



2023 State Hazard Mitigation Plan

State of Alabama

FEMA Approval Date:
August 17, 2023



Executive Summary Background

On October 20, 2000, the U.S. Congress passed the Disaster Mitigation Act of 2000, also known as DMA2K. Among its other features, the Disaster Mitigation Act of 2000 (DMA2K) established a requirement that, in order to remain eligible for federal disaster assistance and grant funds, states and localities must develop and adopt hazard mitigation plans. On February 26, 2002, the Federal Emergency Management Agency (FEMA) published an Interim Final Rule that provided the guidance and regulations under which such plans must be developed. The Final Rule was released in October 2007, and technical corrections were made in September 2009. The Final Rule on standard state mitigation plans and enhanced state mitigation plans is found in the Code of Federal Regulations (CFR) at 44 CFR Parts 201.4 and 201.5 (October 1, 2010). The CFR provides detailed descriptions of both the planning process that states and localities are required to observe, as well as the contents of the plan that emerges.

Additionally, the Flood Insurance Reform Act of 2004 (P.L. 108-264) created two new grant programs: the Severe Repetitive Loss (SRL) and Repetitive Flood Claim (RFC) programs. The Act also modified the existing Flood Mitigation Assistance (FMA) program. One of the provisions of this Act is that if a state includes certain elements as required by the Act, the state will be eligible for an increased federal cost share (100%) for projects funded under the Flood Mitigation Assistance and Severe Repetitive Loss programs that address mitigation of severe repetitive loss properties.¹ Alabama has addressed the repetitive loss provisions required by the Act in the Mitigation Strategy section of this plan.

Act of 2012 extended the National Flood Insurance Program (NFIP) through 2017 and included several reforms, including eliminating subsidized insurance rates for repetitive loss properties. Since 2017, the Consolidated Appropriations Act of 2014 prohibited the implementation of sections of the Biggert-Waters Flood Insurance Reform Act, effectively stopping certain rate increases as a new law was being developed. The Homeowner Flood Insurance Affordability Act of 2014 repealed parts of the previous law, restored grandfathering and limits on rate increases, and updated the approach to ensure the fiscal soundness of the fund by applying an annual surcharge to policyholders.

On October 17, 2004, the State of Alabama officially adopted the initial Alabama Statewide Hazard Mitigation Plan in response to the requirements of DMA2K and CFR Section 201.4(a). In addition, Section 201.4(d) mandates, as amended, that a state update its plan every five years “to reflect changes in development, progress in statewide mitigation efforts, and changes in

¹ Bunning-Bereuter-Blumenau Flood Insurance Reform Act of 2004. <https://www.congress.gov/bill/108th-congress/senate-bill/2238/text>

priorities.” The first update to this plan was approved on October 19, 2007. The 2023 version of this plan is the fifth update in response to the DMA2K requirements.

The State of Alabama will continue to comply with all applicable federal statutes and regulations related to hazard mitigation planning during the periods for which it receives grant funding, in compliance with 44 CFR 201.4 (7). Further, the State of Alabama will amend its plan whenever necessary to reflect changes in state or federal laws and statutes, as required in 44 CFR 201.4(7).

Organization of the Plan

The Alabama Hazard Mitigation Plan is organized into the following nine sections.

Table 1: Plan Contents

Section Number	Section
	Executive Summary
	Plan Approval, Adoption, and Assurances
Section 1	The Planning Process
Section 2	Alabama’s Current and Future Conditions
Section 3	Risk Assessment
Section 4	Capability Assessment
Section 5	Mitigation Strategy
Section 6	Plan Maintenance
Appendices	A. Approval and Implementation B. Glossary of Acronyms and Terms C. Coordination of Local Planning D. Comments Received from SHMTF and FEMA E. Planning Process Documents F. Technological Hazards G. Hazard Mitigation Grant Program Implementation Process H. Updates to the 2018 Mitigation Action Plan

There are references to the Code of Federal Regulations (CFR) throughout the plan as appropriate. These refer to specific section and subsection notations of federal authority outlining the requirements for producing a hazard mitigation plan that meets the criteria set forth and used by the Federal Emergency Management Agency (FEMA) to ensure a plan meets the criteria. References are included in the plan for reviewer convenience.

Highlights of the Plan

The purpose of the plan is to rationalize the process of identifying and implementing appropriate hazard mitigation actions across the state. The document includes a detailed characterization of natural hazards statewide; a risk assessment that describes potential losses to physical assets,

people, and operations; a set of goals, objectives, strategies, and actions that will guide the state's mitigation activities; and a detailed plan for implementing and monitoring the required aspects of the plan. The following provides a brief summary of each section of the plan.

Approval and Adoption

This section describes the plan approval and adoption process and provides assurances as required by the CFR. It also includes documents related to plan adoption, including an approval letter from the Director of the Alabama Emergency Management Agency (AEMA).

The Alabama State Hazard Mitigation Plan was adopted by the Governor through the authority delegated to AEMA. Each State Hazard Mitigation Task Force (SHMTF) member was provided a full draft copy of the plan for review, comment, and endorsement prior to its adoption by the Governor. IEM and AEMA will retain information about the comments received and revisions made throughout the planning process. The plan was approved by the Director of the Alabama Emergency Management Agency through authority delegated by the Governor.

The Planning Process

This section includes a detailed description of the planning process and the individuals and agencies that were involved.

As the process of developing the 2004 plan began, Alabama Governor Bob Riley signed Executive Order No. 19 (EO 19). EO 19 established the State Hazard Mitigation Council (also referred to as the State Hazard Mitigation Task Force (SHMTF) throughout this document, directed the members of the SHMTF to participate in the process, and reiterated the importance of the plan for the state. The Governor delegated responsibility for overseeing the development of the plan for the state. The Governor delegated responsibility for overseeing the development of the plan to the AEMA. Since the Executive Order was signed, the SHMTF has been the core group responsible for all decisions about the planning process and content of plan updates. During the 2023 plan update process, the SHMTF met ten times during the development of the plan and, during the meetings, considered and approved or amended aspects of the plan. A list of the SHMTF members and other agencies involved in the planning process is provided in Section 1.

After all sections of the draft plan were completed, the plan was submitted to the SHMTF for review on March 1, 2023; and the final draft was submitted to the group for review and feedback on March 8, 2023, for review prior to submission to FEMA.

Current and Future Conditions

This section includes a detailed description of the demographic, economic, infrastructural, and geographic conditions of Alabama as well as an outline of trends for population and land-use changes. This section is designed to inform the remainder of the plan about the impact that

hazards can have on specific people, industries, or infrastructure currently or in the future. Because of how important these factors are in understanding risk and creating effective mitigation strategies, this section was added to the 2018 update and continued for the 2023 plan.

Risk Assessment

This section includes a detailed description of the process used to identify, assess, and prioritize Alabama’s natural hazard risks. Section 3.1 provides an overview of the identified hazards and the risk ranking methodology. Section 3.2 provides hazard profiles for 14 natural hazards. Section 3.3 provides a more detailed vulnerability assessment and loss estimation for the highest-ranked hazards. Section 3.4 provides a summary of the impact development trends have on the vulnerabilities outlined in Section 3.3.

As part of the plan update process, the State Hazard Mitigation Task Force reevaluated the State’s hazards based on new and current information and modified its risk assessments based on newly available data. These hazards were then evaluated based on newly acquired data, Jurisdictions were then ranked based on their vulnerability and risk.

Capability Assessment

This section includes a detailed description of the state capabilities that will enable it to implement the plan. This includes summaries of the various programs, policies, and legislation as well as the agency programs and all potential funding sources that could be used to implement specific actions outlined in the plan. Through the plan update process, information about the capabilities of all state agencies was gathered and included in Section 4 Capabilities Assessment.

Mitigation Strategy

This section is a description of the state’s mitigation strategy, goals, and actions. The strategy and goals were reviewed and revised, as required, as part of the 2023 update. This process is detailed in Section 1, and the changes are reflected throughout Section 5. The state hazard mitigation general strategy is to “Reduce vulnerability through collaborative actions and policies that limit the effects of natural hazards on the citizens of Alabama and physical assets.”

The State Hazard Mitigation Team and AEMA originally developed six goals for hazard mitigation in 2004 in support of this general strategy. These goals have been revised since the original plan and were revisited again for the 2023 update by the SHMTF.

Table 2: 2023 Mitigation Goals

Goal Number	Goal
Goal 1	Enhance the comprehensive statewide hazard mitigation system.

Goal Number	Goal
Goal 2	Reduce the State of Alabama’s vulnerability and increase its resilience to hazards to protect people, property, and natural resources.
Goal 3	Foster public awareness and understanding of hazard risks and mitigation opportunities.
Goal 4	Expand and promote coordination and communication with other government agencies, local governments, and other relevant organizations.

The SHMTF members updated the mitigation actions relating to their agency from the 2018 Mitigation Action Plan. Each agency provided implementation status, a funding source, and a priority for their actions. In addition, new actions were provided where appropriate, and this information was consolidated to create the 2023 Mitigation Action Plan.

Plan Maintenance

This section describes how the plan will be periodically evaluated and updated. The Final Rule requires that the State Hazard Mitigation Plan be updated and resubmitted to FEMA for reapproval every five years. In addition to meeting this requirement, AEMA will review the plan annually based on criteria described in Section 6.1.3. The criteria to be evaluated are as follows:

- Changes in the level of risk to the state and its citizens.
- Changes in laws, policies, or regulations at the state or local levels.
- Changes in state agencies or their procedures that will affect how mitigation programs or funds are administered.
- Significant changes in funding sources or capabilities.
- Changes in the composition of the State Hazard Mitigation Task Force.
- Progress on mitigation actions (including project closeouts) and new mitigation actions that the state is considering, and
- Major changes to the local or multi-jurisdictional hazard mitigation plans.

In addition, as outlined in Section 6.1.4, AEMA may initiate the review process under the following conditions:

- At the request of the Governor
- When significant new risks or vulnerabilities are identified
- If the findings of the annual/post-disaster review and evaluation indicate it is warranted.

Section 6.1 describes the process that AEMA will use to initiate and complete periodic reviews and updates. The interim reviews may be relatively straightforward, but the five-year update is expected to comprise a comprehensive update and multi-stage process similar to that of initial plan development.

Section 6 (Plan Maintenance) describes how the state will monitor mitigation activities and measure progress toward achieving the goals described in Section 5 (Mitigation Strategy).

Plan Approval, Adoption, and Assurances

Plan Approval and Adoption Process

Background

Executive Order No. 19 delegates plan development and approval authority to the Director of the Alabama Emergency Management Agency (AEMA). As discussed in earlier sections, EO 19 also designates specific agencies and organizations statewide to participate as members of a State Hazard Mitigation Task Force (SHMTF throughout this document).

The SHMTF last approved this plan in September 2018 and has been involved with the 2023 plan update process. Meeting minutes document the presentation materials and discussions and are provided in Appendix E. This version of the 2023 plan was reviewed and approved by the SHMTF, AEMA, and the Governor's Office prior to submission to FEMA.

AEMA Review and Approval

After all comments are compiled and incorporated, the Director of AEMA will review the document for approval and formal adoption on behalf of the Governor as was the case in previous versions.

Formal Adoption Documents

By agreement between FEMA Region IV and AEMA, the official adoption documents will be provided after FEMA's final review and conditional approval of the plan.

Assurances

The assurances required by 44 CFR Part 201.4 (c) (7) will be included in Appendix A of this plan and contained within the AEMA letter of approval.

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1. The Planning Process

1.1 Description of the Planning Process

The 2023 Alabama State Hazard Mitigation Plan (SHMP) update (plan update) is the result of input from state agencies and groups working together to coordinate between state and local planning efforts in a manner that is consistent with federal regulations. This section provides an overview of the planning process used to develop this plan update and to demonstrate compliance with applicable federal regulations regarding how SHMPs must be developed and updated.

1.1.1 How the 2023 Plan Was Prepared and Updated

1.1.1.1 General Requirements

The 2023 Alabama SHMP is the fifth version of this plan. The initial plan (2004) was prepared according to the process established in the How-To Guides produced by FEMA and the requirements of 44 CFR 201.4. Subsequent plans were developed according to the legislative requirements and updates to the FEMA hazard mitigation guidance.

The initial planning process established in 2004 included vital functions that have been maintained for use during later plan updates. Early in the development of the initial plan, on February 24, 2004, Governor Robert Riley signed Executive Order 19 (EO 19), which outlined the infrastructure around which the initial and later planning process updates should occur.² To this end, EO 19 set forth the following planning process parameters:

- Established the State Hazard Mitigation Council (also known as the State Hazard Mitigation Task Force, or SHMTF), whose role is further described in Section 1.2.2.3
- Encouraged representatives from all state agencies to attend SHMTF meetings
- Directed all state agencies to participate in the development of the plan by providing support as requested by the SHMTF
- Encouraged agencies and other interested parties to participate in the planning process by providing comments and information during meetings, such as through the use of a Government Agency Survey and ongoing communications to stakeholders and meeting participants
- Directed the SHMTF to meet when called by the Chair and remain in place until the five-year update to the plan has been approved by FEMA

² EO 19 by Governor Bob Riley. Alabama Department of Archives & History. Retrieved at: <http://digital.archives.alabama.gov/cdm/singleitem/collection/executive/id/540/rec/2>

During the current planning process, each section of the 2018 plan was revised, and these revisions were approved by the SHMTF. FEMA Region 4 provided input while participating in all 2023 planning meetings, and helped ensure that a solid, approvable plan was presented to the region for approval and later adoption by the AEMA Director on behalf of the Governor.

The 2023 Plan Maintenance section also calls for the SHMTF to assemble annually during the five-year period for which the plan applies, and before the next update is developed, to review and evaluate the plan in the following areas:

- Changes in risk
- Changes in laws, policies, or regulations at the state or local level
- Changes in state agencies or their procedures that may affect mitigation programs or their administration of funds
- Changes in funding sources or capabilities
- Changes in the composition of the SHMTF
- Progress on mitigation actions and new mitigation actions being considered
- New mitigation action items developed

These meetings allowed the SHMTF to review the progress of mitigation actions included in the current plan and develop potential content for inclusion in the next Alabama SHMP revision.

AEMA began working on the 2023 plan update in August 2022 and hired the consulting firm IEM to support the planning process. Work on the 2023 update followed the updated requirements outlined in FEMA's latest version of the *State Mitigation Policy Planning Guide* (April 2022), the requirements of which apply to all plans seeking agency approval on or after April 19, 2023.

The planning process used to develop the Alabama 2023 SHMP is described in this section.

1.1.1.2 Project Management

AEMA and IEM held regular project management conference calls throughout the planning process, starting with an AEMA/IEM Coordination Call to initiate the project. The Project Planning Conference Call was held on July 22, 2022, to introduce the planners from AEMA and IEM, determine an initial strategy for updating the plan, and review the project schedule. Through this and subsequent calls held using the Microsoft Teams platform, AEMA closely monitored the update process and provided direction on both the review of the 2018 State Hazard Mitigation Plan and the creation of the 2023 update. Meetings with the project Steering Committee were held in between those involving the entire SHMTF and the Hazards Working Group.

1.1.1.3 SHMTF Planning Process Meetings

AEMA hosted nine (10) virtual planning meetings with the SHMTF and/or the Hazards Working Group during the planning process. In between these meetings, a steering committee comprised

of AEMA and IEM staff debriefed on meetings held, planned the agenda for upcoming meetings, and discussed issues raised during Task Force meetings that required further consideration.

Table 1.1: Planning Process Meetings

	Date	Meeting Focus
1.	August 23, 2022	Kickoff Meeting
2.	September 13, 2022	Risk Assessment Methodology and Outreach Strategy
3.	October 25, 2022	Profiling Natural Hazards – Hazards Working Group
4.	November 3, 2022	Risk Assessment – Meeting 1
5.	November 7, 2022	Risk Assessment – Meeting 2
6.	November 10, 2022	Hazard Ranking
7.	November 29, 2022	Mitigation Strategy Meeting
8.	February 1, 2023	Initial Review of Draft Plan Sections
9.	March 1, 2023	Initial Review – 2023 State Hazard Mitigation Plan
10.	March 22, 2023	Final Review – State Hazard Mitigation Plan

The plan update was also discussed during three meetings of the Alabama Association of Emergency Managers (AAEM). Two meetings, held on August 4, 2022 and September 19, 2022, included tabletop exercises to prepare members for challenges that might occur during the upcoming winter season. The third meeting, held December 6, 2022 to December 7, 2022, was the organization’s annual meeting. Documentation for all three meetings is included in Appendix E and includes meeting agendas showing the 2023 SHMP as a discussion topic.

In addition to the AEMA Task Force meetings, IEM met individually with program leaders whose subject matter expertise helped shape discussion of mitigation activities mentioned in the plan. One such meeting was held on October 4, 2022, with the state National Floodplain Insurance Program (NFIP) coordinator, who also serves as the state floodplain manager. Discussion included issues such as state-owned and state-leased structures, community NFIP participation, and dams located in the state.

The highlights of each Task Force meeting are outlined in the next section. For each meeting, the agenda, slide deck, notes, and lists of attendees are included in Appendix E (Planning Process Documents). The good attendance at all meetings from a cross-section of stakeholders is a tribute to AEMA’s outreach efforts. The planning process was heavily promoted internally through meeting invitations and project emails that included plan updates, all of which served to promote excellent state agency and stakeholder attendance. Participants were also asked to complete a Government Agency Survey to determine community capabilities.

1.1.1.3.1 Kickoff Meeting

The purpose of the Kickoff Meeting, held on August 23, 2022, was to convene all SHMTF members and present the following information at the outset of the project:

- Project goals and objectives
- Purpose and benefits of hazard mitigation planning
- Project schedule and tasks, including updated Risk Assessment
- Capability Assessment and Mitigation Strategy
- Roles of IEM, AEMA, and the SHMTF in developing the plan update
- Hazard analysis and risk assessment methodology

Throughout the meeting, AEMA and the facilitators emphasized the importance of stakeholder participation at the planning meetings. Participants were asked to identify additional stakeholders who should be invited to participate in the planning process.

All federal and state representatives were invited to the Kickoff Meeting, and, among others, the following representatives from state and federal government attended the meeting:

- Three federal agencies: the United States Army Corps of Engineers (USACE), FEMA Region 4, and several offices of the National Weather Service (NWS)
- Numerous state agencies and regional agencies and other participants, including the Alabama Association of Emergency Managers:
 - Alabama Emergency Management Agency, including AEMA/Legal
 - Alabama Community College System
 - Alabama Department of Insurance
 - Alabama Department of Agriculture and Industry
 - Alabama Office of Water Resources, including Floodplain Management
 - Alabama Department of Economic and Community Affairs
 - Choctawhatchee, Pea, and Yellow Rivers Watershed Management Authority
 - Lee-Russell Council of Governments
 - Governor's Office on Disability
 - Alabama Department of Public Health
 - Top of Alabama Regional Council of Governments (TARCOG)
 - Geological Survey of Alabama
 - Alabama Department of Transportation
 - East Alabama Regional Planning and Development Commission
 - One dual-mission department, the Alabama National Guard (ALNG)

1.1.1.3.2 Risk Assessment Methodology and Outreach Strategy Meeting

The SHMTF met on September 12, 2022, for the Risk Assessment Methodology and Outreach Strategy Meeting. SHMTF members received a briefing on the outreach strategy and reviewed the proposed list of hazards. Participants discussed FEMA's State Mitigation Plan Policy Guide, which requires that the effects of climate change be addressed in each hazard profile. Participants

discussed whether to include the technological hazards listed in the 2022 Emergency Operations Plan (EOP) in the plan update, although no consensus was reached.

1.1.1.3.3 Risk Assessment Meeting

The SHMTF met on October 25, 2022, to discuss the risk assessment methodology. Participants again reviewed the ranking of natural hazards included in the 2018 SHMP and participated in a priority risk exercise to identify each hazard based on criteria that included the probability of occurrence, the level of deaths or injuries that could result from a hazard occurrence, the level of property damage that could be caused by the hazard, the hazard location, and the extent of the hazard, measured according to scientific scales developed for each hazard. An example of this is the Saffir-Simpson Scale, which is used to categorize a hurricane's strength by wind speed.

The ranking exercise resulted in several hazards being identified as being of higher or lower risk to the community than was indicated in the 2018 plan. IEM emphasized that the technological hazards would not be reviewed by FEMA but could be included if the group felt strongly about doing so. The Task Force elected to include technological hazards in the 2023 SHMP update.

1.1.1.3.4 Hazard Identification Workshop 1

The SHMTF met on November 3, 2022, to review hazards profiled in the 2018 plan and discuss whether they should be included in the 2023 plan and whether they should remain classified as low, medium, or high hazard. Members of the Hazards Working Group were also invited to this meeting. The meeting was repeated on November 7, 2022, to enable Task Force members with scheduling conflicts to participate in one meeting or the other. The meeting offered participants new to the mitigation planning process a chance to ask questions about profiling hazards according to the five FEMA-prescribed elements to be included in each hazard profile: description of the hazards, location, magnitude (or extent), previous occurrences, and future probability.

1.1.1.3.5 Hazard Identification Workshop 2

The SHMTF met on November 7, 2022, to review hazards profiled in the 2018 plan, discuss whether they should be included in the 2023 plan, and determine whether they should remain classified as low, medium, or high hazard. This meeting was a repeat of the one held on November 3, 2022, for the benefit of members of the Task Force and Hazards Working Group who were unable to attend the earlier meeting due to scheduling conflicts.

1.1.1.3.6 Hazard Ranking Meeting

The SHMTF met on November 10, 2022, to discuss the Hazard Ranking, which included the ranking of natural hazards. Technological hazards included in the SHMP are the same as those included in the state's 2022 Emergency Operations Plan.

1.1.1.3.7 Mitigation Strategy Meeting

The SHMTF met on November 29, 2022, to discuss the 2023 Mitigation Strategy. A list of the mitigation action items included in the 2018 plan was sent to Task Force members before the

meeting so attendees could provide status updates for each action. The meeting also included a discussion of current hazards of concern and new mitigation actions that could be included in the 2023 update.

1.1.1.3.8 Initial Review of SHMP Sections

The Task Force and stakeholders met on March 1, 2023 to review the initial draft of the SHMP. The draft plan was distributed in two formats to members of the Task Force and stakeholders, although many attendees expressed difficulty accessing the document. IEM summarized the work done by the group and discussed each section of the plan using a Power Point presentation. Throughout the meeting, Task Force members were provided an opportunity to ask questions and recommend additional changes or updated information for inclusion into the draft plan; to ensure information included is correct; and to inquire whether additional information needed to be included. Those present were asked to review the full plan and submit additional comments or recommended revisions to AEMA and IEM by March 10 so their input could be included in the final draft plan.

1.1.1.3.9 Final Review of the State Hazard Mitigation Plan

The SHMTF convened virtually on March 22, 2023, to review the Final Draft of the revised SHMP, which included the group's corrections and recommended changes received to date. Participants provided additional feedback on sections discussed and were reminded that all feedback about recommended revisions or corrections needed to be submitted to AEMA by March 29, 2023 so a final copy of the plan could be produced and reviewed by AEMA and the Governor's Office before it was forwarded to FEMA Region 4 for review and approval.

1.1.1.4 Submission to FEMA

The final draft plan was sent to FEMA Region 4 on (date pending), along with a copy of a completed Plan Review Tool identifying where FEMA reviewers could find information required to address each planning element. FEMA returned its version of the completed Review Tool on (date pending). A summary of comments received from all who provided feedback is available in Appendix D, which also includes a copy of the final FEMA Plan Review Tool documenting FEMA's comments. Appendix D also includes input received from SHMTF members, stakeholders, counties, and the public.

1.1.2 Who Participated in the Planning Process?

Under the leadership of AEMA Director Jeff Smitherman, the Alabama State Hazard Mitigation Task Force (SHMTF) was the primary mechanism for developing and updating the 2023 State Hazard Mitigation Plan. The SHMTF, however, represents a larger organization and process, including the following entities:

- The Governor of Alabama

- Alabama Emergency Management Agency
- Regional Planning Commissions (RPCs)
- AEMA Geographic Divisions
- Other federal and state agencies and interested groups
- County stakeholders and representatives of the Regional Planning Councils
- Consulting firm IEM

Previous versions of this plan included a Technical Advisory Committee (TAC). For the 2023 update, the TAC was replaced by the Hazards Working Group, which included those with expertise in certain hazards who would be able to help identify and rank hazards of concern, and to broaden the discussion of each hazard's impact on the state.

The following sections describe the roles that each participating entity played in the planning process.

1.1.2.1 The Governor of Alabama

By issuing EO 19 on February 24, 2004, the Governor initiated the development of the SHMTF, designated its members, outlined their tasks, and appointed the Director of AEMA to lead the planning effort. The plan update will be approved and adopted by the Governor through the AEMA Director, as was done in previous versions of the plan.

1.1.2.2 The Alabama Emergency Management Agency (AEMA)

AEMA is the lead agency for developing and updating the plan. Although the SHMTF is the group responsible for providing the essential inputs required to update the revision, AEMA serves as a coordinating entity that manages the planning process. The agency facilitated interactions among various participating federal, state, and local governments, and provided oversight and quality control to ensure that the plan and the planning process met FEMA requirements as outlined in 44 CFR and the FEMA hazard mitigation planning guidance. AEMA, with the support of IEM in its role as the project contractor, established a schedule of meeting dates, oversaw updating all sections of the plan, and fostered the involvement of agencies at all levels of government. The AEMA Director was also responsible for rendering final approval and adoption of the plan on behalf of the Governor's Office, which reviewed the final plan before it was sent to FEMA Region 4 for review and approval.

1.1.2.3 The State Hazard Mitigation Task Force

For the 2023 plan update, the name of the group overseeing the mitigation planning process was changed from the State Hazard Mitigation Team (SHMT) to the State Hazard Mitigation Task Force (SHMTF) in keeping with naming conventions used elsewhere in state government. The SHMTF provided overall support and guidance to AEMA throughout the plan update process. Group members were designated by the Governor via EO 19 and were comprised largely of a

cross-section of state organizations that were originally identified to be on a similar team under a previous administration. Federal and regional agencies or groups also participated as a part of the SHMTF. Throughout the plan update, minor changes have been made as new stakeholders have been identified.

AEMA, working together with the SHMTF, oversaw each step of the planning processes and the development of plan content. The SHMTF met 10 times during the plan development process outlined in Section 1.2.1.3. Involvement in these groups was essential because members contributed the following:

- Provided input during each planning process meeting
- Recommended and provided to the AEMA Director sources of information that would be useful in developing the plan
- Provided input on the development of each section of the plan
- Reviewed and provided feedback on the draft plan

SHMTF participants included in EO 19 are listed here, and their participation is also documented in Appendix E (Planning Process Documents).

- The Governor or a Governor's designee (serving as Chairperson of the Task Force)
- The Commissioner of the Alabama Department of Agriculture and Industries (AGI)
- The Attorney General
- The Commissioner of the Alabama Department of Conservation and Natural Resources (DCNR)
- The Director of the Alabama Department of Economic and Community Affairs (ADECA)
- The Director of the Alabama Emergency Management Agency
- The Director of the Alabama Department of Environmental Management (ADEM)
- The State Forester of the Alabama Forestry Commission (AFC)
- The Office of the State Geologist
- The State Historic Preservation Officer
- The Commissioner of the Insurance Department
- The Director of the Governor's Legal Counsel Office
- The Director of the Alabama Department of Public Health (ADPH)
- The Director of the Governor's Public Information Office
- The Director of the Alabama Law Enforcement Agency (ALEA)
- The Commissioner of the Alabama Public Service Commission (PSC)
- The Secretary of State
- The Director of the Alabama Department of Transportation (ALDOT)
- The Director of the Alabama Association of Regional Councils

- The Director of the Alabama League of Municipalities
- The Director of the Alabama Association of County Commissioners
- The Director of the Indian Affairs Commission
- The Chief of the U.S. Army Corps of Engineers
- The Director of the Choctawhatchee, Pea and Yellow Rivers Watershed Management Authority (CPYRWMA)

In addition to the individuals and agencies directly assigned to the SHMTF, EO 19 asked other federal agencies or groups to establish points of contact for HMP efforts:

- The American Red Cross
- The Alabama Military Department (Alabama National Guard)
- The National Weather Service (NWS), Birmingham
- The National Weather Service (NWS), Huntsville
- The National Weather Service (NWS), Mobile
- The National Weather Service (NWS), Tallahassee
- U.S. Air Force, Maxwell AFB
- U.S. Army, Fort Rucker Army Post
- U.S. Department of Agriculture (USDA) Forest Service (USFS)

During the 2023 planning process, AEMA tracked the participation of these entities and developed Table 1.2 to summarize their level of involvement. While EO 19 identifies each participant as being the director or commissioner of agencies and other groups, a designee was often invited or participated on their behalf. Lists of attendees (including names of individual attendees and the agencies that they represent) for each SHMTF meeting may be found in Appendix E.

Table 1.2: Summary of Agencies or Groups Represented at SHMTF Meetings

Agency or Group	Requested by EO 19	Representative Identified for the 2023 Update	Attended at Least One 2023 SHMPTF Meeting	Provided Supporting Data and Documentation
Governor's Office	X	X	X	
Alabama Department of Agriculture and Industries	X	X	X	
Office of the Attorney General, State of Alabama	X	X	X	
Alabama Department of Conservation and Natural Resources	X	X	X	

Agency or Group	Requested by EO 19	Representative Identified for the 2023 Update	Attended at Least One 2023 SHMPTF Meeting	Provided Supporting Data and Documentation
Alabama Department of Economic and Community Affairs	X	X	X	X
Alabama Emergency Management Agency	X	X	X	X
Alabama Department of Environmental Management	X	X	X	X
Alabama Department of Finance-Division of Construction Management				X
Alabama Forestry Commission	X	X	X	
Office of the State Geologist Geological Survey of Alabama	X	X	X	X
State Historic Preservation Officer/ Alabama Historical Commission	X	X	X	X
Alabama Department of Insurance	X	X	X	
Governor's Legal Counsel Office	X	X		
Alabama Department of Public Health	X	X	X	
Governor's Office of Public Information	X	X		
Alabama Law Enforcement Agency	X	X		
Alabama Public Service Commission	X	X	X	
Office of the Alabama Secretary of State	X			
Alabama Department of Transportation	X	X	X	

Agency or Group	Requested by EO 19	Representative Identified for the 2023 Update	Attended at Least One 2023 SHMPTF Meeting	Provided Supporting Data and Documentation
Alabama Association of Regional Councils	X	X	X	
Alabama League of Municipalities	X	X		
Association of County Commissioners of Alabama	X	X		
Alabama Indian Affairs Commission	X	X		
U.S. Army Corps of Engineers	X	X	X	
Choctawhatchee, Pea, and Yellow Rivers Watershed Management Authority	X	X	X	
American Red Cross	X	X	X	
Military Department (Alabama National Guard)	X	X	X	
National Weather Service, Birmingham	X	X	X	
National Weather Service, Huntsville	X	X	X	
National Weather Service, Mobile	X	X	X	
National Weather Service, Tallahassee	X	X	X	
U.S. Air Force, Maxwell AFB	X	X		
U.S. Army, Fort Rucker Army Post	X			
USDA Forest Service	X	X	X	
Alabama Division of Risk Management				
Alabama Department of Senior Services				
Alabama Department of Human Resources		X	X	
Alabama Department of Finance				

Agency or Group	Requested by EO 19	Representative Identified for the 2023 Update	Attended at Least One 2023 SHMPTF Meeting	Provided Supporting Data and Documentation
Alabama State Department of Education		X		
Troy University				
Poarch Band of Creek Indians		X	X	
Federal Emergency Management Agency		X	X	

The importance of each agency's participation cannot be overstated. For example, information from the Department of Finance, Division of Construction Management plays an integral role in the discussion of hazards and community vulnerabilities. Section 5, Mitigation Strategy includes references to specific mitigation and structural hardening requirements required to ensure community resiliency against all hazards, particularly earthquake events that are likely to affect the state. The Division provided the most recent code revisions that will reduce the loss of life and damage to property during a given hazard event, be it an earthquake or otherwise.

1.1.2.4 Regional Planning Councils

Alabama's planning assets include 12 Regional Planning Councils (RPCs) that provide a host of services to the counties in their respective regions. All counties in Alabama are part of an RPC. Historically, RPCs have provided oversight and coordination in developing and updating county-level hazard mitigation plans. In recent years, the RPC has developed divisional hazard mitigation plans whose planning area includes all counties covered by their organization, although some counties maintain their own hazard mitigation plans.

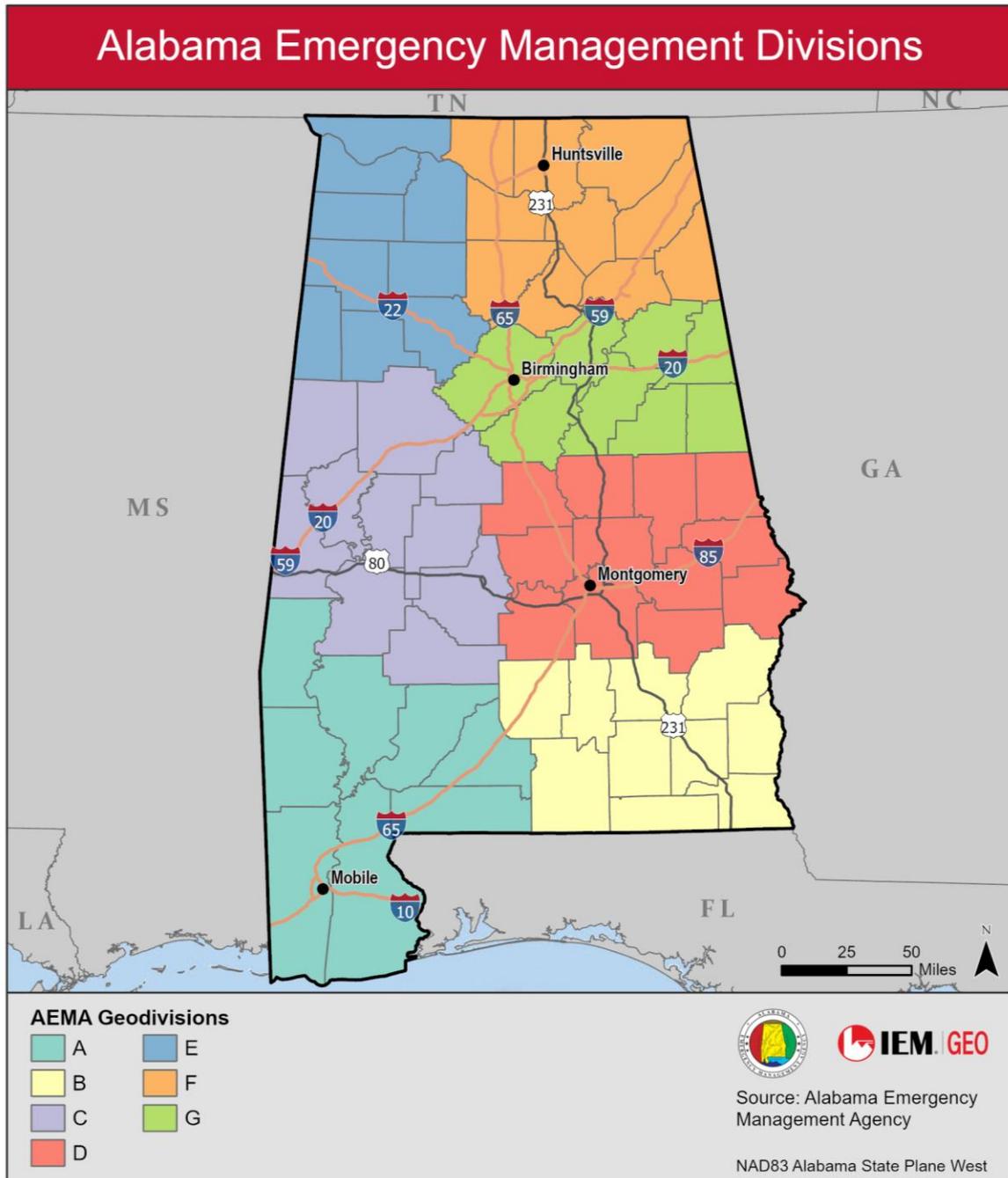
For the 2023 plan update, AEMA's seven regional divisions (named Division A through Division G) worked with the 12 RPCs to promulgate information about the state plan and to gather input from local and regional plans to inform the state-level process. The RPCs are included here and in Appendix E because, in the case of a few counties, the RPCs still maintain some responsibility for the update of local hazard mitigation plans (LHMPs). RPC members also attended SHMTF meetings and actively participated in the discussion of plan elements.

1.1.2.5 AEMA Geographic Divisions

As was the case in developing earlier versions of the SHMP, AEMA and the SHMTF interacted with the 12 RPCs to coordinate information between county plan development and that of the state plan. For the 2023 update process, AEMA and the SHMTF facilitated the planning process by collaborating with staff from AEMA's seven geographic divisions (Division A to Division G) within AEMA's organizational structure. These divisions provided a mechanism for county-level

collaboration and coordination during the development and update of the State Hazard Mitigation Plan. Division meetings are held quarterly and are attended by relevant county stakeholders. In keeping with the outreach strategy (see Section 1.1.3.2) and the project timeline, AEMA and the SHMTF provided materials for distribution to stakeholders at each quarterly meeting to provide information about the state plan update and to gather input about the local and county plans to inform the state-level process. Divisional staff attended SHMTF meetings to provide their community perspective, learn about the SHMP update process, and share this information with their counties.

Figure 1.1: Alabama Emergency Management Divisions



1.1.2.6 Other Federal and State Agencies and Interest Groups

Early in the planning process, AEMA and the SHMTF identified organizations they felt should be involved in the plan development process, including federal and state agencies and others that may be involved in hazard mitigation efforts. In the first stages of the process, AEMA and IEM conducted outreach to these groups, and points of contact were identified. Throughout plan development, these participants were kept informed of the planning process and its outcomes.

Because EO 19 formally established the SHMTF, this group is the only body directly authorized to make decisions about what is included in the plan. However, at points in the process, these other organizations were invited to review materials related to the plan and provide feedback.

FEMA provided technical assistance at every step in the planning process and kept AEMA abreast of the latest requirements needed in the state plan update. AEMA informed FEMA of the planning process and process benchmarks and invited FEMA to participate in all SHMTF meetings. The input of FEMA representatives often provided information and insights not previously addressed but important to consider in developing an approvable plan.

1.1.2.7 County Stakeholder Involvement

Stakeholders from each county were invited to participate in meetings during the mitigation planning process. The name of each county and the meeting(s) that one or more of its representatives attended are shown in Table 1.3.

Table 1.3: County Participation in SHMTF Meetings

County	11/3/22 Risk Assess- ment	11/7/22 Risk Assess- ment 2	11/10/22 Natural Hazards Work Group	11/29/22 Mitigation Strategy	2/1/23 SHMP Sections Review	3/1/23 Initial SHMP Draft Review	3/1/23 Final SHMP Draft Review
Autauga				X			
Baldwin		X		X		X	
Barbour							
Bibb							
Blount							
Bullock							
Butler							
Calhoun	X	X					
Chambers		X		X			
Cherokee							
Choctaw							
Chilton					X		
Clark		X	X				
Clay							
Cleburne							
Coffee	X						
Colbert		X	X				
Conecuh	X	X			X	X	
Coosa							

County	11/3/22 Risk Assess- ment	11/7/22 Risk Assess- ment 2	11/10/22 Natural Hazards Work Group	11/29/22 Mitigation Strategy	2/1/23 SHMP Sections Review	3/1/23 Initial SHMP Draft Review	3/1/23 Final SHMP Draft Review
Covington							
Crenshaw							
Cullman	X	X	X	X			
Dale		X	X	X			
Dallas							
DeKalb							
Dothan						X	
Elmore	X	X	X	X	X		
Escambia		X					
Etowah	X						
Fayette							
Franklin							
Gadsden	X						
Geneva							
Greene							
Hale							
Henry							
Houston							
Jackson							
Jefferson							
Lamar							
Lauderdale							
Lawrence							
Lee						X	
Limestone	X						
Lowndes							
Macon							
Madison							
Marengo							
Marion							
Mobile							
Monroe							
Montgomery							
Morgan		X					

County	11/3/22 Risk Assess- ment	11/7/22 Risk Assess- ment 2	11/10/22 Natural Hazards Work Group	11/29/22 Mitigation Strategy	2/1/23 SHMP Sections Review	3/1/23 Initial SHMP Draft Review	3/1/23 Final SHMP Draft Review
Perry				X			
Pickens							
Pike	X						
Randolph							
Russell		X					
St. Clair							
Shelby	X	X					
Sumter		X	X				
Talladega							
Tallapoosa		X					
Tuscaloosa				X			
Walker							
Washington							
Wilcox							
Winston							

1.1.2.8 Public Involvement

In addition, AEMA representatives discussed the SHMP update at the agency's Initial Planning Meeting and Mid-Term Planning Meeting for the 2022 Winter Weather Tabletop Exercise. Materials from the planning meetings are included in Appendix E. The PowerPoint presentation indicates that the SHMP update was discussed with a range of AEMA stakeholders, as is documented by the sign-in sheets. Entities and their representatives attending the meetings are shown here:

- AEMA administrative staff
- AEMA Divisional Coordinators and staff (7 divisions)
- State and Divisional Emergency Operations Center:
 - SEOC staff, including Communications, Finance, Recovery, and Field Operations
 - Operations of all branches/Emergency Management Centers
 - Logistics
 - Planning
 - ESF-2 (State)
 - External Affairs
 - Divisional counties

- Divisional ESFs
- Governor's Office of Volunteer Services
- County emergency management agencies
- State agencies (Alabama National Guard)
- Federal agencies (U.S. Air Force and the National Weather Service)
- Non-governmental agencies, including the American Red Cross and the Salvation Army
- Private partners, including the Southern Company (utilities) and T-Mobile (telecommunications)

1.1.2.9 Consultant Assistance in Developing the Plan

In addition to the support provided by the organizations previously mentioned, AEMA secured the services of IEM, an international consulting firm experienced in mitigation planning and the other phases of disaster response and recovery. The IEM team met regularly with AEMA to discuss the status of the planning process, coordinated all SHMTF and other meetings, and managed the technical and logistical elements of the planning process. Specific tasks managed by the IEM consulting team to assist AEMA and the SHMTF included the following:

- Provided technical assistance to ensure the 2023 plan update met the requirements outlined in FEMA guidance and 44 CFR 201, including planning guidance and federal compliance
- Collected and analyzed data from the appropriate local, state, and federal sources to describe Alabama's current and future conditions
- Collected and analyzed data for the risk assessment from the appropriate local, state, and federal sources
- Collected and analyzed data from the appropriate state and local agencies for the capability assessment
- Facilitated SHMTF meetings
- Developed materials for meetings
- Documented the plan update process, including developing meeting notes and the lists of invitees and attendees
- Developed and facilitated an outreach strategy to, directly and indirectly, engage stakeholders and the public in the planning process, primarily with each county's emergency management directors sharing information about the plan in their outreach efforts
- Worked with the SHMTF to revise and update the mitigation strategy (including mitigation goals, objectives, and actions)
- Collected and incorporated new data and feedback into the 2023 plan update
- Prepared the draft plan and final plan documents

- Incorporated feedback received from the SHMTF, stakeholders, the community, and FEMA Region 4 into the final plan in order to meet the needs of all participants and be aligned with federal guidance

In addition, the IEM Geographical Information Services (GIS) department worked with AEMA's GIS specialist throughout the planning process to develop updated hazard maps, data tables, and other plan inputs. AEMA provided the shape file of Alabama counties used to update maps included in all plan sections. The Alabama Geological Survey provided a liquefaction fact sheet used to develop the earthquake and landslide maps and hazard profiles. Additional data were acquired through a variety of websites and open data portals, including those of the Alabama Geological Survey, the U.S. Census Bureau, the USGS, the USDA, NOAA, and others. The IEM team used these inputs to update hazard profiles and create updated maps throughout the plan. IEM conducted Hazus module runs (version 6.0) for the earthquake, high winds, hurricane, and flooding profiles, and a SLOSH model for storm surge. The results of each hazard run are included in the hazard profile sections of the plan and elsewhere in the SHMP update.

1.1.3 How Other Agencies Participated in the Planning Process

1.1.3.1 General Participation

A cross-section of state agencies, federal agencies, and community groups was designated by EO 19 as participants in the planning process or were invited to participate, as in the case of federal and community-based organizations. Participants were encouraged to participate in the planning process in several ways. Their primary means of doing so was by attending the SHMTF meetings and engaging in discussions and decisions about various plan procedures and components. The documentation for the entire planning process may be found in Appendix E and includes lists of those invited to participate, attendees, handouts, PowerPoint presentations, and meeting notes.

A range of federal agencies and departments were also identified in EO 19 as recommended participants. Agencies and departments were invited to each SHMTF planning meeting and were encouraged to provide input on all aspects of the plan. AEMA was established as the main point of contact for this purpose, and telephone numbers and email addresses were provided for communications with the federal agencies.

During the 2023 plan update process, AEMA and IEM tracked participation by these state and federal agencies and groups. Refer to Section 1.1, Table 1.3, for a summary of participation by these agencies.

1.1.3.2 Outreach Strategy

44 CFR 201.4 states that “the mitigation planning process should include...interested groups.” AEMA and its consultant developed an outreach strategy to meet this requirement and facilitate

the participation of agencies and groups outside of AEMA. The agency and IEM defined a successful outreach strategy as one that meets the following requirements:

- Informs and educates the community about hazards and risks
- Invites interested parties to contribute feedback at all stages of the planning process about the best ways to implement effective mitigation actions
- Early in the process, identifies potential challenges to implementing mitigation goals and promotes understanding among stakeholder groups about how mitigation improves community resiliency across the board
- Secures data and other inputs that improve the overall quality and accuracy of the plan
- Manages a transparent mitigation planning process that builds trust among planning participants
- Uses a consensus-building approach to plan development by involving a diverse group of stakeholders to engage in shared learning and decision making

The goals of the outreach strategy were as follows:

- **Identify stakeholders:** The plan update process will identify organizations and stakeholders that AEMA and the SHMTF would like to recruit as planning process participants.
- **Promote direct engagement:** To ensure comprehensive outreach, invitations to stakeholder meetings should be sent to stakeholders in all areas of the state.
- **Foster indirect engagement:** Technological solutions should be leveraged to allow for more comprehensive awareness and involvement in the planning process.
- **Document outreach:** All planning outreach efforts should be documented and captured within the plan, including any related meeting materials and notes.

AEMA promoted each segment of the outreach strategy in four specific ways:

- **Conducted outreach to critical partners.** AEMA coordinated with the SHMTF to identify potential partners among the types of organizations that FEMA encourages engagement with during the planning process: emergency management, economic development, land use and development, health and social services, housing, infrastructure, and natural and cultural resources. AEMA and SHMTF determined that they did not have appropriate state-level contacts with organizations recommended by FEMA but will continue to explore partnerships with these types of organizations. They also concentrated on building out organizational involvement by engaging these identified organizations, re-engaging partners involved in the 2023 plan update, and conducting targeted outreach to organizations in each of the FEMA-recommended categories above.
- **Leveraged existing cohorts and/or stakeholder/public engagement activities.** AEMA prepared plan update information for distribution to stakeholders at the quarterly meetings of each AEMA geographic division based on the project timeline.
- **Developed a distinctive and cohesive 2023 SHMP Update brand.** With direction from AEMA about state and departmental style preferences, IEM developed a planning style guide and templates specifically for the 2023 SHMP and associated planning materials, including the updated 2023 SHMP update logo.

- **Ensured meeting materials and plan elements are available for stakeholder and public review.** As discussed earlier, the 2023 plan update process endeavored to secure feedback from all community elements. To satisfy the requirement that the plan be a publicly available resource and thus ensure a comprehensive outreach approach the AEMA website was updated to include the following:
 - Copies of the draft and final plans
 - A link to the AEMA point of contact, who would receive recommendations for updating the plan content
 - A link to the draft plan, which was available March 1, 2023, and maintained through submission to FEMA
 - A link to the final plan being submitted to FEMA

IEM also conducted one-on-one meetings with Task Force members to secure their input on hazards for which they are considered subject matter experts. For example, the Alabama Geological Survey provided invaluable input on earthquakes, landslides, and land subsidence hazards. Updated material incorporated into the 2023 plan includes updated inputs identified for each plan section, including discussion of the hazard analysis, risk and vulnerability assessments, an updated mitigation strategy, and an updated plan maintenance section. The Office of Water Resources supplied information about dams and dam initiatives.

AEMA also collaborated with stakeholders in the following ways in presenting the draft and final plans for review:

- **Generated awareness and fostered engagement through email distribution, ongoing communication, and regular meetings.** These communications provided an update on the planning process and provided planning participants with information to be discussed at upcoming meetings so those attending could share their experiences and perspectives on the issues being discussed. Planning participants were also asked to provide information on all plan sections and to help generate and review plan components as they were developed.
- **Documented outreach activities.** All meeting materials and planning activities were captured and are included in Appendix E of this plan. This includes each meeting's agenda, slide deck, meeting minutes, and list of attendees. An ongoing outreach strategy was also developed for the plan maintenance portion of this document, which is described in Section 6 of the Base Plan.

1.1.4 Agency Coordination During Development of the 2023 State Hazard Mitigation Plan

AEMA secured significant participation on the part of state agencies and stakeholders by assembling an SHMTF that represented a cross-section of departmental and community interests and whose subject matter expertise included all facets of emergency management and management of programs that included mitigation-related activities.

1.1.4.1 Incorporate Information and Data from Local Hazard Mitigation Plans

44 CFR 201.4 requires that state hazard mitigation plans contain a review of FEMA-approved local hazard mitigation planning efforts, including risk assessments and mitigation goals and actions. Considerable progress has been made in local-level planning. When the initial State Hazard Mitigation Plan was developed in 2004, no local hazard mitigation plans had been approved. The number of approved plans (and approved updated plans) has increased with each plan update process. By the 2013 state plan update, most counties had an approved update. At the time of the 2023 state plan update, all counties had approved LHMP updates, or an updated plan was under development. Coordination between AEMA, its local divisions, county emergency management agencies (EMAs), and the 12 RPCs enabled Alabama communities to meet the FEMA funding requirement of having an updated LHMP.

Information from the most recently available LHMPs was reviewed, and information was extracted and incorporated into the 2023 SHMP update, including information from the local risk assessment and mitigation strategy sections. This process ensured that the statewide planning effort included both “top-down” and “bottom-up” opportunities for input and plan development. The process also illustrates how state and local plans dovetail to provide a consistent approach to fostering statewide resilience. The integration of local plans is described further in Section 1.2 and referenced throughout this plan.

1.1.4.2 Cooperatively Completing the Risk Assessment

AEMA also consulted with state and federal agencies represented on the SHMTF to secure data and provide guidance while updating the Risk Assessment. For example, the National Oceanic and Atmospheric Administration (NOAA) provided data from Sea, Lake, and Overland Surges from Hurricanes (SLOSH) models and sea level rise trend data for coastal area analysis. The Office of Water Resources, housed in the Alabama Department of Economic and Community Affairs (ADECA), provided dam inventory information, a critical first step to ensuring community safety. FEMA Region 4 provided National Flood Insurance Program (NFIP) claims data. Agencies consulted by AEMA include those managing statewide mitigation programs that are discussed in Section 4.6.

Table 1.4 is a legend of the agencies and organizations shown in Table 1.5, which shows the sources of inputs used to develop the 2023 Risk Assessment.

Table 1.4: Legend for Hazard Data Source Abbreviations

Abbreviation	Agency/Organization
AFC	Alabama Forestry Commission
ASCE	American Society of Civil Engineers
ASCE/SEI	ASCE Structural Engineering Institute
ASDSO	Association of State Dam Safety Officials

Abbreviation	Agency/Organization
Climate Central	Climate Central
Climate Impact Lab	Climate Impact Lab
FEMA	Federal Emergency Management Agency
GSA	Geological Survey of Alabama
ICC	International Chamber of Commerce
NCEI	National Center for Environmental Information
NDMC	National Drought Mitigation Center
NHC	National Hurricane Center
NLDN	National Lightning Detection Network
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
SERCC	Southeast Regional Climate Center
SGSF	Southern Group of State Foresters
UCS	Union of Concerned Scientists
U.S. Climate Data	U.S. Climate Data
U.S. Dept. of Commerce	U.S. Department of Commerce
U.S. Dept. of Interior	U.S. Department of the Interior
U.S. Drought Monitor	U.S. Drought Monitor
USACE	U.S. Army Corps of Engineers
USDA-RMA	U.S. Department of Agriculture Risk Management Agency
USFS	U.S. Forest Service
USGS	U.S. Geological Survey

Table 1.5: Data Sources for Hazard Information

Agency/ Organization	Dam Failure	Droughts	Earthquakes	Extreme Temperatures	Flooding	Hail	High Winds	Landslides	Lightning	Sea Level Rise and Coastal Land Change	Sinkholes and Land Subsidence	Tsunamis	Wildfire	Winter Storm
ADECA-OWR	X	X												
AFC													X	
ASCE	X													
ASCE/SEI							X							
ASDSO	X													

Agency/ Organization	Dam Failure	Droughts	Earthquakes	Extreme Temperatures	Flooding	Hail	High Winds	Landslides	Lightning	Sea Level Rise and Coastal Land Change	Sinkholes and Land Subsidence	Tsunamis	Wildfire	Winter Storm
Climate Central														X
Climate Impact Lab				X										
FEMA	X	X	X	X	X	X	X		X					X
GSA			X					X			X			
ICC							X							
NCEI						X			X					
NDMC		X												
NHC					X									
NLDN									X					
NOAA		X		X	X	X	X		X	X		X		X
NWS		X		X	X	X	X		X					
SERCC				X										
SGSF													X	
UCS										X				
US Climate Data				X										
US Dept. of Commerce										X				
US Dept. of Interior													X	
US Drought Monitor		X												
USACE	X													
USDA-RMA		X												
USFS													X	
USGS			X		X			X		X	X	X	X	
Vaisala, Inc.									X					

AEMA also worked with state departments and agencies to identify state-owned and/or operated critical facilities that are included in the discussion of community vulnerability. 44 CFR 201.4 states, "State-owned critical or operated facilities...shall also be addressed." Databases including such facilities were merged and used to develop a Geographic Information System (GIS) spatial

overlay of critical facilities vulnerable to one or more hazards. The process of doing so is described further in Section 3.3 (Vulnerability Assessment & Loss Estimation).

The Risk Assessment was finalized after comments and verification were received during several SHMTF meetings. The Hazards Working Group provided input on the ranking of natural and technological hazards, so each hazard was identified as being of low, medium, or high concern to the state. While all local, state, and federal representatives were invited to meetings at which the risk assessment was discussed, AEMA specifically reached out to county representatives to secure their perspective on how hazards affect communities located across the state, and how hazards affecting one area of the state may differ from those in another geographic region.

1.1.4.3 Coordination to Develop the Mitigation Strategy

AEMA worked with the SHMTF to develop the Mitigation Strategy presented in Section 5. AEMA requested that all Task Force members, especially those named as the Responsible Agency for one or more mitigation action(s) listed in the Strategy, do the following:

- Review and update their mitigation actions from the 2018 plan
- Identify new mitigation actions pursued since 2018 or actions the entity would like to add to the plan
- Validate new mitigation actions developed by AEMA and all affected state agencies

AEMA received input and verified information to be included in the Strategy at the November 29, 2023, Mitigation Strategy Meeting, to which all state, federal, and county stakeholders were invited. The Mitigation Strategy was finalized to include all the input received.

1.1.4.4 Coordination with FEMA During the Planning Process

Region 4 staff were invited to all meetings of the Task Force and the Hazards Working Group held between the project kickoff meeting and the March 8, 2023, final draft plan review meeting. FEMA staff were active meeting participants, and their technical assistance included general guidance on the plan update process, especially for the new FEMA HMP requirements outlined in the 2022 SHMP updated planning guidance. This support helped expedite the agency's final review of the submitted plan and accompanied the Plan Review Tool.

1.2 Coordinating Local Planning

1.2.1 Process for Reviewing, Coordinating, and Linking the State and Local Plans

The connection between developing the SHMP and developing local hazard mitigation plans (LHMPs) is a critical one and integral to ensuring the two support each other in terms of how risk is assessed, and mitigation strategies developed.

During the 2023 planning process, the most recent versions of the seven regional and other individual county plans were reviewed for inputs to include in the 2023 SHMP. The review of local plans focused on three primary elements of each:

- Hazard identification and hazard profiles
- Potential loss estimates
- Mitigation goals and actions

This review ensured that the state's mitigation strategy reflects the mitigation strategies of each community. AEMA used this opportunity to identify how hazards affect each section of the state to a greater or lesser degree and to suggest how local plans can be improved during their next update. In future versions of this plan, information from recently updated LHMPs will continue to be incorporated into the state plan, primarily in the sections discussing hazard identification, potential loss estimates, and mitigation goals and actions. The following sections describe the methodology used to review the local plans and a summary of the results.

1.2.2 Review and Incorporation of Local Plan Information into the State Plan Update

1.2.2.1 Hazard Identification and Profiles

As part of the plan update process, the hazard profile sections of all local hazard mitigation plans were reviewed to determine which hazards were identified and profiled by local jurisdictions.

The purpose of this review was to ensure consistency between the state and local plans. The 2023 SHMP uses the same list of natural hazards that was included in the 2018 plan and includes technological hazards listed in the 2022 State Emergency Operations Plan. The technological hazards are not included in the Base Plan but are discussed in Appendix F.

Most county plans profiled the same hazards identified in this plan, with coastal counties profiling hazards unique to the coastal area (e.g., sea level rise, coastal land change, and tsunamis). Some county plans combine some of the hazards that are separated in this plan, such as winter storms and extreme temperatures. For a more complete description of this review process, including a tabular summary of hazards profiled in county plans, refer to Section 3.1.3 (Hazards Profiled in County Plans) and Table 3.5 (Summary of County Hazard Mitigation Plans).

1.2.2.2 Potential Loss Estimates

In previous versions of this document, AEMA conducted an initial review of the loss estimates contained in each local plan to identify common elements that could be incorporated into the plan update. However, local plan developers often used a wide range of methodologies to determine these potential loss estimates and were able to include loss estimates only for hazards for which there is ample historical data, including tornadoes, flooding, high winds and windstorms, and hurricanes. Tornadoes, windstorms, and hurricanes were grouped into a single hazard, High

Winds, in LHMPs developed since 2013, and this approach is used in the 2023 plan update. For the 2023 plan, the SHMTF selected four hazards for a detailed Vulnerability Analysis and Loss Estimation (see Sections 3.1 and 3.3). This analysis included loss estimates at the state level for all four hazards for state-owned or state-insured facilities, as well as potential loss estimates per county for three of the four selected hazards.

Consistent with previous plans, flooding, high winds, and earthquakes were selected for detailed vulnerability analysis at the county level. IEM GIS specialists used FEMA's Hazus loss estimation software to determine potential county-level loss estimates for each of these three hazards. Hazus (Hazard US) is an integrated GIS-based simulation program designed to provide consistent and standardized assessments of vulnerability and provides more transparent and effective approaches to setting local and state priorities. Analysis using other data sources is included for sea level rise and coastal land change. Each Hazus analysis calculated two types of economic losses: (1) immediate losses related to the damage to structures and their contents; and (2) business interruption losses depending on how long businesses remained inoperable after a hazard event. This methodology is described in detail in Vulnerability Assessment & Loss Estimation (Section 3.3.1). While the 2023 plan update includes a Hazus analysis for sea level rise and coastal land change, the risk, vulnerability, and loss estimates are limited to state-owned or state-insured facilities (see Section 3.3.5). County-level loss estimates for sea level rise and coastal land change were not available for this plan.

1.2.2.3 Mitigation Goals and Actions

The final part of the local plan review involved reviewing the local mitigation strategy, including goals and actions. Each LHMP was reviewed to determine if the actions included therein were the same as those defined in the state plan and, conversely, to determine if the state hazard mitigation goals were reflective of local goals, objectives, and actions. Goals included in local plans may not be worded the same as those in the SHMP because the focus area is different (i.e., a plan for a county or region versus for statewide coverage), but the meaning and intent were the same. The 2023 state hazard mitigation goals, further discussed in Section 5.1.1, are as follows:

- **Goal 1:** Enhance the comprehensive statewide hazard mitigation system.
- **Goal 2:** Reduce the State of Alabama's vulnerability and increase its resilience to hazards to protect people, property, and natural resources.
- **Goal 3:** Foster public awareness and understanding of hazard risk and mitigation opportunities.
- **Goal 4:** Expand and promote coordination and communication with other government agencies, local governments, and other relevant organizations.

All communities established goals that were aligned with the last three goals of the SHMP, and many stated goals that were in keeping with Goal 1 but with a local focus. Table 1.6 summarizes the results of the review of county and regional plans.

Table 1.6: Review of County Plan Goals Against 2023 State Plan Goals

County	State Goal 1	State Goal 2	State Goal 3	State Goal 4
Autauga		X	X	X
Baldwin		X	X	X
Barbour		X	X	X
Bibb		X	X	X
Blount		X	X	X
Bullock		X	X	X
Butler		X	X	X
Calhoun		X	X	X
Chambers		X	X	X
Cherokee		X	X	X
Chilton		X	X	X
Choctaw		X	X	X
Clark	X	X	X	X
Clay		X	X	X
Cleburne		X	X	X
Coffee		X	X	X
Colbert	X	X	X	X
Conecuh	X	X	X	X
Coosa		X	X	X
Covington		X	X	X
Crenshaw		X	X	X
Cullman		X	X	X
Dale		X	X	X
Dallas	X	X	X	X
DeKalb		X	X	X
Elmore		X	X	X
Escambia		X	X	X
Etowah		X	X	X
Fayette				
Franklin	X	X	X	X
Geneva		X	X	X
Greene				
Hale				
Henry		X	X	X

County	State Goal 1	State Goal 2	State Goal 3	State Goal 4
Houston		X	X	X
Jackson		X	X	X
Jefferson		X	X	X
Lamar	X	X	X	X
Lauderdale		X	X	X
Lawrence	X	X	X	X
Lee		X	X	X
Limestone		X	X	X
Lowndes		X	X	X
Macon		X	X	X
Madison		X	X	X
Marengo		X	X	X
Marshall		X	X	X
Marion	X	X	X	X
Mobile		X	X	X
Monroe		X	X	X
Montgomery		X	X	X
Morgan		X	X	X
Poarch Creek Indians- Tribe Nation	X	X	X	X
Perry	X	X	X	X
Pickens				
Pike		X	X	X
Randolph		X	X	X
Russell		X	X	X
St. Clair		X	X	X
Shelby	X	X	X	X
Sumter		X	X	X
Talladega		X	X	X
Tallapoosa		X	X	X
Tuscaloosa				
Walker	X	X	X	X
Washington		X	X	X
Wilcox				
Winston	X	X	X	X

1.2.3 Coordination with FEMA During the Planning Process

AEMA and FEMA continued to work cooperatively during the 2023 plan update. FEMA Region 4 participated in the plan update process by providing technical assistance and general guidance on the process. FEMA also provided data for the Risk Assessment (see Table 1.5).

1.2.4 Future Local Plan Review and Incorporation

The 2023 SHMP reflects local hazard risks, loss estimates, and goals and, as such, is a plan that represents statewide interests and concerns. Because such plan elements change over time, the Disaster Mitigation Act of 2000 and 44 CFR 201.4 require local plans to be updated every five years. As local plans are updated, AEMA and the SHMTF will continue to incorporate the latest information available to update the risk and vulnerability assessments, the mitigation strategy, and other plan sections.

1.3 Summary of Review, Analysis, and Update of Each Section

The following summarizes the methodology utilized to review, analyze, and update each section of the plan. As described in Section 1.2, each plan section was reviewed to determine whether revisions to one or more sections were needed to meet FEMA requirements. The detailed language used in previous sections of this plan has been revised, removed, or reorganized where appropriate, and such changes are identified in each section. This was done to keep the document current and user-friendly while highlighting mitigation planning capabilities that have improved over time. As future SHMP updates are developed, the same update process will be used.

Table of Contents: Revisions to the table of contents reflect the new structure and contents of the 2023 plan update.

Executive Summary: The Executive Summary was moved to the front of the plan and now summarizes the 2023 plan update.

Plan Approval, Adoption, and Assurances: This section was also moved to the front of the plan to highlight the importance of adopting the document once it has received the FEMA designation of Approvable Pending Adoption. Minor changes made in this section reflect the dates for the 2023 plan update process.

Section 1 – The Planning Process: This section was revised to reflect the 2023 plan update planning process. Sub-sections were developed to address how the plan was reviewed and updated. A Summary of Review, Analysis, and Update of Each Section (Section 1.4) was created. Additional edits and restructuring include the following:

- Information about integrating mitigation planning elements with those of other planning and program initiatives is now included in Section 4 (Capability Assessment).
- Coordinating Local Planning (Section 1.3), which was a stand-alone section in the 2018 Plan, was revised and integrated with other elements in Section 1 (The Planning Process).
- Criteria for Prioritizing Jurisdictions to Receive Funds Under Existing Programs, a subsection of Coordinating Local Planning in the 2018 plan, was renamed Prioritization of Funding and moved to Section 5 (Mitigation Strategy) as described below.

Section 2 – Alabama’s Current and Future Conditions: This section was introduced in the 2018 plan and discusses the demographic, economic, and geographic profile of the state.

Section 3 – Risk Assessment: The risk assessment section was updated as appropriate to provide information about the state’s current level of risk and vulnerability. Also, each of the hazard profiles was reviewed to determine if more current information was available based on recent studies, actual hazard events, or input from state agencies and local stakeholders. Several SHMTF members provided up-to-date information for inclusion in the hazard profiles section.

Adjustments were made to the content of Section 3 (Risk Assessment). Impacts of Development Trends on Vulnerability was updated based on the information identified in Section 2 (Alabama’s Current and Future Conditions). Additionally, the methodology for prioritizing the list of identified hazards for further analysis was revised so it would be in accord with that used in the state Emergency Operations Plan (EOP). The SHMTF and IEM developed a risk factor (RF) analysis, which ranks hazards by the degree of risk they pose based on a set of factors deemed important by the Task Force and other stakeholders. The RF approach called for detailed risk assessments for earthquakes, high winds (hurricanes, thunderstorms, tornadoes), flooding, sea level rise, and coastal land change. Additional discussion of the RF approach is included in Section 3.1.2.

The methodologies used to update and maintain the vulnerability assessment and potential loss estimates were reviewed from the previous plan update and used as appropriate in this update. Potential loss estimates were updated for the selected hazards (floods, high winds, earthquakes, and local sea level rise and coastal land change) using the identified methodologies and the most current data available, as described in Section 3.3.

Section 4 – Capability Assessment: The content in this section was extracted from the Planning Process and the Mitigation Strategy sections in previous plans to be a stand-alone section. The content pulled from the 2018 Mitigation Strategy includes the following:

- Discussion and evaluation of state pre- and post-disaster hazard management policies, programs, and capabilities (Section 4.1)
- Evaluation of state laws, regulations, policies, and programs related to hazard mitigation and development in hazard-prone areas (Section 4.2)
- State funding capabilities for hazard mitigation projects (Section 4.3), including updated information about ongoing and new FEMA grant programs, such as the recently developed Rehabilitation of High Hazard Potential Dams (HHPD) grant program and the Building Resilient Infrastructure and Communities (BRIC) program, both of which offer tremendous

opportunities for Alabama to identify, and potentially secure funding for, projects to upgrade critical facilities and infrastructure that serve extended geographic areas

- General description and analysis of the effectiveness of local mitigation policies, programs, and capabilities (Section 4.4)

The assessments of state and local capabilities, including state funding capabilities, were reviewed to determine whether the remaining information is relevant. If there have been changes in capabilities, or if new capabilities have been added or existing ones revised, information in the SHMP has been revised accordingly.

Integration into Other Ongoing State Planning Efforts (Section 4.5) and Integration into Other FEMA Mitigation Programs and Initiatives (Section 4.6) are incorporated into Section 4 (Capability Assessment) as noted. Information identified in the previous plan as a potential improvement or integration action was reviewed and updated by AEMA or the appropriate agency.

Section 5 – Mitigation Strategy: During the plan update process, the SHMTF reviewed and updated the State Mitigation Strategy (Section 5.1 of this plan) and State Hazard Mitigation Goals (Section 5.1.1) at the Mitigation Strategy Meeting. In addition, each SHMTF agency was asked to provide an implementation update on each mitigation action described by their agency and identified in the 2018 Mitigation Strategy. Each agency was also encouraged to provide new actions that the agency was interested in pursuing. These were incorporated into the updated Mitigation Action Plan (Section 5.1.2).

Strategy for Repetitive and Severe Repetitive Loss Properties (Section 5.1.3) is included in the 2023 plan update.

For the 2023 plan update, the mitigation actions included in Section 5 and Appendix H are listed in two tables. The first includes actions listed in the 2018 plan and provides an update on the status of each action. The 2023 Mitigation Action Plan Review makes recommendations where necessary to accomplish the following:

- Better position certain ongoing actions from the 2018 plan update for implementation during the 2023 planning cycle
- Combine multiple 2018 actions into a single action that will be included in the 2023 plan update

The second table, the 2023 Mitigation Action Plan, includes all actions from the 2018 plan that have been retained and additional actions identified as being worthwhile to include to improve community resiliency. Collectively, all actions presented will address and improve community resiliency during the five-year period covered by the 2023 plan. The 2023 Mitigation Action Plan also employs a new method for prioritizing mitigation actions, as described in Section 5.1.2.2 (Mitigation Action Prioritization).

Other content changes to Section 5 for the 2023 plan update included updating Mitigation Successes (Section 5.3) to address recent mitigation project successes, and new summaries of Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM)/Building Resilient Infrastructure and Communities (BRIC) projects.

Section 6 – Plan Maintenance: The method for monitoring, evaluating, and updating was slightly revised to reflect the plan maintenance activities that were proven to be effective since the 2018 plan was adopted. As outlined in Section 44 of the Code of Federal Regulations (CFR), the discussion of requirements for coordination of local mitigation planning and the development and updating of local mitigation plans have been expanded to include a description of barriers to updating, adopting, and implementing local hazard mitigation plans.

Appendices: Appendices A through H augment the information presented in the Base Plan and are included in the plan as follows:

Table 1.7: Appendices

Appendix	Title/Content
Appendix A	(Plan) Approval and Implementation
Appendix B	Glossary of Acronyms and Terms
Appendix C	Coordination of Local Hazard Mitigation Planning
Appendix D	Comments Received from the SHMTF and FEMA Region 4
Appendix E	Planning Process Documents
Appendix F	Technological Hazards (from the 2022 Alabama EOP)
Appendix G	Hazard Mitigation Grant Program Implementation Process
Appendix H	Updates to the 2018 Mitigation Action Plan

2. Alabama's Current and Future Conditions

2.1 Current Conditions

The current condition of the population, economy, infrastructure, and natural environment in Alabama supports the determination of areas or communities that are more vulnerable to natural hazards. This section outlines the current conditions across these sections and highlights areas of potential or inherent vulnerability.

2.1.1 Demographics

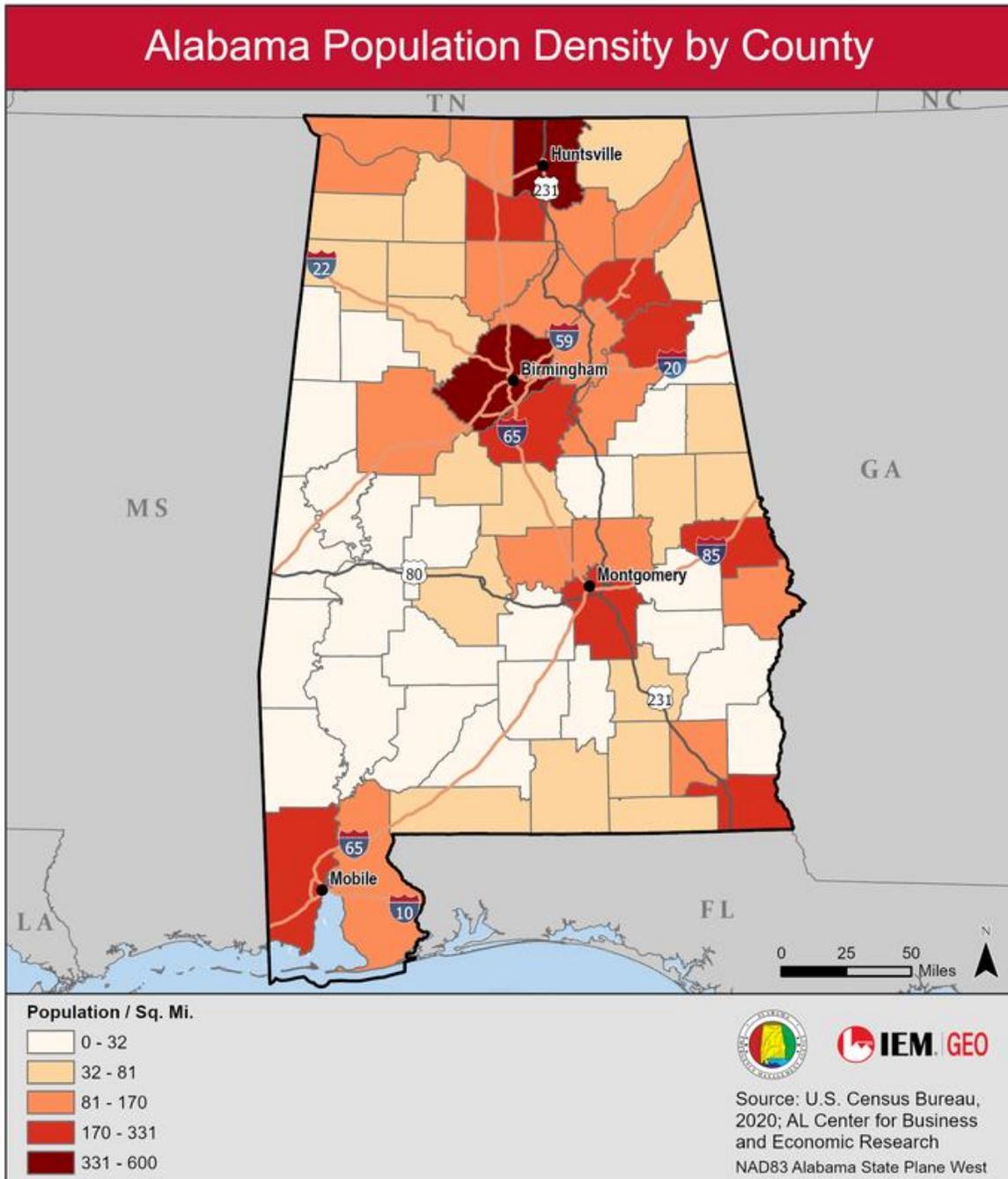
2.1.1.1 Population

Alabama has an estimated total population of 5,039,877, which is an increase of 165,130 people since the last plan update. It is the 24th largest state in the United States in terms of the total population.³ The average population density of the state is 99.2 people per square mile. However, the population density varies throughout the state by county: the maximum population density is 607 people per square mile in Jefferson County, and the minimum population density is 11.8 people per square mile in Perry County.⁴ A map displaying population density per county can be seen in Figure 2.1, followed by a map of the major metropolitan areas in Figure 2.2.

³ 2020 Population and Housing State Data. <https://www.census.gov/library/visualizations/interactive/2020-population-and-housing-state-data.html>

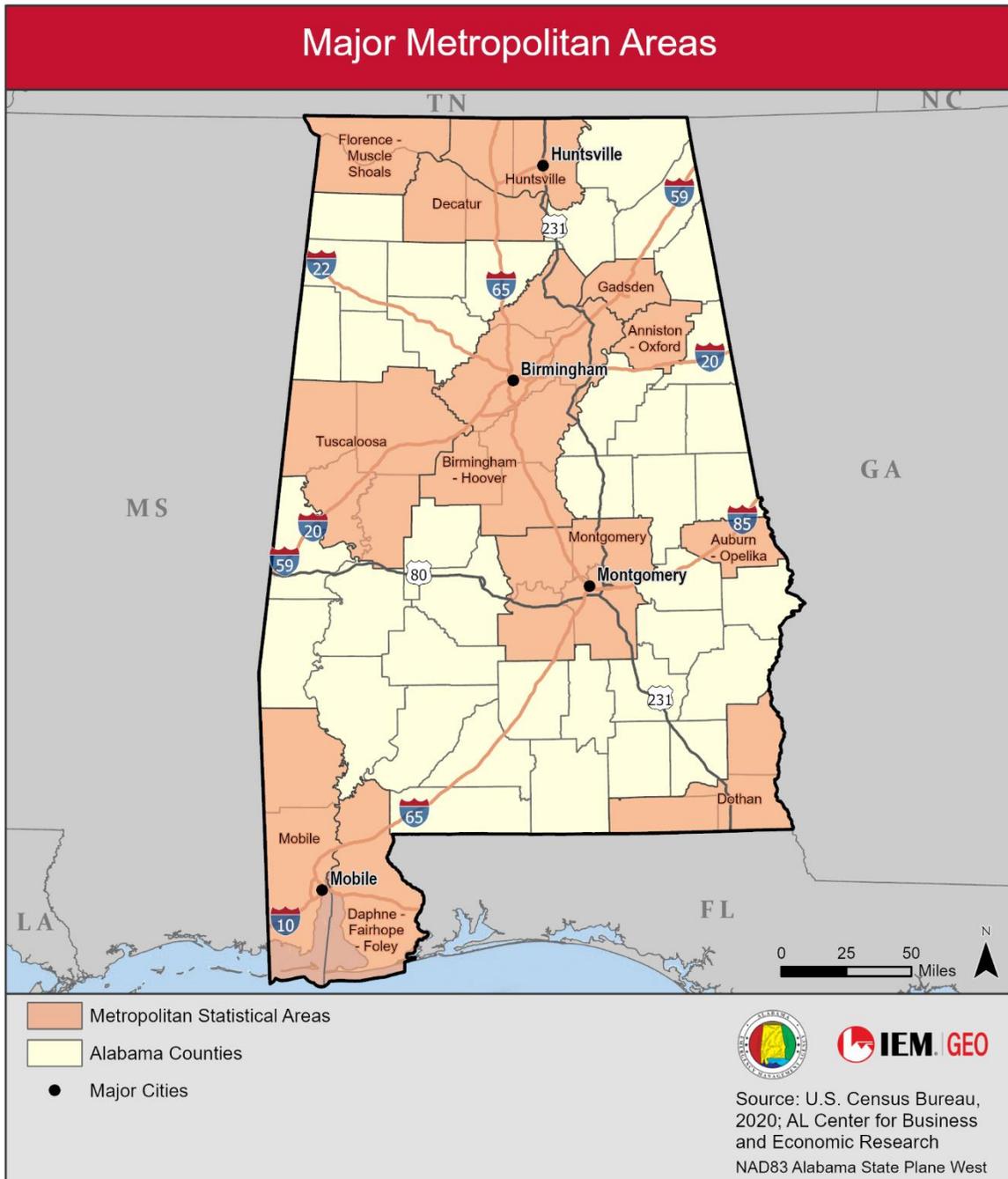
⁴ Densities were calculated by dividing the area of dry land per county by population estimates.

Figure 2.1: Alabama Population Density by County (2020 Census)⁵



⁵ 2020 Population and Housing State Data. <https://www.census.gov/library/visualizations/interactive/2020-population-and-housing-state-data.html>

Figure 2.2: Population Density of Major Metropolitan Areas



2.1.1.2 Population Characteristics

Population growth and distribution, especially regarding increased population density and urbanization, create a corresponding increase the level of vulnerable populations to hazard events. This is especially true as it relates to the State’s most vulnerable populations, which

include the elderly, very young children, those living in poverty and other underserved groups. The following table encapsulates some of the estimated changes from 2010 to 2020 in the statewide overall population and those of the most socially vulnerable and underserved communities. Understanding these characteristics is an important step in achieving equity in hazard mitigation.

A summary of changes in the overall population and percentage of population groups most stressed during and following a disaster are shown in Table 2.1, which compares U.S. Census Bureau findings from the last two decennial reports for the years 2010 and 2020.

Table 2-1: Changes in Select Statewide Population Characteristics, 2010 and 2020

Source: U.S. Census Bureau

Population Characteristic	2010	2020
Total Population	4,779,736	5,074,296
Population 5 and under	6.4%	5.8%
Population 65 and older	15.3%	17.3%
Persons with Disabilities	16.3%	11.5%
Person below poverty level	19.0%	16.1%

Recognizing the effect of disasters on the groups cited in Table 2.1 enables AEMA and its stakeholders and disaster response partners to promote equity in developing the hazard mitigation plan and in identifying mitigation projects that affect these groups.

The elderly, very young, the disabled, those living in poverty, those living without air conditioning or heating, outdoor laborers are most at risk to the effects of extreme heat and winter storms. State residents living in a floodplain are most at risk to flooding. Socially vulnerable and underserved populations may include those who are disabled, those who do not have English as their first language, and people of color. These populations often lack adequate financial resources and have difficulty accessing auxiliary support beyond basic needs. As noted in FEMA's "An Affordability Framework for the National Flood Insurance Program/April 17, 2018", recovering from flood events can be especially challenging because of the financial resources required for flood insurance, flood mitigation measures, and property replacement. Financially disadvantaged populations are often relegated to low-income housing that is in flood-prone areas. Flooding occurs more frequently in these areas, and flood insurance is more expensive for individuals in these areas. Per FEMA's "An Affordability Framework for the National Flood Insurance Program/April 17, 2018", low-income households have great difficulty affording flood insurance, even though they are more likely to be in a flood-prone or special flood hazard area. Renters may have difficulty affording adequate renter's insurance. These factors increase vulnerability and impact. Residents living in the Wildland-Urban Interface (WUI) are most at risk

to wildfires. Those living in poverty and in homes not built using enhanced building codes are most susceptible to the damages of all the natural hazards.

Household income level is an important factor to consider during the mitigation planning process because those living on the margin may not have the resources to improve the resiliency of their homes and other structural assets. Alabama has a median household income of \$52,035, which is lower than the national median income of \$64,004. Alabama has a wide variation of median household income per county, ranging from \$55,088 (Jefferson County) to \$26,150 (Sumter County) and \$78,889 in Shelby County.⁶

It is worth noting that the difference in the percentage of the population living in poverty has decreased from a 2010 figure of 19.0% to a 2020 figure of 16.1%, a difference of 2.9%. According to Alabama Arise, a statewide, community-based organization that advancing public policies to improve the lives of those living in poverty, said the decrease reflects the ability of households to take advantage of the expanded Child Tax Credit (CTC) provision of the American Rescue Plan Act (ARPA), which made the full CTC available to children living in families with low or no earnings. As stated in the organization's September 15, 2022 press release titled "New Census data reveals how good policy choices can cut poverty" (www.alrise.org) also described how the enabled Alabamians to improve their health. The act also extended the credit to include youth up to 17year of age and raised the maximum credit to \$3,000 per child and \$3,600 per child under the age of six. According to Policy changes such as these are credited for not only reducing poverty, but also promoting a healthier population.

Likewise, mobility (or the lack thereof) may affect community members' ability to prepare for and respond to a disaster event. This factor may also present a challenge to educating the public on the hazards facing their community and limit the ability of households to move out of harm's way before a hazard strikes. One measure of population mobility is the type of housing, given that homeowners are less likely to have options for relocation than do renters. In Alabama, an average of 30% of residents are renters, compared to the national average of 13%, implying that Alabama residents are twice as mobile as residents in the rest of the country.⁷ This group is not likely to be able to identify alternate housing should their rental property be structurally damaged during a disaster.

It is also crucial to understand the relationship between population diversity and best practices for communicating to all population segments the planning area's vulnerability to identified hazards, as well as how individuals, households, and businesses may be able to identify and mitigate these vulnerabilities. Language barriers and unique community needs may limit community understanding of hazard-related messages distributed by AEMA, counties, and other agencies

⁶ QuickFacts: Sumter County, Alabama; Jefferson County, Alabama; Alabama; United States.
<https://www.census.gov/quickfacts/fact/table/sumtercountyalabama,jeffersoncountyalabama,AL,US/PST045221>

⁷ ACS B07413 | Geographical Mobility in the Past Year.
<https://data.census.gov/cedsci/table?q=alabama&t=Owner%2FRenter%20%28Tenure%29&tid=ACSDT1Y2021.B07413>

responsible for disaster-related communications. This issue is likely to arise given Alabama's whole community approach to developing and implementing mitigation initiatives.

Alabama's racial and ethnic composition includes a breakdown of 64.2% White (not Hispanic), 25.8% Black (not Hispanic), 4.7% Hispanic, 1.3% Asian (not Hispanic), and 0.3% Other.⁸ Compared to the national average, Alabama has a higher percentage of Black residents (by approximately 13%) and a lower percentage of Hispanic residents (by approximately 14%).⁹ There is one federally recognized tribal government in Alabama, the Poarch Band of Creek Indians, located in Atmore; and about 0.67% of the population is Native American or Alaskan native.¹⁰ Another indicator of diversity can be language. Overall, 1.1% of Alabama's households have limited English proficiency. Language spoken at home can indicate diversity and limited English-speaking households may face direct language barriers that need to be considered and addressed in planning. Limited English-speaking households may need additional support to reduce a language barrier preventing them from participating in mitigation plans and projects.

Alabama faces population vulnerabilities in its older adult and young child populations. Older adults are often less mobile and more likely to have chronic diseases that make them more sensitive to disruptions in their living situations. Young children often cannot care for themselves and may not be able to communicate their needs during a hazard or disaster event, requiring special planning for their needs. Overall, 17.6% of Alabamans are aged 65 or older, and 5.8% are aged 5 or younger, which is consistent with the national average.¹¹ While Alabama has a proportionately sized vulnerable population due to age, over one-fifth of Alabamans are in age groups more vulnerable to the effects of hazards and disasters.

Persons with disabilities or access and functional needs are another important population vulnerability to consider in hazard mitigation planning. Disabled people may require special planning considerations during and following a disaster, especially if they have mobility issues or require regular medical treatment. Disabled people in Alabama make up 16.3% of the total population, which is approximately 13.3% higher than the national average (13%).¹² Being nearly one-fifth of the population, the unique planning characteristics for disabled people are important to consider throughout the hazard mitigation process.

Data such as that provided by the Census Bureau is included in the Social Vulnerability Index (SVI) developed by the Centers for Disease Control and Prevention (CDC). The SVI database shows the degree to which communities may be vulnerable to external community stressors, including the natural and technological hazards profiled as being of concern for the state. The map included as Figure 2.3 shows how the SVI differs among Alabama counties.

⁸ ACS DP05 | ACS Demographic and Housing Estimates.

<https://data.census.gov/cedsci/table?q=alabama&tid=ACSDP1Y2021.DP05>

⁹ ACS S0501 | Selected Characteristics of the Native and Foreign-Born Populations.

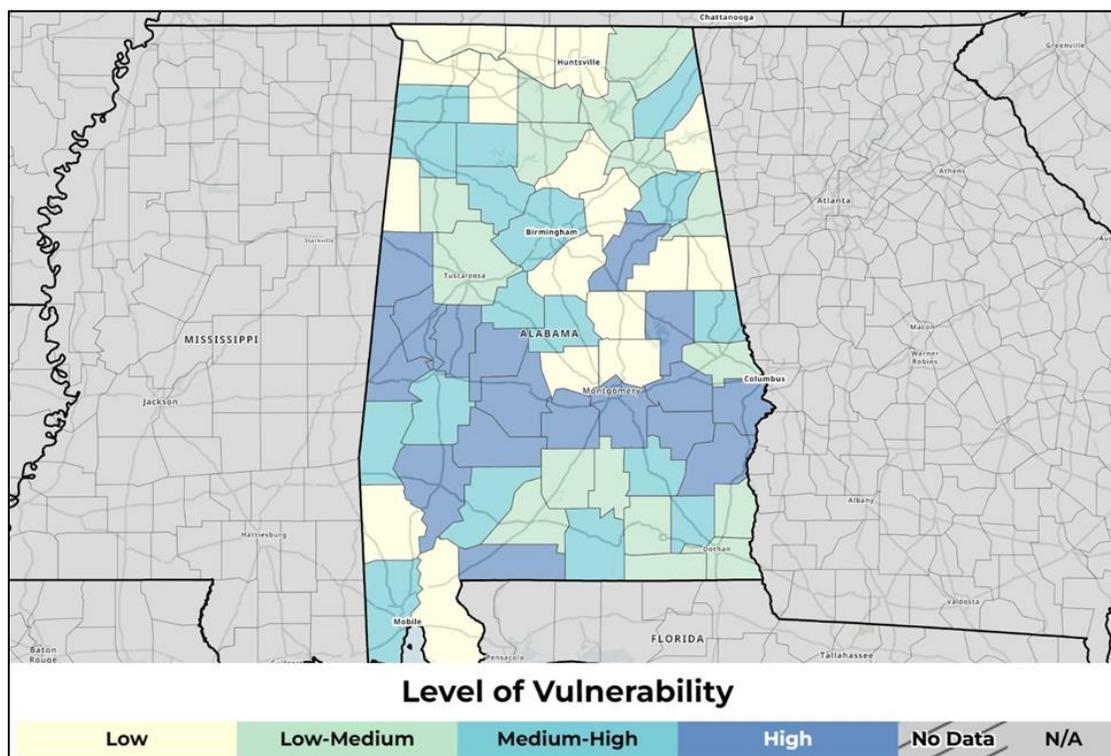
<https://data.census.gov/cedsci/table?q=united%20states&tid=ACSST1Y2021.S0501>

¹⁰ Decennial Census P1 | Race. <https://data.census.gov/cedsci/table?q=alabama>

¹¹ ACS S0601 | Selected Characteristics. [s0601: Selected Characteristics Of ... - Census Bureau Table](#)

¹² ACS S1810 | Disability Characteristics.

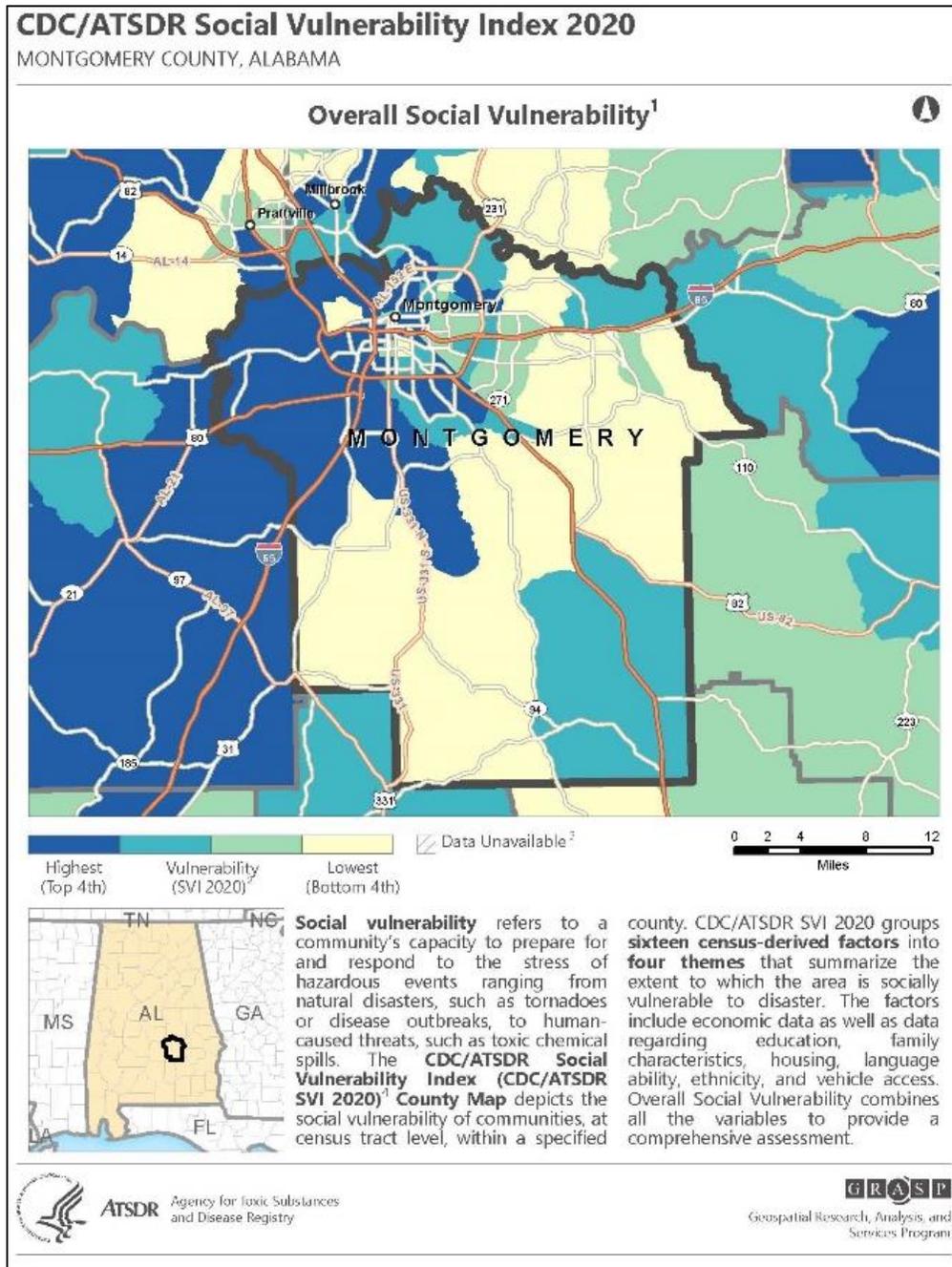
<https://data.census.gov/cedsci/table?q=united%20states&tid=ACSST1Y2021.S1810>

Figure 2.3: Social Vulnerability of Alabama Counties (2020)¹³

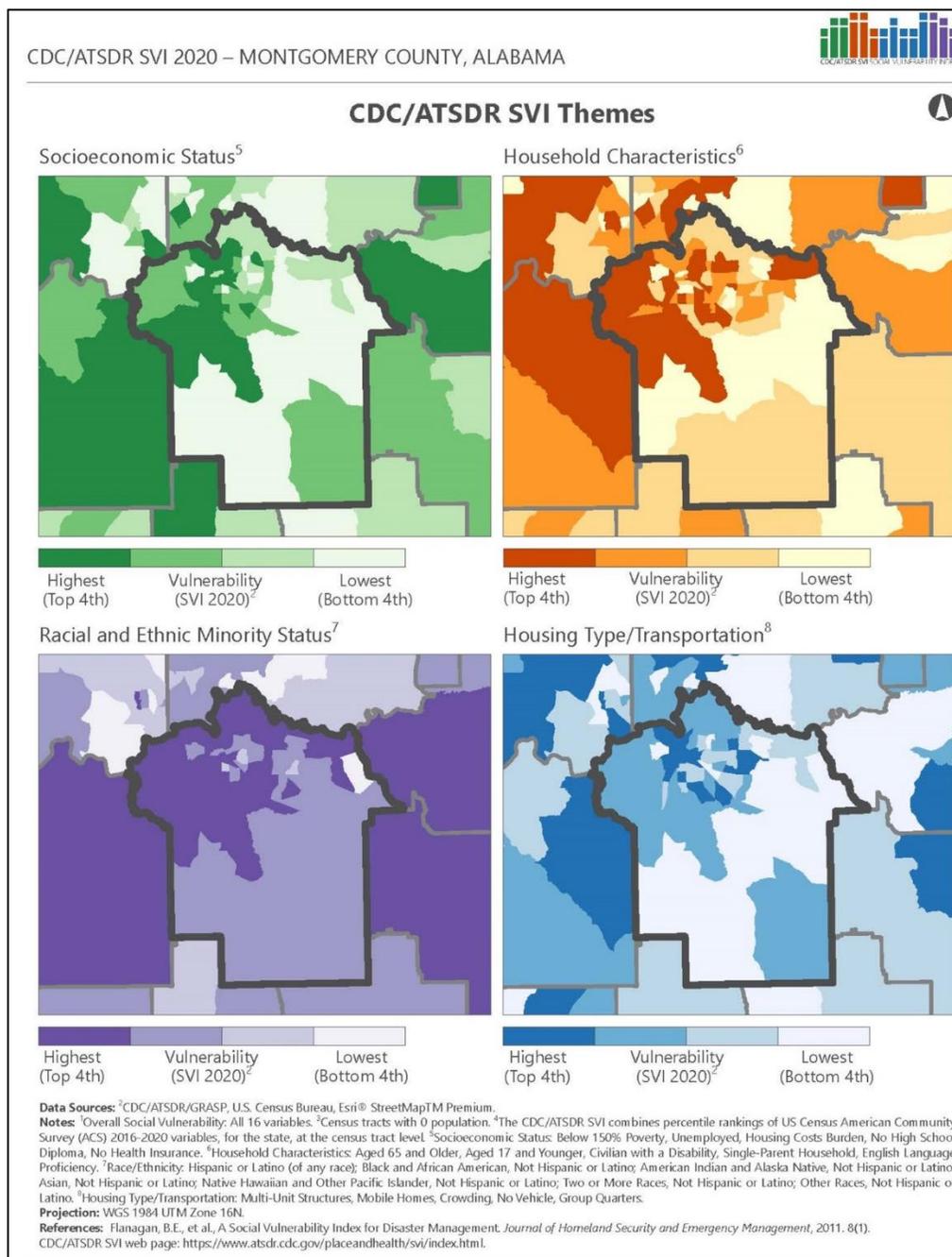
The map shows 32 Alabama counties fall into the Medium-High or High levels of social vulnerability, and only 17 counties are ranked as having a low social vulnerability. The rankings include four primary variables: socioeconomic status, household characteristics, racial and ethnic minority status, and housing type and transportation. These inputs are more fully shown in county-level maps. Maps of this type for Montgomery County are included as an example and serve to illustrate information available for the area that includes the city of Montgomery, the state capital.

¹³ CDC Agency for Toxic Substances and Disease Registry, CDC/ATSDR Social Vulnerability Index 2020 State of Alabama, https://www.atsdr.cdc.gov/placeandhealth/svi/interactive_map.html

Figure 2.4: Overall Social Vulnerability of Montgomery County, AL (2020)¹⁴



¹⁴ Ibid

Figure 2.5: Social Vulnerability of Montgomery County, AL by SVI Themes (2020)¹⁵

AEMA, other state agencies, and stakeholders use social vulnerability indices to ensure hazard mitigation initiatives consider community needs that include those living in older homes that may be less resilient to severe weather; and areas with fewer transportation routes that may be needed should people need to evacuate their home or business. Community levels of social vulnerability have been considered in all aspects of developing the 2023 plan update.

¹⁵ Ibid

2.1.2 Economy and Infrastructure

2.1.2.1 Economy

Alabama has the 20th largest economy in the United States, with a 2021 GDP of \$204.88 billion.¹⁶ Alabama's economy has been growing, with a compound annual growth rate of 1.26% in 2021. The national change was 2.0%. The compound growth rate is a calculation based on the GDP between 2010 and 2021.¹⁷

The largest industries in Alabama in 2022 was trade, transportation, and utilities, which employed 400,000 people. The second largest industry was government, which employed 390,800 people.¹⁸ The fastest-growing industry in Alabama for the year 2022 was construction, accounting for a 10.9% increase from 2021.

Alabama's labor market has an estimated 2,091,500 non-farm jobs and 2,234,900 total employed persons.¹⁹ While the state's unemployment rate (as of September 2022) was lower than the national average, at 2.6%, this still leaves 59,600 people more vulnerable without a steady source of income.²⁰

2.1.2.2 Infrastructure

2.1.2.2.1 Roads, Highways, and Bridges

The quality of roads and bridges may impact the effect of a disaster, or the ability to evacuate during a disaster. The State of Alabama has over 102,200 miles of public roads of which 60% of travel occurs on 11,000 miles of federal and state highways which are maintained by the Alabama Department of Transportation. Of those 11,000 miles, only about 9% have pavement that is in unacceptable or deficient condition.²¹ Roads in poor condition make up 11%. Each motorist pays \$434 per year in costs due to driving on roads in need of repair. Congestion is a growing issue that is expected to affect 17% of Alabama roads by 2035. Two programs are moving the needle on these challenges: Rebuild Alabama and the Alabama Transportation Rehabilitation Improvement Program. These programs have implemented more than 140 roadway improvement projects since 2020.²²

Alabama has 16,161 bridges, of which 41.5% are rated in good condition, 54.7% are in fair condition, and 3.8% are in poor condition. The percentage of poorly rated bridges has decreased significantly at the state level, falling from more than 8.6% in 2015; it is currently much lower than

¹⁶ Gross Domestic Product by State and Personal Income by State, 2nd Quarter, 2022.

<https://www.bea.gov/sites/default/files/2022-09/stgdppi2q22-a2021.pdf>

¹⁷ Real GDP of the United States (2010–2021, \$ Billion). <https://www.globaldata.com/data-insights/macroeconomic/real-gdp-of-the-united-states-2089169/>.

¹⁸ Economy at a Glance: Alabama. <https://www.bls.gov/eag/eag.al.htm>

¹⁹ Economy at a Glance: Alabama. <https://www.bls.gov/eag/eag.al.htm>

²⁰ Ibid.

²¹ 2022 Report Card for Alabama's Infrastructure. <https://infrastructurereportcard.org/state-item/alabama/>

²² Ibid.

the national average of 7.5%. The Alabama Legislature passed the Rebuild Alabama Act in 2019, which provides an additional 10 cents per gallon to the state fuel tax to help close the funding gap for Alabama's roads and bridges. However, Alabama still faces a 10-year annual funding shortfall of \$113 million for addressing the state's future needs and bridge program funding.²³

2.1.2.2.2 Other Transportation Infrastructure

Alabama has 80 public-use airports, of which 9 are major airports. According to a 2020 condition inspection report, less than half of Alabama's airports require multiple types of minor maintenance, while only 17% have other condition-related needs such as lighting, marking, and/or pavement distresses. The 2020 Alabama Statewide Airport System Plan (AL SASP), completed by the Alabama Department of Transportation (ALDOT), showed a system-wide, 10-year development need of \$1.34 billion. However, at current funding levels, an annual funding deficit of \$67.6 million exists. The aviation system in the state is managed by the Federal Aviation Administration and ALDOT and undergoes annual safety inspections. Overall, Alabama has a very accessible airport network, with 80% of the population living within one hour of a commercial airport.²⁴

Alabama has one single deep-water port at Mobile, on the Gulf of Mexico, which is the 11th largest in the United States by volume. Other major ports in Alabama include Birmingham, Decatur, Tuscaloosa, Florence, Guntersville, and Montgomery. Many of these ports handle industry supply shipments.

Alabama has both freight and passenger rail. There are currently 31 freight railroads consisting of 3,720 track miles, all privately owned and maintained. Amtrak operates one passenger rail line through Alabama—the Crescent—which consists of 1,300 track miles, all of which are owned by Norfolk Southern Railway. Freight continues to maintain a strong, well-funded network, while the passenger rail network remains dependent upon federal funding. In recent years, however, federal funding has increased, growing from \$2 million in 2020 to \$4.7 million in 2022. Specific utilization of this funding includes 45 rail/highway safety crossing projects that were authorized in 2021. Locally supplementing the federal funds, multiple grants and P3 investments have contributed to improvements at the Port of Mobile, which has recently seen major rail projects completed and intermodal facilities expanded. Finally, in November 2021, the Infrastructure Investment and Jobs Act (IIJA) was signed into law, which will inject an unprecedented amount of federal funds into freight and passenger rail infrastructure to improve and expand safety, operations, and maintenance programs throughout the nation. At this time, however, the IIJA budgets for Alabama are undetermined.

Currently, more than 75% of Alabama's counties are served by a transit system, providing access to more than 4.1 million people, or over 80% of the state's total population. The 2019 ridership numbers illustrate a growing demand for transit services in rural communities. However, systems across the state face funding shortfalls that do not adequately provide services to meet the

²³ Ibid.

²⁴ Ibid.

demands. While it is estimated that Alabama could receive \$400 million in federal transit funding over five years from the Infrastructure Investment and Jobs Act, state support is also needed to ensure seamless travel by transit across the rural/urban divide. Despite the funding shortfalls, Alabama's transit system operators continue to do a commendable job of managing their assets. The condition of the overall system is improving, as indicated by the geographic availability of transit services, traditional transit providers' innovative delivery of services, and the application of technology that improved customer communication, access, and service efficiency.²⁵ The four major public transportation systems in the state include Birmingham (Jefferson County Transit Authority), Montgomery (Montgomery Area Transit System), Mobile (The Wave Transit System), and the City of Huntsville (Public Transportation Division). The four major privately owned transportation systems in the state include Greyhound Lines, UAB Blazer Express, Auburn's Tiger Transit, and Birmingham Door-to-Door Shuttle Service.

2.1.2.2.3 Dams

According to the U.S. Army Corps of Engineers (USACE) National Inventory of Dams (NID), Alabama has approximately 2,265 dams and is notably the only state that does not have a dam safety program. Most of the dams are for recreation, fishing, or wildlife purposes. Approximately 226 of these dams are high-hazard potential dams. Unfortunately, most dams in Alabama are out of sight and out of mind for the public. As the only U.S. state without a dam safety program, Alabama lacks the institutional office that educates the public, leads dam inspections, and houses dam condition data. Consequently, the potential vulnerability of the public is unknown, and the state disqualifies itself from accessing federal infrastructure funds for inspections, training, improvements, and rehabilitation.²⁶

2.1.2.2.4 Energy

Alabama is home to over 5 million people and consumes roughly the same amount of energy as it produces. There are over 6,000 miles of high (above 230 kV) and low (below 230 kV) voltage transmission lines, 14,400 miles of natural gas pipeline, and nearly 7,000 miles of oil pipeline across the state. Alabama ranked 14th in the nation in terms of energy expenditures per capita, with customers averaging approximately \$4,330 per year on household energy costs. As a state accustomed to severe weather, Alabama's energy infrastructure has become more robust and resilient in the face of these conditions. While the state's energy infrastructure is sufficient to meet today's needs, changes occurring across the state and within the national economy are requiring Alabama to evolve even further into more renewable and distributed energy resources and next-generation smart grid technologies.²⁷

2.1.2.2.5 Drinking Water, Stormwater, and Wastewater

Drinking and wastewater systems in the State of Alabama are regulated by ADEM. In Alabama, 576 permitted public water systems provide safe and reliable drinking water. The challenge

²⁵ Ibid.

²⁶ Ibid.

²⁷ Ibid.

currently facing Alabama's public water systems is that the infrastructure, including water mains, tanks, plants, and pumps, was built between the 1870s and 1980s. It has aged well beyond its intended life, making near-term repair and replacement of these components crucial to the continued operation of our water systems. There are approximately 250 utility networks operating wastewater treatment plants in the state. Like the drinking water systems, much of the wastewater system has exceeded its intended lifetime. Damage to pipes can adversely affect the environment, and sanitary sewer overflows are a common occurrence during storm events.

Alabama's stormwater systems consist of both built and natural infrastructure. Built infrastructure is largely constructed of pipe and ditch systems. Natural infrastructure includes wetlands, streams, vegetation, and other elements that help to manage stormwater quality and quantity using natural materials and processes. The preservation and maintenance of both built and natural systems are essential for ensuring that Alabama's social, environmental, and economic interests are addressed. Deficiencies in capacity and condition contribute to increased funding needs and public health and safety risks. Complicating matters is the fact that Alabama communities lack stormwater system inventory and condition assessment data. This absence of data leads to uncertainty in funding needs and the prioritization of repair, maintenance, and capital investments. Though data on the sector is scarce, it is widely known that Alabama's stormwater infrastructure has significantly exceeded its design life.²⁸

Over the next 15 years, Alabama will require nearly \$3.1 billion for wastewater collection systems (60%) and secondary and advanced treatment systems (40%). Increasing population, industrial, and manufacturing growth exacerbates these needs and puts pressure on systems' capacities, with at least 50% needing expansion to reliably treat and convey wastewater. Additionally, one-quarter of the more than 800,000 septic tanks are estimated to be failing, contributing to potential human health challenges.

2.1.3 Natural Environment

2.1.3.1 Geography

Alabama is located in the southeastern part of the United States. It is surrounded by four states: Tennessee to the north, Georgia to the east, Mississippi to the west, and Florida and the Gulf of Mexico to the south. The total area of the State of Alabama is 50,647.13 square miles, making it the 30th largest state in the United States of America²⁹. Alabama is composed of 67 counties and 12 major metropolitan areas.³⁰

2.1.3.1.1 Geology

Generally, Alabama's varied topography can be summarized as being mountainous in the northeast portion of the state, where the tail end of the Appalachian Mountains is located within

²⁸ Ibid.

²⁹ World Atlas, <https://www.worldatlas.com/maps/united-states/alabama>

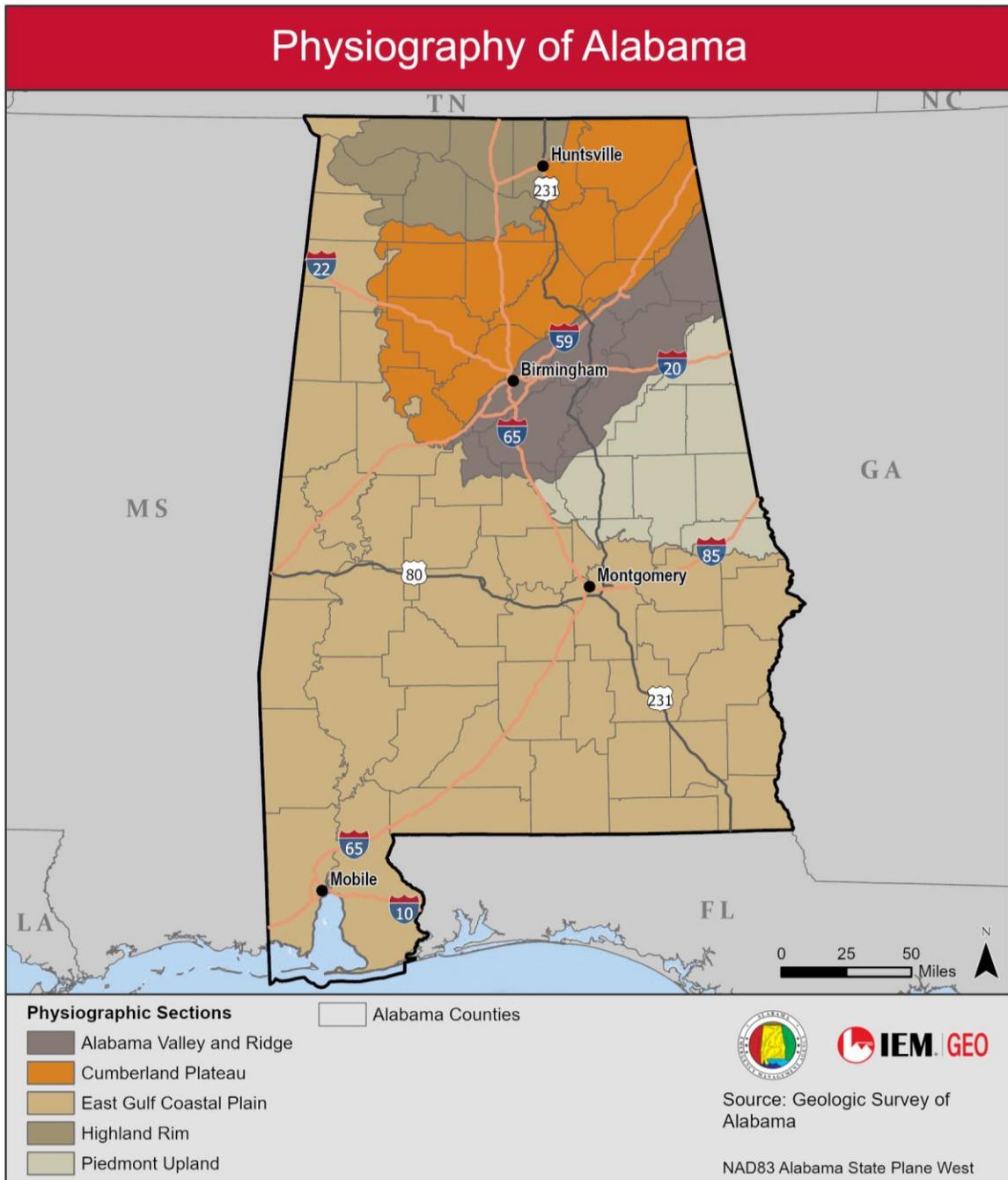
³⁰ QuickFacts: Alabama; United States. <https://www.census.gov/quickfacts/fact/table/AL,US/PST045221>

the state and moving southwest to slope down to the coastal plains, where the state's coastline is. The highest point in the state is Cheaha Mountain at 2,407 feet above sea level, and the lowest point is the coast of the Gulf of Mexico. There are five physiographic sections in the State of Alabama: The Piedmont Upland Section, Alabama Valley and Ridge Section, Cumberland Plateau Section, Highland Rim Section, and East Gulf Coastal Plain Section, as shown in Figure 2.6.³¹ The Piedmont Upland Section, Tennessee Valley and Ridge Section, and Cumberland Plateau Section encompass the Appalachian Highlands Region of the state; the Highland Rim Section encompasses the Interior Plains Region of the state; and the East Gulf Coastal Plain Section encompasses the Atlantic Plain Region of the state.³²

³¹ Physiographic Section of Alabama. Encyclopedia of Alabama. <http://www.encyclopediaofalabama.org/article/h-1362>

³² Ibid.

Figure 2.6: Physiography of Alabama



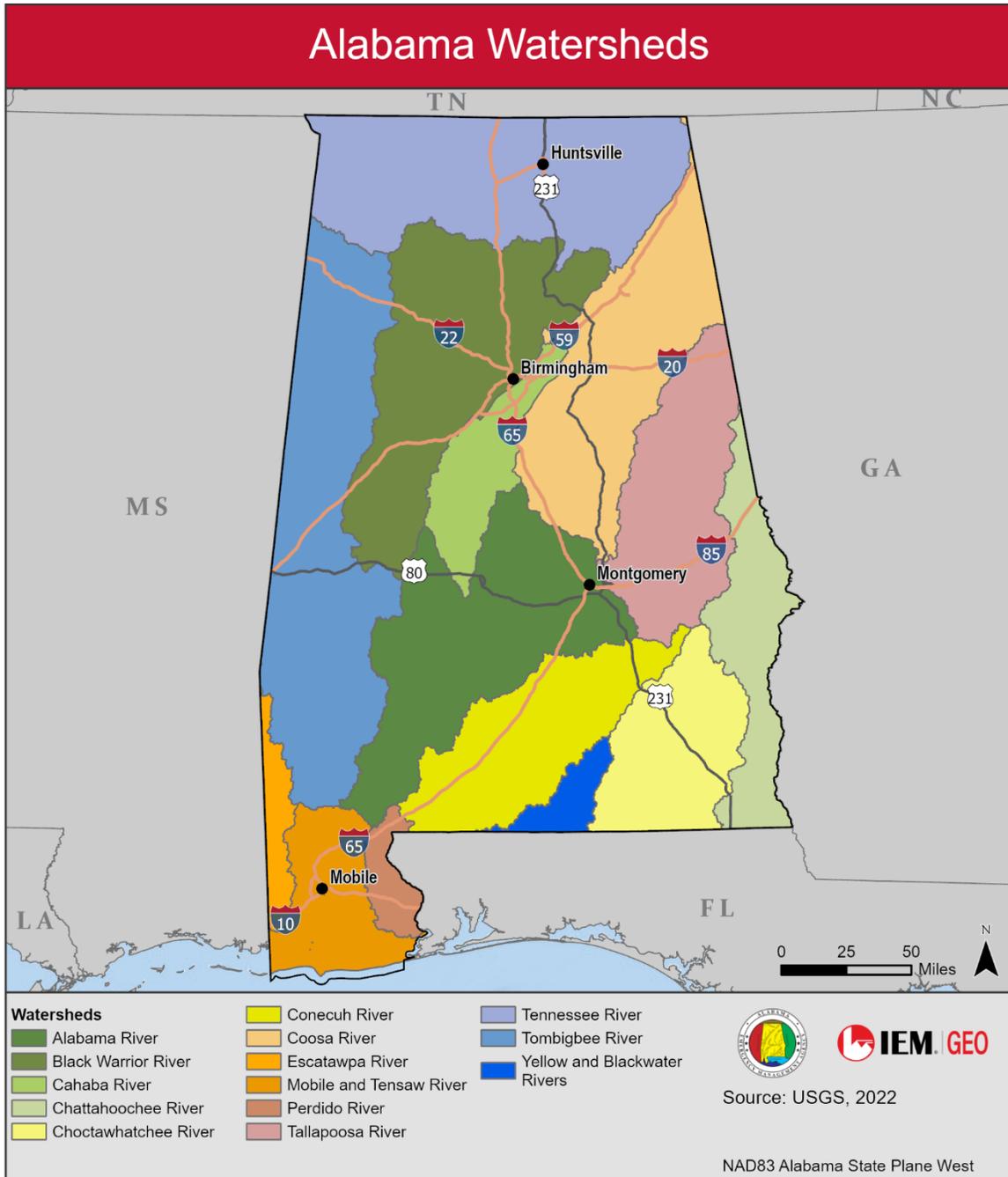
2.1.3.1.2 Rivers and Watersheds

Water is a critical component of Alabama's natural environment, see the figure below. The State of Alabama has more than 132,000 miles of rivers and streams, including 14 major watersheds.³³ The estimated 132,000 miles of river and stream channels represent the state's 17 major river systems, which are carved into Alabama's landscape, with about 61% flowing permanently throughout the year and 39% flowing only intermittently during wetter times. At 1,438 miles, Alabama leads the nation in miles of navigable channels, with 16 lock-and-dam structures on 6 river systems. More than 20 hydroelectric generating facilities and 20 or more impoundments on smaller streams for public water supply have been built throughout the state. The total surface area of lakes, ponds, and reservoirs is 563,000 acres, and about 33.5 trillion gallons of water flow through Alabama's river and stream channels every year. Also, Alabama's underground water

³³ Map – Alabama River Basins (Watersheds). <https://blackwarriorriver.org/map-alabama-river-basins-watersheds/>

supplies are estimated at about 553 trillion gallons, or more than 16 times the amount of surface water.³⁴

Figure 2.7: Alabama River Basins (Watersheds) Map



³⁴ River Systems and Watersheds of Alabama. Encyclopedia of Alabama. <http://www.encyclopediaofalabama.org/article/h-1627>

2.1.3.1.3 Coastline

Alabama's coastline extends for 60 miles along the southern border of the state and includes an additional 600 miles of bay, coastal river, and bayou tidal shoreline. The geography of this area has been determined by unique coastal geological processes in which sea-level fluctuations and wind have eroded and built-up sand along the coastline. Additionally, human influence has impacted the geography of the coastline through use and development. Wetland infill, coastal construction, and dredging for ship channels have contributed to beach erosion and removed habitat for native species.

2.1.3.1.4 Ecosystems

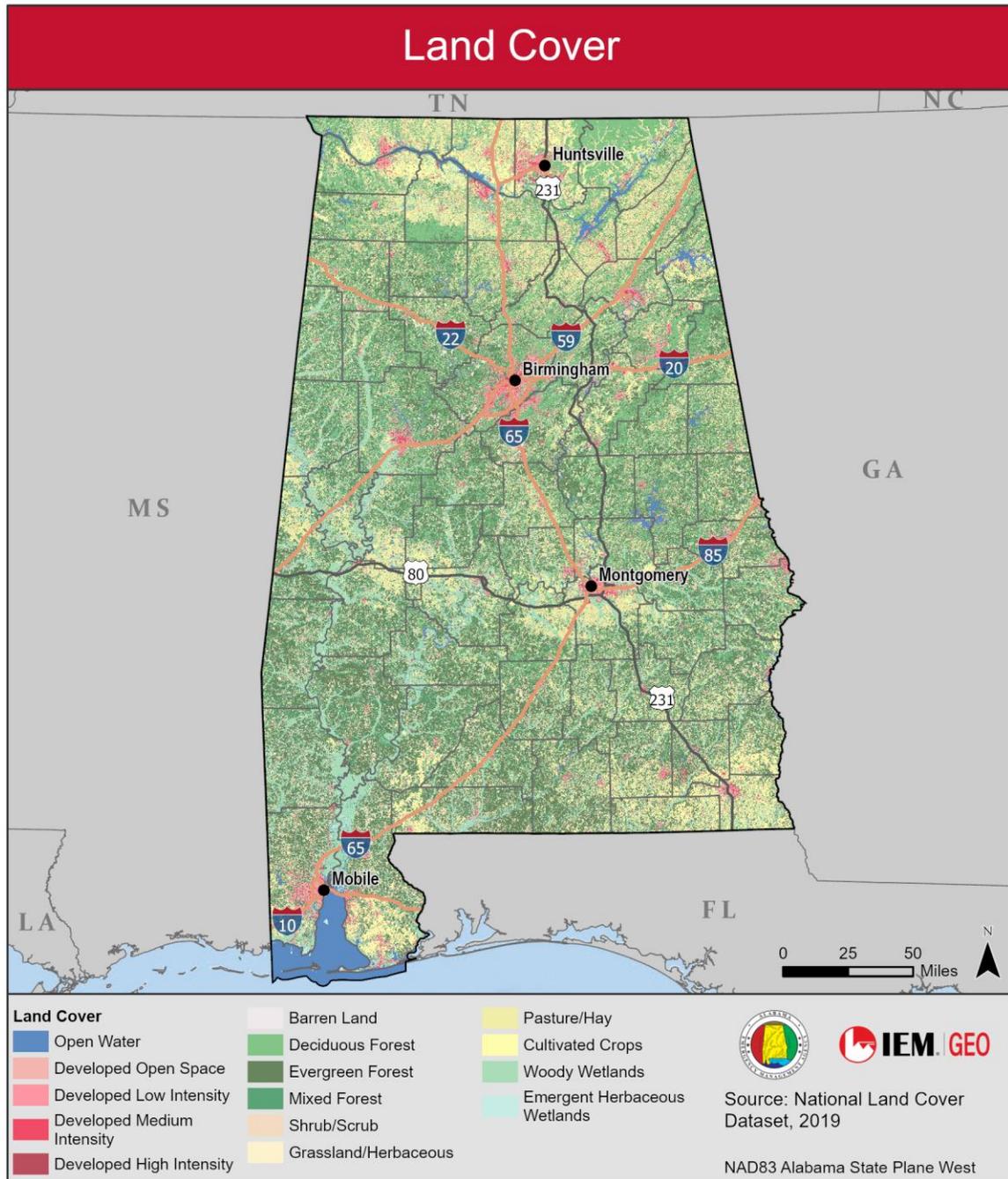
Alabama is one of the most biologically diverse states in the United States and is a global hotspot of diversity for several groups of plants and animals. Supporting this diversity are 64 types of terrestrial ecosystems, including 25 forests and woodlands, 11 wetlands, and 7 glades and prairies. Alabama has many unique ecosystems made possible by its variety of soils, and its glade ecosystems offer the most dramatic example of the connection between geology and biological diversity. Found in the mountainous region of the state, glades are open, sunny ecosystems where the bedrock is at the surface or covered with extremely thin soil. Because trees struggle to gain a foothold, the soil supports rare and unusual wildflowers that can tolerate harsh conditions.³⁵

2.1.3.1.5 Land Use

Much of the state has significant amounts of forest and farmland. As shown in Figure 2.8, many of the counties, even those with large metropolitan areas, are characterized by decentralized development patterns that extend the built environment into rural areas.

³⁵ Ibid.

Figure 2.8: Land Use and Land Cover, State of Alabama



2.1.3.2 Climate

The climate of Alabama can be generalized as temperate, with an average annual temperature of about 64 °F. Occasionally the temperature may rise to 100 °F in the summer; and whereas frosts occur more frequently, snow may sometimes fall in the northern counties. The average summer temperature is 79 °F; the winter average is 48 °F. The state tends to have mild winters,

hot summers, and year-round precipitation.³⁶ Temperatures are generally higher and there tends to be more precipitation in the southern portion of the state, with a concentration in the coastal areas.³⁷ The warmer, wetter conditions of the south can be attributed to the effects of the Gulf of Mexico.

Alabama is subject to severe weather, especially during the warmer months. In late summer and early fall, southern areas can be affected by strong tropical storms, including hurricanes, as they sweep northward from the Gulf and are especially devastating to coastal areas. The northern half of the state lies in the southern range of the country, which is most affected by tornadoes. Occasionally, large-scale outbreaks of multiple tornadoes have turned particularly deadly and destructive in the region.

³⁶ Climate of Alabama. <https://www.britannica.com/place/Alabama-state/Climate>

³⁷ Ibid.

3. Risk Assessment

Many natural and technological hazards impact the State of Alabama. To reduce loss of life and property resulting from these hazards, officials developing updated state and local hazard mitigation plans continue to ensure they have a robust understanding of the risks posed by these hazards based on the most recently available qualitative and quantitative data. Federal regulations and guidelines also require that certain hazard components be included in the risk assessment section of state hazard mitigation plans. Planning guidance is prescribed in 44 CFR Part 201 and covers federal regulations for mitigation planning, and the *State Mitigation Plan Policy Guide (2022)* provides FEMA's official interpretation of these regulations. The required components discussed in these documents include the following:

- An overview of the type and location of all-natural hazards that can affect the state, including information on previous occurrences of hazard events and the probability of future hazard events.
- According to the *State Mitigation Plan Policy Guide*, the probability of future hazard events includes “considerations of changing future conditions, including the effects of long-term changes in weather patterns and climate.”
- An overview and analysis of the state's vulnerability to these hazards. According to the CFR, the state risk assessment should address the jurisdictions most threatened by the identified hazards, as well as the state assets located in the identified hazard areas.
- An overview and analysis of the potential losses to the identified vulnerable structures.
- According to the CFR, an estimate of the potential dollar losses to state assets and critical facilities located in the identified hazard areas.

The Alabama State Hazard Mitigation Plan update approved by FEMA in 2018 assessed statewide risks based on the best available data at the time and complied with existing federal regulations and policies. The 2023 revisions update the previous analyses to reflect the best available data as of December 2022 and to reflect the official FEMA policy on assessing the probability of future hazard events. The 2023 update also includes recent changes in FEMA planning policy to include an analysis of high-hazard dams, impacts of climate change, and the inclusion of equity and diversity considerations.

3.1 Overview

The structure of the risk assessment chapter is intended to support the development of effective mitigation strategies and to demonstrate compliance with federal regulations and policies. Following the overview provided in Section 3.1, Section 3.2 identifies and profiles the hazards affecting Alabama; Section 3.3 provides detailed vulnerability assessments and loss estimates for a subset of the identified hazards; and Section 3.4 discusses the impacts of development trends on vulnerability.

Section 3.1 is further subdivided into three subsections: one on the hazards identified as affecting the state (3.1.1), one on the ranking methodology used to determine which hazards would receive detailed vulnerability assessments, (3.1.2), and one on the hazards profiled in county plans (3.1.3). Section 3.2 presents the greatest volume of information, with 1 subsection for each of the 14 identified hazards (3.2.1 through 3.2.14). Each of these 14 subsections provides a general description of the hazard, a discussion of the nature of the hazard in Alabama, a review of the history of the hazard in Alabama, and a summary of the future probability of the hazard in Alabama. The summary of the future probability of each hazard addresses the anticipated effects of climate change as well as the areas likely to be most vulnerable to the hazard.

3.1.1 Identified Hazards

The list of hazards to be included is reviewed by the State Hazard Mitigation Task Force (SHMTF) with each plan update, leading to minor adjustments over the years and an evolution in the hazards covered by the plan. In the 2007 plan update, a high winds category was created to cover hurricane winds, tornadoes, and windstorms. Storm surge from hurricanes was grouped into the flood hazard category, which also included riverine flooding and flash floods.

During the 2010 plan update process, no significant changes were made to the list of hazards addressed. During the 2013 plan update process, it was determined that the discussion of coastal erosion would be expanded based on available flood data; the discussion of rogue waves was eliminated from the flood discussion; and sea level rise was included as a hazard. During the 2023 plan update process, it was determined that the flood hazards should be discussed under two subsections: inland flooding and coastal flooding.

During the 2023 plan update process, the SHMTF considered hazard additions and adjustments at the Hazards Working Group Meetings on October 25, 2022, and November 10, 2022. It was determined that the plan update should address all the hazards included in the previous plan, with one slight adjustment to the treatment of flooding. To support more effective and resilient mitigation strategies, this plan discusses the flooding impacts of sea level rise in Section 3.2.5 and the coastal change impacts of sea level rise in Section 3.2.10.

Based on the analysis in Section 3.2.5, the SHMTF felt mitigation actions to address current flood hazards may also be considered as ways to address future flood hazards. Based on the analysis in Section 3.2.10, the group determined that coastal planning and management activities should be included in the plan to slow the advance of coastal land change and reduce the damage to properties, infrastructure, and the economy.

The hazard list includes hazards that have occurred in the past as well as those that may occur in the future. In addition, hazards with the greatest chance of significantly affecting the state and its residents are included. A variety of sources were consulted to determine hazards that have

impacted the state historically or that may occur in the future. These included national, regional, and local sources. These sources include the following:

- AEMA
- ADECA
- Alabama Forestry Commission
- FEMA
- Geological Survey of Alabama
- NOAA
- U.S. Geological Survey (USGS)

Input from subject matter experts at each of the following agencies was also solicited during the review of the hazard profiles. Additionally, online resources used for this planning process included the following:

- Climate Mapping for Resilience and Adaptation Tool
- FEMA Community Status Book
- FEMA Disaster Declarations
- NOAA NCEI Storm Events Database
- U.S. Geological Survey (USGS)
- U.S. Census Bureau

Additional details on the process may be found in Section 4: Planning Process. Hazards covered in the updated 2023 plan include the following:

Dam and levee failure	Landslides
Drought	Lighting
Earthquakes	Sea level rise and coastal land change
Extreme temperatures	Sinkholes and land subsidence
Flooding (inland flooding, coastal flooding, flash floods, storm surge)	Tsunamis
Hail	Wildfire
High winds (hurricanes, thunderstorms, tornadoes)	Winter storms

The SHMTF reaffirmed this hazard list at the Hazards Working Group Meetings on October 25 and November 10, 2022.

Three important sources for characterizing the hazards that affect the state are (1) the record of significant meteorological events compiled in the NWS Storm Events Database, (2) data from county emergency managers and other stakeholders, and (3) the record of federal disaster declarations compiled by FEMA. These data sources are briefly summarized next.

3.1.1.1 NWS Storm Events Database

Since 1950, NWS offices across the United States have submitted reports on significant storm events to NWS headquarters. NWS field offices are instructed to document events that are characterized as one or more of the following:

- Of sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce.
- Rare or unusual and generate media attention; or
- Otherwise, significant meteorological events, such as record temperatures or an above-normal precipitation event.

Reports from district NWS offices are forwarded for review to staff at NWS headquarters and compiled into the Storm Events Database (SED), a searchable online platform that can be accessed at www.ncdc.noaa.gov/stormevents.

The database includes a wealth of information that can help characterize hazards within a state and assess historical vulnerability. This information includes the time, date, and location of documented events; a narrative description of the event; the number of injuries and deaths associated with the event; and the estimated amount of property and crop damage caused by the event. It is important to remember a fact NWS repeatedly shares with SED users: the database is a useful tool to the extent that communities, storm spotters, and others report the occurrence of weather incidents. It may appear to the viewer that events are missing, but they are not included in SED if they were not reported to the NWS.

The database is cited frequently throughout this risk assessment and is the source of much of the information about the nature of hazards in Alabama and past occurrences in the state. However, three important caveats must be noted. First, the NWS has consistently collected data on some event types from 1950 to the present, data collection for many hazards did not begin until 1996. Second, some uncertainty is introduced into the database by weather phenomena that involve multiple hazards. For example, high winds, storm surge, flooding, and/or tornadoes may all cause damage during a tropical cyclone. The NWS field offices are instructed to separate the observed damages into different event types depending on the immediate cause, but how to do so is often a subjective decision. Finally, there are limitations to the damage estimates included in the database. Estimates are collected from diverse sources by staff with little or no training in damage estimation and are not compared with actual costs. In addition, damage estimates include only direct physical damage to property, crops, and public infrastructure. Although damage estimates for individual events may be inaccurate, as estimates from many events are added together, the errors become progressively smaller.³⁸

³⁸ Downton, M., Miller, Z., and Pielke, R., 2005. Reanalysis of US NWS Flood Loss Database. *Natural Hazards Review*, Vol. 6, No. 1.

3.1.1.1.1 Historical Overview

The National Centers for Environmental Information (NCEI) receives storm data from the National Weather Service (NWS) and enters this information into the Storm Events Database. NWS receives information from a variety of sources, such as local, county, state, and federal emergency management officials; local law enforcement agencies; Skywarn spotters; NWS damage surveys; newspaper clipping services; the insurance industry; and the general public. Note that NWS does not guarantee the accuracy, validity, or completeness of the event data in the Storm Events Database. Alabama data collected by NCEI and USGS is reflected in the following table.

Table 3.1: 2000–2022 Historical Overview of Hazards and Impacts

Hazard	Property Damage	Crop Damage	Deaths	Injuries
Dam/levee failure	—	—	—	—
Drought	\$0	\$0	0	0
Earthquake	—	—		
Extreme temperatures	\$20,000	\$0	0	0
Flooding (coastal flooding, inland flooding, storm surge)	\$28,813,000	\$0	16	6
Hail	\$0	\$0	0	0
High winds (hurricanes, thunderstorms, tornadoes)	\$466,702,270	\$1,933,500	56	260
Landslides	—	—		
Lighting	\$ 2,082,500	\$0	5	12
Sea level rise and coastal land changes	—	—		
Sinkholes and land subsidence	—	—		
Tsunamis	—	—		
Wildfire	—	—		
Winter storms	\$0	\$0	0	0
TOTAL	\$497,617,770	\$1,933,500	77	278

3.1.1.2 FEMA Disaster Declarations Summary

Another important data source for characterizing hazards in Alabama was the FEMA Disaster Declarations Summary, a dataset summarizing all federally declared disasters. This information begins with the first disaster declaration in 1953 and features all three types of disaster declarations: major disaster, emergency, and fire management assistance. The dataset includes declared recovery programs and geographic areas and is updated daily. The disaster declaration

information summarized in this report was obtained from the dataset posted on November 30, 2022, the most recent available data.

Since 1960, various parts of Alabama have been declared federal disaster areas. On five occasions (in 1977, 1993, 2004 2017 and 2020), the entire state was included in a declaration, each time for a different hazard. The southern counties tend to experience more disaster declarations related to hurricanes and coastal storms, while the northern counties tend to experience more disaster declarations related to tornadoes and ice storms, the latter of which may also be accompanied by flooding. Since 2013, the two disasters that had the largest number of declared counties were Hurricane Irma in September 2017 (the entire state was declared) and Hurricane Nate in October 2017 (47 counties were declared). The state also received an Emergency Declaration and a Disaster Declaration for the Coronavirus Disease 2019 pandemic.

The following table lists the major disaster declarations in Alabama since 1961. More details on these disasters may be found on FEMA's Disaster Declaration website, <https://www.fema.gov/disaster/declarations>.

Table 3.2: Federal Disaster Declarations in Alabama (through January 8, 2022)³⁹

Date	Disaster Number	Type of Incident	# Of Counties Declared
February 27, 1961	109	Floods	Info not available
November 7, 1969	280	Hurricane Camille	2
April 9, 1970	285	Heavy Rain, Tornadoes, and Flooding	2
March 27, 1973	369	Tornadoes and Flooding	28
May 29, 1973	388	Severe Storms and Flooding	12
April 4, 1974	422	Tornadoes	20
January 18, 1975	3007	Tornadoes	5
March 14, 1975	458	Severe Storms and Flooding	23
April 23, 1975	464	Severe Storms and Flooding	8
October 2, 1975	488	Severe Storms, Tornadoes, and Flooding	15
April 24, 1976	3064	Tornadoes	2
April 9, 1977	532	Severe Storms and Flooding	9
July 20, 1977	3045	Drought	67
August 9, 1978	563	Severe Storms and Flooding	1
March 17, 1979	3074	Flooding	9
April 18, 1979	578	Storms, Wind, and Flooding	28

³⁹ FEMA's Disaster Declaration website, <https://www.fema.gov/disaster/declarations>.

Date	Disaster Number	Type of Incident	# Of Counties Declared
September 13, 1979	598	Hurricane Frederic	11
April 20, 1980	619	Severe Storms, Tornadoes, and Flooding	2
April 10, 1981	638	Severe Storms, Tornadoes, and Flooding	1
May 14, 1981	639	Severe Storms and Flooding	1
December 13, 1983	695	Severe Storms, Tornadoes, and Flooding	4
May 11, 1984	3088	Severe Storms and Tornadoes	4
September 7, 1985	742	Hurricane Elena	2
November 17, 1989	848	Severe Storms and Tornadoes	2
February 17, 1990	856	Severe Storms, Tornadoes, and Flooding	27
March 21, 1990	861	Severe Storms, Tornadoes, and Flooding	33
January 4, 1991	890	Severe Storms and Flooding	12
March 15, 1993	3096	Severe Snowfall and Winter Storm	67
March 3, 1994	1013	Severe Winter Storms, Freezing, and Flooding	10
March 30, 1994	1019	Severe Storms, Tornadoes, and Flooding	7
July 8, 1994	1034	Severe Storms and Flooding – Tropical Storm Alberto	10
April 21, 1995	1047	Severe Storms, Tornadoes, and Flooding	5
October 4, 1995	1070	Hurricane Opal	38
February 23, 1996	1104	Severe Winter Storms, Ice, and Flooding	14
March 20, 1996	1108	Severe Storms, Tornadoes, and Flooding	3
July 25, 1997	1185	Hurricane Danny	3
March 9, 1998	1208	Flooding, Severe Storm	6
April 9, 1998	1214	Thunderstorms, Tornado	6
September 30, 1998	1250	Hurricane Georges	14
January 15, 1999	1261	Ice Storm, Freezing Rain	11
February 18, 2000	1317	Winter Storm	3
March 17, 2000	1322	Severe Storm, Flooding	2
December 18, 2000	1352	Tornado	11
March 5, 2001	1362	Severe Storm, Flooding	6
December 7, 2001	1399	Severe Storm, Tornado	19
October 9, 2002	1438	Tropical Storm Isidore	2
November 14, 2002	1442	Severe Storm, Tornado	29
May 12, 2003	1466	Severe Storm, Thunderstorms, Tornado, Flooding	24
September 15, 2004	1549	Hurricane Ivan	67

Date	Disaster Number	Type of Incident	# Of Counties Declared
July 10, 2005	1593	Hurricane Dennis	45
August 29, 2005	1605	Hurricane Katrina	22
March 1, 2007	3292	Severe Storms and Tornadoes	7
September 10, 2008	1789	Hurricane Gustav	2
September 26, 2008	1797	Severe Storms and Flooding – Hurricane Ike	2
April 28, 2009	1835	Severe Storms, Flooding, Tornado, and Straight-Line Winds	21
May 8, 2009	1836	Severe Storms, Flooding, Tornado, and Straight-Line Winds	6
June 3, 2009	1842	Severe Storms, Flooding, Tornado, and Straight-Line Winds	4
December 22, 2009	1866	Tropical Storm Ida	2
December 31, 2009	1870	Severe Storms and Flooding	14
May 3, 2010	1908	Severe Storms, Tornadoes, Straight-Line Winds, Flooding	3
April 28, 2011	1971/3319	Severe Storms, Tornadoes, Straight-Line Winds, Flooding	43
February 1, 2012	4052	Severe Storms, Tornadoes, Straight-Line Winds, Flooding	3
September 21, 2012	4082	Alabama Hurricane Isaac	8
May 2, 2014	4176	Severe Storms, Tornadoes, Straight-Line Winds, Flooding	21
January 21, 2016	4251	Severe Storms, Tornadoes, Straight-Line Winds, Flooding	39
September 11, 2017	3389	Hurricane Irma	67
October 8, 2017	3394	Hurricane Nate	39
November 16, 2017	4349	Hurricane Nate	8
October 18, 2018	EM-3407	Hurricane Michael	1
November 5, 2018	4406	Hurricane Michael	2
April 17, 2019	4426	Severe Storms, Tornadoes, Straight-Line Winds, Flooding	3
April 26, 2018	4362	Severe Storms and Tornadoes	4
December 10, 2020	4573	Hurricane Zeta	5
September 14, 2020	3545	Hurricane Sally	6
September 20, 2020	4563	Hurricane Sally	7
July 10, 2020	4554	Severe Storms, Straight-Line Winds, Tornadoes	8

Date	Disaster Number	Type of Incident	# Of Counties Declared
July 10, 2020	4555	Severe Thunderstorms	9
May 21, 2020	4546	Severe Storms and Flooding	10
March 29, 2020	4503	Covid-19 Pandemic	67
March 13, 2020	3528	Poarch Band of Creek Indians Covid-19	1
March 13, 2020	3472	Covid-19	67
April 17, 2019	4426	Severe Storms, Tornadoes, Straight-Line Winds, Flooding	14
December 21, 2021	4632	Severe Storms and Flooding	15
April 26, 2021	4596	Severe Storms, Straight-Line Winds, Tornadoes, Flooding	16
March 28, 2021	4591	Poarch Band of Creek Indians Covid-19	1

3.1.2 Ranking Methodology

The identified hazards vary in their probability of affecting the state and in their potential impact on the state. The SHMTF and FEMA, therefore, determined that only a subset of the hazards should receive detailed vulnerability assessments. To identify the hazards for which detailed vulnerability assessments would yield the most benefit, AEMA completed a risk factor (RF) analysis. An RF analysis characterizes the degree of risk posed by identified hazards in a planning area based on a set of factors deemed important by the SHMTF and other stakeholders. The identified hazards are assigned a numeric value for each risk factor, and a formula is then applied to aggregate the values into an RF value. The higher the RF value, the greater the hazard risk. The RF approach used by the SHMTF to rank hazard risks in Alabama is summarized in Table 3.3.

The risk assessment categories shown in the table are based on FEMA's Comprehensive Preparedness Guide (CPG) 101⁴⁰ (see pages 3–11 of CPG-101). Those categories include probability, impact, spatial extent, warning time, and duration. Probability indicates how frequently a given hazard event will occur. Impact looks at the systemic loss of life, property, and economic well-being induced by each hazard event. Spatial extent indicates the geographic area a given hazard event will cover and whether a hazard event is expected to be statewide, regional, or extremely localized. Warning time evaluates how far in advance a community will know of an impending hazard event, considering hazard-specific warning systems. Finally, duration indicates the length of time the hazard event will last. The numeric value assigned for each category relies mainly on historical data, local knowledge, consensus opinions from the SHMTF, and information collected through the development of hazard profiles.

⁴⁰FEMA's Comprehensive Preparedness Guide (CPG) 101. [Planning Guides | FEMA.gov](https://www.fema.gov/planning-guides)

To calculate a composite RF ranking, weighting factors were derived from a review of best practice plans and agreed upon by the SHMTF. The weight factors for each risk assessment category are also shown in Table 3.3. To calculate the RF value for a given hazard, the assigned risk value for each category was multiplied by the weighting factor, and the weighted values were added together.

The RF approach complements more quantitative analyses by reflecting participants' local knowledge and experience and providing a consistent metric across different hazards. Nevertheless, Alabama recognizes limitations to this approach. In some cases, for example, risk levels may not be entirely compatible with multi-hazard events. There may also be differences in how hazards are scored in dense urban areas as compared to rural areas. Despite its limitations, however, the method serves as a useful tool for providing systematic and consistent prioritization of qualitative hazard information. In addition, the method can be used to help prioritize mitigation strategies.

A state risk assessment was conducted to review and characterize the impacts of these natural hazards on state assets and populations and to determine the likelihood of future events, the potential impact on lives and property, and the potential geographic location expected to be affected by each hazard. For each hazard identified, the potential impact of climate change was considered in estimating probability, location and extent. Table 3.3 shows the results of the state risk assessment.

Table 3.3: Summary of Risk Factor Methodology for Ranking Hazards

Assessment Level/Degree of Risk	Criteria	Index
Probability of Future Events		
Unlikely	Recurrence interval of greater than every 100 years	0
Occasional	Recurrence interval of 11 to 100 years	1
Likely	Recurrence interval of 1 to 10 years	2
Highly likely	Recurrence interval of less than 1 year	3
Potential Life Impact		
Minor	Very few injuries if any	0
Limited	Minor injuries	1
Critical	Multiple deaths/injuries	2
Catastrophic	A high number of deaths/injuries	3
Potential Property Impact		
Minor	Only minor property damage and minimal disruption of life and/or temporary shutdown of critical facilities	0

Assessment Level/Degree of Risk	Criteria	Index
Limited	More than 10% of property in the affected area damaged/destroyed and/or complete shutdown of critical facilities for more than one day	1
Critical	More than 25% of property in the affected area damaged/destroyed and/or complete shutdown of critical facilities for more than one week	2
Catastrophic	More than 50% of property in the affected area damaged/destroyed and/or complete shutdown of critical facilities for 30 days or more	3
Potential Location		
Negligible	Less than 10% of the state or isolated single-point occurrences	0
Minimal	10–25% of the state or limited single-point occurrences	1
Significant	26–74% of the state or frequent single-point occurrences	2
Extensive	75–100% of the state or consistent single-point occurrences	3
Maximum Probable Intensity		
Weak	Minor classification on the scientific scale, slow speed of onset or short duration of event, resulting in little to no damage	0
Moderate	Moderate classification on the scientific scale, moderate onset speed, or moderate duration of event, resulting in some damage and loss of services for days	1
Major	Major classification on the scientific scale, fast speed of onset or long duration of event, resulting in devastating damage and loss of services for weeks or months	2

The values assigned to each of the identified hazards and the final RF rankings are shown in Table 3.4. The SHMTF reaffirmed that hazards with RF rankings 2.0 or greater pose a major risk to Alabama and should receive detailed vulnerability assessments. Hazards with RF rankings between 1.5 and 1.9 were deemed moderate risks, and hazards with RF rankings less than 1.5 were deemed low risks. As data availability and resources permit, the medium- and low-risk hazards may receive future vulnerability assessments. The three hazards with RF rankings of 2.0 or greater were floods, high winds, and sea level rise/coastal land change. In addition, the SHMTF selected one hazard for detailed vulnerability assessment despite its lower ranking. The earthquake hazard was assigned a moderate RF ranking of 1.9. Nevertheless, data for earthquake vulnerability assessments are readily available through the FEMA Hazus (hazards modeling) program, and a detailed vulnerability assessment is included.

Table 3.4: Hazard Risk Index Qualitative Ranking for Identified Hazards

Hazard	Probab ility	Ind ex Val ue	Life Imp act	Ind ex Val ue	Propert y Impact	Ind ex Val ue	Locati on	Ind ex Val ue	Maxim um Proba ble	Over all Scor e
Dam failure	Occasio nal	1	Critic al	2	Critical	2	Signific ant	2	Moder ate	1.7
Drought	Likely	2	Limit ed	1	Limited	1	Signific ant	2	Low	1.4
Earthquak e	Likely	2	Critic al	2	Critical	2	Minima l	1	Moder ate	1.9
Extreme temperatu res	Highly likely	3	Critic al	2	Minor	0	Extensi ve	3	Moder ate	1.9
Flooding (coastal flooding, storm surge, flash flooding, and inland flooding)	Highly likely	3	Critic al	2	Critical	2	Signific ant	2	Major	2.3
Hail	Likely	2	Mino r	0	Limited	1	Minima l	1	Low	0.95
High winds (hurricane s, thundersto rms, and tornadoes)	Highly likely	3	Critic al	2	Critical	2	Signific ant	2	Major	2.3
Landslide s	Likely	2	Limit ed	1	Limited	1	Minima l	1	Low	1.3
Lighting	Highly likely	3	Limit ed	1	Limited	1	Signific ant	2	Moder ate	1.7
Sea level rise and coastal change	Highly likely	3	Mino r	1	Catastro phic	3	Extensi ve	3	Moder ate	2.0
Sinkhole and land subsiden ce	Highly likely	3	Limit ed	1	Limited	1	Signific ant	2	Moder ate	1.7

Hazard	Probability	Index Value	Life Impact	Index Value	Property Impact	Index Value	Location	Index Value	Maximum Probable	Overall Score
Tsunamis	Unlikely	0	Minor	0	Minor	0	Negligible	0	Low	0
Wildfire	Likely	2	Limited	1	Limited	1	Significant	2	Low	1.4
Winter storms	Likely	2	Limited	1	Limited	1	Significant	2	Low	1.4

3.1.3 Hazards Profiled in County Plans

As part of the plan update process, the hazard profile sections of all local hazard mitigation plans were reviewed to determine which hazards were identified and profiled by local jurisdictions. This process is also briefly described in Section 1.3.2.1 (Hazard Identification and Profiles).

Some local plans simply provided a table listing what hazards affect the local jurisdictions and what hazards do not. Others provided a ranking system. For consistency, this plan update reviews the hazards that are identified and profiled in the local plans. Table 3.5 summarizes the number of counties that profiled each of the hazards identified as affecting the state.

Table 3.5: Summary of County Hazard Mitigation Plans

Hazard	# of Counties that Profile Hazard
Dam failures	55
Drought	62
Earthquakes	62
Extreme temperatures	42
Flooding	64
Hail	48
High winds	67
Landslides	60
Lightning	49
Sinkholes and subsidence	58
Sea level rise and coastal land change	6

Hazard	# of Counties that Profile Hazard
Tsunamis	10
Wildfire	60
Winter storms	67

High wind hazard profiles differ between states and counties and may include severe storms, hurricanes, tropical storms/cyclones, microbursts, and tornadoes. While some counties included an extreme temperature profile, others mentioned characteristics of extreme temperatures within other hazard profiles, such as drought/extreme heat, and winter storms/extreme cold. Several counties profiled human-made hazards and included hazardous material releases, chemical spills, radiation leaks, nuclear accidents, acts of terrorism, criminal activities, and transportation system failures. Additional profiled hazards in several plans include avalanches, communicable diseases/pandemics, celestial impacts, dense fog, and volcanoes.

3.2 Natural Hazards Profiles

3.2.1 Dam Failure

3.2.1.1 Description

A dam is a barrier constructed across a watercourse to store, control, or divert water. Dams vary widely in form and function. They can be constructed of earth, rock, concrete, or mine tailings, and they can support irrigation, electrical generation, flood control, navigation, and/or recreation. Although dams represent a vital component of our national infrastructure, most dams are not owned by public entities. Across the United States, 63% of dams are privately owned, 20% are owned by local governments, 7% are owned by state governments, 4% are owned by the federal government, and 4% are owned by public utilities. The ownership of the remaining dams is undetermined.⁴¹ Dam failure is the uncontrolled release of water (and any associated waste) from a dam. This hazard often results from a combination of natural and human causes and may follow other hazards, such as hurricanes, earthquakes, and landslides. Common causes of dam failure include the following:

- Flooding caused by prolonged rainfall
- Overtopping caused by poor design or debris blockage
- Foundation defects caused by slope instability
- Cracking caused by the natural settling of a dam

⁴¹ United States Cybersecurity and Infrastructure Security Agency, Dam Sector Profile, November 11, 2021, <https://www.cisa.gov/sites/default/files/publications/dams-sector-profile-112221-508.pdf>

- Internal erosion caused by leakage or piping⁴²

According to data collected by the Association of State Dam Safety Officials (ASDSO), most dam failures in the United States are caused by extreme weather events or overtopping (60% and 20%, respectively). Other relatively common causes include piping (10%) and deterioration (6%). Deficient structural condition or design is often an underlying cause of dam failure, and the number of deficient dams in the United States is on the rise. The average age of dams in the United States is 56 years, and about one-third were built more than 50 years ago (the intended lifespan of most dams).⁴³ As the nation's dams age, investments in maintenance, upgrades, and repairs are not keeping pace with the need for improvements. According to the American Society of Civil Engineers (ASCE), the number of high-hazard potential dams known to be deficient is estimated to now exceed 3,000 structures.⁴⁴

This situation is largely the result of the patchwork of state and federal dam safety programs that provide oversight of dams and resources for inspection and maintenance. The federal government oversees about 6.5% of the nation's dams, but state governments are responsible for the remaining 93.5%.⁴⁵ There are strengths and weaknesses to each state program, but many are limited by a lack of statutory authority, limited budgets, and limited staff.

ASDSO also provided Figure 3.1 and Figure 3.2, which expand on and encapsulate the causes of dam failure and dam failure incident drivers.⁴⁶

⁴² Association of State Dam Safety Officials (ASDSO), The Causes of Dam Failure, <https://damsafety.org/what-are-causes-dam-failures>

⁴³ Center for American Progress, 2012. The 10 States Most Threatened by High-Hazard, Deficient Dams. <https://www.americanprogress.org/issues/economy/news/2012/09/20/38679/the10-states-most-threatened-by-high-hazard-deficient-dams/>

⁴⁴ The American Society of Civil Engineers, 2021. Report Card for America's Infrastructure. Overview of Dams. <https://infrastructurereportcard.org/cat-item/dams-infrastructure/>

⁴⁵ FEMA, The National Dam Safety Program: Biennial Report to the United States Congress, Fiscal years 2018–2019. November 2022. https://www.fema.gov/sites/default/files/documents/fema_ndsp-report-congress-fy18-fy19.pdf

⁴⁶ Association of Dam Safety Officials, Dam Failure, and Incidents, <https://damsafety.org/dam-failures>.

Figure 3.1: Dam Failure Incidence, ASDSO

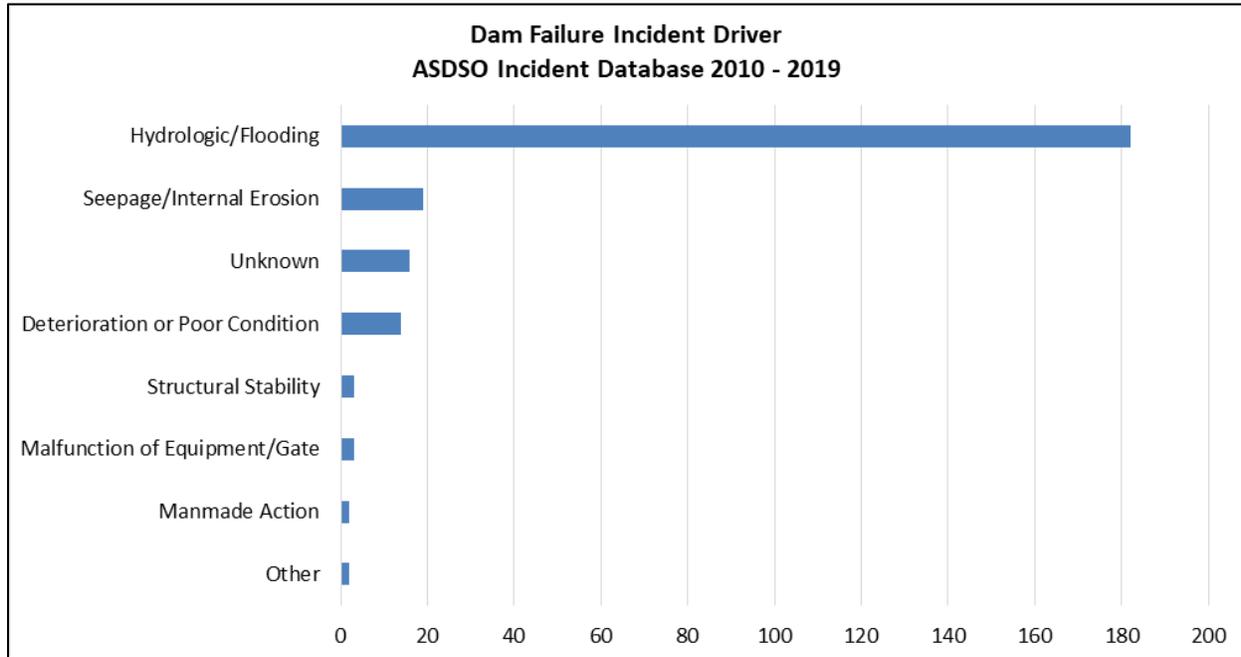
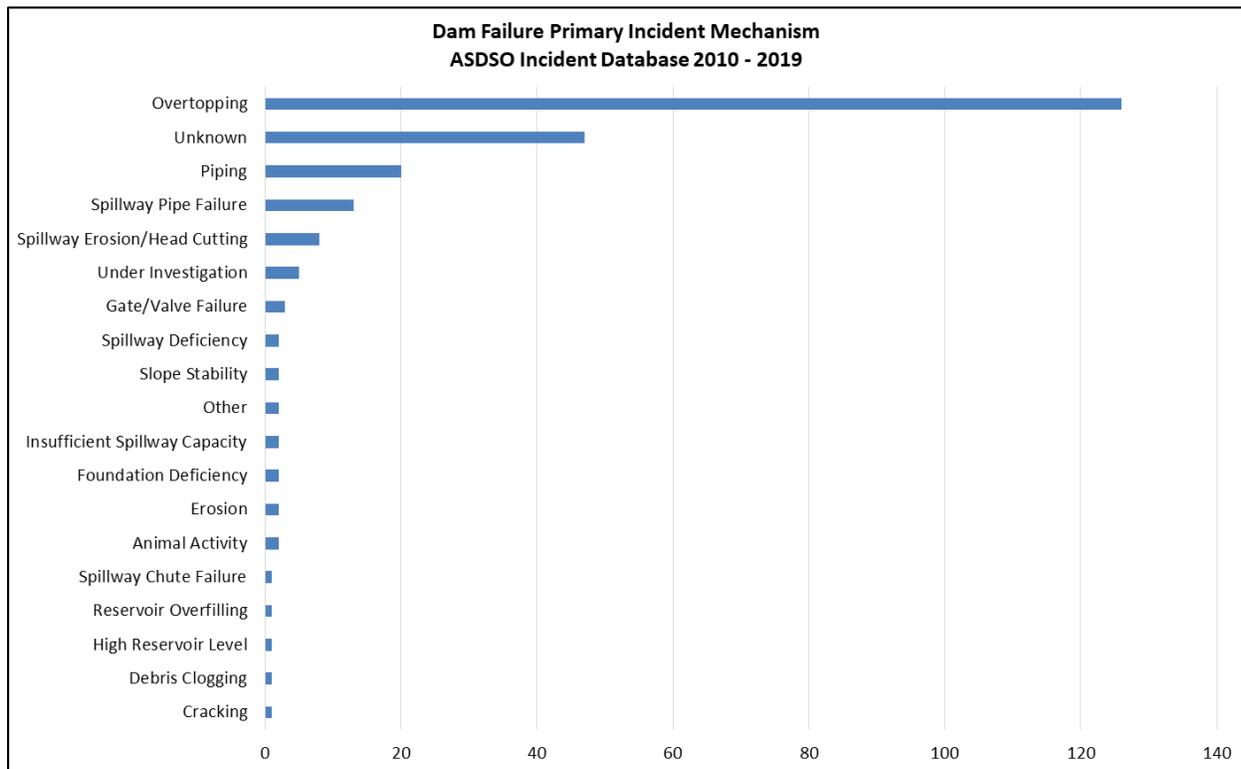


Figure 3.2: Dam Failure Primary Mechanism, ASDSO

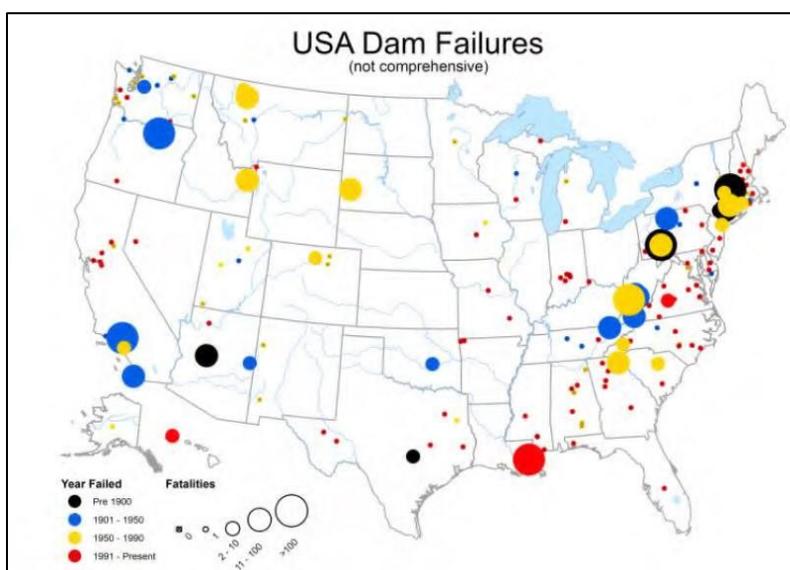


The impact of dam failure in the United States is known to be significant but is not well understood. In the absence of a comprehensive nationwide program, the exact number of dam failures that

have occurred is unknown. According to the ASDSO, however, dam incidents and dam failures have been documented in every state and are known to have taken thousands of lives.⁴⁷ For clarification, an “incident” is a condition that could have resulted in dam failure, but failure did not occur. The ASDSO has also mapped a subset of dam failures with known locations (a comprehensive database is not available) and updated the number of known structures considered high-hazard potential dams. This figure, which was 13,859 in 2009, increased to 16,569 by 2021.

ASDSO records show that 1,084 dam-related incidents occurred between 2010, when the organization began maintaining an incident database, and November 2020, when the database was last updated. This map shows that most failures have caused limited loss of life, but a few have caused more than a hundred fatalities,⁴⁸ as shown in Figure 3.3. Dam failures may also result in significant economic and environmental costs. The inundation of neighboring communities may damage property and infrastructure, and the release of agricultural or industrial wastes may pollute downstream waterways.

Figure 3.3: Dam Failures Reported by State Officials (ASDSO, 2015)



The potential impacts of a dam failure depend on the amount of water impounded by the dam and the density, type, and value of downstream development. Many federal and state dam safety programs use a FEMA classification system to divide dams into one of three categories based on the potential impacts of dam failure. The categories are high, significant, and low and are based on the potential for loss of life and damage to property Table 3.6. It is important to emphasize that this system does not reflect the condition of the dam or its physical integrity. In addition, as more development occurs downstream of a dam, its hazard potential can increase. Across the United

⁴⁷ Association of State Dam Safety Officials, 2018. Dam Failures and Incidents.

<https://damsafety.org/dam-failures>

⁴⁸ Ibid.

States, dam safety regulators have limited ability to restrict development in downstream areas, and the number of high hazard potential dams is rising.⁴⁹

Table 3.6: Dam Hazard Classifications (FEMA, 2004)

Class Hazard Level	Health and Safety Impacts	Economic Impacts
High	Probable loss of life	Widespread damage to homes, industrial and commercial buildings, important utilities, highways, or railroads
Significant	No loss of life expected	Damage to isolated homes, utilities, highways, or railroads
Low	No loss of life expected	Slight damage to farm buildings, forest or agricultural land, or minor roads

3.2.1.2 Nature of the Hazard in Alabama

The State of Alabama includes over 132,000 miles of river and stream channels and more than 4,800 large dams (defined as dams with a capacity greater than 50 acre-feet or a height greater than 25 feet) that support irrigation, electrical generation, flood control, navigation, and/or recreation.^{50, 51} Many of the state's largest dams are on the Black Warrior, Coosa, Tallapoosa, and Tennessee Rivers. These include 14 hydroelectric dams operated by Alabama Power that provide more than 6% of the company's power generation and 7 dams operated by the Tennessee Valley Authority. The state's thousands of smaller dams are distributed throughout Alabama and serve many purposes, from flood control and sediment reduction to irrigation, livestock watering, and recreation.

Because most of Alabama's dams are not subject to record-keeping or inspection requirements, it is difficult to paint a complete picture of the magnitude of the dam failure hazard in the state. Alabama is the only state in the country without a dam safety program. State officials, therefore, have negligible authority to oversee dams and limited resources to collect information on their location, hazard potential, and condition. ADECA has compiled an inventory of the state's dams and their estimated hazard potential, but information on dam conditions and other characteristics is generally not available. Since there are also tens of thousands of small ponds in Alabama, ADECA includes in its inventory only dams with a capacity greater than 50,000 acre-feet or a height greater than 25 feet.

⁴⁹ Association of State Dam Safety Officials, 2018. Dams 101. <https://damsafety.org/dams101>

⁵⁰ Patrick E. O'Neil. Geological Survey of Alabama. River Systems and Watersheds of Alabama. <http://encyclopediaofalabama.org/article/h-1627>. July 2, 2013.

⁵¹ Alabama Department of Economic and Community Affairs. Personal communication from Wardell Edwards. February 7, 2018.

Based on state records, 227 of Alabama’s 2,266 dams (or 10.02% of all large dams) are classified as having a high hazard potential. As noted above, a dam’s hazard potential is based on the potential impact if it were to fail, not its condition or chance of failing. Table 3.7 shows the number of dams in Alabama by hazard level classification. The counties with the largest number of high-hazard potential dams are generally located in the greater Tuscaloosa and Birmingham areas.

The U.S. Army Corps of Engineers (USACE) National Inventory of Dams (NID) also includes records for dams in Alabama and shows the following number of dams at each hazard level.⁵²

Table 3.7: Alabama Dams by Hazard Potential

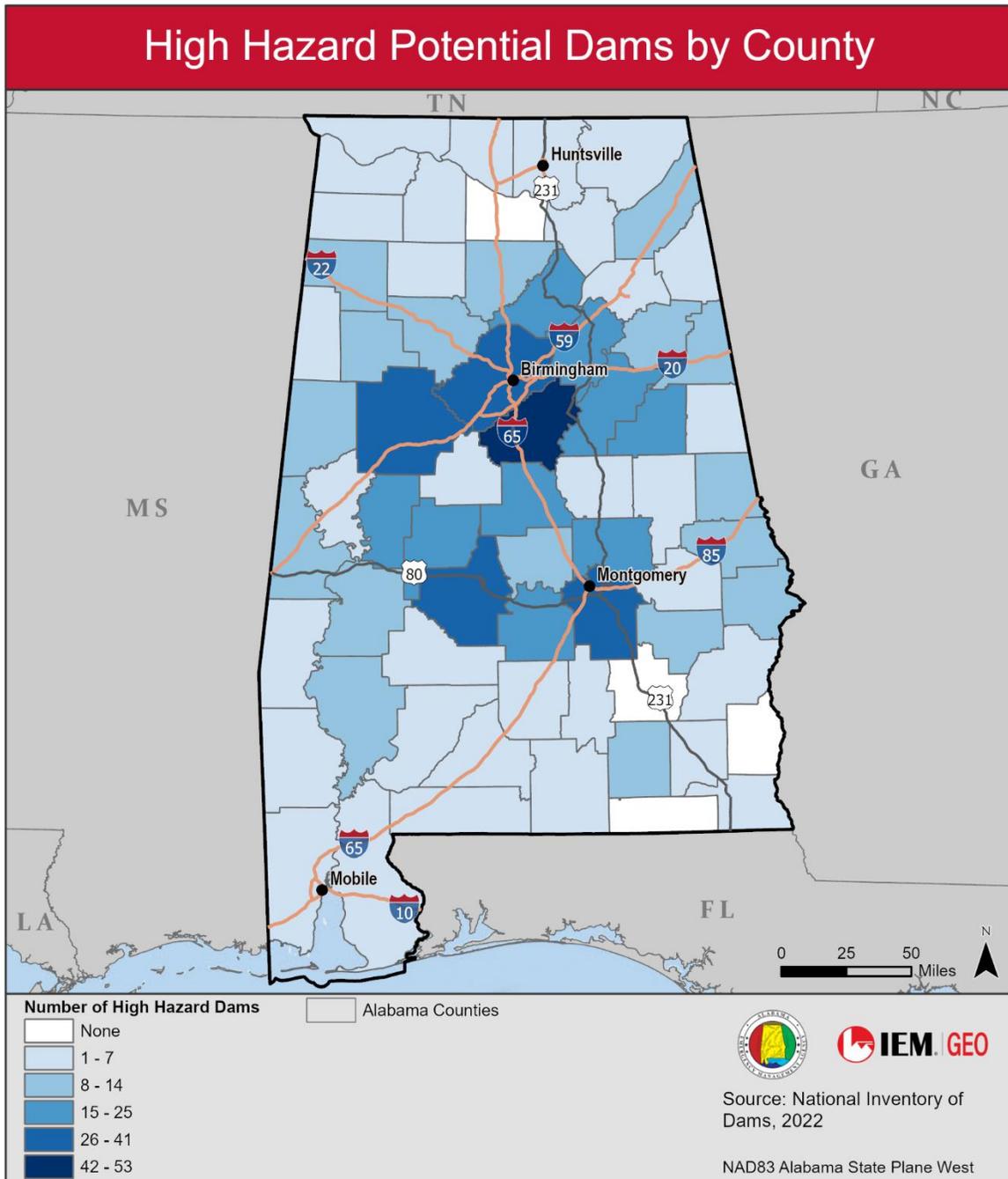
Hazard Level	# of Dams	Hazard Level	# of Dams
High	227	Low	1,595
Significant	443	Undetermined	1

Unfortunately, these records are only current for the small percentage of dams subject to federal oversight. For these dams, the records include information on both dam hazard potential and dam condition. Of the 70 dams in Alabama subject to federal oversight, 38 are classified as high-hazard potential dams. Of these high hazard potential dams, most are classified as being in satisfactory or fair condition, and three are classified as being in poor or unsatisfactory condition. These three dams are:

- The Logan Martin Dam, located on the Coosa River in St. Clair County
- The Little Bear Creek Dam, located on Little Bear Creek in Franklin County
- The Bear Creek Dam, located on Bear Creek in Franklin County

⁵² U.S. Army Corps of Engineers. National Inventory of Dams. <https://damsdev.net/#/>

Figure 3.4: High Hazard Potential Dams by County (ADECA, 2022)



3.2.1.3 Dam Failure History in Alabama

Based on historical records for the past 20 years, there have been several incidents of dam failure reported in the State. However, it is difficult to determine if these failures occurred at high hazard and significant dams. There is no official, comprehensive record of dam failures in Alabama that

documents all dam failure incidents in the state. At the discretion of local officials, however, some jurisdictions have reported selected dam failures to the ASDSO and to the Alabama section of the ASCE. Table 3.8 catalogs these reported dam failures. It should be emphasized that this list is by no means comprehensive, and the number of dam failures omitted from this list is unknown.

Table 3.8: Historical Dam Failure Events (ASDSO and ASCE, 2017)

Date	Location	Description
1975	Elmore County	<p>Original construction of the Bouldin Dam earth embankment was completed in July 1967. The breach occurred-adjacent to the intake on the east side. The breach in the earth embankment extended about 300 feet eastward of the east face of the intake structure. Erosion at the breach extended vertically downward to remove a significant volume of the foundation and the backfill at the east end of the concrete structure. The maximum depth of scour was 165 feet below the top of the earthen embankment and occurred near the east edge of the powerhouse. The upstream slopes of both the east and west dikes were undercut extensively, creating numerous slides.</p> <p>There were no personal injuries reported and no significant damages downstream. The principal damage from failure was to the dam and associated power plant facilities. Reconstruction was completed and the power production resumed in September 1980.</p>
1990	Shelby County	Three earthen dams in Shelby County sustained damage during the flood of February 3–17, 1990. Heavy rains and flooding saturated the Holly Brooke Lake Dam, causing the face to slump. Six families were evacuated, and the water level of the 55-acre pond impounded by the dam was lowered to prevent failure.
1990	Crenshaw County	A dam at Magnolia Shores Lake in Crenshaw County was overtopped during the heavy rains and flooding of March 23, 1990. The downstream slope was damaged, and the lake was drained to prevent a break in the dam. The slope was damaged, and the lake was drained to prevent a break in the dam.
1990	Crenshaw County	The C.D. Clark Dam in Dozier, Crenshaw County, failed and washed out 50 yards of northbound U.S. Highway 29. Lake Tholocco, a 600-acre lake on the Fort Rucker reservation near Ozark, was also drained because of excessive flow through its emergency spillway.
1994	Multiple counties	Local officials reported 160 dam breaks during the July 1994 floods. The state does not require local officials to report dam breaks, so the actual number of breaks was likely higher.
2004	Jefferson County	East Lake Dam in Birmingham overtopped during heavy rainfall in 2004, resulting in severe slope erosion and near failure. Two hundred and seventy residents were evacuated. If failure had occurred, several homes and roadways could have been destroyed.

Date	Location	Description
2004	St. Clair County	Keith Lake Dam in St. Clair County failed during heavy rainfall in 2004. The dam failure created a path of destruction 3,600 feet long and 1,350 feet wide and led to the evacuation of homes, decreased property values, and environmental damages, as well as significant damage to a downstream dam.
2009	Etowah County	A private dam failed near the Gallant community in Etowah County during the heavy rains and flooding of January 6, 2009. The failure produced 12 feet of flooding, leading to the evacuation of nearby residents and the closure of several roads. Property damage was reported to be \$100,000.
2012	St. Clair County	The 55-acre lake at Camp Sumatanga in St. Clair County drained to nearly empty in 2012 due to a collapsed pipe. No significant downstream damage was reported.
2013	Shelby County	A Shelby County dam failed due to soil piping along the 60-inch discharge pipe in 2013. Approximately 200 million gallons of water were released in less than an hour. There was significant damage to roadways and downstream properties.

3.2.1.4 Probability of Dam Failure in Alabama

The probability of a dam failure event impacting the State of Alabama in any given year is Occasional. Dam failures result from multiple natural and human factors that are highly site-specific, and their probability cannot be expressed in quantitative terms. In states with dam safety programs that require dams to be inspected and maintained, the relative probability of dam failures in different jurisdictions can be expressed in qualitative terms. Because there are no inspection and record-keeping requirements in Alabama, the relative hazard in jurisdictions across the state cannot be determined. Over time, however, the probability of a costly dam failure within the state is growing. This is because many of the state's aging dams are not receiving regular inspection and maintenance and because the population in the areas downstream of dams is growing.

An incident that occurred in Shelby County in September 2013 illustrates the concerns of residents living in areas susceptible to dam inundation. An earthen dam in Shelby County broke uphill from homes in the city of Chelsea and flooded some areas with 6 to 10 feet of water. The flooding damaged no property, no one was hurt, and the dam has since been rebuilt. But because the state provides no dam oversight, regulation, or maintenance, there are concerns that residents living in the region fear another flood could happen at any time.⁵³

Alabama is the only state without a dam safety program, which would require only annual maintenance and inspection, as well as critical record keeping on dam conditions and the extent

⁵³ Andrew J. Yawn. Alabama Has the Biggest Dam Problem in the U.S. *Montgomery Advertiser*, February 17, 2017. <https://www.montgomeryadvertiser.com/story/news/local/community/2017/02/17/alabama-has-biggest-dam-problem-us/97945728/>

to which a breach would affect residents downstream. Regular inspections would allow communities to assess the potential risk of dam failure.

3.2.1.4.1 Future Probability

The most common cause of dam failure is flooding due to heavy rains. The probability, location, intensity and impacts of hazards will change over time. Climate change, including changes in temperature, intensity, hazard distribution or frequency of weather events, may increase vulnerability to the hazards in the future. Based on historical knowledge and current conditions, it can be expected that all hazards will see a rise in scope, scale, and frequency of events on a yearly basis.

As the anticipated frequency of heavy rains increases with climate change (see Section 3.2.5.4.1 Future Probability, on flood hazards), the incidence of dam failure in Alabama may increase. The higher frequency of heavy rains is a particular concern for Alabama's coastal counties, which are more likely to experience rainfall as a consequence because of its exposure to hurricanes and other tropical events. There is a high probability an incident or failure could occur because there is no ongoing structural review or regular maintenance that would prevent an unforeseen event.

3.2.1.4.2 Risk and Vulnerability

A community's vulnerability to dam failure is a function of the probability of failure, the exposure of people and property to the uncontrolled release of water, and the susceptibility of people and property to the hazard.

An Emergency Action Plan (EAP) is an important safeguard against the loss of life and property that may result from the failure of a high-hazard potential dam. EAPs are formal documents that identify potential emergency conditions at a dam site and specify actions to be followed to minimize the impact of dam failure. One of the most important components of an EAP is the inundation map. The inundation map shows the locations, people, and infrastructure that could be affected by a dam failure by estimating the area that would be flooded by a complete dam breach. While all 46 federally regulated, high-hazard dams in Alabama are required to have an EAP, the state does not require that non-federal high-hazard potential dams develop EAPs. As discussed above, 227 of Alabama's 2266 dams (or 10.02% of all large dams) are classified as having a high hazard potential. Since only 38 of these dams are federally regulated, the remaining 149 high-hazard potential dams are not required to develop EAPs or inundation maps. Should an incident occur at one of these dams, local and state emergency managers would therefore have limited information on the possible extent of flooding, evacuation, and response needs.

As discussed above, the counties in the greater Tuscaloosa and greater Birmingham areas include the largest numbers of dams with high hazard potential. The failure of these dams is likely to cause loss of life and significant economic loss. Fortunately for the state, there are resources and funding to help mitigate dam incidents and limit structural and community vulnerability. In 2016, the president signed the Water Infrastructure Improvements for the Nation Act (WIIN Act), which includes the development of a Rehabilitation of High Hazard Potential Dam (HHPD) grant

program that awards grants to states managing an authorized dam safety program. Funding for the first three years of the program is shown here.⁵⁴

Table 3.9: FEMA-Funded High Hazard Potential Dam (HHPD) Grant Awards

Fiscal Year	Number of Awards	Federal Share
2019	26	\$153,007–\$1,250,000
2020	20	\$114,943–\$1,035,676
2021	15	\$396,745–\$1,556,603
2022	19	\$226,802–\$3,133,869

The OWR was provided funding and tasked by the legislature with developing and conducting a survey and evaluation study of dams in three counties in Alabama with the objective of developing a framework for a dam safety program in Alabama.

The work was commenced in 2023 and be performed by an engineering consultant to develop an updated inventory of dams in Jefferson, Shelby, and Tuscaloosa Counties; select a group of dams from the inventory to be inspected and evaluated for safety, structural integrity, hazard potential, potential downstream consequences, and the development of emergency action plans; and based on the findings from the study, develop a plan for evaluating the remaining dams in the state as well as a framework and recommendations for a cost-effective implementation of a dam safety program utilizing lessons learned from other states' dam safety programs.

When a dam fails, the stored water can be suddenly released and have catastrophic effects on life and property downstream. The amount of warning time depends largely on the nature of the failure. Homes, bridges, and roads may be demolished in minutes. The impact of the event may be felt for an extended period of time. Residents near a significant or high-hazard dam should become familiar with the dam's emergency action plans if one is available. Emergency plans written for dams include procedures for notification and coordination with law enforcement and other governmental agencies; information on the potential inundation area; plans for warning and evacuation; and procedures for making emergency repairs.

Lifelines- Dam Failure - All

In the event of dam failure, all lifelines are at risk of failure. This can result in catastrophic loss of life and property. Flooded roads can make transportation impossible, making it difficult for emergency services to reach affected communities. The infrastructure may also be damaged or washed away. Crops and livestock may be destroyed, and power outages can lead to a loss of energy-dependent structures and services. Additionally, clean drinking water may be scarce or unattainable.

⁵⁴ Federal Emergency Management Agency. High Hazard Potential Dams Grant Awards, 2019–2022. <https://www.fema.gov/emergency-managers/risk-management/dam-safety/rehabilitation-high-hazard-potential-dams/awards>

3.2.1.5 Consequence Analysis

The information in Table 3.10 provides the consequence analysis of the potential for detrimental impacts of dam failure done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.10: EMAP Consequence Analysis: Dam Failure

Subject	Ranking	Impacts/Dam Failure
Health and Safety of Persons in the Area of the Incident	Severe	The localized impact is expected to be severe for the inundation area and moderate to minimal for other affected areas.
Responders	Minimal	The impact on responders is expected to be minimal with proper training. The impact could be severe if there is a lack of training.
Continuity of Operations	Minimal	Temporary relocation may be necessary if inundation affects government facilities.
Property, Facilities, and Infrastructure	Minimal to severe	The localized impact could be severe for facilities and infrastructure in the inundation area of the incident. The farther away from the incident area, the more likely the damage will lessen, from moderate to minimal.
Delivery of Services	Minimal to severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to the inundation. Minimal to severe, depending on area size and location affected.
Environment	Severe	The impact will be severe for the immediate area. The impact will lessen as distance increases from the immediate incident area.
Economic Conditions	Minimal to severe	Impacts on the economy will greatly depend on the scope of the inundation and the amount of time it takes for the water to recede.
Public Confidence in Jurisdiction's Governance	Minimal to severe	The public's confidence will vary, depending on the perception of whether the failure could have been prevented, the warning time, and the time it takes for response and recovery.

3.2.2 Drought

3.2.2.1 Description

Drought, which is a normal part of nearly all climates, is a water shortage originating from a deficiency in expected precipitation caused by unusual weather patterns. If these weather patterns persist for several months to several years, the drought is considered to be long-term; a

short-term drought may last several weeks to a few months. In addition to its duration, a drought's severity can also depend on such factors as intensity, geographic extent, and regional water supply demands by humans and vegetation. Further, the severity of a drought can be influenced by climatic factors including high temperatures, prolonged high winds, and low relative humidity.⁵⁵

Due to its multidimensional nature, a drought is difficult to define, and conducting a comprehensive risk assessment is challenging. For example, in contrast with other natural hazards, the effects of drought are not immediately apparent and may impact a larger geographic area. Additionally, because the effects of a drought event are slow to accumulate and may linger after an event, the beginning and end of a drought are difficult to determine. Finally, the lack of a universally accepted and precise definition of drought adds to the confusion in tracking the existence and severity of droughts.⁵⁶

Table 3.11: Types of Droughts

Drought Type	Description/Definition
Meteorological	Defined solely on the degree of dryness, expressed as a departure of annual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
Hydrological	Related to the effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
Agricultural	Defined principally in terms of soil moisture deficiencies relative to the water demands of plant life, usually crops.
Socioeconomic	Associates the supply and demand of economic goods or services with elements of meteorological, hydrological, and agricultural drought. Socioeconomic drought occurs when the demand for water exceeds the supply as a result of a weather-related supply shortfall. This type of drought may also be called a "water management drought."

There are many quantitative measures and indices that attempt to define the severity of a drought, which can vary based on the region and application. However, the most widely used index is the Palmer Drought Severity Index (PDSI). The PDSI was developed in the 1960s and is still frequently used to indicate drought conditions throughout the United States. The PDSI may be more widely applied as it accounts for several other factors in addition to total precipitation, including temperature and soil recharge.

Table 3.12: Palmer Drought Severity Index (PDSI) Classifications

Scale Interval	Class Description
4.0 or more	Extremely wet
3.0 to 3.99	Very wet

⁵⁵ FEMA, National Risk Index: Drought (2022). <https://hazards.fema.gov/nri/drought>

⁵⁶ Ibid.

Scale Interval	Class Description
2.0 to 2.99	Moderately wet
1.0 to 1.99	Slightly wet
0.5 to 0.99	Incipient wet spell
0.49 to -0.49	Near normal
-0.05 to -0.99	Incipient dry spell
-1.0 to -1.99	Mild drought
-2.0 to -2.99	Moderate drought
-3.0 to -3.99	Severe drought
-4.0 or less	Extreme drought

Another resource that defines the geographic extent and severity of drought in the United States is the U.S. Drought Monitor. The U.S. Drought Monitor is a map that is updated each week to illustrate the current location and intensity of the drought. Like the PDSI, it is based on many indicators, not just levels of precipitation.⁵⁷

⁵⁷ University of Nebraska, National Drought Mitigation Center. U.S. Drought Monitor. <http://droughtmonitor.unl.edu/>

Table 3.13: U.S. Drought Monitor Classifications

Category	Description	Possible Impacts	Palmer Drought Severity Index (PDSI)	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Drought Indicator Blends (Percentiles)
D0	Abnormally dry	Going into drought: Short-term dryness, slowing planting and growth of crops or pastures Coming out of drought: Some lingering water deficits: pastures or crops not fully recovered	-1.0 to -1.9	21 to 30	21 to 30	0.5 to -0.7	21 to 30
D1	Moderate drought	Some damage to crops and pastures Streams, reservoirs, or wells low; some water shortages developing or imminent Voluntary water-use restrictions requested	-2.0 to -2.9	11 to 20	11 to 20	0.8 to -1.2	11 to 20
D2	Severe drought	Crop or pasture losses likely Water shortages common Water restrictions imposed	-3.0 to -3.9	6 to 10	6 to 10	1.3 to -1.5	6 to 10

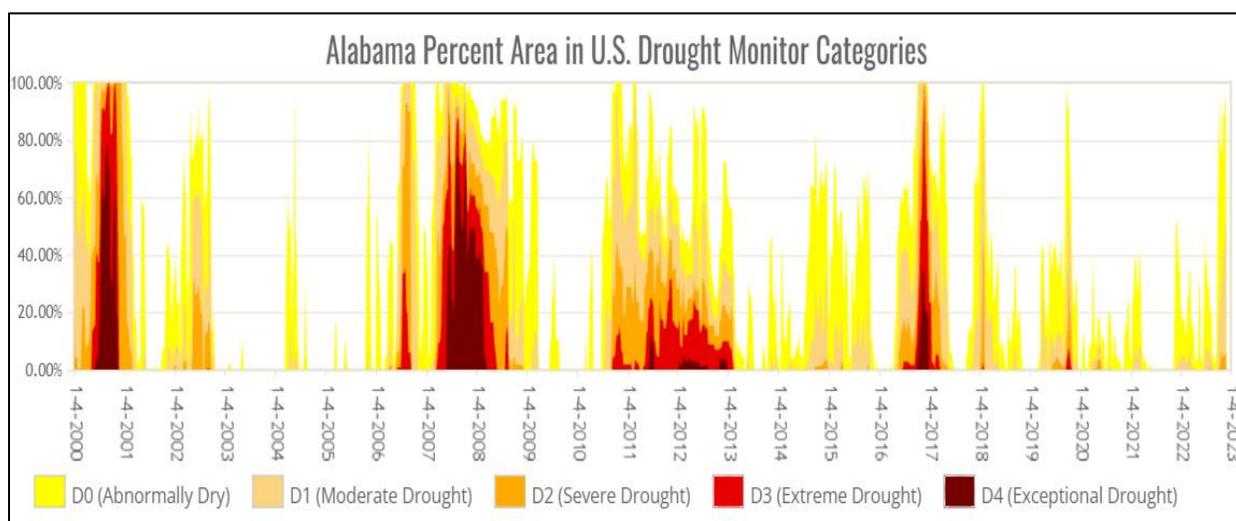
Category	Description	Possible Impacts	Palmer Drought Severity Index (PDSI)	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Drought Indicator Blends (Percentiles)
D3	Extreme drought	Major crop/pasture losses Widespread water shortages or restrictions	-4.0 to -4.9	3 to 5	3 to 5	1.6 to -1.9	3 to 5
D4	Exceptional drought	Exceptional and widespread crop/pasture losses Shortages of water in reservoirs, streams, and wells, creating water emergencies	-5.0 or less	0 to 2	0 to 2	2.0 or less	0 to 2

3.2.2.2 Nature of the Hazard in Alabama

The challenge of defining the extent of the drought hazard in Alabama is illustrated in the national map of drought conditions produced by the National Drought Mitigation Center (NDMC). This map shows the frequency of severe and extreme drought conditions between 1895 and 1995 and represents the latest available long-term summary of drought conditions across the United States.⁵⁸

Drought indices that integrate physical and socioeconomic parameters tend to show more local variability and provide more meaningful information for decision-makers. These indices often show rapidly evolving conditions as both user demands and available supplies shift over time. The U.S. Drought Monitor is an example of a drought index that reflects both physical parameters and socioeconomic impacts. Every week, it consults with a network of more than 350 observers across the country to integrate observed local impacts into a map of drought conditions.

Figure 3.5: Percentage of Land Area Experiencing Drought in the State of Alabama, 2000–2023 Predictions⁵⁹



When a drought does occur in Alabama, the social, economic, and environmental impacts have the potential to be severe and widespread. The following are examples of the potential effects of drought in the State of Alabama, including effects the state has experienced in past drought events:

- Damage to livestock and crops.
- Increased local vulnerabilities to sinkholes and wildfire.
- Water usage conflicts.
- Accelerated coastal erosion.

⁵⁸ <http://drought.unl.edu/Planning/Monitoring/HistoricalPDSIMaps.aspx>

⁵⁹ U.S. Drought Monitor, Time Series. <https://droughtmonitor.unl.edu/DmData/TimeSeries.aspx>

- Damaged fisheries; and high energy demand and the inflated energy prices due to the loss of hydropower.

3.2.2.3 Drought History in Alabama

In the six-year time period from 2017 to 2022, there have been approximately 48 drought events in the State of Alabama. Currently, there are no reported deaths, injuries, property damage, or major crop damage. Based on historical records for the past 20 years, the observed drought events in Alabama ranged in magnitude from D1 to D4.

According to FEMA, Alabama has had one drought that resulted in a federal disaster declaration. The drought, which occurred in 1977, was declared an emergency in all 67 counties of the state. More recently, according to the NWS Storm Event Database, severe drought events have been reported in Alabama almost every year between 2017 and 2022. The majority of these events impacted multiple counties and lasted several months to several years. Additionally, the severity of droughts reported as determined by the U.S. Drought Monitor has varied from moderate to exceptional (D1 to D4). Although drought events have occurred frequently, the severity of several droughts has been exceptional. NOAA's Storm Events Database indicates that no deaths or injuries occurred as a result. However, the most severe drought events in terms of duration, intensity, and extent resulted in widespread agricultural, hydrologic, and sociological impacts.

The following provides a more detailed description of these events and a brief summary of their impacts based on information obtained from the Storm Events Database:

From March 2007 through December 2008, most of central and northern Alabama experienced moderate to exceptional drought conditions. March, traditionally the wettest month of the year, was instead one of the driest on record in 2007. In May 2007, much of the northern area of the state was plunged into historic extreme drought (D3) for the entire month. Area rivers remained at low flow levels, and some reached the lowest recorded for this time of year in more than 50 years. Soil moisture was also at historic lows, in the first percentile or below. Hay cutting ran behind and at a lower production rate. Non-irrigated corn in some areas was believed to be a complete loss. Overall yields were reduced, and the dry conditions caused even further reductions in the expected yields. Local extension agents rated the corn and wheat crops as poor to very poor. Extension agents also reported that cotton and soybeans were stressed due to a lack of soil moisture. Pasturelands produced very low yields of hay due to a lack of growth, so farmers were forced to reduce cattle herds. Drought emergencies were declared by the Alabama Forestry Commission, meaning that prolonged drought conditions were creating a situation where the probability of catastrophic fire activity was high.

By June 2007, drought conditions had spread south through central Alabama and central counties, reaching D4 (exceptional drought) status. Crops continued to be highly stressed due to the lack of rainfall, with losses ranging from 50% to nearly 100%. The number of mandatory water restrictions continued to increase, with fines and surcharges being enforced for excessive water usage. Many residential lawns, shrubbery, and gardens

became severely stressed by the very dry conditions. Through August 2007, major rivers and reservoirs continued to run much below normal. Navigation on major rivers became significantly impacted, and many boat landings on major lakes became unusable due to extremely low lake levels.

Drought conditions continued into January 2008 across most of central and northern Alabama, the threat of water shortages for municipal water systems persisted, and most water restriction plans already in place continued. Agricultural impacts were minimized since it was between growing seasons. By March 2008, several storm systems across central Alabama brought limited improvement; the last remaining area of D4 drought was eliminated, and the D3 area was reduced as well.

Drought conditions continued to improve through June 2008. August 2008 marked the first substantial rainfall for the Central Tennessee Valley since the beginning of the drought. In October 2008, a storm system brought some rainfall to the east-central part of the state, which helped ease D2 drought conditions. Finally, by December 2008, very heavy rainfall put an end to drought conditions in the remaining affected counties. The Drought Monitor, issued on December 16, 2008, reported an end to the drought conditions.

In May 2016, D2 drought conditions were introduced into the northeastern portion of Alabama and subsequently spread to encompass much of north-central Alabama. By the end of July 2016, drought conditions deteriorated in the far western edges of northwest Alabama along the Mississippi state line. Conditions in the area were classified as D2 to D3; D3 conditions also expanded through north-central Alabama. Below-normal rainfall and above-average temperatures continued across central Alabama through September 2016, with drought conditions continuing to worsen.

By October 2016, the Governor of Alabama issued a Drought Emergency Declaration for all of central Alabama, which prohibited all outdoor burning. No measurable rain was recorded that month in the southwest of the state, leading to D2 drought conditions. Many locations across central Alabama received little or no rainfall during the month of October. Drought conditions continued to worsen, with D3 conditions expanding to cover a large portion of central Alabama and D4 conditions occurring across east-central Alabama. This prolonged period of dry weather resulted in worsening drought conditions across central Alabama. By the end of November, 39 counties in central Alabama were experiencing D3 to D4 drought conditions. However, several rounds of beneficial rainfall at the end of November helped alleviate these conditions.

Below-normal rainfall continued for the majority of central Alabama during the month of December. There were a few areas that received near or just above normal monthly rainfall amounts, including the northwest counties and those counties along and south of the I-85 corridor. Drought conditions did not worsen in any county across central Alabama, while six counties were downgraded to one drought-level category.

Rainfall continued in January and February 2017, improving drought conditions across central Alabama, and lowering the drought intensity to D2 and D1 conditions. Through May 2017, significant rainfall over portions of central Alabama eased the drought conditions. By August 2017, there were no drought conditions present in the state.

Severe drought events in Alabama have significantly affected agriculture. Table 3.14 provides data estimates of economic loss from the USDA Risk Management Agency.⁶⁰ Updated data economic losses since 2014 was not available for this plan update. On average, a total of \$21,239,838 has been paid in the state annually for agricultural losses resulting from drought. The largest indemnity payments occurred in 2000. Recently, since 2006, indemnity payments have been the highest in years during which severe drought conditions have been reported. For example, between 2006 and 2008, indemnity payments totaled \$107,484,469.

Table 3.14: Indemnity Payments for Losses Suffered from Drought in Alabama

Year	Indemnity Payment
1989	\$4,650,131
1990	\$61,162,359
1991	\$6,467,996
1992	\$1,252,901
1993	\$24,302,234
1994	\$355,637
1995	\$21,380,107
1996	\$11,011,138
1997	\$20,011,224
1998	\$25,405,242
1999	\$25,907,889
2000	\$72,835,802
2001	\$13,991,483
2002	\$15,242,492
2003	\$262,027
2004	\$3,191,851
2005	\$2,576,453
2006	\$41,545,014
2007	\$47,119,706
2008	\$18,819,749

⁶⁰ University of Nebraska, National Drought Mitigation Center. Drought Indemnity Payment Data. <http://drought.unl.edu/Planning/Impacts/DroughtIndemnityData.aspx>

Year	Indemnity Payment
2009	\$4,060,393
2010	\$40,012,370
2011	\$46,804,629
2012	\$19,350,399
2013	\$523,961
2014	\$23,992,596

In recognition of the potential widespread impacts of drought and to ensure consistent communication of drought conditions and impacts, the Alabama Department of Economic and Community Affairs – Office of Water Resources (ADECA-OWR) last revised the Alabama Drought Management Plan (DMP) in November 2018. The DMP establishes state-level operating procedures and a framework for the assessment of drought conditions, assists stakeholders and water managers in mitigating drought conditions, and encourages water conservation practices.⁶¹ In April 2014, the state passed the Alabama Drought Planning and Response Act, which formally established the state government’s role in planning, monitoring, and responding to drought conditions. The law also established the Alabama Drought Assessment and Planning Team (ADAPT), and its Technical subcommittee, the Monitoring and Impact Group (MIG), which monitor current drought conditions and potential impacts. The ADECA-OWR coordinates the monitoring of drought conditions in Alabama and periodically issues an Alabama Drought Declaration.⁶²

Table 3.15: Declared Disasters in the State of Alabama, 2017–2022

Date	County(s) Affected
December 4, 2019	Autauga, Barbour, Bullock, Butler, Coffee, Conecuh, Covington, Crenshaw, Dale, Elmore, Escambia, Geneva, Henry, Houston, Lee, Lowndes, Macon, Montgomery, Pike, and Russell
June 17, 2020	Baldwin, Colbert, Franklin, Lauderdale, Lawrence, Limestone, Marion, Mobile, and Winston
July 29, 2020	Barbour, Coffee, Dale, Geneva, Henry, Houston, and Pike
September 1, 2020	None
March 10, 2021	Bibb, Calhoun, Chambers, Chilton, Choctaw, Clarke, Clay, Cleburne, Coosa, Dallas, Fayette, Greene, Hale, Jefferson, Lamar, Marengo, Marion, Monroe, Perry, Pickens, Randolph, Shelby, St. Clair, Sumter, Talladega, Tallapoosa, Washington, and Wilcox

⁶¹ Alabama Department of Economic and Community Affairs, Office of Water Resources. Drought Planning and Management in Alabama. <http://adeca.alabama.gov/Divisions/owr/Pages/Drought.aspx> 23

⁶² Alabama Department of Economic and Community Affairs, Office of Water Resources. Drought Planning and Management. <http://adeca.alabama.gov/Divisions/owr/Pages/Drought.aspx>

Date	County(s) Affected
April 15, 2021	Calhoun, Chambers, Chilton, Clay, Cleburne, Coosa, Randolph, Talladega, and Tallapoosa
May 11, 2021	None
February 24, 2022	None
April 20, 2022	Baldwin, Barbour, Coffee, Dale, Geneva, Henry, Houston, Mobile, and Pike
May 26, 2022	Baldwin, Barbour, Coffee, Colbert, Dale, DeKalb, Franklin, Geneva, Henry, Houston, Jackson, Lauderdale, Lawrence, Limestone, Madison, Marshall, Mobile, Morgan, and Pike
June 29, 2022	Autauga, Baldwin, Barbour, Bibb, Blount, Bullock, Butler, Calhoun, Chambers, Cherokee, Chilton, Choctaw, Clarke, Clay, Cleburne, Coffee, Colbert, Conecuh, Coosa, Covington, Crenshaw, Cullman, Dale, Dallas, DeKalb, Elmore, Escambia, Etowah, Fayette, Franklin, Geneva, Greene, Hale, Henry, Houston, Jackson, Jefferson, Lamar, Lauderdale, Lawrence, Lee, Limestone, Lowndes, Macon, Madison, Marengo, Marion, Marshall, Mobile, Monroe, Montgomery, Morgan, Perry, Pickens, Pike, Randolph, Russell, Shelby, St. Clair, Sumter, Talladega, Tallapoosa, Tuscaloosa, Walker, Washington, Wilcox, and Winston
July 27, 2022	Barbour, Bibb, Blount, Calhoun, Chambers, Cherokee, Chilton, Clay, Cleburne, Coffee, Colbert, Coosa, Cullman, Dale, DeKalb, Etowah, Fayette, Franklin, Geneva, Hale Henry, Houston, Jackson, Jefferson, Lamar, Lauderdale, Lawrence, Limestone, Madison, Marion, Marshall, Morgan, Perry, Pickens, Pike, Randolph, Shelby, St. Clair, Sumter, Talladega, Tallapoosa, Tuscaloosa, Walker, and Winston
August 31, 2022	Colbert, DeKalb, Franklin, Jackson, Lauderdale, Lawrence, Limestone, Madison, Marshall, and Morgan
October 5, 2022	Baldwin, Barbour, Butler, Coffee, Colbert, Conecuh, Covington, Crenshaw, Dale, DeKalb, Escambia, Franklin, Geneva, Henry, Houston, Jackson, Lauderdale, Lawrence, Limestone, Madison, Marshall, Mobile, Morgan, and Pike

3.2.2.4 Probability of Drought in Alabama

The probability of a drought event impacting the State of Alabama in any given year is Likely. As discussed above, the State of Alabama has experienced severe drought conditions as defined by the Palmer Drought Severity Index approximately 5–10% of the time annually over the course of a calendar year. At the same time, abnormally dry conditions, as defined by the U.S. Drought Monitor, are observed to affect some part of the state nearly every year. Because the impacts of a drought event are typically widespread, it is likely that when drought conditions occur, a large percentage of the state will be affected. As a result, drought conditions are highly likely and can be expected throughout the state. However, because the severity and frequency of a drought event are difficult to forecast given the complexity of the conditions that determine its extent and impacts, it is difficult to quantify the relative probability of drought hazards across the state.

3.2.2.4.1 Future Probability

The probability, location, intensity and impacts of hazards will change over time. Climate change, including changes in temperature, intensity, hazard distribution or frequency of weather events, may increase vulnerability to these hazards in the future. Based on historical knowledge and current conditions, it can be expected that all hazards will see a rise in scope, scale, and frequency of events on a yearly basis.

Several agencies at the federal, regional, and state levels monitor indicators of drought conditions, including precipitation, streamflow, and temperature, but these resources provide only information on current conditions or short-term forecasts. However, according to the National Climate Assessment report, “hydrological droughts are expected to increase in frequency and intensity across most of the country through the end of the twenty-first century.”⁶³

With respect to the Southeast, although some forecast models predict drought to increase specifically across the Gulf Coast, these models are uncertain due to variations in future precipitation projections. However, the National Climate Assessment report does predict that future climate-related issues and increasing development patterns in the Southeast will likely threaten water supplies, which may also increase the risk of drought.

3.2.2.4.2 Risk and Vulnerability

A community’s vulnerability to loss from drought is a function of the probability of drought, the exposure of water supplies and economic activities to the hazard, and the susceptibility of water supplies and economic activities to the hazard. As demonstrated, the risk of drought is prevalent throughout the state and the impacts are potentially widespread.

Agriculture is an important economic activity in Alabama that is highly vulnerable to drought. This vulnerability is amplified by the prevalence of rain-dependent agriculture in the state. In Alabama, only 15% of the land currently available for farming is irrigated, compared to 61% of cropland in Mississippi and 40% in Georgia.⁶⁴

Across much of the state, less than 8% of cropland is irrigated. Many farmers are therefore at risk of lower yields and reduced revenues when droughts occur. To incentivize investments in irrigation infrastructure, the Alabama Legislature introduced an income tax credit for agricultural irrigation systems in 2012. Legislation enacted in 2017 has increased this tax credit for the tax years beginning after December 31, 2017, through December 31, 2022.

Additionally, as drought can be exacerbated by extreme heat, areas of the state that experience high temperatures may also be more vulnerable to the adverse impacts of drought conditions. Severe drought can also increase the potential for wildfires, and as such, areas that are more susceptible to wildfires may also be more vulnerable to drought.

⁶³ Ingram, K., K. Dow, L. Carter, J. Anderson, eds. 2013. *Climate of the Southeast US: Variability, Change, Impacts, and Vulnerability*. Washington DC: Island Press.

⁶⁴ Alabama Agricultural Experiment Station, 2017. NRCS Funds to Demonstrate and Promote Best Irrigation Practices in Alabama. <http://aaes.auburn.edu/news/nrcs-funds-to-demonstrateand-promote-best-irrigation-practices-in>

Figure 3.6: Harvested Cropland as Percent of Land in Farms

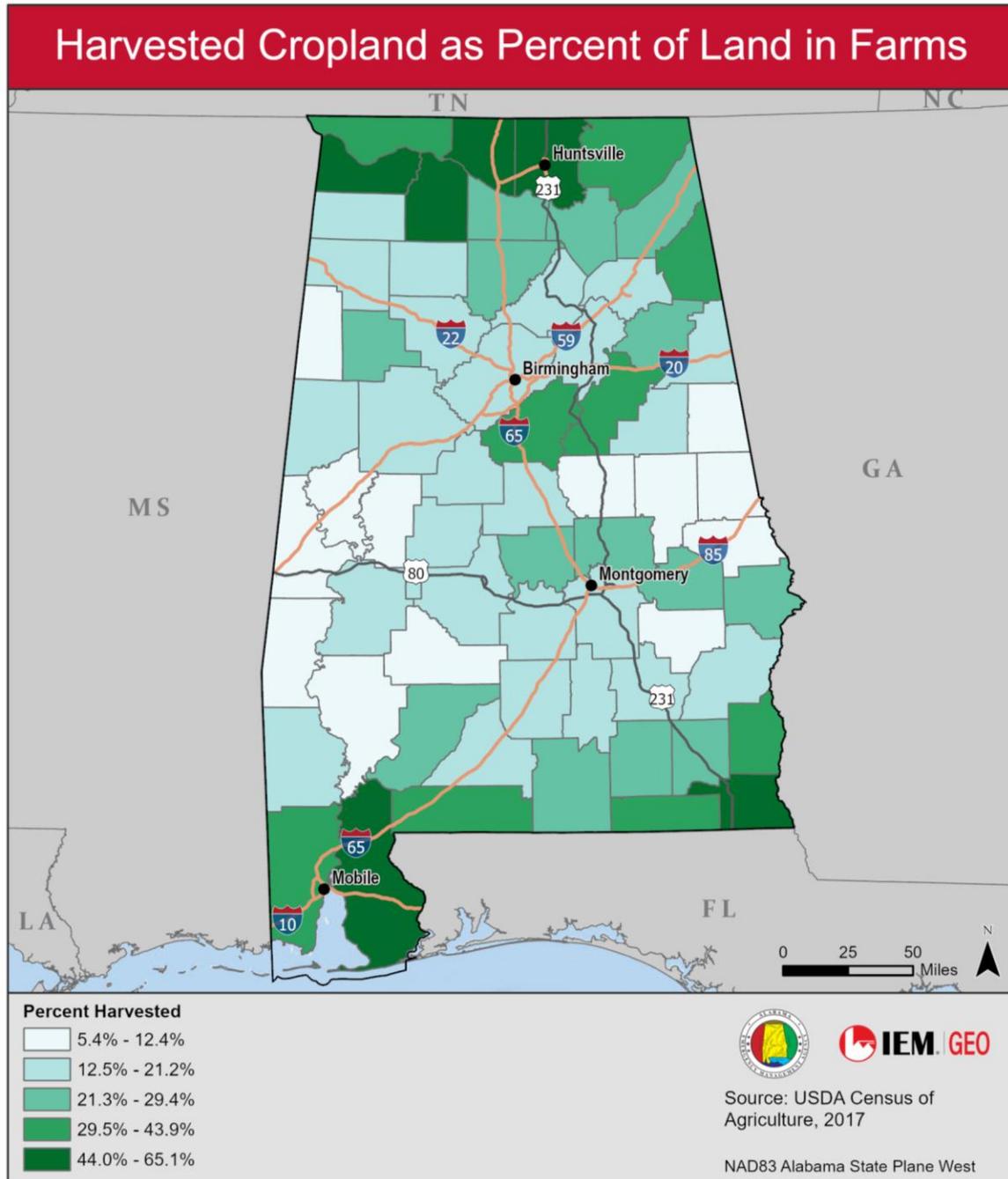


Figure 3.7: Irrigated Cropland as Percent of All Harvested Cropland

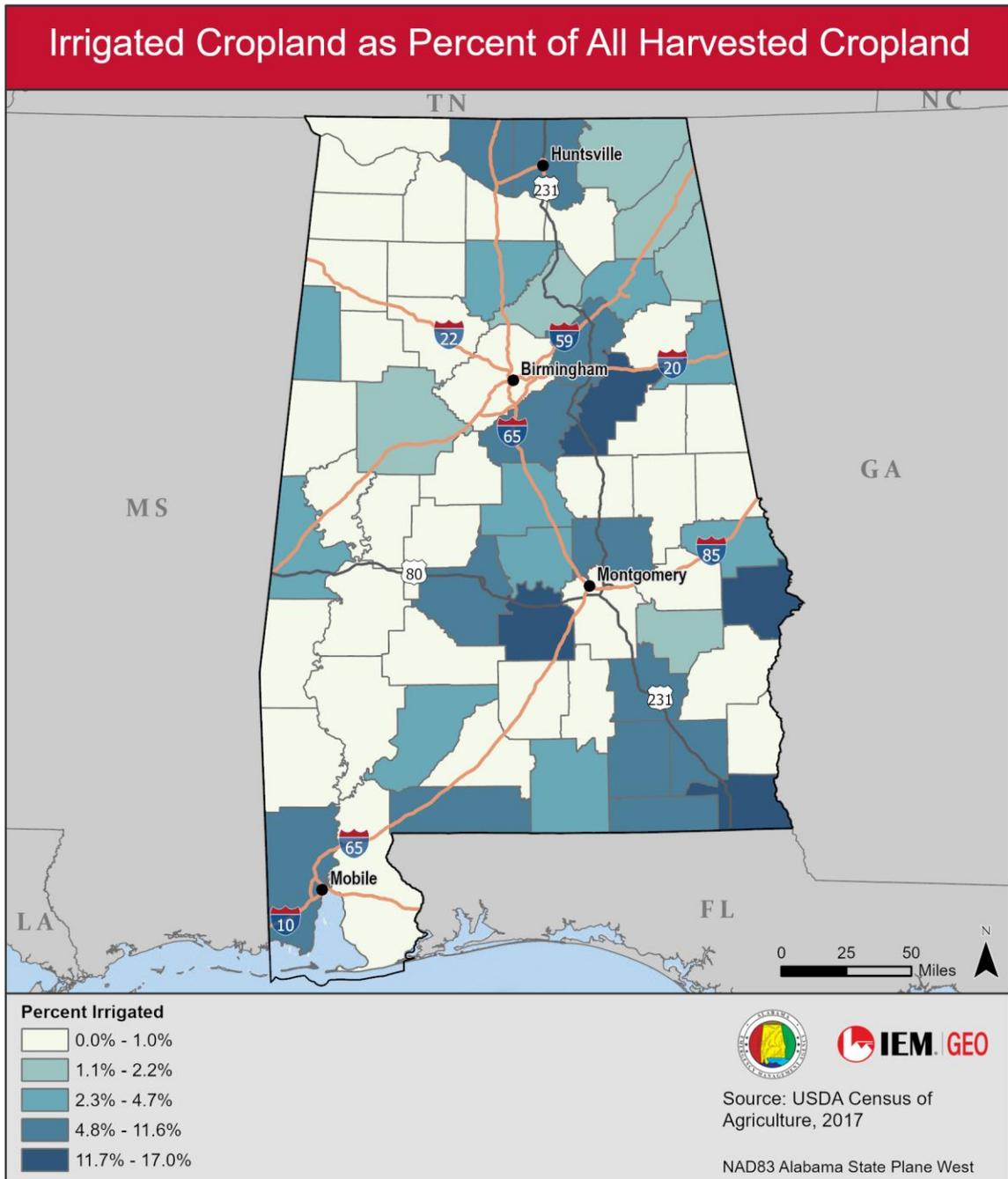


Table 3.16: Drought Events and Damages, 2017–2022⁶⁵

Hazard Type	Jurisdiction	No. of Events	Total Property Damage	Total Crop Damage	Death	Injuries
Drought	Autauga	1	0	0	0	0
	Barbour	3	0	0	0	0
	Bibb	5	0	0	0	0
	Blount	5	0	0	0	0
	Bullock	3	0	0	0	0
	Calhoun	6	0	0	0	0
	Chambers	2	0	0	0	0
	Cherokee	4	0	0	0	0
	Chilton	4	0	0	0	0
	Clay	5	0	0	0	0
	Cleburne	5	0	0	0	0
	Coffee	4	0	0	0	0
	Coosa	4	0	0	0	0
	Dale	5	0	0	0	0
	Dallas	1	0	0	0	0
	Dekalb	1	0	0	0	0
	Elmore	4	0	0	0	0
	Etowah	5	0	0	0	0
	Fayette	5	0	0	0	0
	Geneva	4	0	0	0	0
	Greene	3	0	0	0	0
	Hale	3	0	0	0	0
	Henry	5	0	0	0	0
	Houston	3	0	0	0	0
	Jackson	2	0	0	0	0
	Jefferson	6	0	0	0	0
	Lamar	4	0	0	0	0
	Lee	3	0	0	0	0
	Lowndes	1	0	0	0	0
	Macon	5	0	0	0	0
Madison	1	0	0	0	0	
Marengo	1	0	0	0	0	

⁶⁵ NECI data

Hazard Type	Jurisdiction	No. of Events	Total Property Damage	Total Crop Damage	Death	Injuries
	Marion	3	0	0	0	0
	Marshall	1	0	0	0	0
	Montgomery	3	0	0	0	0
	Perry	1	0	0	0	0
	Pickens	6	0	0	0	0
	Pike	3	0	0	0	0
	Randolph	3	0	0	0	0
	Russell	3	0	0	0	0
	Shelby	11	0	0	0	0
	St. Clair	6	0	0	0	0
	Sumter	3	0	0	0	0
	Talladega	4	0	0	0	0
	Tallapoosa	4	0	0	0	0
	Tuscaloosa	7	0	0	0	0
	Walker	7	0	0	0	0
	Winston	3	0	0	0	0

Drought synopsis for the State of Alabama:

- February 2018:** Much above-normal rainfall during the first half of the month erased rainfall deficits across all of central Alabama and brought all counties below severe drought (D2) status. Significant rainfall during the first half of the month of February also lowered the drought intensity to a D1 category.
- October 2019:** A severe (D2) drought was introduced to the drought monitor. D2 drought conditions persisted in northeastern Alabama beginning in September. Conditions escalated to D3 status in North Marshall by October 15. The drought subsided through the end of the month, and D2 status was dropped in early November.
- November 2019:** Several rounds of significant rainfall and cooler temperatures during the first half of November resulted in a dramatic improvement in drought conditions across Central Alabama. Beneficial rainfall during the first half of November caused the drought intensity to fall below severe (D2) criteria.

Lifelines-Drought- Food, Water, and Shelter

The main lifeline for drought is food, water, and shelter. Most crops and animals require water to thrive and grow, without which they stress and ultimately die. The shelter is also affected as drought can severely damage structural integrity as the soil pulls away from beams, buildings, bridges, etc. Mitigating drought moving forward will take conservation, thinking outside the box, and innovation to continue the standard of living (state) have come to know.

3.2.2.5 Consequence Analysis

The information in Table 3.17 provides the consequence analysis of the potential for detrimental impacts of drought done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.17: EMAP Consequence Analysis: Drought

Subject	Ranking	Impacts/Drought
Health and Safety of Persons in the Area of the Incident	Minimal to moderate	Drought impact tends to be agricultural; however, because of the lack of precipitation that leads to drought, water supply disruptions can occur, which can affect people. The impact is expected to be minimal.
Responders	Minimal	With proper preparedness and protection, the impact on the responders is expected to be minimal.
Continuity of Operations	Minimal	There is minimal expectation for utilization of the COOP.
Property, Facilities, and Infrastructure	Minimal to severe	Impact on property, facilities, and infrastructure could be minimal to severe, depending on the length and intensity of the drought. The structural integrity of buildings and buckling of roads could be affected.
Delivery of Services	Minimal	The impact on the delivery of services should be nonexistent or minimal unless transportation nodes are affected.
Environment	Minimal to severe	The impact on the environment could be severe. Drought can severely affect farming, ranching, wildlife, and plants due to the lack of precipitation.
Economic Conditions	Minimal to moderate	Impacts on the economy will be dependent on how extreme the drought is and how long it lasts. Communities that depend on water recreation could be tested, as well as agricultural.
Public Confidence in Jurisdiction's Governance	Minimal	Confidence could be an issue during periods of extreme drought if planning is not in place to address intake needs and the loss of agricultural crops.

3.2.3 Earthquake

3.2.3.1 Description

An earthquake is “a sudden motion or trembling caused by an abrupt release of accumulated strain on the tectonic plates that comprise the Earth’s crust.” These plates, known as the lithosphere, vary in thickness from 6.5 miles beneath oceans to 40 miles beneath mountains, averaging 20 miles. Most earthquakes originate along faults close to or at plate boundaries. A small percentage of earthquakes originate within the plates. The powerful forces that build

mountains along continental margins can buckle the earth's crust or create faults within a plate's interior. The movement of the continental crust over the earth's interior can also produce small amounts of movement and stress within a plate, causing rock movement along faults that formed long ago.

The intense seismic vibrations that travel outward from the rupture site through the earth, causing the ground to "vibrate," are created when the rocks suddenly slip along a fault. The three types of seismic waves that can be produced are: compressional (P) waves, shear (S) waves that travel through the body of the earth, and surface waves, which cause structures to vibrate from side to side. Ground shaking typically increases with the energy released and decreases the farther you travel from the earthquake's epicenter.

The Richter scale is a quantitative measure of an earthquake's magnitude (size), or amount of energy released, by determining the logarithm of the amplitude (height) of the largest wave calibrated to a scale by a seismograph. For example, near the epicenter, an earthquake with a magnitude of 3 will be felt indoors by some people but will do no damage to buildings; one that reaches 6 will topple chimneys and weak walls; and one that measures 8 will cause nearly total damage to human structures. The public commonly refers to the Richter scale (ML); however, other, more accurate scales are also used today, which include body wave magnitude (Mb) and surface wave magnitude (M_s). All three scales have limitations regarding frequency range and the type of seismic signal. Due to these limitations, a more uniformly applicable extension of the magnitude scale, the moment magnitude (M_w), was developed. This scale provides the most reliable size estimates of large earthquakes. The following table provides context for understanding the Richter Scale.

Table 3.18: Richter Scale⁶⁶

Richter Magnitude	Feels Like Kilograms (kg) of TNT	Extra Information
0–1	0.6–20 kg of dynamite	We cannot feel these.
2	600 kg of dynamite	The smallest quake people can normally feel.
3	20,000 kg of dynamite	People near the epicenter can feel this quake.
4	60,000 kg of dynamite	This will cause damage around the epicenter. It is the same as a small fission bomb.
5	20 million kg of dynamite	Can cause damage to weak buildings in the area of the epicenter.
6	60 million kg of dynamite	Can cause great damage around the epicenter.
7	20 billion kg of dynamite	Creates enough energy to heat New York City for one year. Can be detected all over the world. Causes serious damage.

⁶⁶ Adapted from "What Is the Richter Scale." SMS Tsunami Warning. <https://www.sms-tsunami-warning.com/pages/richter-scale#.Y6Hn2VHMKUk>

Richter Magnitude	Feels Like Kilograms (kg) of TNT	Extra Information
8	60 billion kg of dynamite	Causes death and major destruction. Destroyed San Francisco in 1906.
9	20 trillion kg of dynamite	Rare, but would cause unbelievable damage!

Two ways of measuring the intensity of ground shaking at a particular place are the Modified Mercalli Intensity (MMI) and the peak ground acceleration (PGA). The MMI, expressed as Roman numerals between I and XII, is based on earthquake damage and effect observations. For example, an earthquake with an MMI of III will be felt noticeably indoors; one with an MMI of VII will cause light damage in buildings of poor construction; and one with an MMI of XII can cause complete structural damage. The PGA gives a more objective measure of the degree of shaking. Ground motion acceleration is measured using accelerographs and is expressed as a percentage of the force of gravity. The PGA is the maximum acceleration value for a particularly strong motion record and is widely used by engineers to describe the intensity of ground shaking a building must be designed to withstand without collapsing.

It is possible to relate magnitude measurements to felt intensity using the MMI or instrumental intensity using the PGA (see the following table). The relationships are approximate, however, and assume that the location of interest is near the earthquake's epicenter and that the earthquake's focus is relatively shallow. For example, ground shaking generally begins to be felt at a magnitude of 3.0, an MMI of II, and a PGA of 0.17% g. Damage to buildings of poor construction typically begins at a magnitude of 5.0, an MMI of VII, and a PGA of 10% g. Finally, damage to ordinary buildings generally starts at a magnitude of 5.5, an MMI of VIII, and a PGA of 34% g.

Table 3.19: Richter Magnitude, MMI, and PGA Scales

Richter Magnitude	MMI Felt Intensity	PGA (% g) Ground Acceleration	Perceived Shaking	Potential Damage
Less than 5	I	Less than 0.17	Not felt.	None
Less than 5	II–III	0.17–1.4	Felt by some indoors.	None
Less than 5	IV–V	1.4–9.2	Felt by nearly everyone.	None
5	VI–VIII	9.2–34	Most people are alarmed and run outside.	Damage is negligible in buildings of good construction but considerable in buildings of poor construction.
5.5	VIII	34–65	Most people are alarmed	Damage is slight in specially designed structures, considerable

Richter Magnitude	MMI Felt Intensity	PGA (% g) Ground Acceleration	Perceived Shaking	Potential Damage
~6	IX	65–124	Most people are alarmed and run outside.	Damage is considerable in specially designed buildings. Buildings shift from their foundations and partly collapse.
6.5	X–XII	>124	Most people are alarmed and run outside.	Most masonry structures are destroyed. The ground is badly cracked. Considerable landslides occur on steep slopes.

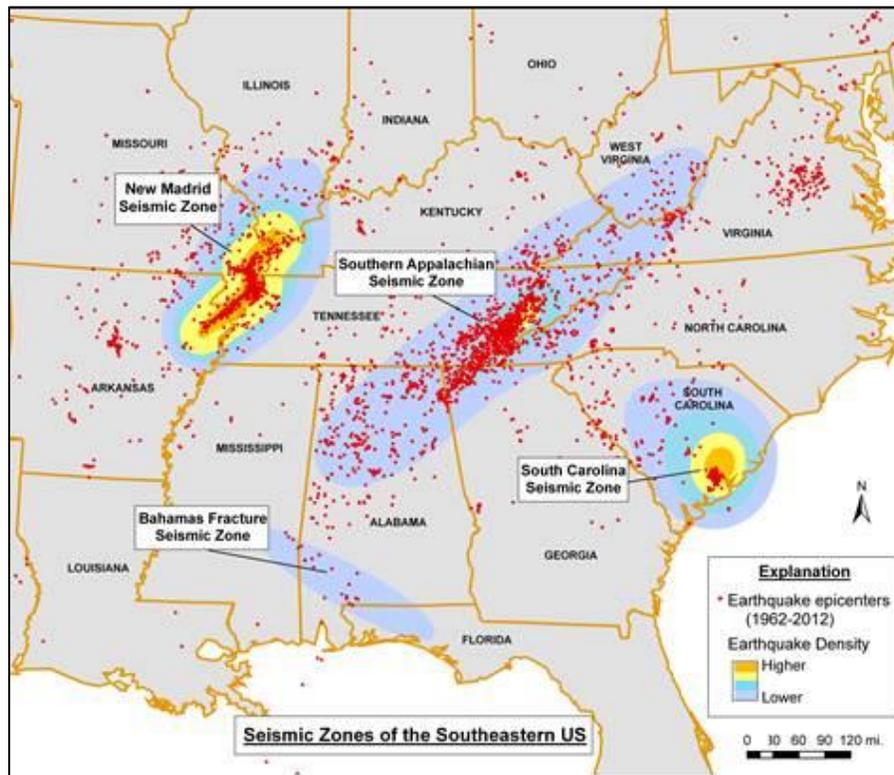
Earthquakes have the potential to cause sudden and devastating losses to critical infrastructure and buildings, injuries, and death. Secondary hazard impacts include surface faulting, ground failure, fire, avalanches, dam failure, liquefaction (a process in which water-saturated sediment temporarily loses strength and acts as a fluid), economic devastation, and untold refugees.

The factors determining the impact of an earthquake include the intensity of ground shaking, the occurrence of secondary hazards, and the design of the structures subject to these hazards. Therefore, communities that adopt and enforce up-to-date seismic codes can reduce the loss of life and property when earthquakes occur.

3.2.3.2 Nature of the Hazard in Alabama

Earthquakes felt in Alabama are associated with four seismic zones: the Southern Appalachian Seismic Zone, the Bahamas Fracture Seismic Zone, the South Carolina Seismic Zone, and the New Madrid Seismic Zone, as shown in the following figure.⁶⁷

⁶⁷ Earthquakes of Alabama. <https://gsa.state.al.us/gsa/geologic/hazards/earthquakes/alquakes>

Figure 3.8: Seismic Zones of the Southeastern United States

As discussed above, secondary seismic hazards can significantly increase the impact of an earthquake. One secondary hazard of particular concern in Alabama is ground failure through landslides, sinkholes, or liquefaction. To help the AEMA understand the distribution of areas susceptible to liquefaction, GSA conducted a modeling study and produced a set of susceptibility maps. Alabama's coastal plains and major floodplains were determined to be highly susceptible to liquefaction and subsequent ground failure. GSA has recommended additional studies to better understand the distribution of areas susceptible to landslides and sinkholes. Given that these phenomena were triggered during the magnitude 4.9 Fort Payne earthquake in 2003, GSA finds that it is highly likely that landslides and sinkholes will be triggered by future events, especially in the central and northeastern portions of the state. In addition, the proportion of structures across the state not built to withstand intense earthquakes also increases the potential impact of earthquakes in Alabama.

Another secondary impact of concern in Alabama is the influx of evacuees from neighboring states. In the event that the New Madrid fault or the Bahamas Fracture Zone produces a large quake, residents from Florida, Missouri, and Tennessee, among other states, could potentially seek safe refuge in Alabama. While it is difficult to estimate how many people would seek safety in Alabama, it is not difficult to understand the economic impact that evacuees would have on Alabama in the aftermath of any sizable seismic event.

Figure 3.9: Southeastern U.S. Seismic Zones and Earthquake Hazards

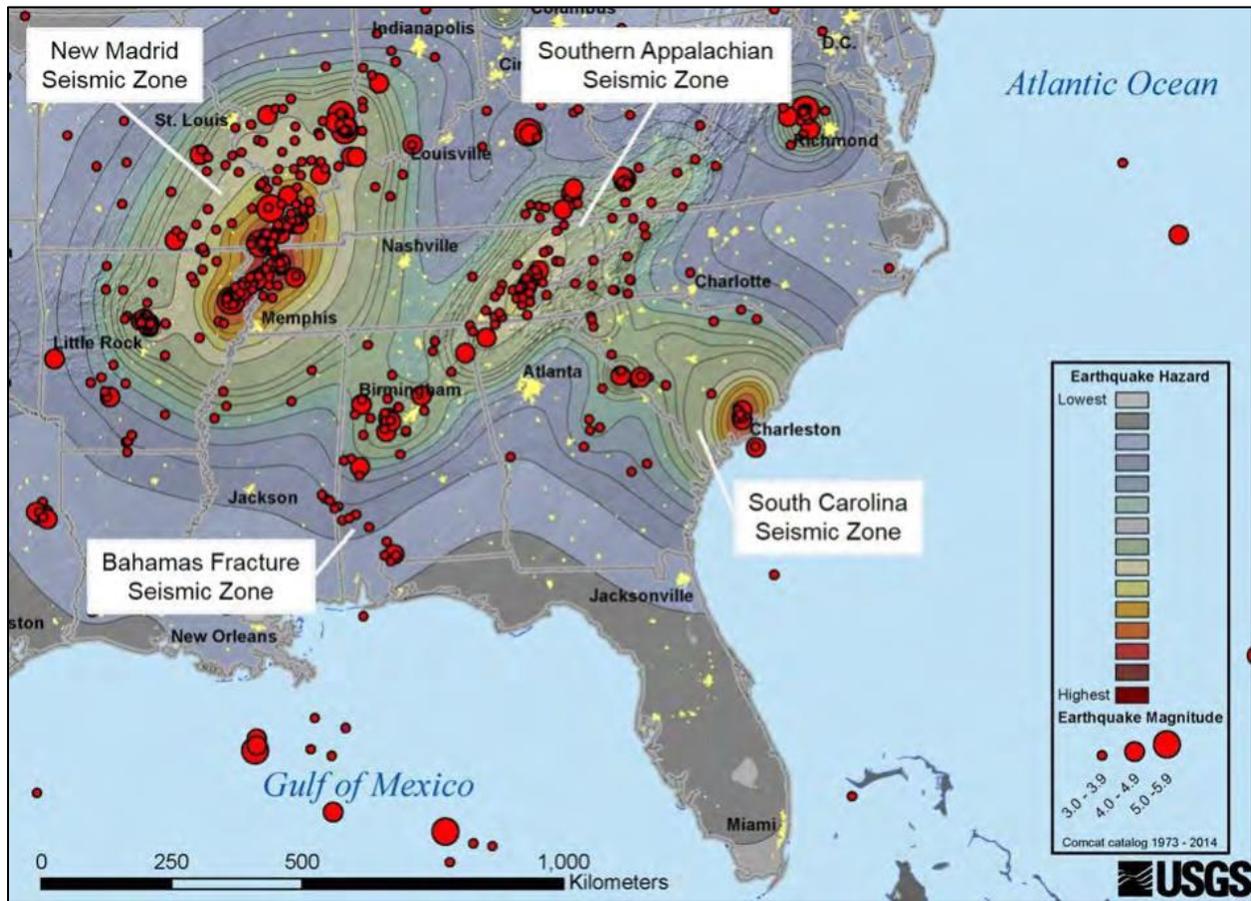
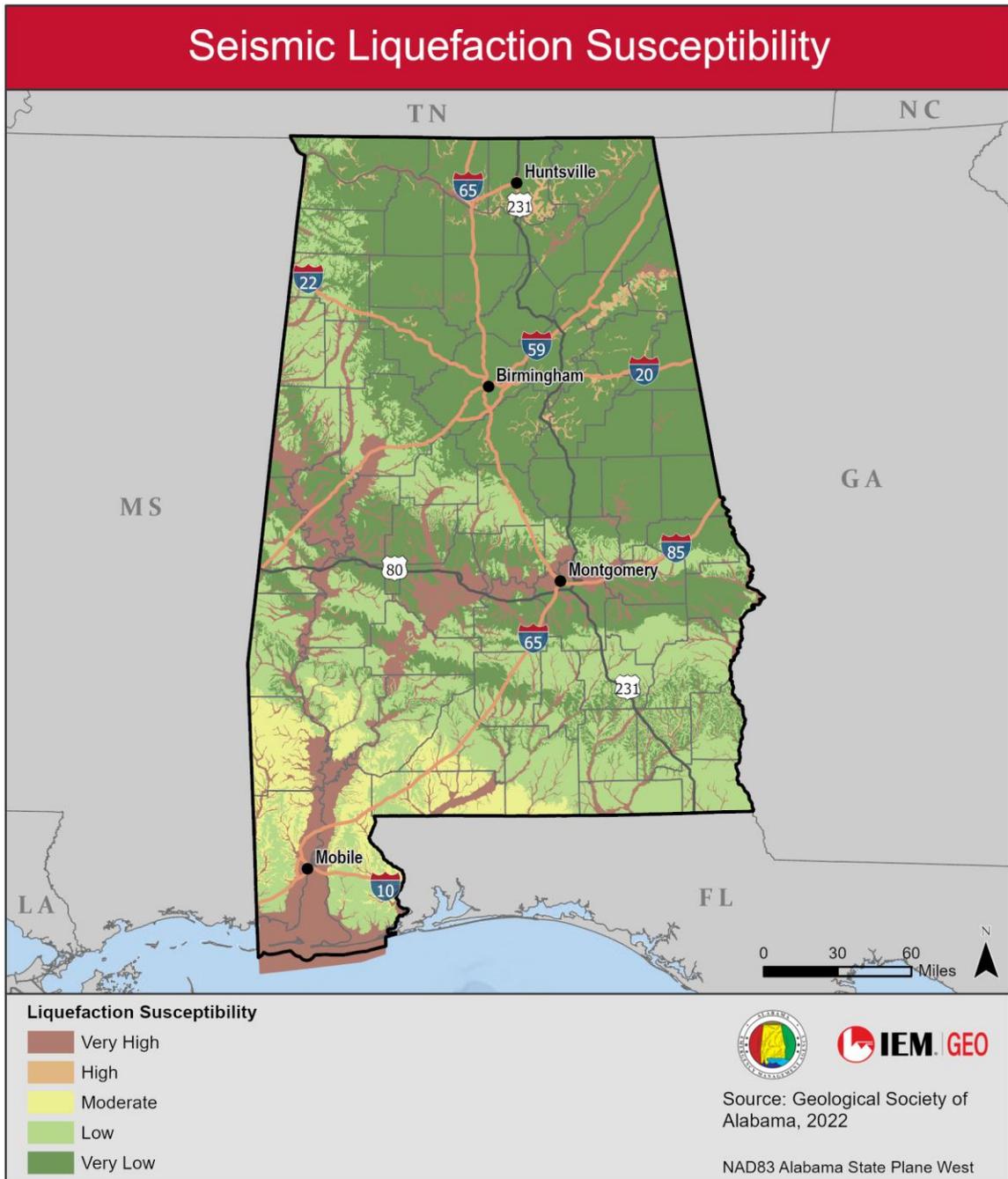


Figure 3.10: Seismic Liquefaction Susceptibility



3.2.3.3 Earthquake History in Alabama

Based on historical records for the past 20 years, one earthquake event has occurred in Alabama with a magnitude of 4.9 with a Maximum Intensity of VI. The first recorded earthquake in Alabama was on February 4, 1886, which impacted the residents of Sumter and Marengo Counties. The

largest earthquake in Alabama’s recorded history occurred on October 18, 1916, with an epicenter near Easonville, in St. Clair County. Measuring 5.1 magnitude, the earthquake caused buildings to sway, and the Irondale underground water supply went dry. Most earthquakes in Alabama are considered minor, with magnitudes below 3.0. Only 57 earthquakes in the GSA catalog (16% of the total) exceeded 3.0, and only one exceeded 5.0.

GSA maintains an extensive catalog of earthquakes centered in Alabama, with records dating back to the 1886 earthquake. The following figures show the epicenters and magnitudes of historical earthquakes in Alabama and compare the location of these epicenters to the location of seismic zones in the Southeastern United States.

Figure 3.11: Alabama Earthquake Magnitude (GSA, 2017)

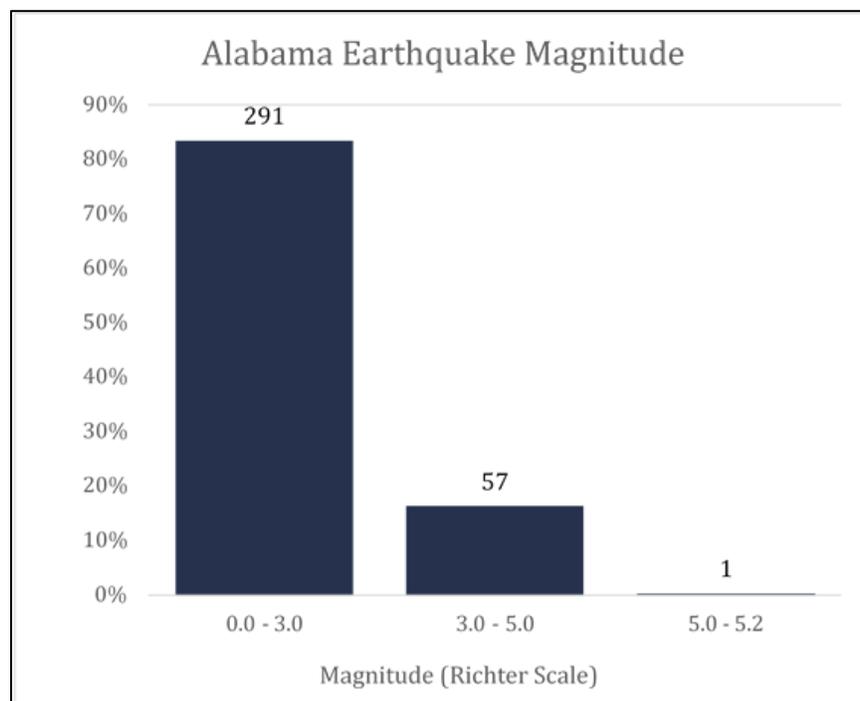
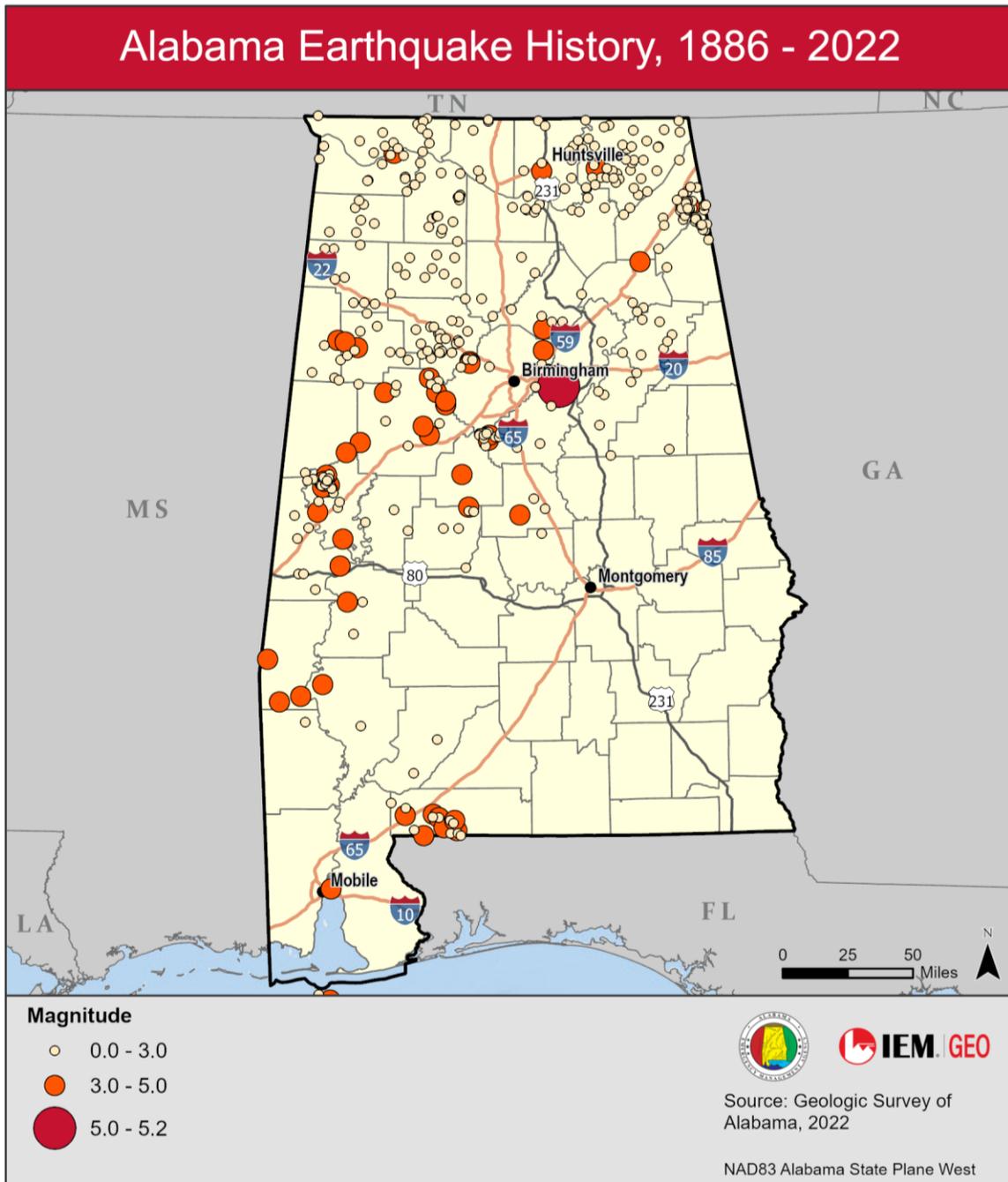


Figure 3.12: Alabama Earthquake History (GSA, 2017)



Earthquakes centered in Alabama are not the only earthquakes with the potential to impact the state. Intraplate earthquakes associated with the New Madrid Seismic Zone to the northwest and the South Carolina Seismic Zone to the east are often felt in Alabama and have the potential to cause considerable damage. For example, in 1811 and 1812, a series of earthquakes of approximately 7.7 in magnitude occurred in northeast Arkansas and southeast Missouri. Because the earthquakes shook the rigid craton (a large, stable block of the earth’s crust forming the

nucleus of the continental plate), their shock waves traveled great distances, cracking pavement, and ringing church bells as far away as Washington, DC. According to GSA, the intensity of ground shaking in Alabama ranged from an MMI of IV in the southeast to an MMI of VII in the northwest. An MMI of VII is high enough to cause considerable damage in buildings of poor construction. In 1886, a magnitude 7.3 earthquake occurred in Charleston, South Carolina, about 400 miles east of Alabama’s border. GSA reported that this earthquake “caused minor damage in the northeastern part of the state.” For example, a 1933 photo of the Alexander-Hurt-Whately house in Tuskegee shows a large crack in one wall reported to have been caused by the Charleston quake. While these earthquakes were centered in other states, they demonstrate how earthquakes in the New Madrid Seismic Zone and South Carolina Seismic Zone have the potential to cause considerable damage in Alabama.

The following table is a summary of the impacts of seven earthquakes centered in the state that caused structural damage. The information in the table was compiled by GSA and the USGS.⁶⁸ For each earthquake, the table lists the approximate location of the epicenter, the magnitude, the maximum felt intensity, and the reported impacts. GSA has also developed MMI maps of the felt shaking intensity for the three largest earthquakes centered in Alabama. These are reproduced in Figure 3.13. It is important to note the range of magnitudes and the difference between the location of the epicenter and the location of the reported impacts. These features show how the impact of an earthquake depends not only on the level of ground shaking but also on the amount and quality of nearby development. Since the 2013 plan update, no earthquakes have caused structural damage in Alabama.

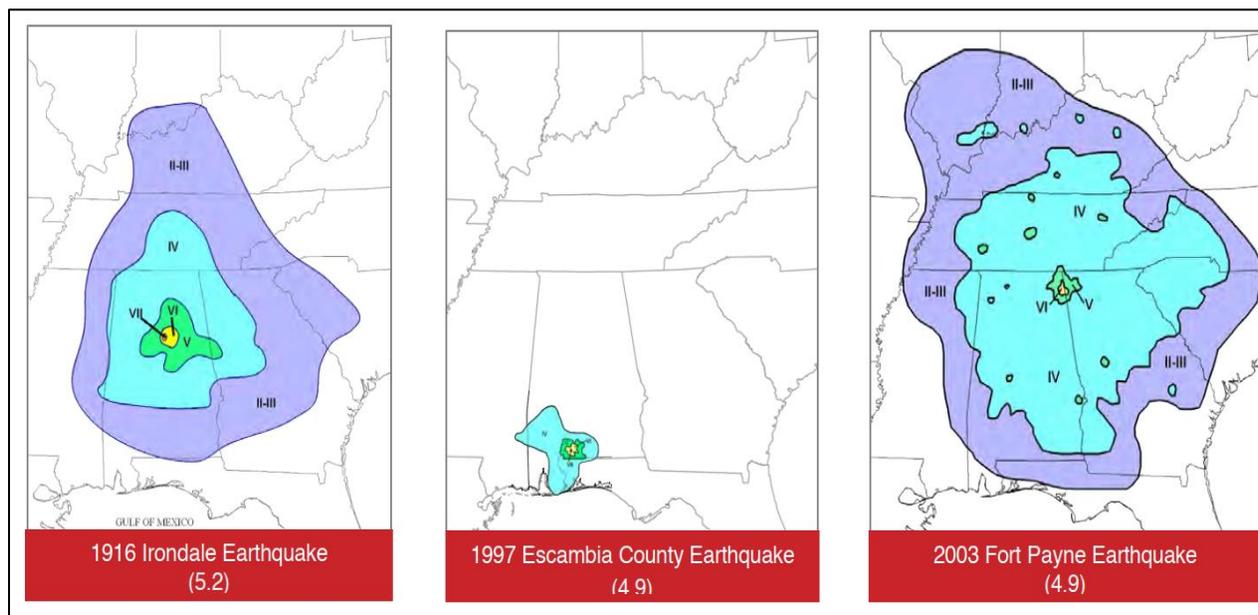
Table 3.20: Historical Earthquakes in Alabama that Produced Structural Damage (1916–2022)

Year	Epicenter	Magnitude	Maximum Intensity (MMI)	Reported Impacts
2003	City of Fort Payne, DeKalb County	4.9	VI	Building damage caused by this earthquake included broken windows, minor cracks in masonry, and chimneys that collapsed or broke. The earthquake also caused the development of minor landslides and sinkholes and muddied the underground water supply for the town of Valley Head, causing the pumps to shut down. The earthquake’s depth limited significant damage in the nearby city of Fort Payne. The quake was felt in several neighboring states.
1997	City of Brewton,	4.9	VII	This is the second largest recorded earthquake to originate in Alabama. Effects from the shaking were seen as far away as

⁶⁸ U.S. Geological Survey, 1987. Historical Seismicity in the Southern Appalachian Seismic Zone. Open-File Report 87-433. <https://pubs.usgs.gov/of/1987/0433/report.pdf>

Year	Epicenter	Magnitude	Maximum Intensity (MMI)	Reported Impacts
	Escambia County			Lawrence County, where a berm around a pond failed, spilling water and fish across a road. Shaking from the earthquake was felt in Florida and Mississippi. The impact of this earthquake was limited by the rural character of the area near the epicenter.
1989	Littleville, Colbert County	3.9	VI	A Colbert County official reported that south of Florence, between Littleville and Russellville, a basement wall collapsed beneath a house. Only slight damage was reported north of the epicenter at Florence, where windows were cracked, and hairline cracks formed in plaster. The earthquake was also felt in Lauderdale, Lawrence, and Morgan Counties in northwest Alabama.
1975	Community of Palmerdale, Jefferson County	4.4	VI	This earthquake cracked a sheetrock ceiling and shifted lamps on tables at Palmerdale, north of Birmingham. In addition, it caused slight damage at Watson, where furniture was displaced slightly. The quake was also felt in southern Tennessee.
1959	City of Huntsville, Madison County	3.9	VI	This earthquake damaged Hazel Greene and Meridianville chimneys and cracked Huntsville plaster. According to accounts collected by the USGS, the earthquake also “shook the buildings violently at New Sharon, knocking canned goods from shelves and sending frightened residents fleeing from their homes.”
1957	Town of Guntersville, Marshall County	4.3	VI	This earthquake shook residents in most of northern and central Alabama, southern Tennessee, and western Georgia. The earthquake was felt by, awakened, and alarmed many. Minor damage was reported to several chimneys, walls, and cement steps.
1916	Town of Irondale, Jefferson County	5.2	VII	This is the largest recorded earthquake to originate in Alabama. Near the epicenter, chimneys were knocked down, windows were broken, and frame buildings were severely shaken. While Irondale was a sparsely populated rural area in 1916, it is now a suburb of the state’s most populous city, Birmingham. A similar earthquake today would have a much more significant impact.

Figure 3.13: Felt Intensity Maps for the Three Largest Historical Earthquakes Centered in Alabama (GSA, 2013)



3.2.3.3.1 Other Significant Earthquake Events Since the 2018 Plan Update

There have been five earthquakes with a magnitude of 3.0 or more since the last plan update:

Table 3.21: Earthquakes Since the 2018 Plan

Date and Time	Magnitude and Depth	Location
December 22, 2021, 06:20 GMT* (1 year ago)	3.1	40 miles northwest of Montgomery, Alabama; 41 reports
September 3, 2020, 15:07 GMT (2 years ago)	3.8 4km	Escambia County, Alabama, 9.2 miles southwest of Brewton; 11 reports
May 10, 2020, 08:33 GMT (2 years ago)	3.1 8.4 km	13 miles east of Winchester, Franklin County, Tennessee; 40 reports
March 11, 2019, 18:36 GMT (4 years ago)	3.1 5 km	10.1 miles southwest of Brewton, Escambia County, Alabama; 3 reports
Jan 4, 2019, 02:37 GMT (4 years ago)	3.0 13 km	8.5 miles east of Shelbyville, Bedford County, Tennessee; 16 reports

*Greenwich Mean Time (GMT) is 6 hours ahead of Central Standard Time (CST).

3.2.3.4 Probability of Earthquakes in Alabama

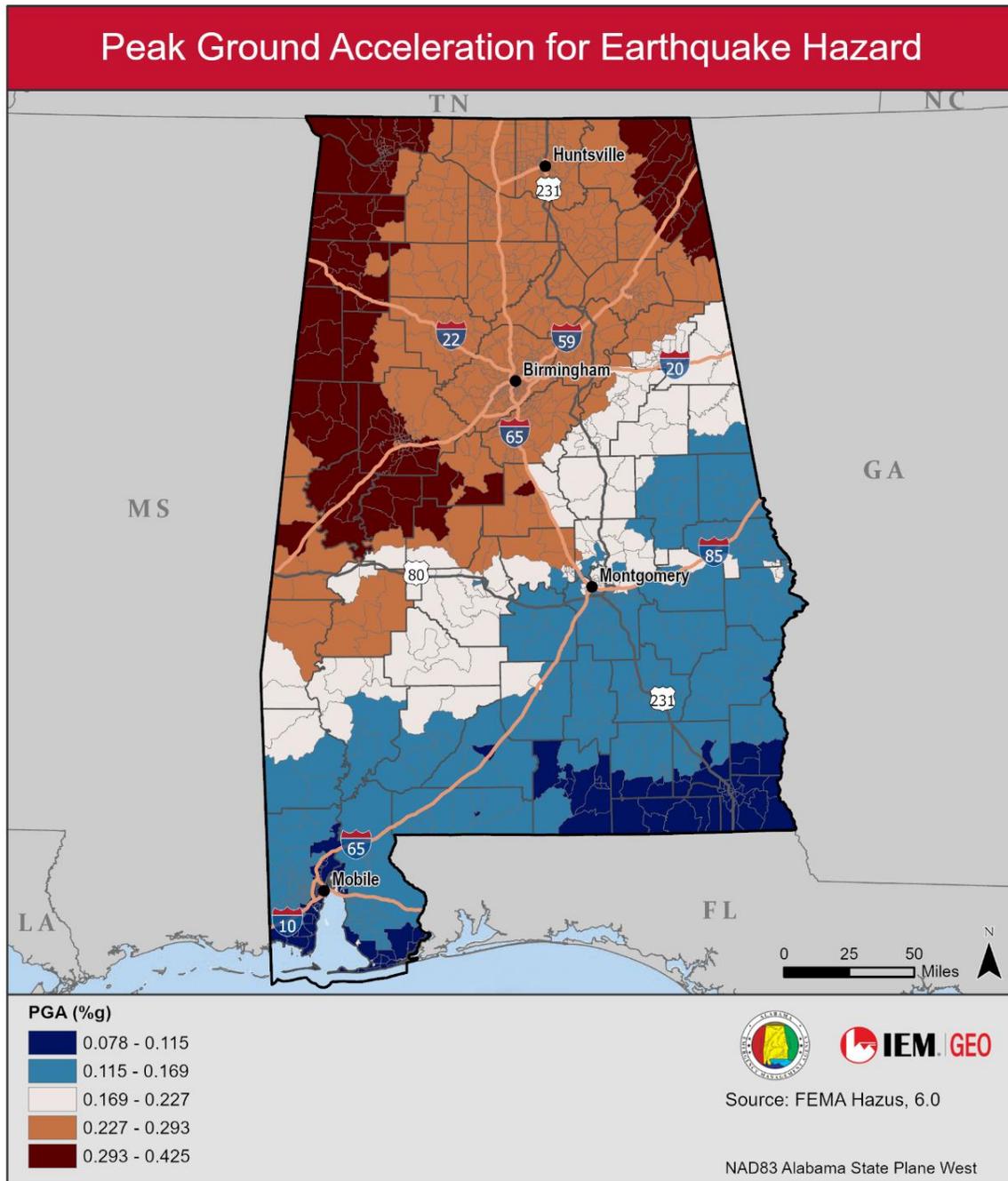
The probability of an earthquake event impacting the State of Alabama in any given year is Likely. In the past 136 years, Alabama has recorded 57 earthquakes with a magnitude of 3.0–5.0 and

one over 5.0. This averages out to one earthquake of magnitude 3.0 or greater every 2.34 years. For earthquakes of less than 3.0 magnitude, Alabama has seen 291; this equates to approximately two earthquakes of less than 3.0 in any given year.

The USGS has published national seismic hazard maps that include the PGA likely to occur at two probability levels: the 500-year event (10% probability of exceedance in 50 years) and the 2,500-year event (2% probability of exceedance in 50 years). The USGS selected these frequencies to reflect the average design life of a building (50 years) and the different risk tolerance levels for various applications.

The PGA in Alabama, with a recurrence interval of 2,500 years (2% probability of exceedance in 50 years), is reflected in the following figure. As described above, PGA is expressed as a percentage of the force of gravity, or % g. Poorly constructed buildings typically sustain damage beginning at a PGA of 10% g. The areas with the highest probability of significant shaking events include the greater Birmingham region, DeKalb County, and Escambia County.

Figure 3.14: PGA in Alabama with a Recurrence Interval of 2,500 Years (2% probability of exceedance in 50 years)



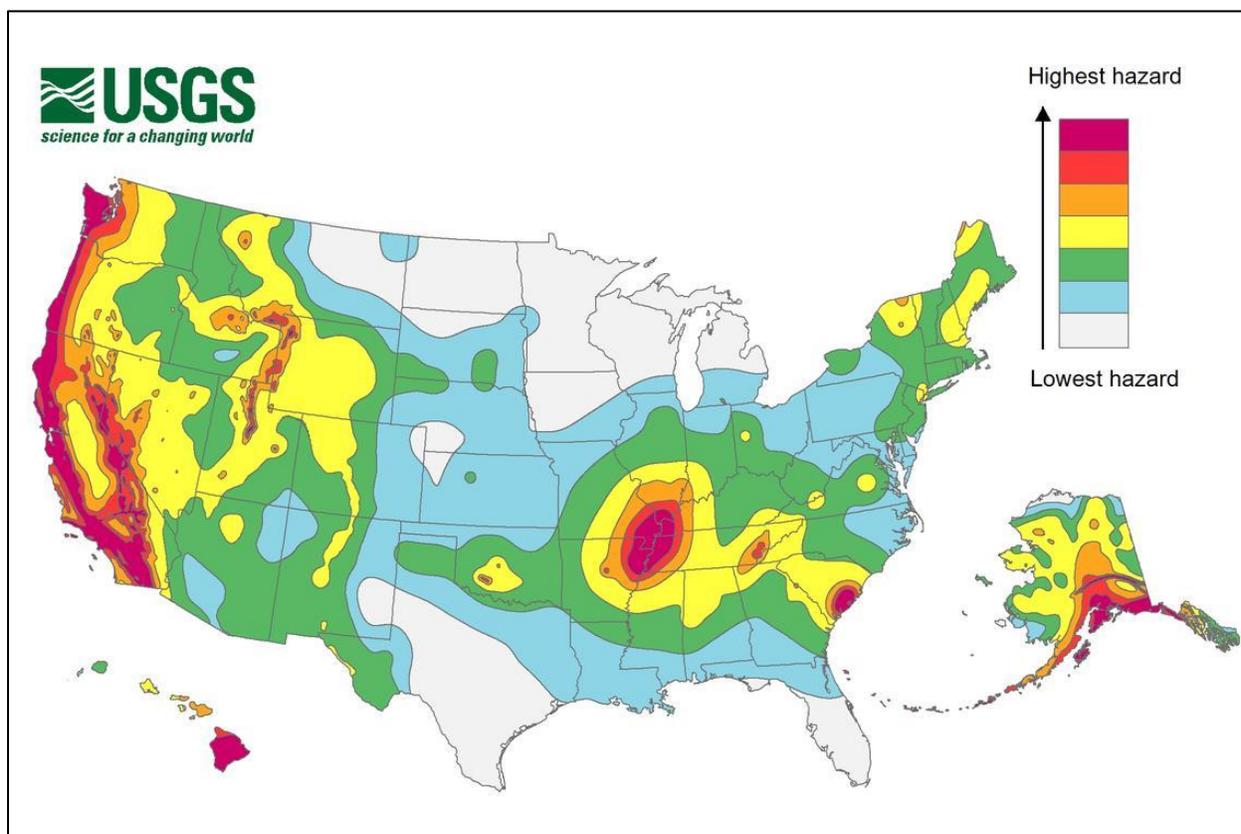
The New Madrid Seismic Zone and South Carolina Seismic Zone can also impact Alabama. According to a study by the USGS and the University of Memphis Center for Earthquake Research and Information (CERI), the probability of a magnitude 6.0 or greater earthquake occurring in the New Madrid region in the next 50 years is 25–40%, and the probability of a magnitude 7.0 or greater earthquake is 7–10%. If a strong New Madrid earthquake with a magnitude equal to the

historic 1811–1812 earthquakes (7.0–8.0) were to occur today, the estimated damage to the central United States would be in the hundreds of billions of dollars, including more than \$10 billion in Alabama alone. In Alabama, the shaking would be the most severe in the northwest part of the state. Nonstructural items (such as light fixtures and bookshelves) would be at the greatest risk for damage from such an event, but structural damage to weaker buildings and utilities (such as pipelines) could also occur. This damage could be caused by direct ground shaking or secondary hazards such as ground failure, fire, hazardous material release, or dam failure.

Induced earthquakes are also a concern in Alabama. Around 2009, earthquakes of 3.0 or more magnitude began to increase significantly, from 21 per year between 1973 and 2008 to 99 per year between 2009 and 2013. In 2014, the USGS reported 659 earthquakes greater than 3.0 in the central and eastern United States. These were believed to be caused by deep wastewater disposal related to industrial activity. Earthquake activity decreased when rates of injection decreased. In Kansas, the Kansas Corporate Commission issued orders to reduce the pressures and quantities allowed for certain areas of underground injection and disposal of produced water. Within two years, earthquake activity decreased from 1,967 earthquakes in six months to 668 earthquakes in the next six-month period—a reduction of 66%.⁶⁹ In response to the increased earthquake activity by injections, the USGS began incorporating an updated earthquake catalog that includes all induced activity. The following map shows that Alabama has a moderate chance of earthquakes, and the northern and western portions of the state are the most affected.

⁶⁹ Kansas Hazard Mitigation Plan.

https://www.kansastag.gov/AdvHTML_doc_upload/Chapter%203%20%20Risk%20Assessment%20Reduced_Part1.pdf

Figure 3.15: Seismic Hazard Forecasts

The probability of Alabama having an earthquake over 5.0 is low; it has happened only once since 1886. However, should an earthquake of 5.0 or greater occur in Alabama, the consequences could be high, depending on the location of the epicenter. In addition, the secondary hazards could have devastating impacts.

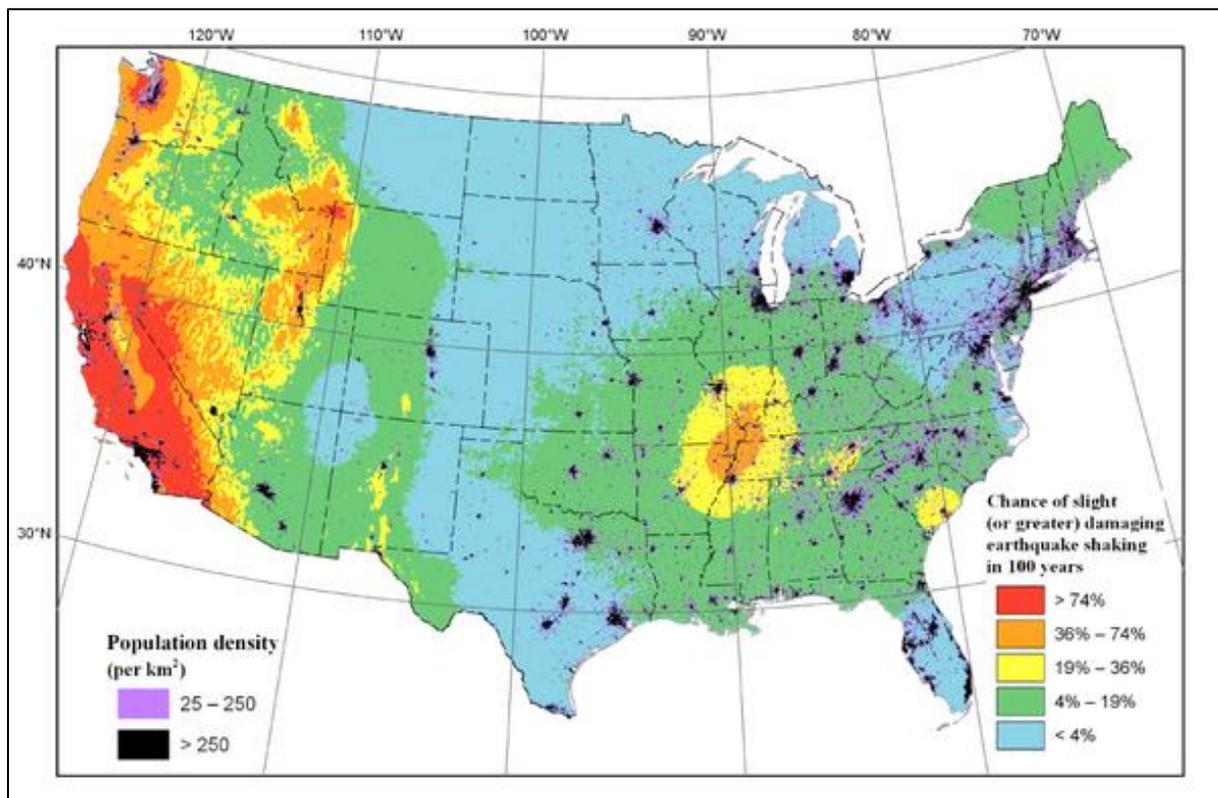
3.2.3.4.1 Future Probability – Climate Change

The probability, location, intensity and impacts of hazards will change over time. Climate change, including changes in temperature, intensity, hazard distribution or frequency of weather events, may increase vulnerability to these hazards in the future. Based on historical knowledge and current conditions, it can be expected that all hazards will see a rise in scope, scale, and frequency of events on a yearly basis.

According to Paul Lundgren of NASA’s Jet Propulsion Laboratory, “Scientists know earthquakes can be triggered or inhibited by changes in the amount of stress on a fault. The largest climate variable that could change fault stress loads is surface water in the form of rain and snow.” He goes on to say, “Typically, where we’ve seen these types of correlations is in micro-seismicity—tiny earthquakes with magnitudes less than zero, far smaller than humans can feel.” Larger earthquakes are unknown, as it is hard to ascertain when a fault may be at a critical point where

a climate event could stress the fault to the breaking point.⁷⁰ So, while climate change could adversely affect earthquake activity in Alabama, it appears to be contained in micro seismicity. The USGS published maps projecting potentially damaging earthquake shaking in the next 100 years. As seen in Figure 3.16, Alabama has anywhere from a 4% to a 36% chance of seismic activity from a damaging earthquake.

Figure 3.16: Damaging Earthquake Shaking in 100 Years (USGS, 2023)⁷¹



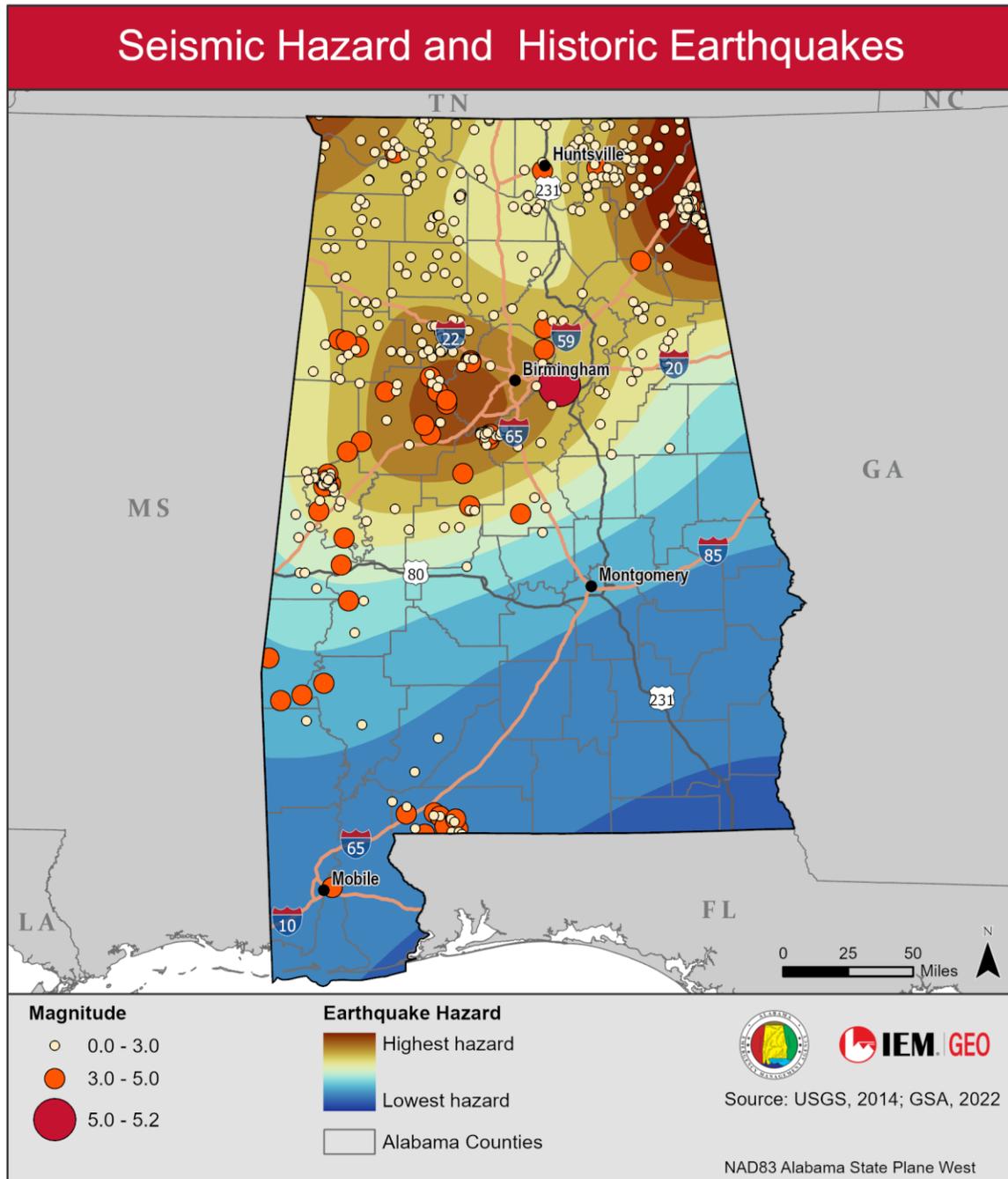
3.2.3.4.2 Risk and Vulnerability

A detailed assessment of vulnerability to earthquakes in Alabama is provided in Section 3.3.

⁷⁰ Can Climate Affect Earthquakes, or Are the Connections Shaky? NASA Global Climate Change. <https://climate.nasa.gov/news/2926/can-climate-affect-earthquakes-or-are-the-connections-shaky/>

⁷¹ USGS. The 2023 National Seismic Hazard Model – What's Shaking? <https://www.usgs.gov/programs/earthquake-hazards/science/2023-national-seismic-hazard-model-whats-shaking>

Figure 3.17: Alabama Hazard and Seismicity Map (2014)



Lifeline- Earthquake- All

All lifelines are assigned to earthquakes dependent upon the quake’s intensity and magnitude, the distance from the epicenter, and what type of soil infrastructures are built on. Safety and security will be affected since Law Enforcement and Emergency Services may be delayed based upon the destruction of highways and roadways and possible damage to communications

stations. Food and water may be inadequate or absent due to the destruction of infrastructures, loss of power, possible water contamination, and roadways being impassable.

3.2.3.5 Consequence Analysis

The information in Table 3.22 provides a consequence analysis of the potential for detrimental impacts of an earthquake prepared for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.22: EMAP Consequence Analysis: Earthquake

Subject	Ranking	Impacts/Earthquake
Health and Safety of Persons in the Area of the Incident	Minimal to severe	Impact in the incident area is expected to be minimal to severe depending on the epicenter.
Responders	Minimal to moderate	With proper preparedness, training, and protection, the impact on the responders is expected to be minimal to moderate.
Continuity of Operations	Minimal to moderate	The COOP could be activated if the earthquake or aftershocks damage buildings. The farther away from the epicenter, the lower the expectations.
Property, Facilities, and Infrastructure	Minimal to severe	The impact could be severe for properties, facilities, and infrastructure that are close to the epicenter.
Delivery of Services	Minimal to severe	Depending on the PGA of the earthquake, delivery services could be disrupted if there is damage to roads, utilities, etc.
Environment	Minimal to severe	No expectation of environmental impact (minimal). Induced earthquakes due to wastewater injections could potentially pollute drinking wells, underground water sources, etc. This could have moderate to severe consequences.
Economic Conditions	Minimal to severe	If the epicenter is near a large city, the economic conditions could be severe.
Public Confidence in Jurisdiction's Governance	Minimal to severe	Depending on the severity of the earthquake, response and recovery could be called into question.

3.2.4 Extreme Temperatures

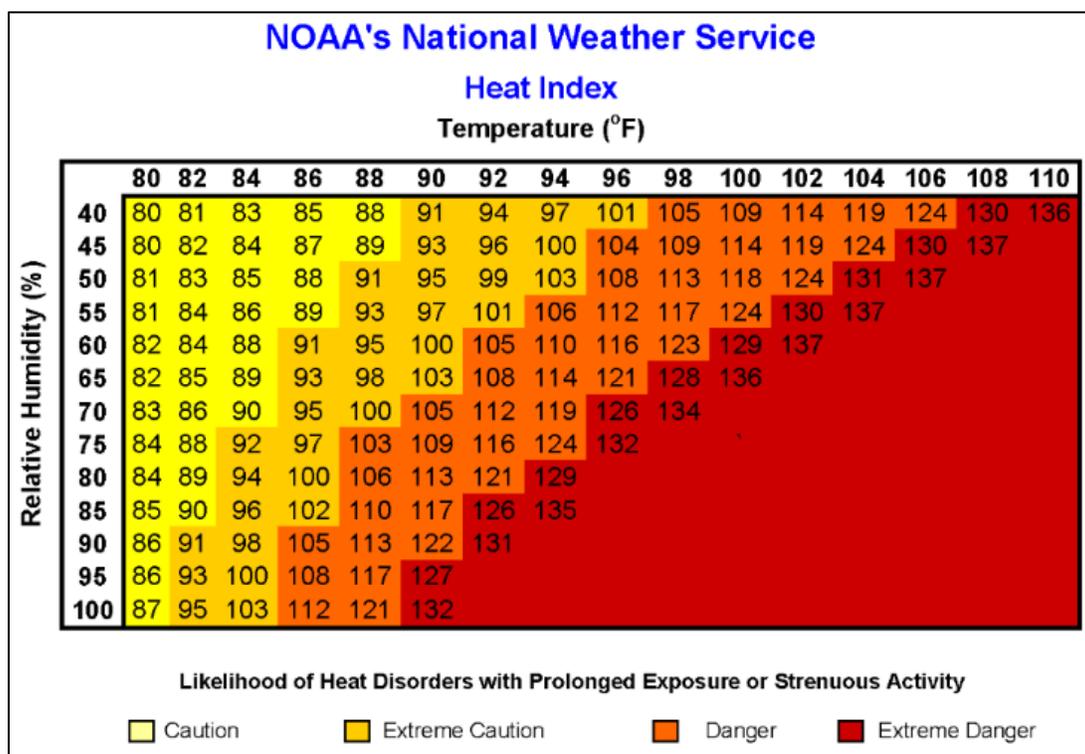
3.2.4.1 Description

The hazard of extreme temperatures encompasses instances of both extreme heat and extreme cold. Both extremes are profiled in this section.

3.2.4.1.1 Extreme Heat

Extreme heat can be defined as a period of excessively hot weather with higher-than-average temperatures combined with high humidity. Extreme heat often occurs in the summer months but can vary regionally.⁷² Temperatures above 100 °F are generally considered dangerous. Heat stress can be indexed by combining the effects of temperature and humidity.

Figure 3.18: Heat Index, NOAA



The heat index estimates the relationship between dry bulb temperatures (at different humidity levels) and the skin's resistance to heat and moisture transfer. The higher the temperature or humidity, the higher the apparent temperature. The major human risks associated with extreme heat are as follows:

- **Heat/sun stroke:** Considered a medical emergency, heat/sun stroke is often fatal. It occurs when the body's responses to heat stress are insufficient to prevent a substantial rise in the body's core temperature. While no standard diagnosis exists, a medical condition is usually diagnosed when the body's temperature exceeds 105 °F due to environmental temperatures. Rapid cooling is necessary to prevent death, with an average fatality rate of 15% even with treatment.
- **Heat exhaustion:** While much less serious than heatstroke, heat exhaustion can cause victims to complain of dizziness, weakness, or fatigue. Body temperatures may be normal or slightly to moderately elevated. The prognosis is generally good with fluid treatment.

⁷² Federal Emergency Management Agency, 2016. Preparing for Extreme Heat. [natural_hazards_2.pdf \(fema.gov\)](https://www.fema.gov/natural-hazards-2.pdf)

- **Heat syncope:** This refers to a sudden loss of consciousness and is typically associated with people exercising who are not acclimated to warm temperatures. Causes little or no harm to the individual.
- **Heat cramps:** These may occur in people unaccustomed to exercising in the heat and generally cease to be a problem after acclimatization.

Table 3.23: Heat Index and Symptoms⁷³

Heat Index	Symptoms
80–90	Fatigue possible with prolonged exposure and/or physical activity
90–105	Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and/or physical activity
105–130	Sunstroke, heat cramps, and heat exhaustion likely; heatstroke possible with prolonged exposure and/or physical activity
130 or higher	Heatstroke/sunstroke highly likely with continued exposure and/or physical activity

In addition to affecting people, severe heat places significant stress on plants and livestock. The effects of severe heat on agricultural products may include reduced yields and even the loss of crops. Similarly, extreme temperatures can impact livestock. For example, heat stress severely reduces fertility and milk production in cows.⁷⁴

3.2.4.1.2 Extreme Cold

Although less likely, extreme cold temperatures can also impact Alabama. Every winter, Arctic air and brisk winds can lead to very low wind chill values in the United States. Prolonged exposure to the cold can cause frostbite or hypothermia and become life-threatening. Frostbite occurs when the extremities become excessively cold, and prolonged exposure can cause permanent damage to the skin and tissues. Hypothermia is a serious health condition where a person's body temperature falls below 95 °F and can possibly lead to death. Both conditions are influenced by wind conditions. Various wind chill indices have been developed to predict cold temperatures' effect on humans. For instance, a temperature of 5 °F will have a wind chill of -19 °F if the wind is blowing at 30 mph. Cold weather can also impact crops and livestock. Cold air has the potential to freeze produce, which can damage or kill it.

Older adults are more prone to being impacted by extreme heat and cold events. This is because they do not adjust as well as other demographics to drastic changes in temperature, they are more likely to have a medical condition that changes normal body responses to heat and cold, and they are more likely to take prescription medications that impact the body's ability to react to changes in temperature. Access to climate control systems, such as air conditioning and heating,

⁷³ [Risks of Extreme Heat - RHSB](#)

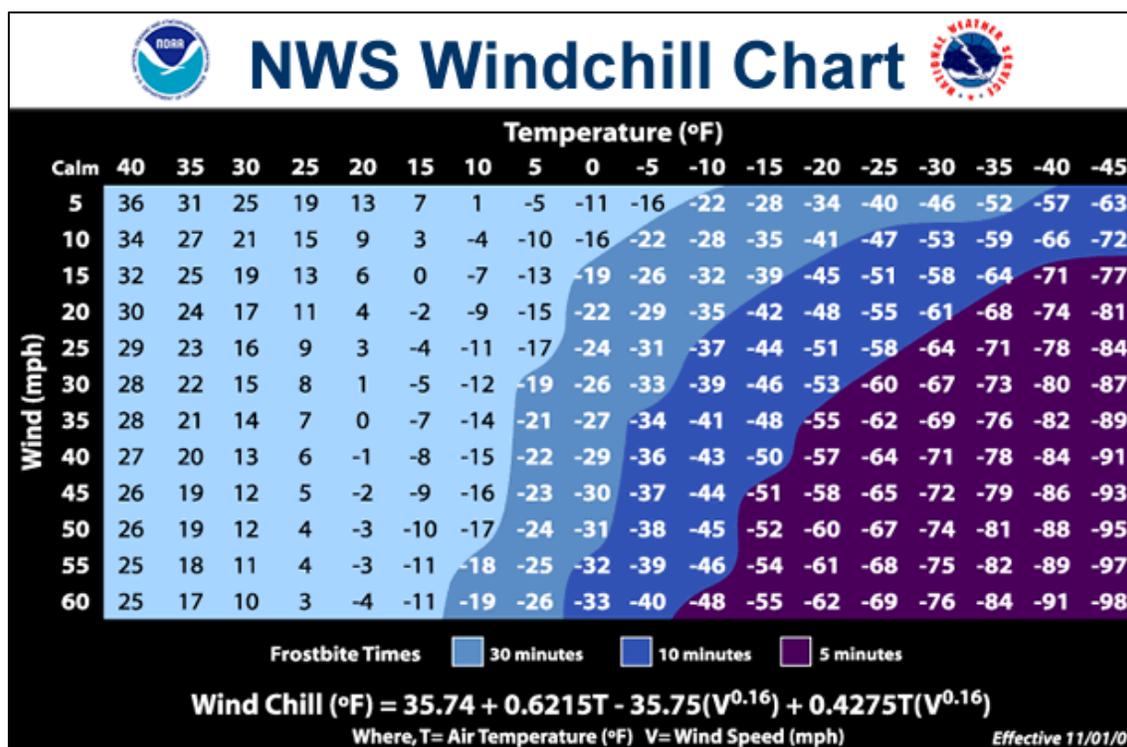
⁷⁴ Dobson, H et al., 2007. "The High Producing Dairy Cow and Its Reproductive Performance." *Reproduction in Domestic Animals*. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2748269/>

provides protection from the impacts of extreme heat and cold events and is one way to mitigate the potential impacts of an extreme temperature event.

Extreme cold has a variety of extent and severity markers and characteristics. The National Weather Service issues Extreme Cold Warnings when the temperature feels like it is 30 °F or colder across a wide area for a period of at least several hours. When possible, these advisories are issued a day or two before the onset of the conditions.

The Wind Chill scale is perhaps the most common extent/severity marker for extreme cold. The National Weather Service (NWS) calculates wind chill using wind speed and the actual temperature. While wind chill is not necessarily related to extreme cold as a single cause, the advisory system that the NWS currently uses relies on wind chill to relay warning and advisory information to the public. Extreme cold severity is a function of wind chill and other factors, such as precipitation amount (rain, sleet, ice, and/or snow).

Figure 3.19: NWS Windchill Chart⁷⁵



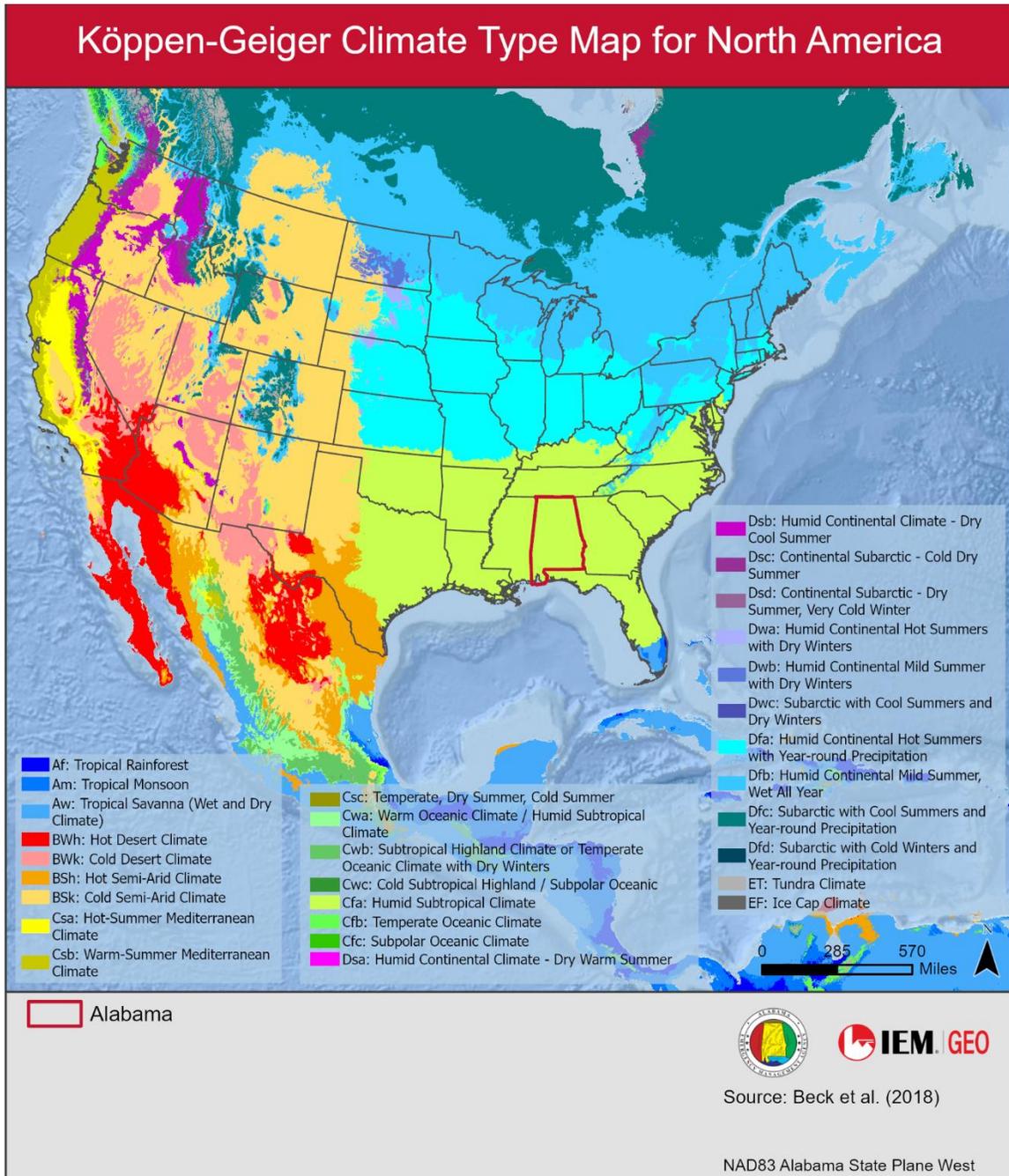
3.2.4.2 Nature of the Hazard in Alabama

According to the Köppen-Geiger climate classification system, Alabama has a humid subtropical climate. This climate type is characterized by relatively high temperatures and evenly distributed precipitation throughout the year. Summers feature high temperatures with warm, oppressive nights and are generally wetter than winters. The coldest month is generally mild, with occasional

⁷⁵ [Wind Chill Chart \(weather.gov\)](https://www.weather.gov/windchill)

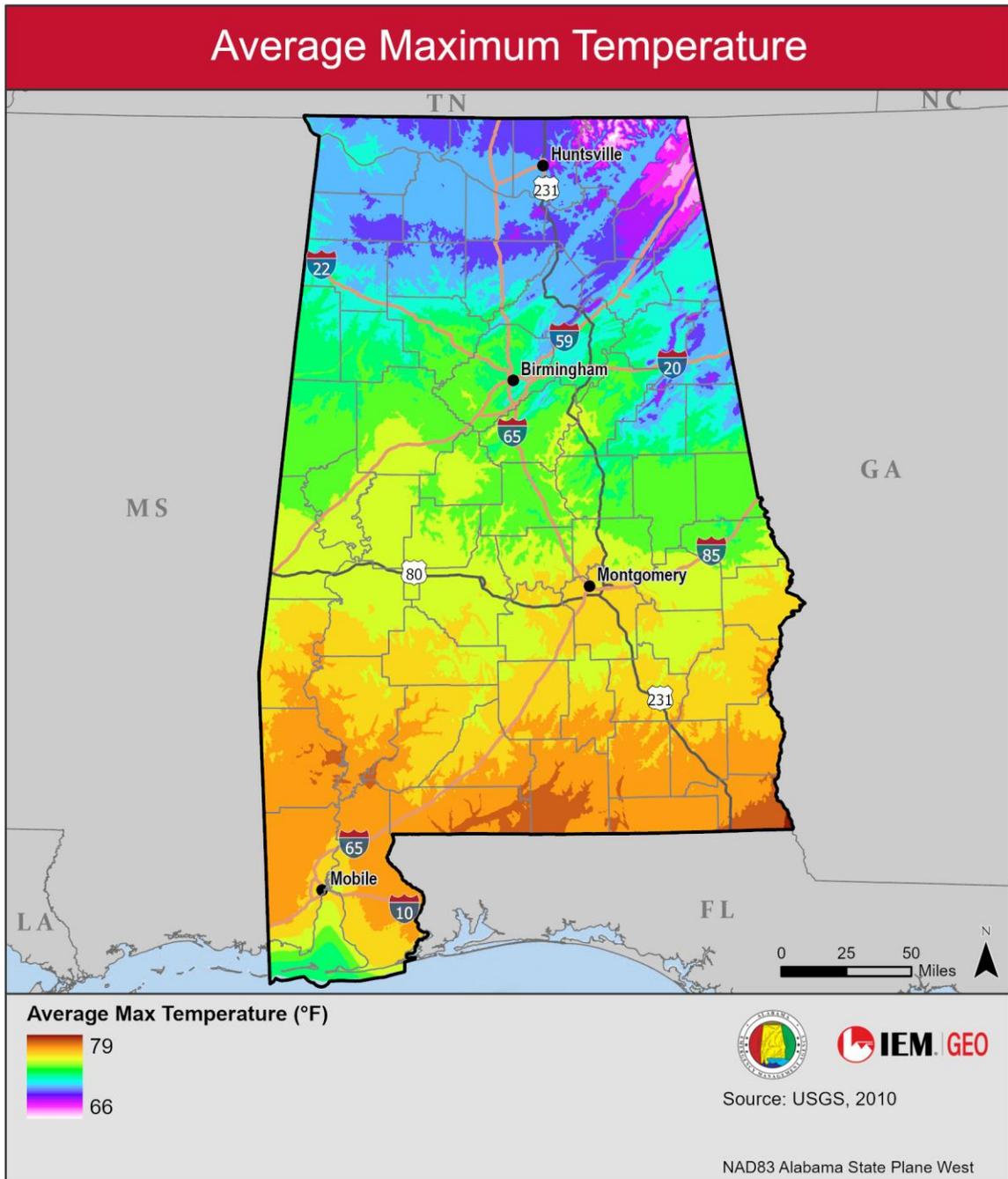
frosts. Based on historical records for the past 20 years, the observed extreme temperature events in Alabama ranged in magnitude from a high of 100 F to a low of 2 F.

Figure 3.20: Köppen-Geiger Climate Type for North America⁷⁶



⁷⁶ [alabama-state-hazard-mitigation-plan_3-risk-assessment_draft.pdf \(wordpress.com\)](#)

Figure 3.21: Average Maximum Temperature



3.2.4.2.1 Nature of Extreme Heat in Alabama

Table 3.24: Historical Extreme Heat Events in the State of Alabama⁷⁷

Temperature	Date	Location
112 °F	January 30, 1997	Centerville

Summers in Alabama are among the hottest in the United States, with high temperatures averaging over 90 °F throughout the state. Because extreme heat is prevalent across the state, residents are accustomed to these conditions and are not significantly impacted. However, extreme heat has been known to induce heat stroke among older adults. Some cases have resulted in death. Additionally, some extreme heat events have had significant impacts on crops. Temperature records from Alabama weather stations can help illustrate the nature of the extreme temperature threat in Alabama.

The following table shows the number of extreme heat days recorded by weather stations located in Alabama's four largest cities. Extreme heat days were defined as days in which the maximum temperature exceeded 90 °F. For each station, the table shows the average annual number of extreme heat days recorded each month as well as across the entire year. The averages were calculated across the period of record for each station, which ranged from 45 years for the Huntsville station to 50 years for the Mobile station. Cities in southern Alabama experience more frequent extreme heat days, with Montgomery experiencing an average of 78 extreme heat days per year and Mobile experiencing an average of 74 extreme heat days per year.

The National Weather Service, in working with the conditions set in the 2018, plan has explained the differences in the numbers from the two plans as follows:

Extreme heat days were defined as days in which the maximum temperature exceeded 90°F. For each station, the table shows the average annual number of extreme heat days recorded each month as well as across the entire year. The averages were calculated across the period of record for each station, which ranged from 45 years for the Huntsville station to 50 years for the Mobile station.

Table 3.25: Average Number of Extreme Heat Days

Month/ Station	Birmingham	Huntsville	Mobile	Montgomery
January	0	0	0	0
February	0	0	0	0
March	0	0	0	0
April	0	0	0	0

⁷⁷ State Climate Extremes Committee (SCEC). [Records | State Climate Extremes Committee \(SCEC\) | National Centers for Environmental Information \(NCEI\) \(noaa.gov\)](#)

Month/ Station	Birmingham	Huntsville	Mobile	Montgomery
May	2	2	3	4
June	10	10	13	16
July	17	15	19	22
August	15	14	18	21
September	7	6	9	11
October	0	0	1	1
November	0	0	0	0
December	0	0	0	0
Annual	51	46	61	75

3.2.4.2.2 Nature of Extreme Cold in Alabama

Table 3.26: Historical Extreme Cold Events in the State of Alabama⁷⁸

Temperature	Date	Location
-27 °F	September 6, 1925	New Market

Winters are generally mild in Alabama, as they are throughout most of the southeastern United States, with an average low temperature of 53 °F.⁷⁹ The mild winter climate makes extreme cold temperatures uncommon throughout the state. However, because residents are unaccustomed to the severe cold weather, there have been cases where the cold temperatures have caused death. Additionally, most crop species in Alabama do not have a tolerance for cold temperatures, making them more susceptible to the impacts of cold weather.

Cities in northern Alabama experience more frequent extreme cold days with Birmingham experiencing an average of 55 extreme cold days per year and Huntsville experiencing an average of 62 extreme cold days per year.

The National Weather Service, in working with the conditions set in the 2018 plan, has explained the differences in the numbers from the two plans as follows:

Extreme cold days were defined as days in which the minimum temperature was less than 32°F. As in the table for extreme heat days, Table 3.27 shows the average annual number of extreme cold days recorded each month as well as across the entire year.

⁷⁸ State Climate Extremes Committee (SCEC). Records. [Records | State Climate Extremes Committee \(SCEC\) | National Centers for Environmental Information \(NCEI\) \(noaa.gov\)](#)

⁷⁹ U.S. Climate Data, 2018. Alabama. <https://www.usclimatedata.com/climate/alabama/united-states/3170>

Table 3.27: Average Number of Extreme Cold Days

Month/ Station	Birmingham	Huntsville	Mobile	Montgomery
January	16	18	8	13
February	11	13	5	8
March	4	6	1	2
April	1	1	0	0
May	0	0	0	0
June	0	0	0	0
July	0	0	0	0
August	0	0	0	0
September	0	0	0	0
October	0	1	0	0
November	6	7	2	4
December	13	15	6	10
Annual	51	59	22	38

3.2.4.3 Extreme Temperature History in Alabama

3.2.4.3.1 Extreme Heat

The NWS Storm Events Database began collecting information on extreme heat events in 2008. Since that time, local field offices have reported 48 extreme heat episodes, or 3.4 episodes per year. Most of these episodes were relatively localized, affecting three counties or less. Two of the episodes, however, were widely felt across the state. The extreme heat episode of June 27–28, 2009, was reported to have affected seven counties, while the extreme heat episode of August 15, 2010, was reported to have affected eight counties. None of these events recorded since 2008 were reported to have caused direct damage; however, one death was reported on June 27, 2022, and several were reported to have caused injuries, ten in 2008 and 24 in 2009.

Table 3.28: Extreme Heat Events in Alabama, 1980–2022

Date	Counties Impacted	Description
July–September 1980	80% of the state	From mid-July through mid-September 1980, a sustained period of extreme heat and high humidity took its toll on the state. The month of July alone saw an estimated 120 heat-related deaths, the loss of more than 200,000 chickens, and the loss of half the state’s corn crop. The hottest day of the summer was July 17, when over 80% of the state reached 100 °F and nearly one-quarter of the state reached 105 °F. The highest reading on that day was 108 °F, recorded in the cities of Bessemer, Aliceville, and Jasper.
June 7–8, 2008	Madison	Heat illnesses prompted the hospitalization of four individuals. Temperatures climbed to between 90 and 95 °F, and heat index values reached 95–100 °F.
July 21, 2008	Madison	A strong upper-level ridge of high pressure in place across the southeastern United States led to temperatures in the upper 90s to low 100s across Madison County. A record high of 103 °F was set at Huntsville International Airport. This, coupled with dew points in the mid-60s, produced heat index values between 105 and 110 °F. This caused some heat-related illnesses in Madison County.
June 19, 2009	Lauderdale Colbert	A large ridge of high pressure built over the region, producing hot weather over several days. Daytime high temperatures reached the mid- to upper 90s during this period. In combination with humid air, heat index values climbed into the 100–105 °F range across northwest Alabama, including the Shoals. One newspaper reported that at least 12 people were treated for heat illness at a Florence hospital.
June 27–28, 2009	Lauderdale Colbert Cullman Limestone Lawrence Madison Morgan	A ridge of high pressure persisted over the region on June 27 and 28, producing hot temperatures in the upper 90s to around 100 °F. The heat, combined with high humidity, pushed heat index values into the 105–110 °F range on both days.

Date	Counties Impacted	Description
August 15, 2010	Morgan Madison Colbert Lauderdale Lawrence Limestone Cullman Franklin	Heat index values reached 110–115 °F in northwest and north-central Alabama.
July 10–11, 2011	Lauderdale Colbert Madison	Hot and very humid conditions produced dangerous heat during this period, mainly across northwest and north-central Alabama. Overnight lows were in the mid- to upper 70s at most locations, including a low of 80 at the University of Alabama in Huntsville on the morning of July 12. High temperatures reached the upper 90s to around 100. Heat index values of 105 to 111 were observed. At least two fatalities have been blamed on this heat wave.
June 29–July 1, 2012	Madison Colbert Montgomery	A strong ridge of high pressure shifted eastward from the Central Plains to the southeastern Continental United States, bringing with it record-breaking temperatures. Afternoon highs surpassed 100 °F. With a moist airmass in place, the heat index value reached 112 °F at the Montgomery Regional Airport on June 30.
July 14, 2015	North Alabama	Temperatures climbed to the mid- to upper 90s during the afternoon of July 14. With high dew points in the low- to mid-70s, heat index values reached or exceeded 105 °F over most of northern Alabama.
August 5, 2016	Lauderdale	As temperatures reached the mid- to upper 90s with dew points in the mid- to upper 70s, the heat index reached 110 °F in Muscle Shoals and nearby locations during the afternoon hours.
July 27, 2022	Cullman	A six-month-old female infant died after being left in a vehicle. Although limited details are available, it is assumed that the infant was left inside the vehicle sometime on July 26 when temperatures were in the low- to mid-90s. The infant was found the next morning around 7 am.

3.2.4.3.2 Extreme Cold

Although extreme cold is less common in Alabama than extreme heat, Alabama residents are less accustomed to and less well-prepared for extreme cold and therefore more vulnerable to these events. The NWS Storm Events Database began collecting information on extreme cold events in 1996. Since that time, local field offices have reported 109 extreme cold episodes, or 5.2 episodes per year. Most of these episodes were relatively localized, affecting three counties or fewer. Eleven of the episodes, however, were widely felt across the state. The most widely felt were two extreme cold events recorded in 1996 that were reported to have affected 50 counties, and events recorded in 2003 and 2014 that were reported to have affected 39 counties each. None of the events recorded since 2008 were reported to have caused direct property damage or injury, but one event was reported to have caused direct crop damage, and several were reported to have caused direct deaths. The extreme cold event of March 7, 1996 was reported to have caused more than \$81 million in direct crop damage (adjusted to 2017 dollars). Six of the recorded events were reported to have caused one death each, for a total of six deaths attributed to extreme cold.

Table 3.29: Extreme Cold Events in Alabama, 2000–2018

Date	Counties Impacted	Description
February 6, 2000	Montgomery	A new record low temperature of 20 °F was measured at Dannelly Field.
April 9, 2000	Montgomery Jefferson Madison	Record low temperatures of 31 °F for April were recorded in each county.
July 24–25, 2000	Madison	A new record low temperature of 63 °F was measured at Huntsville International Airport.
August 15, 2000	Montgomery	An early morning temperature of 64 °F was measured at Dannelly Field. This temperature tied the previous record low temperature for August.
September 17, 2000	Madison	A morning low temperature of 47 °F was measured at Huntsville International Airport. This temperature is tied to the previous record low temperature for September.
October 8–12, 2000	Madison Jefferson Montgomery	Record low temperatures for the month of October were recorded in each county.
November 22, 2000	Montgomery	The morning low temperature recorded at Dannelly Field was 21 °F. This measurement established a new record low temperature for November.
December 1, 2000	Madison Montgomery Jefferson	Record low temperatures were recorded for each county. This was the coldest December since records began in 1910.
December 31, 2000	Jefferson	A Birmingham man died from hypothermia after being found outside of the Norwood boarding house where he lived. The coroner reported that the man's body temperature was 77 °F when he was found. The morning low reported at Birmingham airport was 16 °F.
March 26–28, 2001	Madison	The early morning low temperature recorded at Huntsville International Airport was 27 °F. This temperature established a new daily record low temperature.
May 23, 2001	Madison	The low temperature of 47 °F tied the record low for this date, which was first set in 1963.

Date	Counties Impacted	Description
August 21, 2001	Madison	The morning low temperature measured at Huntsville International Airport was 57 °F, which established a new record low temperature for the date.
September 26–28, 2001	Jefferson Madison Montgomery	Record low temperatures for September were recorded in these counties.
October 17–18, 2001	Jefferson Madison Montgomery	Record low temperatures for October were recorded in these counties.
October 28–30, 2001	Madison Montgomery	New record low temperatures for October were recorded in these counties.
February 28, 2002	Montgomery Tuscaloosa Colbert Madison Jefferson Calhoun	Record low temperatures for February were recorded in these counties.
May 20–21, 2002	Madison Montgomery Jefferson	Record low temperatures for May were recorded in these counties.
January 24, 2003	All counties	The coldest temperatures in seven years were recorded across much of northern and central Alabama and lasted for about two days. Early morning temperatures ranged from 2 to 10 °F. The coldest temperatures were measured in outlying areas. Although no new records were established, these temperatures were very cold for the Deep South. Many area residents reported frozen and broken water pipes as a result of the extended cold. Several lawn sprinkler systems also froze and broke, making many areas very icy. One woman in Talladega was found dead outside, apparently succumbing to the harsh, cold conditions. Many area farmers lost a large part of their strawberry crops.

Date	Counties Impacted	Description
January 7–8, 2015	Cullman Colbert Lawrence Madison Morgan Limestone Franklin Lauderdale DeKalb Marshall Jackson	An arctic cold front pushed through the region on the afternoon of January 7, bringing gusty northerly winds of 20–30 mph. Temperatures fell through the 20s and quickly into the teens and single digits during the evening and overnight. Wind chills fell below zero during the mid- to late evening hours in northern Alabama. Although winds diminished considerably through the early morning hours of January 8, wind chills remained below zero, with temperatures bottoming out in the single digits.
January 7, 2017	Franklin	Minor winter weather was observed. With a very cold air mass in place, there were light snowfall accumulations. Additionally, cold air convection from the northwest produced widespread apparent temperatures around 0 °F on the morning of January 7. Widespread sub-zero temperatures were observed.
January 17, 2018	Jackson DeKalb	Temperatures falling into the lower teens combined with north winds lowered wind chills into the zero to -10 °F range for most areas during the early morning hours of January 17. After sunrise, north winds increased in northeast Alabama, with sustained winds of 10–20 mph and gusts over 30 mph. This resulted in wind chills dropping into the -10 to -15 °F range for a few hours. The wind chill also dropped into the -10 to -15 °F range atop the higher elevations of Jackson County. The wind chill dropped to as low as -12 °F at Fort Payne.

3.2.4.4 Probability of Extreme Temperatures in Alabama

The probability of an Extreme Temperature event impacting the State of Alabama in any given year is Highly Likely. The probability of extreme temperatures in Alabama is a function of the state's geography and climate. With its humid subtropical climate type, the state is likely to experience many days with maximum temperatures in excess of 90 °F and somewhat fewer days with minimum temperatures lower than 32 °F.

3.2.4.4.1 Future Probability of Extreme Heat in Alabama

The probability, location, intensity and impacts of hazards will change over time. Climate change, including changes in temperature, intensity, hazard distribution or frequency of weather events, may increase vulnerability to these hazards in the future. Based on historical knowledge and current conditions, it can be expected that all hazards will see a rise in scope, scale, and frequency of events on a yearly basis.

The probability of experiencing extreme temperatures in Alabama is a function of the state's geography and climate. With its humid subtropical climate type, the state is likely to experience many days with maximum temperatures in excess of 90 °F and somewhat fewer days with minimum temperatures lower than 32 °F. As Alabama experiences the impacts of climate change, the average temperature will increase, and excessive heat events will be more likely to occur. Climate change will mean that Alabama will experience more extremely hot days, there may be a reduction in crop yield, livestock may be harmed, and there may be an increase in the risk of heat stroke and other heat-related diseases.

The Climate Impact Lab provides climate projections for the rest of the twenty-first century based on Coupled Model Intercomparison Project Phase 5 (CMIP5). In this model, the gridded projections were aggregated into regional estimates.

As these projections indicate, the number of extreme heat days is projected to increase throughout the state. In addition, the number of heat waves (defined as consecutive days exceeding 95 °F) is expected to increase significantly by the end of the twenty-first century, with the projected increase ranging from 97% to 207%.

3.2.4.4.2 Future Probability of Extreme Cold in Alabama

The number of extremely cold days is projected to decrease. In addition, overall warming is projected to increase the length of the freeze-free season or the period between the last spring frost and the first fall frost. In the northern tier of the state, the length of the freeze-free season may increase by as much as 30 days by the middle of the 21st century. This change could have implications for pest management and crop damage, as well as vector-borne diseases and public health.

3.2.4.4.3 Risk and Vulnerability

In the United States, the projected increase in heat wave deaths is expected to be the single greatest driver of economic impacts from climate change.⁸⁰ A community's vulnerability to heat waves will depend not only on the probability of the hazard, but also on the characteristics of the built environment, the characteristics of the exposed population, and any adaptation measures taken by the community. In developed areas, the heat-wave risk is related to both regional climate change and local urban heat island effects. Neighborhoods in the city center and neighborhoods with less vegetation are most impacted by the urban heat island effect and will have the greatest exposure to high temperatures (particularly at night).⁸¹ In Alabama, the densest neighborhoods in the state's cities and towns may be particularly vulnerable to extreme heat events. As discussed above, certain demographic groups are more susceptible to extreme heat than others. These groups include older adults, infants, young children, and people with chronic health problems.⁸² Members of these groups who do not have access to air conditioning will be the most vulnerable to heat-related health impacts. Society and technology could moderate the vulnerability of these groups, however. For example, cities could open cooling centers during heat waves for those who lack access to air conditioning.

Table 3.30: Extreme Temperature in the State of Alabama, 2017–2022⁸³

Hazard Type	Jurisdiction	No. of Events	Total Property Damage	Total Crop Damage	Deaths	Injuries
Excessive heat	Colbert	1	0	0	0	0
	Franklin	1	0	0	0	0
	Lauderdale	2	0	0	0	0
	Lawrence	1	0	0	0	0
	Limestone	1	0	0	0	0
	Madison	1	0	0	0	0
	Morgan	1	0	0	0	0
Extreme cold/wind chill	Dekalb	1	0	0	0	0
	Franklin	1	0	0	0	0
	Jackson	1	0	0	0	0

⁸⁰ Brad Plumer and Nadja Popovich, As Climate Changes, Southern States Will Suffer More Than Others. New York Times, June 29, 2017. <https://www.nytimes.com/interactive/2017/06/29/climate/southern-states-worse-climate-effects.html>

⁸¹ Lemonsu, A., Viguie, V., Daniel, M., and Masson, V., 2015. Vulnerability to Heat Waves: Impact of Urban Expansion Scenarios on Urban Heat Island and Heat Stress in Paris (France). *Urban Climate*, Volume 14, Part 4. <https://www.sciencedirect.com/science/article/pii/S2212095515300316>

⁸² National Oceanic and Atmospheric Administration, National Weather Service, 2017. Who Is Most Vulnerable During a Heat Wave? <https://www.weather.gov/media/lx/wcm/Heat/MostVulnerableHeatIndex.pdf>

⁸³ [Storm Events Database - Search Page | National Centers for Environmental Information \(noaa.gov\)](#)

Hazard Type	Jurisdiction	No. of Events	Total Property Damage	Total Crop Damage	Deaths	Injuries
Cold/wind chill	Colbert	4	0	0	0	0
	Cullman	3	0	0	0	0
	Dekalb	3	0	0	0	0
	Franklin	4	0	0	0	0
	Jackson	3	0	0	0	0
	Lauderdale	4	0	0	0	0
	Lawrence	4	0	0	0	0
	Limestone	4	0	0	0	0
	Madison	4	0	0	0	0
	Marshall	3	0	0	0	0
	Morgan	4	0	0	0	0
	Shelby	1	0	0	0	0

Excessive Heat and Extreme Cold/Wind Chill Synopsis for the State of Alabama:

- August 13, 2019:** Temperatures reached the mid- to upper 90s with dew points in the mid- to upper 70s. This resulted in heat index values of around 110 in northwest Alabama and 105–110 in north-central and northeast Alabama.
- July 30/31, 2021:** Late morning and afternoon temperatures climbed into the 92-to-97-degree range. As a frontal boundary moved into portions of northern Alabama and southern middle Tennessee, this produced very humid conditions and dangerous heat index values ranging from 110 to 113 degrees in portions of northwestern Alabama. During the early and mid-afternoon hours, temperatures climbed into the mid- to upper 90s, and very humid conditions produced extremely dangerous heat index values ranging from 110 to 113 degrees.
- January 2017:** Minor winter weather was observed January 6–7. With a very cold air mass in place, a minor moisture return, wrapping around on the backside of a surface low, centered southeast of the region, produced light snowfall accumulations, generally around a half inch. However, higher amounts were reported in the higher elevations of Dekalb County. Additionally, cold air convection from the northwest produced widespread apparent temperatures around 0 °F on the morning of January 7. Widespread sub-zero temperatures were observed in Franklin County, and observation reports showed apparent temperatures dropping to around -5 °F across the county.
- January 2018:** Temperatures falling into the lower teens combined with north winds lowered wind chills into the zero to -10 °F range for most areas during the early morning hours of January 17. After sunrise, north winds increased in northeast Alabama with sustained winds of 10–20 mph and gusts over 30 mph. This resulted in wind chills dropping into the -10 to -15 °F range for a few hours. The wind chill dropped to as low as -12 °F at Fort Payne.

In the 15-year period before 2017–2022 data shown in Tables 3.31 and 3.32, there have been approximately 30 excessive heat events with around 34 associated injuries. There have also been

approximately 88 cold/wind chill events with no reported information, 100 extreme cold/wind events with no reported information, 8 freezing fog events with no reported information, 200 frost/freeze events with no reported information, and about 300 heavy snow events with about \$30,000 worth of property damage. There have also been about 100 ice storm events with over \$500,000 worth of property damage, about 200 winter storm events with 3 deaths and 2 injuries along with over \$100,000 worth of property damage, and about 200 winter weather events with approximately \$15,000 in property damage and 11 injuries and 7 deaths that were related to the events.

In Tables 3.31 and 3.32, the extreme heat and extreme cold have been condensed to show a snippet of the events that have happened over the course of the last few years, from 2017 to 2022. There were no related deaths/injuries or property/crop damage, but this demonstrates how often these events occur.

Table 3.31: Extreme Heat Events in the State of Alabama, 2017–2022

Location	Start Date	Event Type	Deaths	Injuries	Property Damage	Crop Damage
COLBERT	7/30/2021	Excessive heat	0	0	0	0
FRANKLIN	8/13/2019	Excessive heat	0	0	0	0
LAUDERDALE	8/13/2019	Excessive heat	0	0	0	0
JACKSON	8/13/2019	Heat	0	0	0	0
LAUDERDALE	7/12/2018	Heat	0	0	0	0
LAWRENCE	7/20/2020	Heat	0	0	0	0
LAWRENCE	7/30/2021	Heat	0	0	0	0
LAWRENCE	7/31/2021	Heat	0	0	0	0
LIMESTONE	7/12/2018	Heat	0	0	0	0
MADISON	7/13/2018	Heat	0	0	0	0

Table 3.32: Extreme Cold Events in the State of Alabama, 2017–2022

Location	Start Date	Event Type	Deaths	Injuries	Property Damage	Crop Damage
MORGAN	1/1/2018	Cold/wind chill	0	0	0	0
MORGAN	1/2/2018	Cold/wind chill	0	0	0	0
DEKALB	1/17/2018	Extreme cold/wind chill	0	0	0	0
FRANKLIN	1/7/2017	Extreme cold/wind chill	0	0	0	0
MARSHALL	12/11/2018	Freezing fog	0	0	0	0

Location	Start Date	Event Type	Deaths	Injuries	Property Damage	Crop Damage
MORGAN	12/11/2018	Freezing fog	0	0	0	0
COLBERT	11/20/2017	Frost/freeze	0	0	0	0
COLBERT	3/9/2018	Frost/freeze	0	0	0	0
BLOUNT	1/2/2022	Heavy snow	0	0	0	0
BLOUNT	3/12/2022	Heavy snow	0	0	0	0
CHOCTAW	1/6/2017	Ice storm	0	0	\$10,000	0
CLARKE	1/6/2017	Ice storm	0	0	\$10,000	0
AUTAUGA	12/8/2017	Winter storm	0	0	0	0
AUTAUGA	1/16/2018	Winter storm	0	0	0	0
BALDWIN CENTRAL	12/8/2017	Winter weather	0	0	0	0
BALDWIN CENTRAL	1/17/2018	Winter weather	0	0	0	0

Lifeline- Extreme Temperature - All

High temperatures and low temperatures pose a risk to all individuals. During these extreme weather conditions, vulnerable populations are particularly at risk. Heat stroke and related conditions can result in death during extreme heat, while hypothermia, frostbite, carbon monoxide poisoning, and heart attacks are potential dangers during extreme cold. Power outages are more likely to occur during either of these weather events, which can result in communication outages and road inaccessibility, making emergency services and food supplies unavailable.

3.2.4.5 Consequence Analysis

Extremes of heat and cold in environmental conditions can be very detrimental to health and comfort as human bodies attempt to maintain a state of homeothermy at a core temperature of about 98.6 °F. When exposed to extremes of heat and cold, human bodies have natural reactions to the extreme conditions.

Extreme heat is the number one weather-related killer in the United States, resulting in hundreds of fatalities each year. In fact, on average, extreme heat claims more lives each year than floods, lightning, tornadoes, and hurricanes combined.

The hazard of extreme heat is that when the body heats up too quickly to cool itself safely or when too much fluid or salt is lost through dehydration or sweating, body temperature rises, and heat-related illness may develop. Heat disorders share one common feature: the individual has been in the heat too long or exercised too much for his or her age and physical condition.

Studies indicate that, other things being equal, the severity of heat disorders tends to increase with age. Conditions that cause heat cramps in a 17-year-old may result in heat exhaustion in

someone 40 years old and in heat stroke in a person over 60. Given its low frequency, humans, animals, and so forth are not acclimated to extreme cold weather events. The average mortality on a winter's day is about 15% higher than on a summer's day. Cold weather is responsible for deaths through such things as hypothermia, influenza, and pneumonia. It is also an indirect factor in several ways, such as death and injury from falls, accidents, carbon monoxide poisoning, and house fires, all of which are partially attributable to cold.

The information in Table 3.33 provides the consequence analysis of the potential impacts of extreme temperatures prepared for accreditation with the Emergency Management Accreditation Program (EMAP).

Lifeline- All

All lifelines are assigned to extreme temperatures depending upon the meteorological changes that may accompany these extreme temperatures. Law Enforcement and Emergency services may be delayed due to snow fall, icy condition, or roads warped from heat. If power grids are effected or the community imposes a brownout businesses and healthcare institutions may not be able to operate causing food insecurity and limited access to emergency medical issues as well as communication issues and fuel shortages. Possible land, air and water contamination may occur depending upon the method of storing hazardous materials due to expansion and contraction of liquids, gasses and the materials the storage containers are constructed from.

Table 3.33: EMAP Consequence Analysis: Extreme Temperatures

Subject	Ranking	Impacts/Extreme Temperatures
Health and Safety of Persons in the Area of the Incident	Minimal to severe	Depending on the duration of the event, the impact in the incidence area is expected to be severe for unprepared and unprotected persons. The impact will be minimal to moderate for prepared and protected persons.
Responders	Minimal to severe	The impact could be severe if proper precautions are not taken, such as hydration in the heat and clothing in the extreme cold. With proper preparedness and protection, the impact would be minimal.
Continuity of Operations	Minimal	Expectations for utilization of the COOP is minimal.
Property, Facilities, and Infrastructure	Minimal to severe	Depending on the temperature extremes and whether or not there has been any precipitation, the impact on infrastructure could range from minimal to severe.
Delivery of Services	Minimal	Impact on the delivery of services should be nonexistent or minimal.
Environment	Severe	The impact on the environment could be severe. Extreme heat and cold have the potential to seriously damage wildlife and plants (trees, crops, etc.).

Subject	Ranking	Impacts/Extreme Temperatures
Economic Conditions	Minimal to severe	Impacts on the economy will be dependent on how extreme the temperatures get, but only in the sense of whether people will venture out to spend money. Utility bills could increase dramatically, causing more financial hardship and putting a strain on infrastructure and crops.
Public Confidence in Jurisdiction's Governance	Minimal to moderate	Confidence will be dependent on how well utilities hold up as they are stretched to provide heat and cool air, depending on the extreme. Planning and response could be challenged.

3.2.5 Flooding

3.2.5.1 Description

Flooding is the inundation of normally dry land and is the leading cause of natural disaster economic losses in the United States. Flooding can be caused by many different types of weather systems, including slow-moving frontal systems, inland-moving tropical cyclones, and intense summertime thunderstorms. In coastal areas, flooding can also be caused or intensified by high tides. When local weather stations issue flood warnings or report flood damages, they often classify flood events into categories based on the extent and velocity of rising waters. Table 3.34 summarizes flood types based on the definitions used in the NWS Storm Events Database.

Table 3.34: Flood Types (NWS, 2022)

Flood Type	Extent	Description
Flash flood	Areas near creeks and streams and low-lying areas	<p>A life-threatening, rapid rise of water into a normally dry area that begins within minutes to several hours of the causative event (e.g., intense rainfall, dam failure, ice jam). Ongoing flooding can intensify into shorter-term flash flooding in cases where intense rainfall results in a rapid surge of rising floodwaters. Conversely, flash flooding can transition into ongoing flooding as rapidly rising waters abate.</p> <p>Note: This section provides in-depth information on the nature of flash flooding and past occurrences but limited information on the relative probability of flash flooding across the state. This is because flash flooding can happen anywhere when the local meteorological, soil, and land cover conditions are right.</p>

Flood Type	Extent	Description
Flood	Small- to large-scale areas	Any high flow, overflow, or inundation by water that causes damage. In general, this would mean the inundation of normally dry areas caused by an increased water level in an established watercourse, or ponding of water, which poses a threat to life or property. Floods can range from larger-scale area floods to smaller-scale urban and small-stream flooding that commonly occurs in poorly drained or low-lying areas.
Coastal flood	Low-lying coastal areas	Flooding of coastal areas due to the vertical rise above normal water level caused by strong, persistent onshore wind, high astronomical tide, and/or low atmospheric pressure, resulting in damage, erosion, flooding, fatalities, or injuries.
Nuisance flooding	Low-lying coastal areas	Shallow coastal flooding caused by the convergence of extreme high tides with other meteorological conditions (e.g., onshore winds). This type of flooding can occur even on sunny days. While nuisance flooding can cause significant public inconvenience, it does not cause significant structural damage to buildings.

A floodplain is any land area susceptible to inundation by water from any source. For riverine flooding, the factors that determine the extent of the floodplain include rainfall intensity, duration, and extent; soil saturation; topography; and land cover. Higher streamflow is generated when rainfall is heavy, soils are frozen or saturated, slopes are steep, or drainage areas are highly impervious (covered with surfaces that do not absorb water, such as roofs, roads, and parking lots). High streamflow tends to translate into larger floodplains where the land adjacent to rivers and streams is characterized by wide flat areas (as opposed to steep river valleys).

For coastal and storm surge flooding, the factors that determine the extent of the floodplain include the size, strength, intensity, and speed of the storm that is driving storm surge and wave action; the direction the storm is moving relative to the shoreline; how steeply the sea floor is sloping along the shore; topography; and the astronomical tide. In general, storm surge is most damaging when it occurs along a shallowly sloped shoreline, during high tide, and in developed areas with limited natural buffers (such as barrier islands, coral reefs, and coastal vegetation).⁸⁴ Furthermore, the damage from storm surge and waves is greatest in the right front quadrant of a tropical cyclone. This is where the storm, its winds, and ocean waves are all moving in an onshore direction due to the counterclockwise rotation of hurricanes in the Northern Hemisphere.⁸⁵

⁸⁴ Wright, James M., 2007. Floodplain Management: Principles and Current Practices. Chapter 2: Types of Floods and Floodplains.

<https://training.fema.gov/hiedu/docs/fmc/chapter%202%20-%20types%20of%20floods%20and%20floodplains.pdf>

⁸⁵ Ibid.

Both localized and widespread floods are considered hazards when people and property are affected. Injuries and deaths can occur when people are swept away by flood currents or when bacteria and disease are spread by floodwaters. Extensive property damage can be caused by the force or volume of floodwaters. Moving water creates hydrodynamic forces that can damage the walls of buildings, scour around their foundations, and damage roads and bridges. The magnitude of these forces is related to both the velocity and depth of the flooding. Studies have shown that deep water moving at low velocities can cause as much damage as shallow water moving at high velocities. The debris carried by moving water can also cause damage, acting like battering rams against the walls of buildings. Standing water also exerts a force on buildings through the weight of the water. Three feet of standing water can exert enough lateral force to collapse the walls of a typical frame house, and basement walls and floors are particularly susceptible to damage.⁸⁶ Soaking is another cause of property damage related to the volume of floodwaters. Soaking can damage plywood, gypsum wallboard, and household goods. In addition, floodwaters usually carry suspended sediments, debris, other contaminants such as oil, farm and lawn chemicals, and untreated sewage. When floodwaters recede, these contaminants remain in flooded buildings and on their contents. It is important to note that even when flooding does not cause property damage or loss of life, it can cause economic disruption through traffic diversions and temporary business closures. Shallow coastal flooding caused by extreme high tides often causes these public inconveniences, which is why this type of flooding is sometimes called “nuisance flooding.”

3.2.5.1.1 Floodplains

According to FEMA, a floodplain is any land area susceptible to being inundated by floodwaters from any source. The USGS further defines a floodplain as a relatively flat lowland that borders a river and is usually dry but is subject to flooding.

The impact of floods is highly dependent on the amount, type, and design of development in the floodplain. The federal government has therefore developed nationwide programs to identify flood-prone areas, such as Risk MAP (Risk Mapping, Assessment, and Planning), and to encourage development patterns that place fewer people and assets in harm’s way through the National Flood Insurance Program (NFIP). To identify flood-prone areas, the Risk MAP program produces flood hazard maps (also known as Flood Insurance Rate Maps, or FIRMs) that delineate flood zones based on the expected frequency of flooding. This level of flood is referred to as the “base flood,” the “1% flood,” or the “100-year flood.” The area that would be inundated by a base flood is commonly called the 100-year floodplain. This is often misunderstood because many assume such a flood would only occur once every 100 years; however, as explained, “100” refers to the 1% chance of the flood reaching that specified floodplain in any given year. The same theory is applied to understand the 500-year floodplain; it has a 0.2% chance of occurring each year.

⁸⁶ FEMA, 1998. Managing Floodplain Development Through the National Flood Insurance Program: Home Study Course. Unit 1: Flood and Floodplain Management.
https://www.fema.gov/pdf/floodplain/nfip_sg_unit_1.pdf

The areas of flood risk on FIRMs are called Special Flood Hazard Areas (SFHAs). The 100-year floodplain is considered a high-risk area and is denoted as Zone A. The 500-year floodplain is shown as shaded Zone X, or moderate risk area. The areas with less 0.2% chance of flood annually are marked as Zone X however, anywhere it can rain it can flood. Additionally, high-risk coastal areas are denoted as Zone V.

Table 3.35 describes the flood zones used in current FIRMs. Note that Zone A and Zone V areas are also known as SFHAs. To encourage effective floodplain management, the NFIP makes more affordable flood insurance available to communities that adopt and enforce floodplain management regulations. Participating communities must meet the NFIP requirements for each flood zone.

Table 3.35: NFIP Flood Zones

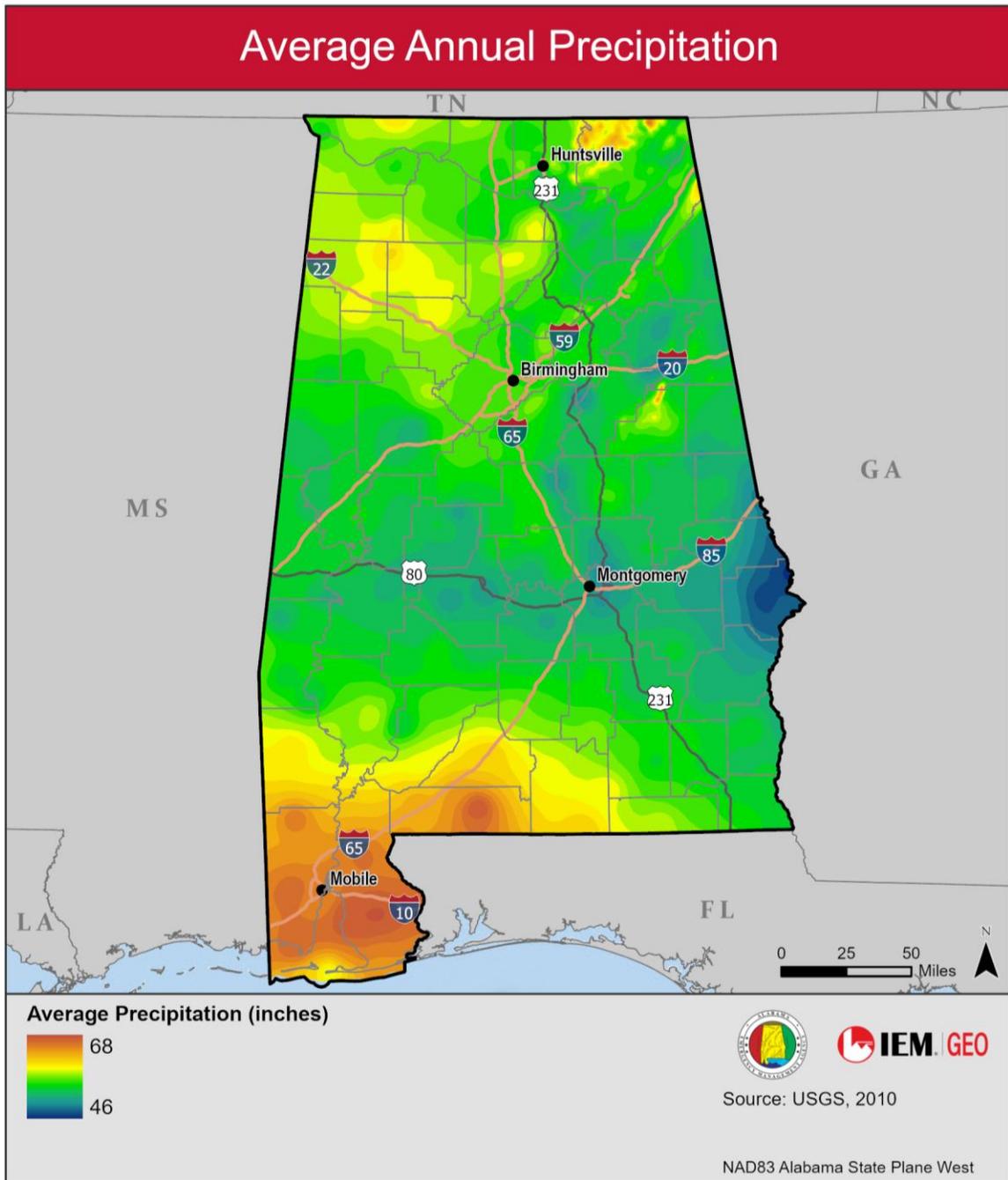
Zone	Description
Low to Moderate Risk Areas	
C and X	Area of minimal flood hazard usually depicted on FIRMs as above the 500-year flood level. Zone C may have ponding and local drainage problems that do not warrant a detailed study or designation as a base floodplain. Zone X is the area determined to be outside the 500-year flood and protected by levees from 100-year flood.
B and X (shaded)	Area of moderate flood hazard, usually the area between the limits of the 100-year and 500-year floods. B zones are also used to designate base floodplains of lesser hazards, such as areas protected by levees from 100-year flood, shallow flooding areas with average depths of less than 1 foot, or drainage areas less than 1 square mile.
High-Risk Areas	
A	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas, no depths or base flood elevations are shown within these zones.
AE	The base floodplain where base flood elevations are provided. AE zones are now used on new format FIRMs instead of A1–A30 zones.
A1–A30	These are known as numbered A zones (e.g., A7 or A14). This is the base floodplain where the FIRM shows a BFE (old format).
AH	Areas with a 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
AO	River or stream flood hazard areas and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these zones.

Zone	Description
AR	Areas with a temporarily increased flood risk due to the building or restoration of a flood control system (such as a levee or a dam). Mandatory flood insurance purchase requirements will apply, but rates will not exceed those for unnumbered A zones if the structure is built or restored in compliance with Zone AR floodplain management regulations.
A99	Areas with a 1% annual chance of flooding will be protected by a federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones.
High-Risk Coastal Areas	
V	Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage. No base flood elevations are shown within these zones.
VE, V1– V30	Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
Undetermined Risk Areas	
D	Areas with possible but undetermined flood hazards. No flood hazard analysis has been conducted. Flood insurance rates are commensurate with the uncertainty of the flood risk.

3.2.5.2 Nature of the Hazard in Alabama

Alabama has a warm and humid climate characterized by often turbulent weather patterns and year-round precipitation. As shown in Figure 3.22, Alabama receives more rainfall than much of the United States, particularly along the state's Gulf Coast. These features of the state's climate, together with its location on the Gulf of Mexico, resulting in frequent riverine and coastal flooding events.

Figure 3.22: 30-Year Average Annual Precipitation (1981–2022)⁸⁷



According to the NWS Storm Events Database, Alabama has experienced more than 1,000 significant or loss-producing flood events from 2000 to 2022, or about 45 flood events per year. While flood events occur year-round, most take place in the months of April through July. Table

⁸⁷ www.climate.gov/news-features/featured-images/new-maps-annual-average-temperature-and-precipitation-us-climate

3.36 shows the number of reported flood events by county, with the counties listed from most reported flood events to least. As expected, the coastal counties experience particularly frequent flood events, including coastal flooding and storm surges.

Table 3.36: Reported Flood Events by County, 2000–2022 (NWS, 2022)⁸⁸

County	Flash Flood	Flood	Coastal Flood or Storm Surge	All Flood Events
Madison County	170	44	0	214
Lauderdale County	146	47	0	193
Mobile County	140	8	35	183
Baldwin County	99	8	35	142
Jefferson County	123	12	0	135
Colbert County	116	14	0	130
Morgan County	95	31	0	126
Cullman County	69	12	0	81
Limestone County	61	20	0	81
Dekalb County	57	23	0	80
Marshall County	53	21	0	74
Jackson County	42	26	0	68
Shelby County	59	6	0	65
Lamar County	54	5	0	59
Tuscaloosa County	48	10	0	58
Houston County	42	12	0	54
Lawrence County	40	11	0	51
Clarke County	40	3	0	43
Geneva County	31	12	0	43
Blount County	33	6	0	39
Escambia County	36	3	0	39
Coffee County	31	7	0	38
Elmore County	35	3	0	38
Dale County	31	6	0	37
Montgomery County	31	6	0	37
Franklin County	31	4	0	35
Choctaw County	34	0	0	34
Talladega County	25	8	0	33
Walker County	30	2	0	32

⁸⁸ NOAA. Storm Events Database. <https://www.ncdc.noaa.gov/stormevents/>

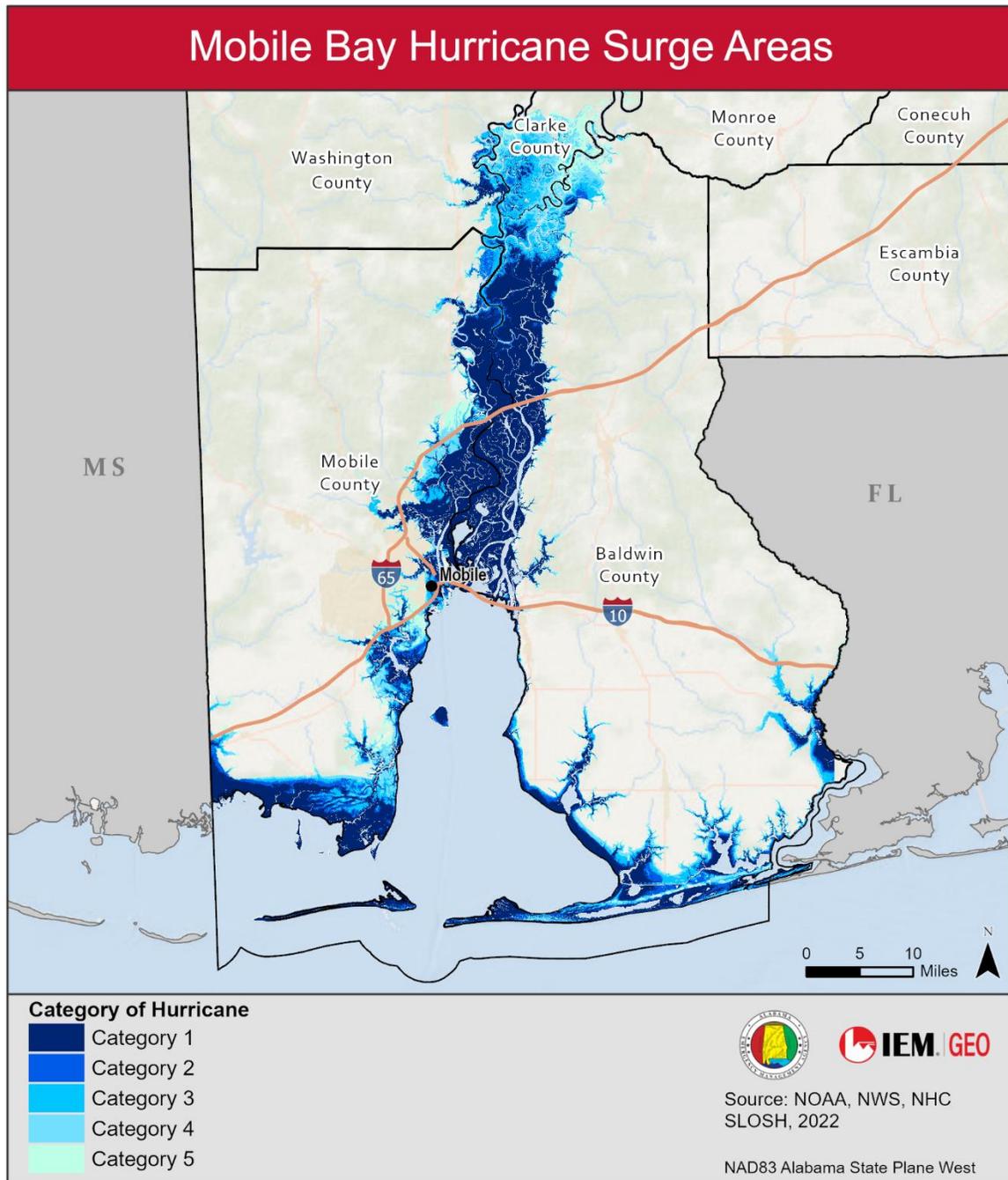
County	Flash Flood	Flood	Coastal Flood or Storm Surge	All Flood Events
Calhoun County	27	2	0	29
Etowah County	20	8	0	28
Marion County	25	2	0	27
Cherokee County	18	7	0	25
St. Clair County	22	3	0	25
Monroe County	21	3	0	24
Autauga County	19	4	0	23
Sumter County	16	7	0	23
Randolph County	17	5	0	22
Lee County	19	2	0	21
Chambers County	16	3	0	19
Washington County	19	0	0	19
Pickens County	12	6	0	18
Russell County	17	1	0	18
Hale County	11	6	0	17
Lowndes County	14	2	0	16
Tallapoosa County	13	3	0	16
Clay County	14	1	0	15
Crenshaw County	13	2	0	15
Winston County	15	0	0	15
Bibb County	10	3	0	13
Covington County	12	1	0	13
Dallas County	12	1	0	13
Butler County	11	1	0	12
Fayette County	12	0	0	12
Greene County	8	4	0	12
Pike County	11	0	0	11
Chilton County	10	0	0	10
Conecuh County	10	0	0	10
Wilcox County	10	0	0	10
Henry County	7	2	0	9
Macon County	8	1	0	9
Perry County	8	1	0	9
Bullock County	8	0	0	8
Cleburne County	7	0	0	7

County	Flash Flood	Flood	Coastal Flood or Storm Surge	All Flood Events
Marengo County	6	0	0	6
Barbour County	5	0	0	5
Coosa County	2	0	0	2

As discussed above, the extent of storm surge flooding is highly dependent on the size, strength, intensity, and speed of the storm that is driving storm surge and wave action. Figure 3.23 shows the sensitivity of storm surge flooding in Baldwin and Mobile Counties to hurricane intensity (as categorized by the Saffir-Simpson Hurricane Wind Scale). Since many factors influence storm surge heights, this figure shows the worst-case outcome at each location based on a series of storm surge scenarios. To emphasize the areas with the highest degree of exposure, the storm surge zones corresponding to the lowest hurricane intensity (Category 1 hurricanes) are displayed in the darkest color.⁸⁹ The data shown in Figure 3.23 was derived from storm surge inundation maps created by the National Hurricane Center (NHC) Storm Surge Unit with the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model. Emergency managers often use the SLOSH model in hurricane evacuation studies.

⁸⁹ FEMA, 2012. Summary of the Coastal Flood Loss Atlas.
https://data.femadata.com/MOTF/CFLA/CFLA_Summary_FINAL.pdf

Figure 3.23: Storm Surge Scenarios for Saffir-Simpson Hurricane Categories 1 Through 5 (FEMA)



3.2.5.3 Flood History in Alabama

Alabama experiences flooding and flood impacts almost every year. To demonstrate the potential impacts of flooding in Alabama, Table 3.37 summarizes the six flood events recorded by the Storm Events Database that were reported to generate the highest losses.

Table 3.37: Alabama Flood History, 1996–2017 (NWS, 2022)⁹⁰

Date	Estimated Damage (in 2022 dollars)	Counties Declared Disaster Areas	Description
March 8, 1998	\$519 million	Barbour Butler Coffee Conecuh Covington Crenshaw Dale Escambia Geneva Henry Houston Randolph	An intense Gulf storm deposited up to 14 inches of rain across southeast Alabama on March 6-8. Subsequent flooding damaged hundreds of homes disrupted the water supply for 300 residents and washed out many county and state roads. A portion of the levee in Elba failed, causing 2,000 people to evacuate. Communities suffering the worst damage were Malvern, Slocomb, Geneva, and Samson.
September 28, 1998	\$28.5 million	NA	Torrential rains of 8 to 24 inches produced flash flooding in Geneva County. Numerous roads were damaged or washed out. Significant losses were incurred to peanut and cotton crops.
September 22, 2002	\$8.45 million	NA	Very heavy rain fell across central Alabama during the early morning hours. The heaviest rain was measured generally from Tuscaloosa to Birmingham to Wedowee. Radar-estimated rainfall amounts averaged 3 to 5 inches, with many localized areas getting over 7 inches in only a few hours. The hardest hit area was the Birmingham Metropolitan Area, where the damage stretched from Bessemer to Pelham to Mountain Brook to Vestavia Hills. The flooding damaged more than 120 homes and 20 businesses and washed out several bridges and culverts. Many roads were temporarily closed and impassable, and over 200 automobiles suffered significant damage in Vestavia Hills.

⁹⁰ NOAA. Storm Events Database. <https://www.ncdc.noaa.gov/stormevents/>

Date	Estimated Damage (in 2022 dollars)	Counties Declared Disaster Areas	Description
May 7, 2003	\$1.33 billion	38 counties across the state	<p>Heavy rains fell across the state. In Jefferson County, up to 12 inches of rain fell in a few hours, with 5 to 8 inches of the total occurring in just one hour. Especially hard hit were Leeds, Brookside, Cardiff, Fultondale, Trussville, and Birmingham.</p> <p>Numerous homes across the county were flooded. At least 120 roadways were impassable. Several sewage treatment plants were flooded, and minor contamination occurred. Several roadways had their pavement removed and then washed away. Several bridges were damaged. In the Irondale area across the park, 74 municipal mobile homes were damaged. Trussville reported that buildings, police cars, fire trucks, utility trucks, and businesses were damaged. Brookside reported that the city hall and fire department were heavily damaged by the floodwaters. In Graysville, 10 people were rescued from their flooded vehicles, and 20 homes were evacuated. In Fultondale, almost \$1 million of damage occurred to city services. At least 25 homes and businesses were damaged in Fultondale. In Morris, one manufacturing plant was flooded.</p>
May 7, 2009	\$8.47 million	Autauga Bullock Elmore Montgomery	<p>A slow-moving area of thunderstorms brought considerable flash flooding to several counties in central and southeast Alabama. A relatively narrow but rather long swath of rainfall ranging from 3 to more than 7 inches stretched from northeastern Autauga County, across the city of Montgomery, and into southern Russell and northern Barbour Counties. Peak rainfall amounts approached 10 inches. Numerous county roads and city streets became impassable and suffered extensive damage due to flooding caused by torrential rainfall. The cities of Wetumpka, Millbrook, and Deatsville were especially hard hit. At least 43 homes, 10 businesses, and 2 churches also suffered damage due to the flooding.</p>
April 29, 2014	\$34.5 million	NA	<p>A strong storm system brought record flooding along with severe thunderstorms that produced damaging winds and tornadoes to the region. Extremely heavy rain in a short period of time resulted in</p>

Date	Estimated Damage (in 2022 dollars)	Counties Declared Disaster Areas	Description
			<p>significant flash flooding issues across West Mobile, Midtown Mobile, and Downtown Mobile. The southern half of Baldwin County experienced historic flooding. Fourteen hundred homes were affected, and property losses were estimated at \$17 million, with another \$10 million for infrastructure damage. Almost every road south of Highway 104 experienced flooding. Numerous roads were flooded between Highway 104 and just north of Interstate 10. Emergency management officials reported having to rescue dozens of people from homes and vehicles due to the rapid rise of the water.</p>
October 7, 2021	NA		<p>Flash flooding from heavy rain sparked deadly flash flooding in parts of Alabama from October 6 to October 7, killing four people—including a 4-year-old girl—as crews rushed to rescue individuals from cars and homes, officials said.</p> <p>In northern Alabama’s Marshall County, a girl was found dead in the city of Arab, and an 18-year-old woman was found dead in nearby Union Grove. And in central Alabama, a 23-year-old man and a 23-year-old woman died after floodwater swept their vehicle over a guardrail the night of October 6 in the city of Hoover, just south of Birmingham.</p> <p>Floodwater rushed onto roads, parking lots, and yards as inches of rain quickly fell on parts of the state the evening of October 6. Some areas received 6–13 inches over the previous several days, and parts of the Birmingham area received 4–7 inches in just a few hours on October 6 alone, the National Weather Service said. Radar indicated that even more may have fallen in some areas.</p>
February 3, 2022	\$157,438.00	No	<p>A strong storm system brought flooding along the Coley Creek gravity-fed sewer system. Extremely heavy rain in a short period of time resulted in significant flash flooding issues across parts of Tallapoosa County. No homes were flooded, and no rescues were necessary.</p> <p>Alexander City’s infrastructure suffered an estimated loss of \$157,438.00 on the Coley Creek sewer basin. There was major damage to eight different locations where repairs had to be made on the gravity</p>

Date	Estimated Damage (in 2022 dollars)	Counties Declared Disaster Areas	Description
			system. Also, two pumps were destroyed (underwater) at the pumping station. Emergency management officials, both local and state, along with city employees of Alexander City, performed the damage assessments. This was a significant event for Alexander City, with some interruptions of normal services to its citizens.

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Flooding varies in intensity (depth) in Alabama. Based on historical records for the past 20 years, the observed flooding events in Alabama ranged in magnitude from flood depths of over 40 feet in some cases exceeding the flood stage on several major rivers in the State. Several examples are provided below:

- Clarke County on 2/22/2020 reported at Coffeerville Lock and Dam, the river crested at 46.85 feet on February 22nd, which is right near the major flood level of 47 feet.
- Russell County on 5/8/2003 reported heavy rains forced the Chattahoochee River to flood sections of the county. The river gauge at Columbus, GA showed the river in flood from the 8th through the 10th with a crest of 40.0 feet, the flood stage is 34 feet.

Describing intensity measures for flooding presents a limitation because flood depth is not recorded in the NWS database. It is anticipated that going forward flood depth will be recorded, per declared disaster, in a JFO database. If this anticipated database is developed, the State will have access to the data, and it will be reported in the next SHMP update.

3.2.5.4 Probability of Floods in Alabama

Based on historical records, over the past 20 years flooding in the State has resulted from torrential rains of 3 to 24 inches. Additionally, several tropical storms and hurricanes have also produced significant rainfall and storm surge that has resulted in flooding. The probability of a flooding event impacting the State of Alabama in any given year is Highly Likely. The regulatory flood hazard maps developed by FEMA represent the best guides available for predicting flooding in Alabama. Figure 3.24 shows the extent of the 1% annual chance floodplain in Alabama. In any given year, the shaded locations have at least a 1% chance of experiencing inundation from riverine or coastal flooding. Over time, however, the chance of flooding in a given location increases. For example, a location with a 1% chance of flooding over one year has a 26% chance of flooding over 30 years, the typical term of a home mortgage.

Figure 3.24: Areas with a 1% or Greater Annual Chance of Flooding (FEMA)



3.2.5.4.1 Future Probability

The probability, location, intensity and impacts of hazards will change over time. Climate change, including changes in temperature, intensity, hazard distribution or frequency of weather events, may increase vulnerability to these hazards in the future. Based on historical knowledge and current conditions, it can be expected that all hazards will see a rise in scope, scale, and frequency of events on a yearly basis.

The future probability of riverine flooding in Alabama is likely to change with changes in weather patterns and land cover. Both historical trends and future projections suggest that the frequency of heavy rains in the Southeast will rise through the twenty-first century. According to the Southeast Regional Report for the National Climate Assessment, the entire Southeast has seen increases in the frequency of extreme precipitation events since 1900, with particularly pronounced increases in the lower Mississippi River Valley and along the northern Gulf Coast.⁹¹ Model simulations of future precipitation also show significant increases in the frequency of extreme rainfall in the Southeast, as well as increases in annual rainfall. The increase in extreme precipitation is expected to be particularly pronounced along the southern Appalachians and in parts of Tennessee and Kentucky. As these changes in weather patterns intersect with changes in land cover related to development, Alabama can expect its risk of riverine flooding to rise.

The future probability of coastal flooding in Alabama will reflect changes in the probability of tropical cyclones and hurricanes, as well as changes in sea level with climate change. According to the National Climate Assessment, hurricane hazards are generally expected to increase through the twenty-first century. The measures of hurricane activity include intensity, frequency, and duration. Since high-quality satellite data first became available in the early 1980s, scientists have observed a substantial increase in all of these measures of hurricane activity for North Atlantic hurricanes, as well as an increase in the frequency of the strongest (Categories 4 and 5) hurricanes.⁹² Although simulations of future hurricane activity span a range of possible outcomes, on average, the models project an increase in the annual number of Category 4 and 5 hurricanes by the late twenty-first century, as well as a slight decrease in the number of tropical cyclones.⁹³ Changes in the storm tracks of North Atlantic hurricanes are less well understood.⁹⁴

Sea level rise will also have profound impacts on the future probability of coastal flooding. Coastal areas are seeing higher and higher sea levels as global changes interact with local factors. Across the globe, sea levels have remained relatively stable over the past few thousand years, climbing less than a few tenths of a millimeter per year.⁹⁵ Since the mid-to-late nineteenth century, however, sea level rise has accelerated dramatically. Sea levels rose by an average of 1.7 to 1.8 mm/year over the twentieth century but rose by an average of 2.8 mm/year between 1993 and 2017. On the global scale, climate change is driving the rising seas. Warming oceans are causing ocean waters to expand, and the melting of land-based ice (glaciers and ice sheets) is causing ocean volumes to rise. On the local scale, a range of local factors can hasten or slow the rate of sea level rise seen by communities. These factors, described in greater depth in Section 3.2.10,

⁹¹ Ingram, K., K. Down, L. Carter, J. Anderson, eds., 2013. *Climate of the Southeast US: Variability, Change, Impacts, and Vulnerability*. Washington, DC: Island Press.

⁹² Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds., 2014: Climate Change Impacts in the US: The Third National Climate Assessment. US Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2.

⁹³ Ibid.

⁹⁴ Woolings, T., Gregory, J. M., Pinto, J. G., Meyers, M., and Brayshaw, D. J. (2012). Response of the North Atlantic Storm Track to Climate Change Shaped by Ocean–Atmosphere Coupling. *Nature Geoscience*, volume 5, pp. 313–317.

⁹⁵ National Aeronautics and Space Administration, Goddard Institute for Space Studies, 2007. Science Briefs: Sea Level Rise, After the Ice Melted and Today.

include land subsidence, changes in regional ocean currents, and tectonic movements. These global and local processes are certain to continue, driving sea level rise throughout the world. Future sea level rise is a certainty; however, the rate at which it will unfold is unknown. The best guide to future planning is therefore the range of local sea level rise scenarios developed by expert working groups. In the United States, a federal task force convened by the U.S. Global Change Research Program and the National Ocean Council has produced a comprehensive set of sea level rise scenarios for coastal communities across the country.⁹⁶ The scenarios developed for coastal Alabama are discussed further in Section 3.2.10.

Regardless of the timing, sea level rise along the Alabama coast will lead to more frequent floods that cause more damage. As discussed above, coastal flooding comes in many forms, from the shallow coastal flooding associated with extreme tides that mostly causes inconvenience to the storm surges driven by hurricanes that can wreak havoc on coastal communities. Sea level rise will mean more frequent and damaging events for all forms of coastal flooding, from nuisance high tides to life-threatening storm surges.

Even on sunny days or during small storms, rising sea levels mean that extreme high tides can cause nuisance flooding more frequently and over a greater area. Nuisance flooding can be disruptive and expensive to the local economy, particularly in tourism-dependent areas such as the coastal areas of Mobile and Baldwin Counties. Across the United States, NOAA estimates that nuisance flooding now occurs three to nine times more frequently than it did 50 years ago.⁹⁷

Rising sea levels will also mean that deadly and destructive storm surges will push farther inland than they once did. This will place more people, property, and valuable infrastructure at risk, including essential facilities such as wastewater treatment plants. As storm surges push farther inland, they can also accelerate the erosion of beaches, dunes, and coastal wetlands. These features serve as natural flood defenses by reducing the height and energy of large waves. The erosion of these natural defenses leaves coastal communities even more vulnerable to the next storm surge event.

FEMA's State Plan Policy Guide requires states to consider changes to climate conditions that may affect their vulnerability to natural hazards. A review of the literature suggests that flooding hazards in Alabama are likely to increase. Alabama State Climatologist John R. Christy weighs in on extreme precipitation and flooding:

Present infrastructure that is intended to cope with flooding rains is usually not able to withstand the most extreme events that we know have occurred in the past. The tradeoffs between costs and effectiveness to deal with such events is the bane of local, state, and federal governments. The lesson from this report is that the worst flooding events [and driest droughts—see below] of the past are certain to occur again and may be even more extreme no matter what influence extra GHGs might exert. Examining the longest-term datasets will provide the

⁹⁶ Sweet, W. V., Kopp, R. E., Weaver, C. P., Obeysekera, J., Horton, R. M., Thieler, E. R., & Zervas, C. (2017). Global and Regional Sea Level Rise Scenarios for the US. NOAA Technical Report NOS CO-OPS 083. NOAA/NOS Center for Operational Oceanographic Products and Services.

⁹⁷ NOAA, National Ocean Service, 2018. What Is High Tide Flooding?
<https://oceanservice.noaa.gov/facts/nuisance-flooding.html>Change

*best range of potential events that can occur in the next 25 to 50 years for which adaptation should be considered.*⁹⁸

3.2.5.4.1.1 Probability of Flooding in Alabama

The probability of a Flooding event impacting the State of Alabama in any given year is Highly Likely. According to the NCEI Storm Events Database, since the 2018 plan update, Alabama has had over 500 flash floods with 7 deaths, 4 injuries, and \$10,430,000 in damages. This averages approximately 100 flash floods, 1.4 deaths, 0.8 injuries, and \$2,086,000 in damages annually. It is important to note that this is approximate, as some years may not have flash floods and some years may have two or more. However, it is an average and represents a strong assumption that Alabama will have flash floods in any given year.

Since the 2018 plan update, Alabama has had 189 floods, with no deaths and one injury, and an estimated \$255,000 in property damages. This averages out to 37.8 floods, 0.2 injuries, and \$51,000 in damages per year. It is important to note that this is approximate, as some years may not have floods and some years may have two or more. However, it is an average and represents a strong assumption that Alabama will have floods in any given year.

Since the last plan update, Alabama has had 32 storm surge events, with one death, no injuries, and an estimated \$19,528,000 in property damages. This averages out to 6.4 storm surge events with 0.2 deaths or injuries and \$3,905,600 million in property damages. It is important to note that this is approximate, as some years may not have a storm surge and some years may have two or more. However, it is an average and represents a strong assumption that Alabama will have a storm surge in any given year.

Since the last plan update, Alabama has had 15 coastal flooding events, with no deaths, injuries, or reported property damage. This averages out to 5 coastal flooding events with no deaths or injuries or property damage. It is important to note that this is approximate, as some years may not have floods and some years may have two or more. However, it is an average and represents a strong assumption that Alabama will have coastal flooding in any given year.

3.2.5.4.1.2 National Flood Insurance Program and Repetitive Loss Properties

As of June 2022, 434 communities in Alabama were participating in the NFIP; 61 communities with identified flood hazard areas were not. Furthermore, there are 44,710 NFIP policies in the State of Alabama, with flood insurance coverage totaling over \$11.536 million. According to the Alabama NFIP Insurance Status Report and the NFIP Policy and Claims Report, there have been 45,317 NFIP claims in Alabama since the beginning of the program in 1978, with the total paid equal to over \$1.194 billion. With an 86% participation rate, it is clear that the NFIP is extremely important to the State of Alabama. Furthermore, Alabama residents pay \$28.2 million in insurance premiums each year to the NFIP, proving that Alabama is also important to the NFIP.

⁹⁸ Office of the Alabama Climatologist, The Alabama Climate Report - University of Alabama. <https://www.nsstc.uah.edu/alclimatereport/>

Table 3.38: Alabama NFIP Participation⁹⁹

Description	Totals
Number of communities participating in NFIP	433
Number of non-participating communities	61
Number of communities suspended	1

Table 3.39: Alabama NFIP Policies¹⁰⁰

Description	Totals
Number of NFIP policies in Alabama	44,710
Total coverage	\$11,536,337,200
Total number of claims since 1978	45,317
Total amount of claims paid since 1978	\$1,194,929,808

One of the consequences of flooding is repetitive loss (RL). An RL property is one for which two or more losses of at least \$1,000 each have been paid by the NFIP over a rolling 10-year period. RL properties are the focus of strong mitigation programs. Mitigating RL and severe repetitive loss (SRL) properties is strategic because targeting them to mitigate will prevent flooding and losses in likely properties and give a high return on investment. An SRL property is one (1) that has incurred flood-related damage for which four or more separate claims payments have been made, with the amount of each claim (including Building and Content payments) exceeding \$5,000, with the cumulative amount of such claims exceeding \$20,000; or (2) for which two separate claims payments (building payments only) have been made under such coverage with the cumulative amount of such claims exceeding the market value of the building. In both instances, at least two of claims must be within 10 years of each other, and claims made within 10 days of each other will be counted as one claim.

There are 5,738 RL properties in Alabama with 17.313 million in total losses accounting for \$669.5 million in claims for damage to buildings and contents. Of those, 997 were SRL properties with 4,898 total losses and \$253.4 million in total claims.¹⁰¹ Table 3.40 shows the top 16 counties with RL properties.

⁹⁹ FEMA. Community Status Book Report: Communities Participating in the National Flood Program. <https://www.fema.gov/cis/AL.html>

¹⁰⁰ NFIP Policy Information by State.

https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fnfip-services.floodsmart.gov%2Fsite%2Fdefault%2Ffiles%2Fnfip_policy-information-by-state-20220930.xlsx&wdOrigin=BROWSELINK

¹⁰¹ FEMA's NFIP PIVOT system (version 2.73.01161, dated 12/6/2022). Total includes mitigated and unmitigated structures that are insured and uninsured. Data acquired 3/22/2023.

Table 3.40: Repetitive Loss Properties¹⁰²

County	Totals Properties	Total Losses
Baldwin County	2642	7892
Mobile County	2114	6526
Jefferson County	330	964
Shelby County	123	499
Coffee County	57	141
Escambia County	44	136
Montgomery County	24	66
Greene County	22	56
Geneva	22	52
Lauderdale County	21	65
Morgan County	20	61
Tuscaloosa	20	52
Pickens County	19	64
Colbert County	15	59
Dale	15	36

3.2.5.4.1.3 Community Rating System

Furthermore, the NFIP's Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result of the CRS, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from community actions meeting the three goals of the CRS:

- Reduce flood losses
- Facilitate an accurate insurance rating
- Promote awareness of flood insurance

As of October 1, 2022, there were 14 communities enrolled in the CRS program.¹⁰³

3.2.5.4.2 Risk and Vulnerability

A detailed assessment of Alabama's vulnerability to flooding is provided in Section 3.3.

¹⁰² Ibid.

¹⁰³ FEMA. Community Status Book Report: Communities Participating in the National Flood Program. <https://www.fema.gov/cis/AL.html>

Lifeline- Flooding- All

All lifelines are assigned to flooding due to the high impact of loss of life and property during these incidents. Law Enforcement Officers, Emergency Medical Services, and rescue attempts may be delayed or impossible due to road flooding and blockage from debris. Due to these same problems, businesses and stores will be closed, causing food insecurities and access to daily necessities. Because of power outages, communications may be impossible, with some people unable to call for help. Hazardous materials may leak into the water and the ground, causing current and future problems to people, crops, and livestock.

3.2.5.5 Consequence Analysis

Public health concerns that may result from flooding include the need for disease and injury surveillance, community sanitation, evaluation of flood-affected food supplies, private water, and sewage sanitation, vector control (for mosquitoes and other pests that thrive in water or moist areas), and mold.

The information in Table 3.41 provides the consequence analysis of the potential for detrimental impacts of flooding done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.41: EMAP Consequence Analysis: Flooding

Subject	Ranking	Impacts/Flooding
Health and Safety of Persons in the Area of the Incident	Severe	Depending on the level of floodwaters, the impact of the immediate area could be severe. Individuals farther away from the incident area are at a lower risk of being affected. Casualties are dependent on warning time.
Responders	Minimal	Impact on responders is expected to be minimal unless they live within the affected area.
Continuity of Operations	Minimal to severe	Temporary relocation may be necessary if inundation affects government facilities.
Property, Facilities, and Infrastructure	Severe	The localized impact could be severe for facilities and infrastructure in the inundation area of the incident. The farther away from the incident area, the more likely the damage will lessen, from moderate to minimal.
Delivery of Services	Minimal to severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to the floodwaters.
Environment	Severe	The immediate area will be severely impacted. The impact will lessen as distance increases from the immediate incident area.

Subject	Ranking	Impacts/Flooding
Economic Conditions	Minimal to severe	Impacts on the economy will greatly depend on the area flooded, the water depth, and the amount of time it takes for the water to recede.
Public Confidence in Jurisdiction's Governance	Minimal to severe	The public's confidence will vary, depending on the perception of whether the flood could have been prevented, the warning time, and the time it takes for response and recovery.

3.2.6 Hail

3.2.6.1 Description

Hail is defined by the NWS as “frozen precipitation in the form of balls or irregular lumps of ice.”¹⁰⁴ This type of precipitation is produced by severe thunderstorms characterized by very cold upper-level air and strong updrafts. The cold upper-level air causes water droplets to freeze, and the strong updrafts keep the frozen droplets suspended while layers of ice are added. When the lumps of ice become too large to be suspended by updrafts, they fall to the ground as hail. Hailstorms occur most frequently in the late spring and early summer when the jet stream moves northward across the Great Plains. This creates steep temperature gradients from the surface to the upper air masses, producing the strong updrafts required for hail formation. While thunderstorms are most common along the Gulf Coast, thunderstorms that produce hail are more common in the Great Plains, where the temperature contrasts associated with the jet stream are greatest.

Hailstone size is related to the intensity of the thunderstorms that produce them, and to the temperature at the surface. The higher the temperature at the Earth's surface, the greater the strength of the updrafts within a thunderstorm, and the larger the hailstones that form. Most hailstones are less than two inches in diameter, but sometimes hailstones as large as softballs (4.5 inches in diameter) are observed.

Table 3.42: TORRO Hail Intensity Scale

Intensity	Typical Hail Diameter (mm)	Intensity Category	Probable Damage
H0	5	Hard Hail	No damage

¹⁰⁴ National Oceanic & Atmospheric Administration, National Weather Service, 2015. Storm Data Preparation. National Weather Service Instruction 10-1605. <http://www.nws.noaa.gov/directives/sym/pd01016005curr.pdf>

Intensity	Typical Hail Diameter (mm)	Intensity Category	Probable Damage
H1	*5–15	Potentially Damaging	Slight general damage to plants, crops
H2	*10–20	Significant	Significant damage to fruit, crops, vegetation
H3	20–30	Severe	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	25–40	Severe	Widespread glass damage, vehicle bodywork damage
H5	30–50	Destructive	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	40–60	Destructive	Bodywork of grounded aircraft dented; brick walls pitted
H7	50–75	Destructive	Severe roof damage, risk of serious injuries
H8	60–90	Destructive	Severe damage to aircraft bodywork
H9	75–100	Super Hailstorms	Extensive structural damage: risk of severe or even fatal injuries to persons caught in the open
H10	Greater than 100	Super Hailstorms	Extensive structural damage: risk of severe or even fatal injuries to persons caught in the open

3.2.6.2 Nature of the Hazard in Alabama

Hailstorms in Alabama are not as common as hailstorms in the Great Plains, but severe hailstorms are reported every year. More hailstorms are reported in the northern part of the state, where severe thunderstorms are more common. The frequency of hailstorms in Alabama is greatest in the spring, with the most episodes of severe hail generally reported in April.

3.2.6.3 Hail History in Alabama

Hailstorms in Alabama are moderately loss-producing atmospheric hazards. Based on historical records for the past 20 years, the observed hail events in Alabama ranged in magnitude from 0.75 to 5.38 inches with observed diameters of penny-sized hail to baseball/tennis ball-sized hail. According to NOAA's Storm Events Database, hailstorms in Alabama caused more than \$31.2 million in direct economic losses (adjusted to 2017 dollars) between 1955 and 2017. About \$29.5 million of the reported losses were from property damage, and \$1.7 million were from crop damage. Since the Storm Events Database began collecting data on hailstorms in 1955, local field offices have reported 3,765 hail episodes or about 60 episodes per year. Five of the reported hail episodes produced property damage exceeding \$1 million (adjusted to 2017 dollars), and two produced crop damages exceeding \$75,000 (adjusted to 2017 dollars). Since the last plan was

completed there have been multiple hail events in the State of Alabama, however, there have been no reported property or crop damage and no deaths or injuries associated with the events.

In Table 3.43 the hail events that have occurred in the State of Alabama have been condensed to show a small part of how many times hail has occurred in the state over the past few years.

Table 3.43: Hail Events in the State of Alabama, 2017–2022

Location	Start Date	Deaths	Injuries	Property Damage	Crop Damage
AUTAUGA CO.	4/9/2021	0	0	0	0
BALDWIN CO.	4/15/2021	0	0	0	0
BARBOUR CO.	4/5/2017	0	0	0	0
BLOUNT CO.	4/24/2021	0	0	0	0
BLOUNT CO.	4/6/2022	0	0	0	0
BUTLER CO.	3/30/2017	0	0	0	0
CALHOUN CO.	4/24/2021	0	0	0	0
CHOCTAW CO.	4/5/2022	0	0	0	0
COFFEE CO.	4/24/2021	0	0	0	0
ETOWAH CO.	3/27/2017	0	0	0	0
LEE CO.	4/5/2017	0	0	0	0
MADISON CO.	2/22/2022	0	0	0	0
SHELBY CO.	5/22/2020	0	0	0	0
WINSTON CO.	3/14/2019	0	0	0	0

While the range of hail events is too numerous to list for the state, listed below is the range of the most intense events from 2018 – 2023, which reached 3.00 inches or more in diameter.

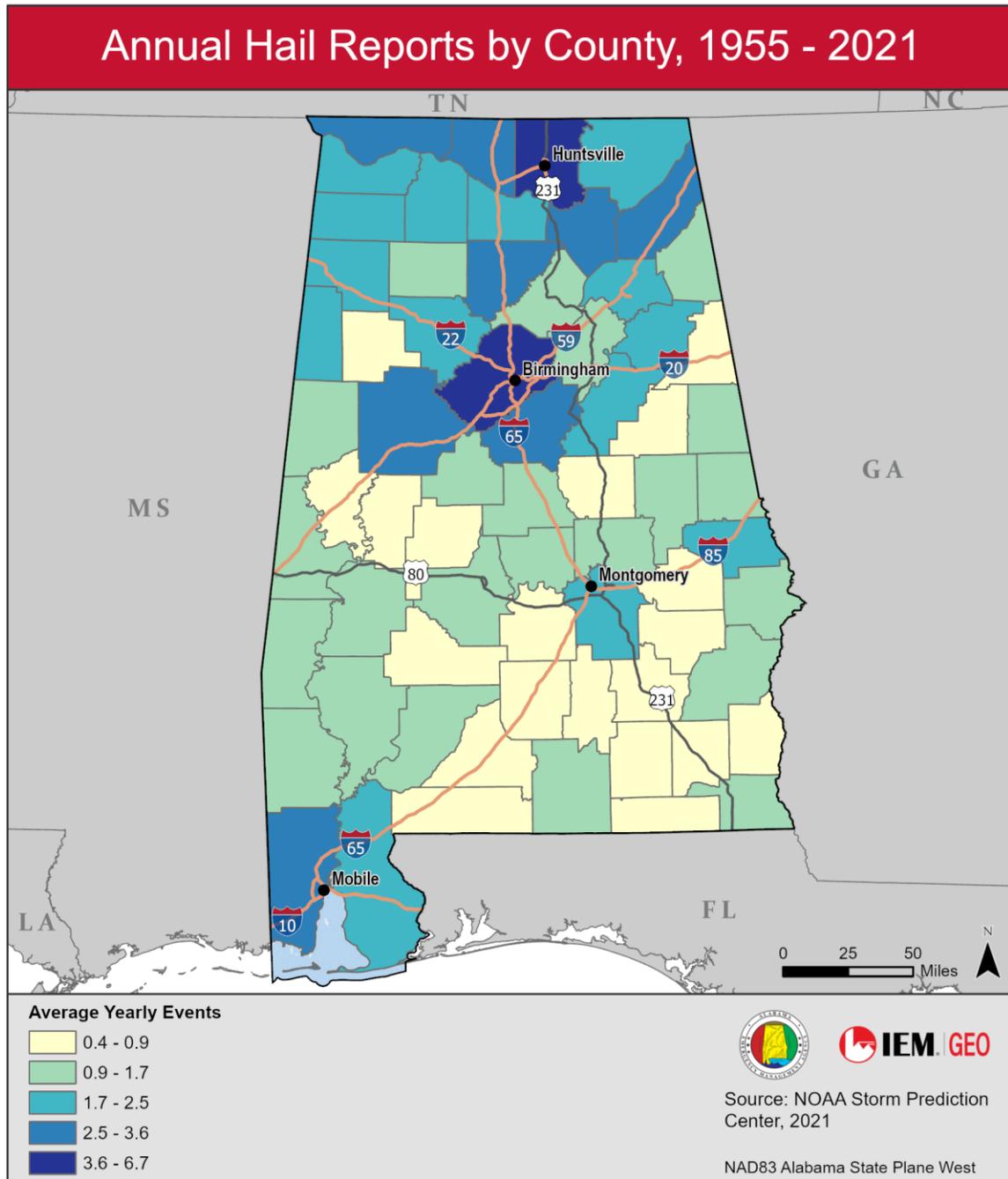
- Orange Beach-Baldwin County: On 4/10/2021, hail measured 4.00 inches in diameter.
- Hightogy-Lamar County: On 3/29/2020, hail measured 3.00 inches in diameter.
- Battleground-Cullman County: On 3/19/2018, hail measured 4.00 inches in diameter.
- Walter-Cullman County: On 3/19/2018, hail measured 5.38 inches in diameter.
- Liberty-Blount County: On 3/19/2018, hail measured 3.00 inches in diameter.
- Hollis Crossroads-Cleburne County: On 7/21/2018, hail measured 3.00 inches in diameter.

There were no fatalities or injuries reported for these events.

3.2.6.4 Probability of Hailstorms in Alabama

The probability of a hail event impacting the State of Alabama in any given year is Highly Likely. Reported hailstorms have historically affected northern counties more frequently than southern counties. It is important to note, however, that the distribution of reported hail events reflects both where hail events occurred and where people were located to observe and report these events. In other words, there is reporting bias in the Storm Events Database. This reporting bias probably contributes to the high frequency of observed hail events in Jefferson and Madison Counties.

Figure 3.25: Annual Hail Reports by County, 1955–2021



3.2.6.4.1 Future Probability

The probability of hail events is directly tied to the probability of severe thunderstorms. According to the Southeast Regional Report prepared for the Third U.S. National Climate Assessment, the

effect of climate change on the future probability of severe thunderstorms is unclear.¹⁰⁵ Although scientists have seen a significant increase in the number of severe thunderstorm reports since 1950, this appears to be related to better detection and reporting systems. Future projections generated by climate simulations are also unclear. One of the building blocks for severe thunderstorms is the atmospheric instability that results when warm, moist air near the Earth's surface rises and interacts with cooler and drier air higher in the atmosphere. While the frequency of unstable conditions is expected to increase throughout the twenty-first century, global climate models predict significant variability from one year to the next.

3.2.6.4.2 Risk and Vulnerability

The probability, location, intensity and impacts of hazards will change over time. Climate change, including changes in temperature, intensity, hazard distribution or frequency of weather events, may increase vulnerability to these hazards in the future. Based on historical knowledge and current conditions, it can be expected that all hazards will see a rise in scope, scale, and frequency of events on a yearly basis.

A community's vulnerability to loss from hailstorms is a function of the probability of severe hailstorms, the exposure of property and crops to hailstorms, and the susceptibility of property and crops to hail impact. In Alabama, high hail frequency and high property exposure intersect in the northern metropolitan areas of Huntsville and Birmingham. Based on the record of past damages, cars exposed to the elements (such as those on dealership lots) tend to be particularly susceptible to hail damage. Car dealerships tend to be located in areas with higher population densities. Based on these factors, the counties in northern Alabama are most vulnerable to property damage from hail. Many of the state's northern counties are also among the leading agricultural counties in terms of acres of cropland. The counties of Lauderdale, Limestone, Madison, Jackson, DeKalb, Cherokee, Lawrence, Morgan, and Cullman all had more than 65,000 acres of cropland in 2007.¹⁰⁶ These counties are therefore more vulnerable to crop damage from hail.

Table 3.44: Hail Events and Damages by County 2017-2022

Hazard Type	Jurisdiction	No. of Events	Total Property Damage	Total Crop Damage	Deaths	Injuries
Hail	Autauga Co.	3	0	0	0	0
	Baldwin Co.	15	0	0	0	0
	Barbour Co.	4	0	0	0	0
	Bibb Co.	3	0	0	0	0
	Blount Co.	13	0	0	0	0

¹⁰⁵ Ingram, K., K. Dow, L. Carter, J. Anderson, eds. 2013. *Climate of the Southeast US: Variability, Change, Impacts, and Vulnerability*. Washington, DC: Island Press.

¹⁰⁶ The University of Alabama, Department of Geography. Alabama Maps: Agriculture.

Hazard Type	Jurisdiction	No. of Events	Total Property Damage	Total Crop Damage	Deaths	Injuries
	Butler Co.	2	0	0	0	0
	Calhoun Co.	18	0	0	0	0
	Chambers Co.	5	0	0	0	0
	Cherokee Co.	12	0	0	0	0
	Chilton Co.	7	0	0	0	0
	Choctaw Co.	4	0	0	0	0
	Clarke Co.	16	0	0	0	0
	Clay Co.	3	0	0	0	0
	Cleburne Co.	10	0	0	0	0
	Coffee Co.	6	0	0	0	0
	Colbert Co.	15	0	0	0	0
	Conecuh Co.	4	0	0	0	0
	Coosa Co.	3	0	0	0	0
	Covington Co.	9	0	0	0	0
	Crenshaw Co.	4	0	0	0	0
	Cullman Co.	20	0	0	0	0
	Dale Co.	10	0	0	0	0
	Dallas Co.	3	0	0	0	0
	Dekalb Co.	14	0	0	0	0
	Elmore Co.	13	0	0	0	0
	Escambia Co.	1	0	0	0	0
	Etowah Co.	21	0	0	0	0
	Fayette Co.	5	0	0	0	0
	Franklin Co.	13	0	0	0	0
	Geneva Co.	5	0	0	0	0
	Greene Co.	1	0	0	0	0
	Hale Co.	7	0	0	0	0
	Henry Co.	1	0	0	0	0
	Houston Co.	3	0	0	0	0
	Jackson Co.	10	0	0	0	0
	Jefferson Co.	27	0	0	0	0
	Lamar Co.	6	0	0	0	0
	Lauderdale Co.	11	0	0	0	0
	Lawrence Co.	7	0	0	0	0
	Lee Co.	18	0	0	0	0

Hazard Type	Jurisdiction	No. of Events	Total Property Damage	Total Crop Damage	Deaths	Injuries
	Limestone Co.	17	0	0	0	0
	Lowndes Co.	2	0	0	0	0
	Macon Co.	3	0	0	0	0
	Madison Co.	40	0	0	0	0
	Marengo Co.	6	0	0	0	0
	Marion Co.	14	0	0	0	0
	Marshall Co.	24	0	0	0	0
	Mobile Co.	8	0	0	0	0
	Monroe Co.	15	0	0	0	0
	Montgomery Co.	4	0	0	0	0
	Morgan Co.	15	0	0	0	0
	Perry Co.	2	0	0	0	0
	Pickens Co.	5	0	0	0	0
	Pike Co.	1	0	0	0	0
	Randolph Co.	8	0	0	0	0
	Russell Co.	8	0	0	0	0
	Shelby Co.	9	0	0	0	0
	St. Clair Co.	11	0	0	0	0
	Sumter Co.	7	0	0	0	0
	Talladega Co.	16	0	0	0	0
	Tallapoosa Co.	2	0	0	0	0
	Tuscaloosa Co.	12	0	0	0	0
	Walker Co.	19	0	0	0	0
	Washington Co.	2	0	0	0	0
	Wilcox Co.	4	0	0	0	0
	Winston Co.	8	0	0	0	0

The following is a hail synopsis for the State of Alabama during 2020–2022:

- **November 2020:** An isolated storm produced marginally severe hail and wind in the Enterprise area. The public reported nickel-to-quarter-sized hail near Enterprise via social media.
- **April 2021:** An airmass characterized by deep shear, steep mid-level lapse rates, and above-normal daytime temperatures combined to produce favorable conditions for large hail.
- **March 2022:** A short wave passed through Alabama, interacting with a warm front moving northward across north-central Alabama. There was sufficient instability to produce marginally severe hail. Penny-sized hail was reported in Locust Fork.

Lifeline- Hail- All

Hail can pose a serious threat to various aspects of life. It has the potential to cause extensive damage to transportation methods, including airplanes, which could result in emergency landings due to engine damage and fires. Even passenger vehicles can be affected by hail, causing visibility issues, and increasing the risk of accidents. Furthermore, windshields may be damaged, leading to the entry of glass and debris into the vehicle, putting humans at risk of injury. Also, hail can negatively affect crops and roaming livestock in agricultural areas.

3.2.6.5 Consequence Analysis

The information in Table 3.45 provides the consequence analysis of the potential for detrimental impacts of hail done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.45: EMAP Consequence Analysis: Hail

Subject	Ranking	Impacts/Hail
Health and Safety of Persons in the Area of the Incident	Severe	The impact on the immediate area could be severe for affected areas and moderate to light for other, less affected areas, depending on whether individuals are caught outside during the event.
Responders	Minimal	The impact on responders is expected to be nonexistent or minimal.
Continuity of Operations	Minimal to moderate	Temporary relocation may be necessary if government facilities experience damage.
Property, Facilities, and Infrastructure	Severe	The localized impact could be severe for facilities and infrastructure in the incident area. Utility lines, roads, and residential and business properties will be the most affected.
Delivery of Services	Minimal to severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damage sustained.
Environment	Severe	The impact could be severe for the immediately impacted area, depending on the size of the event. The impact will lessen as distance increases from the immediate incident area.
Economic Conditions	Minimal to severe	The local economy and finances may be adversely affected, depending on the damage sustained.
Public Confidence in Jurisdiction's Governance	Minimal to moderate	Response and recovery will be in question if they are not timely and effective. Warning systems in place and the timeliness of those warnings could be questioned.

3.2.7 High Winds

3.2.7.1 Description

Wind is one of the leading causes of power outages and damages, partly due to heavy storms blowing down electrical lines, which disrupts service from homes, businesses, and schools alike. Annual economic losses from cyclones alone cost Alabama \$20 billion to \$50 billion from 1980 through 2022,¹⁰⁷ and the United States as a whole saw total costs of nearly \$1.2 trillion for the same years, with 6,708 deaths. Tornadoes in the United States caused an average \$2.5 billion in damages and 70 deaths.¹⁰⁸ High winds are typically associated with three weather phenomena: tornadoes, thunderstorms, and tropical cyclones, often overlapping. Flooding and storm surges associated with these hazards are discussed in Section 3.2.5.

According to the National Weather Service (NWS), “A tornado is a violently rotating column of air extending from the base of a thunderstorm down to the ground.”¹⁰⁹ A tornado can exceed 250 miles per hour, with damage paths more than one mile wide and 50 miles long, making it the most violent of all atmospheric storms. Reports of tornadoes 2.6 miles wide have been reported in El Reno, Oklahoma, in 2013; some have paths longer than 50 miles, such as the 1925 Tri-State (Missouri, Illinois, and Indiana) Tornado that was on the ground continuously for 219 miles,¹¹⁰ killing 695 people and injuring approximately 1,300 others.¹¹¹

The magnitude of a tornado is measured in terms of its maximum wind speed, which is estimated based on observed damage. The two most widely used scales for tornado magnitude are the Fujita Tornado Scale (or F Scale, developed in 1971 by Theodore Fujita of the University of Chicago), shown in Table 3.46,¹¹² and the Enhanced Fujita Tornado Scale (or EF Scale, implemented by the NWS in 2007), shown in Table 3.47.¹¹³ Both scales use observed damage to estimate wind speeds, but the EF Scale takes more variables into account than the F Scale and estimates lower speeds, to include damages that could be incurred. Figure 3.26 shows how the EF Scale in use today compares to the F Scale used before 2007.¹¹⁴ The historical databases maintained by the NWS continue to report F Scale ratings for historical events.

¹⁰⁷ Billion-Dollar Weather and Climate Disasters: Summary Stats. NOAA NCEI.

¹⁰⁸ Economic Damage Caused by Tornadoes in the United States from 1995 to 2021. Statista. <https://www.statista.com/statistics/237409/economic-damage-caused-by-tornadoes-in-us/>

¹⁰⁹ NOAA. <https://www.nssl.noaa.gov/education/svrwx101/tornadoes/>

¹¹⁰ The Tri-State Tornado of 1925. <https://www.ustornadoes.com/2014/03/18/the-tri-state-tornado-of-1925/>

¹¹¹ The Tri-State Tornado. History. <https://www.history.com/this-day-in-history/the-tri-state-tornado>

¹¹² The Enhanced Fujita Scale (EF Scale). National Weather Service. <https://www.weather.gov/oun/efscale>

¹¹³ Explanation of EF-Scale Ratings. National Weather Service. https://www.weather.gov/hun/efscale_explanation; The Fujita Scale, Explained. UChicago News. <https://news.uchicago.edu/explainer/fujita-scale-explained>

¹¹⁴ Original F Scale. [Pin on Aunt Heather Piper \(pinterest.com\)](https://www.pinterest.com/pin/1000000000000000000/)

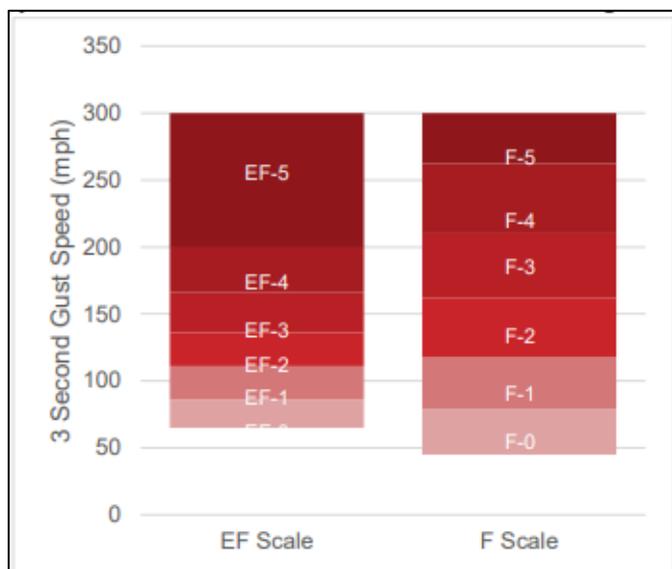
Table 3.46: Fujita Tornado Scale (F Scale)¹¹⁵

F Scale	Character	Estimated winds	Description
Zero (F0)	Weak	40-72 mph	Light Damage. Some damage to chimneys; branches broken off trees, shallow-rooted trees uprooted, sign boards damaged.
One (F1)	Weak	73-112 mph	Moderate damage. Roof surfaces peeled off; mobile homes pushed foundations or overturned; moving autos pushed off road.
Two (F2)	Strong	113-157 mph	Considerable damage. Roofs torn from frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light objects become projectiles.
Three (F3)	Strong	158-206 mph	Severe damage. Roofs and some walls torn from well- constructed houses; trains overturned; most trees in forested area uprooted; heavy cars lifted and thrown.
Four (F4)	Violent	207-260 mph	Devastating damage. Well- constructed houses leveled; structures with weak foundation blown some distance; cars thrown; large missiles generated.
Five (F5)	Violent	260-318 mph	Incredible damage. Strong frame houses lifted off foundations, carried considerable distances, and disintegrated; auto-sized missiles airborne for several hundred feet or more; trees debarked.

Table 3.47: Enhanced Fujita Scale (EF Scale) for Tornado Magnitude¹¹⁶

ENHANCED FUJITA SCALE		DAMAGE
EF-0	(65-85 MPH)	LIGHT
EF-1	(86-110 MPH)	MODERATE
EF-2	(111-135 MPH)	CONSIDERABLE
EF-3	(136-165 MPH)	SEVERE
EF-4	(166-200 MPH)	DEVASTATING
EF-5	(200+ MPH)	INCREDIBLE

Figure 3.26: Comparison of EF Scale and F Scale for Tornado Magnitude (NOAA, 2016)



¹¹⁵ NWS. [The Enhanced Fujita Scale \(EF Scale\) \(weather.gov\)](https://www.weather.gov)

¹¹⁶ Tornado Central. [The Enhanced Fujita Scale: How Tornadoes are Rated | The Weather Channel](https://www.weatherchannel.com)

Thunderstorms are local storms, usually of short duration, accompanied by lightning and thunder. The average thunderstorm in the US is about 15 miles in diameter and lasts less than 30 minutes in any location.¹¹⁷ The United States National Weather Service has defined a severe thunderstorm as any storm that produces tornado winds greater than 58 miles per hour or hail with a diameter of at least 1 inch. There are three types of thunderstorms (derecho was added as an associated type of thunderstorm pertaining to wind):¹¹⁸

- **Isolated thunderstorms:** These are local thunderstorms that are relatively short-lived and usually do not produce intense weather on the ground. Typically, they are made up of one or more convective cells, each of which goes through a well-defined life cycle. These storms tend to occur in the late afternoon and early evening when surface temperatures are at their highest due to solar heating.
- **Multiple-cell thunderstorms and mesoscale convective systems:** Mesoscale systems are generally associated with violent weather at the ground, made up of organized multiple-cell or squall lines. These storm systems tend to have a horizontal extent or pattern and can cause thunderstorms to develop hundreds of miles in diameter over a region. They occur in clusters of cells in various stages of development and move together as a group. These severe thunderstorms commonly occur in the spring when cool winds move over warm and moist surface air flowing north from the Gulf of Mexico. These can last for hours or days.
- **Supercell storms:** When winds are favorable, the updraft and downdraft of a storm become organized and twist around, reinforcing each other. This results in a long-lived supercell storm. They are the most intense of all thunderstorms, with updraft speeds that can exceed 130 feet per second. They can suspend hailstones as large as a grapefruit and are the most likely storm to produce intense wind and hail damage, as well as powerful tornadoes.
- **Derecho:** By definition, a derecho is a widespread, long-lived windstorm that is associated with a band of rapidly moving showers or thunderstorms. The damage is generally directed in one direction along a relatively straight swath. Straight-line wind damage is sometimes used to describe the damage done by a derecho. If the wind damage swath extends more than 240 miles and includes wind gusts of at least 58 mph or greater along most of its length, the event may be classified as a derecho. A derecho swept through the entire State of Alabama from north to south on June 28, 2018, resulting in more than 156,000 customers without power, one fatality in Clay County, and widespread wind damage.

Severe thunderstorm winds vary in intensity in Alabama. Based on historical records for the past 20 years, the observed severe thunderstorm winds events in Alabama ranged in magnitude from 35 kts to a high of 87 kts. While the range of severe thunderstorm winds is too numerous to list for the state, listed below is the range of the most intense thunderstorm winds from 2018 – 2023, which reached 80 kts or more.

- Molder-Madison County: On 06/28/2018, wind speeds were reported at 87 kts.

¹¹⁷Science Technology. <https://www.reference.com/science-technology/long-thunderstorms-last-a34835dc5db8d2a9/>

- Gosport-Clarke County: On 11/27/2019, wind speeds were reported at 87 kts.
- Monterey-Butler County: On 1/9/2022, wind speeds were reported at 87 kts.
- Poarch Creek Indian Tribal Nation-Escambia County: On 3/18/2022, wind speeds were reported at 87 kts.
- Sullivan Crossroads-Lauderdale County: On 3/30/2022, wind speeds were reported at 81 kts.
- Walker Springs-Clarke County: On 3/30/2022, wind speeds were reported at 83 kts.

While there were no fatalities reported for the above high winds, there were 10 injuries during the Poarch Creek Indian Tribal Nation-Escambia County event.

Per NOAA data, AL experienced more than 500 thunderstorm wind events between April 2017 and December 2022. In 2017, Baldwin, Clarke, Colbert, Conecuh, Crenshaw, Lauderdale, and Madison Counties had thunderstorm wind speeds that equaled or exceeded 60 knots. In 2018, Butler, Conecuh, Crenshaw, Houston, Mobile, Monroe, and Wilcox Counties had thunderstorm wind speeds that equaled or exceeded 60 knots. In 2020, Coffee and Dale Counties had thunderstorm wind speeds that equaled or exceeded 60 knots. In 2021, Colbert, DeKalb, Geneva, Jackson, Morgan, and Lauderdale Counties had thunderstorm wind speeds that equaled or exceeded 60 knots. In 2022, Colbert, Houston, Jackson, Lauderdale, and Lawrence Counties had thunderstorm wind speeds that equaled or exceeded 60 knots.

[Note: 1 knot (kt) = 1.15077945 miles per hour]

A tropical cyclone is a rotating, organized system of clouds and thunderstorms that originates over tropical or subtropical waters and has a closed low-level circulation. Tropical cyclones rotate counterclockwise in the Northern Hemisphere. They are classified as follows:¹¹⁹

- **Tropical depression:** A tropical cyclone with maximum sustained winds of 38 mph (33 knots) or less.
- **Tropical storm:** A tropical cyclone with sustained winds of 39 to 73 mph (34 to 63 knots).
- **Hurricane:** A tropical cyclone with maximum sustained winds of 74 mph (64 knots) or higher. In the western North Pacific, hurricanes are called typhoons; similar storms in the Indian and South Pacific Oceans are called cyclones.
- **Major hurricane:** A tropical cyclone with maximum sustained winds of 111 mph (96 knots) or higher, corresponding to a Category 3, 4, or 5 on the Saffir-Simpson Hurricane Wind Scale, Figure 3.27.¹²⁰

Hurricanes are intense tropical cyclones with maximum sustained winds over water of 74 mph or higher. These storms are much larger than thunderstorms or tornadoes. The eye of a hurricane typically ranges from 20 to 40 miles in diameter, followed by the most intense part of the storm,

¹¹⁹ Tropical Cyclone Climatology. National Hurricane Center and Central Pacific Hurricane Center. <https://www.nhc.noaa.gov/climo/>

¹²⁰ Saffir-Simpson Hurricane Wind Scale. National Hurricane Center and Central Pacific Hurricane Center. <https://www.nhc.noaa.gov/aboutsshws.php>

the eyewall.¹²¹ Outward from the eyewall are rain bands—concentric bands of intense rain and wind that are mixed with areas of less intensity. It is in the rain bands that tornadoes associated with hurricanes form.¹²² These storms can cause extensive loss of life and property through related hazards, including high winds, storm surge, flooding, coastal erosion, and lightning. This section, however, addresses only high winds. Flooding and storm surge hazards related to hurricanes and severe storms are discussed in Section 3.2.5.

Figure 3.27: Saffir-Simpson Hurricane Wind Scale

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph 64-82 kt 119-153 km/h	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph 83-95 kt 154-177 km/h	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph 96-112 kt 178-208 km/h	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph 113-136 kt 209-251 km/h	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	157 mph or higher 137 kt or higher 252 km/h or higher	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

3.2.7.2 Nature of the Hazard in Alabama

High winds from thunderstorms, tornadoes, and hurricanes are Alabama's most significant loss-producing natural hazards. According to the NCEI Storm Events Database, between 1950 and 2022, high winds caused nearly 738 fatalities and more than \$15.3 billion in losses. Hurricane winds are less deadly than tornadoes and thunderstorm winds; however, economically, they have accounted for more than \$5.3 billion in direct losses since 1950. Since 2018, tornadoes have accounted for 416 events, 38 fatalities, and \$5.082 million in direct losses; thunderstorm winds and high winds have accounted for more than 500 events, no fatalities, and \$570,000 in direct losses; and hurricanes have accounted for 7 events and no fatalities but have contributed to \$313 million in direct losses.¹²³

¹²¹ What Is the Eye of Hurricane? World Atlas. <https://www.worldatlas.com/articles/what-is-the-eye-of-a-hurricane.html>

¹²² Anatomy of a Hurricane. National Park Service. <https://www.nps.gov/articles/anatomy-of-a-hurricane.htm>

¹²³ Storm Events Database. NOAA National Centers for Environmental Information. <https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=1%2CALABAMA>

Tornado frequency and intensity vary across Alabama but are generally associated with the frequency and intensity of thunderstorms. The non-coastal regions of Alabama have a disproportionately high frequency of intense thunderstorms and, thus, a disproportionately high frequency of strong tornadoes. Although tornadoes are most common between March and August, they can occur anytime.

Alabama's coastal region is subject to the highest risk from hurricane winds. Wind speeds tend to decrease significantly within 12 hours of landfall as drier and cooler air begins to power the eyewall. However, hurricane-force winds (winds greater than or equal to 74 mph) can extend well inland, depending on a hurricane's strength and forward motion. NOAA scientists developed the Inland Wind Model to estimate the maximum sustained surface wind as a storm moves inland. Model results show that hurricane-force winds can extend inland under a range of conditions. A Category 4 hurricane with 24 knots of forward motion could produce hurricane-force winds as far north as Birmingham.

Figure 3.28: Maximum Wind Envelope for Category 2 Hurricane at 16 Knots (inland wind model)

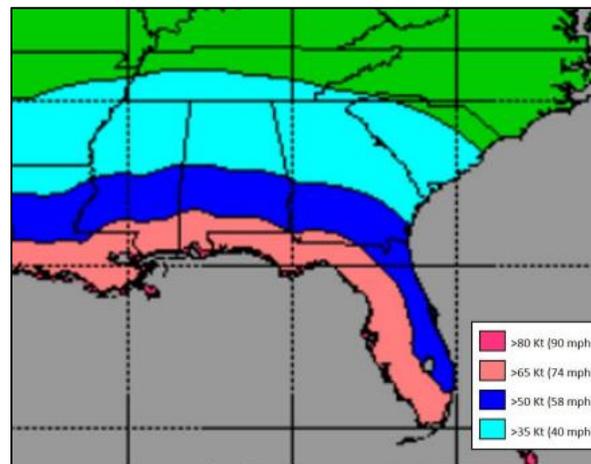
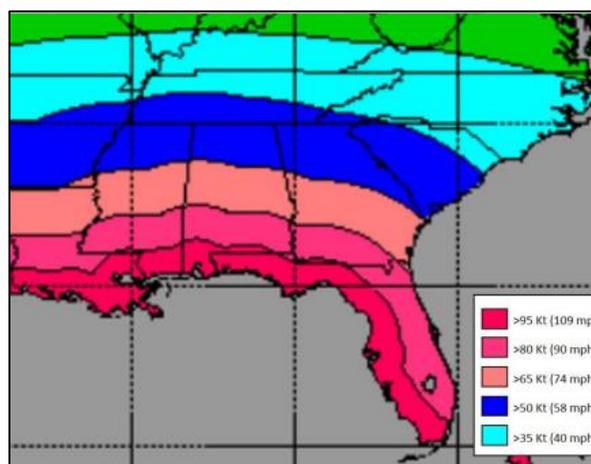


Figure 3.29: Maximum Wind Envelope for Category 4 Hurricane at 24 Knots (inland wind model)



3.2.7.3 High Wind History in Alabama

3.2.7.3.1 Tornado-Related High Wind History in Alabama

Since the 2018 plan update, Alabama has seen 416 tornado events resulting in 38 deaths, 226 injuries, and \$5.379 million in property and crop loss damages. Since 1950, Alabama has recorded 2,871 tornado events. Most tornadoes measured between F-0 and F-2 on the Fujita Scale and EF-0 to EF-2 on the Enhanced Fujita Scale, but 283 were more damaging tornadoes, measuring F-3 or EF-3 or greater. Tornadoes can happen in any month; however, the months of March and April historically have had the highest frequency of strong tornadoes, followed by November and December.

Tornadoes have caused much damage in Alabama since the 1950s, with the damage length of a tornado anywhere from 3 miles to 1,708 miles. The damage length in miles for 1950–1921, with 2011 being the worst, is shown in the following figure.

Figure 3.30: Tornado Damage Length (Miles), 1950–2021

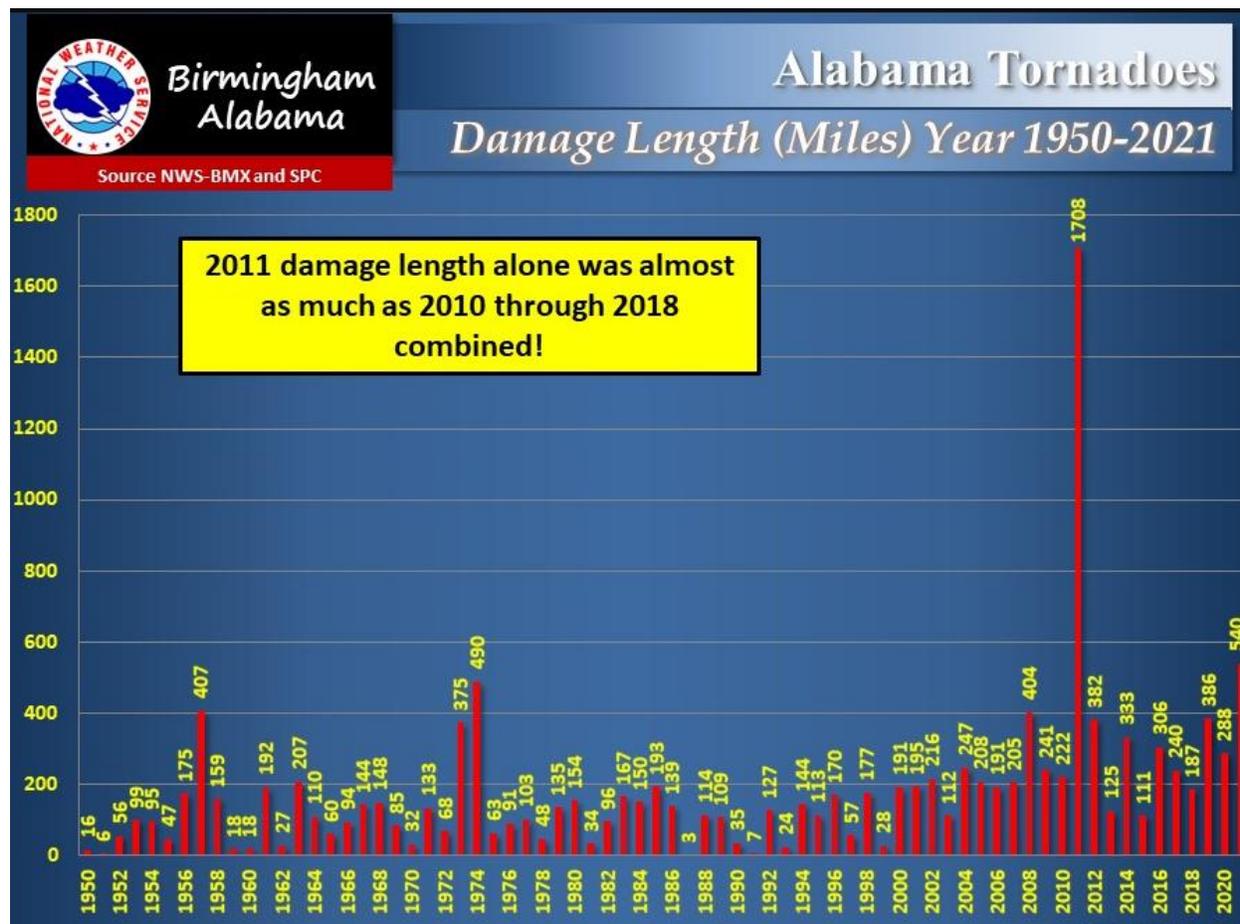
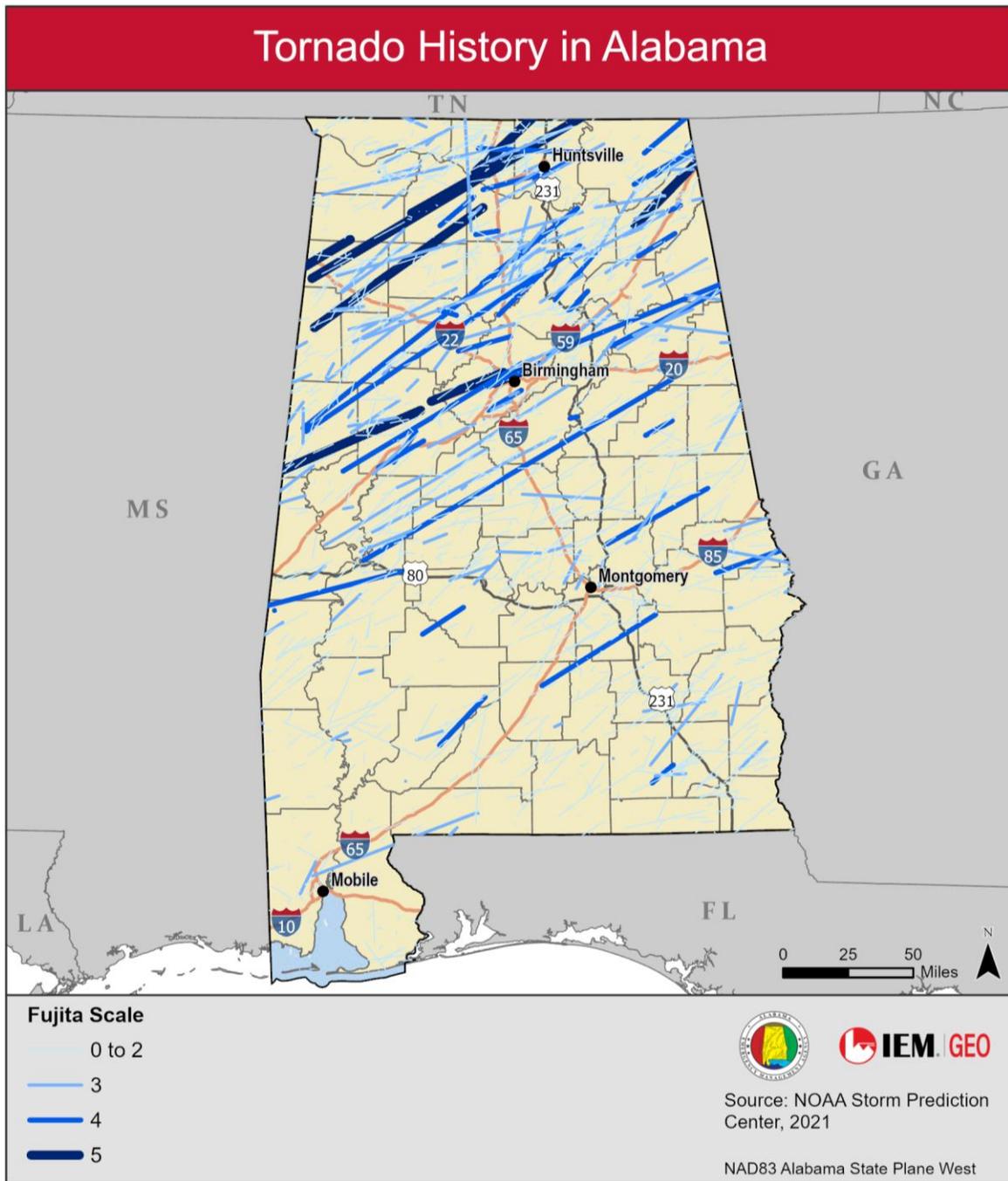


Figure 3.31 shows the history of tornadoes in Alabama, and Figure 3.32 shows the tornado tracks as the hazard moved across the state.

Figure 3.31: Tornado History in Alabama Through 2022



NOAA’s Storm Events Database has collected data on tornado events since 1950. Between 1950 and 2022, tornadoes in Alabama caused at least \$15.3 billion in direct property damage, 738 deaths, and 8,372 injuries. Sixteen of the most significant tornadoes to strike Alabama, as defined by the damage reported in the Storm Events Database, are described in the following table. As discussed in the introduction, property damage estimates from the Storm Events Database come with some limitations. The estimates are collected from diverse sources by staff with little or no

training in damage estimation and are not compared with actual costs. In addition, they include only direct physical damage to property, crops, and public infrastructure. Although damage estimates for individual events may be quite inaccurate, the errors become progressively smaller as estimates from many events are added together.¹²⁴

¹²⁴ Storm Data FAQ Page. NOAA National Centers for Environmental Information.
<https://www.ncdc.noaa.gov/stormevents/faq.jsp>

Table 3.48: Significant Tornadoes in Alabama

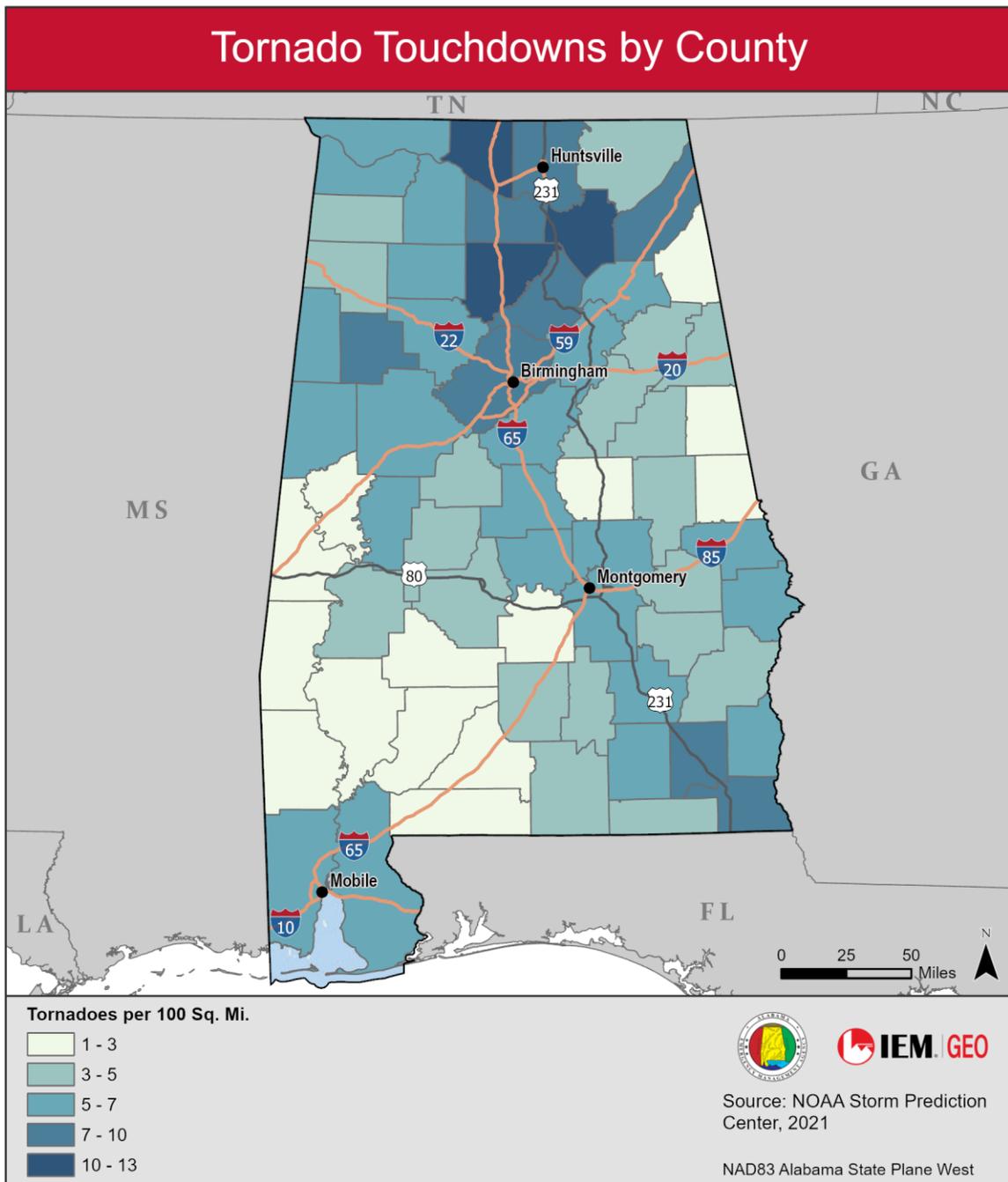
Year	Location	Description
1932	Central and Northeastern Alabama	On March 21, 1932, seven tornadoes ripped through a dozen central and northeastern Alabama counties, leaving 268 people dead and 1,834 injured.
1974	Northwestern Alabama	A “super outbreak” occurred on April 3, 1974, between 3 and 9 p.m. At least seven tornadoes killed 86 people and injured 938. The following day, April 4, 1974, 20 counties were declared federal disaster areas.
1994	Northern Alabama	On March 30, 1994, the President declared seven counties in north Alabama major disaster areas resulting from tornadoes, flooding, and severe storms that struck the region on March 27, 1994. The storms moved across northeast Alabama to the Georgia state line, spawning tornadoes, flooding, and straight-line winds. These events were responsible for 22 deaths, over 150 injuries, and extensive property damage. The 50-mile-long tornado path of the Cherokee County storm places it among the longest tornado tracks ever recorded in Alabama.
1995	Northern Alabama	Severe storms that began on February 15 and continued through February 20, 1995, produced high winds, rain, and tornadoes across north Alabama. The NWS confirmed three tornadoes, one of which was an F-3 event that passed through the northern part of the state. On April 21, 1995, President Clinton issued a major disaster declaration for the five Alabama counties of Cullman, DeKalb, Marion, Marshall, and Winston. In the community of Arab, five people died as a result of the storms. Across the five counties, more than 30 people were injured, and close to 300 homes and farm buildings were damaged.
2007	Throughout Alabama, including Wilcox and Coffee Counties	On March 1, 2007, 12 tornadoes touched down throughout the State of Alabama, two of which were rated EF-4. The first EF-4 tornado occurred in Wilcox County, causing one death and significant damage to about 70 residential properties. The second, which developed near the Enterprise Municipal Airport in Coffee County, caused 8 deaths, 121 injuries, and damage to at least 370 houses.
2007	Southern Alabama	On April 14, 2007, an EF-1 tornado struck parts of Bullock, Conecuh, Crenshaw, Dale, and Monroe Counties. The tornado damaged residences, churches, and a poultry farm and left trees uprooted along its path. Property damage from this event totaled \$1.26 million (\$1.69 million in 2022 dollars).

Year	Location	Description
2008	Northern Alabama	On February 6, 2008, the Weather Forecast Office (WFO) for the Huntsville County Warning Area experienced a tornado outbreak. While the majority of the tornadoes were EF-0 and EF-1, two EF-4 tornadoes were also reported. The EF-4 tornadoes caused five fatalities and dozens of injuries in Walker, Lawrence, and Jackson Counties. Property damage was estimated at \$525,000 (\$713,618 in 2022 dollars).
2008	Central Alabama	A long-lived supercell moved through Florida and into Alabama on February 17, 2008, producing a tornado outbreak along with hail and wind damage. The most significant tornado damage was associated with an EF-3 tornado in Autauga County, where an estimated 200 residences and 40 businesses were damaged or destroyed, and 50 people reported injuries. Property damages were estimated at \$12.3 million (\$16.71 million in 2022 dollars), with \$10 million (\$13.59 million in 2022 dollars) attributed to Autauga County alone.
2009	Northwestern Alabama	On April 19, 2009, supercells erupted across northwest Alabama. Initially, these storms produced large hail, with up to baseball-sized hail reported in Franklin County. As the early evening progressed, this supercell tracked into Lawrence and Morgan Counties, producing wind damage and at least six tornadoes (the most severe measuring EF-2) as it moved east. The tornadoes caused two fatalities and property damage of \$1.162 million (\$1,585million in 2022ars).
2010	Northeast Alabama	At least eight tornadoes hit northeast Alabama on 0. Marshall and DeKalb Counties were hardest hit. Some of the tracks were several miles long and reached EF-4 strength. No fatalities were reported, but the damage was severe, including \$15.8 million (\$21.8 million in 2022 dollars) in property damage and over 93 homes destroyed in Marshall County alone.
2011	Central and southwest Alabama	A strong line of thunderstorms produced several tornadoes in central and southwest Alabama on April 15, 2011. A total of 40 tornadoes were recorded in the state, 30 of which touched down in central Alabama. This single tornado event set a (short-lived) state record. Several injuries were reported, as well as three fatalities in Washington County. These tornadoes largely spared populated areas but damaged rural homes and timber holdings. According to the Alabama Forestry Commission, the tornadoes produced nearly \$7.3 million (\$9.5 million in 2022 dollars) in timber losses.
2011	Throughout Alabama	The tornado events of April 27, 2011 impacted the most populated areas in the state and are the worst recorded in Alabama's history. Sixty-two confirmed tornadoes were reported, with magnitudes ranging from EF-1 to EF-5. The tornadoes caused 248 fatalities and 2,219 injuries throughout the state. In all, 35 of Alabama's 67 counties had damages. However, the overall events (including straight-line winds, severe storms, and flooding) led to disaster declarations in

Year	Location	Description
		43 counties. AEMA estimates damage at \$1.2 billion (\$1.6 billion in 2022 dollars), though the Storm Events Database estimates damage as high as \$4.6 billion (in 2017 dollars). According to the Insurance Information Institute, almost \$3 billion of the \$3.2 billion that Alabama insurers paid out for catastrophe losses in 2011 can be traced directly to the tornadoes, hail, and thunderstorms associated with this super outbreak. The April 25–28, 2011, super outbreak was the largest single-system tornado outbreak ever recorded and the second deadliest in U.S. history.
2014	Northern and eastern Alabama	The deadly tornado outbreak of April 28–29, 2014, produced EF-3 tornadoes in four Alabama counties: Limestone, Cullman, Etowah, and Lee. These counties reported a total of 6 fatalities and 39 injuries. The outbreak was part of a more extensive storm system that generated 84 tornadoes over four days, causing 35 fatalities and over 300 injuries.
2016	Central Alabama	From November 29 to 30, 2016, a slow-moving weather system produced tornadoes, damaging winds, and some hail across central Alabama. EF-3 tornadoes were reported in Morgan and Dekalb Counties and were responsible for one death and nine injuries.
2018	Northern Alabama	On March 19, 2018, a powerful severe weather system produced a broken line of supercell thunderstorms and affected areas near and north of I-20. Fifteen tornado touchdowns were confirmed across the state, ranging in magnitude from EF-0 to EF-3. The most intense damage was located near and north of I-20 and near and east of I-65, but damage also occurred in the northwest sections of the state.
2019	Lee County	Since the last plan update, an EF-4 was recorded in Lee County on March 3, 2019. There were 23 fatalities and 90 injuries. The American Red Cross estimated that 225 homes were destroyed, while another 133 sustained major damage.
2021	Jefferson County	The storm that produced the tornado over Jefferson County developed over Central Mississippi. As the storm moved across Mississippi and into West Alabama, it exhibited episodes of mid-level rotation but was not strong enough to produce a tornado. As the storm entered Jefferson County, its structure underwent organization. A rotational signature quickly matured, with an associated BWER signature on KBMX radar. A strong tornado formed just north of the city of Birmingham. This tornado resulted in 1 fatality and 30 injuries.
2021	Multiple	A potent storm system affected central Alabama on Thursday, March 25, 2021. A highly sheared environment combined with increasing instability produced numerous tornadic thunderstorms. Severe parameters supported significant and long-track supercells, prompting the issuance of a rare high-risk convective outlook from the Storm Prediction Center for portions of central

Year	Location	Description
		Alabama. A total of 10 tornado tracks were surveyed in central Alabama. This included four EF-3 tornadoes, three EF-2 tornadoes, and three EF-1 tornadoes. Damage was significant along the paths of the most intense tornadoes; unfortunately, injuries and fatalities occurred. Some storms were cyclic, meaning the same storm produced multiple tornadoes. The most impressive tornado of the event was the long-track tornado that traveled nearly 80 miles from Hale County to Shelby County. This ranked as the seventh-longest single tornado track in the State of Alabama and resulted in 6 deaths and 10 injuries.
2022	Multiple	2022 saw multiple tornadoes throughout the state (92 events), with the strongest being EF3s. In Hale County, an EF2 tornado resulted in 1 death and 8 injuries, and in March 2022, Bibb County had one injury from an EF3. Damages were the worst with two EF0 tornadoes, one in Geneva County on April 5, 2022, with an estimated 75K in damages, and one in Houston County on the same day, with an estimate of 75K in damages.

Figure 3.32: Tornado Touchdowns by County

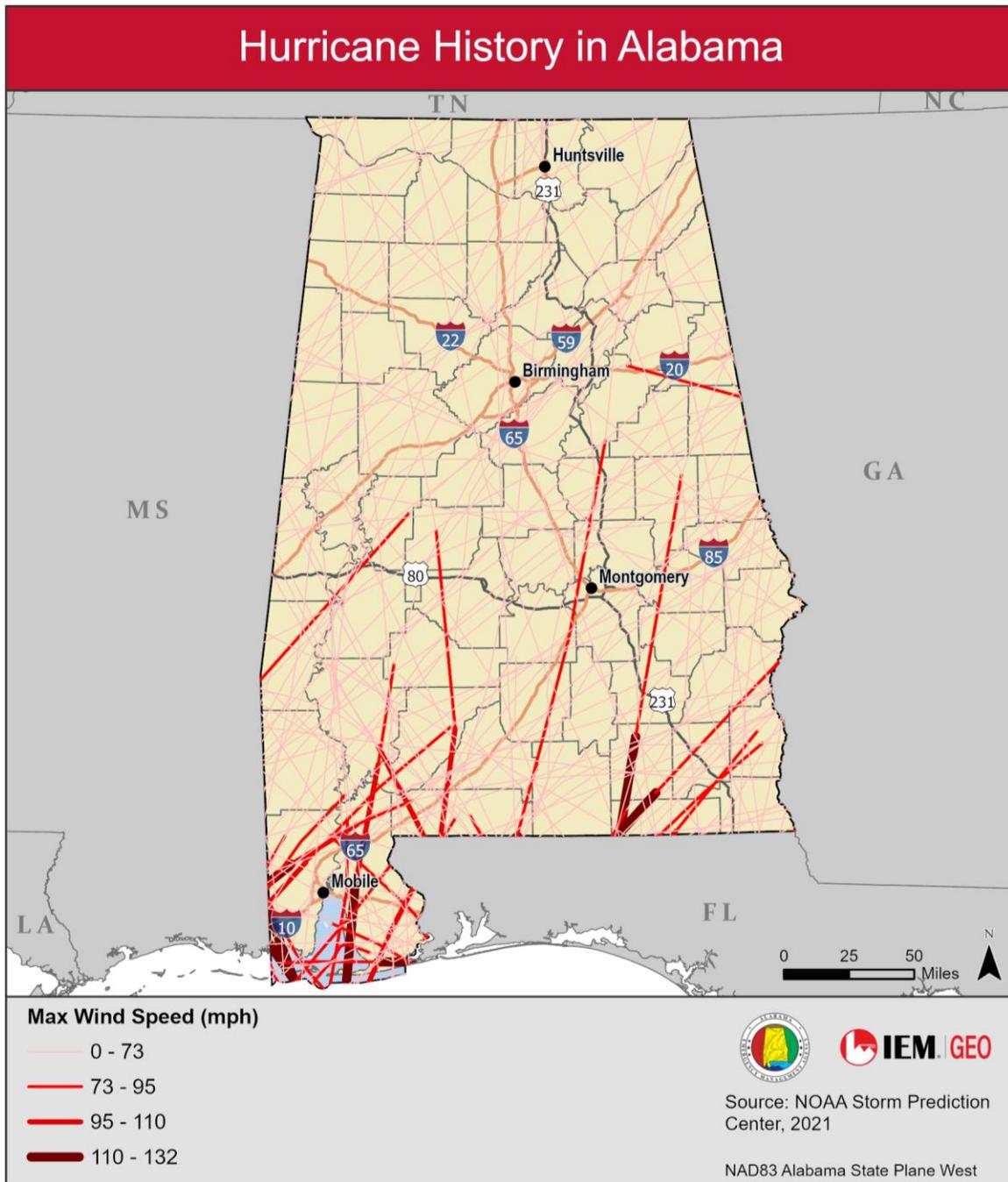


3.2.7.3.2 Hurricane-Related High Wind History in Alabama

Between 1852 and 2022, NOAA recorded 122 tropical cyclone tracks in Alabama. Most tropical cyclones had maximum sustained wind speeds below 64 knots. Three hurricanes, all Category 2, have struck Alabama since the last plan update, causing \$314 million in property damage and \$1.6 million in crop damage. Eighteen of the 122 tropical cyclones have struck the Alabama coast

with hurricane-force winds. The hurricanes that hit Alabama included a single Category 3 hurricane (Frederic in 1979, which crossed the western end of Dauphin Island as a Category 4 hurricane) and 11 Category 2 hurricanes (including Eloise in 1975, Opal in 1995, Ivan in 2004, Dennis in 2005, Michael in 2018, and Sally in 2020). Since the last plan update, no Category 3 or higher hurricanes have struck Alabama.

Figure 3.33: Hurricane History in Alabama



NOAA's Storm Events Database has collected data on hurricane events since 1996. Before summarizing this data, it is important to understand how the database defines different hazard categories. Hurricanes are complicated events that involve multiple hazards, including storm surges, flooding, high winds, and tornadoes. To prevent double counting of damages, the NWS instructs its field offices to separate damages caused by different hazards and to assign only wind-related damages to the hurricane category. It also advises its field offices to choose the hazard category based on the storm's strength at their location. As hurricanes move inland and weaken, wind-related damages may therefore be assigned to other hazard categories (such as tropical storms or strong/high winds). Between 1996 and 2022, hurricane winds caused two deaths and more than \$5.3 billion in direct economic losses in Alabama. According to the Storm Events Database, the two hurricane seasons in which hurricane winds caused the most direct damages were 2004 (\$3.26 billion) and 2005 (\$1.3 billion). Eight of the most significant hurricanes to affect Alabama, as defined by the estimated damage, are described in the following table.

Table 3.49: Significant Hurricanes to Affect Alabama

Year	Estimated Damage	Description
1979	\$7.7 billion	One of Alabama's costliest hurricanes was Hurricane Frederic, a Category 3 event that resulted in widespread damage in south and southwest Alabama. Frederic came ashore on September 12, 1979, and caused enormous damage to parts of Alabama, Florida, and Mississippi. With winds reaching 145 miles per hour, Hurricane Frederic moved over Dauphin Island (near the mouth of Mobile Bay) and inland just west of Mobile, Alabama. The damage estimate from Frederic was \$2.3 billion (\$7.7 billion in 2017 dollars). Based on information from emergency preparedness officials, 250,000 people were safely evacuated in advance of Frederic. Eleven counties were included in the federal disaster declaration: Baldwin, Choctaw, Clarke, Conecuh, Covington, Escambia, Geneva, Marengo, Mobile, Monroe, and Washington. The hurricane impact area comprised 20.5 percent of the total land area of the State of Alabama. AEMA reports that the storm caused more than 250 deaths.
1997	\$92.6 million	Hurricane Danny came ashore through Mobile Bay beginning during the evening of July 18 and continuing through the morning of July 19, 1997. Danny had sustained winds of approximately 85 miles per hour. The most severe wind damage was concentrated in Gulf Shores and Dauphin Island's Fort Morgan and West Beach areas. Most of the damage to residential and commercial buildings was roof and water damage and broken windows. Most of the businesses were able to reopen within a day or two after the storm, except for some condominiums and hotels. As a result of the storm, three counties were declared disaster areas and received federal assistance to aid in repairs.
2004	\$3.26 billion	Hurricane Ivan made landfall on September 16, 2004, near Gulf Shores in Baldwin County as a strong Category 3 hurricane. In Baldwin County, the coastal areas from Fort Morgan to Gulf Shores to Orange Beach saw the worst damage from a hurricane in over a hundred years. Fallen trees caused extensive structural damage and power outages in inland areas. Agriculture interests also suffered major losses, with significant damage to the cotton, soybean, and pecan crops. The soybean and pecan crops were nearly destroyed. Seven deaths in Alabama were attributed to Hurricane Ivan, with six due to high storm surge levels and one due to a fallen tree. The entire state was declared a federal disaster area. Property damage was estimated at more than \$3.2 billion, and crop damage at more than \$32 million.
2005	\$1.25 billion	Hurricane Katrina made landfall along the Louisiana and Mississippi Gulf Coasts on August 29, 2005, as a strong Category 3 hurricane before moving inland along the Mississippi-Alabama border. Katrina's winds had impacts that were widespread across western and central Alabama. Thousands of

Year	Estimated Damage	Description
		trees and power lines were brought down, minor to major structural damage occurred, and power outages were lengthy and widespread. Several locations remained without power for over a week. In addition, six tornadoes occurred across central Alabama associated with Katrina (four F-0s and two F-1s). Alabama Power reported that this was the worst event in its history for damage and power outages statewide. Twenty-two counties in the western half of the state were declared a federal disaster area.
2017	\$17.7 million	The unusually active 2017 hurricane season saw Hurricane Nate strike the northern Gulf Coast on October 7–8. Hurricane Nate made two landfalls as a Category 1 hurricane, first in southeast Louisiana and then near Biloxi, Mississippi. The storm then tracked inland, spawning several tornadoes, and causing tree damage, structural damage, and power outages across Alabama.
2018	\$315 million	Hurricane Michael made landfall as an unprecedented (for the region) high-end Category 4 hurricane on the Saffir-Simpson Hurricane Wind Scale in the Florida Panhandle, with a maximum sustained wind speed of 155 mph and a minimum pressure of 919 MB. Based on wind, Michael is the fourth most powerful hurricane to hit the United States, behind the Labor Day Hurricane (1935), Hurricane Camille (1969), and Hurricane Andrew (1992), and the most powerful storm to impact the Florida Panhandle in recorded history. Based on central pressure, Michael is the third most powerful hurricane to hit the United States, behind only the Labor Day Hurricane (1935) and Hurricane Camille (1969). The storm caused catastrophic damage from wind and storm surge, particularly in the Panama City Beach, Mexico Beach, and Cape San Blas areas. The widespread catastrophic damage spread well inland as Hurricane Michael remained at Category 3 strength into southwest Georgia. One of the hardest hit locations was from Mexico Beach to Indian Pass, where 9 to 14 feet of peak storm surge inundation was observed. In addition, wave action caused even higher total water values; waves destroyed the second story of multiple buildings in Mexico Beach.
2020	\$311.6 million	Hurricane Sally made landfall in Gulf Shores, Alabama, at 5 a.m. on September 16, 2020, as a strong Category 2 hurricane with maximum sustained winds of 105 mph. Sally produced widespread wind, storm surge, and freshwater flooding across coastal Alabama and the western Florida Panhandle. Flood and wind damage also extended well inland, into inland southwest Alabama and south-central Alabama. Sally was an extremely slow-moving hurricane, which prolonged and exacerbated the local impacts. The storm was moving at less than 5 mph at the time of landfall, resulting in a long duration of tropical storm and hurricane-force winds, storm surge, and torrential rainfall. Damages for Alabama due to property damage were approximately \$310 million, and for crop damage, it was \$1.6 million. (NCEI)

3.2.7.4 Probability of High Winds in Alabama

The probability of a high winds event impacting the State of Alabama in any given year is Highly Likely. According to the NCEI storm database, since the last plan update, Alabama has had 416 tornadoes, with 38 fatalities and \$5.379 million in damages. This averages approximately 83 tornadoes, 7.6 fatalities, and \$1,075,800 in damages annually. It is important to note that this is approximate, as some years may not have had tornadoes and some years may have had two or more. However, it is an average and represents a strong assumption that Alabama will have tornadoes in any given year.

Since the last plan update, Alabama has had three hurricanes, with no fatalities and an estimated \$627 million in property and crop damages. This averages out to 0.6 hurricanes, zero fatalities, and \$125 million of damages per year. While hurricanes do not strike Alabama every year, the economic toll is staggering.

Since the last plan update, Alabama has had two fatalities and over \$10 million in damages due to thunderstorm winds. The number of events is difficult to ascertain because each event can be counted multiple times by a county; however, the average of 0.4 fatalities and \$2 million in damages per year makes it clear that there is a high probability of thunderstorm winds in Alabama.

The National Risk Index is a compilation of expected annual losses, social vulnerability, and community resilience to an identified risk. The formula applied is: $\text{Expected Annual Loss} \times \text{Social Vulnerability} \div \text{Community Resilience} = \text{Risk Index}$.

According to the National Risk Index, the risk index for a tornado in Alabama is relatively high, as depicted in the following figure.

Figure 3.34: FEMA National Risk Index for Tornadoes in Alabama

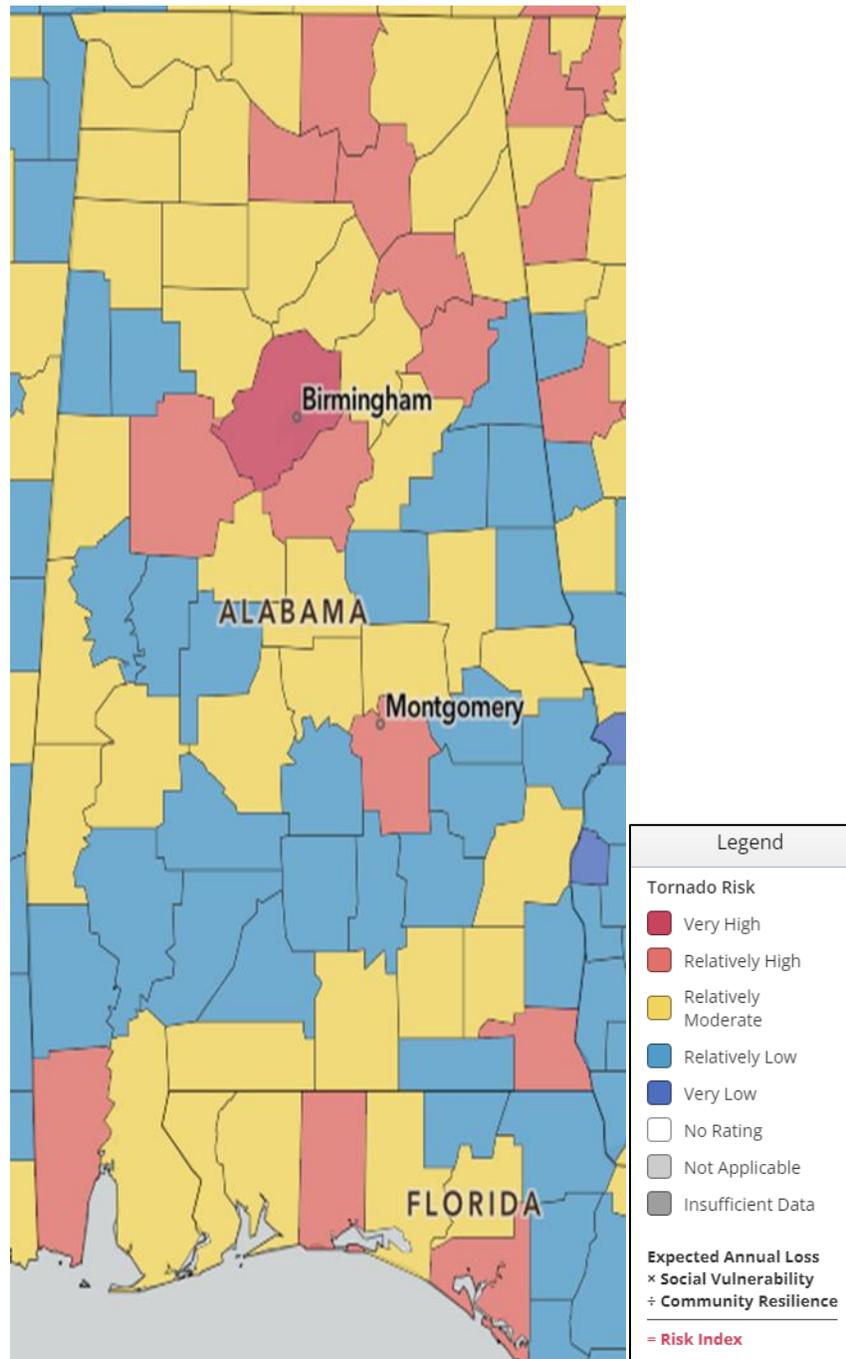
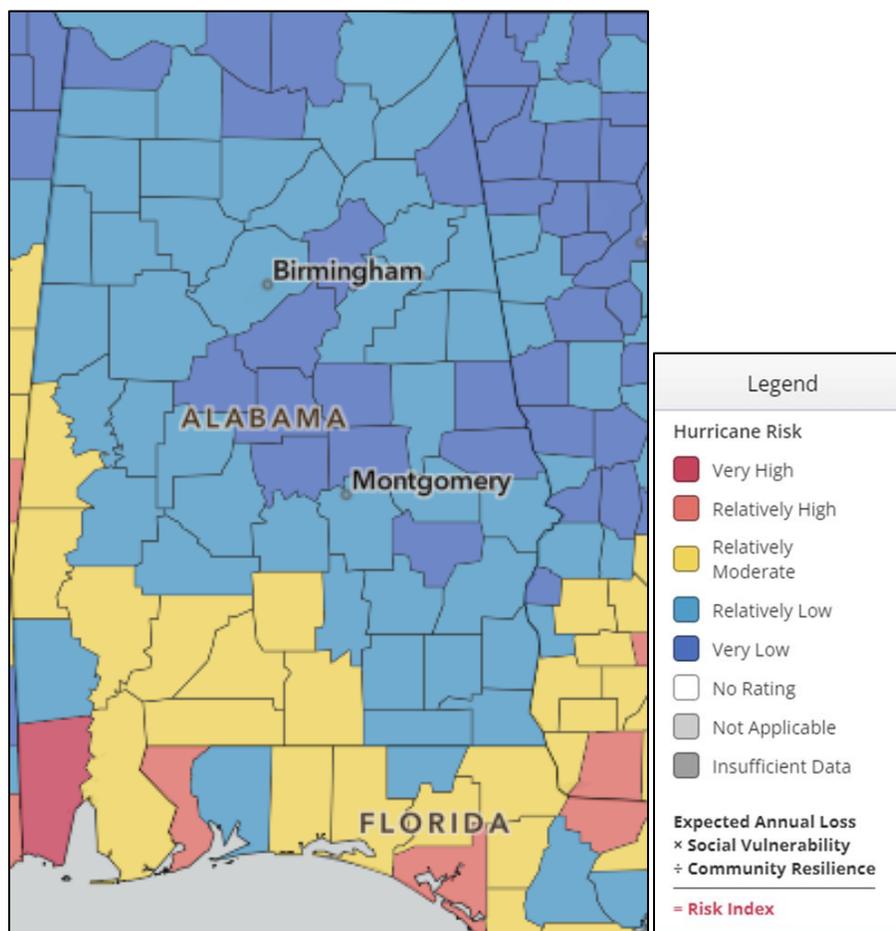


Figure 3.35: FEMA National Risk Index for Hurricanes in Alabama



The National Risk Index for Hurricanes in Alabama depends on where you are. Mobile is at very high and relatively high risk for hurricanes; however, the northern portions of the state have a low risk. That does not mean the winds won't reach them, but they will be downgraded.

3.2.7.4.1 Future Probability

The probability, location, intensity and impacts of hazards will change over time. Climate change, including changes in temperature, intensity, hazard distribution or frequency of weather events, may increase vulnerability to these hazards in the future. Based on historical knowledge and current conditions, it can be expected that all hazards will see a rise in scope, scale, and frequency of events on a yearly basis.

FEMA's State Plan Policy Guide requires states to consider changes to climate conditions that may affect their vulnerability to natural hazards. A review of the literature suggests that hurricane hazards in Alabama are likely to increase, while changes in tornado hazards remain uncertain. Alabama State Climatologist John R. Christy weighs in:

While no significant change in hurricane frequency and intensity has been observed, and anticipated changes due to GHGs are uncertain (some speculate a slight increase in the strongest

hurricanes but not in overall numbers), hurricanes and tropical storms will cause major and even catastrophic damage in the future. The value and density of the built-up infrastructure on the coastline continue to increase; thus, these storms will cause damages that exceed any similar strikes from past decades. As a result, the Gulf Coast, including Mobile and Baldwin Counties, is expanding its status as a target-rich environment for such disasters.¹²⁵

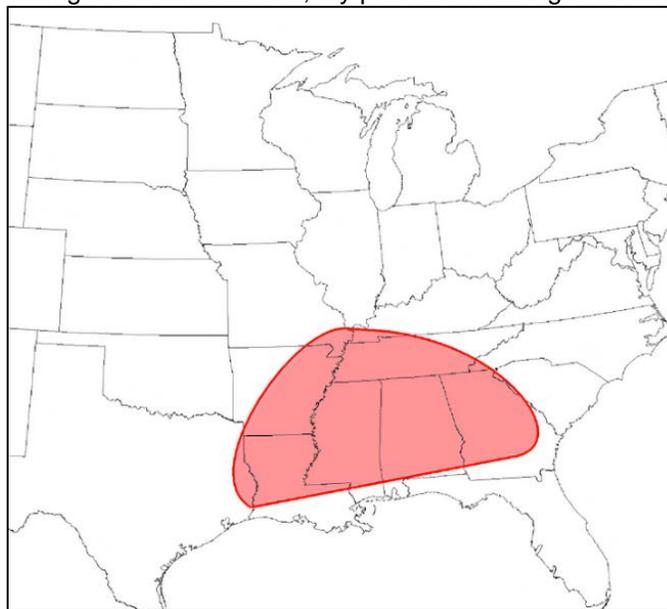
On tornadoes, Christy says:

One may only offer conjectures about tornadic tendencies looking ahead. With that in mind, one can note that it is likely, just as with hurricane fluctuations, that the occurrence of tornadoes is subject to multi-decadal variability as part of the natural dynamics of the climate system. In this case, one would expect that an increase in major U.S. tornado events is entirely plausible and may move the annual counts back to their pre-1987 levels in the next few decades with or without extra GHGs.¹²⁶

Data has also indicated that Tornado Alley is shifting eastward. Historically, it has been centered over Texas, Oklahoma, and Kansas. It is now moving toward areas of the southeastern United States. This area has a high frequency of strong, long-track tornadoes that are often violent. The following figure shows this area.

Figure 3.36: Tornado Alley Moving SE

I am running a few minutes late; my previous meeting is running over.



¹²⁵ John R. Christy, "A Practical Guide to Climate Change in Alabama."

https://www.nsstc.uah.edu/aosc/climatechangePDF/AlabamaClimatePracticalGuide_lowres.pdf

¹²⁶ Ibid.

In summary, emergency management personnel and first responders can expect the probability of damaging high winds associated with thunderstorms, tornadoes, and hurricanes to increase through the twenty-first century.

3.2.7.4.2 Risk and Vulnerability

A detailed assessment of vulnerability to high winds in Alabama is provided in Section 5.3.

Lifeline- High winds- All

All lifelines are assigned to high winds due to the high risk of damage in affected areas. With that being said, high winds are generally contained in small areas; however, high winds can affect larger areas where tornadoes and hurricanes may develop. Safety and security may be affected, causing delays in areas due to down trees and powerlines; communication systems and energy-reliant items may be affected for the same reasons. With power outages, those relying on home use of medical equipment may be at risk. Browns Ferry nuclear plant and Joseph M. Farley nuclear plants have the potential to cause catastrophic disasters if damaged by tornadoes and hurricanes, allowing for contamination to a wide radius of the state's residents.

3.2.7.5 Consequence Analysis

The information in Table 3.50 provides the consequence analysis of the potential for detrimental impacts of high winds done for accreditation with the Emergency Management Accreditation Program (EMAP).

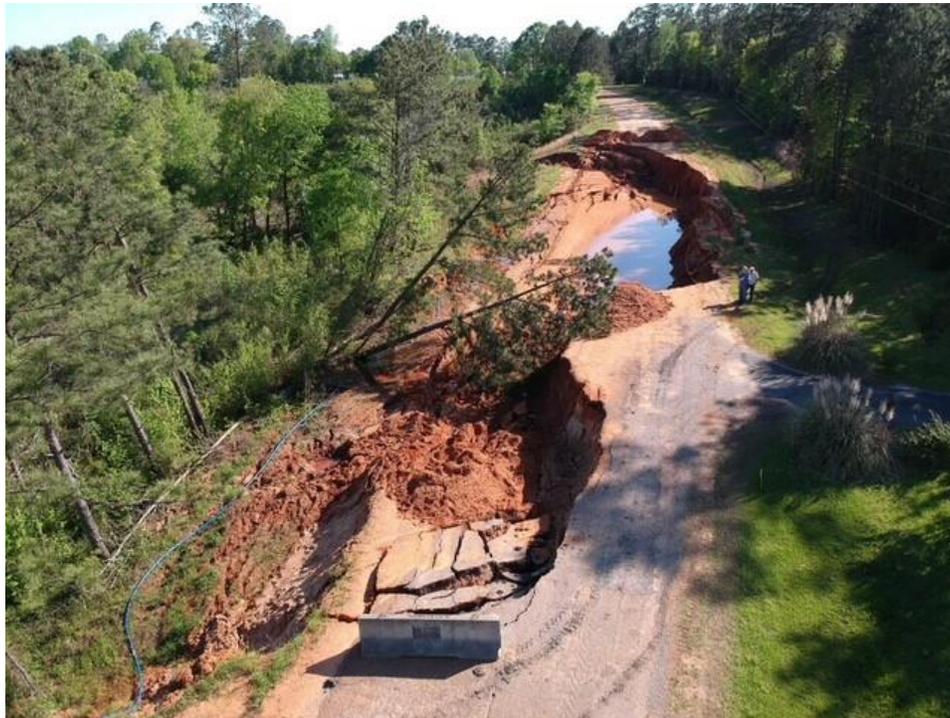
Table 3.50: EMAP Consequence Analysis: High Winds

Subject	Ranking	Impacts/High Winds
Health and Safety of Persons in the Area of the Incident	Minimal to severe	Depending on the type of high wind event, the impact to persons within the affected area(s) could be minimal to severe.
Responders	Minimal to severe	Depending on the type of high wind event, the impact to responders within the affected area(s) could be minimal to severe.
Continuity of Operations	Minimal	Temporary relocation may be necessary if government facilities experience damage.
Property, Facilities, and Infrastructure	Minimal to severe	Depending on the wind event, the localized impact could be minimal to severe for facilities and infrastructure in the incident area. Utility lines could be affected and could be severe.
Delivery of Services	Minimal to moderate	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damage sustained.
Environment	Minimal to severe	The impact may be severe for the immediate impacted area with regard to trees, bushes, crops,

Subject	Ranking	Impacts/High Winds
		etc. The impact will lessen as distance increases from the immediate incident area.
Economic Conditions	Minimal to severe	Impacts on the economy will greatly depend on the type of event and the trajectory of the event. Revenue could be impacted if tourism and businesses are halted due to structural and infrastructure damage.
Public Confidence in Jurisdiction's Governance	Moderate to severe	Response and recovery will be in question if they are not timely and effective. Warning systems in place and the timeliness of those warnings could be questioned.

3.2.8 Landslides

Figure 3.37: Landslide at Bridgeport Road, Wilcox County, Alabama, 2018¹²⁷



3.2.8.1 Description

Landslide is a general term that refers to the “downward and outward movement of slope-forming soil, rock, and vegetation under the influence of gravity.”¹²⁸ There are many types of landslides, but some of the most common are rock falls, debris flows, mudflows, slides, and creep.

Landslides are defined in terms of their material type, movement velocity, and movement character, and Figure 3.38 shows schematic diagrams developed by the USGS to illustrate each landslide type.¹²⁹ Debris flows are considered one of the most dangerous forms of landslides. This type of landslide usually starts on steep slopes during heavy rainfall and often follows roadway drainage networks and streams. Because debris flows move rapidly and with great force, they can destroy almost everything in their path. Debris flows and mudflows differ only in the materials that flow downslope and are depicted by the same schematic.

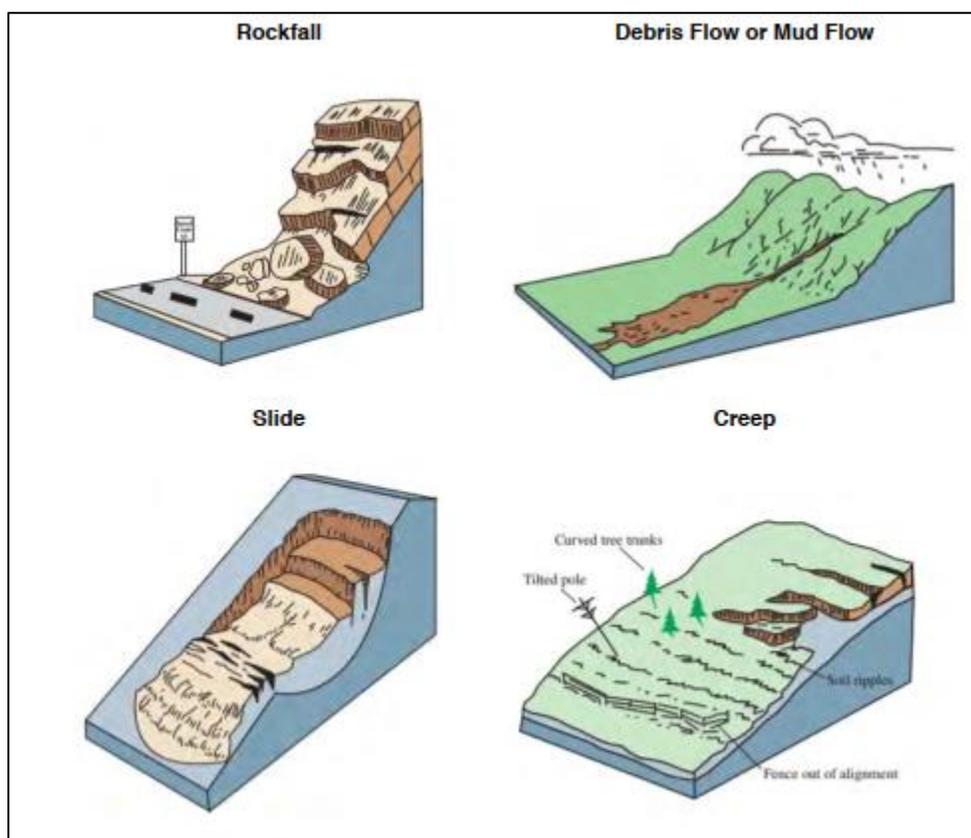
¹²⁷ Photo taken by Phil Norsworthy, Jr.

¹²⁸ Geological Survey of Alabama, 2018. Geologic Hazards: Landslide Science and Types. <https://www.gsa.state.al.us/gsa/geologic/hazards/landslides>

¹²⁹ U.S. Geological Survey, 2004. Landslide Types and Processes. Fact Sheet 2004-3072. <https://pubs.usgs.gov/fs/2004/3072/pdf/fs2004-3072.pdf>

Table 3.51: Landslide Types

Landslide Type	Material	Movement Velocity	Movement Character
Rock fall	Masses of rock	Varies	Material falls freely.
Debris flow	Loose soil, rock, and organic matter combined with water	Rapid	Material flows like a viscous fluid.
Mudflow	A slurry of water and fine sediment	Rapid	Material flows like a viscous fluid.
Slide	Intact masses of soil or rock	Variable, but generally moderate	The material slides downslope as a coherent, cohesive unit.
Creep	Masses of soil or rock	Very slow, generally imperceptible	Material moves slowly downslope, often causing leaning utility poles, trees, and retaining walls along the slope.

Figure 3.38: Landslide Types (USGS, 2004)

Landslides pose a risk to both property and life. They can damage or destroy homes, roads, infrastructure, forests, and farms. Because landslides are often triggered or exacerbated by other natural hazards, including flooding, earthquakes, and wildfires, the damage they cause is often

attributed to the triggering events. In addition, landslides can contribute to other hazards, such as dam failure. Landslides happen when areas that are landslide-prone are subject to natural and/or human-induced changes in the environment. Landslide-prone areas can be identified based on rock strength, slope, land cover, and known historical landslides. In general, landslides are more likely in areas with steeper slopes, weaker rocks, and sparser vegetation. Future landslides are also more likely to occur in areas with known historical landslides. Although landslides are most common in mountainous regions, they can also occur in areas with low relief, particularly when natural or human-induced triggers are present. The environmental changes that can trigger a landslide include the following:

- High precipitation
- Changes in groundwater level
- Seismic activity
- Construction or mining activity
- Over-steepening of slopes by excavation or other development
- Changes in surface water runoff
- Heavy loads on slopes¹³⁰

It is important to emphasize that the likelihood of landslides is enhanced when slopes are destabilized by construction or erosion. Roadcuts and other excavated areas are particularly susceptible to landslides.

3.2.8.2 Nature of Hazard in Alabama

The geologic units that are most prone to landslides are those characterized by strongly cemented rocks and very steep slopes (more than 30 degrees); weakly cemented rocks and moderately steep slopes (more than fifteen degrees); and shales, clayey soils, or poorly compacted fills and slightly steep slopes (more than ten degrees). The Geological Survey of Alabama (GSA) has developed a map of landslide susceptibility based on state data on Alabama rock types and USGS data on topography.

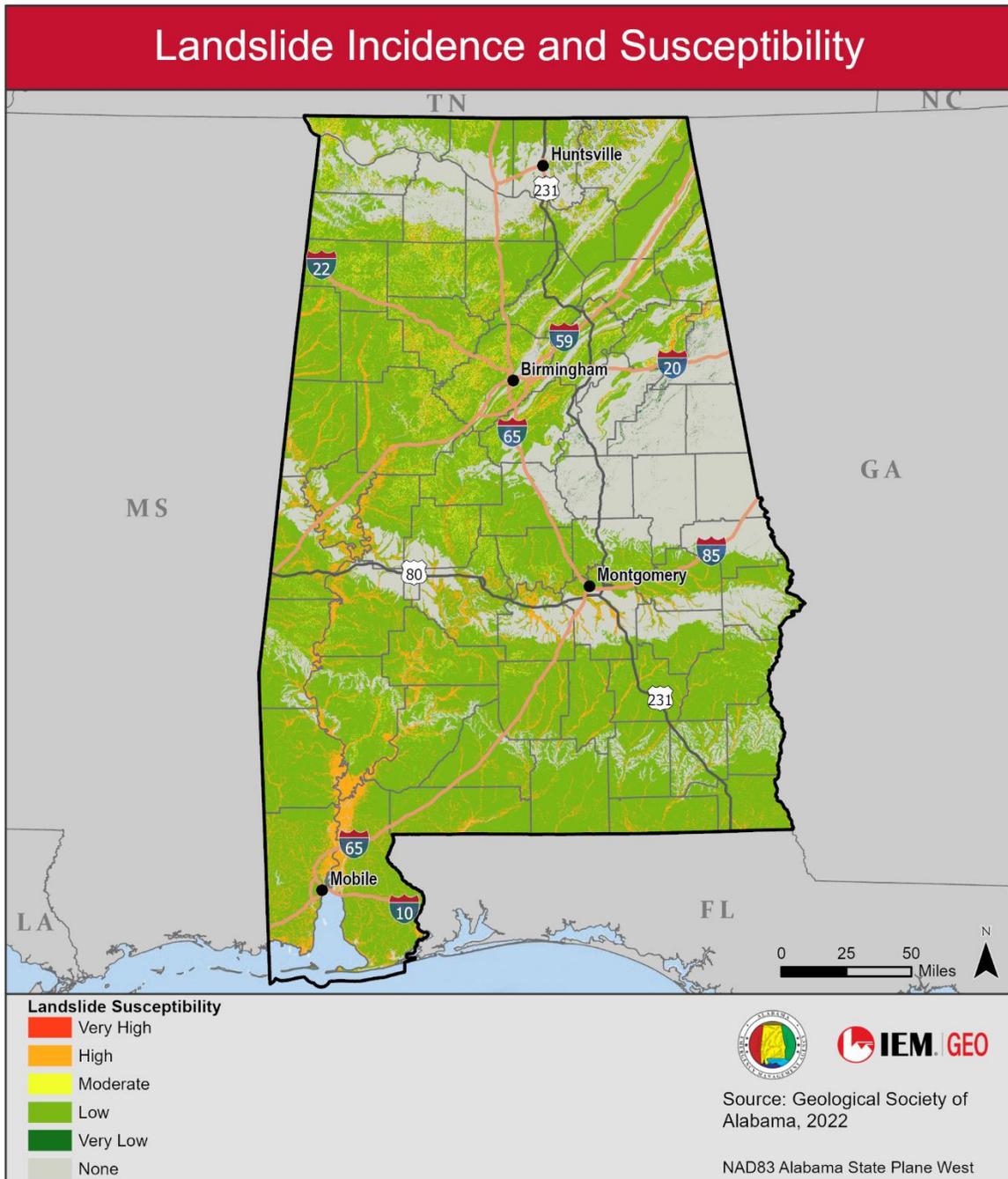
Much of the state is underlain by weak rocks and shallow slopes, and many of the geologic provinces with steeper slopes are also characterized by stronger rocks. Areas of steeper slopes tend to be concentrated in the Piedmont Upland, Valley, and Ridge, and Cumberland Plateau geologic provinces located in the northeastern part of the state, as well as along river bluffs and roadcuts throughout the state. Areas of strongly cemented rock tend to be concentrated in the Piedmont Upland geologic province in the eastern part of the state and the Highland Rim geologic province in the northern part of the state. The GSA map in Figure 3.39 shows how the interaction of geology and slope throughout the state produces highly localized areas of landslide susceptibility. In addition to geology and slope, mapping known historical landslides helps assess

¹³⁰ Geological Survey of Alabama, 2018. Geologic Hazards: Landslide Science and Types. <https://www.gsa.state.al.us/gsa/geologic/hazards/landslides>

where landslides are likely to occur in the future. Points on the map show the incidence of past landslides. Notable geologic units with a documented history of landslides include, but are not limited to, the Tuscaloosa Group, Pottsville Formation, Parkwood Formation, Pennington Formation, Bangor Limestone, and Pride Mountain Formation. For details on the soil, clays, shales, slopes, and fractures of these units and how these factors contribute to slide susceptibility, see USGS Bulletin 1649.¹³¹ Landslides become more likely during heavy rainfall. Annual rainfall averages indicate that the southwestern part of Alabama receives the most rainfall.

¹³¹ J.S. Pomeroy, R. Thomas; Geologic relationships of slope movement in northern Alabama (1985); [\[PDF\] Geologic relationships of slope movement in northern Alabama | Semantic Scholar](#)

Figure 3.39: Landslide Incidence and Susceptibility (GSA, 2018)



3.2.8.3 Landslide History in Alabama

Alabama does not maintain a statewide real-time or near-real-time record or reporting system for landslide events. In the late 1970s and early 1980s, however, scientists at GSA developed a map of historical landslide events based on historic topographic maps. Historical landslide events were identified by examining the contour lines in the 1:24,000-scale topographic maps published by

the USGS through 1982 and identifying all features with curvatures characteristic of landslide events.

To illustrate the potential impacts of landslides, Table 3.52 shows several historical events in Alabama that were reported to be geologically significant or to cause property damage. No new major landslide events were reported by GSA for the 2018 plan update. Landslides reported in local newspapers were added to the table.

Table 3.52: Landslides in Alabama, 2018–2022

Date	Location	Description
2020	Franklin County	Landslide closed part of SR-187 in Franklin County in late 2020. The road was repaired and later reopened in Spring 2021.
September 2019	Madison County 34.711534, 86.540971	On US-431 northbound, Monte Sano Mountain, in Huntsville, Madison County. Large blocks fell into the road, with debris stretching over two lanes.
February 2019	Marshall County 34° 20' 59.09" N, 86° 18' 34.72" W	Along SR-69 at milepost 280, in Marshall County, in the Tuscumbia Limestone-Fort Payne Chert.
February 2019	Morgan County 34° 30' 42.19" N, 86° 35' 54.07" W	Along US-231 at milepost 301.7, in Morgan County. It was within the Pennington Formation and likely the reactivation of an ancient slide along the mountain slope.
2017 or 2018	Marion County	I-22 landslide area in Marion County.
2018	Wilcox County	CR-37 landslide area in Wilcox County. An ongoing creep/slide. Slope issue began in 2007 and continued for years but became a larger problem in 2018. In the upper surface clays and silts of the Porters Creek. Damaged a water main that was ruptured by the slide.
2017 or 2018	Jackson County	A rockfall area along SR-117 in Jackson County.
2018 or 2019	Dekalb County	Spring rains caused a landslide on SR-117 near Mentone in Dekalb County. An emergency repair project by ALDOT had to be performed because the landslide closed SR-117.

Figure 3.40: Landslide at Bridgeport Road, Wilcox County, Alabama, 2018¹³²**Table 3.53: Significant Landslides in Alabama Since the Last Plan¹³³**

Date	Description
February 2020	A stretch of highway 231 near Huntsville in Morgan County collapsed due to a landslide. Repairs have been underway to reopen the four-lane highway by the end of the fiscal year 2020.
November 2020	A stretch of Highway 187 in Franklin County collapsed due to a landslide. Repairs were made, and the highway reopened in May 2021.

Describing intensity measures for landslides presents a limitation because the exact ranges of size are not usually provided. (The size is usually expressed by how many traffic lanes are affected.) However, an internet search revealed the following:

- A November 2011 AL.com news article [Clines, Keith. (November 29, 2011). DOT Clears Landslide and Reopens Alabama 35 in Jackson County this Afternoon. The Huntsville Times] described a 75-foot affected area.
- A December 2015 AL.com news article [Thornton, William. (December 28, 2015). Apparent Landslide Closes Traffic on US 431, North of Attalla. Anniston/Gadsden Real-Time News] described a 50-foot affected area.

¹³² Photo taken by Phil Norsworthy, Jr.

¹³³Alabama.com, Closed Highway 231 near Huntsville may open sooner than expected. [Closed Highway 231 near Huntsville may open sooner than expected - al.com](https://www.al.com/news/local/closed-highway-231-near-huntsville-may-open-sooner-than-expected)

- A May 2020 News 19 internet article (Highway 231 Bridge Work Ready to Go in Morgan County) described a 1,000-foot affected area.

3.2.8.4 Probability of Landslides in Alabama

The probability of a landslide event impacting the State of Alabama in any given year is Likely. The probability of landslides cannot be expressed in terms of specific frequencies or return periods. These events are the culmination of multiple naturally occurring and human-induced geological processes that play out over a range of timescales and can be highly localized. Areas that are more landslide-prone can be identified, however, based on geologic characteristics and historic landslide events.

3.2.8.4.1 Future Probability of Landslides

The probability, location, intensity and impacts of hazards will change over time. Climate change, including changes in temperature, intensity, hazard distribution or frequency of weather events, may increase vulnerability to these hazards in the future. Based on historical knowledge and current conditions, it can be expected that all hazards will see a rise in scope, scale, and frequency of events on a yearly basis.

Some of the processes that increase the likelihood of landslides may be impacted by future climate change. These include high precipitation and changes in groundwater levels. If rainfall events become more intense in the future, the incidence of landslides in Alabama may increase. At the same time, more prolonged and intense drought events could lead to more groundwater withdrawals and the lowering of some water tables. In some instances, this effect could reduce the likelihood of landslides.

3.2.8.4.2 Risk and Vulnerability

A community's vulnerability to loss from landslides is a function of the probability of landslides, the exposure of structures to landslides, and the susceptibility of structures to landslides. In Alabama, landslide risk is highly site-specific and difficult to generalize. To the extent that new development takes place near steep slopes, drainage ways, or natural erosion valleys, it will be more vulnerable to loss from landslides. In addition, roadways are particularly vulnerable to disruption from landslides. Roadway systems with more redundancy will be more resilient to temporary closures.

Lifeline- Landslides- Energy, Communications, Transportation, Safety and Security, Food, Water, and Shelter

Multiple Lifelines are assigned to the hazard landslides and are all dependent upon the amount of land displaced as well as the amount of population affected. Power poles may be downed, not allowing rapid communication, and roads and rail lines may be covered with debris and impassable, which may affect emergency services and transportation of goods and services. Landslides may also cause flash flooding wiping out crops, livestock, and human lives.

3.2.8.5 Consequence Analysis

The information in Table 3.54 provides the consequence analysis of the potential for detrimental impacts of a landslide done for accreditation with the Emergency Management Accreditation Program (EMAP).

Figure 3.41: Landslide at Bridgeport Road, Wilcox County, Alabama, 2018¹³⁴



Figure 3.42: Rockfall at US-431 in Huntsville, Alabama, 2019¹³⁵



¹³⁴ Photo taken by Phil Norsworthy, Jr.

¹³⁵ Photo taken by Phil Norsworthy, Jr.

Table 3.54: EMAP Consequence Analysis: Landslide

Subject	Ranking	Impacts/Landslide
Health and Safety of Persons in the Area of the Incident	Moderate to severe	The localized impact could be moderate to severe for the incident area.
Responders	Minimal	The impact on responders would be minimal.
Continuity of Operations	Minimal	The expectation of execution of the COOP is minimal unless a facility is impacted.
Property, Facilities, and Infrastructure	Minimal to severe	There is a risk of severe damage if the facilities and infrastructure are on or near the landslide.
Delivery of Services	Minimal	Impacts on the delivery of services could be severe if roads/utilities are affected. Otherwise, the impact would be nonexistent or minimal.
Environment	Minimal	Other than the immediate area, the impact on the area would be minimal.
Economic Conditions	Minimal	Impacts to the economy will depend on the severity of the damage (e.g., roads blocked, businesses caught in the landslide).
Public Confidence in Jurisdiction's Governance	Minimal to severe	Local development policies will be questioned, as well as bank stabilization.

3.2.9 Lightning

3.2.9.1 Description

Lightning is a discharge of electricity in the atmosphere that occurs between clouds, the air, or the ground. Although lightning can occur during such events as volcanic eruptions, intense forest fires, and large hurricanes, it most typically occurs during a thunderstorm. In a thunderstorm, rising and descending air separates positive and negative charges. Additionally, the presence of water and ice particles may also affect the distribution of the electrical charge. The subsequent discharge of energy between these positive and negative charge areas results in lightning.

Thunder is a by-product of lightning. In only a few millionths of a second, the air surrounding a lightning strike is heated to 50,000 °F, a temperature five times higher than the surface of the sun.¹³⁶ Thunder is the result of this rapid heating and cooling of air near the lightning that causes a shock wave.¹³⁷

¹³⁶ Determining the Distance Between Lightning and Thunder. [Distance Between Lightning and Thunder | Lightning Master Corporation](#)

¹³⁷ Ibid.

The risk posed by lightning is often underestimated by people in the vicinity. High winds, rainfall, and a darkening cloud cover are the warning signs for possible cloud-to-ground lightning strikes. Although many lightning casualties happen at the beginning of an approaching storm, a significant number occur after a thunderstorm has passed. Although the lightning threat diminishes after the last sound of thunder, the threat may persist for more than 30 minutes after the storm.¹³⁸ When thunderstorms are in the area but not overhead, the lightning threat may still exist. Lightning can strike outward up to 10 miles from the storm.¹³⁹ Additionally, although most lightning-related deaths and injuries have occurred during the summer, weather conditions conducive to thunderstorms and lightning can occur throughout the year.¹⁴⁰

According to the NWS, there are approximately 25 million cloud-to-ground flashes detected every year in the United States. However, approximately half of all cloud-to-ground lightning flashes have more than one ground strike point, resulting in at least 30 million ground strike points on average each year. In addition, there are roughly 5–10 times as many cloud-to-cloud flashes as there are cloud-to-ground flashes.¹⁴¹ Although cloud-to-cloud lightning occurs more frequently, cloud-to-ground lightning flashes pose a threat to human life. Cloud-to-ground lightning can kill or injure people through a direct or indirect strike. Although not as common, a direct strike is potentially the deadliest. However, a portion of the lightning current that has struck a taller object, such as a tree or pole, can branch off and reach a nearby person, generally within 2 feet of the object. In addition, electrical current from a lightning strike may be conducted through the ground to a person after striking a nearby object. Lightning current may also travel longer distances through power lines or plumbing pipes to a person who is in contact with an electric appliance or plumbing fixture; this is known as conduction.

Lightning strikes the United States about 25 million times a year. Although most lightning occurs in the summer, people can be struck at any time of the year. Lightning kills about 20 people in the United States each year, and hundreds more are severely injured.¹⁴²

3.2.9.2 Nature of the Hazard in Alabama

Although lightning can occur anywhere in the United States, it is more likely to occur in areas with conditions conducive to thunderstorm cloud formation.

These conditions are often met along the Gulf of Mexico, which has high frequencies of cloud-to-ground lightning flashes, with Texas having the greatest annual average of cloud-to-ground flashes combined with cloud pulses. Alabama, in close proximity to the Gulf of Mexico, ranks

¹³⁸ Lightning Safety Tips; Ian Scott (July 2017); [Lightning Safety Tips - SkyScan USA](#)

¹³⁹ Ibid.

¹⁴⁰ National Oceanic and Atmospheric Administration (NOAA), The National Severe Storms Laboratory. Severe Weather 101 – Lightning. <https://www.nssl.noaa.gov/education/svrwx101/lightning/faq/>

¹⁴¹ Ibid.

¹⁴² National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS). Lightning Safety Tips and Resources. [Lightning Safety Tips and Resources \(weather.gov\)](#)

twelfth among the 48 continental states in annual average cloud-to-ground flashes combined with cloud pulses.¹⁴³

The frequency and duration of thunderstorms are the main factors that influence the frequency of lightning strikes. Based on historic data collected by the NWS, southern counties near the Gulf of Mexico have the highest frequency of thunderstorms in the state. These counties include Baldwin, Mobile, Washington, and Escambia. While the remainder of the state also experiences high frequencies of thunderstorms, counties located in the northern half of the state have more frequent thunderstorms than those that are centrally located. In addition to thunderstorm frequency and duration, past lightning strikes can help determine where lightning is more likely to occur in the future.

3.2.9.3 Lightning History in Alabama

NOAA's National Centers for Environmental Information (NCEI) maintains the Storm Events Database that records storm occurrences and other severe weather events, including lightning strikes, which have caused casualties, injuries, property damage, and/or disruption to commerce. According to the Storm Events Database, 34 lightning strikes were reported in Alabama between 2018 and 2022, resulting in 5 fatalities and 12 injuries. Additionally, lightning caused \$2,082,500 in property damage.

To illustrate the impacts of lightning events, Table 3.55 provides select incidents of lightning strikes that have resulted in death, injuries, and/or property damage in the state. The information in the table includes the date and location of the strike, the number of fatalities and/or injuries, the value of property damage adjusted for inflation, and a brief description of the impact. This information was obtained from NCEI's Storm Events Database. These select incidents show the severity and potential for widespread damage resulting from a lightning strike.

Table 3.56 is a snippet of the costliest lightning strikes that have occurred in the State of Alabama since 2017. These reflect either the high cost of living or the high cost of property.

Table 3.55: Lightning Events in the State of Alabama 2017–2022

County	Start Date	Deaths	Injuries	Property Damage	Crop Damage
JEFFERSON	5/20/2017	0	0	\$100,000	0
BALDWIN	8/26/2017	1	5	0	0
SHELBY	6/25/2018	0	0	\$300,000	0

¹⁴³ Total Lightning Statistics, 2021 Annual Lightning Report. Vaisala. [2021 Annual Lightning Report \(vaisala.com\)](https://www.vaisala.com/2021-annual-lightning-report)

County	Start Date	Deaths	Injuries	Property Damage	Crop Damage
TALLAPOOSA	9/10/2018	0	0	\$250,000	0
HOUSTON	2/9/2021	0	0	\$150,000	0
MONTGOMERY	8/2/2021	0	0	\$850,000	0
LAMAR	3/18/2022	0	0	\$150,000	0

Table 3.56: Significant Lightning Events in the State of Alabama, 2017–2022

Event	Date	Description
Lightning	September 2020	A 14-year-old male was struck by lightning at the 1500 block of Neel School Road. Little information was available, but the injury was not believed to be serious.
	August 2021	An upper-level disturbance enhanced convective activity along a stalled-out cold front near the I-85 corridor. The storms produced periods of very heavy rainfall, damaging winds, and frequent lightning across Montgomery County. Lightning caused a fire at the Elevate 5050 Apartment Complex. Twelve units were destroyed.
	June 2022	Several lightning strikes caused damage in southwest Alabama.

3.2.9.4 Probability of Lightning in Alabama

The probability of a lightning event impacting the State of Alabama in any given year is Highly Likely. Areas that have a high density of cloud-to-ground lightning strikes are at a greater risk for potential property damage, injuries, or fatalities. Since the previous plan, there has been an average of 37.87 cloud-to-ground lightning strikes with cloud pulses, ranking Alabama eleventh out of 48 states in the continental United States.¹⁴⁴

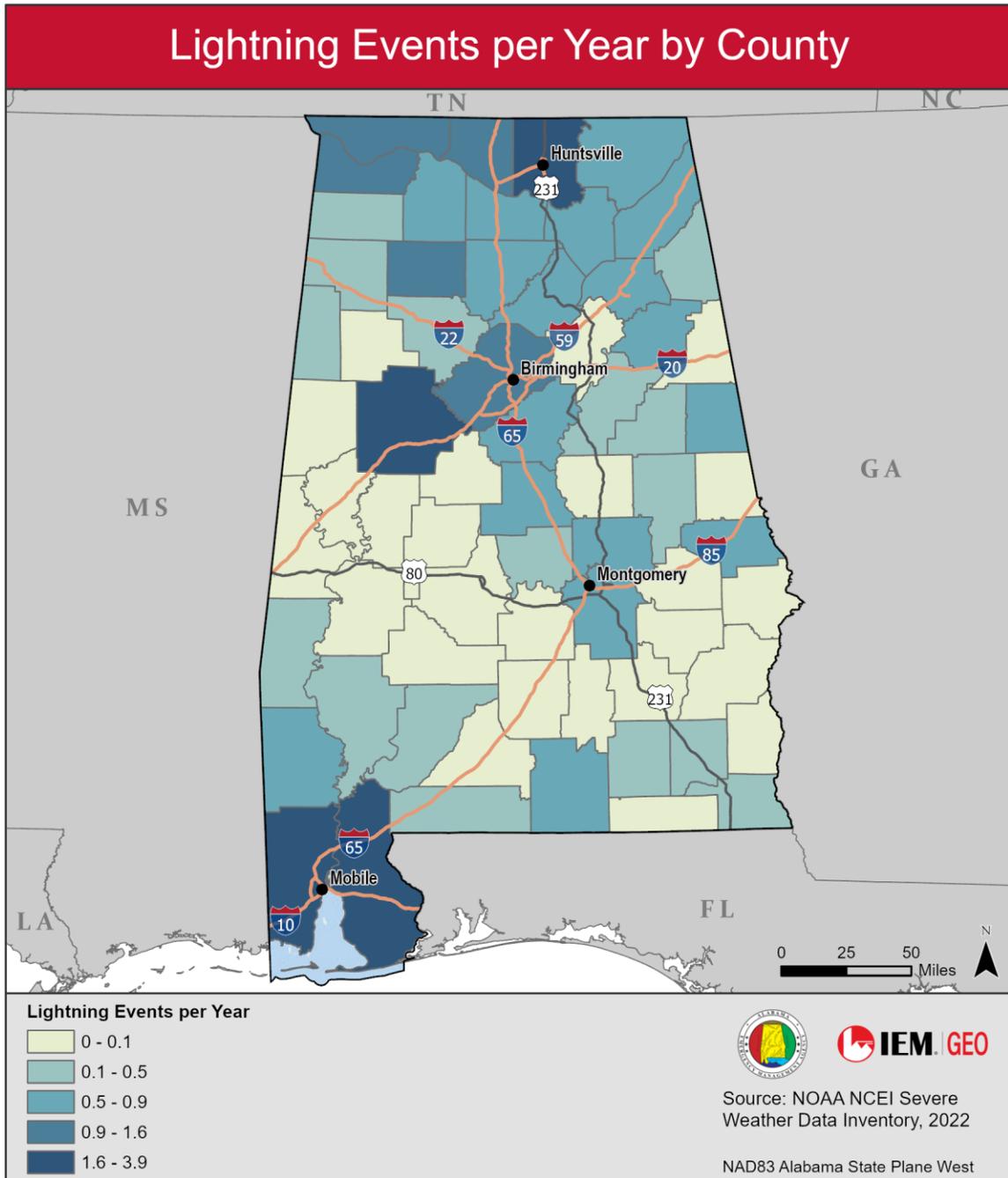
Alabama’s southernmost counties have the highest average annual densities of lightning flashes in the state. As a result, the likelihood of a cloud-to-ground lightning strike is highest in Mobile and Baldwin Counties. However, other counties near the southern border and in the western half of the state also have high densities of lightning flashes and a higher probability of a lightning strike than those in the eastern portion of the state, where lightning flash densities diminish.

However, because the impacts of a lightning strike are so localized, the site-specific incidence of a lightning strike occurring is considered very low. For example, while on average over a quarter of a million cloud-to-ground lightning strikes are recorded annually, between 1996 and 2017, only

¹⁴⁴ Total Lightning Statistics, 2021 Annual Lightning Report. Vaisala. [2021 Annual Lightning Report \(vaisala.com\)](https://www.vaisala.com)

approximately 30 lightning occurrences per year were reported to result in property damage, fatalities, or injuries according to NCEI Storm Events Database.

Figure 3.43: Lightning Events Per Year by County (National Risk Index)



3.2.9.4.1 Future Probability

The probability, location, intensity and impacts of hazards will change over time. Climate change, including changes in temperature, intensity, hazard distribution or frequency of weather events, may increase vulnerability to these hazards in the future. Based on historical knowledge and current conditions, it can be expected that all hazards will see a rise in scope, scale, and frequency of events on a yearly basis.

Since the probability of a lightning event is influenced by the probability of a severe thunderstorm occurrence, potential future changes in climate and weather conditions may impact the future probability of cloud-to-ground lightning strikes. However, future projections for the severity and frequency of thunderstorms are uncertain in the Southeast United States. Although the number of severe thunderstorms reported in this region has increased in the last 50 years, it has largely been attributed to advancements in reporting technologies.¹⁴⁵ Further, the future probability of lightning activity is not forecasted as lightning strikes are frequent and widespread. Additionally, forecasters' understanding of the cloud electrification process is incomplete.¹⁴⁶

3.2.9.4.2 Risk and Vulnerability

A community's vulnerability to loss from lightning strikes is a function of the probability of lightning strikes, the exposure of structures and people to the hazard, and the susceptibility of structures and infrastructure to the hazard. Although the southern and western portions of the state have the highest probability of cloud-to-ground lightning flashes, the large percentage of plans that recognize lightning as a significant hazard indicates that the risk of lightning is high throughout the state. People and property throughout the state are vulnerable to loss of life, injury, or property damage from lightning. The people who are most susceptible to death or injury from lightning strikes are those who are engaged in outdoor activities and/or exposed to the outdoors. Therefore, vulnerability at the individual level is influenced both by the individual's ability to seek suitable shelter and their level of understanding of lightning safety procedures.

Table 3.57: Lightning Damages by County

Hazard Type	Jurisdiction	No. of Events	Deaths	Injuries	Total Property Damage	Total Crop Damage
Lightning	Baldwin Co.	2	1	5	\$0	0
	Bibb Co.	1	0	1	\$0	0
	Clarke Co.	3	0	0	\$54,000	0
	Coffee Co.	4	0	0	\$131,000	0
	Conecuh Co.	1	0	0	\$2,000	0

¹⁴⁵ Climate of the Southeast United States, Variability, Change, Impacts, and Vulnerability, K. T. Ingram, K. Dow, L. Carter, J. Anderson (11/13/2013); [Climate of the Southeast United States: Variability, Change, Impacts, and Vulnerability | CAKE: Climate Adaptation Knowledge Exchange \(cakex.org\)](https://www.cakex.org/Climate-of-the-Southeast-United-States-Variability-Change-Impacts-and-Vulnerability)

¹⁴⁶ National Oceanic and Atmospheric Administration (NOAA), The National Severe Storms Laboratory. Severe Weather 101 – Lightning. <https://www.nssl.noaa.gov/education/svrwx101/lightning/forecasting/>

Hazard Type	Jurisdiction	No. of Events	Deaths	Injuries	Total Property Damage	Total Crop Damage
	Elmore Co.	1	0	0	\$20,000	0
	Houston Co.	2	1	0	\$150,000	0
	Jefferson Co.	2	0	1	\$100,000	0
	Lamar Co.	1	0	0	\$150,000	0
	Lauderdale Co.	2	0	1	\$500	0
	Lee Co.	2	1	2	\$0	0
	Madison Co.	3	1	0	\$35,000	0
	Mobile Co.	3	1	0	\$20,000	0
	Montgomery Co.	1	0	0	\$850,000	0
	Morgan Co.	3	0	1	\$20,000	0
	Shelby Co.	1	0	0	\$300,000	0
	Tallapoosa Co.	2	0	1	\$250,000	0

Lifelines-Lightening- All

Lightning, like hail, has the distinction of affecting all lifelines. As do other hazards within this plan. Lightning can decimate communications, start wildfires, and threaten people, property, crops, and livestock. Utility Infrastructure is at risk, and one strike on a bridge can see it collapse. As storms and lightning are expected to strengthen in the coming decades, these effects will worsen, causing the potential for greater harm to citizens and property.

3.2.9.5 Consequence Analysis

The information in Table 3.58 provides the consequence analysis of the potential for detrimental impacts of lightning done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.58: EMAP Consequence Analysis: Lightning

Subject	Ranking	Impacts/Lightning
Health and Safety of Persons in the Area of the Incident	Minimal to moderate	Impact on the health and safety of persons could be minimal to moderate if within the incident area.
Responders	Minimal	The impact on responders is expected to be minimal.

Subject	Ranking	Impacts/Lightning
Continuity of Operations	Minimal	Temporary relocation may be necessary if government facilities experience damage, such as fire, from a strike.
Property, Facilities, and Infrastructure	Minimal to severe	The impact could be severe if property, facilities, or infrastructure take a direct hit, which could result in fire or destruction.
Delivery of Services	Minimal to severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damages sustained.
Environment	Minimal to severe	The impact will be isolated yet severe for any trees, animals, etc. that take a direct hit or are in the path of any fire that may be generated due to the lightning strike.
Economic Conditions	Minimal	The local economic impact should be fairly minimal unless lightning causes fires that damage businesses and stop revenue.
Public Confidence in Jurisdiction's Governance	Minimal	Response and recovery will be in question if they are not timely and effective, specifically if electricity and other utilities are affected.

3.2.10 Sea Level Rise and Coastal Land Change

3.2.10.1 Description

Sea level rise is an increase in the level of the world's oceans due to global warming. The cause of the warming is as varied as the opinions on this phenomenon; however, burning fossil fuels is a significant cause due to the release of carbon dioxide and other heat-trapping gases into the atmosphere. Once this heat is trapped, the oceans absorb the majority, and the water then becomes warmer and expands. As a result, thermal expansion, or ocean water expansion accounts for about 1mm of rise per year.¹⁴⁷ However, most of the sea level rise is from the meltwater of land-based ice sheets and glaciers, which adds about 2 mm per year combined. Typically, the ice sheets and glaciers melt somewhat during the summer and refreeze in the winter. However, with the average temperature rising, these ice sheets and glaciers are experiencing melting at an accelerated pace, which outpaces their refreeze in the winter.

Sea level rise is a serious threat to coastal life. It increases the intensity of storm surges, contributes to flooding, and damages the coastal areas themselves, which are being hit hard. Because there are dense population centers along the coast, the displacement of these people also creates hardship. In addition, coastal ecosystems are at risk due to soil and groundwater being contaminated with salt.

¹⁴⁷ Sea Level Change. NASA. <https://sealevel.nasa.gov/faq/12/what-causes-sea-level-rise/>

At the local level, a range of factors can hasten or slow the rate of sea level rise seen in communities. Depending on the direction and magnitude of these local factors, local sea levels can rise faster or slower than the global average or even fall.¹⁴⁸ Local factors that influence coastal water height include regional ocean currents and changes in ground elevation. Differences in ground elevation can be caused by many different natural processes and human activities. The most common natural causes are fault processes, sediment compaction, sediment loading, and glacial isostatic adjustment. In contrast, the most common human causes are fluid withdrawal (i.e., the extraction of oil, gas, and groundwater) and surface water drainage.

Sea level rise will fundamentally change the coast and coastal environments in the United States and further exacerbate hazards caused by flooding, not to mention creating new coastal change hazards. This section will discuss the slow-moving but enduring threats posed by the effects of sea level rise on coastal areas. The goal will be to highlight the profound and irreversible effects of rising local sea levels on coastal environments and to highlight where coastal and inland communities can intervene to interrupt these impacts and preserve coastal resources.

The physical effects of local sea level rise will range from more frequent and extensive "nuisance flooding" to chronic inundation and coastal land loss. Coastal ecosystems that communities depend on will also be transformed. With approximately 94.7 million Americans living in densely populated coastal areas,¹⁴⁹ these effects will be felt by a large share of the nation's population.

3.2.10.1.1 Nuisance Flooding Versus Chronic Inundation

As its name suggests, nuisance flooding refers to shallow coastal flooding that can cause significant public inconvenience but not necessarily substantial structural damage to buildings. These inconveniences can be temporary road and business closures, overwhelmed stormwater systems, damage to transportation infrastructure, and coastal erosion. In addition, as local sea levels rise, the gap between mean sea level and nuisance water levels gets smaller, meaning fewer extreme events (high tides, for example) can also cause nuisance flooding.

On the other hand, chronic inundations refer to episodic coastal flooding so frequent that it makes regular routines impossible. According to the Union of Concerned Scientists (UCS), flooding occurs on average once every other week. It defines a "chronically inundated community" as any coastal community that experiences this frequency of flooding over 10% or more of its area.¹⁵⁰ Chronic inundation disrupts people's routes, livelihoods, homes, and communities. For urban communities, impacts may include lower home values and inaccessible business districts. In contrast, for rural communities, impacts can consist of lower farm productivity and homes isolated from emergency services.

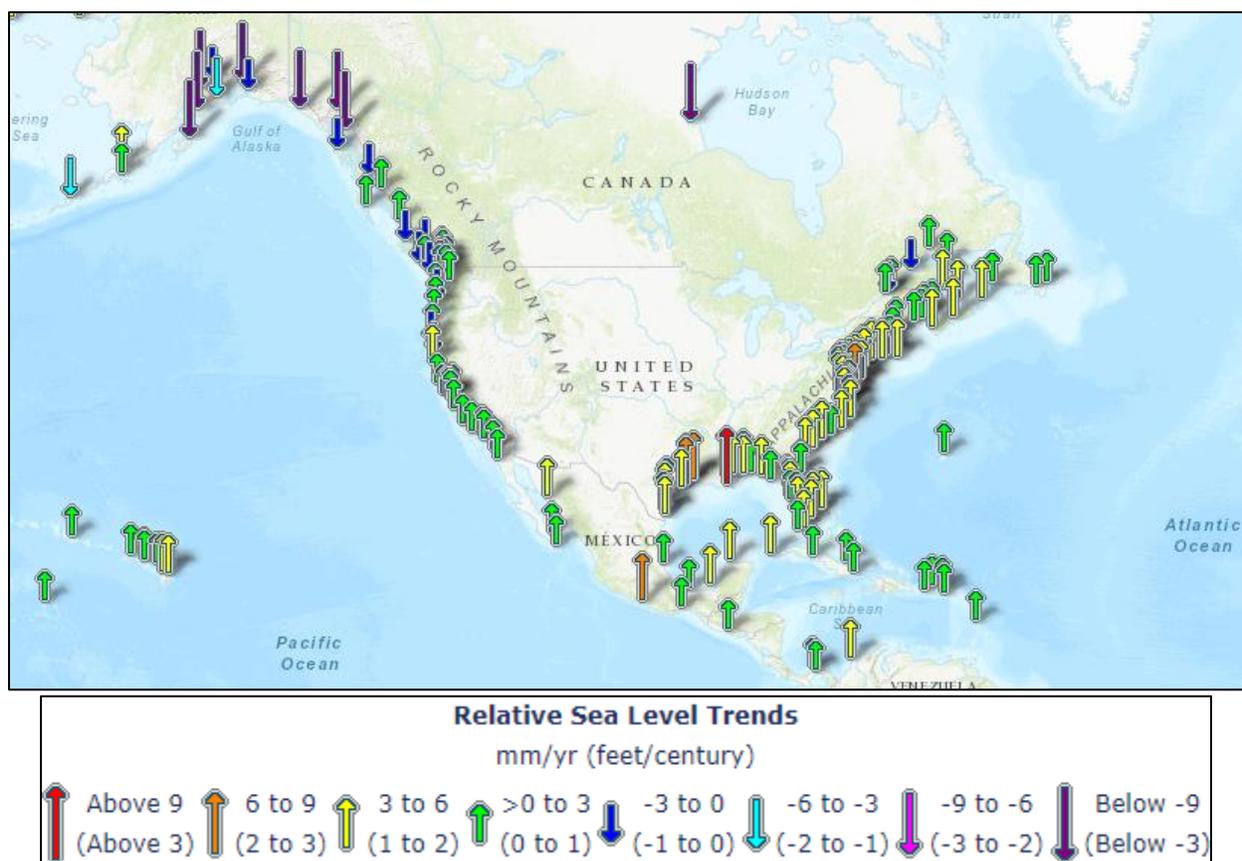
¹⁴⁸ NOAA (2018). What Is the Difference Between Local Sea Level and Global Sea Level? <https://oceanservice.noaa.gov/facts/sealevel-global-local.html>

¹⁴⁹ About 60.2M Live in Areas Most Vulnerable to Hurricanes. Census.gov. <https://www.census.gov/library/stories/2019/07/millions-of-americans-live-coastline-regions.html>

¹⁵⁰ Union of Concerned Scientists, 2017. When Rising Seas Hit Home. [When Rising Seas Hit Home | Union of Concerned Scientists \(ucsusa.org\)](https://www.ucsusa.org/when-rising-seas-hit-home)

According to the National Oceanic and Atmospheric Administration’s 2022 “Sea Level Rise Scenarios” report, the Gulf of Mexico and the eastern United States will see the worst impacts of sea level rise. The report states that over the next 30 years, the sea level will rise about a foot on average, with the western Gulf of Mexico being hit the hardest.¹⁵¹ Researchers suggest that “subsidence leads to the highest rates along the Gulf Coast, driven by regional and local factors, such as river sediment compaction and withdrawal of subsurface fluids.” It is also noted that as sea levels continue to rise, coastal water levels, from the mean to the extreme, are growing deeper and reaching farther inland along the U.S. coastlines. For example, minor high-tide flooding is accelerating and is now double what it was in 2000, as shown in the following figure.

Figure 3.44: Local Sea Level Trends¹⁵²



As an example, Grande Isle, Louisiana, is rising at 9 mm/year, followed by New Canal at 6.25 mm/year. Galveston, Texas, is rising at 6.62 mm/year. Alabama is seeing a rise of 4.79 mm/year in Mobile, and Dauphin Island is seeing a 4.25 mm/year rise.

¹⁵¹ Global and Regional Sea Level Rise Scenarios for the United States. NOAA Report. <https://aambpublicoceanservice.blob.core.windows.net/oceanserviceprod/hazards/sealevelrise/noaa-nos-techrpt01-global-regional-SLR-scenarios-US.pdf>

¹⁵² Tides & Currents: Sea Level Trends. NOAA. <https://tidesandcurrents.noaa.gov/sltrends/sltrends.html>

Figure 3.45: High-Tide Flooding and Relative Sea Level)¹⁵³

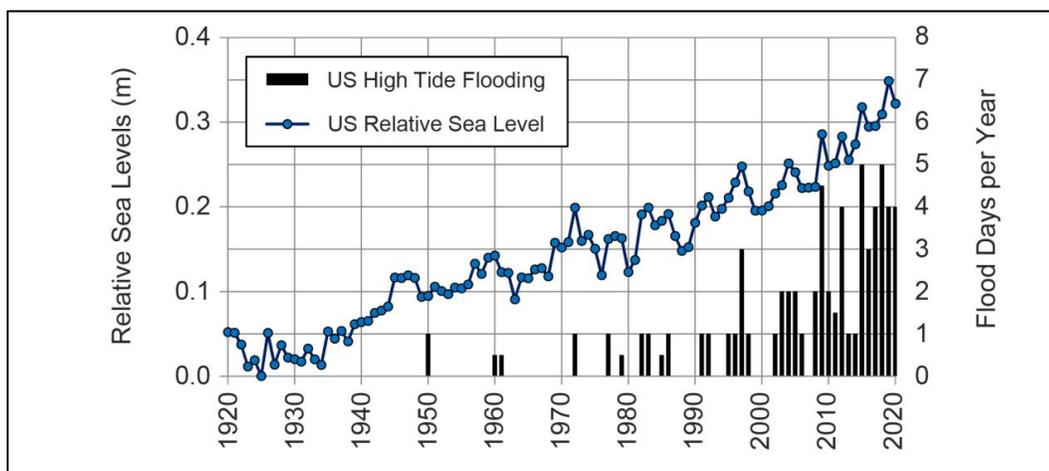
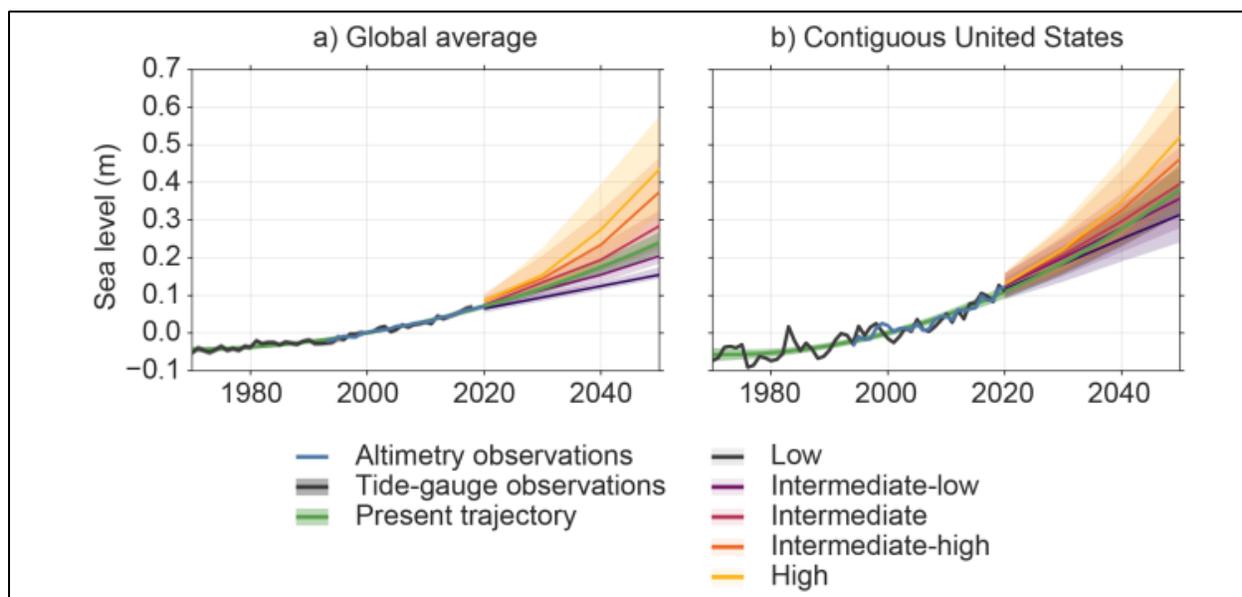


Figure 3.46: Observation-Based Extrapolations for Sea Level Rise¹⁵⁴



The Port of Mobile is an essential driver of Alabama's state and regional economies. Located on the western shore of Mobile Bay at the confluence of several rivers flowing into the Gulf of Mexico, the port has both an inland waterway and ocean access. Essential commodities handled at the port include coal, petroleum products, iron and steel, paper, aluminum, and perishable foodstuffs. In 2019, more than 8,900 vessels called at the Port of Mobile, and the cargo throughput exceeded

¹⁵³ Global and Regional Sea Level Rise Scenarios for the United States. NOAA Report. <https://aambpublicoceanservice.blob.core.windows.net/oceanserviceprod/hazards/sealevelrise/noaa-nos-techrpt01-global-regional-SLR-scenarios-US.pdf>

¹⁵⁴ Ibid

56 million short tons.¹⁵⁵ According to the Alabama State Port Authority, the port has a total economic value of \$26.8 billion and supports more than 161,000 direct and indirect jobs.¹⁵⁶

3.2.10.1.2 Coastal Land Loss

Coastal land loss is the permanent loss of low-lying coastal land and is the final step in the transition from dry land to open water. Local sea level rise contributes to coastal land loss, but it is not the only factor determining the location and extent of this transition. Coastal environments are complex and dynamic systems shaped by interacting natural and human factors, and many of these factors play a role in coastal land loss. The natural factors at play include erosion, reductions in sediment supply, and wetland deterioration, while the human factors include sediment excavation, river modification, and coastal construction.

3.2.10.1.3 Coastal Ecosystem Transformation

Coastal ecosystems provide many valuable services, from supporting tourism to protecting the built environment from storm surges and waves. Unfortunately, human activities are already significantly stressing these ecosystems, and rising local sea levels will exacerbate these stresses.¹⁵⁷

For example, as the local sea level rises, marshes will migrate landward. However, if the uplands are developed and unavailable for migration, the marsh could drown. The loss of coastal ecosystems represents an aesthetic and cultural loss as well as a substantial economic loss. In many coastal communities, commercial fisheries, recreation, and tourism are essential components of the local economy—and Alabama is no exception.

3.2.10.2 Nature of the Hazard in Alabama

Based on historical records for the past 20 years, the observed sea level rise and coastal change in Alabama ranged in magnitude/rise from 4.25 mm/year to 4.79 mm/year. Alabama has 60 miles of shoreline along the Gulf of Mexico, and the tidal shoreline that borders all of the coastal bays, rivers, and bayous in Mobile and Baldwin Counties reaches another 600 miles. The shoreline around Mobile County accounts for approximately 100 miles. Baldwin County alone generates more than \$2 billion in tourism revenue annually and employs more than 50,000 people. The coast of Alabama is a top tourist attraction, so sea level rise and coastal changes can affect more than just the environment; they also affect the state's economy. Sea-level fluctuations, waves,

¹⁵⁵ USDOT Port Calls Report.

<https://explore.dot.gov/views/PortProfiles2020/ProfileDashboard?%3Aembed=y&%3AisGuestRedirectFromVizportal=y>

¹⁵⁶ Alabama State Port Authority: Business. <https://www.alports.com/business/>

¹⁵⁷ Moser, S. C., M. A. Davidson, P. Kirshen, P. Mulvaney, J. F. Murley, J. E. Neumann, L. Petes, and D. Reed (2014). Ch. 25: Coastal Zone Development and Ecosystems. In *Climate Change Impacts in the U.S.: The Third National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, pp. 579–618.

erosion, and deposition are among the many geologic processes that continue to shape the Alabama shoreline today.¹⁵⁸

Local sea level rise along the Gulf Coast is occurring more quickly than the global average because of relatively high land subsidence rates. The best-understood cause of land subsidence along the Gulf Coast is the long-term rebound of the earth's crust following the retreat of the glaciers. This phenomenon is known as glacial isostatic adjustment. Glacial isostatic adjustment throughout the Gulf of Mexico is driving land subsidence at a rate of at least 0.4 mm/year.¹⁵⁹

While geological interpretations, seismic campaigns, and flow modeling often provide a relatively rich knowledge and understanding of the driving mechanisms for production, induced subsidence is still poorly understood, and forecasts are often very uncertain. This is related to the multiple poorly constrained models that translate gas production to ground surface displacements. Fluid extraction is most likely to contribute to land subsidence in areas where the density of oil and gas wells is highest and where the geotechnical properties of the substrate are most conducive to compaction. The following figure shows the location of oil and gas wells relative to the location of substrates prone to compaction. This map is based on a USGS karst map (2004) showing the location of thick, unconsolidated sediments with signs of subsidence.¹⁶⁰ With this overlay, the southern portions of Baldwin County are likely to experience subsidence caused by fluid extraction.

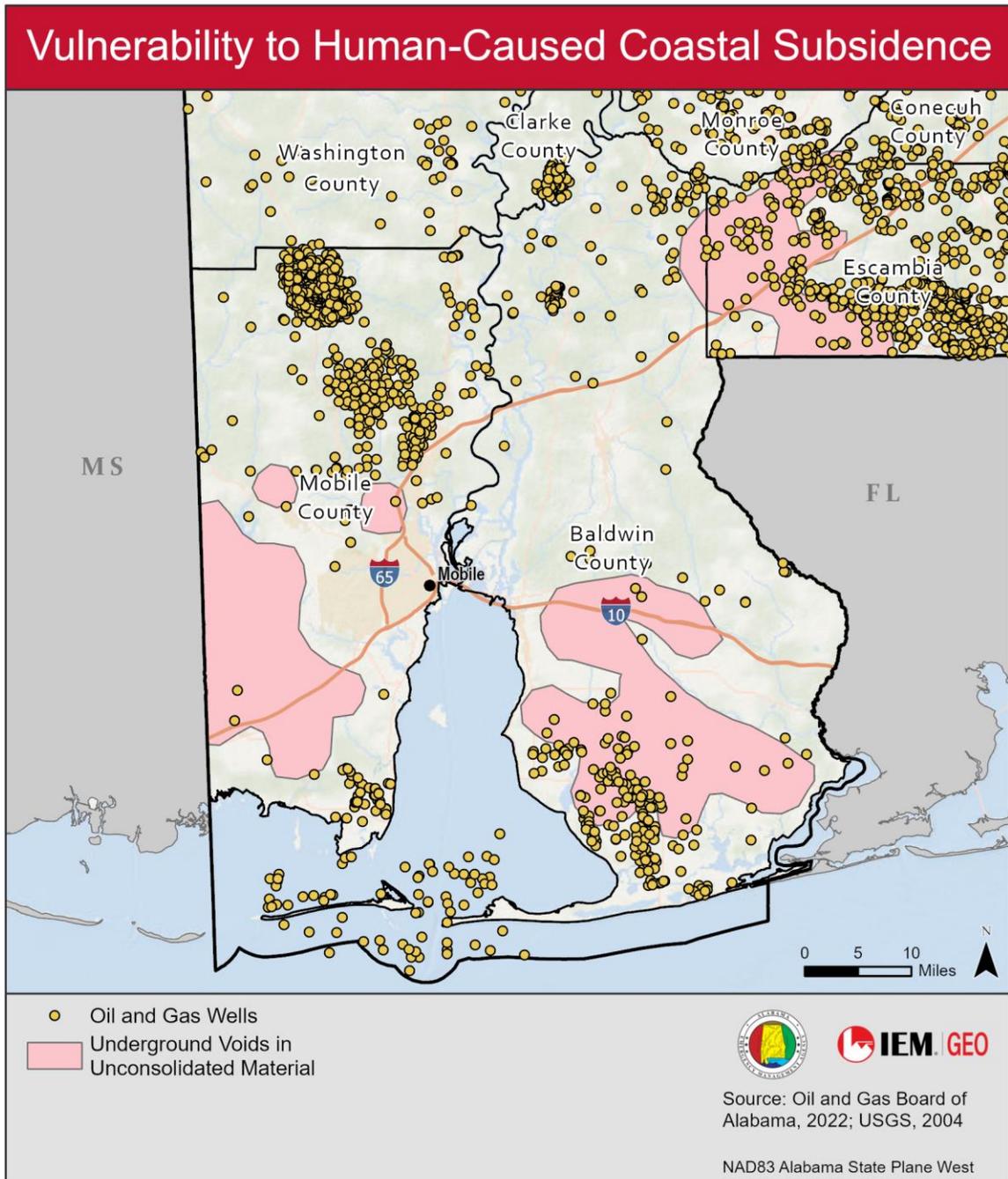
¹⁵⁸ Alabama's Coastline. Alabama Encyclopedia

¹⁵⁹ Subsidence and Coastal Geomorphic Change in South-Central Louisiana. USGS.

<https://www.usgs.gov/centers/spcmssc/science/subsidence-and-coastal-geomorphic-change-south-central-louisiana>

¹⁶⁰ U.S. Geological Survey (2004). Engineering Aspects of Karst. Open-File Report 2004-1352, Retrieved at: https://pubs.usgs.gov/of/2004/1352/data/USA_karst.pdf

Figure 3.47: Vulnerability to Human-Caused Coastal Subsidence

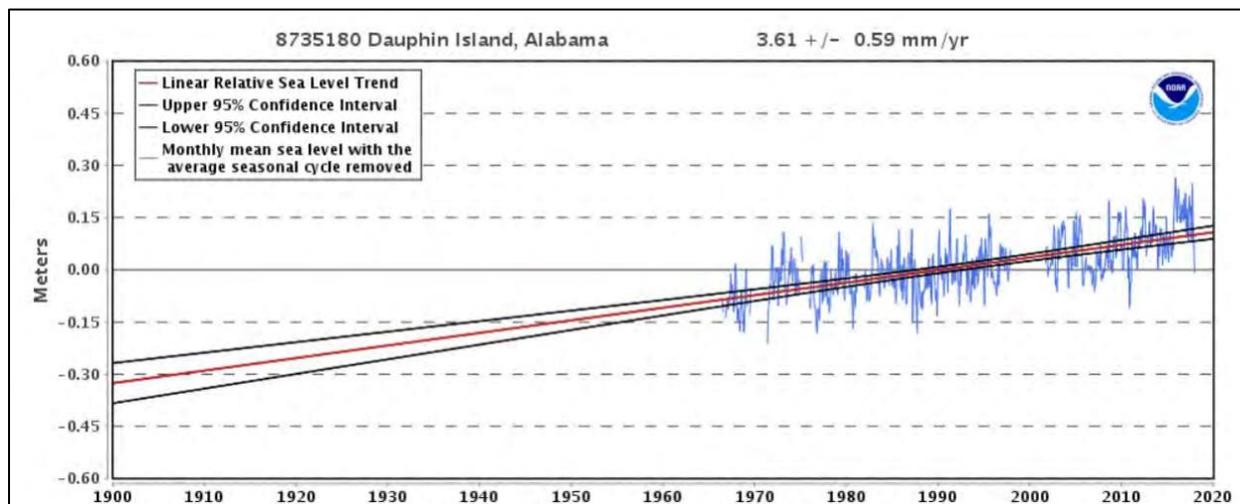


3.2.10.3 Sea Level Rise History in Alabama

NOAA tracks local sea level rise through its National Water Level Observation Network (NWLON). This network includes nine tide stations in Alabama. Only the Dauphin Island and Mobile State Docks, however, have records long enough to detect long-term trends in local sea levels. The

following figure shows the long-term trend in mean sea level measured by the station at Dauphin Island.

Figure 3.48: Dauphin Island Sea Level Trend (NOAA, 2018)



Based on a comprehensive analysis of observed sea levels, NOAA determined that local sea levels at Dauphin Island are rising at an average rate of 3.61 mm/year (with a 95% confidence interval of +/- 0.59 mm/year), while local sea levels at the Mobile State Docks are rising at an average rate of 3.45 mm/year (with a 95% confidence interval of +/- 1.62 mm/year). These local trends exceed the global average of 1.7 mm/year but are lower than some of the local trends observed in Louisiana and Texas. By separating the various components of local sea level rise, NOAA has also developed estimates of the rate of vertical land motion for the tide stations with the longest records. Based on data collected between 1966 and 2006, the land surface at the Dauphin Island station was estimated to be subsiding at an average rate of 1.22 mm/year.¹⁶¹

3.2.10.4 Probability of Sea Level Rise in Alabama

The probability of a Sea Level Rise and coastal change event impacting the State of Alabama in any given year is Highly Likely. NOAA's 2022 Sea Level Rise Technical Report projects that through the year 2150, the Gulf Coast will see a rise of 14–18 inches, the highest among all the U.S., Caribbean, and Hawaiian Islands. Since the 2017 report, the confidence level has increased because of sea-level science advances. As a result, coastal flooding caused by tide and storm surge heights will increase and move farther inland, causing damaging flooding to occur more than 10 times as often as it does today. Major flooding is expected to occur five times as often as it does today, or 0.2 events per year as compared to 0.04 events per year now. Should emissions not be curtailed, the sea level rise in 2100 is projected to be approximately 2 feet.

Sea level rise is a certainty along the Alabama coast. Questions to ask in assessing the hazards posed by local sea level rise include the following:

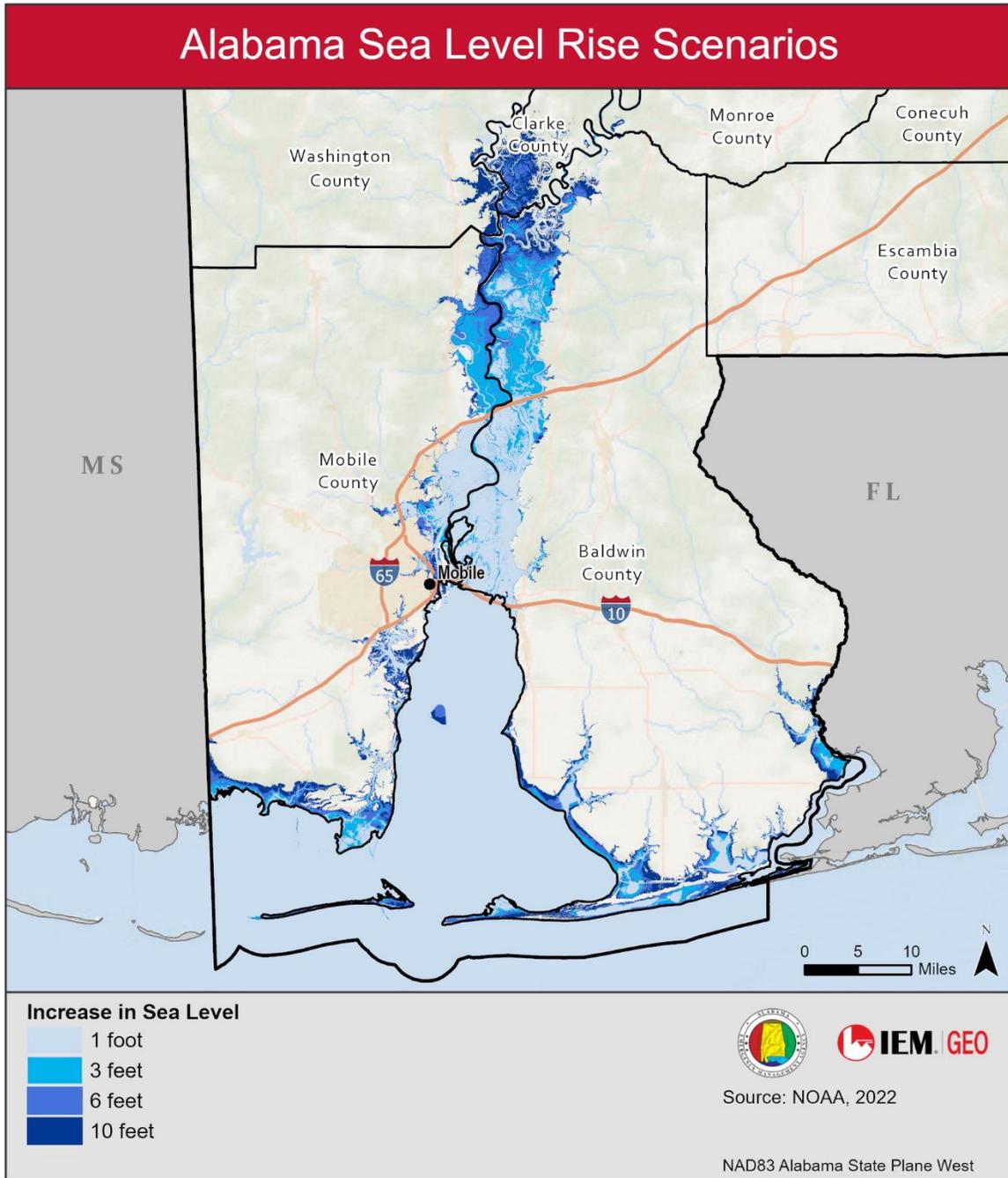
¹⁶¹ NOAA, 2018. Sea Level Trends. <https://tidesandcurrents.noaa.gov/sltrends/>

- How quickly is the local sea level expected to rise?
- How much time do coastal communities have to prepare for the various levels of coastal change (i.e., nuisance flooding, chronic inundation, and coastal loss)?

While much of the projections from the NOAA 2022 Sea Level Rise Technical Report can help answer the above questions, it also depends on the future rate of local land subsidence and how emissions are reigned in. Human activities can stress the trajectories of land subsidence and emissions on natural systems as well as the responses of those systems. How quickly will land-based glaciers and ice sheets melt? How aggressively are underground oil, gas, and water resources extracted, and how quickly do regional land elevations fall? These additional questions are important as the Gulf Coast faces higher sea level rise and coastal changes compared to other areas.

Translating the local sea level rise rate in Alabama into the amount of time that coastal communities must prepare for different levels of coastal change would require complex, high-resolution analyses beyond the scope of this hazard mitigation plan. However, a safe guess is that now would be a good time if they have yet to start. In addition, permanent submergence is costly and disruptive in its impacts. The figure below shows the scenarios for sea level rise in Alabama up to 10 feet of water.

Figure 3.49: Alabama Sea Level Rise Scenarios



3.2.10.4.1 Future Probability

The probability, location, intensity and impacts of hazards will change over time. Climate change, including changes in temperature, intensity, hazard distribution or frequency of weather events, may increase vulnerability to these hazards in the future. Based on historical knowledge

and current conditions, it can be expected that all hazards will see a rise in scope, scale, and frequency of events on a yearly basis.

Sea level rise is a gradual process that happens over time. It might be easier to plan for if it were an episodic event. Unfortunately, future change in this hazard is projected to get worse, culminating in over a foot of sea level rise by 2050 and 2 feet by 2100 in the Gulf areas, with the level of certainty growing due to scientific gains. This will forever change the coastline as we know it.

3.2.10.4.2 Risk and Vulnerability

A detailed assessment of vulnerability to sea level rise in Alabama is provided in Section 3.3.

Lifelines- Sea level rise- Food, Water and Shelter, and Transportation

Though sea level rise occurs slowly, providing ample time for solutions, this will still affect coastal communities and communities further inland over time. Food, water, and shelter will all be reduced, with the land being displaced by water. Crops will be unable to grow, and homes will be moved, potentially causing overcrowding of communities and more stress placed upon food supplies and medical services. Transportation routes will be cut off, and alternative routes will need to be created so as not to interrupt the delivery of services and goods.

3.2.10.5 Consequence Analysis

Sea level rise and coastal change are slow-moving phenomena. Although it is happening, it is happening at a pace that, to date, the State of Alabama has been able to manage. The areas along the coast are the most susceptible, and as time goes on, the sea level rise will continue to move the built environment inland and change the shape of the coastline forever. This change could have effects on tourism and development and affect Alabama's revenue.

The information in Table 3.59 provides the consequence analysis of the potential for detrimental impacts of sea level rise and coastal change done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.59: EMAP Consequence Analysis: Sea Level Rise and Coastal Change

Subject	Ranking	Impacts/Sea Level Rise and Coastal Change
Health and Safety of Persons in the Area of the Incident	Minimal	Health and safety impacts will be minimal. The slow rise of sea level and coastal change will allow for the movement of people out of harm's way.
Responders	Minimal	The impact on responders will be minimal due to the slow nature of the hazard.
Continuity of Operations	Minimal	There is a minimal expectation for the execution of the COOP.

Subject	Ranking	Impacts/Sea Level Rise and Coastal Change
Property, Facilities, and Infrastructure	Moderate to severe	Facilities and infrastructure will be affected by sea level rise and coastal change; however, due to the slow nature of the hazard, the built environment can be prepared for the coming change.
Delivery of Services	Minimal	As time goes on, delivery of services will accommodate sea level rise and coastal change.
Environment	Moderate to severe	The environmental impacts in the immediate area could be severe, with marshes drowning and changes affecting wildlife and vegetation.
Economic Conditions	Moderate to severe	Impacts on the economy in the immediate area will be severe, affecting tourism, the fishing industry, and the revenue of Alabama as a state.
Public Confidence in Jurisdiction's Governance	Minimal	Public confidence will be maintained as long as government jurisdictions show that steps are being taken to accommodate the hazard.

3.2.11 Sinkholes and Land Subsidence

3.2.11.1 Description

Subsidence is a common hazard globally and in the United States, particularly in areas under water-soluble rocks such as evaporite and carbonate, typical of karst terrain. Land subsidence is most often caused by human activities, such as the removal of subsurface water. Other issues that can cause subsidence are aquifer-system compaction, drainage of organic soils, underground mining, hydro compaction, natural compaction, sinkholes, and thawing permafrost. Subsidence also occurs when the ground above a manmade or natural void collapse, resulting in a surface depression referred to as a sinkhole. These can be localized events or slow, regional lowering of the land surface. Whether gradual or catastrophic, any subsidence is a risk to public safety and property.

More than 17,000 square miles in approximately 45 states have been directly affected by this hazard in the United States. In addition, land subsidence is an often-overlooked environmental consequence of our land and water practices, creating even further subsidence issues.

For the purposes of this hazard, this section will focus on land subsidence associated with mining and sinkholes.

There are four major categories associated with the development of sinkholes and subsidence:¹⁶²

- **Dissolution sinkholes:** These are caused by dissolving rock. Rainwater is naturally acidic, becoming even more acidic once it hits vegetation. As this acidic water flow moves through preexisting openings such as along joints and fractures and in the zone of water-table

¹⁶² Sinkholes. USGS. <https://www.usgs.gov/special-topics/water-science-school/science/sinkholes>

fluctuation where groundwater is in contact with the atmosphere, the rock it encounters dissolves. As the dissolving continues, the cracks and crevices become more extensive, leading to caves and caverns until the cover weakens and a sinkhole develops.

- Cover-subsidence sinkholes: These develop gradually where covering sediments are permeable and contain sand.
- Cover-collapse sinkholes: These occur where the covering sediments contain a large amount of clay. They can develop abruptly and cause massive damage.
- Human-induced subsidence and sinkholes: These are found near groundwater pumping and construction or development practices. An example is pumping water from an aquifer. Aquifer systems are balanced by groundwater fluid pressure. When pumping is done for urban water supply and irrigation, it can upset this delicate balance and result in sinkholes in sinkhole-prone areas. In addition, oil extraction can result in sinkholes due to the resulting sediment compaction.

The potential for sinkholes is most significant in areas of terrain referred to as karst. Karst topography is a conglomerate of closed depressions, sinking streams, and cavern openings and is usually underlain by rocks that are easily dissolved by water, such as carbonates, sulfates, and halides. However, this terrain can also develop through processes other than the dissolution of stones that create underground voids.

While sinkholes are a naturally occurring process, the built environment can add to the problem. When groundwater conditions are altered, such as by pumping aquifers for irrigation, sinkholes can appear in susceptible areas. Constructing heavy buildings on weak topographical areas can also cause sinkholes. Climate and climate change contribute to sinkhole development through increased drought conditions and storm intensity.

Areas prone to sinkholes cover a large area of the United States; however, the areas with the most damage from sinkholes tend to occur in Florida, Texas, Alabama, Missouri, Kentucky, Tennessee, and Pennsylvania.

Figure 3.50: Sinkhole Data (GSA)¹⁶³

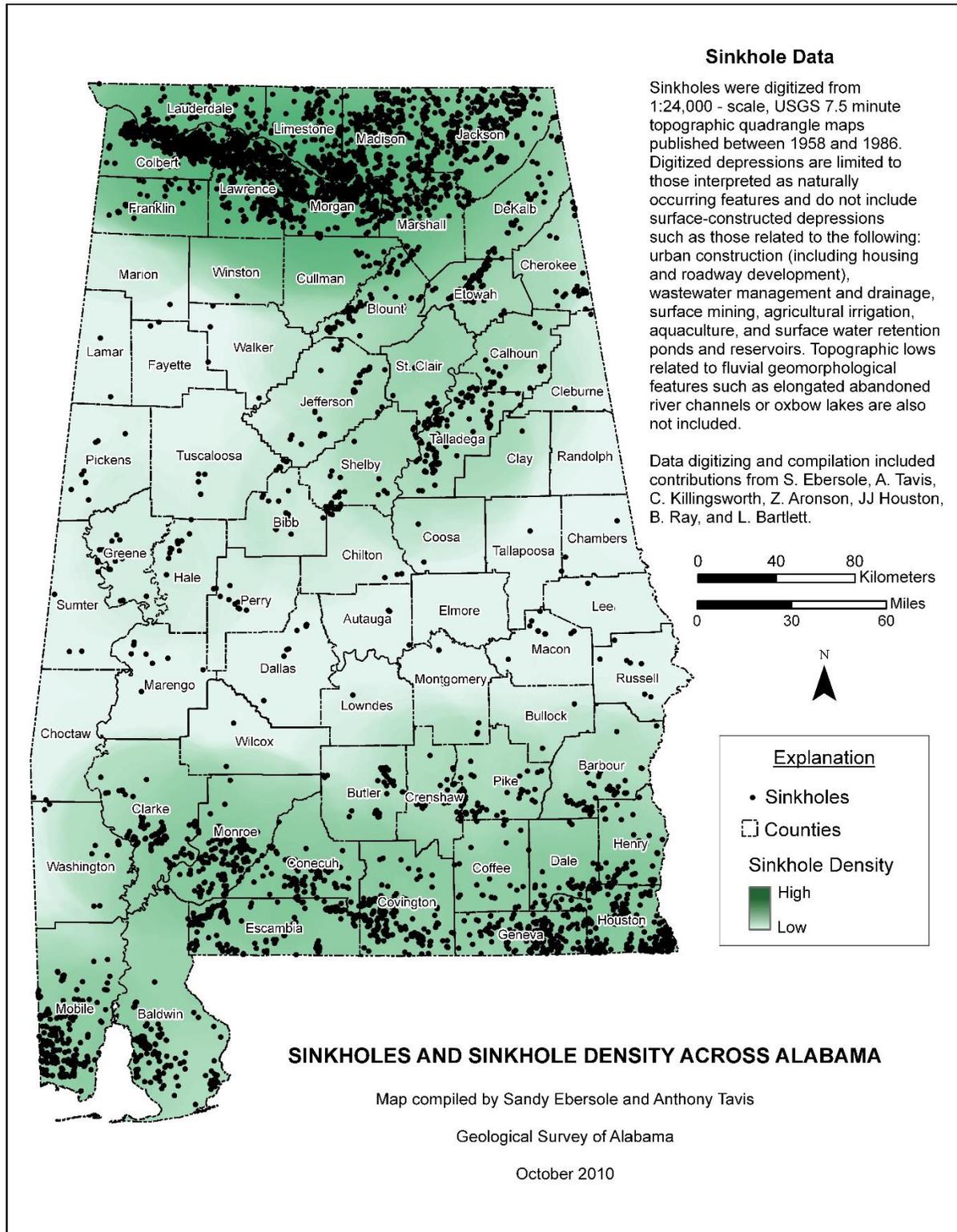
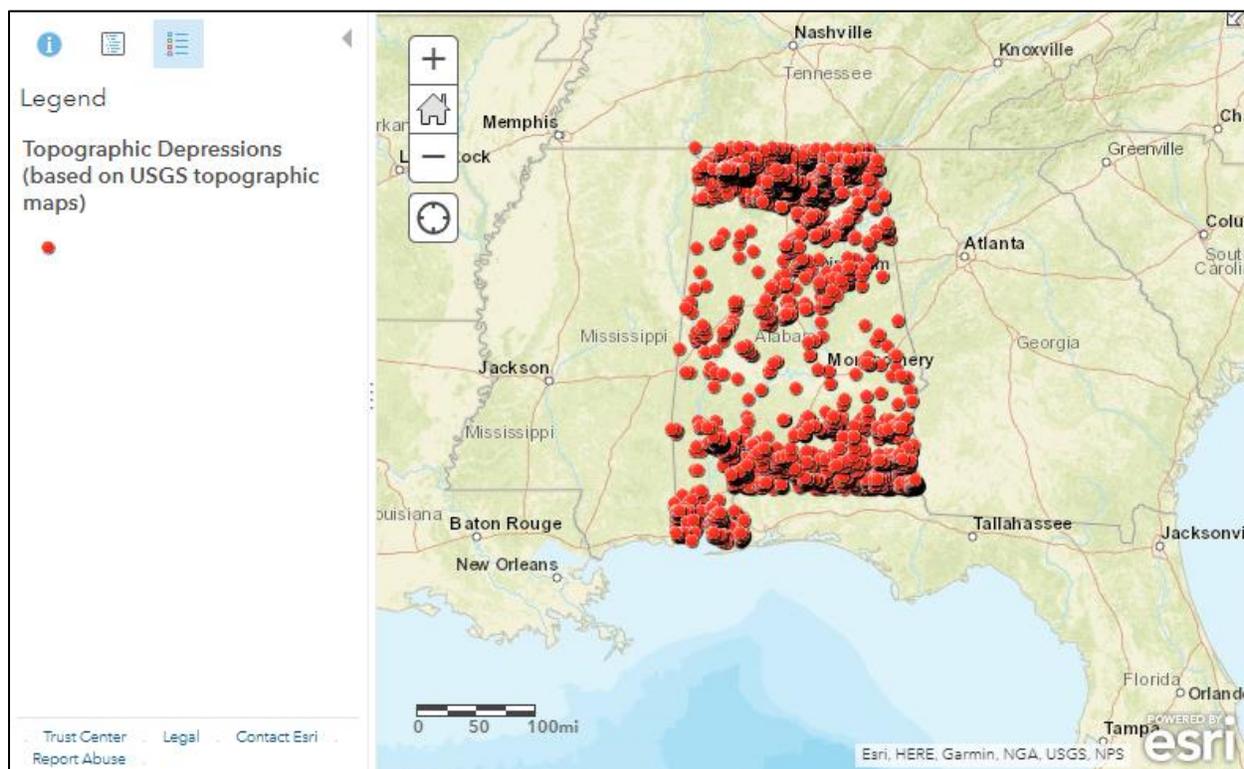


Figure 3.51: Topographic Depressions Related to Sinkholes and Mine Subsidence (GSA)¹⁶⁴



3.2.11.2 Nature of the Hazard in Alabama

Based on historical records for the past 20 years, the observed sinkhole and land subsidence events in Alabama ranged in magnitude with heavy bands of karst areas in both the northern and southern parts of the State. Per the Geological Survey of Alabama, “the most common causes of land subsidence are the development of sinkholes in areas underlain by soluble carbonate rocks or ground collapse above abandoned mines. Many areas of the state, particularly north Alabama, are underlain by carbonate rocks, such as limestone, which are susceptible to dissolution and the formation of caves and sinkholes.” Figure 3.51 shows sinkholes and mine subsidence across Alabama, and 3 sinkholes and other ground depressions in karst areas related to sinkholes or depressions related to mine subsidence.¹⁶⁵

Karst topography is the makeup of sinkholes, springs, and cave openings, of which Alabama has many, as seen in the figure above. These underground voids vary in size from small fissures and tubes to large caves and caverns. For underground voids caused by the dissolution of soluble rock, the number and size of solution features tend to be larger at lower latitudes and in younger rocks. Large caves increase the potential for sinkhole collapse and gradual subsidence; solution tubes can lead to subsidence, flooding of excavations, leaks in reservoirs, and weakening

¹⁶³ Ibid.

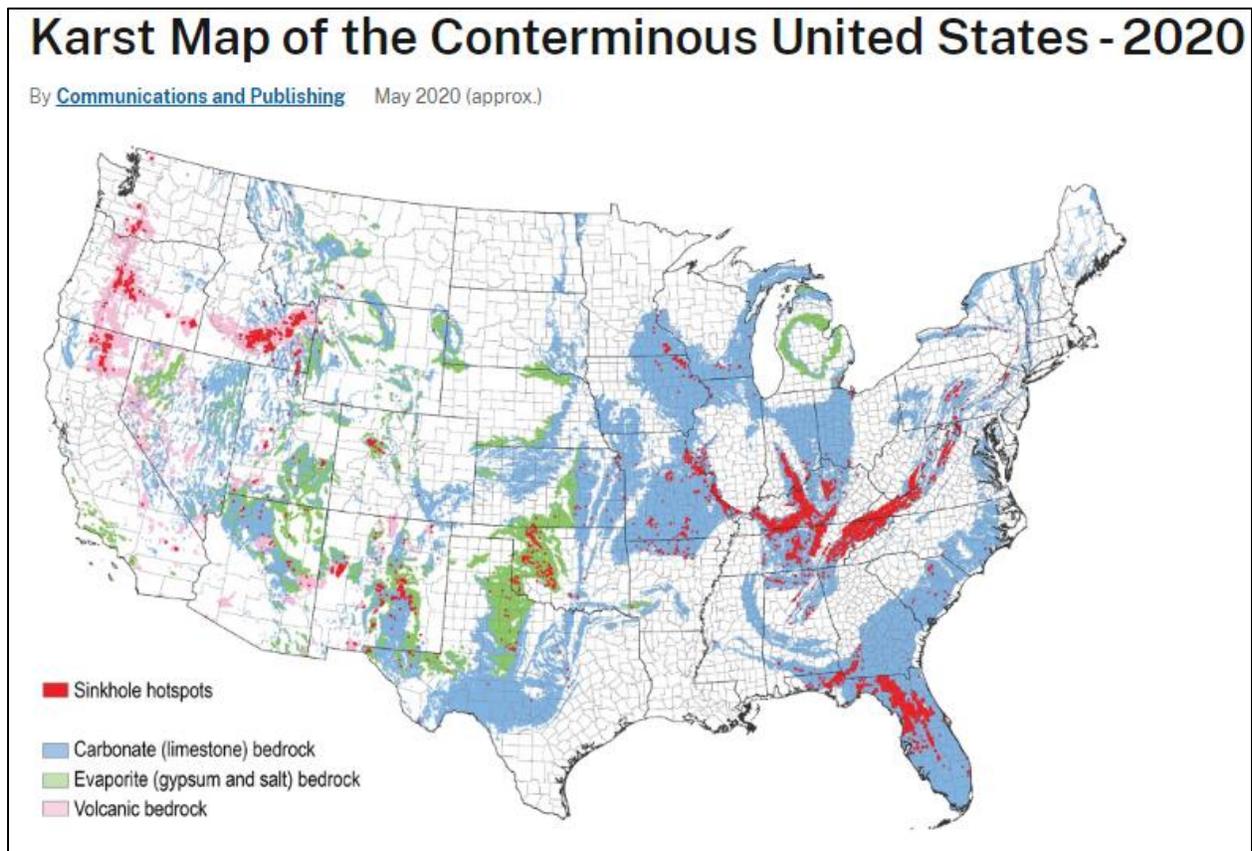
¹⁶⁴ Ibid.

¹⁶⁵ Ibid

retaining walls. In addition, solution fissures can lead to leaks in reservoirs and instability in cuts, bridge abutments, piers, and dam foundations and abutments.

The longest karst topographic feature in the state is the Newsome Sinks area in Morgan County, which is a little over 4 miles long. Lying underneath is the Mississippian-era Bangor Limestone. Newsome Sinks is a part of the Tennessee-Alabama-Georgia karst area referred to as TAG, one of the densest karst areas in the United States, as shown in the following figure. In addition, the map shows carbonite and evaporite bedrock, along with sinkholes in karst areas.

Figure 3.52: U.S. Karst Map



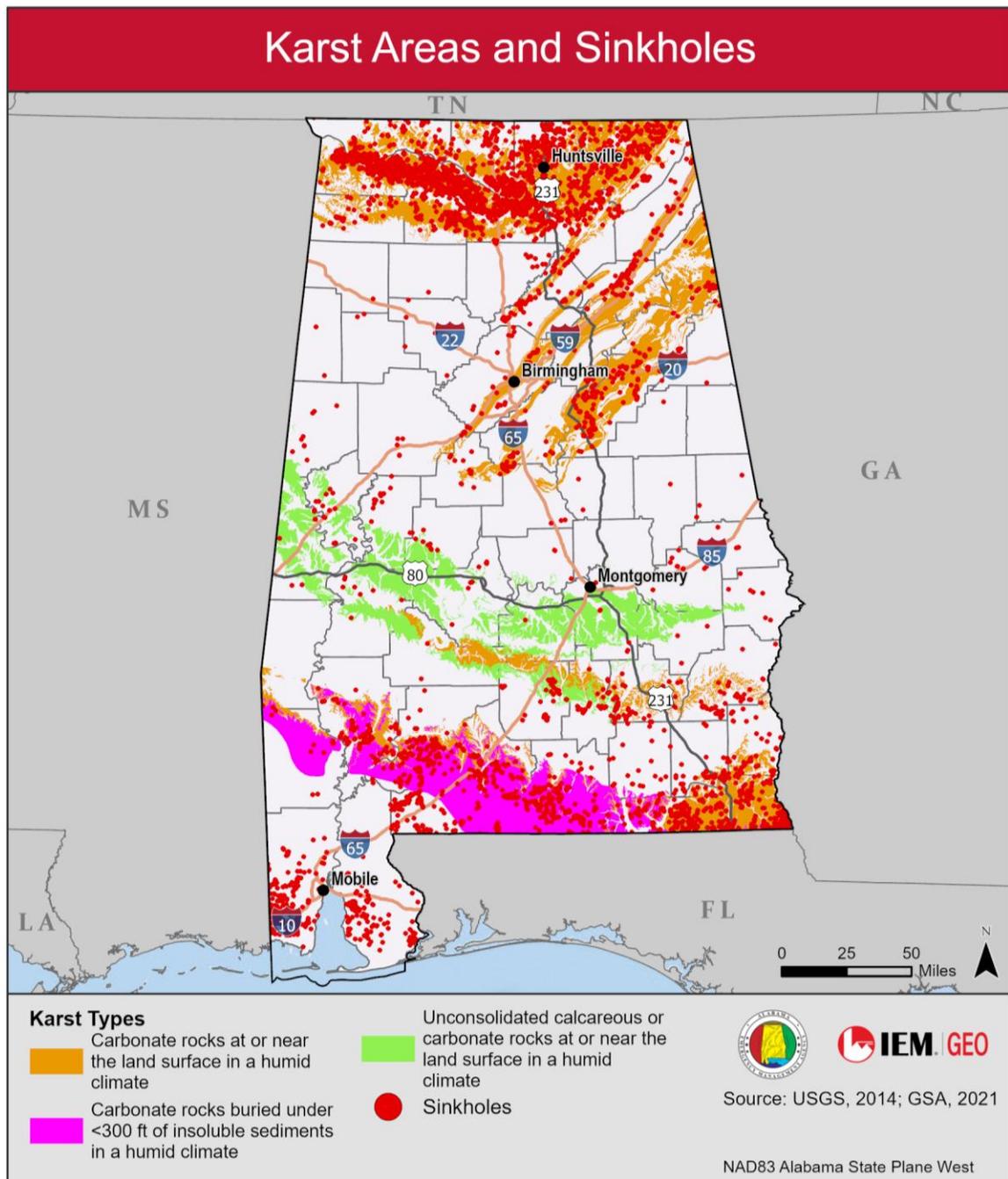
The largest sinkhole in Alabama is located near Calera in Shelby County. The Golly Hole is 325 feet long, 300 feet wide, and 120 feet deep. The sinkhole occurred due to drought conditions when the underground water table was low. Underlain by soft limestone, this area of Shelby County has a known sinkhole history.

Figure 3.53: Golly Hole, Shelby County



The band of karst areas in the state's center consists mainly of unconsolidated calcareous or carbonate rocks and tends to be least prone to sinkhole development. The karst areas in the Coastal Plain consist mainly of carbonate rock buried deeply beneath insoluble sediments. These areas are prone to broad, slowly developing, shallow sinkholes. The karst areas in the northern part of the state can be prone to sudden sinkhole collapse. In the Valley and Ridge and Cumberland Plateau physiographic sections, sinkholes are often related to carbonate geology with and without complex structures and faults. In the Highland Rim and northern Cumberland Plateau physiographic sections, cave density and sinkhole density are well correlated, with some sinkholes connected to caves in deep vertical shafts. The north section of Alabama includes some of the state's most populous areas, such as Huntsville, and is among the most intensely developed karst areas in the United States. The following figure illustrates the karst terrain and active sinkholes in Alabama.

Figure 3.54: Karst Terrain and Sinkholes in Alabama



Localized subsidence is also common in those areas of the state underlain by abandoned coal and iron mines. Pillars left for roof support in the mines generally deteriorate over time and eventually collapse, removing support. This is mainly a problem where mines underlie more recently developed residential areas and roads. Abandoned coal mines in Alabama are concentrated in the northeast and central Alabama, especially in areas underlain by the Pottsville Formation geologic unit.

As mentioned in this section, groundwater withdrawal is an important driver of sinkhole development in Alabama. A previous study estimated that more than 4,000 human-induced sinkholes and areas of subsidence have occurred in Alabama since 1900.¹⁶⁶ Most have occurred since 1950, and most have resulted from a decline in the water table associated with groundwater withdrawals. Sinkholes related to wells tend to be located within 150 meters of the withdrawal site. In comparison, sinkholes related to quarry operations tend to be found within 600 meters of the withdrawal site. Recent sinkholes associated with groundwater withdrawal have ranged from 1 to 90 meters in diameter and 0.3 to 30 meters in depth.¹⁶⁷

3.2.11.3 Sinkholes and Land Subsidence History in Alabama

As the population in Alabama continues to expand, the problem of sinkholes will increase. In addition, as water demand for agricultural production continues to increase, the state is seeing more sinkhole growth associated with groundwater withdrawals. Recent years have seen sinkholes reported throughout the state, and periods of drought have aggravated the problem.

Alabama does not maintain a statewide real-time or near real-time record or reporting system of sinkhole or subsidence events in the state; however, GSA has developed a map of sinkholes, prepared by examining the 1:24,000-scale topographic maps published by the USGS between the years 1938 and 1987, and by identifying all topographic depressions that were likely produced by naturally occurring sinkholes.

Sinkholes affect all states to varying degrees; however, Alabama ranks among the top seven states in terms of the costliest sinkhole damages. Collapses have occurred beneath highways, streets, railroads, buildings, sewers, gas pipelines, and vehicles—to name a few examples. The cost of road repairs related to sinkhole development demonstrates the considerable damage that sinkholes can cause. For example, in 2013, a sinkhole affecting the northbound lane of Interstate 65 in Morgan County cost \$1.2 million to repair. Other sinkhole repairs costing hundreds of thousands of dollars have occurred along Interstate 59 in Birmingham, near Regions Field in Birmingham, and along Weaver Road in Anniston.

Table 3.60: Alabama’s Most Widely Reported Sinkhole Events

Date	Location	Description
1972	City of Calera, Shelby County	A large sinkhole developed near Calera in a matter of seconds in December 1972. The sinkhole is about 425 feet long, 350 feet wide, and 150 feet deep. Called the “December Giant” or the “Golly Hole,” the sinkhole is the largest on record in the United States. This sinkhole occurred during a drought when the water

¹⁶⁶ Newton, J. G. (1976). Induced and Natural Sinkholes in Alabama—A Continuing Problem Along Highway Corridors, in *Subsidence over Mines and Caverns, Moisture and Frost Action, and Classification*: National Academy of Science Transportation Research Rec. 612, pp. 9–16.

¹⁶⁷ Poland, J. F., & International Hydrological Programme. (1984). *Guidebook to Studies of Land Subsidence Due to Groundwater Withdrawal*. Paris: UNESCO.

Date	Location	Description
		table was much lower than normal. This was discovered by hunters two days after someone reported hearing a roaring noise, trees breaking, and his house shaking.
1990	Hale County	In 1990, a sinkhole formed in Hale County. An oil and gas drill rig had reached a depth of 755 feet when the drilling fluid was lost in the hole. In two hours, unconsolidated sediments overlying carbonate rock sank into subsurface cavities, carrying the drill rig downward with them. The weight of the fluids in the adjacent mud pit facilitated the rapid downward movement of the sediments. Another well was successfully drilled across the road to a total depth of 12,000 feet.
Late 1990s	City of Trussville, Jefferson County	Trussville provides a prime example of sinkholes' impact on a growing community where land and groundwater are in great demand. Sinkholes first formed beneath and around the Trussville Middle School, forcing its closure and rebuilding at another site. Sinkholes continued to form in nearby parks and neighborhoods and drained a pond. Damage has been estimated to be in the millions of dollars.
2007	City of Madison, Madison County	During an extreme drought in northern Alabama, a sinkhole formed beneath the corner of a house in a new subdivision, and the house tipped into the depression. More than \$100,000 was spent to repair the home and protect it from future impacts.
2008	City of Birmingham, Jefferson County	In January 2008, a homeowner in Bush Hills lost his house when a massive sinkhole swallowed it. The sinkhole was 75 feet wide at its widest and 30 feet deep.
2013	City of Hartselle, Morgan County	A sinkhole measuring 4 feet deep, and 3 feet wide developed in the southbound lane of Interstate 65. An emergency lane closure was implemented while crews repaired the highway. Road closures for sinkhole repair are common in northern Alabama.
2019	Highway 53 north of Huntsville	A sinkhole opened on Alabama Highway 53 north of Huntsville, reducing northbound traffic to just one lane. The hole, located on the shoulder of the highway, is about 7½ feet wide and 12 to 14 feet deep.

3.2.11.4 Probability of Sinkholes and Land Subsidence in Alabama

The probability of a Sinkhole and land subsidence event impacting the State of Alabama in any given year is Highly Likely. Due to the lack of reporting on sinkholes and land subsidence in Alabama, it is not easy to ascertain the frequencies or return periods. However, based on the geographical terrain of Alabama and the historical events, there is a high probability that sinkholes will continue to plague the state. The karst areas in the northern part of the state, in the Valley and Ridge and Cumberland Plateau provinces, are the most prone to sinkholes.

3.2.11.4.1 Future Probability

The probability, location, intensity and impacts of hazards will change over time. Climate change, including changes in temperature, intensity, hazard distribution or frequency of weather events, may increase vulnerability to these hazards in the future. Based on historical knowledge and current conditions, it can be expected that all hazards will see a rise in scope, scale, and frequency of events on a yearly basis.

Future climate change could impact the processes that tend to accelerate sinkhole development. As storms are forecast to be more intense, acidic rain will assuredly seep into crevices and other areas and exacerbate the problem. Added to severe storms are increased drought conditions and groundwater withdrawals, both of which can remove the support provided by water pressure and upset the balance of these delicate systems, resulting in the collapse of underground voids. As a result, sinkholes in Alabama will increase, particularly in the state's northern counties.

3.2.11.4.2 Risk Vulnerability

A community's vulnerability to sinkhole loss is a function of the probability of sinkholes, the exposure of structures to sinkholes, and the susceptibility of structures to sinkholes. In Alabama, the communities in the greater Huntsville area and the greater Birmingham area are more vulnerable to loss from sinkholes due, in part, to their larger populations.

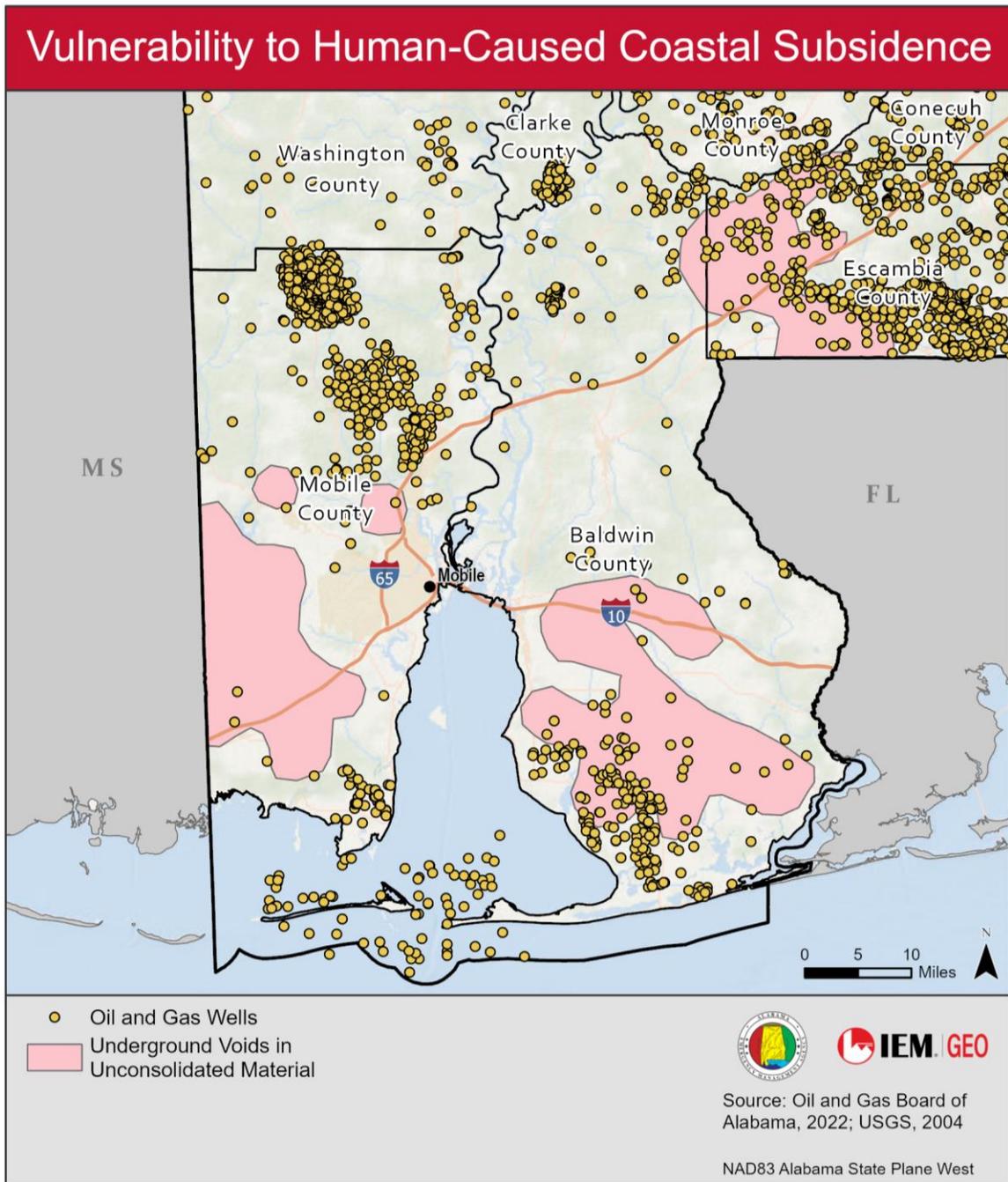
Another important consideration is the environmental risk posed by sinkholes. Groundwater is the primary water resource for most of the state's population, including several large cities and many smaller towns. Since sinkholes are direct conduits to the state's groundwater supply, dumping in sinkholes and spills in karst areas can contaminate the public's water supply. This makes them (and the public's water supply) highly vulnerable to contamination. Recognizing the potential for contamination, Alabama has a state law that prohibits dumping in sinkholes.

Lifeline- Sink Holes, Land Subsidence- All

All lifelines are assigned to the category of sinkholes and land subsidence. Dependent on the location and size of these events, all lifelines can be diminished. Transportation routes may disappear, leaving access to medical care, emergency services, and the purchase of necessities intangible until the event has been resolved. Groundwater supplies may be drained, leaving a swath of citizens without water, and due to the dumping of contaminated materials into sinkholes, viable water sources may be eliminated altogether. Limited communication may be available until powerlines and transformers have been restored.

Figure 3.55 below shows the susceptibility to human-caused coastal subsidence due to oil and gas wells, and underground voids in unconsolidated material.

Figure 3.55: Vulnerability to Human-Caused Coastal Subsidence



3.2.11.5 Consequence Analysis

The information in Table 3.61 provides the consequence analysis of the potential for detrimental impacts of sinkholes and land subsidence done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.61: EMAP Consequence Analysis: Sinkholes and Land Subsidence

Subject	Ranking	Impacts/Land Subsidence
Health and Safety of Persons in the Area of the Incident	Moderate to severe	The local impact is expected to be moderate to severe for the incident area, depending on the scale of the area affected and whether it is in an area that is populated or has structures.
Responders	Minimal	The impact on responders would be minimal.
Continuity of Operations	Minimal	The expectation of execution of the COOP is minimal unless a facility is impacted.
Property, Facilities, and Infrastructure	Severe	Localized impact on facilities and infrastructure in the incident area has the potential to do severe damage.
Delivery of Services	Minimal	Impacts on the delivery of services could be severe if roads/utilities are affected. Otherwise, the impact would be nonexistent to minimal.
Environment	Minimal	The impact on the area would be minimal, except in the immediate vicinity of the landslide or sinkhole.
Economic Conditions	Minimal	Impacts on the economy will depend on the severity and location of the damage.
Public Confidence in Jurisdiction's Governance	Minimal to severe	Policies governing local development will be called into question (minimal to severe).

3.2.12 Tsunamis

3.2.12.1 Description

A tsunami is a series of long waves generated in the ocean by a sudden displacement of a large volume of water. Underwater earthquakes, landslides, volcanic eruptions, meteor impacts, or onshore slope failures can cause this displacement. Most tsunamis originate in the Pacific “Ring of Fire,” the area of the Pacific bounded by the eastern coasts of Asia and Australia and the western coasts of North America and South America, which is the most active seismic feature on earth. Tsunami waves can travel at speeds averaging 450 to 600 miles per hour. As a tsunami nears the coastline, its speed diminishes, its wavelength decreases, and its height greatly increases. Some waves have been known to reach over 100 feet high. However, waves that are only 10 to 20 feet high can be very destructive and cause many deaths and injuries.

After a major earthquake or other tsunami-inducing activity, a tsunami could reach the shore within a few minutes. From the source of the tsunami-generating event, waves travel outward in all directions as ripples. As these waves approach coastal areas, the time between successive wave crests varies from 5 to 90 minutes. The first wave is usually not the largest in the series of waves, nor is it the most significant. One coastal community may experience no damaging waves,

while another may experience destructive and deadly waves. Some low-lying areas may experience severe inland flooding and deposition of debris more than 1,000 feet inland.

Along the West Coast, the Cascadia Subduction Zone threatens California, Oregon, and Washington with devastating local tsunamis. Earthquakes of a magnitude of 8 or more have occurred in the zone, and there is a 35% chance that an earthquake of this magnitude could occur before 2045 (estimated between the years 1995 and 2045).

3.2.12.2 Nature of the Hazard in Alabama

The tsunami risk in Alabama is very low: there is less than a 2% chance of a damaging tsunami in the next 50 years.¹⁶⁸ The Gulf Coast is not located near a subduction zone, and not much seismic activity has been recorded in the region. However, a tsunami is possible. In 1918, an earthquake near Puerto Rico triggered a tsunami that is the only one on record for the Gulf Coast. It is believed that the geography of the Gulf protects it somewhat from the impacts of a tsunami from outside the Gulf of Mexico.¹⁶⁹ Recent USGS and National Tsunami Hazard Mitigation Program (NTHMP) assessments have identified that the most significant tsunami risk comes from underwater landslides. Ancient landslides, active approximately 7,000 years ago, are where an occurrence would be likely, due to sediments continuing to empty into the Gulf, mainly from the Mississippi River. This sediment contributes to slope steepening and excess pore water pressure, which may lead to additional landslide risk and, thus, tsunamis.¹⁷⁰

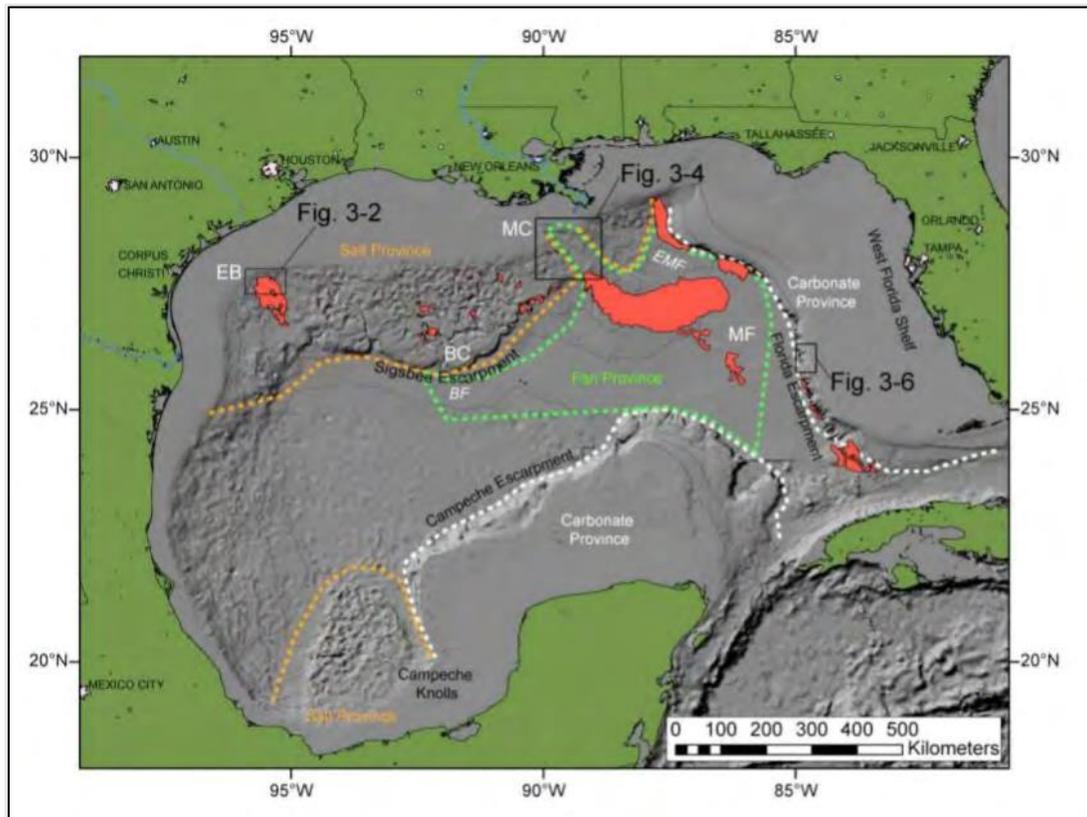
Although the tsunami risk is low for Alabama, the impacts could be devastating should one occur. The coastline is densely populated, and a tsunami could decimate building structures and cause loss of life to those who reside in coastal communities.

¹⁶⁸ Global Facility for Disaster Reduction and Recovery. Alabama: Tsunami. <https://thinkhazard.org/en/report/3214-united-states-of-america-alabama/TS>

¹⁶⁹ National Oceanic and Atmospheric Administration (NOAA). U.S. Tsunami Hazard. <https://nws.weather.gov/nthmp/ushazard.html>

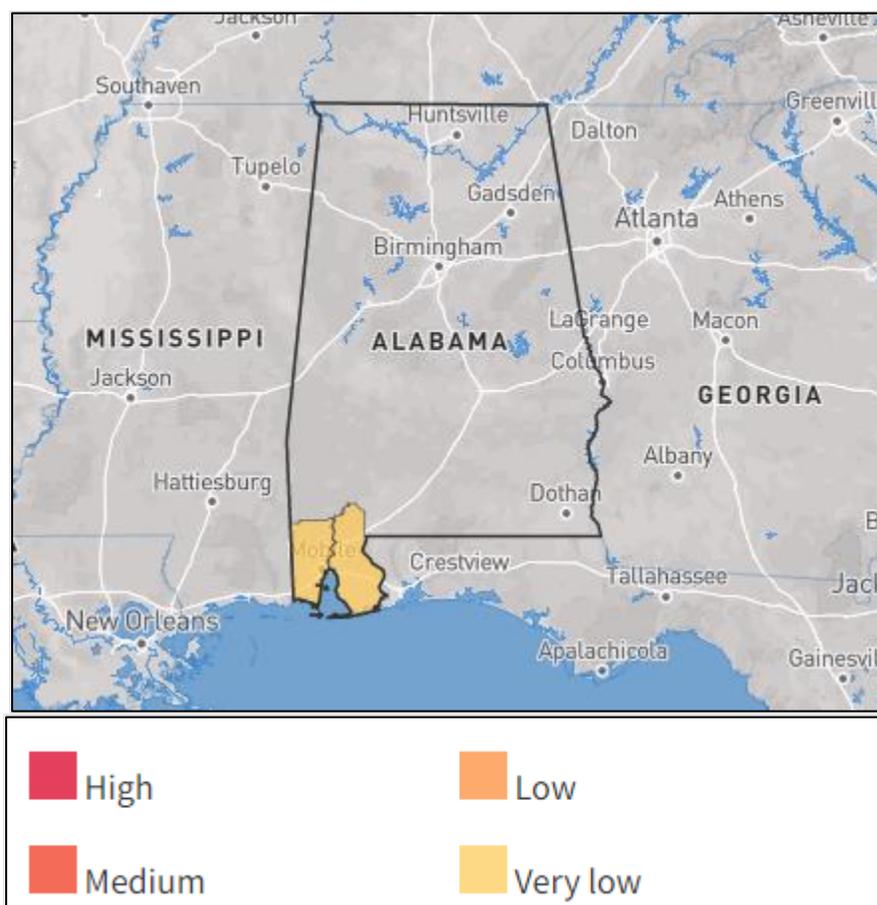
¹⁷⁰ Tsunami Research Group. National Tsunami Hazard Mitigation Program (NTHMP). <https://www.tamug.edu/tsunami/NTHMP.html>

Figure 3.56: Large Submarine Landslides in the Gulf of Mexico (USGS, 2008)



3.2.12.3 Tsunami History in Alabama

Based on historical records for the past 20 years, there has not been a tsunami event to impact Alabama. The Gulf of Mexico has only ever recorded one tsunami event, and Alabama has no recorded tsunami events. The one recorded incident was due to an earthquake off the coast of Puerto Rico, which generated a small tsunami that showed up on a tide gauge in Galveston, Texas.

Figure 3.57: Counties in Alabama at Greatest Risk of a Tsunami¹⁷¹

3.2.12.4 Probability of Tsunamis in Alabama

The probability of a tsunami event impacting the State of Alabama in any given year is Unlikely. Should Alabama experience an event, it would most likely be from a landslide tsunami on the Gulf Coast. Scientists continue studying the landslide theory due to the sedimentation deposited by the Mississippi River, which creates steeper slopes and higher pore pressure within the water, which could cause a tsunami. However, the size of any tsunami is difficult to ascertain.

3.2.12.4.1 Future Probability

The probability, location, intensity and impacts of hazards will change over time. Climate change, including changes in temperature, intensity, hazard distribution or frequency of weather events, may increase vulnerability to these hazards in the future. Based on historical knowledge and current conditions, it can be expected that all hazards will see a rise in scope, scale, and frequency of events on a yearly basis.

¹⁷¹ GFDRR. Alabama: Tsunami. <https://thinkhazard.org/en/report/3214-united-states-of-america-alabama/TS>

According to the Global Facility for Disaster Reduction and Recovery (GFDRR), climate change could impact the tsunami risk in Alabama via the global mean sea level rise. Regional sea level rise is difficult to predict, however, and therefore the focus should remain on the built environment and protecting the floodplain and coastal areas.

3.2.12.4.2 Risk and Vulnerability

The counties of Mobile and Baldwin are the most vulnerable to tsunami activity, although the probability of an occurrence is low.

Lifeline- Tsunamis- All

Though the risk to Alabama from tsunamis is very low, should one hit the coastal region, the damage could be astronomical, depending on wave size. Communities and transportation routes may be wiped out entirely. Power grids would be destroyed, as would most homes and businesses, including medical centers, groceries stores, and pharmacies. Safety and security would be immobile until the water had receded, and the debris removed.

3.2.12.5 Consequence Analysis

The information in Table 3.62 provides the consequence analysis of the potential for detrimental impacts of a tsunami prepared for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.62: EMAP Consequence Analysis: Tsunami

Subject	Ranking	Impacts/Tsunami
Health and Safety of Persons in the Area of the Incident	Severe	The localized impact is expected to be severe for the inundation area, depending on the height of the tsunami.
Responders	Minimal to moderate	With proper training, the impact on responders is expected to be minimal. The impact could be severe if there is a lack of training. The unknown is what is beneath the water as responders respond, which could increase the level of severity.
Continuity of Operations	Minimal	Temporary relocation may be necessary if inundation affects government facilities.
Property, Facilities, and Infrastructure	Severe to minimal	The localized impact could severely affect facilities and infrastructure in the incident's inundation area. The farther away from the incident area, the more likely the damage will lessen from moderate to minimal.
Delivery of Services	Minimal to severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to the inundation. Minimal to severe, depending on area size and location affected.

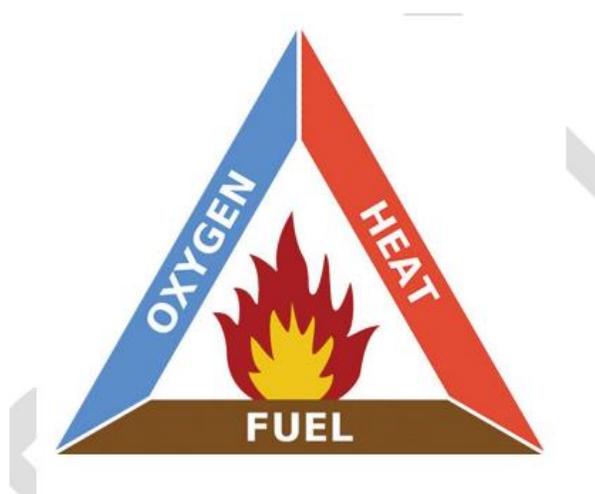
Subject	Ranking	Impacts/Tsunami
Environment	Severe	The impact will be severe for the immediately impacted area, including marshes, plants, etc. The impact will lessen as distance increases from the immediate incident area.
Economic Conditions	Severe to minimal	Impacts on the economy will greatly depend on the scope of the inundation and the amount of time it takes for the water to recede. If the tsunami is large, the economic impacts on tourism, the fishing industry, and ports could be severe.
Public Confidence in Jurisdiction's Governance	Minimal to severe	The public's confidence will vary, depending on the perception of whether the damage could have been prevented, the warning time, and the time it takes for response and recovery.

3.2.13 Wildfire

3.2.13.1 Description

Wildfire can be defined as any nonstructural fire that occurs in the wild. Wildfires are uncontrolled blazes fueled by weather, wind, and dry underbrush that have the ability to burn a significant amount of land within a short period of time. Three conditions need to be present for a wildfire to burn: fuel, oxygen, and a heat source.¹⁷²

Figure 3.58: The Fire Triangle (Sonoma County Gazette)



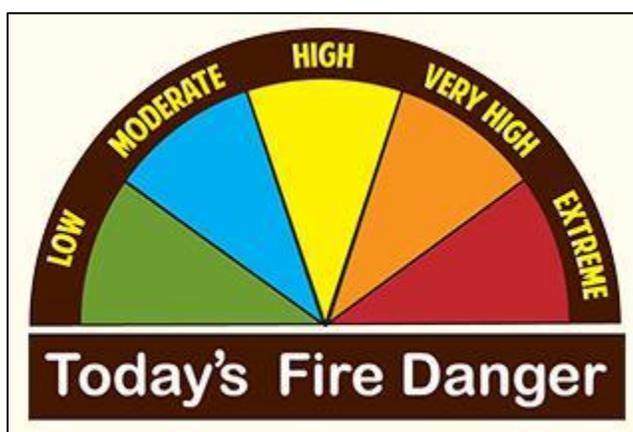
Wildfires have had a significant impact on the United States. Over 100,000 wildfires clear up to 5 million acres of U.S. land every year. Wildfires have the ability to destroy everything in their path.

¹⁷² National Geographic, 2018. Climate 101: Wildfires.
<https://www.nationalgeographic.com/environment/natural-disasters/wildfires/>

Three distinct types of wildland fires have been defined and include naturally occurring wildfires, human-caused wildfires, and prescribed fires. Wildfires are typically human caused, which distinguishes them from other natural disasters.¹⁷³

The U.S. Department of Agriculture (USDA) Forest Service has adopted a National Fire Danger Rating System. The purpose of the system is to help prevent human-caused wildfires from occurring. This system allows fire managers to express the level of fire danger in an area (and the need for fire protection) in terms of qualitative or numeric indices. Knowledge of the fire danger level in an area can help people make decisions on whether it is safe to have a campfire, burn debris, and so forth. If the fire danger level is very extreme, the USDA Forest Service has the ability to restrict certain activities.¹⁷⁴

Figure 3.59: National Fire Danger Rating System¹⁷⁵



The occurrence of wildfires is monitored and reported by many different state and federal agencies. To consistently report the size of wildfires, all federal agencies use a fire size classification system developed by the National Wildfire Coordinating Group. This system assigns fires to one of several fire size ranges based on the number of acres within the final perimeter. The largest fires are assigned to Class D (100 to 300 acres), Class E (300 to 1,000 acres), Class F (1,000 to 5,000 acres), or Class G (5,000 acres or more).

3.2.13.2 Nature of the Hazard in Alabama

Approximately 71% of Alabama's land area is forestland, and 85% of this forestland is owned by nonindustrial private landowners.¹⁷⁶ Therefore, the vast majority of wildland fires in Alabama occur on privately owned lands. Additionally, most of the wildland fires in Alabama occur in areas where

¹⁷³ Ibid.

¹⁷⁴ US Department of Agriculture, Forest Service, 2018. National Fire Danger Rating System. <https://www.fs.usda.gov/detail/invo/home/?cid=stelprdb5173311>

¹⁷⁵ National Fire Danger Rating System. <https://www.fs.usda.gov/detail/cibola/landmanagement/resourcemanagement/?cid=stelprdb5368839>

¹⁷⁶ Alabama Cooperative Extension System, 2014. Meet the Neighbors: Understanding Who Owns Alabama's Woodlands. <https://ssl.acesag.auburn.edu/pubs/docs/F/FOR-2006/FOR-2006-archive.pdf>

residential properties or other structures are endangered. Areas, where homes are built near or among lands prone to wildland fire, are known as the “wildland-urban interface.” As more people move into natural areas for their privacy, beauty, recreational opportunities, and affordable real estate, the wildland-urban interface in Alabama is growing and now faces the risk of major losses from wildfires. In Alabama, most wildland-urban interface areas are considered “intermixed.” Instead of large forest areas surrounding an isolated town, the pattern of development in Alabama is characterized by many scattered residences and farms distributed throughout the forest areas.

Based on an analysis by the Alabama Forestry Commission, there are 1,350 potential wildland-urban interface communities at risk of wildfire damage in Alabama, and the number of these communities is projected to increase with time.¹⁷⁷

The following two factors contribute significantly to wildfire behavior in Alabama:

- **Fuel:** The type of fuel and the fuel loading (measured in tons of vegetative matter per acre) have a direct impact on fire behavior. Fuel types vary from light fuels (grass) to moderate fuels (Southern Rough, or flammable evergreen shrubs) to heavy fuels (slash, or woody debris). The type of fuel and the fuel load determine the potential intensity of the wildfire and how much effort must be expended to contain and control it.
- **Weather:** The most variable factor affecting wildfire behavior is the weather. Important weather variables are precipitation, humidity, temperature, and wind. Weather events ranging in scale from localized thunderstorms to large cold fronts can have major effects on wildfire occurrence and behavior. Extreme weather conditions, such as extended drought and low humidity, can lead to extreme wildfire activity.

In addition to affecting people, wildfires may severely impact crops and livestock. Wildfires often destroy food crops and supplies, which inflict severe economic losses on farmers. The forest resources of Alabama also supply one of the main industries of the state. Timber loss to a fire creates an economic loss to both the private landowner and the state’s economy. The forestry industry in Alabama directly creates 70,000 jobs, and another 100,000 are associated with the industry. In total, the industry adds about \$12.2 billion to the economy each year.¹⁷⁸ Therefore, wildfires can potentially have a significant economic impact on the state’s economy.

Wildfires in Alabama are generally moderate in intensity, resulting in the destruction of undergrowth and some timber. With Alabama’s long growing season, the soil surface layer of the forest recovers quickly, minimizing erosion and water quality impacts.

3.2.13.3 Wildfire History in Alabama

The frequency and severity of wildfires are dependent on weather and human activity. The number of fires and acres burned from January 2009 through February 2018 was recorded by the

¹⁷⁷ Southern Group of State Foresters, 2008. Fire in the South 2: The Southern Wildfire Risk Assessment. <http://www.southernforests.org/resources/publications/fire-in-the-south-2-pdf/view>

¹⁷⁸ Ibid.

Alabama Forestry Commission. Alabama had a total of 18,807 fires during this 10-year period, affecting a total of 287,237 acres.¹⁷⁹

The data on wildfire size and cause for those that occurred in Alabama between 1980 and 2016 was collected from fire records from the U.S. Fish and Wildlife Service, the National Park Service within the U.S. Department of the Interior, and the U.S. Forest Service within the USDA.¹⁸⁰ Nearly all wildfires in Alabama are human caused. If not promptly controlled, wildfires may grow into an emergency or disaster. During a series of severe fire situations between 1999 and 2001, nine wildfires in Alabama were declared fire disaster emergencies by FEMA.¹⁸¹ Even small fires, however, can threaten lives, damage forest resources, and destroy structures.

In Alabama, there are an average of 4,000 wildfires that burn 40,000 acres a year. On average, wildfires destroy 46 homes, 114 structures, and 1,100 vehicles per year.¹⁸² The Alabama Forestry Commission's Annual Reports provide a wide variety of statistics related to wildfire occurrence and prevention. According to the Alabama Forestry Commission's Annual Report for fiscal year 2016, between October 2015 and September 2016, 1,793 wildfires burned 22,252 acres in Alabama. This caused the destruction or damage of 33 homes, 3,404 other structures, and 107 vehicles. However, about 1,265 homes were saved as a direct result of the firefighter response.

The Forestry Commission is also heavily involved in mitigation activities. During the 2016 fiscal year, the Forestry Commission completed 27,492 acres in prescribed burns. Furthermore, the commission administered \$1,042,810 in grant money appropriated by the Alabama Legislature. This grant money was used, among other things, to provide and maintain countywide communication systems for volunteer fire departments in 37 counties and assist in federal fire and in-state responses.¹⁸³

In 2017, there were 13,157 prescribed fires in the State of Alabama and 944,455 acres burned. No information was available for prescribed fires following 2017.¹⁸⁴

¹⁷⁹ Alabama Forestry Commission, 2018. Wildfire Information by Date Range. http://www.forestry.alabama.gov/fire_totals_date_range.aspx?bv=1&s=4

¹⁸⁰ Department of the Interior, 2017. Federal Fire Occurrence Website. <https://wildfire.cr.usgs.gov/firehistory/about.html>

¹⁸¹ Federal Emergency Management Agency, 2018. FEMA Disaster Declarations Summary. <https://www.fema.gov/media-library/assets/documents/28318>

¹⁸² The Southern Group of State Foresters. Fire in the South. http://www.forestry.alabama.gov/PDFs/fire_in_the_south.pdf

¹⁸³ Alabama Forestry Commission, 2016. 2016 Annual Report. https://forestry.alabama.gov/Pages/Other/Forms/Annual_Reports/Annual_Report_2016.pdf

¹⁸⁴ U.S. Prescribed Fires by State. <https://www.statista.com/statistics/204014/highest-number-of-prescribed-fires-in-the-us-by-states/>

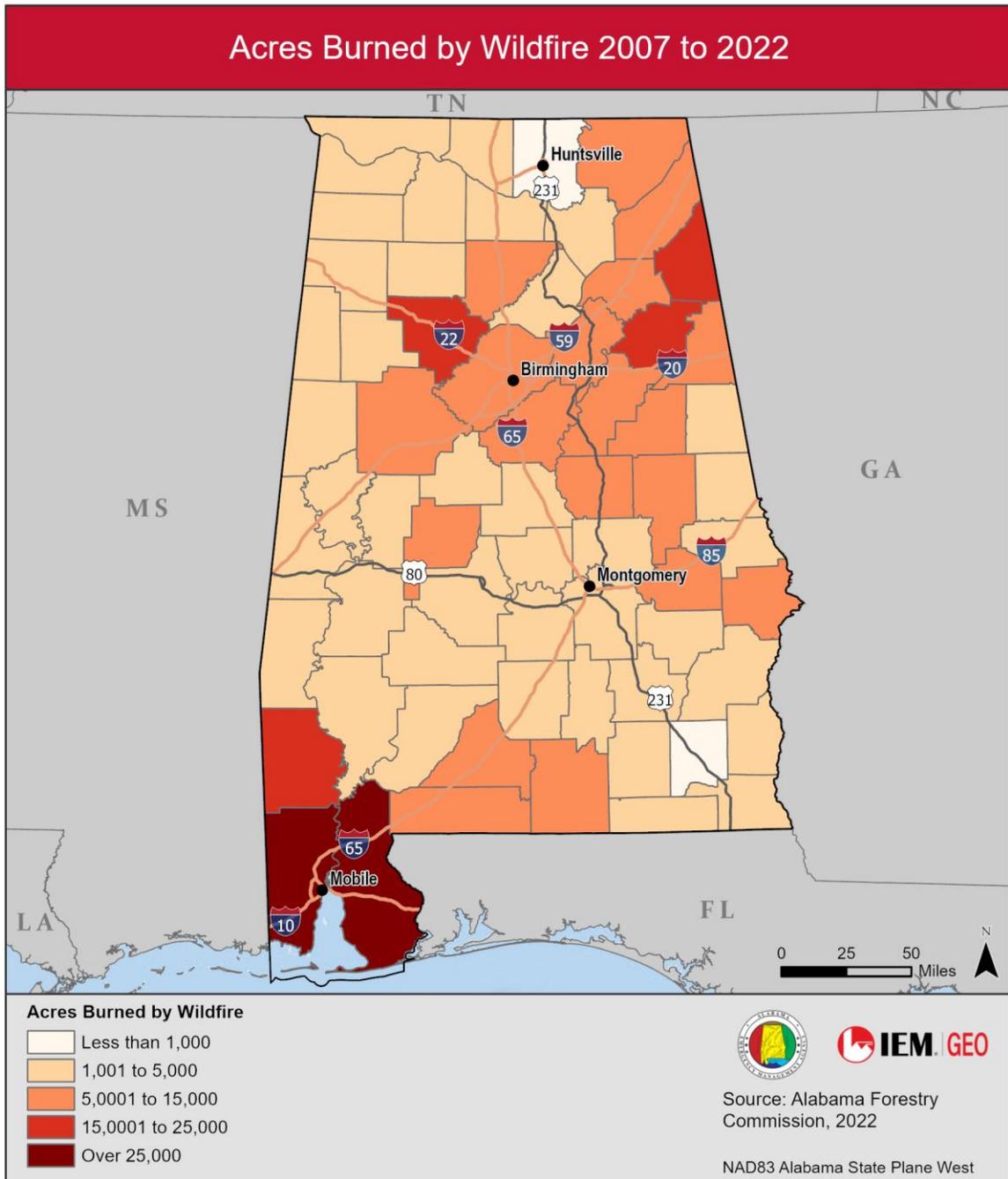
Table 3.63: Wildfire Events in the State of Alabama, 2002–2016

County	Start Date	Deaths	Injuries	Property Damage	Crop Damage
Colbert	3/8/2010	0	1	\$3,000	0
Franklin	9/18/2010	0	0	\$100,000	0
Dekalb	8/29/2011	0	0	0	0
Colbert	11/12/2011	0	0	0	0
Lauderdale	3/18/2012	0	0	0	0
Colbert	3/14/2014	0	0	0	0
Franklin	3/14/2014	0	0	0	0
Dekalb	4/1/2014	0	0	0	0
Lawrence	10/16/2015	0	0	0	0

The largest recorded events were defined as those with fire size classes of D, E, or F. The data used for this analysis is a collection of fire records from the U.S. Fish and Wildlife Service, the National Park Service, the Bureau of Indian Affairs, the Bureau of Land Management, and the U.S. Forest Service within the U.S. Department of the Interior and the USDA. Because these agencies complete fire records only when they participate in the fire response, this data represents a sample of all the fires that have occurred in Alabama. This sample, however, provides insight into the location and extent of past fires.¹⁸⁵

¹⁸⁵ Department of the Interior, 2017. Federal Fire Occurrence Website. <https://wildfire.cr.usgs.gov/firehistory/about.html>

Figure 3.60: Acres Burned by Wildfire 2007 to 2022



3.2.13.4 Probability of Wildfires in Alabama

The probability of a wildfire event impacting the State of Alabama in any given year is Likely. Unlike other natural hazards, the probability of wildfires cannot be expressed in terms of specific frequencies or return periods. These events are the culmination of multiple natural and human-caused factors that play out over a range of timescales and can be highly localized. Regions that

are more prone to wildfires can be identified, however, based on historic wildfire events. Analysis of these events indicates that the counties that are more likely to experience wildfires include Cherokee, Calhoun, Cleburne, Clay, Talladega, Bibb, Hale, Winston, Escambia, Covington, Baldwin, and Mobile Counties.

Table 3.64: Number of Wildfires by County, 2017–2022

County	Number of Fires	Acres Affected
Autauga	126	1,102
Baldwin	318	10,017
Barbour	97	1,850
Bibb	57	715
Blount	64	428
Bullock	75	2,327
Butler	171	741
Calhoun	188	5,964
Chambers	134	2,294
Cherokee	135	3,512
Chilton	166	1,863
Choctaw	65	927
Clarke	83	877
Clay	97	2,643
Cleburne	147	3,797
Coffee	64	468
Colbert	51	497
Conecuh	174	2,482
Coosa	104	1,698
Covington	131	4,104
Crenshaw	63	786
Cullman	101	1,579
Dale	55	251
Dallas	146	671
DeKalb	229	1,490
Elmore	36	328
Escambia	163	2,570
Etowah	51	1,145
Fayette	93	868
Franklin	75	554
Geneva	74	537

County	Number of Fires	Acres Affected
Greene	72	542
Hale	70	231
Henry	84	743
Houston	81	659
Jackson	64	749
Jefferson	148	1,526
Lamar	102	759
Lauderdale	44	739
Lawrence	24	469
Lee	67	1,436
Limestone	82	270
Lowndes	61	434
Macon	198	3,181
Madison	9	161
Marengo	106	920
Marion	127	806
Marshall	30	451
Mobile	333	9,288
Monroe	92	1,325
Montgomery	54	436
Morgan	78	482
Perry	129	4,109
Pickens	59	1,177
Pike	65	817
Randolph	132	947
Russell	166	4,811
Saint Clair	86	1,462
Shelby	108	3,155
Sumter	33	831
Talladega	217	3,618
Tallapoosa	127	1,120
Tuscaloosa	138	1,154
Walker	215	2,050
Washington	192	3,789
Wilcox	148	1,236
Winston	77	585
Total	7,351	115,553

3.2.13.4.1 Future Probability

The probability, location, intensity, and impacts of hazards will change over time. Climate change, including changes in temperature, intensity, hazard distribution or frequency of weather events, may increase vulnerability to these hazards in the future. Based on historical knowledge and current conditions, it can be expected that all hazards will see a rise in scope, scale, and frequency of events on a yearly basis.

As with most natural hazards, wildfires are strongly influenced by weather phenomena. As the climate changes, Alabama is projected to become more prone to wildfire occurrences. Alabama is at risk of facing a considerable increase in wildfire threat levels between now and 2050. According to research conducted by Climate Central and ICF, by 2050 the average number of days with high wildfire potential is projected to double from 25 to 50 days a year.¹⁸⁶ Therefore, Alabama should anticipate that the probability of wildfires occurring will increase in the future.

3.2.13.4.2 Risk and Vulnerability

A community's vulnerability to fire loss is a function of the probability of wildfires, the exposure of structures and assets to wildfires, and the susceptibility of structures and assets to wildfires. The State of Alabama is highly vulnerable to losses from wildfires. The southern United States often leads the nation in the number of wildfires that occur each year. In Alabama, the high vulnerability to wildfires is driven by the state's extremely hot summers, extensive forest cover, and large and growing wildland-urban interface.¹⁸⁷ As population growth and development continue to gravitate toward more remote and rural landscapes, more of Alabama's people, infrastructure, and assets will become vulnerable to loss from wildfires.¹⁸⁸

Wildfires also pose a risk to Alabama's forestry industry, which represents the second-largest sector of the state's economy. Alabama's forestry industry provides over 122,000 jobs in timber production and processing and contributes over \$21 billion to the state's economy each year. This industry is supported by 23 million acres of timberland (about 69% of the total land area in the state) managed by 440,000 forestland owners.¹⁸⁹ Wildfires pose a risk not only to the assets of these forestland owners but also to a principal sector of the state's economy.

Based on the drivers of wildfire risk and loss, Alabama's vulnerability to the hazard will likely increase, with the largest greatest increase in occurrences in the state's northeast and coastal regions. While northeast Alabama is likely to become more vulnerable given its high growth rates, decentralized development patterns, and growing wildland-urban interface (WUI), coastal Alabama is expected to become more vulnerable due to its very hot climate and the more severe

¹⁸⁶ Climate Central, 2018. States at Risk Alabama Report Card. https://reportcard.statesatrisk.org/report-card/alabama/wildfires_grade

¹⁸⁷ The Southern Group of State Foresters. Fire in the South 2.

<https://southernforests.org/resources/publications/fire-in-the-south-2-pdf>

¹⁸⁸ Alabama Forestry Commission, 2010. 50 Ways to Make Your Woodland Home Firewise.

https://forestry.alabama.gov/Pages/Management/Forms/50_Ways_to_Protect_Your_home.pdf

¹⁸⁹ Alabama Forestry Commission, 2016. 2016 Annual Report.

https://forestry.alabama.gov/Pages/Other/Forms/Annual_Reports/Annual_Report_2016.pdf

impacts climate change is expected to have on the region. Although vulnerability to wildfire may be higher in these two regions, the risk of losses from wildfire is expected to grow statewide. Figure 3.61 illustrates how the frequency of wildfire varies by region in the state, and Figure 3.62 shows the expected level of wildfire intensity in different geographic segments.

Figure 3.61: Regional Frequency of Wildfire Events

Source: National Interagency Fire Center, Wildfire Interagency Geospatial System

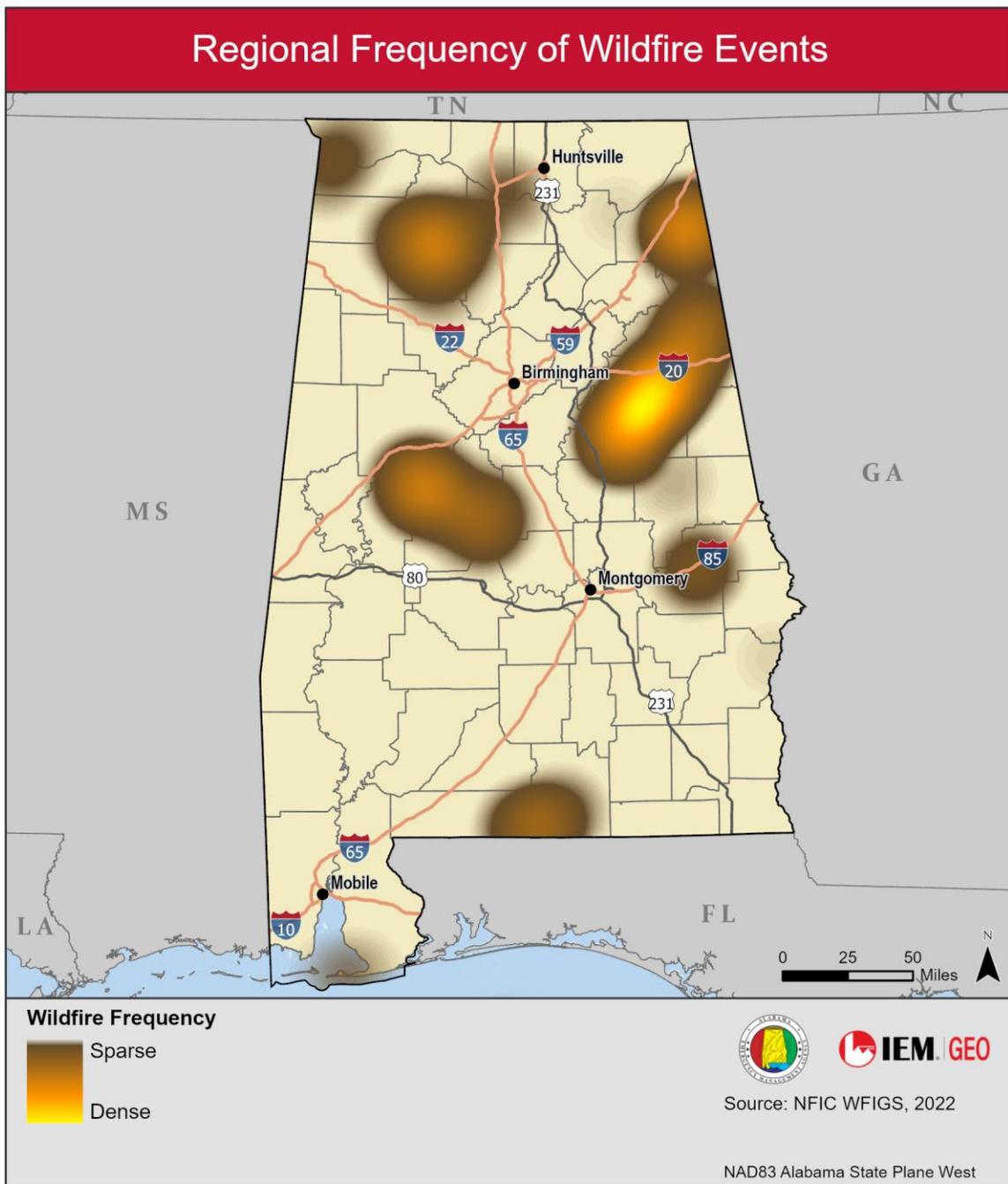
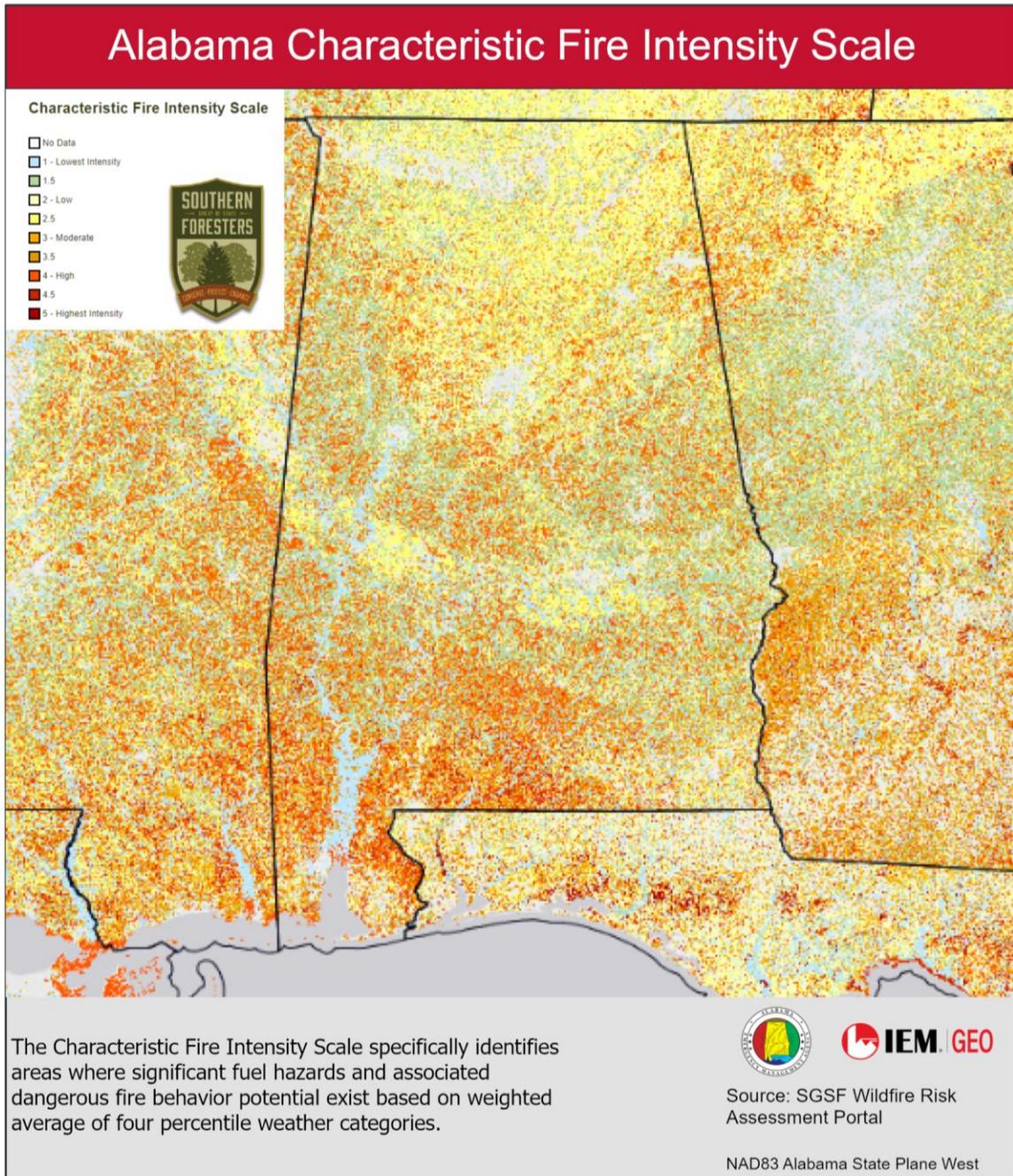


Figure 3.62: Alabama Characteristic Fire Intensity Scale

Source: National Interagency Fire Center, Wildfire Interagency Geospatial System



Lifelines: Wildfires- All Hazards

Wildfires may cause significant disruptions to transportation, communication, power, gas services, and water supply. In addition, they can harm air quality and result in the loss of property, crops, resources, animals, and human lives.

3.2.13.5 Consequence Analysis

The information in Table 3.65 provides the consequence analysis of the potential for detrimental impacts of wildfire done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.65: EMAP Consequence Analysis: Wildfire

Subject	Ranking	Impacts/Wildfire
Health and Safety of Persons in the Area of the Incident	Severe	The impact on the immediate area could be severe for affected areas and moderate to light for other, less affected areas. However, smoke could adversely affect populations and animals at a great distance from the immediate area.
Responders	Minimal to severe	The impact on responders could be severe depending on the size and scope of the fire, especially for firefighters. The impact will be low to moderate for support responders, with the main threat being smoke inhalation.
Continuity of Operations	Minimal to severe	Temporary relocation may be necessary if government facilities experience damage (from minimal to severe) or if smoke becomes too intense.
Property, Facilities, and Infrastructure	Severe	The localized impact could be severe for facilities and infrastructure in the incident area. Property, facilities, and infrastructure are all vulnerable to destruction by wildfire.
Delivery of Services	Minimal to severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damages sustained.
Environment	Severe	The impact will be severe for trees, bushes, animals, crops, and so forth in the immediately impacted area. The impact will lessen as distance increases from the immediate incident area.
Economic Conditions	Minimal to moderate	Impacts on the economy could be moderate in the immediate area.
Public Confidence in Jurisdiction's Governance	minimal to Severe	Response and recovery will be in question if they are not timely and effective. Evacuation orders and shelter availability could be called into question.

3.2.14 Winter Storms

3.2.14.1 Description

Winter storms historically come with extreme cold and precipitation in the form of snow, ice, and/or sleet. Winter storms can also be tied to other natural hazards, such as coastal flooding and erosion, severe thunderstorms, tornadoes, and extreme winds. These storm events can immobilize regions, blocking roads, highways, emergency services, and the flow of supplies, among others. Livestock, if unprotected, can be lost. Heavy snow may cause roofs to collapse and knock down trees and power lines. Economically, winter storms can devastate a community through snow removal, damage repair, business and crop losses, and power failures. The following tables show different types of winter precipitation and medical conditions that can arise from winter precipitation.

Table 3.66: Winter Storm Precipitation Types¹⁹⁰

Precipitation Type	Description
Freezing rain	Rain that freezes when it hits the ground, creating a layer of ice on roads, walkways, trees, and power lines.
Sleet	Rain that turns to ice before reaching the ground.
Snow	Precipitation that falls in the form of ice crystals. The ice crystals are formed individually in clouds, but when they fall, they stick together in clusters of snowflakes. Snowflakes develop different patterns depending on the temperature and humidity in the air. ¹⁹¹
Snow squalls	Brief, intense snow showers accompanied by strong, gusty winds. Accumulations could be significant.
Blowing snow	Wind-driven snow that reduces visibility. Blowing snow may be falling snow and/or snow on the ground picked up by the wind.

Table 3.67: Medical Conditions Caused by Winter Precipitation¹⁹²

Medical Condition	Description
Frostbite	When skin or body tissue is damaged from freezing. Most common in parts of the body farthest from your heart, such as fingers, toes, ears, and nose.
Hypothermia	When body temperature drops below what is needed to be healthy. Opposite of a heat stroke.

¹⁹⁰ Be Prepared for a Winter Storm. <https://community.fema.gov/ProtectiveActions/s/article/Winter-Storm>

¹⁹¹ Types of Precipitation. <https://education.nationalgeographic.org/resource/types-precipitation>

¹⁹² Be Prepared for a Winter Storm. <https://community.fema.gov/ProtectiveActions/s/article/Winter-Storm>

Winter storms can have a wide geographical impact, affecting large populations. The region's climatology, its built infrastructure, and where the winter storm hits can all determine the impact of a winter storm. Northern Maine is used to winter storms and is prepared for what nature delivers; however, the southeastern United States is less prepared because winter storms are a rare occurrence and therefore can cause significant disruptions.

3.2.14.2 Nature of the Hazard in Alabama

Due to Alabama's geographical location, winter storms are not as severe or as common as those endured by their northern neighbors. Typically, a winter storm in Alabama consists of freezing rain or a few inches of snow that may or may not impact roadways. However, because Alabama these events are infrequent, winter storms tend to be very disruptive to transportation, commerce, and the population. The following table illustrates how the warning criteria established by the Mobile, Alabama, and New York City Weather Forecast Offices vary from state to state regarding the risk to life and property from a winter storm.

Table 3.68: Local Warning Criteria for Winter Storms

Warning Type	New York City Warning Criteria	Mobile, AL, Warning Criteria
Winter Storm	Snow accumulation of 6 inches in a 12-hour period or 8 inches in a 24-hour period Ice accumulation of ½ inch or more	Snow accumulation of 2 inches in a 12-hour period Sleet or ice pellet accumulation of ½ inch or more
Ice Storm	Freezing rain with ice accumulation of ½ inch or more	Freezing rain with ice accumulation of ¼ inch or more

Ice storms pose a particularly significant risk to life and property. Trees, cars, roads, and other surfaces develop a coating or glaze of ice, making even small accumulations extremely hazardous to motorists and pedestrians. The most prevalent impacts of heavy accumulations of ice are slippery roads and walkways that lead to vehicle and pedestrian accidents; collapsed roofs from fallen trees and limbs and heavy ice and snow loads; and felled trees, telephone poles and lines, electrical wires, and communication towers. In addition, because of severe ice storms, telecommunications and power can be disrupted for days. Such storms can also cause exceptionally high rainfall that persists for days, resulting in heavy flooding.

3.2.14.3 Winter Storm History in Alabama

Based on historical records for the past 20 years, winter storm events in Alabama have ranged in magnitude from 1.0 inches to over 12.0 inches of snow. According to the National Centers for Environmental Information (NCEI) Storm Events Database, winter storms caused more than \$32 million in direct economic losses between 1996 and 2017. Between 2017 and 2022, the NCEI Storm Events Database shows no record of financial losses for the state. The most damaging events between 1996 and 2017 were ice storms, which accounted for nearly \$28 million in direct

economic losses, followed by a mix of precipitation types, which accounted for nearly \$5 million. Between 2017 and 2022, the NCEI Storm Events Database shows no economic losses from ice storms or winter storms with mixed precipitation. Between 1996 and 2022, the most frequently recorded events were winter storms with a mix of precipitation (45 events), heavy snow (18 events), and ice storms (12 events). It is important to note that the NCEI Storm Event Database is only an estimate. The dataset depends on field reporting from various sources. So, winter storms with a mix of precipitation were taken from winter weather; however, it is difficult to ascertain if that includes freezing fog, snow, or ice. However, the dataset shows that there were more winter storms with a mix of precipitation than heavy snow or ice storms.

Since the Storm Events Database began collecting data on winter storms in 1996, Alabama has had five winter storms that were reported to cause more than \$1 million in estimated damages. In addition, Alabama had one federal emergency declaration for severe snowfall in 1993. There have been no declarations between 2014 (the last federal declaration for a winter storm) and 2022. The following table summarizes these historical storms and their reported impacts and includes winter storms since 2017 that were not declared.

Table 3.69: Winter Storms in Alabama (1993–2022)

Date	Type	Estimated Damage	Description
March 12, 1993	Snowstorm	\$85–\$170 million	A winter storm described as the worst in Alabama history struck on March 12, 1993, and lasted through midday on March 13, 1993. Snow accumulated 6–12 inches over North Alabama and 2–4 inches over the Gulf Coast. A 40-mile-wide band of 12–20 inches fell from the Birmingham area northeastward to DeKalb and Cherokee Counties, generally following the Appalachian Mountains. It was estimated that 400,000 residences were without electricity, and many remained so for several days. Compounding the snow and power problems, temperatures fell well into the single digits and teens across much of the state. There were at least 14 deaths associated with exposure or stress due to the storm. The entire state was declared a federal disaster area.
December 23, 1998	Ice storm	\$21.6 million	A winter storm brought a mixture of freezing rain, sleet, and rain to the northern half of Alabama. The northwest corner of Alabama was especially hard hit. The northwest quarter of the state saw temperatures at or below freezing for the majority of the event, as well as significant ice accumulations of ½ to 1 inch. As a result, numerous trees were downed across every county. Significant power outages were encountered in all counties, and many locations did not return to service until the 26th or 27th. The National Guard was activated in a few northwestern counties to help with cleanup duties. Numerous roads were closed during the event, which included Interstate 65 and 565 in the Huntsville area. One fatality occurred in Huntsville when a homeless man died of exposure. In addition, multiple vehicle accidents and single automobile accidents occurred due to the icy road conditions. These accidents resulted in at least five fatalities and numerous minor injuries.
January 22, 2000	Ice storm	\$3.8 million	A light mixture of rain, freezing rain, sleet, and snow fell on the morning of the 22nd. Several bridges became ice-covered, and numerous trees received a glaze of ice. Several trees and tree limbs started breaking and falling on roads by the evening, causing scattered power outages. In the early morning of the 23rd, temperatures cooled off to the point where significant icing began. Numerous locations received icing up to at least 1 inch. Trees and power lines were downed throughout the area,

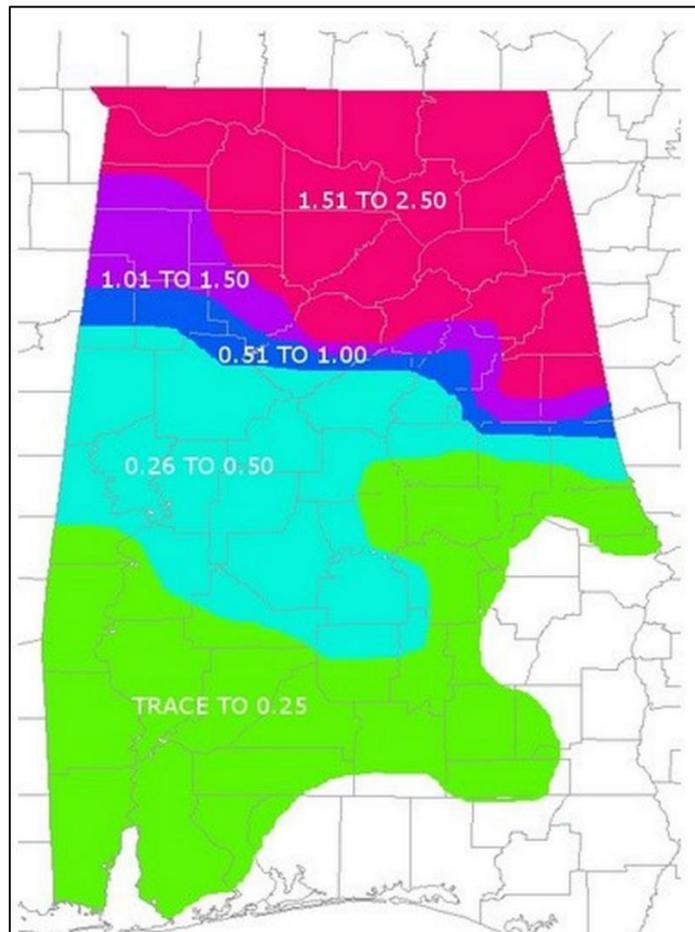
Date	Type	Estimated Damage	Description
			and many downed trees blocked roads. Numerous roads were closed, especially at higher elevations. The Alabama National Guard was activated and dispatched to northeast Alabama to help with tree removal and cleanup. Thousands of customers were without power for several days. Falling trees damaged numerous homes and automobiles. An Alabama man was killed when he drove his car into a large mass of tree limbs covering SR 71 near Rosalie. Numerous other traffic accidents were reported, and several people had minor injuries.
January 28, 2000	Ice storm	\$1.6 million	Very light precipitation started falling early in the morning of the 28th. The precipitation was initially a mix of rain, sleet, and snow. Little to no accumulation of snow occurred across the area. As the day progressed, the precipitation changed to light freezing rain and lasted until the afternoon of the 29th. Significant accumulations of ice occurred on trees and bridges, mainly in the higher elevations. Most of this area had been hit very hard by an ice storm on the 22nd and 23rd and had not yet recovered. Numerous trees and power lines went down across the area, and the falling trees damaged several homes and automobiles. Many roads were impassable and closed. A young man was killed in Dekalb County when a car slid into him while he was riding a four-wheeler. Thousands of people were without power for several hours.
January 28, 2014	Winter storm	\$1 million	A mixture of winter precipitation fell across Central Alabama beginning on the 28th. Travel conditions quickly deteriorated as snow, sleet, and ice accumulated. Brief periods of freezing rain resulted in a light glaze of ice on area roadways and bridges at the onset of precipitation. As precipitation transitioned to all snow, it melted and refroze quickly on area roadways, further deteriorating travel conditions. In many locations across Central Alabama, snow accumulated on top of a layer of ice. Hundreds of wrecks and hazardous road conditions left thousands of people stranded in their vehicles on area roadways for hours; many remained there overnight. Many others abandoned their vehicles in favor of walking to nearby shelters. As temperatures remained below freezing through the 30th, there was only a slight improvement in icy road conditions. Seven fatalities (indirect) were attributed to vehicle accidents on icy roads in Central Alabama. One fatality (indirect) resulted from a male slipping on ice outside his home. One fatality (direct) resulted from severe hypothermia. Due to the high number of vehicle accidents and vehicles abandoned in

Date	Type	Estimated Damage	Description
			favor of walking to shelters, there were likely unreported indirect injuries in the dozens across the affected area.
December 14, 2017	Winter storm	Unknown	A storm system moved through Alabama, dropping up to 7.5 inches of snow in Choctaw County. Other counties saw anywhere from a trace to 4 inches of snow.
January 16–17, 2018	Winter storm	Unknown	This storm marks only the second time in recorded history that two measurable snow events were recorded in Mobile in the same winter (December through February). The state saw anywhere from a dusting to 3.5 inches of snow. Mobile saw up to 1.2 inches.
February 2021	Winter storm	Unknown	A winter storm moved through northern and central Alabama, bringing frigid temperatures and icy conditions. Due to the frigid air, many schools and businesses were closed.

3.2.14.4 Probability of Winter Storms in Alabama

The probability of a winter storm event impacting the State of Alabama in any given year is Likely. Since 1996, Alabama has had 45 winter storms with a mix of precipitation for an average of 1.73 events per year. Heavy snow averages less than 1 event per year, and ice storms average an estimated 0.5 events per year. The probability that Alabama will have at least one event per year, including winter weather, is likely; however, the northern counties have a greater likelihood of seeing an event. The following figure shows the average annual snowfall for Alabama.

Figure 3.63: Average Annual Snowfall for Alabama



3.2.14.4.1 Future Probability

The probability, location, intensity and impacts of hazards will change over time. Climate change, including changes in temperature, intensity, hazard distribution or frequency of weather events, may increase vulnerability to these hazards in the future. Based on historical knowledge and current conditions, it can be expected that all hazards will see a rise in scope, scale, and frequency of events on a yearly basis.

The Gulf of Mexico strongly influences the weather in Alabama. While the state is classified as “warm temperate zone,” latitude and regional topography are outliers. In addition, while freezing temperatures can reach the Gulf Coast in most winters, these cold temperatures rarely persist.¹⁹³ Climate models suggest that the climate in Alabama will continue to warm moving forward, although the southeastern United States is one of the few regions in the world that has experienced slight overall warming of the daily maximum temperature since 1900.¹⁹⁴ It is difficult to find information on the future probability of winter storms in Alabama, which can be attributed to the expectation that the climate will continue to warm. However, the freeze-free season is expected to lengthen by more than a month by the late 21st century. The reduction in cold winter temperatures could see tropical and subtropical species migrate northward, and landscapes could be transformed.

3.2.14.4.2 Risk and Vulnerability

Northern Alabama counties face the greatest risk from winter storms because they have the highest density of exposed infrastructure and population density. While Alabama does not have a large propensity for winter storms, when they do occur, they cause disruptions to the economy, transportation, infrastructure, and the state's citizens. Therefore, the susceptibility of the northern counties to winter storms is an issue that must be addressed at the community level—with generators, alternate transportation routes, or connections, as an example. Figure 3.63 shows the frequency of winter storm events for the years 1996 through 2022.

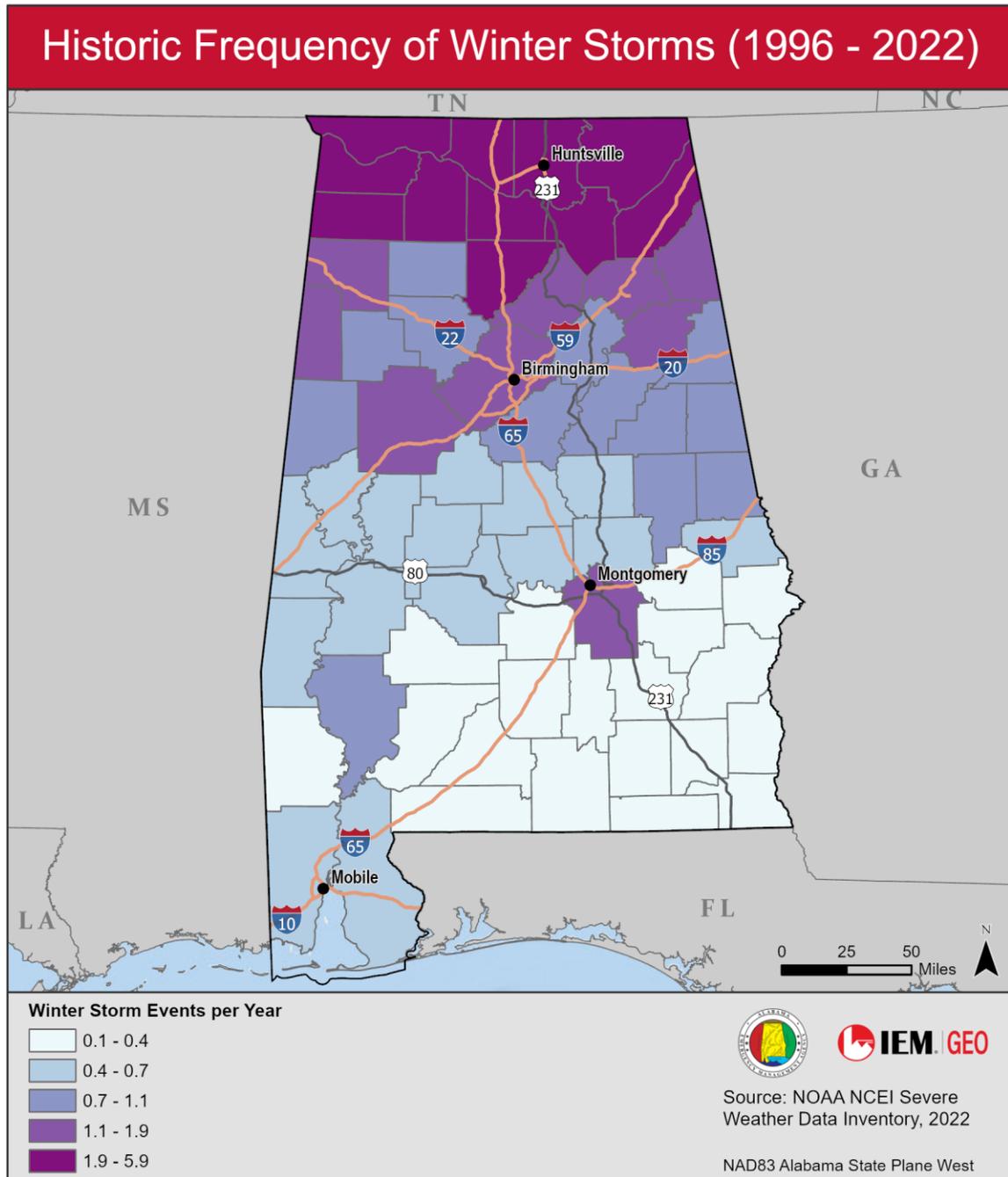
Lifeline- Winter storm- ALL

Heavy snowfall and ice accumulation can have disastrous consequences, such as collapsing roofs, falling trees, and power outages resulting in frozen and burst pipes and a lack of life-saving heat sources. This can result in homes and farms being cut off for several days. In rural regions, livestock that are not properly shielded may be at risk. The economic impact of snow removal expenses, repair work, and lost business can be severe in urban areas. Road conditions may be severe enough to impede emergency service vehicles causing delayed medical care.

¹⁹³ Climate of the Southeastern United States. <https://earthathome.org/hoese/climate/>

¹⁹⁴ Fourth National Climate Assessment. <https://nca2018.globalchange.gov/chapter/19/>

Figure 3.64: Frequency of Winter Storms (1996--2022)



3.2.14.5 Consequence Analysis

People and crops are adversely affected by winter storms, especially when storms are accompanied by strong winds that create blizzard conditions with blinding wind-driven snow, severe drifting, and dangerous wind chill. Strong winds with these intense storms and cold fronts

can knock down trees, utility poles, and power lines. According to NOAA, the following statistics result from winter storm events:

Ice and Snow:

- About 70% of injuries result from vehicle accidents.
- People caught in a storm account for 25% of injuries.
- Most injuries happen to males over 40 years of age.

Due to Cold:

- 50% happen to individuals over 60 years of age.
- More than 75% tend to be males.
- 20% occur in the home.

The information in Table 3.70 provides the consequence analysis of the potential for detrimental impacts of winter storms done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 3.70: EMAP Consequence Analysis: Winter Storms

Subject	Ranking	Impacts/Winter Storms
Health and Safety of Persons in the Area of the Incident	Severe	The impact on the immediate area could be severe for affected areas and moderate to light for other, less affected areas.
Responders	Moderate to severe	The impact on responders could be severe for unprotected personnel and moderate to light for prepared personnel.
Continuity of Operations	Minimal	Minimal expectation of execution of the COOP.
Property, Facilities, and Infrastructure	Minimal to severe	Localized impact on facilities and infrastructure in the incident area. Utility lines are most affected.
Delivery of Services	Minimal to severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damages sustained.
Environment	Minimal to severe	Impacts on the economy will greatly depend on the severity of the winter storm, its longevity, and any damages sustained, such as by utilities and roads.
Economic Conditions	Minimal to severe	Impacts on the economy will greatly depend on the severity of the winter storm, its longevity, and any damages sustained, such as by utilities and roads.
Public Confidence in Jurisdiction's Governance	Minimal to severe	Response and recovery will be in question if they are not timely and effective. Utility failure could be called into question if outages are persistent.

3.3 Vulnerability Assessment & Loss Estimation

3.3.1 Methodology

Vulnerability assessment is the process of evaluating the potential loss to a community from natural hazards. As discussed above, vulnerability depends on the probability of occurrence of a hazard event, the exposure of people and property to the hazard, and the susceptibility of people and property to the hazard. Different methodologies exist for assessing the risk posed by natural hazard events, ranging from qualitative to quantitative. In this section, quantitative methodologies are applied to the four hazards identified by the SHMTF as having a high probability, high mitigation potential, and/or well-developed assessment methodology.

As in previous plans, floods and high winds were selected for further analysis based on their high probability of occurrence and ease of mitigation, while earthquakes were selected based on the well-developed Hazus loss estimation methodology. Unlike in previous plans, sea level rise was also selected for further analysis. In developing this plan update, the SHMTF determined that sea level rise has a high probability of occurrence in Alabama and a high ease of mitigation through planning and design approaches. Quantitative methodologies were applied to determine the vulnerability of both state assets and local jurisdictions.

3.3.1.1 Methodology for State Assets

According to FEMA guidance, state assets “may include state-owned or operated buildings, infrastructure, and critical facilities,” and critical facilities are those “structures that the state determines must continue to operate before, during, and after an emergency.”¹⁹⁵ After discussing the FEMA guidance with partners in state agencies, the SHMTF decided to assess the vulnerability of state-insured facilities. An inventory of state-insured facilities was provided by ADECA and originated with the Division of Risk Management. This inventory includes 13,213 structures and contains information on structure type, name, location, and replacement value. Table 3.71 shows the number and value of the different types of structures in the inventory of state-insured facilities. These state-insured facilities and other data on critical facilities were included in the Hazus analysis as user-defined facilities.

Table 3.71: State-Insured Facilities (DORM, 2022)

Facility Type	Number of Vulnerable Structures	Replacement Value
Agriculture	23	\$35,290,591,796.80
Education	10,776	\$4,214,522,054,796.20

¹⁹⁵ FEMA, 2022, State Mitigation Plan Policy Guide.

Facility Type	Number of Vulnerable Structures	Replacement Value
Government	129	\$302,568,217,434.20
Healthcare	63	\$246,649,402,719.30
Institutional	438	\$225,279,775,047.90
Military	58	\$185,699,799,101.70
Parks/Recreation	1,080	\$533,747,475,439.30
Port Authority	103	\$467,059,331,430.20
Public Safety	58	\$82,063,265,032.00
Transportation	470	\$320,115,510,345.50
Total	13,198	\$6,612,995,423,143.10

The quantitative methodology for assessing the vulnerability of state assets consisted of geocoding all inventoried assets and performing a GIS analysis. For each hazard, the methodology mapped the magnitude of the largest event expected to occur within the design life of a building, identified the areas where the magnitude of this event would cause significant damage, and intersected this area with the location of state assets.

3.3.1.2 Methodology for Local Jurisdictions

According to the State Mitigation Plan Policy Guide, state hazard mitigation plans “must provide a current summary of the most vulnerable jurisdictions,” and vulnerability should be analyzed in terms of “damage and loss...related to populations and assets.”¹⁹⁶ To meet these criteria, the SHMTF decided to apply FEMA’s Hazus loss estimation software, version 6.0. Hazus is an integrated GIS-based simulation system that was designed to promote more consistent and standardized assessments of vulnerability and more transparent and effective approaches to setting local and state priorities.

The methodology embedded in the Hazus software divides the loss estimation process into three phases. The first phase is the hazard analysis phase. In this phase, the model analyses the physical processes that determine loss. In the case of flood hazards, for example, the model would determine the depth and velocity of flooding associated with different flood frequencies.

The second phase is the damage estimation phase. In this phase, the model overlays the hazard layer with an inventory layer to identify the buildings and infrastructure exposed to the hazard, then uses vulnerability curves to estimate the extent of structural damage. Each of the Hazus analyses conducted for Alabama used a combination of the default Hazus inventory and user defined data. The default inventory includes information on (1) the general building stock (the number and characteristics of residential, commercial, industrial, agricultural, and other

¹⁹⁶ FEMA, 2015, State Mitigation Plan Policy Guide.

buildings), (2) essential facilities (e.g., police stations) and high-potential loss facilities (e.g., dams), (3) selected transportation systems (e.g., highway bridges), and (4) utility systems (e.g., water treatment plants). A thorough description of the building inventory and other default Hazus data is available in the Hazus Inventory Technical Manual.¹⁹⁷

The quality and accuracy of results from Hazus analysis can be greatly improved with locally developed input, commonly referred to as a Level 2 analysis. When local data sources were found to be more current or detailed than the Hazus default, these were added into the model using CDMS (Comprehensive Data Management System) as user-defined facilities. These included state-provided datasets for building footprints, fire stations, hospitals, law enforcement and EMS facilities, public and private schools, emergency operations centers, military installations, dam lines, natural gas plants, wastewater plants, oil and gas wells, electric substations, railroad bridges, general manufacturing facilities, and port facilities. Hazus 6.0 uses National Structure Inventory (NSI) 2022 data from USACE, 2020 Census data, and primarily 2022 economic values.

The third phase is the loss estimation phase. In this phase, the model quantifies the economic losses caused by the estimated structural damage. Each of the Hazus analyses conducted for Alabama used the damage estimates to calculate two kinds of economic losses: (1) immediate losses related to the damage to structures and their contents (building loss, content loss, and business inventory loss); and (2) business interruption losses related to how long businesses remain inoperable (relocation loss, wage loss, income loss, and rental income loss). Note that income loss refers to business owners' income. The spatial resolution of the modeled losses depends on the modeled hazard. While losses related to flooding and high winds are calculated at the census block level (the smallest census geography), losses related to earthquakes are calculated at the census tract level. The frequency of the modeled losses can also vary depending on the available data. When data is available on the extent of the natural hazard at different probability levels, it is common to present loss estimates in terms of the average annualized loss (AAL). This value condenses the estimated losses at each modeled probability level into a single value representing the average annual loss. Only two of the three Hazus analyses conducted for Alabama present the loss estimates in terms of average annualized loss the earthquake analysis and the high winds analysis. While data for these hazards was available at a series of probability levels, data for flood hazards was available only for the 1% annual chance flood. Loss estimates for flood hazards are therefore presented for only the 1% annual chance event.

3.3.2 Earthquakes

Seismic risk is a function of the probability and frequency of the earthquake hazard, exposure, and susceptibility. While the probability and frequency of earthquake hazards are essentially constant on human timescales, the vulnerability to damage and loss can increase with population growth and development. The following sections summarize potential earthquake impacts to both state assets and jurisdictions throughout Alabama.

¹⁹⁷ Hazus 6.0 Inventory Technical Manual (fema.gov).

3.3.2.1 Vulnerability of State Assets

To assess the vulnerability of state-insured facilities and critical infrastructure to earthquakes, all structures located in areas characterized by a higher relative earthquake hazard and high susceptibility to liquefaction were identified. Relative earthquake hazard was derived from the 2018 USGS National Seismic Hazard Map for the shaking event with a recurrence interval of 2,500 years (2% probability of exceedance in 50 years). As described above, PGA is expressed as a percentage of the force of gravity, or % g, and damage to buildings of poor construction generally begins at a PGA of 10% g. Relative susceptibility to liquefaction was derived from the GSA modeling study (Figure 3.10). As described above, liquefaction is one of several secondary hazards that can increase the impact of an earthquake. While the GSA has recommended projects to study additional secondary hazards in Alabama, the distribution of other secondary hazards in Alabama is not currently available. Vulnerable assets were defined as those assets located in areas with a PGA exceeding 10% g, and a high or very high susceptibility to liquefaction.

Of the more than 13,198 state-insured facilities, 557 are located in areas with a relatively high probability of strong ground shaking and a high susceptibility to ground failure through liquefaction (Table 3.72). These facilities have a combined replacement value of more than \$1 billion, or approximately 4% of the value of all state-insured facilities.

Table 3.72: State-Insured Facilities Vulnerable to Earthquake Hazard

Facility Type	# of Vulnerable Structures	% of Total Structures for Facility Type	Replacement Value	% of Total Value for Facility Type
Agriculture	7	30.4%	\$226,769,690.00	0.64%
Education	485	4.5%	\$309,789,554,304.00	7.35%
Government	8	6.2%	\$5,952,533,680.00	1.97%
Healthcare	12	19.0%	\$6,432,916,160.00	2.61%
Institutional	51	11.6%	\$2,709,906,428.00	1.20%
Military	2	3.4%	\$2,785,965,900.00	1.50%
Parks/Recreation	42	3.9%	\$2,789,314,560.00	0.52%
Port Authority	2	1.9%	\$164,721,640.00	0.04%
Public Safety	10	17.2%	\$1,520,304,550.00	1.85%
Transportation	61	13.0%	\$13,860,657,424.00	4.33%
Total	680	5.2%	\$346,232,644,336.00	5.24%

The essential facilities Hazus inventory includes 142 hospitals, 1,930 schools, 82 EOCs, 578 police stations, and 1,544 fire stations. Of these structures, 16 are located in areas with a relatively high probability of strong ground shaking and a high susceptibility to ground failure through liquefaction (Table 3.73). Most of these facilities are dams.

Table 3.73: Expected Damage to Essential Facilities: Earthquake

Facility Type	# of Structures	At Least Moderate Damage >50%	With Functionality >50% on Day 1
Hospitals	142	11	100
Schools	1,930	109	1,390
EOCs	82	9	55
Police Stations	578	45	403
Fire Stations	1,544	107	1,214
Total	4,276	281	3,162

3.3.2.2 Vulnerability of Jurisdictions

FEMA's Hazus software, version 6.0, was used to estimate seismic vulnerability across the state. The methodology uses Hazus standard seismic hazard algorithms along with state-wide building stock, transportation, and utility data, as well as the user-defined facilities for essential and high-potential loss structures. The calculation algorithms quantify the potential losses associated with seismic hazards using information about shake probabilities, soil characteristics, and other parameters. As discussed in Section 3.3.1, Hazus was used to calculate two kinds of economic losses: (1) immediate losses related to the damage to structures and their contents, and (2) business interruption losses related to how long businesses remain inoperable.

The following tables show the average annualized earthquake losses for Alabama aggregated at the county scale. While Table 3.74 shows immediate economic losses (building loss, contents loss, and business inventory loss), Table 3.75 shows business interruption losses (relocation costs, income loss, rental loss, and wage loss). Figure 3.64 shows the spatial distribution of the total average annualized losses (the sum of immediate losses and business interruption losses). Note that losses are shown at the census tract level. While the county-level tables show the highest annualized losses in Jefferson and Madison Counties, the census-tract level map shows the highest annualized losses in census tracts located in Madison, Morgan, Colbert, and Lauderdale Counties.

Table 3.74: Potential Immediate Losses from Earthquake Hazards

County	Building Loss	Contents Loss	Business Inventory Loss	Total Immediate Loss
Autauga	\$95,873,000	\$117,468,000	\$13,240,000	\$226,581,000
Baldwin	\$108,606,000	\$138,625,000	\$12,588,000	\$259,819,000
Barbour	\$25,315,000	\$25,411,000	\$3,650,000	\$54,376,000
Bibb	\$54,412,000	\$70,012,000	\$7,322,000	\$131,746,000
Blount	\$102,805,000	\$118,739,000	\$12,936,000	\$234,480,000
Bullock	\$7,672,000	\$8,889,000	\$735,000	\$17,296,000
Butler	\$25,712,000	\$28,839,000	\$3,189,000	\$57,740,000
Calhoun	\$230,865,000	\$306,214,000	\$40,982,000	\$578,061,000
Chambers	\$22,287,000	\$28,394,000	\$2,733,000	\$53,414,000
Cherokee	\$61,388,000	\$84,269,000	\$9,507,000	\$155,164,000
Chilton	\$108,945,000	\$144,732,000	\$19,037,000	\$272,714,000
Choctaw	\$69,844,000	\$87,397,000	\$6,654,000	\$163,895,000
Clarke	\$39,353,000	\$47,648,000	\$8,156,000	\$95,157,000
Clay	\$19,968,000	\$26,490,000	\$2,858,000	\$49,316,000
Cleburne	\$18,445,000	\$22,331,000	\$1,793,000	\$42,569,000
Coffee	\$57,304,000	\$65,271,000	\$4,028,000	\$126,603,000
Colbert	\$331,179,000	\$393,163,000	\$69,600,000	\$793,942,000
Conecuh	\$6,693,000	\$8,436,000	\$676,000	\$15,805,000
Coosa	\$11,413,000	\$15,058,000	\$1,067,000	\$27,538,000
Covington	\$15,574,000	\$17,465,000	\$2,458,000	\$35,497,000
Crenshaw	\$13,312,000	\$14,802,000	\$928,000	\$29,042,000
Cullman	\$254,398,000	\$287,151,000	\$45,199,000	\$586,748,000
Dale	\$27,002,000	\$30,337,000	\$3,356,000	\$60,695,000
Dallas	\$57,850,000	\$73,421,000	\$10,322,000	\$141,593,000
DeKalb	\$229,376,000	\$312,300,000	\$45,406,000	\$587,182,000
Elmore	\$83,270,000	\$104,369,000	\$8,700,000	\$196,339,000
Escambia	\$33,086,000	\$36,687,000	\$4,734,000	\$74,507,000
Etowah	\$220,612,000	\$313,673,000	\$30,748,000	\$565,033,000
Fayette	\$103,984,000	\$118,166,000	\$22,374,000	\$244,524,000
Franklin	\$182,224,000	\$243,818,000	\$28,816,000	\$454,858,000
Geneva	\$7,668,000	\$6,872,000	\$962,000	\$15,502,000
Greene	\$29,609,000	\$45,324,000	\$4,511,000	\$79,444,000
Hale	\$53,480,000	\$69,653,000	\$5,488,000	\$128,621,000
Henry	\$10,046,000	\$10,307,000	\$1,248,000	\$21,601,000

County	Building Loss	Contents Loss	Business Inventory Loss	Total Immediate Loss
Houston	\$40,210,000	\$44,577,000	\$5,738,000	\$90,525,000
Jackson	\$175,829,000	\$245,582,000	\$13,783,000	\$435,194,000
Jefferson	\$1,503,344,000	\$2,131,058,000	\$233,789,000	\$3,868,191,000
Lamar	\$100,336,000	\$120,254,000	\$20,088,000	\$240,678,000
Lauderdale	\$435,115,000	\$532,083,000	\$82,655,000	\$1,049,853,000
Lawrence	\$93,802,000	\$114,328,000	\$12,350,000	\$220,480,000
Lee	\$107,380,000	\$135,196,000	\$16,115,000	\$258,691,000
Limestone	\$299,979,000	\$364,959,000	\$45,490,000	\$710,428,000
Lowndes	\$8,145,000	\$10,013,000	\$1,135,000	\$19,293,000
Macon	\$27,344,000	\$32,984,000	\$2,925,000	\$63,253,000
Madison	\$1,080,454,000	\$1,419,627,000	\$154,221,000	\$2,654,302,000
Marengo	\$46,882,000	\$57,831,000	\$7,507,000	\$112,220,000
Marion	\$200,860,000	\$256,818,000	\$34,939,000	\$492,617,000
Marshall	\$266,584,000	\$331,382,000	\$42,822,000	\$640,788,000
Mobile	\$180,477,000	\$245,737,000	\$20,628,000	\$446,842,000
Monroe	\$19,814,000	\$22,641,000	\$2,975,000	\$45,430,000
Montgomery	\$398,064,000	\$454,339,000	\$57,266,000	\$909,669,000
Morgan	\$410,792,000	\$488,346,000	\$77,809,000	\$976,947,000
Perry	\$20,683,000	\$26,515,000	\$3,023,000	\$50,221,000
Pickens	\$88,616,000	\$122,696,000	\$9,823,000	\$221,135,000
Pike	\$38,802,000	\$48,913,000	\$3,970,000	\$91,685,000
Randolph	\$21,273,000	\$27,229,000	\$2,677,000	\$51,179,000
Russell	\$43,117,000	\$47,583,000	\$4,860,000	\$95,560,000
Shelby	\$352,681,000	\$531,093,000	\$49,513,000	\$933,287,000
St. Clair	\$150,976,000	\$176,047,000	29,097,000	\$356,120,000
Sumter	\$65,639,000	\$97,285,000	\$6,212,000	\$169,136,000
Talladega	\$139,388,000	\$182,555,000	\$19,272,000	\$341,215,000
Tallapoosa	\$39,844,000	\$52,570,000	\$6,135,000	\$98,549,000
Tuscaloosa	\$932,479,000	\$1,402,155,000	\$145,202,000	\$2,479,836,000
Walker	\$181,423,000	\$228,560,000	\$29,418,000	\$439,401,000
Washington	\$16,834,000	\$17,750,000	\$1,625,000	\$36,209,000
Wilcox	\$20,462,000	\$23,795,000	\$2,020,000	\$46,277,000
Winston	\$114,047,000	\$139,869,000	\$22,173,000	\$276,089,000
Total	\$10,341,245,000	\$13,554,107,000	\$1,603,358,000	\$25,498,710,000

Table 3.75: Potential Business Interruption Losses from Earthquake Hazards

County	Income Loss	Relocation Loss	Rental Income Loss	Wage Loss	Total Business Interruption Losses
Autauga	\$64,781,000	\$32,411,000	\$50,987,000	\$25,473,000	\$173,652,000
Baldwin	\$85,565,000	\$47,579,000	\$60,278,000	\$41,606,000	\$235,028,000
Barbour	\$17,046,000	\$8,711,000	\$12,580,000	\$7,823,000	\$46,160,000
Bibb	\$36,436,000	\$15,483,000	\$24,754,000	\$15,149,000	\$91,822,000
Blount	\$69,361,000	\$32,343,000	\$50,290,000	\$27,530,000	\$179,524,000
Bullock	\$6,021,000	\$3,458,000	\$5,327,000	\$2,646,000	\$17,452,000
Butler	\$21,366,000	\$11,987,000	\$18,446,000	\$8,252,000	\$60,051,000
Calhoun	\$166,614,000	\$86,318,000	\$125,930,000	\$69,735,000	\$448,597,000
Chambers	\$17,233,000	\$13,508,000	\$14,898,000	\$9,122,000	\$54,761,000
Cherokee	\$43,830,000	\$21,583,000	\$36,670,000	\$18,946,000	\$121,029,000
Chilton	\$70,425,000	\$33,159,000	\$54,200,000	\$26,350,000	\$184,134,000
Choctaw	\$55,235,000	\$13,497,000	\$19,044,000	\$45,452,000	\$133,228,000
Clarke	\$31,498,000	\$16,199,000	\$27,295,000	\$13,625,000	\$88,617,000
Clay	\$15,038,000	\$7,875,000	\$12,817,000	\$6,449,000	\$42,179,000
Cleburne	\$13,923,000	\$6,157,000	\$7,719,000	\$6,028,000	\$33,827,000
Coffee	\$45,623,000	\$10,014,000	\$13,764,000	\$43,192,000	\$112,593,000
Colbert	\$183,783,000	\$112,293,000	\$164,200,000	\$95,297,000	\$555,573,000
Conecuh	\$5,790,000	\$2,893,000	\$4,280,000	\$2,196,000	\$15,159,000
Coosa	\$8,362,000	\$2,108,000	\$4,167,000	\$3,033,000	\$17,670,000
Covington	\$12,119,000	\$4,451,000	\$7,519,000	\$5,240,000	\$29,329,000
Crenshaw	\$11,003,000	\$4,740,000	\$6,284,000	\$4,664,000	\$26,691,000
Cullman	\$154,602,000	\$93,664,000	\$129,464,000	\$69,168,000	\$446,898,000
Dale	\$21,746,000	\$11,373,000	\$15,583,000	\$9,884,000	\$58,586,000
Dallas	\$41,101,000	\$16,289,000	\$26,332,000	\$15,866,000	\$99,588,000
DeKalb	\$148,927,000	\$113,957,000	\$144,837,000	\$65,761,000	\$473,482,000
Elmore	\$57,761,000	\$35,321,000	\$46,339,000	\$25,959,000	\$165,380,000
Escambia	\$24,800,000	\$14,065,000	\$18,788,000	\$12,263,000	\$69,916,000
Etowah	\$162,416,000	\$118,164,000	\$158,813,000	\$71,910,000	\$511,303,000
Fayette	\$60,107,000	\$40,351,000	\$59,068,000	\$25,674,000	\$185,200,000
Franklin	\$121,384,000	\$81,368,000	\$112,129,000	\$56,293,000	\$371,174,000
Geneva	\$5,610,000	\$2,095,000	\$2,871,000	\$2,188,000	\$12,764,000
Greene	\$20,667,000	\$14,973,000	\$18,825,000	\$9,325,000	\$63,790,000
Hale	\$37,885,000	\$18,607,000	\$23,722,000	\$16,999,000	\$97,213,000
Henry	\$7,602,000	\$3,947,000	\$5,112,000	\$3,330,000	\$19,991,000
Houston	\$29,178,000	\$16,705,000	\$24,329,000	\$15,084,000	\$85,296,000

County	Income Loss	Relocation Loss	Rental Income Loss	Wage Loss	Total Business Interruption Losses
Jackson	\$133,268,00	\$91,409,000	\$117,884,00	\$66,931,000	\$409,492,000
Jefferson	\$1,058,385,000	\$649,236,00	\$937,207,00	\$482,987,00	\$3,127,815,00
Lamar	\$60,205,000	\$30,007,000	\$48,450,000	\$26,582,000	\$165,244,000
Lauderdale	\$283,926,00	\$143,544,000	\$210,529,00	\$123,222,00	\$761,221,000
Lawrence	\$68,842,000	\$30,519,000	\$50,499,000	\$26,225,000	\$176,085,000
Lee	\$87,388,000	\$43,196,000	\$50,434,000	\$34,047,000	\$215,065,000
Limestone	\$200,592,00	\$97,891,000	\$142,224,000	\$85,129,000	\$525,836,000
Lowndes	\$5,885,000	\$2,997,000	\$3,451,000	\$2,304,000	\$14,637,000
Macon	\$26,264,000	\$13,903,000	\$21,311,000	\$8,549,000	\$70,027,000
Madison	\$726,063,00	\$423,052,00	\$573,895,000	\$322,543,000	\$2,045,553,000
Marengo	\$32,274,000	\$17,637,000	\$29,906,000	\$14,619,000	\$94,436,000
Marion	\$121,569,00	\$83,016,000	\$123,687,00	\$57,270,000	\$385,542,000
Marshall	\$183,839,00	\$125,081,00	\$166,690,00	\$86,863,000	\$562,473,000
Mobile	\$140,255,00	\$117,043,00	\$137,585,00	\$68,922,000	\$463,805,000
Monroe	\$15,674,000	\$12,105,000	\$14,386,000	\$6,916,000	\$49,081,000
Montgomery	\$298,052,00	\$180,563,00	\$266,867,00	\$139,267,00	\$884,749,000
Morgan	\$242,909,00	\$144,434,00	\$223,644,00	\$111,680,00	\$722,667,000
Perry	\$16,202,000	\$7,659,000	\$12,264,000	\$7,017,000	\$43,142,000
Pickens	\$64,819,000	\$33,491,000	\$43,360,000	\$29,590,000	\$171,260,000
Pike	\$43,046,000	\$17,717,000	\$23,459,000	\$14,015,000	\$98,237,000
Randolph	\$18,678,000	\$8,396,000	\$13,502,000	\$7,075,000	\$47,651,000
Russell	\$32,225,000	\$13,344,000	\$18,796,000	\$13,326,000	\$77,691,000
Shelby	\$228,030,00	\$148,551,00	\$201,066,00	\$99,797,000	\$677,444,000
St. Clair	\$4,300	\$92,206,000	\$43,397,000	\$65,621,000	\$201,228,300
Sumter	\$64,465,000	\$24,808,000	\$35,028,000	\$23,426,000	\$147,727,000
Talladega	\$99,050,000	\$45,554,000	\$66,307,000	\$42,521,000	\$253,432,000
Tallapoosa	\$30,055,000	\$15,682,000	\$23,160,000	\$15,525,000	\$84,422,000
Tuscaloosa	\$765,591,00	\$387,442,00	\$569,468,00	\$26,507,000	\$2,019,008,00
Walker	\$132,084,00	\$69,899,000	\$111,839,00	\$54,952,000	\$368,774,000
Washington	\$12,417,000	\$3,895,000	\$6,698,000	\$4,307,000	\$27,317,000
Wilcox	\$15,468,000	\$5,701,000	\$8,097,000	\$5,873,000	\$35,139,000
Winston	\$71,386,000	\$39,717,000	\$57,080,000	\$34,590,000	\$202,773,000
Total	\$7,153,748,30	\$4,187,341,000	\$5,859,831,000	\$3,255,710,000	\$20,456,630,300

Figure 3.65: Annualized Loss Estimates for Earthquake Hazard

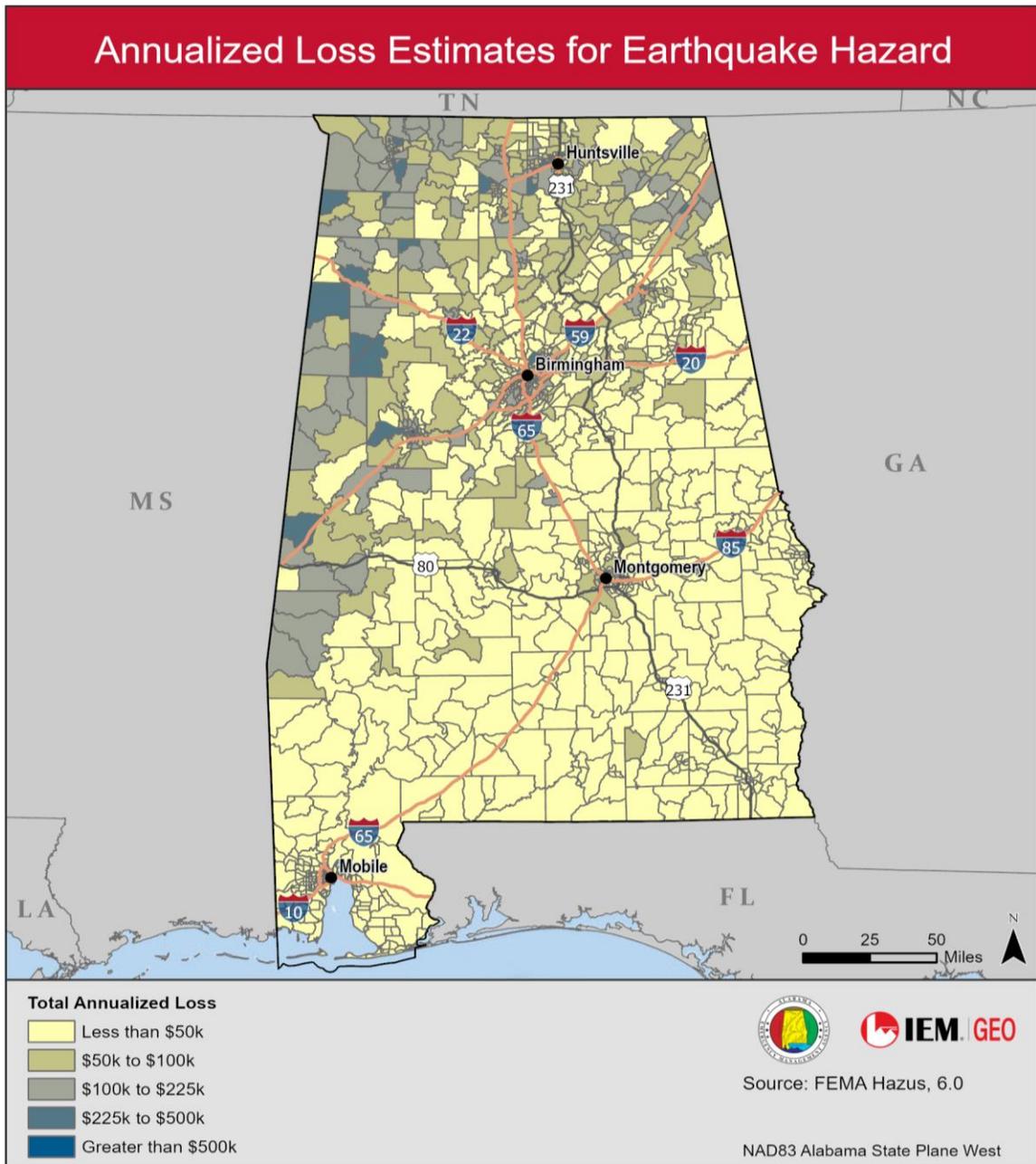


Figure 3.66: State Inventory Moderate Building Damage for Earthquake Hazard

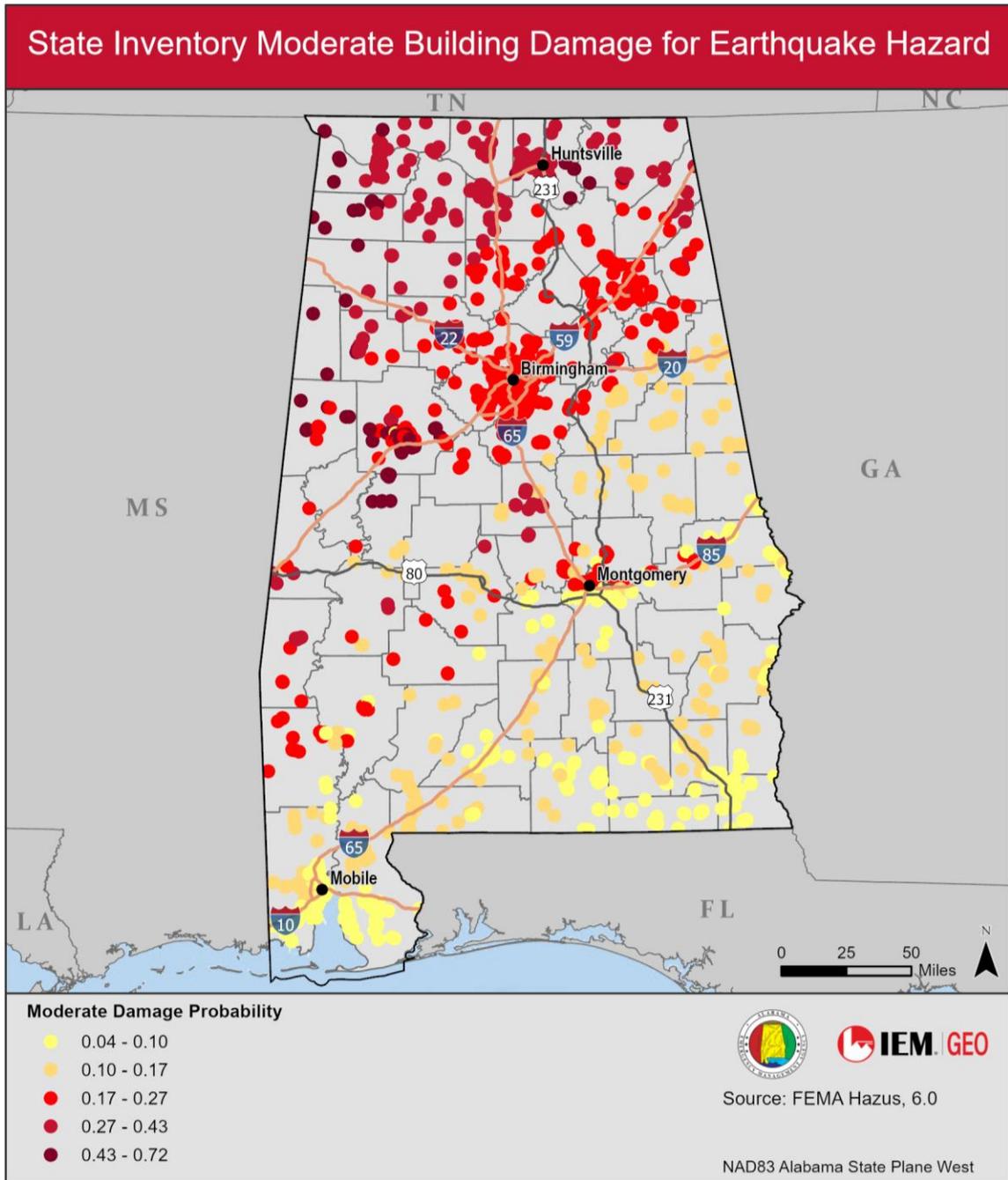
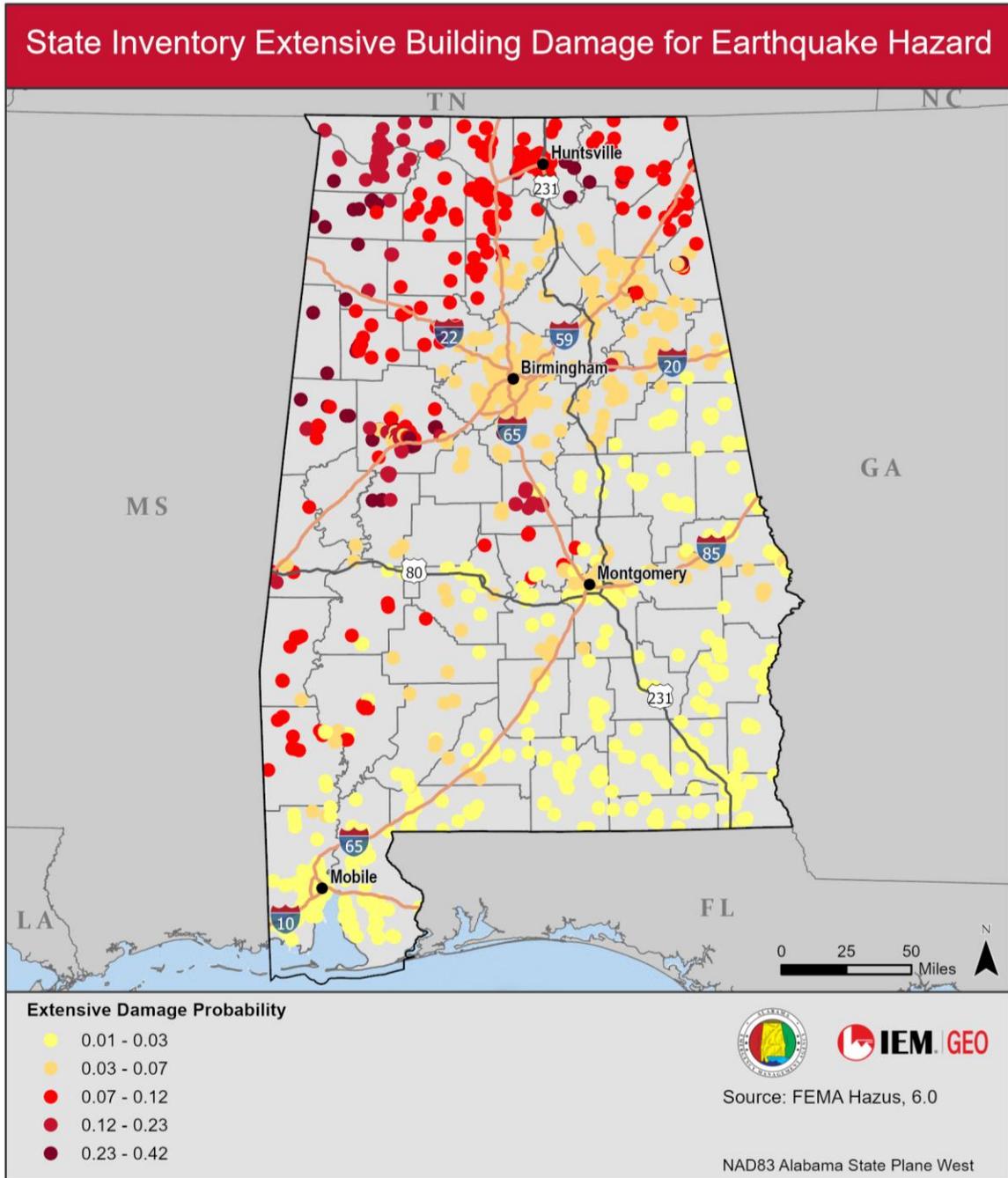


Figure 3.67: State Inventory Extensive Building Damage for Earthquake Hazard



3.3.3 Flooding

The risk of damage and loss from flooding is a function of the flood hazard; the exposure of people, buildings, and infrastructure; and the susceptibility of the exposed communities and structures. As discussed in Section 3.2.5, the probability of both riverine and coastal flooding will

likely increase with climate change. The precise amount by which the probability of flooding will increase, however, is uncertain. This section, therefore, summarizes the potential impacts of flooding on state assets and jurisdictions under the present conditions.

3.3.3.1 Vulnerability of State Assets

The vulnerability of state assets to flooding was determined based on the flood zones mapped by FEMA's Risk MAP program. As discussed in Section 3.2.5, the flood zones delineated by the Risk MAP program include areas with a 1% annual chance of flooding, areas with a 0.2% annual chance of flooding, and coastal high-hazard areas. Coastal high hazard areas are those with a 1% annual chance of flooding that are subject to additional hazards associated with storm-induced waves.

Of the more than 13,198 state-insured facilities, 244 are located within the 1% annual chance floodplain (Table 3.76). These facilities consist mostly of park and recreation facilities, education facilities, transportation facilities, and port facilities, and have a combined replacement value of more than \$30 billion for a 1% annual chance flood. Of the 4,275 essential facilities included in Hazus, the flood scenario did not identify any expected to have moderate damage.

Table 3.76: State-Insured Facilities Vulnerable to 1% Annual Chance Flood

Facility Type	# of Vulnerable Structures	% of Total Structures for Facility Type	Replacement Value	% of Total Value for Facility Type
Education	113	1.05%	\$16,605,337,790.58	0.39%
Government	2	1.55%	\$68,642,040.00	0.02%
Institutional	13	2.97%	\$17,916,000.73	0.11%
Parks/Recreation	14	1.30%	\$577,411,052.26	0.11%
Port Authority	84	81.55%	\$12,866,999,021.70	2.75%
Transportation	18	3.83%	\$22,662,001.98	0.01%
Total	244	1.85%	\$30,158,967,907.24	0.46%

3.3.3.2 Vulnerability of Jurisdictions

The relative vulnerability of jurisdictions to flood hazards can be estimated based on both historic losses and Hazus modeling of potential losses. As discussed in Section 3.2.5, the NFIP is a program established by the federal government to reduce and insure flood losses. Through this program, FEMA collects extensive data on the location of NFIP insurance claims. In addition to tracking the location of claims and the value of payments for building and contents losses, FEMA tracks the number of repetitive loss (RL) and severe repetitive loss (SRL) properties, and the claims associated with them. The distribution of NFIP claims and RL/SRL claims indicates where the historical vulnerability to flood events was greatest.

Figure 3.67, Figure 3.68, Figure 3.69, and Figure 3.70 show the distribution of NFIP claims, NFIP repetitive loss claims, NFIP claims per 1,000 persons, and NFIP repetitive loss claims per 1,000 persons, respectively. Table 3.77 provides a summary of severe repetitive loss properties and claims. The first two figures in the series highlight that all the major metropolitan areas have seen high numbers of insurance claims, but the coastal counties and the counties in the greater Birmingham area have seen the highest numbers of repetitive loss claims. The third and fourth figures in the series take population density into account and show the counties where the number of per capita claims is highest. These figures reveal that per capita losses are particularly high in Greene and Coffee Counties. The table summarizes the total SRL properties and losses by county and summarizes the total and average payments. The coastal counties of Baldwin and Mobile have the highest total payments and average payments for SRL properties. While Jefferson has fewer SRL properties, the average claim payment per property is the third highest due to increased property values in this area of Alabama.

Communities living in low-lying areas or floodplains are especially vulnerable to flooding events. These regions are prone to inundation when rivers or lakes overflow their banks or experience heavy rainfall. Residents in these areas face a higher risk of property damage, displacement, and the loss of essential services such as electricity, water, and transportation. This is especially true for the socially vulnerable population and underserved communities. These populations and communities often face increased vulnerability to flooding. Limited resources, inadequate housing conditions, and a lack of access to early warning systems or evacuation options can exacerbate their vulnerability. These communities may have fewer resources to recover from flood-related damage and are at risk of facing prolonged hardships.

Urban populations residing in densely populated cities are also vulnerable to flooding. Impermeable surfaces, such as concrete and asphalt, can exacerbate the impact of heavy rainfall, leading to urban flooding. Inadequate drainage systems, combined with high population density, can result in significant property damage, disruption of essential services, and safety concerns.

Individuals with limited mobility or disabilities may face additional challenges during flooding events. Evacuation procedures, access to emergency shelters, and transportation options may not be adequately equipped to accommodate their needs. This can heighten their vulnerability and hinder their ability to seek safety and support during floods.

Moreover, agricultural communities are vulnerable to the effects of flooding. Farmland located in flood-prone areas can suffer significant crop losses, soil erosion, and damage to agricultural infrastructure. Farmers and agricultural workers may face economic hardships due to disrupted livelihoods and the long-term impacts on their agricultural practices.

The National Risk Index is a compilation of expected annual losses, social vulnerability, and community resilience to an identified risk. The formula applied is $\text{Expected Annual Loss} \times \text{Social Vulnerability} \div \text{Community Resilience} = \text{Risk Index}$, as discussed in Section 5. According to the National Risk Index, the risk index for flooding in Alabama is relatively high.

Figure 3.68 Number of NFIP Claims (1978–2022)

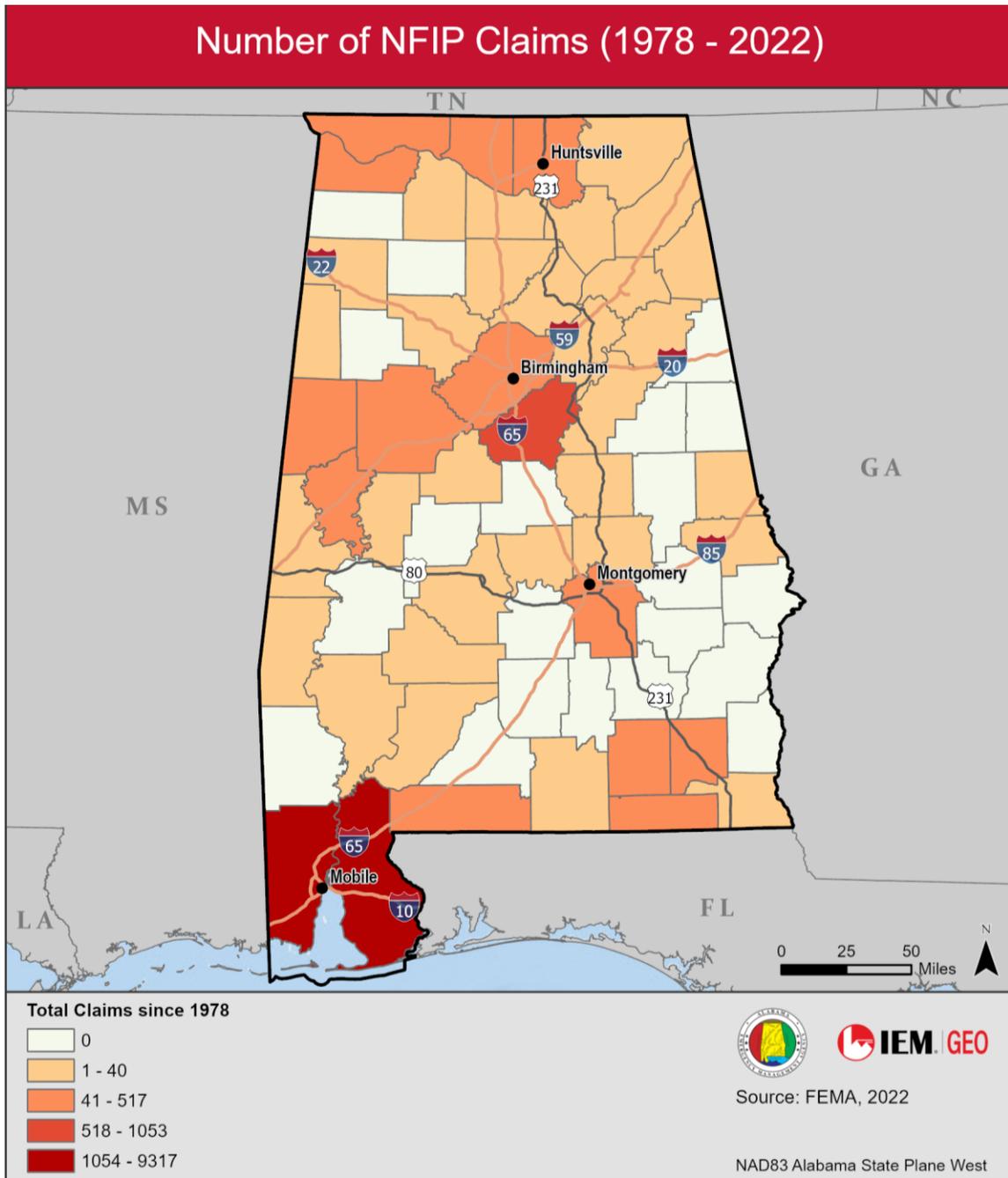


Figure 3.69: Number of NFIP Repetitive Loss Claims (1978–2022)

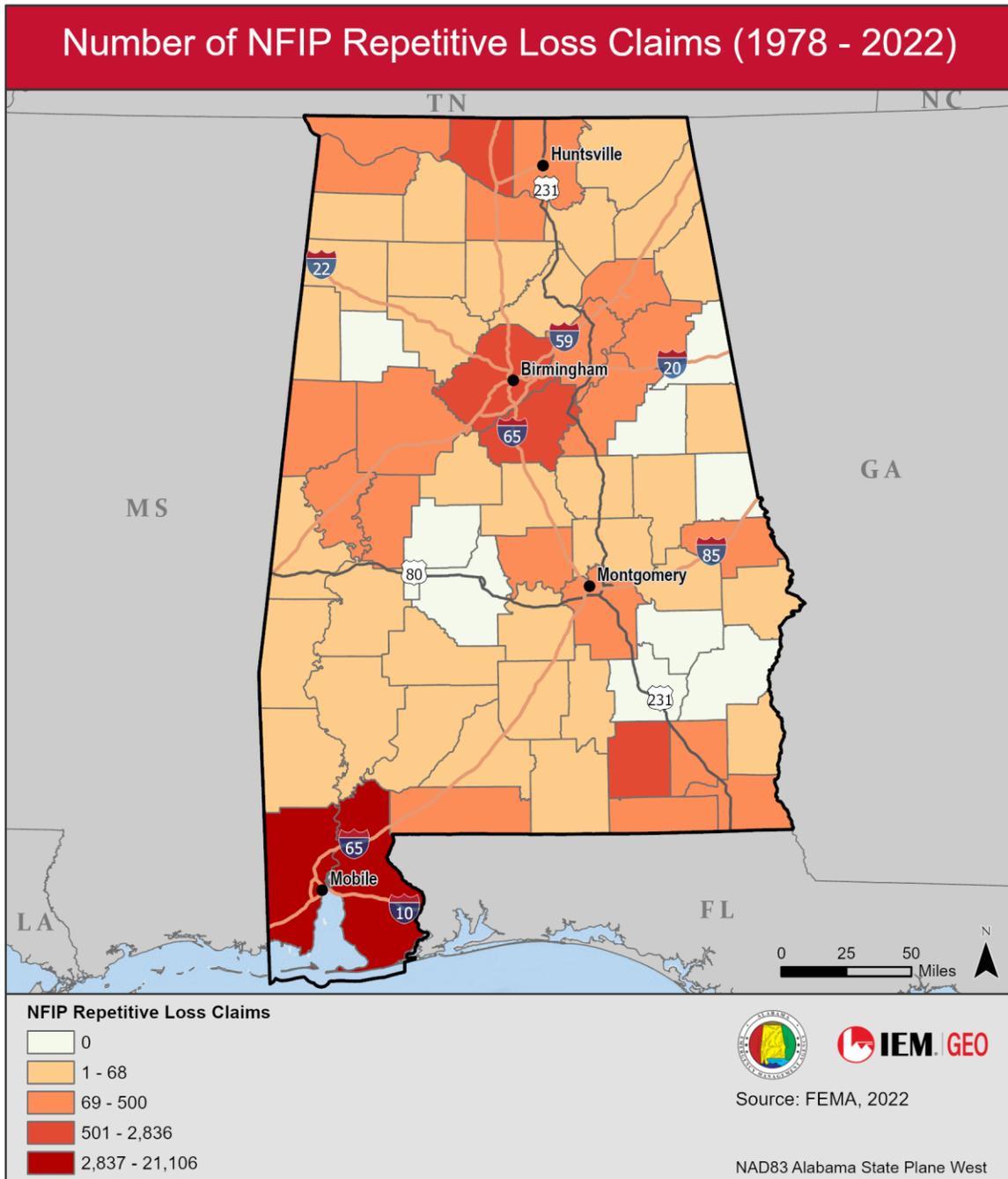


Figure 3.70: Number of NFIP Claims per 1,000 Persons (1978–2022)

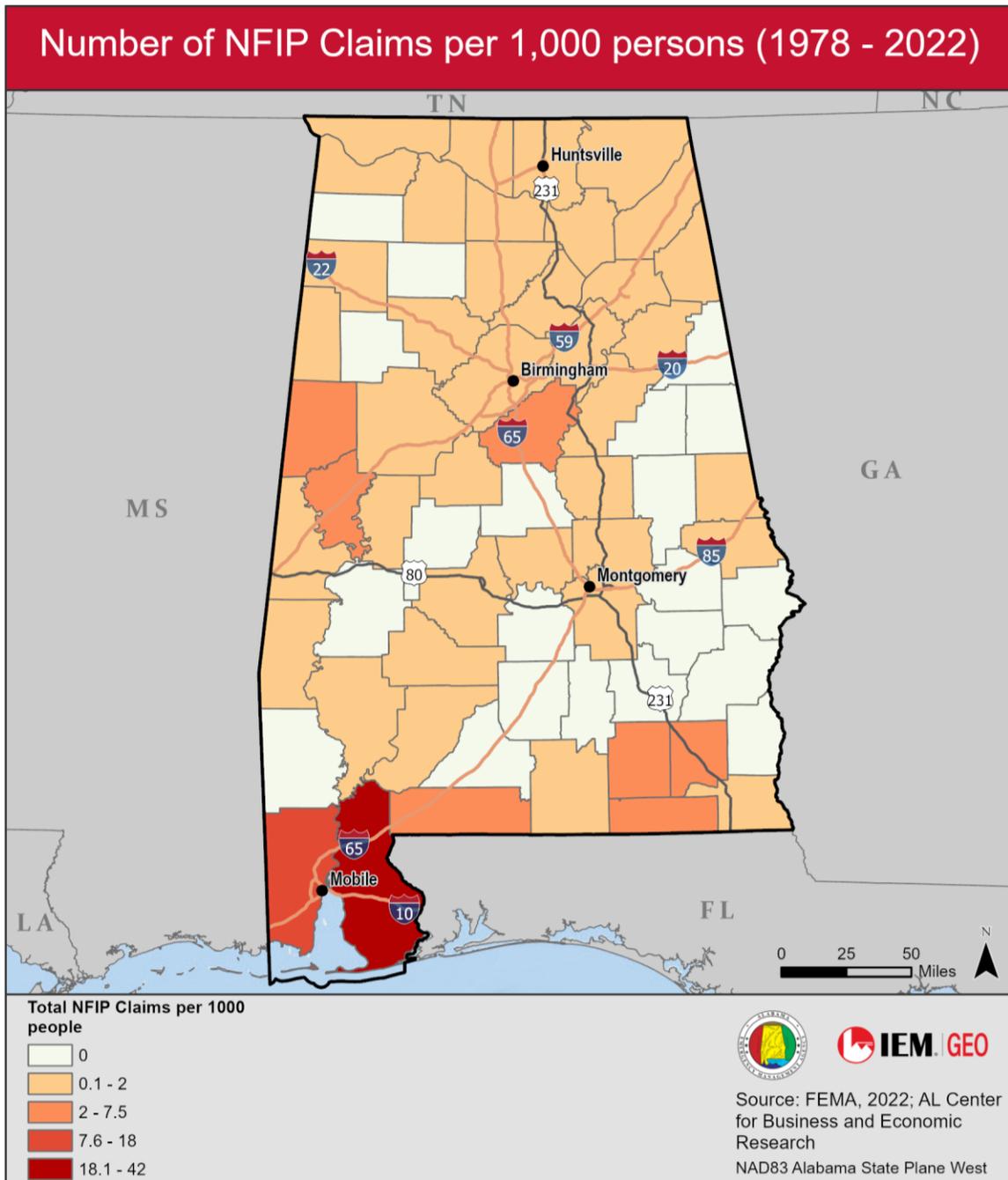
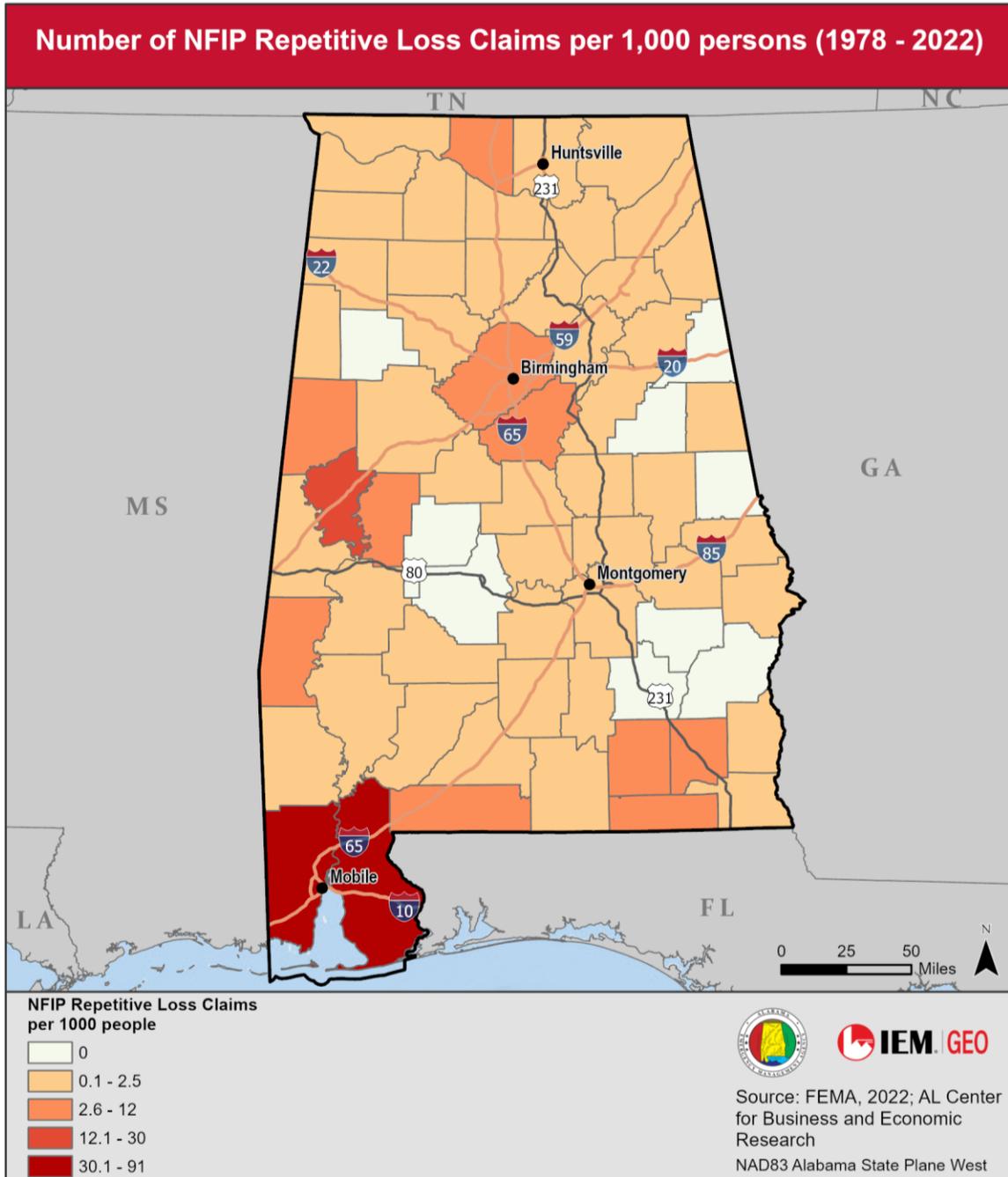


Figure 3.77: Number of NFIP Repetitive Loss Claims per 1,000 persons (1978–2022)

County	Total Properties	Total Losses	Total Claims Payments	Average Claims Payment
Baldwin	432	1965	\$136,951,404.00	\$69,695.00
Mobile	448	2148	\$89,117,941.00	\$41,489.00
Shelby	52	317	\$8,232,684.00	\$25,971.00
Jefferson	35	190	\$7,681,910.00	\$40,431.00
Madison	7	36	\$775,354.00	\$21,538.00
Escambia	6	33	\$3,595,801.00	\$108,964.00
Coffee	6	20	\$642,649.00	\$32,132.00
Dale	5	14	\$752,864.00	\$53,776.00
Pickens	4	19	\$452,220.00	\$23,801.00
Colbert	3	31	\$818,812.00	\$26,414.00
Greene	3	14	\$326,868.00	\$23,348.00
Montgomery	3	14	\$381,045.00	\$27,217.00
Geneva	3	11	\$330,309.00	\$30,028.00
Houston	3	9	\$650,989.00	\$72,332.00
Morgan	2	18	\$660,448.00	\$36,692.00
Blount	1	6	\$659,774.00	\$109,962.00
Lawrence	1	6	\$65,935.00	\$10,989.00
Coosa	1	5	\$158,193.00	\$31,639.00
Marshall	1	5	\$217,941.00	\$43,588.00
Tuscaloosa	1	5	\$86,993.00	\$17,399.00
Choctaw	1	4	\$70,090.00	\$17,523.00
Lauderdale	1	4	\$84,481.00	\$21,120.00
St. Clair	1	4	\$59,446.00	\$14,862.00
Elmore	1	3	\$660,448.00	\$36,692.00
Covington	1	2	\$29,149.00	\$36,692.00
DeKalb	1	2	\$36,393.00	\$18,196.00
Etowah	1	2	\$13,585.00	\$6792.00
Unknown	3	11	\$467,157.00	\$42,469.00
Total	1027	4898	\$253,980,893.00	\$1,041,751.00

Figure 3.71: Summary of NFIP Severe Repetitive Loss Properties and Claims



FEMA's Hazus software, version 6.0, was also used to estimate potential flood losses across the state. The methodology used a Level II analysis for riverine flooding. The latest available FEMA flood maps and ground elevation data were used to derive local flood depths. This data was combined with the Hazus inventory data, user-defined datasets, and the default depth-damage curves to estimate damages and associated losses. As discussed in Section 3.3.1, Hazus was used to calculate two kinds of economic losses: (1) immediate losses related to the damage to structures and their contents, and (2) business interruption losses related to how long businesses remain inoperable.

The following tables show the flood losses associated with the 1% annual chance flood event aggregated at the county scale. As discussed in Section 3.3.1, flood depth data was not available for multiple flood frequencies, and the average annualized loss therefore could not be calculated. While Table 3.78 shows immediate economic losses (building loss, contents loss, and business inventory loss), Table 3.79 shows business interruption losses (relocation costs, income loss, rental loss, and wage loss). The estimated immediate losses for the 1% annual chance flood are highest for Baldwin, Madison, and Jefferson Counties, while the estimated business interruption losses are highest for Mobile, Jefferson, and Madison Counties.

Figure 3.71 shows the spatial distribution of the total average annualized losses (the sum of immediate losses and business interruption losses). Note that losses are shown at the census tract level. The census tracts with the highest estimated losses are located in the coastal areas of Mobile and Baldwin Counties and in the western part of the greater Montgomery area.

Table 3.78: Potential Immediate Losses from Flood Hazards (1% annual chance)

County	Building Loss	Contents Loss	Inventory Loss	Total Immediate Loss
Autauga	\$4,896,000	\$5,560,000	\$458,000	\$10,914,000
Baldwin	\$229,505,000	\$194,353,000	\$11,538,000	\$435,396,000
Barbour	\$37,736,000	\$30,936,000	\$6,258,000	\$74,930,000
Bibb	\$78,690,000	\$72,687,000	\$8,629,000	\$160,006,000
Blount	\$13,314,000	\$11,072,000	\$1,769,000	\$26,155,000
Bullock	\$266,000	\$560,000	\$0	\$826,000
Butler	\$27,080,000	\$27,775,000	\$717,000	\$55,572,000
Calhoun	\$22,684,000	\$36,804,000	\$5,865,000	\$65,353,000
Chambers	\$3,439,000	\$5,706,000	\$786,000	\$9,931,000
Cherokee	\$7,941,000	\$5,970,000	\$568,000	\$14,479,000
Chilton	\$13,113,000	\$8,700,000	\$486,000	\$22,299,000
Choctaw	\$133,809,000	\$117,149,000	\$11,296,000	\$262,254,000
Clarke	\$5,887,000	\$4,313,000	\$410,000	\$10,610,000
Clay	\$133,000	\$58,000	\$0	\$191,000

County	Building Loss	Contents Loss	Inventory Loss	Total Immediate Loss
Cleburne	\$10,799,000	\$14,161,000	\$4,680,000	\$29,640,000
Coffee	\$22,753,000	\$16,403,000	\$1,416,000	\$40,572,000
Colbert	\$49,251,000	\$75,831,000	\$19,160,000	\$144,242,000
Conecuh	\$1,760,000	\$1,098,000	\$9,000	\$2,867,000
Coosa	\$21,093,000	\$11,492,000	\$141,000	\$32,726,000
Covington	\$68,009,000	\$39,528,000	\$1,393,000	\$108,930,000
Crenshaw	\$5,698,000	\$6,136,000	\$338,000	\$12,172,000
Cullman	\$28,217,000	\$23,106,000	\$1,039,000	\$52,362,000
Dale	\$1,058,000	\$929,000	\$178,000	\$2,165,000
Dallas	\$25,539,000	\$28,873,000	\$2,018,000	\$56,430,000
DeKalb	\$16,282,000	\$15,911,000	\$1,881,000	\$34,074,000
Elmore	\$10,286,000	\$15,680,000	\$896,000	\$26,862,000
Escambia	\$13,086,000	\$19,285,000	\$1,036,000	\$33,407,000
Etowah	\$31,149,000	\$29,270,000	\$2,317,000	\$62,736,000
Fayette	\$5,970,000	\$10,725,000	\$4,215,000	\$20,910,000
Franklin	\$12,262,000	\$9,890,000	\$1,630,000	\$23,782,000
Geneva	\$13,451,000	\$11,459,000	\$936,000	\$25,846,000
Greene	\$4,447,000	\$2,660,000	\$139,000	\$7,246,000
Hale	\$31,526,000	\$24,727,000	\$1,762,000	\$58,015,000
Henry	\$21,027,000	\$12,491,000	\$473,000	\$33,991,000
Houston	\$41,350,000	\$43,170,000	\$4,737,000	\$89,257,000
Jackson	\$23,869,000	\$37,160,000	\$1,536,000	\$62,565,000
Jefferson	\$63,960,000	\$88,577,000	\$9,925,000	\$162,462,000
Lamar	\$12,860,000	\$15,858,000	\$1,721,000	\$30,439,000
Lauderdale	\$24,764,000	\$22,248,000	\$2,304,000	\$49,316,000
Lawrence	\$5,891,000	\$4,533,000	\$221,000	\$10,645,000
Lee	\$9,303,000	\$6,816,000	\$521,000	\$16,640,000
Limestone	\$17,014,000	\$12,843,000	\$1,237,000	\$31,094,000
Lowndes	\$4,245,000	\$3,913,000	\$216,000	\$8,374,000
Macon	\$778,000	\$415,000	\$4,000	\$1,197,000
Madison	\$45,839,000	\$72,068,000	\$5,696,000	\$123,603,000
Marengo	\$47,543,000	\$59,692,000	\$5,416,000	\$112,651,000
Marion	\$3,810,000	\$6,717,000	\$638,000	\$11,165,000
Marshall	\$52,362,000	\$54,258,000	\$7,396,000	\$114,016,000
Mobile	\$211,377,000	\$363,786,000	\$45,641,000	\$620,804,000
Monroe	\$565,000	\$743,000	\$4,000	\$1,312,000

County	Building Loss	Contents Loss	Inventory Loss	Total Immediate Loss
Montgomery	\$22,244,000	\$38,825,000	\$5,089,000	\$66,158,000
Morgan	\$8,464,000	\$13,572,000	\$2,050,000	\$24,086,000
Perry	\$5,541,000	\$4,740,000	\$905,000	\$11,186,000
Pickens	\$5,075,000	\$8,546,000	\$324,000	\$13,945,000
Pike	\$8,772,000	\$13,489,000	\$849,000	\$23,110,000
Randolph	\$17,584,000	\$13,230,000	\$314,000	\$31,128,000
Russell	\$3,237,000	\$4,537,000	\$327,000	\$8,101,000
Shelby	\$35,185,000	\$42,670,000	\$3,967,000	\$81,822,000
St. Clair	\$20,458,000	\$20,609,000	\$3,850,000	\$44,917,000
Sumter	\$15,475,000	\$23,936,000	\$854,000	\$40,265,000
Talladega	\$60,820,000	\$64,388,000	\$6,941,000	\$132,149,000
Tallapoosa	\$68,363,000	\$38,381,000	\$983,000	\$107,727,000
Tuscaloosa	\$33,054,000	\$46,074,000	\$4,598,000	\$83,726,000
Walker	\$45,523,000	\$62,669,000	\$9,772,000	\$117,964,000
Washington	\$1,414,000	\$1,322,000	\$58,000	\$2,794,000
Wilcox	\$11,173,000	\$8,958,000	\$14,000	\$20,145,000
Winston	\$701,000	\$554,000	\$25,000	\$1,280,000
Total	\$1,900,769,000	\$2,090,595,000	\$222,570,000	\$4,213,934,000

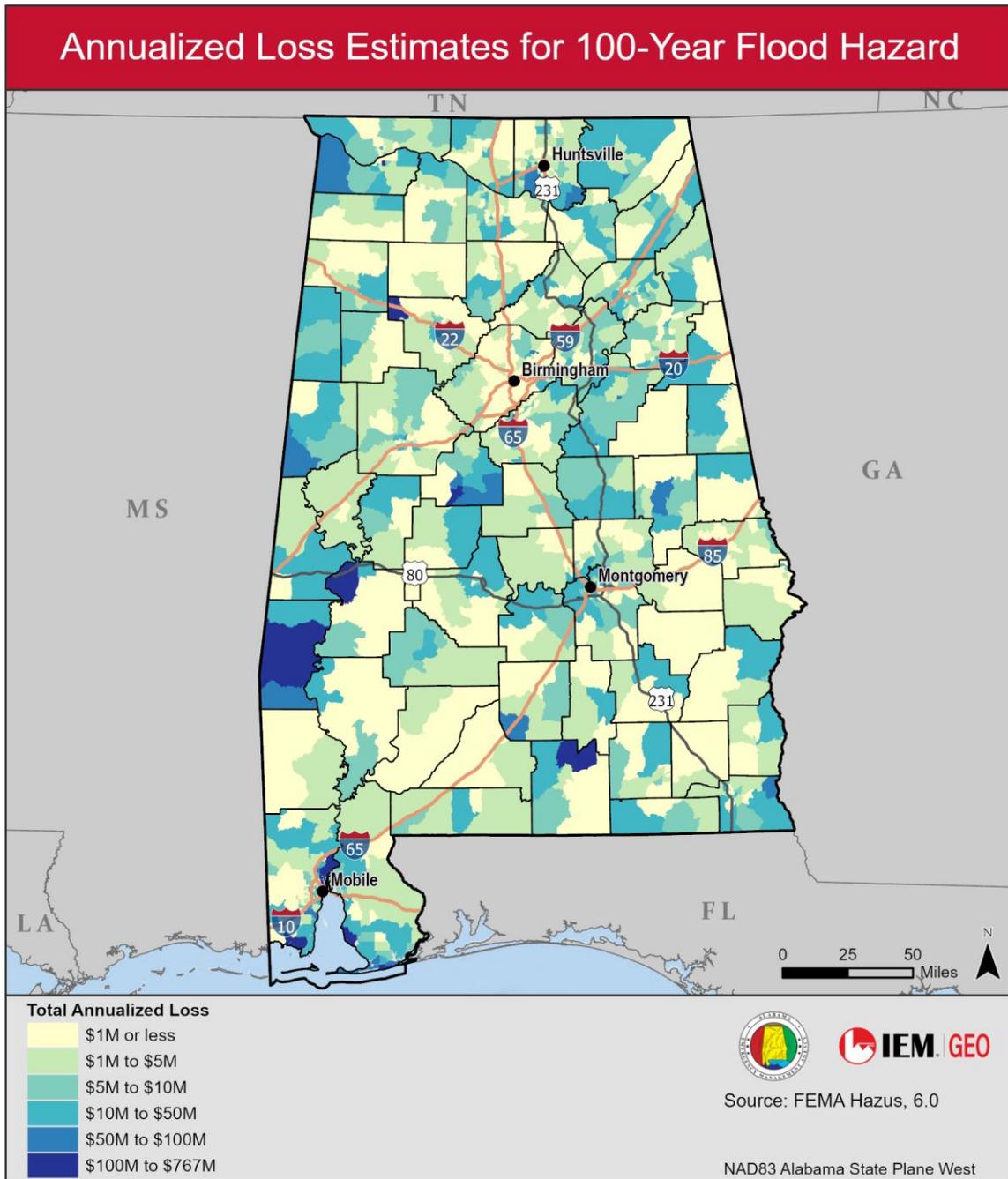
Table 3.79: Potential Business Interruption Losses from Flood Hazards (1% annual chance flood)

County	Income Loss	Relocation Loss	Rental Income Loss	Wage Loss	Total Business Interruption Losses
Autauga	\$7,671,000	\$6,523,000	\$27,186,000	\$3,271,000	\$44,651,000
Baldwin	\$150,832,000	\$195,521,000	\$202,468,000	\$92,213,000	\$641,034,000
Barbour	\$7,140,000	\$6,180,000	\$13,142,000	\$4,582,000	\$31,044,000
Bibb	\$14,544,000	\$19,476,000	\$64,306,000	\$7,319,000	\$105,645,000
Blount	\$5,986,000	\$13,664,000	\$20,895,000	\$4,133,000	\$44,678,000
Bullock	\$134,000	\$146,000	\$285,000	\$40,000	\$605,000
Butler	\$5,470,000	\$10,877,000	\$24,279,000	\$2,263,000	\$42,889,000
Calhoun	\$51,466,000	\$93,773,000	\$266,861,000	\$27,364,000	\$439,464,000
Chambers	\$1,729,000	\$3,924,000	\$7,434,000	\$772,000	\$13,859,000
Cherokee	\$4,243,000	\$2,201,000	\$8,140,000	\$1,503,000	\$16,087,000
Chilton	\$3,078,000	\$3,546,000	\$8,332,000	\$1,344,000	\$16,300,000
Choctaw	\$25,728,000	\$18,308,000	\$56,356,000	\$29,206,000	\$129,598,000
Clarke	\$1,681,000	\$1,574,000	\$2,176,000	\$722,000	\$6,153,000

County	Income Loss	Relocation Loss	Rental Income Loss	Wage Loss	Total Business Interruption Losses
Clay	\$17,000	\$0	\$0	\$2,000	\$19,000
Cleburne	\$3,556,000	\$5,779,000	\$7,941,000	\$2,168,000	\$19,444,000
Coffee	\$7,006,000	\$7,902,000	\$19,231,000	\$8,382,000	\$42,521,000
Colbert	\$19,180,000	\$37,062,000	\$49,070,000	\$12,744,000	\$118,056,000
Conecuh	\$338,000	\$222,000	\$943,000	\$122,000	\$1,625,000
Coosa	\$3,747,000	\$2,108,000	\$2,507,000	\$1,800,000	\$10,162,000
Covington	\$14,116,000	\$5,532,000	\$8,199,000	\$4,740,000	\$32,587,000
Crenshaw	\$922,000	\$1,483,000	\$2,704,000	\$435,000	\$5,544,000
Cullman	\$5,749,000	\$9,460,000	\$12,290,000	\$2,375,000	\$29,874,000
Dale	\$2,434,000	\$2,495,000	\$4,686,000	\$835,000	\$10,450,000
Dallas	\$31,034,000	\$38,279,000	\$64,677,000	\$13,064,000	\$147,054,000
DeKalb	\$7,932,000	\$15,755,000	\$42,394,000	\$3,761,000	\$69,842,000
Elmore	\$13,910,000	\$26,825,000	\$47,676,000	\$6,588,000	\$94,999,000
Escambia	\$9,697,000	\$17,797,000	\$24,659,000	\$4,837,000	\$56,990,000
Etowah	\$24,021,000	\$34,889,000	\$64,877,000	\$10,530,000	\$134,317,000
Fayette	\$2,540,000	\$3,947,000	\$12,746,000	\$1,480,000	\$20,713,000
Franklin	\$4,133,000	\$7,850,000	\$12,125,000	\$1,866,000	\$25,974,000
Geneva	\$5,755,000	\$7,669,000	\$10,693,000	\$2,175,000	\$26,292,000
Greene	\$1,948,000	\$251,000	\$613,000	\$883,000	\$3,695,000
Hale	\$8,523,000	\$2,553,000	\$12,039,000	\$2,800,000	\$25,915,000
Henry	\$3,762,000	\$2,007,000	\$2,861,000	\$1,253,000	\$9,883,000
Houston	\$18,817,000	\$32,427,000	\$79,780,000	\$8,833,000	\$139,857,000
Jackson	\$26,753,000	\$62,321,000	\$83,828,000	\$11,699,000	\$184,601,000
Jefferson	\$20,029,000	\$35,347,000	\$46,869,000	\$9,685,000	\$111,930,000
Lamar	\$4,342,000	\$7,893,000	\$24,538,000	\$2,176,000	\$38,949,000
Lauderdale	\$10,526,000	\$9,173,000	\$24,830,000	\$4,367,000	\$48,896,000
Lawrence	\$6,138,000	\$6,746,000	\$13,430,000	\$2,184,000	\$28,498,000
Lee	\$12,552,000	\$11,488,000	\$14,048,000	\$5,201,000	\$43,289,000
Limestone	\$13,369,000	\$23,664,000	\$31,851,000	\$7,117,000	\$76,001,000
Lowndes	\$3,256,000	\$2,177,000	\$3,891,000	\$1,138,000	\$10,462,000
Macon	\$318,000	\$87,000	\$78,000	\$68,000	\$551,000
Madison	\$100,668,000	\$197,882,000	\$296,600,000	\$57,176,000	\$652,326,000
Marengo	\$11,948,000	\$22,001,000	\$46,560,000	\$6,475,000	\$86,984,000
Marion	\$1,690,000	\$6,498,000	\$12,340,000	\$4,059,000	\$24,587,000
Marshall	\$10,171,000	\$13,206,000	\$46,325,000	\$4,846,000	\$74,548,000
Mobile	\$201,075,000	\$354,584,000	\$898,114,000	\$111,327,000	\$1,565,100,000
Monroe	\$340,000	\$629,000	\$798,000	\$123,000	\$1,890,000
Montgomery	\$66,877,000	\$146,139,000	\$305,591,000	\$42,841,000	\$561,448,000

County	Income Loss	Relocation Loss	Rental Income Loss	Wage Loss	Total Business Interruption Losses
Morgan	\$29,717,000	\$50,496,000	\$86,825,000	\$13,949,000	\$180,987,000
Perry	\$1,437,000	\$972,000	\$3,869,000	\$647,000	\$6,925,000
Pickens	\$12,882,000	\$35,694,000	\$65,827,000	\$6,221,000	\$120,624,000
Pike	\$1,730,000	\$3,987,000	\$2,370,000	\$902,000	\$8,989,000
Randolph	\$3,852,000	\$4,469,000	\$6,489,000	\$1,490,000	\$16,300,000
Russell	\$3,595,000	\$6,949,000	\$24,376,000	\$1,378,000	\$36,298,000
Shelby	\$41,449,000	\$81,297,000	\$159,708,000	\$24,004,000	\$306,458,000
St. Clair	\$19,679,000	\$20,788,000	\$45,547,000	\$8,288,000	\$94,302,000
Sumter	\$4,454,000	\$10,124,000	\$16,288,000	\$3,427,000	\$34,293,000
Talladega	\$48,130,000	\$75,066,000	\$118,363,000	\$22,098,000	\$263,657,000
Tallapoosa	\$9,356,000	\$4,568,000	\$7,977,000	\$3,908,000	\$25,809,000
Tuscaloosa	\$35,115,000	\$71,896,000	\$83,585,000	\$22,804,000	\$213,400,000
Walker	\$11,513,000	\$17,253,000	\$26,102,000	\$5,741,000	\$60,609,000
Washington	\$796,000	\$442,000	\$867,000	\$318,000	\$2,423,000
Wilcox	\$10,781,000	\$3,752,000	\$10,181,000	\$3,202,000	\$27,916,000
Winston	\$112,000	\$100,000	\$457,000	\$20,000	\$689,000
Total	\$1,193,489,000	\$1,925,693,000	\$3,693,093,000	\$655,284,000	\$7,467,559,000

Figure 3.72: 1% Annual Chance Loss Estimate for Flood Loss



3.3.4 High Winds

The risk of damage and loss from high winds is a function of the high wind hazard; the exposure of people, buildings, and infrastructure; and the susceptibility of the exposed communities and

structures. As discussed in Section 3.2.7, the probability of damaging high winds will likely increase with climate change. The precise amount by which the probability of high winds will increase, however, is uncertain. This section, therefore, summarizes the potential impacts of high winds on state assets and jurisdictions under present conditions.

3.3.4.1 Vulnerability of State Assets

The vulnerability of state assets to high winds was determined using Hazus 6.0. Hurricane wind hazards were based on probabilistic models of 10-, 20-, 50-, 100-, 200-, 500-, and 1,000-year return periods.

Of the more than 13,198 state-insured facilities, 1,138 are located in areas vulnerable to hurricane winds. These facilities mostly consist of education facilities which have a combined replacement value of more than \$3 billion. For the 50 year return period, education facilities are expected to experience \$1.2 Trillion in losses, or 18% of the value of all state-insured facilities..

Table 3.80: State-Insured Facilities Vulnerable to High Wind Hazard

Facility Type	# of Vulnerable Structures	% of Total Structures for Facility Type	Replacement Value	% of Total Value for Facility Type
Agriculture	3	13.04%	\$632,453,136.75	1.79%
Education	890	8.26%	\$1,208,840,102,508.34	28.68%
Government	4	3.10%	\$76,095,855.29	0.03%
Healthcare	13	20.63%	\$11,334,093,690.09	4.60%
Institutional	54	12.33%	\$10,502,179,582.75	4.66%
Military	6	10.34%	\$8,958,139,281.60	4.82%
Parks/Recreation	37	3.43%	\$5,363,944,096.80	1.00%
Port Authority	92	89.32%	\$315,594,960,929.06	67.57%
Transportation	39	8.30%	\$18,933,331,292.41	5.91%
Total	1,138	8.62%	\$1,580,235,300,373.10	23.90%

Table 3.81: Critical Infrastructure Vulnerable to High Wind Hazard

Facility Type	# of Structures	Probability of at Least Moderate Damage >50% 100-Year Return Period	Probability of at Least Moderate Damage >50% 500-Year Return Period
Hospitals	142	6	13
Schools	1,930	94	216
EOCs	82	1	2

Facility Type	# of Structures	Probability of at Least Moderate Damage >50% 100-Year Return Period	Probability of at Least Moderate Damage >50% 500-Year Return Period
Police Stations	578	13	54
Fire Stations	1,544	12	97
Total	4,276	126	382

3.3.4.2 Vulnerability of Jurisdictions

FEMA's Hazus software, version 6.0, was used to estimate high wind vulnerability across the state. The methodology uses Hazus default algorithms for high wind hazards, statewide building stock data, and user-defined facilities. The calculation algorithms quantify the potential losses associated with a hurricane using information about sea surface temperature, central pressure, translation speed, and surface roughness. Hurricane wind hazards were based on probabilistic models of 10-, 20-, 50-, 100-, 200-, 500-, and 1000-year return periods. As discussed in Section 3.3.1, Hazus was used to calculate two kinds of economic losses: (1) immediate losses related to the damage to structures and their contents, and (2) business interruption losses related to how long businesses remain inoperable.

The following tables show the average annualized hurricane wind losses for Alabama aggregated at the county scale. While Table 3.82 shows immediate economic losses (building loss, contents loss, and business inventory loss), Table 3.83 shows business interruption losses (relocation costs, income loss, rental loss, and wage loss). Figure 3.72 shows the spatial distribution of the total average annualized losses (the sum of immediate losses and business interruption losses). Note that losses are shown at the census tract level. Both the county-level tables and the census tract-level map show the highest annualized losses in Mobile and Baldwin Counties.

It is instructive to compare the magnitude of average annualized losses for earthquake hazards and high wind hazards. While the potential immediate losses across the state of Alabama total more than \$702.7 million for high wind hazards, they total slightly more than \$25 million for earthquake hazards. This finding reflects the lower probability of earthquake hazards discussed in Section 3.2.3.

Table 3.82: Potential Immediate Losses from High Wind Hazards

County	Building Loss	Contents Loss	Business Inventory Loss	Total Immediate Loss
Autauga	\$984,000	\$344,000	\$6,000	\$1,334,000
Baldwin	\$183,203,000	\$87,100,000	\$3,149,000	\$273,452,000
Barbour	\$510,000	\$188,000	\$6,000	\$704,000
Bibb	\$169,000	\$76,000	\$1,000	\$246,000

County	Building Loss	Contents Loss	Business Inventory Loss	Total Immediate Loss
Blount	\$131,000	\$47,000	\$0	\$178,000
Bullock	\$184,000	\$71,000	\$1,000	\$256,000
Butler	\$1,368,000	\$561,000	\$19,000	\$1,948,000
Calhoun	\$321,000	\$104,000	\$1,000	\$426,000
Chambers	\$202,000	\$80,000	\$1,000	\$283,000
Cherokee	\$55,000	\$18,000	\$0	\$73,000
Chilton	\$421,000	\$149,000	\$2,000	\$572,000
Choctaw	\$992,000	\$161,000	\$8,000	\$1,161,000
Clarke	\$1,741,000	\$740,000	\$39,000	\$2,520,000
Clay	\$64,000	\$30,000	\$0	\$94,000
Cleburne	\$41,000	\$20,000	\$0	\$61,000
Coffee	\$7,838,000	\$1,559,000	\$76,000	\$9,473,000
Colbert	\$62,000	\$10,000	\$0	\$72,000
Conecuh	\$1,666,000	\$707,000	\$26,000	\$2,399,000
Coosa	\$91,000	\$40,000	\$0	\$131,000
Covington	\$6,561,000	\$2,934,000	\$173,000	\$9,668,000
Crenshaw	\$959,000	\$387,000	\$8,000	\$1,354,000
Cullman	\$189,000	\$72,000	\$1,000	\$262,000
Dale	\$2,871,000	\$1,131,000	\$40,000	\$4,042,000
Dallas	\$805,000	\$256,000	\$11,000	\$1,072,000
DeKalb	\$118,000	\$34,000	\$0	\$152,000
Elmore	\$1,163,000	\$469,000	\$5,000	\$1,637,000
Escambia	\$11,715,000	\$5,602,000	\$393,000	\$17,710,000
Etowah	\$244,000	\$87,000	\$0	\$331,000
Fayette	\$69,000	\$29,000	\$0	\$98,000
Franklin	\$44,000	\$18,000	\$0	\$62,000
Geneva	\$3,417,000	\$1,581,000	\$71,000	\$5,069,000
Greene	\$103,000	\$36,000	\$0	\$139,000
Hale	\$225,000	\$78,000	\$1,000	\$304,000
Henry	\$667,000	\$227,000	\$9,000	\$903,000
Houston	\$6,766,000	\$2,700,000	\$103,000	\$9,569,000
Jackson	\$73,000	\$19,000	\$0	\$92,000
Jefferson	\$2,933,000	\$1,134,000	\$8,000	\$4,075,000
Lamar	\$47,000	\$20,000	\$0	\$67,000
Lauderdale	\$85,000	\$8,000	\$0	\$93,000

County	Building Loss	Contents Loss	Business Inventory Loss	Total Immediate Loss
Lawrence	\$52,000	\$14,000	\$0	\$66,000
Lee	\$1,500,000	\$622,000	\$9,000	\$2,131,000
Limestone	\$135,000	\$31,000	\$0	\$166,000
Lowndes	\$333,000	\$132,000	\$5,000	\$470,000
Macon	\$224,000	\$85,000	\$1,000	\$310,000
Madison	\$487,000	\$92,000	\$0	\$579,000
Marengo	\$514,000	\$186,000	\$6,000	\$706,000
Marion	\$61,000	\$23,000	\$0	\$84,000
Marshall	\$160,000	\$36,000	\$0	\$196,000
Mobile	\$212,567,000	\$104,395,000	\$4,943,000	\$321,905,000
Monroe	\$2,990,000	\$1,259,000	\$73,000	\$4,322,000
Montgomery	\$4,768,000	\$1,531,000	\$58,000	\$6,357,000
Morgan	\$164,000	\$50,000	\$0	\$214,000
Perry	\$162,000	\$61,000	\$1,000	\$224,000
Pickens	\$117,000	\$50,000	\$0	\$167,000
Pike	\$1,379,000	\$518,000	\$17,000	\$1,914,000
Randolph	\$89,000	\$35,000	\$0	\$124,000
Russell	\$413,000	\$139,000	\$2,000	\$554,000
Shelby	\$1,414,000	\$508,000	\$3,000	\$1,925,000
St. Clair	\$292,000	\$125,000	\$1,000	\$418,000
Sumter	\$266,000	\$86,000	\$2,000	\$354,000
Talladega	\$395,000	\$170,000	\$1,000	\$566,000
Tallapoosa	\$414,000	\$205,000	\$1,000	\$620,000
Tuscaloosa	\$1,418,000	\$525,000	\$6,000	\$1,949,000
Walker	\$251,000	\$118,000	\$0	\$369,000
Washington	\$1,913,000	\$940,000	\$14,000	\$2,867,000
Wilcox	\$736,000	\$291,000	\$5,000	\$1,032,000
Winston	\$62,000	\$29,000	\$0	\$91,000
Total	\$472,373,000	\$221,083,000	\$9,306,000	\$702,762,000

Table 3.83: Potential Business Interruption Losses from High Wind Hazards

County	Income Loss	Relocation Loss	Rental Income Loss	Wage Loss	Total Business Interruption Losses
Autauga	\$52,000	\$6,000	\$12,000	\$18,000	\$88,000
Baldwin	\$19,827,000	\$4,834,000	\$5,504,000	\$8,807,000	\$38,972,000
Barbour	\$33,000	\$7,000	\$10,000	\$15,000	\$65,000
Bibb	\$5,000	\$1,000	\$1,000	\$2,000	\$9,000
Blount	\$3,000	\$0	\$1,000	\$1,000	\$5,000
Bullock	\$11,000	\$2,000	\$3,000	\$4,000	\$20,000
Butler	\$126,000	\$25,000	\$40,000	\$50,000	\$241,000
Calhoun	\$9,000	\$1,000	\$2,000	\$4,000	\$16,000
Chambers	\$8,000	\$2,000	\$2,000	\$3,000	\$15,000
Cherokee	\$2,000	\$0	\$0	\$1,000	\$3,000
Chilton	\$17,000	\$2,000	\$5,000	\$6,000	\$30,000
Choctaw	\$84,000	\$10,000	\$15,000	\$93,000	\$202,000
Clarke	\$167,000	\$34,000	\$69,000	\$71,000	\$341,000
Clay	\$2,000	\$0	\$1,000	\$1,000	\$4,000
Cleburne	\$1,000	\$0	\$0	\$0	\$1,000
Coffee	\$652,000	\$72,000	\$105,000	\$720,000	\$1,549,000
Colbert	\$1,000	\$0	\$0	\$1,000	\$2,000
Conecuh	\$203,000	\$44,000	\$77,000	\$75,000	\$399,000
Coosa	\$3,000	\$0	\$1,000	\$1,000	\$5,000
Covington	\$759,000	\$104,000	\$190,000	\$286,000	\$1,339,000
Crenshaw	\$94,000	\$18,000	\$24,000	\$36,000	\$172,000
Cullman	\$5,000	\$1,000	\$1,000	\$2,000	\$9,000
Dale	\$223,000	\$41,000	\$57,000	\$97,000	\$418,000
Dallas	\$57,000	\$10,000	\$19,000	\$26,000	\$112,000
DeKalb	\$4,000	\$1,000	\$1,000	\$1,000	\$7,000
Elmore	\$52,000	\$8,000	\$11,000	\$19,000	\$90,000
Escambia	\$1,507,000	\$375,000	\$492,000	\$614,000	\$2,988,000
Etowah	\$6,000	\$1,000	\$1,000	\$2,000	\$10,000
Fayette	\$2,000	\$0	\$0	\$1,000	\$3,000
Franklin	\$1,000	\$0	\$0	\$0	\$1,000
Geneva	\$337,000	\$60,000	\$92,000	\$114,000	\$603,000
Greene	\$6,000	\$1,000	\$2,000	\$2,000	\$11,000
Hale	\$17,000	\$3,000	\$4,000	\$6,000	\$30,000

County	Income Loss	Relocation Loss	Rental Income Loss	Wage Loss	Total Business Interruption Losses
Henry	\$56,000	\$10,000	\$13,000	\$20,000	\$99,000
Houston	\$542,000	\$121,000	\$187,000	\$244,000	\$1,094,000
Jackson	\$2,000	\$1,000	\$0	\$1,000	\$4,000
Jefferson	\$78,000	\$17,000	\$20,000	\$33,000	\$148,000
Lamar	\$1,000	\$0	\$0	\$0	\$1,000
Lauderdale	\$2,000	\$0	\$0	\$1,000	\$3,000
Lawrence	\$1,000	\$0	\$0	\$0	\$1,000
Lee	\$60,000	\$12,000	\$14,000	\$24,000	\$110,000
Limestone	\$3,000	\$0	\$0	\$1,000	\$4,000
Lowndes	\$27,000	\$6,000	\$8,000	\$10,000	\$51,000
Macon	\$12,000	\$2,000	\$3,000	\$4,000	\$21,000
Madison	\$8,000	\$1,000	\$1,000	\$3,000	\$13,000
Marengo	\$39,000	\$7,000	\$11,000	\$18,000	\$75,000
Marion	\$2,000	\$0	\$0	\$1,000	\$3,000
Marshall	\$5,000	\$1,000	\$1,000	\$2,000	\$9,000
Mobile	\$25,276,000	\$9,015,000	\$10,323,000	\$10,527,000	\$55,141,000
Monroe	\$377,000	\$72,000	\$115,000	\$145,000	\$709,000
Montgomery	\$307,000	\$73,000	\$121,000	\$164,000	\$665,000
Morgan	\$3,000	\$0	\$0	\$1,000	\$4,000
Perry	\$11,000	\$2,000	\$3,000	\$4,000	\$20,000
Pickens	\$5,000	\$1,000	\$1,000	\$2,000	\$9,000
Pike	\$125,000	\$36,000	\$54,000	\$54,000	\$269,000
Randolph	\$3,000	\$0	\$1,000	\$1,000	\$5,000
Russell	\$20,000	\$3,000	\$4,000	\$7,000	\$34,000
Shelby	\$36,000	\$5,000	\$6,000	\$12,000	\$59,000
St. Clair	\$0	\$6,000	\$1,000	\$1,000	\$8,000
Sumter	\$21,000	\$5,000	\$10,000	\$9,000	\$45,000
Talladega	\$12,000	\$2,000	\$3,000	\$5,000	\$22,000
Tallapoosa	\$14,000	\$2,000	\$3,000	\$6,000	\$25,000
Tuscaloosa	\$55,000	\$11,000	\$16,000	\$24,000	\$106,000
Walker	\$5,000	\$1,000	\$1,000	\$2,000	\$9,000
Washington	\$156,000	\$13,000	\$30,000	\$56,000	\$255,000
Wilcox	\$58,000	\$8,000	\$13,000	\$22,000	\$101,000
Winston	\$1,000	\$0	\$0	\$0	\$1,000

County	Income Loss	Relocation Loss	Rental Income Loss	Wage Loss	Total Business Interruption Losses
Total	\$51,599,000	\$15,096,000	\$17,705,000	\$22,483,000	\$106,883,000

Figure 3.73: Annualized Loss Estimates for Hurricane Hazard

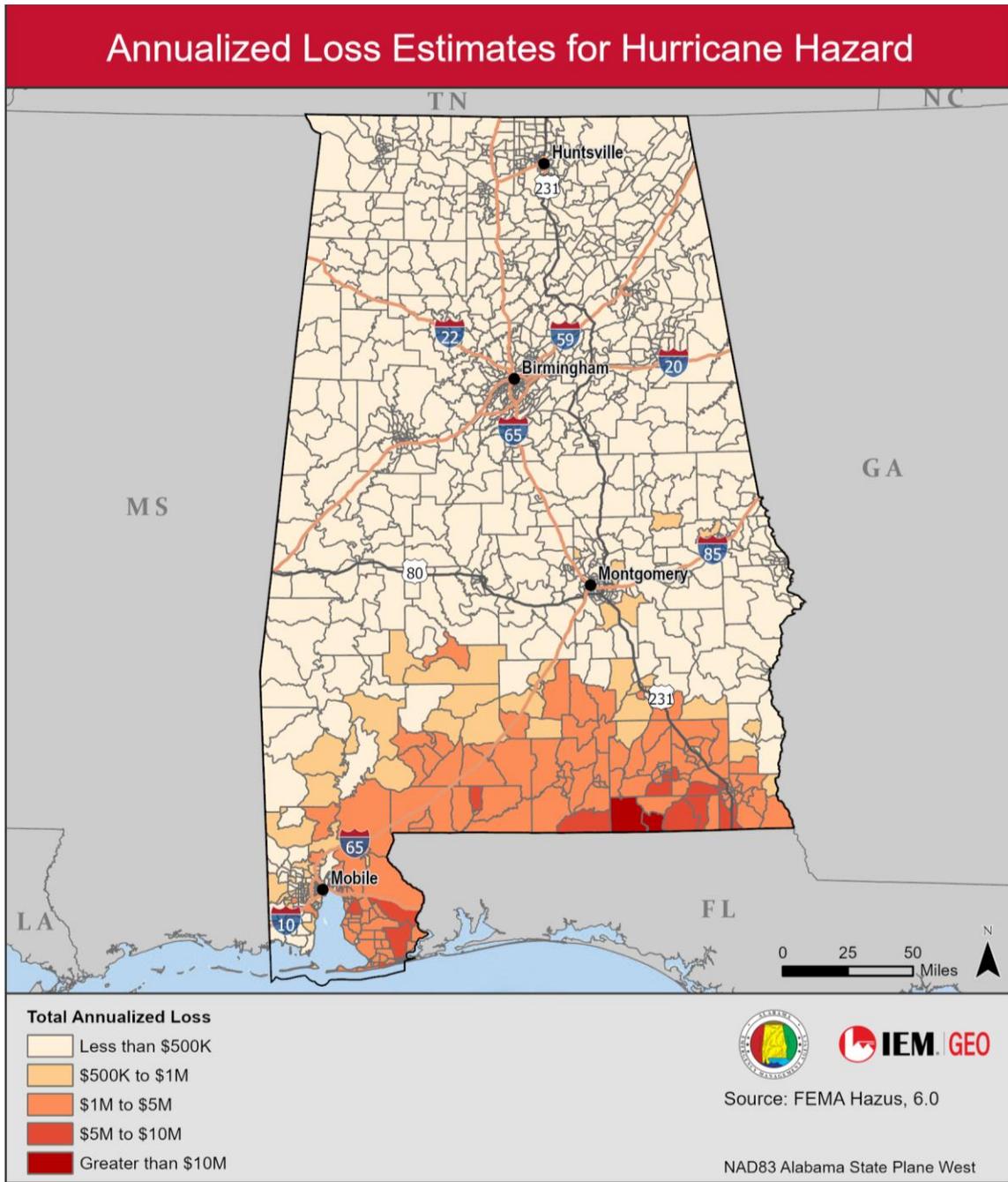


Figure 3.74: State Inventory Moderate Building Damage for Hurricane Hazard

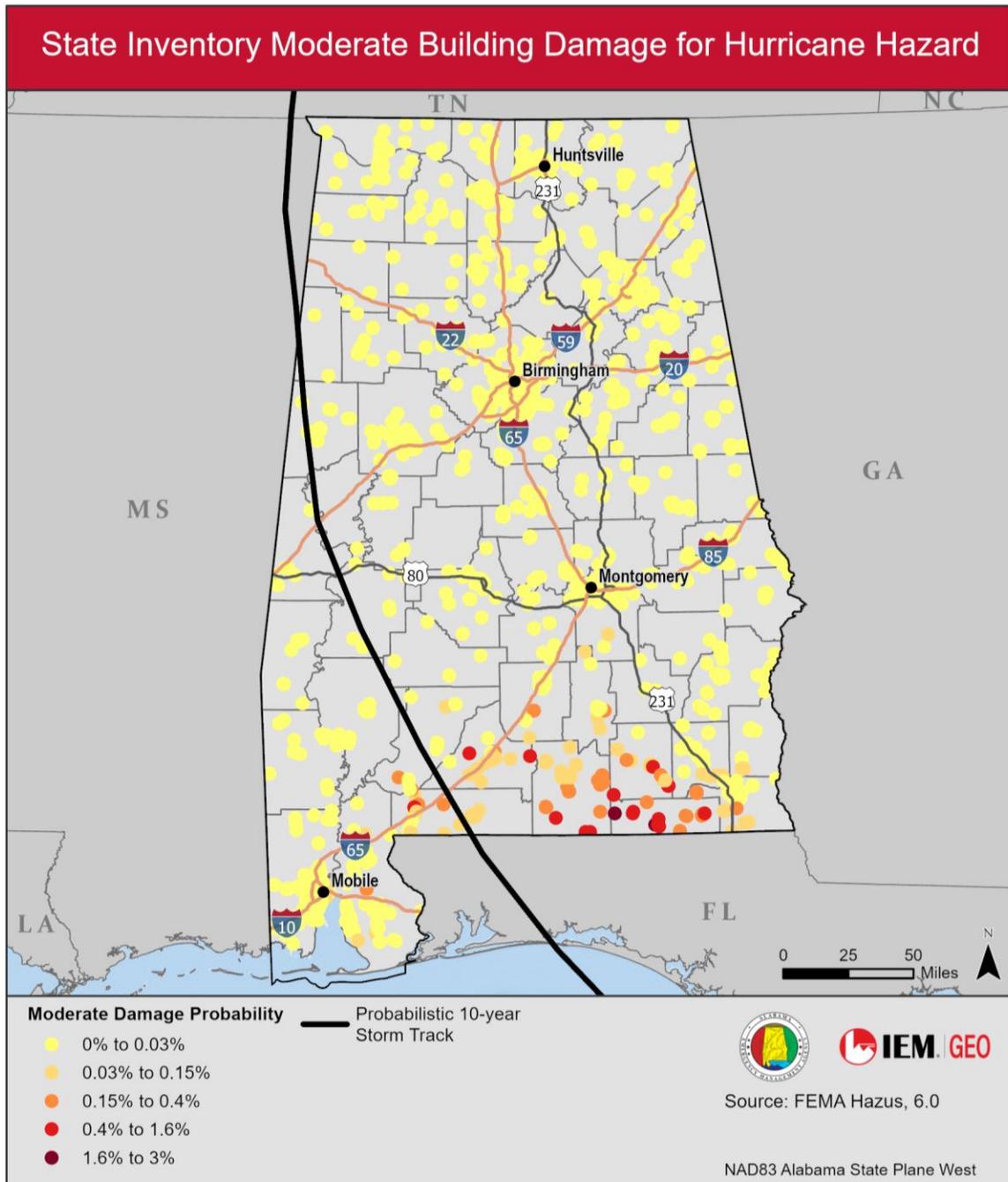
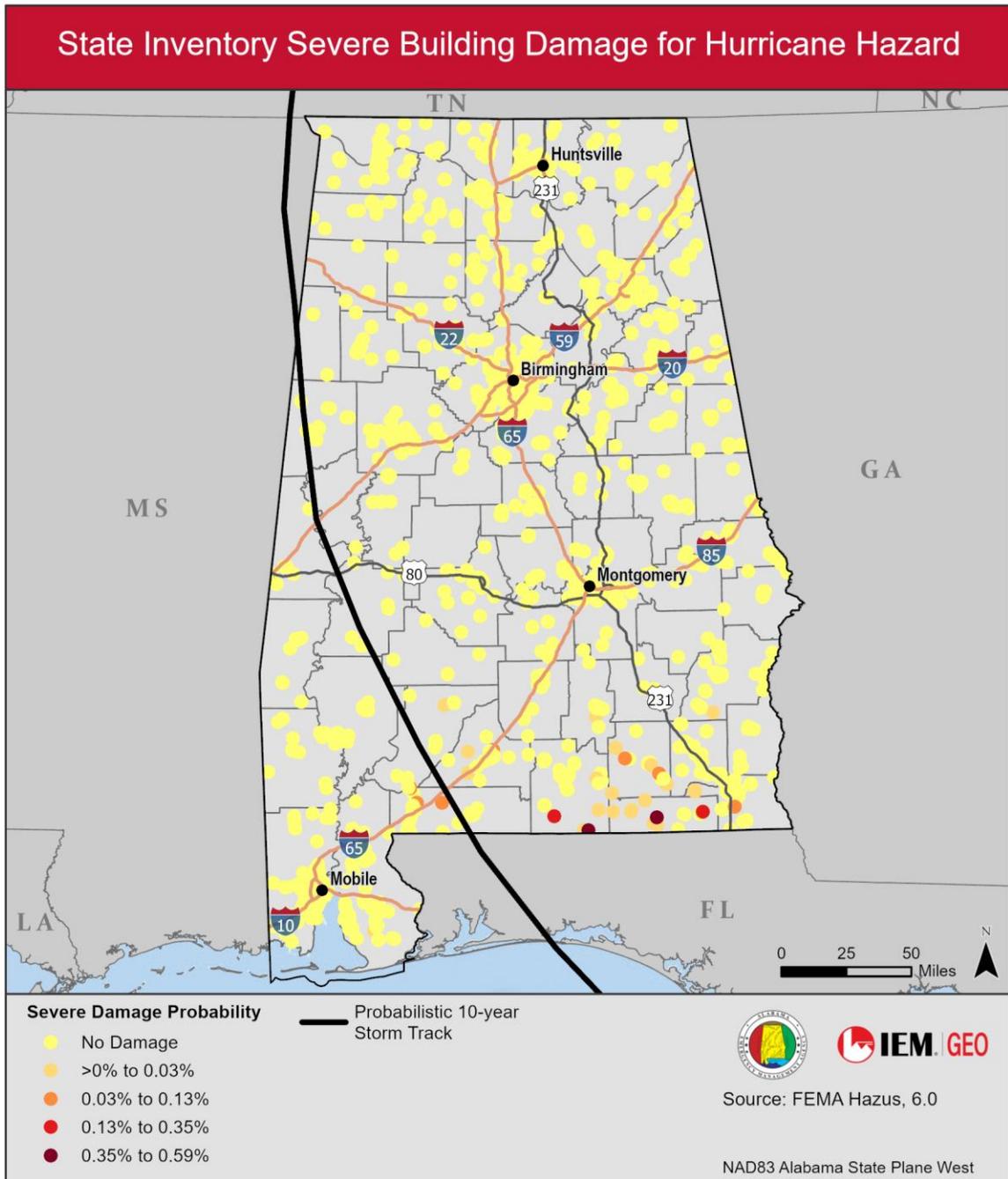


Figure 3.75: State Inventory Severe Building Damage for Hurricane Hazard



As discussed in Section 3.2.7, modeling and mapping the probability of tornado wind hazards is complicated by the lack of available data. In the absence of accurate models of tornado hazard, it is not possible to model the future vulnerability of people and property across Alabama counties. Historic vulnerability to tornado hazards, however, can be used as a rough guide to future vulnerability. Table 3.84 shows the tornado-related property damage sustained by each county in Alabama between 1950 and 2022, as recorded in the Storm Events Database. It is important to

note that the damage estimates in the Storm Events Database are collected from diverse sources by staff with little or no training in damage estimation and that these estimates are often not compared with actual costs. Nevertheless, this dataset represents the most complete and consistent available record of tornado damage in the United States. Based on their historical vulnerability, the counties of Tuscaloosa, Limestone, Jefferson, and Madison are likely to be the most vulnerable to tornado damage and loss.

Table 3.84: Historical Tornado Damage by County

County	Property Damage	Crop Damage	Total Damage
Tuscaloosa	\$1,598,000,000	\$662,000	\$1,598,662,000
Limestone	\$1,018,000,000	\$50,000	\$1,018,050,000
Jefferson	\$1,001,000,000	\$2,200,000	\$1,003,200,000
Madison	\$524,982,000	\$0	\$524,982,000
Coffee	\$286,954,000	\$50,000	\$287,004,000
St. Clair	\$236,930,000	\$50,005,000	\$286,935,000
Marion	\$179,945,000	\$0	\$179,945,000
Walker	\$171,175,000	\$80,000	\$171,255,000
Tallapoosa	\$118,508,000	\$42,000	\$118,550,000
Cullman	\$97,555,000	\$45,500	\$97,600,500
Elmore	\$61,790,000	\$100,000	\$61,890,000
Hale	\$47,533,000	\$0	\$47,533,000
Dale	\$43,876,000	\$0	\$43,876,000
Pickens	\$42,349,000	\$15,000	\$42,364,000
Bibb	\$40,258,000	\$0	\$40,258,000
Fayette	\$39,122,000	\$0	\$39,122,000
Shelby	\$36,910,000	\$0	\$36,910,000
Marshall	\$34,144,000	\$50,500	\$34,194,500
Talladega	\$31,513,000	\$0	\$31,513,000
Perry	\$30,610,000	\$25,000	\$30,635,000
Clay	\$26,613,000	\$3,000	\$26,616,000
Calhoun	\$131,054	\$20,000	\$151,054
Russell	\$28,736,000	\$2,000	\$28,738,000
Morgan	\$14,470,000	\$0	\$14,470,000
Dekalb	\$25,218,000	\$30,000	\$25,248,000
Blount	\$33,454,000	\$54,000	\$33,508,000
Franklin	\$51,263,000	\$0	\$51,263,000
Cherokee	\$21,989,000	\$0	\$21,989,000

County	Property Damage	Crop Damage	Total Damage
Lawrence	\$42,138,000	\$8,000	\$42,146,000
Lee	\$13,704,000	\$0	\$13,704,000
Henry	\$27,067,000	\$500	\$27,067,500
Etowah	\$25,387,000	\$73,000	\$25,460,000
Montgomery	\$15,991,000	\$0	\$15,991,000
Jackson	\$9,821,000	\$5,000	\$9,826,000
Dallas	\$17,532,000	\$60,000	\$17,592,000
Marengo	\$26,736,000	\$0	\$26,736,000
Autauga	\$17,240,000	\$0	\$17,240,000
Baldwin	\$9,818,000	\$0	\$9,818,000
Chilton	\$4,731,000	\$5,000	\$4,736,000
Winston	\$16,999,000	\$22,000	\$17,021,000
Sumter	\$17,925,000	\$0	\$17,925,000
Coosa	\$3,865,000	\$20,000	\$3,885,000
Colbert	\$7,191,000	\$5,000	\$7,196,000
Monroe	\$5,710,000	\$0	\$5,710,000
Houston	\$9,430,000	\$0	\$9,430,000
Choctaw	\$15,387,000	\$0	\$15,387,000
Mobile	\$8,424,000	\$0	\$8,424,000
Covington	\$9,345,000	\$0	\$9,345,000
Greene	\$9,257,000	\$0	\$9,257,000
Pike	\$4,729,000	\$10,000	\$4,739,000
Randolph	\$6,203,000	\$0	\$6,203,000
Chambers	\$5,530,000	\$50,000	\$5,580,000
Lamar	\$5,552,000	\$45,000	\$5,597,000
Escambia	\$8,376,000	\$0	\$8,376,000
Clarke	\$2,831,000	\$3,000,000	\$5,831,000
Lauderdale	\$2,893,000	\$0	\$0
Conecuh	\$3413000	\$0	\$3,413,000
Crenshaw	\$4,377,000	\$0	\$4,377,000
Barbour	\$3,575,000	\$5,000	\$3,580,000
Lowndes	\$1,761,000	\$29,000	\$1,790,000
Washington	\$6,219,000	\$0	\$6,219,000
Butler	\$1,404,000	\$17,000	\$1,421,000
Geneva	\$4,056,000	\$3,000	\$4,059,000

County	Property Damage	Crop Damage	Total Damage
Cleburne	\$3,072,000	\$17,000	\$3,089,000
Wilcox	\$3,312,000	\$0	\$3,312,000
Macon	\$1,613,000	\$0	\$1,613,000
Bullock	\$774,000	\$9,000	\$783,000
Total	\$6,223,523,054	\$56,817,500	\$6,280,340,554

3.3.5 Sea Level Rise and Coastal Land Change

The risk of damage and loss from sea level rise is a function of the hazard; the exposure of people, buildings, and infrastructure; and the susceptibility of the exposed communities and structures. As discussed in Section 3.2.10, sea level rise is a certainty in Alabama, but its rate could increase or decrease depending on human activities and the response of natural systems. To inform coastal planning, scientists have developed a range of sea level rise scenarios. This section examines the impacts of a 1-foot, 3-foot, and 6-foot rise in local sea levels to illustrate the range of possible impacts. The only jurisdictions vulnerable to sea level rise are Mobile and Baldwin Counties.¹⁹⁸

3.3.5.1 Vulnerability of State Assets

Of the more than 13,198 state-insured facilities, 5 would be vulnerable to a 1-foot rise in local sea level, 94 would be vulnerable to a 3-foot rise, and 125 would be vulnerable to a 6-foot rise (Table 3.85, Table 3.86, and Table 3.87). These facilities consist mostly of park and recreation facilities and port facilities and have a combined replacement value of more than \$7 million for a 1-foot rise in local sea level, more than \$25 million for a 3-foot rise, and more than \$74 million for a 6-foot rise.

Table 3.85: State-Insured Facilities Vulnerable to 1-Foot Local Sea Level Rise (pending update)

Facility Type	# of Vulnerable Structures	% of Total Structures for Facility Type	Replacement Value	% of Total Value for Facility Type
Agriculture	0	0.0%	\$0	0.0%
Education	3	0.0%	\$7,056,445	0.0%
Government	0	0.0%	\$0	0.0%

¹⁹⁸ Due to limitations in the floodplain mapping data available, sea level rise products have only been produced for Mobile and Baldwin Counties and are not currently available for other counties near the coast. The availability of data in other counties does not mean that these counties do not face risk from sea-level rise.

Facility Type	# of Vulnerable Structures	% of Total Structures for Facility Type	Replacement Value	% of Total Value for Facility Type
Healthcare	0	0.0%	\$0	0.0%
Military	0	0.0%	\$0	0.0%
Parks/Recreation	1	0.1%	\$285,242	0.1%
Port Authority	1	0.6%	\$33,117	0.0%
Public Safety	0	0.0%	\$0	0.0%
Transportation	0	0.0%	\$0	0.0%
Total	5	0.7%	\$7,374,804	0.1%

Table 3.86: State-Insured Facilities Vulnerable to 3-Foot Local Sea Level Rise (pending update)

Facility Type	# of Vulnerable Structures	% of Total Structures for Facility Type	Replacement Value	% of Total Value for Facility Type
Agriculture	0	0.0%	\$0	0.0%
Education	3	0.0%	\$7,056,445	0.0%
Government	0	0.0%	\$0	0.0%
Healthcare	0	0.0%	\$0	0.0%
Military	0	0.0%	\$0	0.0%
Parks/Recreation	87	7.1%	\$16,765,186	4.8%
Port Authority	2	1.2%	\$559,849	0.2%
Public Safety	2	0.3%	\$639,477	0.1%
Transportation	0	0.0%	\$0	0.0%
Total	94	8.6%	\$25,020,957	5.1%

Table 3.87: State-Insured Facilities Vulnerable to 6-Foot Local Sea Level Rise

Facility Type	# of Vulnerable Structures	% of Total Structures for Facility Type	Replacement Value	% of Total Value for Facility Type
Agriculture	0	0.0%	\$0	0.0%
Education	6	0.1%	\$8,390,383	0.0%
Government	0	0.0%	\$0	0.0%
Healthcare	0	0.0%	\$0	0.0%
Military	0	0.0%	\$0	0.0%
Parks/Recreation	104	8.5%	\$19,913,037	5.7%
Port Authority	13	7.7%	\$45,883,729	13.1%
Public Safety	2	0.3%	\$639,477	0.1%

Facility Type	# of Vulnerable Structures	% of Total Structures for Facility Type	Replacement Value	% of Total Value for Facility Type
Transportation	0	0.0%	\$0	0.0%
Total	125	16.6%	\$74,826,626	18.9%

Very few critical facilities are located in areas that would be inundated by local sea level rise. No critical facilities would be submerged by a 1- or 3-foot rise in sea level, and only two commercial facilities would be submerged by a 6-foot rise in local sea level. Recall, however, that state assets and critical facilities could face severe impacts well before they become submerged, from the amplified coastal flooding and storm surge discussed in Section 3.2.5 to the increasing frequency and extent of episodic tidal flooding discussed in Section 3.2.10.

3.4 Impacts of Development Trends on Vulnerability

As discussed in Section 3.1, the structure of the risk assessment chapter is intended to support the development of effective mitigation strategies and to demonstrate compliance with federal regulations and policies. While Sections 3.2 and 3.3 profile the hazards that affect Alabama, assess the vulnerability of the state and its counties, and provide loss estimates, this section discusses the impacts of development trends on vulnerability.

3.4.1 Impacts of Development Trends on Vulnerability

Overall, the population of Alabama is increasing, though at a slightly slower rate than much of the United States. From 2010 to 2020, the population of Alabama increased by approximately 5.11%, or 244,543 people, while the population of the United States increased by approximately 7.35%, or 454,075 people per state.¹⁹⁹ However, within the State of Alabama, the rate of population change is variable (Figure 3.75). Only 27 out of the 67 counties in Alabama have increased in population from 2010 to 2020, and of those 27, seven have seen changes of less than 1,000. The three counties with the highest percentage of population change are Baldwin County (27.2%), Lee County (24.2%), and Limestone County (25.1%).²⁰⁰

Alabama's population is only expected to continue to increase. It is predicted that by 2040, there will be an 11% population increase compared to the 2010 census.²⁰¹ The top five counties in terms of population size are anticipated to be (in order): Baldwin County, Limestone County, Lee

¹⁹⁹ QuickFacts: Alabama; United States. Census Bureau.

<https://www.census.gov/quickfacts/fact/table/AL,US/PST045221>

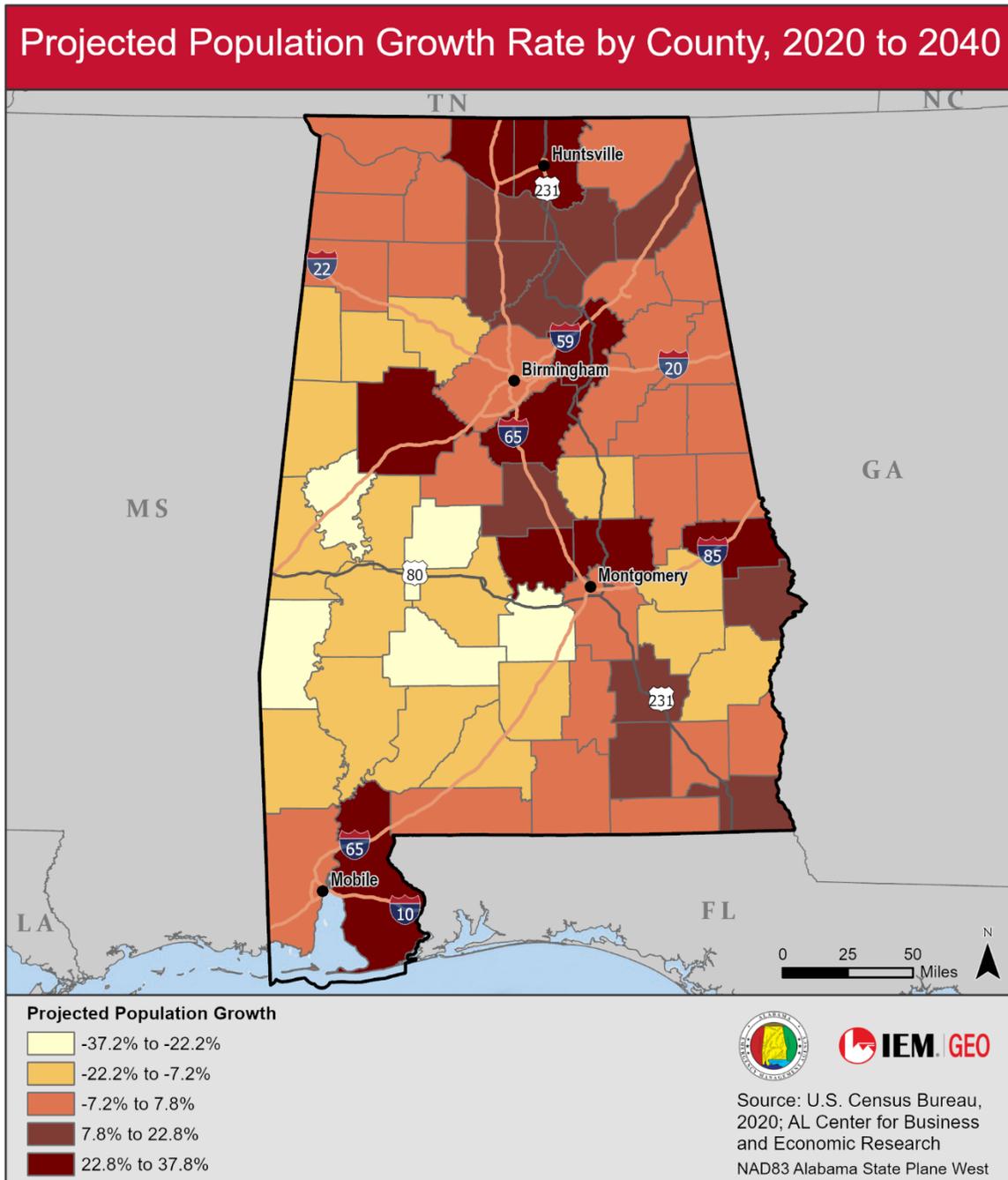
²⁰⁰ Total Population of Each County in Alabama. Datawrapper. Census Bureau.

https://www.datawrapper.de/_X98RG/

²⁰¹ AL.com: News. <https://www.al.com/news/2021/05/15-alabama-counties-expected-to-grow-the-most-by-2040.html>

County, Shelby County, and St. Clair County.²⁰² The largest population increase is anticipated to be 65.1% in Baldwin County (see Figure 3.75).

Figure 3.76: Projected Population Growth Rate, 2020–2040



²⁰² Ibid.

As the state's population increases, there will be a greater chance that people will be exposed to different hazards and require state resources for protection and recovery. The larger population increases in coastal counties (Baldwin and Mobile) are particularly concerning due to the significant exposure of this region to coastal hazards, including hurricanes and sea level rise.

3.4.2 Land Use Trends

Alabama's land is becoming more developed. The most densely populated counties in Alabama are those surrounding the major metropolitan areas of Birmingham, Huntsville, and Mobile. While these counties have more urbanized areas than other parts of the state, they still have significant amounts of forest and farmlands and are characterized by decentralized development patterns that extend the built environment into rural areas.

In the next 20 to 30 years, population growth rates are expected to vary widely across the state. However, decentralized growth patterns are expected to continue to prevail. The counties adjacent to the state's largest cities are expected to experience the highest growth rates, while the counties encompassing these cities are expected to experience only moderate growth. The one exception to this trend is Huntsville, where high growth rates are expected in both Madison and Limestone Counties.

From 2012 to 2017, the number of farms in Alabama decreased by 6%,²⁰³ and the number of acres used for farmland decreased by 4%. Additionally, land development in Alabama has grown from approximately 1.1 million acres to 2 million acres, as can be seen in Figure 3.76.²⁰⁴

²⁰³ 2017 Census of Agriculture State Profile: Alabama.

https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Alabama/cp99001.pdf

²⁰⁴ U.S. Department of Agriculture. 2017 National Resources Inventory. February 24, 2021.

https://publicdashboards.dl.usda.gov/t/FPAC_PUB/views/RCADVLandUsebyStateNRI20171/StateLandUseTrend?%3Aembed=y&%3AisGuestRedirectFromVizportal=y

Figure 3.77: Developed Land, Alabama

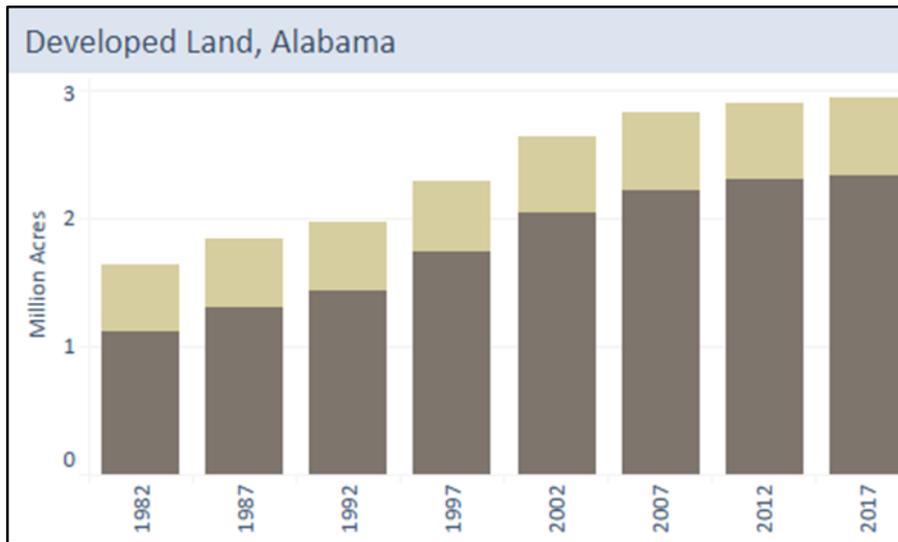
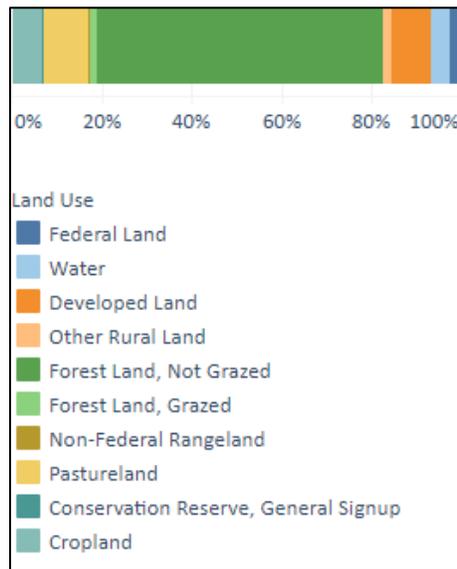


Figure 3.77 shows the overall land use in Alabama as of 2017 (the newest data available).²⁰⁵

Figure 3.78: Overall Land Use, Alabama, 2017



These patterns of development, in conjunction with population trends, are likely to make the coastal regions of the state much more vulnerable to hazards.

Sea level rise threatens to be one of the largest factors changing land use in Alabama in the coming years. The combination of global sea level rise with natural and human-induced land subsidence is reducing the amount of usable land next to the Gulf of Mexico (see Sections 3.2.10 and 3.2.11 for more information).

²⁰⁵ Ibid.

3.4.3 Intersections Between High-Growth Areas and High-Risk Areas

The growth patterns projected for Alabama are likely to intersect with high-risk areas throughout the state, placing more people and property at risk. Some aspects of the projected trends in population and development that can be expected to exacerbate future losses include the following:

- New population growth is often concentrated along economically desirable coastal areas that are at high risk of coastal flooding, storm surge, and wind damage.
- New development and associated parking, roads, and other impervious surfaces can increase urban runoff, exacerbating flooding hazards.
- New construction in previously rural areas can expand the wildland-urban interface, increasing exposure to wildfires.
- Population growth across the unconsolidated aquifers of the Coastal Plain can increase the demand for limited water resources, exacerbating the problem during times of drought in times of drought.
- Ongoing beach development and construction can increase the risk of beach erosion.
- More development in the state's karst areas, particularly in the Huntsville area, can increase the probability of property and infrastructure damage.

As part of the update to the risk assessment, the impacts of the identified hazards on the state's most vulnerable populations and under-served communities were considered. The Social Vulnerability Index (SVI) which was developed by the Centers for Disease Control and Prevention (CDC) was used. The map shows 32 Alabama counties fall into the Medium-High or High levels of social vulnerability, and only 17 counties are ranked as having a low social vulnerability. The rankings include four primary variables: socioeconomic status, household characteristics, racial and ethnic minority status, and housing type and transportation.

As the State's vulnerable population continues to increase, the hazard risk to the socially vulnerable and underserved communities will continue to rise.

4. Capability Assessment

All of the capabilities and funding listed below support pre- and post-disaster mitigation activities.

4.1 Capability Emergency Management Accreditation Program (EMAP) Assessment

Since November 2002, AEMA has used the Emergency Management Accreditation Program (EMAP) assessment process to evaluate its pre- and post-disaster hazard management policies, programs, and capabilities. The EMAP assessment was most recently completed on April 27, 2017. EMAP provides AEMA with a baseline for continuing assessments that will be considered in future plan reviews and updates. AEMA is an active participant in EMAP, and in the past, the AEMA Director served on the EMAP Commission. Findings from the EMAP assessment are highlighted throughout this section.

The 2017 EMAP evaluation found the State's emergency management program strategy to be compliant in all areas, and AEMA is, therefore, EMAP certified based on the results of an all-hazards identification, risk assessment, and impact analysis (as required by the EMAP standard). The State complies with all the other qualifying "sub-elements," including:

- a) Use of appropriate building construction standards.
- b) Hazard avoidance through appropriate land use practices.
- c) Relocation, retrofitting, or removal of structures at risk.
- d) Removal or elimination of the hazard.
- e) Reduction or limitation of the amount or size of the hazard.
- f) Segregation of the hazard from that which is to be protected.
- g) Modification of the basic characteristics of the hazard.
- h) Control of the rate of release of the hazard (met for natural hazards).
- i) Provision of protective systems or equipment.
- j) Establishment of hazard warning and communication procedures; and
- k) Redundancy or duplication of critical systems, equipment, information, operations, or materials.

4.2 Laws, Regulations, Policies, and Programs for Pre- and Post-Disaster Hazard Management

4.2.1 Laws

The following is a review of the State laws of pre-disaster and post-disaster hazard management. AEMA was established through Section 4 of Alabama Law, 1955, Act No. 47, commonly known as the Alabama Emergency Management Act of 1955 (also as Code of Alabama 31-9, 1955).²⁰⁶

Section 10, Alabama Law, 1955, Act No. 47, authorized and directed local governments to establish organizations for emergency management.²⁰⁷ Under this legislation, each county is required to have an emergency management organization, either individually or jointly. Appropriate ordinances and/or resolutions are required to establish each local organization and must provide for the organization, powers, duties, divisions, services, and staff of the agency. The Emergency Management Agency (EMA) office must maintain and display current functional statements and organizational charts. Initial submittals of annual budgets must be accompanied by a functional statement and an organizational chart. Subsequent submissions of the organizational chart and functional statement are required only when a change/revision is published. FEMA Form 85-17, Staffing Pattern for each participating political jurisdiction, is a required part of the State's annual Comprehensive Cooperative Agreement. Thus, the current annual State submission reflects local agencies meeting the eligibility criteria to receive EMA funds.

One of the most significant state-enabling statutes related to hazard mitigation can be found in Title 11, Chapter 52, Planning, Zoning, and Subdivisions of the Code of Alabama. Section 11-52 et seq. is the state planning enabling legislation for municipalities only. First enacted in 1935, the statute provides municipalities broad powers for comprehensive planning, capital improvements programming, and the regulation of land use, development, and conservation of land areas through zoning ordinances and subdivision regulations. It permits municipalities to create planning commissions to oversee planning and land use controls, and Boards of Adjustments to hear appeals. It is the basis for floodplain management regulations within all municipalities and provides additional powers to control the location and types of development activities that might be affected by other natural hazards, including landslides and land subsidence.

Unincorporated areas of counties in Alabama are severely restricted by the lack of a state planning enabling statute. Only three counties statewide Baldwin, Jefferson, and parts of Shelby County are permitted to establish zoning ordinances by special acts adopted by the State. County

²⁰⁶ AL Code § 31-9-4, 1955. Retrieved at: [Section 31-9-82 - Committee. :: 2012 Code of Alabama :: US Codes and Statutes: US Law: Justia](#)

²⁰⁷ AL Code § 31-9-10, 2012. Retrieved at: [Chapter 9 - EMERGENCY MANAGEMENT.:: 2012 Code of Alabama.:: US Codes and Statutes: US Law: Justia](#)

regulation of subdivisions within unincorporated areas, however, is granted by Title 11, Chapter 24 of the Code of Alabama. County commissions are permitted to regulate the subdivision of land and the construction of streets and utilities with the advice of an advisory board. Municipalities may enforce subdivision regulations within their police jurisdictions, which extend two miles beyond the municipal boundaries within unincorporated areas of a county.

Code of Alabama, Title 11, Chapter 19, Sections 11-19-1 through 11-19-24, entitled The Comprehensive Land Use Management Act was enacted to prevent economic and human loss in flood-prone areas and permit counties to manage floodplain development within unincorporated areas. This act provides the established county commission the authority to create a comprehensive land-use management program for floodplain management, in accordance with the NFIP criteria. As a result, unincorporated communities are eligible for flood insurance through the NFIP. The program helps mitigate damages caused by floods by controlling land use and development and improving the long-range management of flood-prone areas. The statute authorizes each county commission to adopt floodplain management ordinances for unincorporated areas. County Planning Commissions are granted broad authority to control development in flood-prone zones by adopting ordinances and Flood Insurance Rate Maps that delineate the various flood zones controlled by the adopted ordinances. Each county must appoint an administrator of the program and provide for a Board of Adjustment to hear appeals to the ordinance requirements.

Title 41, Chapter 14, Article 6, Code of Alabama, establishes established the State Building Commission in 1945. Effective October 1, 2015, the Building Commission established in Section 41-9-140 was abolished. All powers, authority, and jurisdiction of the Building Commission were transferred to the Division of Construction Management within the Department of Finance by that act. That (Department of Finance Division of Construction Management). The 2021 International Building Code was adopted in 2022 as the State Building Code and is enforced by the Division of Construction Management (DCM). The State Building Code is limited to any new construction, addition, renovation, modification of mechanical, electrical, plumbing systems, sitework and generally any and all work on state-owned property and/or using state funds, on all public and private kindergarten through twelfth grade (K-12) schools, on public postsecondary schools, on hotels/motels and on movie theaters. DCM's code jurisdiction over plans and specifications of all municipal and county-owned projects is limited to such projects meeting Americans with Disabilities Act (ADA) Standards. DCM does not have jurisdiction over residential property or commercial property except for hotels/motels and movie theaters.²⁰⁸

Title 41, Chapter 23, Article 5 of the Code of Alabama establishes the Alabama Energy and Residential Codes, Act 2010 (AERC) Board. The AERC Board is granted the authority to adopt and implement the Alabama Energy and Residential Codes, which include mandatory residential building codes for jurisdictions that had not implemented these prior to 2010. Effective October 1, 2016 the AERC Board adopted the 2015 International Residential Code, with amendments as

²⁰⁸ Alabama Department of Finance, Real Property Management, Division of Construction Management

the Alabama Residential Energy Code, and the 2015 International Residential Code, with amendments as the Alabama Residential Building Code. The Alabama Building Code has been adopted by many local governments in the state.

Title 24, Chapters 4, 4A, and 5, Code of Alabama, establishes the Alabama Manufactured Housing Commission to regulate manufactured and modular homes and buildings, including anchoring requirements. Manufactured Homes must meet the Federal specifications of the U.S. Department of Housing and Urban Development.

Executive Order No. 14 June 14, 1971, provides for "Assignment of Emergency Preparedness Functions to State Departments and Agencies," as of June 14, 1971, and was adopted by reference by AEMA.

Executive Order No. 27 March 3, 1966, provides for the "Creation of the State Office of Emergency Planning," as of March 3, 1966, and was adopted by reference by the Alabama Emergency Management Agency. Executive Orders 27 and 14 authorize the Governor to use the services, equipment, supplies, and facilities of existing State departments, offices, and agencies for emergency management purposes. In the event of an impending or actual attack or manmade, technological, or natural disaster, Section 4 of Executive Order 14 authorizes the transfer of direction, personnel, or functions of state agencies, boards, and commissions for performing or facilitating disaster or emergency services.

Executive Order No. 40, July 23, 1985, states that AEMA shall act as the coordinating agency for the state in the event of an incident/accident involving a leak, spill, or release of hazardous material, or threat of same. AEMA shall develop, in cooperation with other departments and agencies of the State government, the necessary plans, rules, and procedures for responding to these incidents/accidents. AEMA will be responsible for ensuring that these plans, rules, and procedures are implemented and carried out in the State of Alabama. This executive order further requests that departments and agencies of state government who have response capability cooperate with the AEMA, the Department of Public Safety, and the Department of Environmental Management in the establishment of a coordinated and unified system that will assure the citizens of Alabama have the best protection available from hazardous materials, spills, leaks, and releases. This executive order was adopted by AEMA.

Executive Order 19, February 24, 2004, established Alabama's State Hazard Mitigation Team (now referred to as the State Hazard Mitigation Task Force) directing all State agencies to participate in the development of the State Hazard Mitigation Plan. The SHMT is directed to develop the Plan and to assist in prioritizing and selecting hazard and pre-disaster mitigation grant program project applications. The SHMTF is intended to function for the duration of Plan development and remain in place until the three-year plan to update the hazard mitigation plan has been approved by FEMA. The SHMTF is active in the development of local plans statewide, with a focus on information sharing, issues resolution, and commonality of approaches and objectives.

The Alabama Drought Planning and Response Act (Code of Alabama, 1975, §§9-10C-1 et seq.) became law on April 9, 2014, and formally established the state government's role in planning, monitoring, and responding to severe drought conditions. This law replaced a previously issued executive order, established the ADAPT, and defined permanent roles for ADECA-OWR as well as other state agencies.

4.2.2 Regulations

Much of the authority to perform pre-disaster planning and mitigation through development regulations is allocated to the local-level counties and municipalities. Alabama has granted localities very limited authority to regulate development through its planning-enabling legislation. Based on the New York City Zoning Ordinance of 1925, Alabama's 1935 enabling legislation has remained virtually unchanged to this day. It restricts enabling authority to cities and towns only, requiring counties to seek special acts to extend zoning controls to unincorporated communities. "Smart Growth" efforts have recently begun to examine and modernize the State legislation to better promote improved land development practices.

While Smart Growth efforts have not amended the state planning legislation, it is improving land development practices. One example of this is the 2003 Alabama Land Recycling and Economic Redevelopment Act. This legislation established a revolving loan program (funded by a \$1 million EPA grant) to be administered through the ADEM. The purpose of the legislation is to encourage voluntary cleanup and reuse of Brownfield sites in Alabama.

Alabama enacted the Comprehensive Land Use Management Act to give individual counties the right to establish commissions to control development in flood-prone and hazard areas through land use planning and zoning. Each commission has the right to establish and enforce zoning and construction limits in flood-prone areas. While this method is a reasonable approach for permitting floodplain management within unincorporated areas, a state-wide program to enable localities to plan for and manage the full range of land use and development in all areas, both incorporated and unincorporated areas, should be considered.

Administered and enforced by ADEM, the ADEM Division 8 Coastal Program Regulations contain explicit guidance on the regulation of development in the Coastal Zone, mandating specific requirements and restrictions relevant to building in flood-prone or storm surge vulnerable areas. Development throughout Alabama's coastline in Mobile and Baldwin Counties continues to accelerate, illustrating the conflicting objectives of community development and natural resource protection under hazard mitigation guidelines.

4.2.3 Policies

Alabama has instituted hazard management policies through various state agencies and authorities to properly address and manage projects that reduce risk to natural and manmade hazards. Each agency is responsible for drawing up guidelines to mitigate and manage hazards

associated with operations normally handled through the agency's daily functions and operations as well as while recovering from a disaster. Agencies with these hazard management/mitigation policies include AEMA, DCNR, ADEM, and ADECA. The relevant policies of each agency are discussed below.

While appropriate policies appear to be in place, funding mechanisms are substantially reliant on Federal funding with local match requirements. To achieve the desired result of these sound policies, some additional dedicated State funding sources would be beneficial from a management, enforcement, and implementation standpoint. Current policies describe comprehensive organizational responsibilities and interactive capabilities between state and local authorities, coordinating agencies, and local populations. Disaster response policies, it may be noted, are particularly established.

4.2.3.1 Alabama Emergency Management Agency

AEMA is the leading agency responsible for coordinating hazard management activities for Alabama. As previously described, the Alabama Emergency Management Act of 1955 (Code of Alabama 31-9, 1955), first established the AEMA and defined the roles, powers, and duties of emergency management within the state. Furthermore, as a result of the state's continuing legislative review process, Code of Alabama 31-9, Act 522 was signed into law by Governor Bob Riley on April 20, 2006.²⁰⁹ The act amended Sections 31-9-3, 4, 8, and 10, related to state emergencies, and AEMA was strengthened to provide for emergency proclamations, expand the authority of state and local responders, establish degrees of emergency classifications, and provide for the powers of political subdivisions for emergency management.

In 2004, AEMA began to comprehensively review Alabama's legislation related to emergency management responsibilities. Prior to Hurricane Ivan, AEMA's Director formed the AEMA Legislation Committee. The purpose of this committee was to review current Alabama Emergency Management statutes (Code of Alabama 31-9, 1975, as amended) and compare them to emergency management statutes of other states to determine if new legislation (or amendments to existing legislation) were needed to better support the mission and goals of AEMA in its service to the citizens of Alabama.

Between the 2007 and 2010 updates, only one piece of AEMA-related legislation was reviewed, the Alabama Disaster Recovery Program (Act 342). This legislation and the associated program are discussed in more detail in Section 4.2.4.6. No additional legislation was reviewed between 2010 and the SHMP 2023 update.

The Alabama Emergency Operations Plan (EOP) is the primary guiding document for Alabama's post-disaster hazard management policy. In March 2022, Governor Kay Ivey issued the 2022 State of Alabama EOP to replace the previous plan approved in 2017. According to the 2022 EOP:

²⁰⁹ Code of Alabama 31-9, 1975. Retrieved at: [Alison on Alabama Legislature \(state.al.us\)](https://alison.alabama.gov/)

The EOP, using the National Response Plan (NRP) and the National Incident Management System (NIMS), establishes the mechanisms to:

- Maximize the integration of incident-related prevention, preparedness, response, and recovery activities.
- Improve coordination and integration of State, County, local, Tribal, private-sector, and nongovernmental organization partners.
- Maximize efficient utilization of resources needed for effective incident management.
- Improve communications and increase situational awareness.
- Facilitate mutual aid and State support to County, local, and Tribal governments.
- Facilitate State-to-State support.
- Provide proactive and integrated State response to catastrophic events; and
- Determine priorities and coordinate protection, response, and recovery of critical infrastructure.²¹⁰

The NRP, as a core plan for national incident management, is linked to an array of incident or hazard-specific federal contingency plans that are designed to implement the specific statutory authorities and responsibilities of various departments and agencies. Therefore, state agencies that partner with federal agencies should be operating under the same guidelines to ensure complete and comprehensive coordination.

Alabama Emergency Support Functions (ESFs) are functional and expand upon the concept of operations contained in the basic plan. Annexes provide specific responses for agencies of government and define their responsibilities. The Standard Operating Guidelines (SOGs) required for the implementation of the state EOP are not included because of their voluminous nature. SOGs are the general operating guidelines for departments and agencies and are maintained by those departments and agencies.

An annual review of the EOP will be undertaken by the AEMA director and those agencies and departments of the State government having emergency assignments. The director will ensure that a list of all plan holders is maintained at the AEMA Office and that updates are sent to each one of these individuals. AEMA intends to continuously update and revise the EOP to reflect current emergency management requirements and conditions. The most recent update of Alabama's EOP included the National Response Framework (NRF) 2nd Edition and the FEMA Region IV Response Plan.²¹¹

This includes the National Disaster Recovery Framework, NRF 3rd Edition, and the other three Frameworks (Prevention, Protection, and Mitigation) as they become available.

This plan requires fair and equal treatment to all regardless of race, creed, color, national origin, sex, age, or handicap. The priorities will be life safety, incident stabilization, and the protection of property and the environment.

²¹⁰ AEMA; 2012, EOP [State of Alabama \(wordpress.com\)](https://www.alabamastate.gov/wordpress.com)

²¹¹ AEMA, 2017. State of Alabama Emergency Operations Plan.

4.2.3.2 Alabama Department of Conservation and Natural Resources

The DCNR State Lands Division (SLD)-Coastal Section, is the lead agency for the Alabama Coastal Area Management Program (ACAMP) which is described further in Section 4.2.4.2. As such, the SLD-Coastal Section is responsible for developing policies and programs, coordinating fiscal management, conducting education and outreach, and leading the overall administration of the ACAMP. The policies of the ACAMP recommend pre-disaster mitigation planning and are intended to discourage development in higher-risk coastal zones, which are more vulnerable to natural threats such as flooding and hurricanes. The primary authority for ACAMP is the Alabama Coastal Area Act of 1976 (Act 534). The Alabama coastal zone extends inland to the continuous 10-foot contour in Mobile and Baldwin Counties. Potential funding is available for ACAMP actions and must be approved by NOAA, and pursuant to NOAA requirements, and can be utilized only in coastal counties (Baldwin and Mobile Counties).

4.2.3.3 Alabama Department of Environmental Management

ADEM, through its Administrative Code and Division 8 Coastal Program Regulations, permits, regulates, and monitors use and activities that have a direct or significant impact on coastal Alabama and its resources. These regulations specifically control development in higher-risk coastal zones, which are more vulnerable to natural threats such as flooding and hurricanes. Activities regulated under these regulations include construction and other activities on Gulf of Mexico beaches and dunes in the Alabama Coastal Zone. The Division 8 regulations address construction along beaches and dunes and any developments greater than five acres to provide protection for the primary dunes, beach sands, and covering vegetation by regulating construction or alteration of the beach from the mean high tide line to the Construction Control Line (CCL). The CCL is a defined, surveyed line essentially paralleling, and setback from, the Gulf shoreline. Structures located seaward of this line are not permitted by the program. The CCL was designed to provide long-term protection of the beaches and dunes by prohibiting construction seaward of this established setback line. The CCL helps protect property values and minimize damage from storm surges and other natural hazards. Developers are not allowed to remove primary dune or beach sands and/or vegetation between the CCL and the mean high tide.

The regulations relevant to the CCL require an environmental impact and natural hazards study for any condominium, motel, hotel, or similar development located on a property intersected by the CCL. This requirement includes a wave height study addressing the flood and erosion potential at the project site using eroded beach profiles for pre- and post-development. Additional components of the Division 8 regulations include:

- A beach and dune enhancement plan which calls for dune fencing, dune walkovers, and planting of vegetation to control shoreline erosion and minimize impacts to beaches and dunes;
- Control of the use of bulkheads, retaining walls, and similar structures which could impact beaches, dunes, and structures during storm surge; and
- Permitting and certification requirements for dredging and filling in the coastal area.

Baldwin County and Mobile County have adopted the 2018 International Building Code and International Residential Code.²¹² The City of Mobile has adopted the 2021 International Building Code and International Residential Code. Enforcement of local building codes is included in all local mitigation plans, and in addition, all coastal municipalities have zoning and subdivision regulations in effect. Mobile and Baldwin, the coastal counties, both have flood hazard ordinances in effect for unincorporated areas, but, of these two, only Baldwin County is authorized by State law to administer comprehensive zoning regulations within its unincorporated jurisdiction.

4.2.4 Programs

In the past, primary responsibility for coordination and facilitation of hazard mitigation activities was assigned to AEMA, with the primary focus on responding to local requests from private citizens, citizen groups, planning agencies, and municipal and county governments for assistance with grant applications and coordination with FEMA for judgment on applicability and justification. The transition from a reactive to a more pre-emptive hazard mitigation protocol currently is underway, as local plans are developed and updated and more specific and detailed risk assessment models are developed in accordance with ongoing state plan initiatives.

Pre-disaster management programs in Alabama are established primarily at the local, rather than state or federal level. However, the State of Alabama does manage two programs aimed at pre-disaster mitigation planning: the Alabama Shoreline Erosion and Hazard Mitigation Plan and the Alabama Coastal Area Management Program (ACAMP). In addition, the State of Alabama promotes FEMA grant programs (Section 4.4.2) and the Community Rating System (CRS) program as Federal pre-disaster management programs.

Post-disaster management programs in Alabama are established primarily at the State level. The State of Alabama manages the Alabama Emergency Operations Plan program aimed at post-disaster response and mitigation (Section 4.2.3.1). In addition, Alabama has the Disaster Recovery Program and the Emergency Watershed Protection Program. Other programs relevant to hazard mitigation include those of the USACE and the Property Assessed Clean Energy Financing.

4.2.4.1 Alabama Floodplain Management Program

ADECA OWR administers the Alabama Floodplain Management Program. ADECA receives funding from FEMA through the Community Assistance Program, State Support Services Element (CAP-SSSE) Cooperative Agreement, which is a mechanism that supports States' floodplain management efforts and flood reduction measures through local communities' participation in the National Flood Insurance Program (NFIP). The NFIP is a FEMA Program. The NFIP provides federally-backed flood insurance for property owners, renters, and business owners in communities who adopt and agree to enforce a flood damage prevention ordinance

²¹² International Code Council, 2018. Alabama. Retrieved at: <https://www.iccsafe.org/about-icc/government-relations/map/alabama/>

that meets minimum standards in accordance with 44 Code of Federal Regulations (CFR) as approved by FEMA. The purpose of the ordinance is to reduce loss of life and damage to property from the peril of flood. As of 2023, 433 Alabama communities participated in the NFIP, with more than 44,700 flood insurance policies in force.

Flood damage prevention ordinances allow development in FEMA's Special Flood Hazard Areas (SFHAs), but the ordinance specifies how that development is to occur. Communities may adopt higher standards to further reduce risk. These community regulations are designed to ensure that the development causes no negative flood impact on any other properties. Development is defined any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials. Ordinances contain provisions for 44 CFR Sections 59.1 and 60.3 for all development. All development in SFHAs must be permitted by the NFIP community and all other provisions, including obtaining elevation certificates of structures and other required certifications that are specified in the community ordinance.

Key provisions in community ordinances are for new construction and substantial improvements. Substantial improvement, which includes the term 'substantial damage', means any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the "start of construction" of the improvement. This term includes structures which have incurred "substantial damage", regardless of the actual repair work performed. The term does not, however, include either:

- (1) Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions or
- (2) Any alteration of a "historic structure", provided that the alteration will not preclude the structure's continued designation as a "historic structure".

New construction and substantial improvements must be built to the current code. This reduces the possibility of a structure being damaged by the peril of flood and of being a repetitive loss or severe repetitive loss structure. See FEMA or ADECA websites for further information on repetitive and severe loss properties. As stated above, all communities participating in the NFIP must adopt and enforce minimum floodplain development regulations. At least 86% of the state's cities and counties have floodplain development regulations.

There has been one new community join the NFIP since the 2018 Plan. No Alabama communities have withdrawn or otherwise been suspended or sanctioned from the NFIP during that time period for a total of 433 communities participating in the NFIP in Alabama. Over the past 10 years (since 2013), there has been a general downward trend of the number of NFIP policies. From 2013 through 2021 the average decrease in the number of NFIP policies was 1,076 annually. From

2021 through 2023 the average number of policies decreased by 4,967 annually (as of April 2023); almost 5 times the previous trend. While the number of policies decreased between 2013 and 2021, the total coverage for NFIP policies increased from \$12,344 million to \$13,037 million. However, the total coverage decreased dramatically by comparison between 2021 to 2023 from \$13,307 million to \$11,093 million. The point of inflection (2021) for these changes in NFIP insurance trends coincides with when FEMA's Risk Rating 2.0 became effective (October 1, 2021).

4.2.4.1.1 Sharing NFIP Data

The OWR coordinates with AEMA to provide updated NFIP-related data on state and local NFIP participation, mapping updates, and updated repetitive loss data. This data is used by AEMA and local communities throughout the state to update and enhance their mitigation and resiliency planning activities to develop disaster-resistant communities.

The repetitive loss data provided by OWR is used to help inform the State's strategy for encouraging local communities in their efforts to address mitigating repetitive loss properties. AEMA works with local communities to address prioritizing the retrofitting of repetitive loss properties in their respective list of mitigation actions. As part of the grant application process, AEMA shares the repetitive loss property data with potential sub-applicants interested in applying for funding opportunities under the HMA grant programs (FMA, HMA, and BRIC).

FEMA created and funded the Map Modernization Program (Map Mod) which was in effect from 2003-2008. It was FEMA's initiative to transform how flood maps were created and accessed with the vision to provide flood maps and data for communities nationwide that are more reliable, easy-to-use, and readily available. A key to its success was recognizing the connection between reliable flood maps and effective flood damage reduction. Map Mod focused on updating existing Special Flood Hazard Areas (SFHAs) and converting paper flood maps to a digital platform. The Cooperating Technical Partners (CTP) program was created through Map Mod, providing opportunities to states and jurisdictions to manage flood map development at the local level, realizing that local involvement leads to increased flood risk awareness and product acceptance. The Alabama OWR entered into a CTP agreement with FEMA on September 30, 2002, assuming responsibility for the technical accuracy of the Flood Insurance Rate Maps (FIRMs) across the State.²¹³ The OWR's FY23 FEMA Risk Mapping, Assessment, and Planning (Risk MAP) Program Business Plan (which is updated annually) was referenced in this plan update and outlines the Alabama OWR's floodplain management capabilities and accomplishments.

The Alabama Floodplain Management Program (AFPMP) was created by the OWR to provide a comprehensive floodplain management and mapping program effectively and efficiently within the State of Alabama. Over the years, AFPMP has grown to include a variety of floodplain management activities including flood hazard mapping, community engagement and risk communication, conduction of Community Assistance Visits and Community Assistance Contacts to audit community compliance with the NFIP, outreach, community training, data management,

²¹³ State of Alabama Office of Water Resources Risk MAP Program Business Plan, FY 2017

program management, project planning, project management, and Letter of Map Revision (LOMR) review partnership as specified in CAP-SSSE.

In FY 2010, FEMA transitioned into the Risk MAP Program. The Risk MAP program focuses on increasing flood risk awareness and resilience at the local level through effective community engagement and sustainable mitigation actions and the development of enhanced risk identification products, including watershed-based studies that cross political boundaries. To allow for the successful implementation of the Risk MAP vision within the State of Alabama, OWR further expanded the AFPMP to include a Risk MAP Coordinator role, the production of flood risk assessment data, hazard mitigation planning coordination activities, and mitigation action tracking at the local level.

Risk MAP projects in Alabama are underway in several watersheds throughout the state. As mentioned in the previous plan update, the joint storm surge study with Florida has been completed. The maps for Baldwin County have an effective date of April 19, 2019, and Mobile County has an effective date of June 5, 2020.

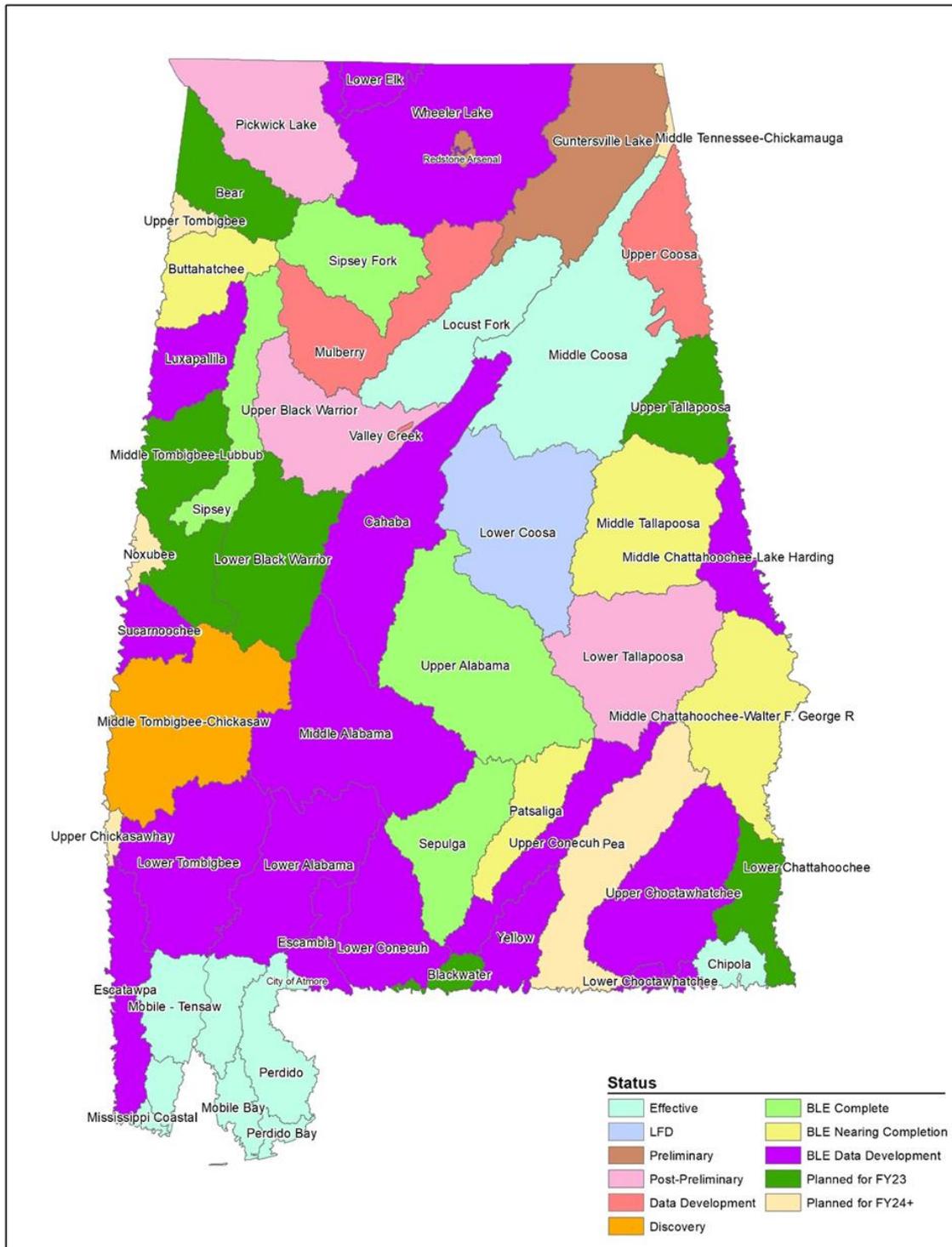
There are also several new flood insurance studies that have been completed recently in the northern counties of Alabama, including the two large metropolitan areas of Birmingham and Huntsville. New FIRMs are pending adoption in the City of Huntsville and surrounding Madison County as well as several other counties that border the Tennessee River. The new FIRMs for the City of Birmingham and Jefferson County are dated September 24, 2021.

Across the state, over 20 base-level engineering (BLE) projects are complete or ongoing to update the Zone A modeling and more are already funded. Although these projects do not result in updated effective maps, they do produce updated models. These updated models can be used as “best available data” for the purpose of emergency management, mitigation planning, and economic development.

In accordance with FEMA guidance, all watersheds within the State have been prioritized for study based on current flooding risk, the need for engineering updates, and the availability of quality topographic data, parcel data, and building footprints. Alabama’s FY23 Risk MAP Business Plan outlines the state’s plan to restudy various watersheds and build capabilities related to flood risk analysis. According to the plan, Alabama estimates that approximately 45% (2,328 miles) of existing AE Zones (detailed) studies are still in need of updated engineering to meet FEMA’s New, Validated, or Updated (NVUE) goals. In 2017, OWR received funding to address the lack of base flood elevations on almost 34,000 Zone A miles for planning and risk mitigation. The solution was the development of statewide Zone A water surface elevations (WSEL) grids for public access.

To meet the NVUE requirements and the additional program goals and performance measures outlined in this Business Plan, OWR estimates that approximately \$8,100,000 will be needed each year over the next three years, and the total program funding level required for FY 2023 to FY 2025 is estimated to be approximately \$24,200,000. Figure 4.1 below shows the year each HUC-8 watershed in the state was funded or will be funded in the future for a new flood insurance study.

Figure 4.1: Watershed Status by HUC 8 Boundaries Showing Most Recent Projects Status²¹⁴



²¹⁴ State of Alabama Office of Water Resources Risk MAP Program Business Plan, FY23 to FY25

The AFPMP provides technical assistance to FEMA's NFIP communities who voluntarily joined the NFIP and who adopt and agree to enforce their flood damage prevention ordinance in exchange for federally-backed insurance for property owners, renters, and business owners to reduce the financial impact of flooding. AFPMP also conducts Community Assistance Visits to ensure communities are enforcing their flood damage prevention ordinances. As of 2022, 433 Alabama communities participate in the NFIP with more than 44,700 flood insurance policies in force.²¹⁵

The OWR, through FEMA's CAP-SSSE funding process, provides technical assistance to communities to achieve and maintain compliance and good standing in the NFIP program. The State does this by:

- Promoting reduction of flood losses in NFIP participating communities through adherence to communities' Flood Damage Prevention Ordinances which meet minimum NFIP regulations, mitigation planning, education, and awareness,
- Working with communities during post-disaster operations to provide needed technical assistance to address NFIP issues; and
- Recruiting nonparticipating communities into the NFIP program.²¹⁶

In partnership with FEMA, the OWR uses federal and state funds to meet the overall objective of reducing flood hazards in communities participating in the NFIP. Each year, the state NFIP staff conduct approximately 16-20 in-depth Community Assistance Visits (CAV) and 45-75 Community Assistance Contacts (CAC) with public officials. The purpose of CAVs and CACs is to assess compliance with their ordinances and to provide technical assistance in follow-up. The outreach efforts of this program include technical consultations with public officials, providing published material to the public and presenting seminars and conferences on floodplain management and flood risk mitigation. The State NFIP Coordinator also conducts training courses such as Floodplain Management 101 and L273: Managing Floodplain Development through the NFIP. These courses target floodplain administrators throughout the State to provide them with a working understanding of their duties and responsibilities and the tools available to them to perform their duties.²¹⁷

OWR prepared a Strategic Plan for NFIP State Coordination that was completed in June 2013. The Plan provided an evaluation of the State NFIP Coordinator within the comprehensive AFPMP and to form recommendations so this role may be improved and/or expanded to ensure coordination efforts of the NFIP are effective and best serve the citizens, property, and resources within the State. The NFIP coordination efforts were reviewed and evaluated per the elements of the CAP-SSSE methodology and both long-term and short-term strategies are identified including defining the overall goals of the Alabama program while identifying specific actions and

²¹⁵ Ibid.

²¹⁶ Ibid.

²¹⁷ Ibid.

implementation schedules, deliverables, budget, staffing, and support monitoring and evaluating tasks, as necessary.²¹⁸

The OWR is currently developing an updated strategic plan and anticipates that it will be completed in 2023 or 2024. It will include elements similar to the 2013 Plan in addition to including procedures for key program activities. It will also discuss how the State NFIP Coordinator and NFIP staff are incorporating FEMA's NFIP Transformation (new initiative that began to be implemented in 2020) tools and priorities into its NFIP efforts. A significant part of the initiative is a renewed focus by FEMA and the states on improving local programmatic compliance and floodplain development compliance. The CAVs, CACs, and substantial improvement/damage tracking will be utilized significantly in the effort.

The OWR has developed and implemented a revised approach to how it conducts CAVs in 2022. It involves sending an initial email with a survey form to be completed by the local floodplain administrators. Follow-up telephone calls and letters are being utilized as needed to ensure a response. CACs are being used more comprehensively as a tool to screen communities to evaluate their need for outreach, training, and corrective action measures regarding how they permit, inspect, enact enforcement measures in non-compliant development, and record-keeping.

Communities participating in the NFIP must adopt a local floodplain ordinance meeting the minimum NFIP criteria. These ordinances stipulate that after a disaster, all residential and non-residential structures located within Special Flood Hazard Areas must be evaluated for substantial damage.

Historically, substantial damage has not been consistently enforced nationwide by communities. Disaster damage data has shown us that buildings constructed to current regulations and codes usually receive minimal to no damage from flood disasters. However, those buildings that are not in compliance with current building standards, whether built prior to flood maps and regulations or are new construction or substantial improvements not currently in compliance, are at greatest risk of suffering extensive damage. The principal way to stop this cycle and address these structures is through enforcement of the substantial damage provision of floodplain management regulations. Substantial damage evaluations apply to damage from any source, including all types of disasters including flooding, fire, earthquakes, tornados, etc., and even termites.

The Alabama Office of Water Resources NFIP Office developed a Substantial Damage Determination and Enforcement Implementation Plan (SD Plan) in 2021 that was based on the work done in response to Hurricanes Sally and Zeta in 2020. The objective of the SD Plan is to define the State's role in activities relating to community enforcement of substantial damage determinations in the pre- and post-disaster environments. Topics included in the SD Plan include standard operation procedures for communications during an approaching/eminent storm or other potential disaster event (when there is sufficient lead time) and during the

²¹⁸ State of Alabama Office of Water Resources Risk MAP Program Business Plan, FY23

immediate post-disaster period (for any disaster including wind events, flooding, fire, earthquake, etc.); SDE training for communities during pre-disaster and post-disaster; reference to the Alabama Post-Flood Recovery Guidebook which provides in-depth discussions substantial damage determination concepts, pre-disaster preparation, post-disaster planning, field strategies, calculating the cost to repair, and finding market value. The SD Plan also addresses enforcement procedures and coordination with FEMA disaster response staff.

The Alabama SD Plan focuses upon how the Alabama Floodplain Management Program (AFMP) Office will work with FEMA and local floodplain administrators to ensure that the minimum requirements of the NFIP regarding substantial damages are implemented. It generally addresses the following key points:

1. How and when the AFMP Office will communicate with communities on Substantial Damage in an active disaster.
2. What training the AFMP Office will provide for communities and other State Officials on Substantial Damage Pre-Disaster/Post-Disaster.
3. How the AFMP Office will work with FEMA to support/validate communities' depiction of market value, repair cost, depreciation and other values used in Substantial Damage determinations.
4. What the AFMP Office will use as the follow-up mechanism for enforcement of substantial damage determinations.
5. How the AFMP will coordinate with the SHMO and FEMA recovery staff on Substantial Damage during the post-disaster period.
6. How the AFMP will coordinate with the SHMO and NFIP communities within the disaster area for mitigation options.

The Community Rating System (CRS) Program was implemented by the FEMA through the NFIP and allows policyholders within participating communities to receive a discount on NFIP policies after communities implement community-level flood mitigation solutions. Any NFIP community may apply for inclusion in the CRS Program and be credited for a range of flood hazard mitigation activities that exceed NFIP minimum standards.

Through the FEMA contractor, Insurance Services Office (ISO), a community applicant is graded based on criteria set forth in CRS guidelines for flood hazard mitigation. The grade assigned to each community results in a CRS classification. The CRS class determines the applicable insurance discount for the policyholders within the community.

The CRS class rating is a scale of one through ten, with Class 1 communities receiving a 45 percent discount and Class 10 communities receiving no discount. Class 10 communities have either never participated in the CRS program or were previously retrograded and their participation rescinded. Table 4.1 summarizes each CRS class and the applicable discount.

Table 4.1: CRS Class and Discount

CRS Class	Discount (percent)
1	45
2	40
3	35
4	30
5	25
6	20
7	15
8	10
9	5
10	0

According to data compiled by FEMA through February 2023, Alabama has 14 communities participating. Table 4.2 lists the participating communities in Alabama and the current CRS class and status of each community.

Table 4.2: Alabama Participating CRS Communities and CRS Class²¹⁹

FEMA Community Number	Community Name	CRS Entry Date	Current Effective Date	Current CRS Class	Status
10144	Auburn, City of	5/1/2014	4/1/2022	8	Current
15000	Baldwin County	10/1/1995	5/1/2017	7	Current
10116	Birmingham, City of	10/1/1994	10/1/2022	5	Current
10418	Dauphin Island, Town of	4/1/2001	5/1/2019	7	Current
10007	Foley, City of	5/1/2017	5/1/2017	8	Current
15005	Gulf Shores, Town of	10/1/1993	10/1/2013	8	Current
15006	Homewood, City of	10/1/2001	10/1/2001	9	Current
10123	Hoover, City of	10/1/1991	10/1/2020	8	Current
10153	Huntsville, City of	10/1/1991	10/1/2012	8	Current
10151	Madison County	5/1/2014	10/1/2021	8	Current
15011	Orange Beach, City of	10/1/1991	10/1/2007	7	Current

²¹⁹Community Rating System. FEMA, 2023. Retrieved at: <https://www.fema.gov/cis/AL.htm>.

FEMA Community Number	Community Name	CRS Entry Date	Current Effective Date	Current CRS Class	Status
10189	Pell City, City of	10/1/1992	5/1/2012	8	Current
10002	Prattville, City of	10/1/1991	5/1/2008	8	Current
10203	Tuscaloosa, City of	5/1/2016	5/1/2017	8	Current

According to FEMA, each community must submit a recertification document by October 1 each year to maintain eligibility for the program. The recertification requirement includes documentation that mitigation program activities initially credited to the community have continued, in addition to documenting any new strategies implemented since the previous October 1. Any community that has received a Class 9 or better classification will revert to Class 10 on the following May 1 unless it submits the signed recertification worksheet by October 1 of each year. If the recertification does not include all the needed documentation, the community may lose enough points to cause a retrograde in its CRS classification. A repetitive loss community that fails to submit a copy of its annual outreach project or a Category C repetitive loss community (a community that has 50 or more repetitive loss properties that have not been mitigated) that fails to submit its annual progress report will revert to a Class 10.

The AFMP Office regularly encourages and promotes participation in the CRS through its newsletters and technical presentations. It has hosted training by ISO's CRS Specialists in 2014, 2017, and 2023. The AFMP Office is planning to initiate a statewide CRS User's Group which will serve as a support and educational resource for local communities who participate in the CRS and those with an interest in joining. One goal of this effort is to get the support and assistance from either one or more universities and/or one or more of the regional planning commissions in the state that can help facilitate the development and participation of smaller regional groups in the state. The AFMP Office will continue its support of the CRS program through participation in CRS user groups, offering training workshops, and outreach in its newsletters and presentations.

4.2.4.2 Alabama Coastal Area Management Program

The ACAMP a networked program that was approved by NOAA in 1979 as part of the National Coastal Zone Management Program. ADCNR State Lands Division is responsible for planning and policy development while ADEM is responsible for permitting, monitoring, and enforcement activities, as detailed in the ADEM Division 8 Coastal Programs Rules (ADEM Admin. Code R 335-8).

The ACAMP consists of comprehensive management policies and guidance for the protection and enhancement of the quality, quantity, and viability of coastal resources and the management of the uses of these resources. Resource protection includes addressing such issues as shoreline erosion, water, and air quality, wildlife habitat protection, wetland protection, dune protection, urban development, and hazard management. This program also helps protect coastal resources by providing technical assistance on zoning regulations and hazard mitigation to local

governments. ACAMP has an annual grant program that with NOAA approval, provides funding for planning projects occurring in Baldwin and Mobile Counties that protect coastal environments and communities.

The ACAMP Strategic Plan (2013-2018) describes actions the ACAMP staff plan to undertake to achieve the goals and objectives of the program. In the fiscal year 2016, NOAA evaluated the ACAMP performance, focusing on three target areas: program administration, state and local partnerships, and the coastal nonpoint pollution control program. Overall, the evaluation concluded that the ACAMP was successfully implementing and enforcing its federally approved coastal management program.

In 1996, the State of Alabama applied to FEMA to receive funding to develop the Alabama Shoreline Erosion and Hazard Mitigation Plan. The plan addresses inlet management, dredge, dredge fill, monitoring, building codes, erosion rates, and hazard mitigation. Development of the plan involved the work of local planners coordinating the central storage of GIS data, review of the effectiveness of local building codes, and promotion of land use management, density, and development restrictions that mitigate coastal hazards.²²⁰ All ACAMP funding expenditures must be approved by NOAA. Funding for construction, as opposite to planning projects, is only allowable for public access projects. This funding is only available for work in coastal counties.

4.2.4.3 Alabama Drought Management Plan

On June 24, 2011, Governor Bentley issued Executive Order 19 on Drought Planning and Management, formally tasking OWR to support drought planning throughout the state and streamline the organizational structure. The OWR completed the most current version of the Alabama Drought Management Plan in 2018. According to the plan,

*The Alabama Drought Management Plan defines a process to address drought and drought-related activities, such as monitoring climatic conditions, vulnerability assessments, impact assessments, response, and mitigation. This plan creates a statewide regional structure to identify the different areas impacted by drought conditions, identify risks associated with drought conditions and identify ways to possibly avoid droughts and when drought emergencies cannot be avoided, identify ways to mitigate the impacts of droughts. These objectives are accomplished through the development of drought triggers and indicators and by providing guidance on responses to drought conditions for the various sectors impacted by droughts.*²²¹

²²⁰ Alabama Coastal Hazards Assessment, n.d. Alabama Shoreline Erosion and Hazard Mitigation Plan Summary. Retrieved at:

http://webapp1.dlib.indiana.edu/virtual_disk_library/index.cgi/4288138/FID1019/HTM/alshore.htm.

²²¹ ADECA, 2004. Alabama Drought Management Plan. Retrieved at:

http://www.allianceforwaterefficiency.org/uploadedFiles/Resource_Center/Library/United_States/Alabama/Alabama-Statewide-Drought-Plan-2004.pdf.

On April 9, 2014, the Alabama Drought Planning and Response Act formally established the State of Alabama's role in drought management.

4.2.4.4 Alabama Dam Safety Issues

Over the years, Alabama has tried to organize a Safe Dams program. ADECA-OWR has collected data on dams through 2019 and provided its data to the National Inventory of Dams (NID) to be used in the NID database. In 2023, ADECA-OWR was provided funding and direction to develop and conduct an evaluation study of dams in three counties in Alabama with the objective of developing a framework for a dam safety program in Alabama. The creation of the Safe Dams program was an action on the 2013 action plan and remains an ongoing action in the 2023 action plan.

4.2.4.5 Alabama Disaster Recovery Program

The Alabama Disaster Recovery Program was created in April of 2009 through Act 342. This Act also established the Disaster Recovery Fund to fund the program and assist counties and municipalities in satisfying local needs during and "immediately following certain disasters when an emergency or major disaster declaration is not requested by the Governor or has been denied by the President. The act also creates the Alabama Disaster Recovery Program Committee and provides for the disbursement of funds upon a proclamation of the Governor or Legislature and a proclamation by the affected local governing body." To receive funds, local governments have a hazard mitigation plan in place. As of the update of this plan, the state legislature has not funded the Disaster Recovery Fund.

4.2.4.6 Alabama Long-Term Recovery Program

ADECA established a Long-Term Recovery program with a full-time State Coordinator in response to Hurricane Katrina in 2005 to coordinate long-term disaster recovery planning. ADECA worked alongside the FEMA Long-Term Recovery Team to prepare a Long-Term Recovery Plan for the communities of Mobile County. The plan was adopted by all communities and incorporated by amendment into local mitigation plans. Following the April 2011 tornadoes, the Governor established ADECA as the official coordinating agency for long-term community recovery efforts through Executive Order 18, which was signed on June 13, 2011.²²² During this process, six areas of recovery were identified, and task forces were assigned to each: housing, economic recovery, infrastructure, health, and social services, community planning and capability building, and natural and cultural resources. The long-term recovery program is locally driven but draws on guidance from ADECA. Nine communities participated in long-term recovery efforts following the April 2011 tornadoes: Cordova, Geiger, Hackleburg, Holt, Jefferson County, Phil Campbell, Pleasant Grove, Rainsville, DeKalb County, and Sipse. Planning is currently still in progress.

²²² Executive Order Number 18 by Governor Robert Bentley. Alabama Department of Archives & History. Retrieved at: <http://digital.archives.alabama.gov/cdm/singleitem/collection/executive/id/540/rec/20>

4.2.4.7 USDA Natural Resources Conservation Service (NRCS) Emergency Watershed Program (EWP)

The USDA NRCS is authorized under the 1996 Farm Bill to provide technical and financial assistance for emergency watershed protection. The rules for the administration of this Emergency Watershed Protection (EWP) program are codified under 7 CFR 624. The EWP program “consists of measures to reduce hazards to life and property from floods, drought, and the products of excessive runoff or erosion on any watershed impaired by a natural occurrence.”²²³ The program offers technical and financial assistance to landowners and land managers, through a sponsor (state or local government or Indian tribe), upon a Presidential Emergency Declaration or an emergency declaration by the state conservationist. The Alabama Natural Resources Conservation Service developed an Emergency Recovery Plan (ERP) in 2017 that outlines guidance and establishes responsibilities for the administration of the EWP program in Alabama.²²⁴ This plan addresses the recovery actions and inter-agency coordination that the Alabama NRCS will follow when an emergency is declared, and the Emergency Watershed Protection Program is initiated and/or implemented. Alabama NRCS worked with a variety of cooperating technical partners to develop this plan, including AEMA, Alabama Soil and Land Water Conservation Committee, USACE, ADEM, AFC, DCNR, and USFWS.

According to the 2017 plan, the EWP program has been primarily used in Alabama to recover from heavy rainfall events, flooding, hurricanes, and tornados. Typical recovery projects largely include stabilizing gully erosion, removing sediment from drainage ways, removing log jams (especially from under bridges), and installing stream bank protection.

4.2.4.8 U.S. Army Corps of Engineers

With respect to flooding, historically, there have been several cooperative ventures initiated by local interests over the past two decades involving the USACE. With the specific intention of mitigating hazards in several notable flood-prone areas within metropolitan areas, several waterway improvements studies, notably in Shelby, Jefferson, Mobile, and Baldwin Counties (which together comprise the majority of flood damage claims in the State) have been prepared. Several studies have performed comprehensive cost/benefit analyses to mitigate prospective flood zones, and some limited structural improvements are on record, but many of the studies have typically culminated prior to the execution of specific mitigation actions, due to local funding constraints.

4.2.4.9 Property-Assessed Clean Energy Financing Program

The Property Insurance and Energy Reduction Act of Alabama (§11-81-240 through 250/Title 11, Chapter 81, Article 8) established the Property Assessed Clean Energy Financing Program in the

²²³ Emergency Watershed Protection (EWP) Program Alabama Emergency Recovery Plan, October 2017, 22.

²²⁴ Ibid.

State of Alabama. This program allows property owners to borrow money from local governments to fund energy improvements, including resiliency and energy-efficiency improvements.²²⁵

4.2.4.10 Community Lifelines

In addition to identifying state capabilities across all four capability types, thinking about how community lifelines contribute to the pre-and post-disaster capability of the state is important in order to understand risk and establish mitigation priorities. FEMA's National Response Framework, 4th Edition, identifies seven critical community lifelines that are the most fundamental services in the community. When stabilized, they enable all other aspects of society to function. Community lifelines also support deeper analyses of state capabilities. For example, analyzing transportation networks may find mitigation capabilities within the state's Department of Transportation. Community lifelines can help find and leverage important mitigation capabilities to assess in implementing the SHMP.



4.3 Funding Capabilities for Hazard Mitigation Projects

4.3.1 Grant Administration

In Alabama, the Governor has designated the Director of the AEMA as the officer of the State authorized to accept Federal funding for emergency management purposes through Section 18, Alabama Law, 1955, Act No. 47. Funds received are deposited by the State Treasurer, and disbursed by the State Comptroller, subject to requisition by the AEMA Director.

AEMA operates its funding mechanisms in accordance with the following enabling state and federal legislation, regulations, and program criteria. Funds for the operation of AEMA are authorized in an appropriation made by the legislature based on a budget submitted in accordance with the Code of Ala. 1975, §§ 41-4-80 through 41-4-96. Funding for local emergency management organizations is authorized by the Code of Ala. 1975, §§ 31-9-10, 31-9-24. Budgets are submitted as required by the political subdivision, and as specified in paragraph V.C.2c (2) of the Alabama Emergency Management Agency Administrative Manual, dated October 1, 1985, and revised January 31, 2023. Accounts to manage local funding should be established within the local government's existing accounting system.

²²⁵ U.S. Department of Energy, n.d. Local Options-Property Assessed Clean Energy Financing. Retrieved at: <https://www.energy.gov/savings/local-option-property-assessed-clean-energy-financing-2>.

There is a hazard mitigation plan requirement for many emergency-related federal grants. This means that the grants are dependent upon the state and local governments' demonstration that a comprehensive management process is in place by applicants and sub-applicants having a FEMA-approved hazard mitigation plan in place. States, state agencies, and local jurisdictions are required to have a state hazard mitigation plan in place by the application deadline for BRIC and Flood Mitigation Assistance (FMA) funding and at the time of the Presidential major disaster declaration for HMGP funding, with limited exception.²²⁶

Local jurisdictions desiring project application funds and maintenance and services funds must follow the criteria as outlined in the Alabama Emergency Management Agency Administrative Manual, dated October 1, 1985, and revised January 31, 2023. State and local agencies will maintain such accounts, records, papers, and other pertinent supporting materials, which will permit an accurate determination of the status of Federal and other contributions.

Alabama relies exclusively on a local matching approach to secure appropriate levels of funding. Alabama's current strategy is to access federal funds for qualifying initiatives and facilitate the development of local funding sources through municipal and county entities to fund local match requirements. To date, the State of Alabama has continually met the local match requirements associated with the funding of Federal sponsored programs, due in part to the continued financial support of the hazard mitigation programs and initiatives by local city and county governments.

AEMA hosts a robust grants management website, Alabama EMA Grant Manager,²²⁷ that includes an online grants management portal to track applications, a wealth of information about the Public Assistance (PA) program and HMGP to include sample HMA project type sub applications, template forms, reference documents, and state contact information.

4.3.2 FEMA Funding Opportunities

4.3.2.1 FEMA Hazard Mitigation Grant Program

Since the last plan, FEMA has implemented new direction for federal funding. Justice 40 and community lifelines are just a small example of these additions. Justice 40 initiative- Justice 40 is a whole-of-government effort. It works to deliver at least 40% of the benefits from federal climate and clean energy investments to disadvantaged communities. HMPs are crucial in delivering those benefits. States should assess how mitigation resources and programs are made available. Mitigation capabilities should assess resources across communities. They should also help the state's HMP reduce barriers to those resources. FEMA's grant programs, including Building Resilient Infrastructure and Communities (BRIC) and Flood Mitigation Assistance (FMA), advance Justice 40. States can meet FEMA grant program requirements by building capabilities in underserved communities.

²²⁶ FEMA, 2015. Hazard Mitigation Assistance Guidance. Retrieved at: https://www.fema.gov/media-library-data/1424983165449-38f5dfc69c0bd4ea8a161e8bb7b79553/HMA_Guidance_022715_508.pdf.

²²⁷ <https://grants.ema.alabama.gov/index.cfm>

4.3.2.2 FEMA Hazard Mitigation Grant Program

Some of the most significant mitigation actions in Alabama have been accomplished with HMGP funding. FEMA uses a sliding scale to determine the amount of HMGP funds that it provides after a presidential disaster declaration. FEMA provides 15 percent of the first \$2 billion spent in overall assistance. FEMA then provides 10 percent of each dollar between \$2 billion and \$10 billion and 7.5 percent for each dollar between \$10 billion and \$35.3 billion. In the State of Alabama, local governments are currently the prime source of funding for the local match associated with this program. At this time, the SHMTF believes that local municipalities will continue at their current level of participation in funding local match requirements.

Since Hurricane Ivan in 2004, a little over half of all HMGP dollars spent in Alabama has gone towards building or retrofitting safe rooms in shelters, public facilities, and private residences. The second largest bucket of HMGP projects have been the acquisition of vulnerable properties or “buyouts” that move people out of damage-prone areas. Two summary tables of Alabama’s HMGP projects can be found in Section 5.3 Mitigation Successes. While HMGP funding is not sufficient to accomplish all the desired projects, it continues to be the centerpiece of the Alabama Hazard Mitigation Strategy.

The State of Alabama Hazard Mitigation Administrative Plan documents the State's process for administering HMGP funds. While specifically intended as the primary guidance for state management of HMGP activities only, it represents the current administrative model for the state’s acquisition and stewardship of funding mechanisms generally; and, as such, it is the best current framework describing Alabama’s financial management capabilities. The plan defines applicant eligibility criteria, the application process, and management procedures for the distribution of funding under the program. The State Hazard Mitigation Administrative Plan is an evolving document that is updated after each declared disaster in accordance with current state and federal policy, guidance, laws, and executive orders.

The plan is designed to interlock the Public Assistance Plan and the Individual and Family Grant Administrative Plan. These last two mentioned plans are part of the comprehensive approach that AEMA has fostered toward hazard mitigation.

HMGP grants can also be used for funding the development of local hazard mitigation plans. Appendix C: Funding for Local Hazard Mitigation Projects and Planning provides additional information on how federal grants are used in Alabama to support local hazard mitigation planning.

4.3.2.3 FEMA Flood Mitigation Assistance

The FMA Program provides funding to States and communities so that measures are taken to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP. FEMA distributes FMA funds to States that, in turn, provide funds to communities. The State serves as the grantee and program administrator for the FMA grant. Federal funding is available for up to 75 percent of the eligible activity costs, however,

under certain circumstances, FEMA will provide 100 percent Federal cost share for projects that address severe repetitive loss (SRL) properties and 90 percent for repetitive loss (RL) properties. Alabama's mitigation strategy emphasizes the mitigation of RL and SRL properties and includes actions to provide outreach and education to local communities about how to apply for these specific grants.

AEMA has utilized the FMA program grants in association with numerous projects consistent with its purpose of providing funding to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP. Typical examples of eligible FMA projects funded in Alabama under this program in recent years include elevation, acquisition, and relocation projects involving NFIP-insured structures, and advanced assistance to prioritize and develop future mitigation projects. AEMA, in conjunction with ADECA, actively promotes the FMA grant program every year.

4.3.2.4 FEMA Pre-Disaster Mitigation/Building Resilience in Communities (BRIC)

The PDM Program was authorized by §203 of the Robert T. Stafford Disaster Assistance and Emergency Relief Act (Stafford Act), 42 USC, as amended by §102 of the Disaster Mitigation Act of 2000 (DMA2K). Funding for the program is provided through the National Pre-Disaster Mitigation Fund to assist states and local governments (including Native American tribal governments) in implementing cost-effective hazard mitigation activities that complement a comprehensive mitigation program. Funds are used for the implementation of pre-disaster hazard mitigation measures that are cost-effective and designed to reduce injuries, loss of life, and damage and destruction of property, including damage to critical services and facilities under the jurisdiction of the states or local governments. The DMA2K emphasizes the importance of strong state and local planning and comprehensive program management at the state level.

Alabama has facilitated several initiatives consistent with PDM objectives, enabling the State and its communities to implement more preventive, pre-disaster activities. Funds are applied for and used to implement a sustained pre-disaster natural hazard mitigation program to reduce overall risk to the population and structures, while also reducing reliance on funding from actual disaster declarations. Alabama recognizes that the PDM program provides a significant opportunity to raise risk awareness and to reduce the State's disaster losses through pre-disaster mitigation planning and the implementation of planned, pre-identified, cost-effective mitigation measures, with a focus on funding mitigation projects that address NFIP repetitive flood loss properties.

FEMA made \$250,000 in planning grants available to the State to facilitate the development of the initial state plan in 2004, and additional funding for the subsequent plan updates. The State of Alabama has also helped administer PDM funds to local EMA offices and Regional Planning Councils (RPCs) for a variety of mitigation activities, including planning. There are currently 17 open PDM grants related to hazard mitigation plan projects that total about \$1 million. Excluding planning grants, there are about \$10 million in PDM grants for other activities such as drainage

projects, safe rooms, and acquisitions. Section 5.3 contains a table that summarizes these different PDM projects.

PDM grants can also be used for funding the development of local hazard mitigation plans. At least 11 counties across Alabama used PDM grants to fund the latest update to their local hazard mitigation plans. Appendix C: Funding for Local Hazard Mitigation Projects and Planning provides additional information on how federal grants are used in Alabama to support local hazard mitigation planning.

4.3.2.5 FEMA Public Assistance

The State has performed many projects utilizing PA funding. The Alabama Public Assistance Plan provides procedures to manage Public Assistance funds. The Public Assistance Program provides supplemental Federal disaster grant assistance for the repair, replacement, or restoration of disaster-damaged, publicly owned facilities, and the facilities of certain private non-profit (PNP) organizations. The Federal share of assistance is at least 75 percent of the eligible cost for emergency measures and permanent restoration. The State determines how the non-federal share (up to 25 percent) is split with the applicants (typically half). Eligible applicants include the states, local governments, Indian tribes, and certain PNP organizations. The State is the grant administrator for all funds provided under the Public Assistance Program. Part 13 of the CFR gives the states more discretion to administer federal programs in accordance with their own procedures and thereby simplifying the program and reducing delays. As a grantee, the State is responsible for administering the programmatic and grants management requirements of the Public Assistance Program. Key among the programmatic requirements is informing the applicants of the assistance available to them: what is eligible and how to apply for it. Grant management includes applying for federal assistance, monitoring, and closing out the grant. The State and FEMA work in partnership to provide prompt and consistent service to all applicants.

Under the revised Public Assistance Program, the State has many of the same roles and responsibilities as the initial system. FEMA recognizes that states have different capabilities to perform their assigned duties. FEMA continues to work in partnership with those states requiring technical assistance to serve the needs of their applicants.

Once insurance requirements are established, FEMA will reduce otherwise eligible costs by the actual or anticipated insurance recoveries the applicant receives. The State must notify FEMA of any entitlement to an insurance settlement or recoveries for a facility and its contents. For insurable buildings located in a special flood hazard area and damaged by flood, the reduction is the maximum amount of insurance proceeds the applicant would have received had the building and its contents been fully covered by a standard flood insurance policy under the NFIP. The applicant is required to buy insurance in the amount of the eligible damages for flood and general hazards.

For small projects, a grant is based on an estimate of the cost of the work. For large projects, a final grant is based on actual eligible costs. In large projects, the State disburses progress

payments, as required. The dollar amount of a small or large project changes each fiscal year and is based on the Consumer Price Index.

There have been five new federal disaster declarations in Alabama as of January 2018, including emergency declarations and major disaster declarations. At the time this update was written, \$1,000,438,970.29 had been obligated for Alabama PA projects.²²⁸

Public Assistance Mitigation, or “406” Mitigation, is available for permanent work projects (categories C-G). It is different from HMGP, or 404 Mitigation, which is also tied to a disaster event in that 406 funding is paid for through the Public Assistance Program and is specifically designated to fund mitigation measures during the repair of eligible disaster-damaged facilities. This mitigation is designed to reduce the likelihood of a facility that was damaged in a disaster experiencing similar damages in the future. Establishing PA mitigation goals early-on in a disaster event and providing technical assistance to potential applicants is key to ensuring this type of funding is effectively utilized.

4.3.2.6 FEMA Community Assistance Program State Support Services Element

CAP-SSSE is a long-standing and effective partnership between FEMA and the states that recognize the value of state-led community assistance in reducing flood losses and disaster suffering. Since the 1980’s, FEMA has partnered with states through cooperative agreements to leverage their unique capabilities, relationships, and land use authorities to ensure that development is guided to reduce risk from flooding and to prevent increases in flooding potential.

CAP-SSSE Program provides funding to State NFIP Coordinating Agencies to support communities in implementing the regulations of the NFIP. States partner with FEMA to evaluate local compliance with their community’s flood damage prevention ordinance and provide technical assistance to support communities in adopting, administering, and enforcing effective flood loss reduction standards for land use and development. They also work to implement statewide actions that reduce the damage and cost of flooding.

State NFIP Coordinating Agencies are responsible to maintain the capability to perform a variety of duties including enacting enabling legislation for communities to regulate development in the floodplain, promoting NFIP participation, providing technical assistance to support communities in implementing floodplain management regulations, conducting audits and assessments of local programs, and disseminating program information to other state and local agencies and other duties and responsibilities set forth in 44 CFR 60.25(b).

FEMA created and in 2020 implemented the CAP-SSE Tiered State Framework (TSF) to provide clarity on the goals and performance standards of CAP-SSSE. The TSF helps FEMA recognize, invest in, and incentivize state efforts to develop and maintain each State NFIP Coordinating Agency’s Capability, capacity, performance, and statewide coordination that is necessary to carry out the duties of a State NFIP Coordinating Agency as defined in 44 CFR 60.25(b).

²²⁸ FEMA, 2018. Disasters. Retrieved at: <https://www.fema.gov/disasters>.

Annually ADECA-OWR prepares a statement of work and budget to perform the activities prescribed in the TSF and annual CAP-SSSE NOFO that are pertinent to and a priority for Alabama. Typically, ADECA-OWR receives between \$220, 000 and \$300, 000 to perform the work associated with those activities.

4.3.2.7 FEMA Emergency Management Performance Grant Program

Under the Emergency Management Performance Grant (EMPG) Program, funds are provided by FEMA as authorized in Public Law 81-920 for the purpose of increasing operational capability at the state and local level. These funds can be expended for necessary and essential personnel and administrative expenses, including but not limited to salaries, benefits, travel, office supplies, equipment, and administrative communications. The State and/or local governments must match on a one-for-one basis financial assistance provided for EMPG Program purposes. To be eligible to receive EMGP Program funds to support a local emergency management program, a political subdivision must meet the criteria as referenced in the Alabama Emergency Management Agency Administrative Manual, dated October 1, 1985, and revised January 31, 2023.

4.3.2.8 Building Resilience in Communities (BRIC)

The Building Resilience Infrastructure and Communities (BRIC) program was established after the passing of the Disaster Recovery Reform Act of 2018. BRIC is funded by a 6% set-aside from federal post-disaster grant funding. Given that the annual cost of disaster has only gone up recently, the available BRIC funds have also increased year after year. The first application period opened in September 2020. Typically, the BRIC application period is open from September to January each year. BRIC also includes a non-competitive State set aside amount, as well as a larger competitive fund which projects from across the Nation can compete for.

This means that eligible applicants, including the State of Alabama, can anticipate there will be consistent, stable mitigation funding available every year, even if the State does not experience a declared disaster in any given year.

BRIC is designed to support states, local communities, tribes, and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards. The BRIC program guiding principles are supporting communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility and providing consistency. Competitive applications are scored on qualitative criteria including, according to the FY22 NOFO; Risk reduction/resilience effectiveness, climate change and other future conditions, implementation measures, population impacted, community engagement and other outreach activities, and leveraging partners. BRIC also takes equity in mitigation into account and prioritizes benefits to disadvantaged communities.

The State submitted one project in FY20 which was not selected. In FY21, 3 projects were submitted and 2 were identified for further review, totaling \$999,844.91. "Identified for further review" means the sub application has met the NOFO requirements and will now work with the

applicable FEMA Region to complete pre-award activities such as an Environmental and Historic Preservation (EHP) review. Each year, the number of applications nationally has increased. However, as the BRIC criteria are further defined, and best practices are established, it is expected the State will be able to successfully apply for additional funding through BRIC.

4.3.2.8.1 Alternative Cost-Effectiveness Methodology

On Oct. 7, 2022, FEMA announced an increase in program accessibility for communities for the fiscal year 2022 Building Resilient Infrastructure and Communities (BRIC) and Flood Mitigation Assistance grant program application cycle. This increased support will benefit underserved communities with challenges meeting the Benefit-Cost Analysis (BCA) requirement when accessing funding through Hazard Mitigation Assistance (HMA) grant programs.

4.3.2.9 Legislative Pre-disaster Mitigation (L-PDM)

Legislative Pre-disaster Mitigation (L-PDM) is a program by which Congress sets aside money for lawmakers to fund projects in their respective states.

4.3.2.10 High Hazard Potential Dams (HPPD)

The President signed the [Water Infrastructure Improvements for the Nation Act](#) or the “WIIN Act,” on December 16, 2016, which adds a new grant program under FEMA’s National Dam Safety Program ([33 U.S.C. 467f](#)). Section 5006 of the Act, Rehabilitation of High Hazard Potential Dams, provides technical, planning, design, and construction assistance in the form of grants for the rehabilitation of eligible high-hazard potential dams. High Hazard Potential is a classification standard for any dam whose failure or mis-operation will cause loss of human life and significant property destruction.

The Rehabilitation of High Hazard Potential Dams Grant (HHPD) awards provide technical, planning, design, and construction assistance in the form of grants for the rehabilitation of eligible high hazard potential dams. A state or territory with an enacted dam safety program, the State Administrative Agency, or an equivalent state agency, is eligible for the grant.

In the Fiscal Year 2022, FEMA allocated \$22 million in grant funding to continue the Rehabilitation of High Hazard Potential Dam program, including nearly \$11 million from Bipartisan Infrastructure Law. Of the total funding, \$11.64 million will be available for planning and design activities and \$10.36 million will be available for construction-ready activities only.

The State of Alabama does not have a State Dam Safety Program at this time and will not be eligible for HPPD funding at this time.

[Rehabilitation Of High Hazard Potential Dam \(HHPD\) Grant Program | FEMA.gov](#)

4.3.2.11 Safeguarding Tomorrow through Ongoing Risk Mitigation Revolving Loan Fund (Safeguarding Tomorrow RLF)

The [Safeguarding Tomorrow through Ongoing Risk Mitigation \(STORM\) Act](#) became law on Jan. 1, 2021, and authorizes FEMA to provide capitalization grants to states, eligible federally recognized tribes, Puerto Rico, and the District of Columbia to establish revolving loan funds that provide hazard mitigation assistance for local governments to reduce risks from natural hazards and disasters. The Act amends the [Robert T. Stafford Disaster Relief and Emergency Assistance Act](#).

On Dec. 20, 2022, FEMA published the first Notice of Funding Opportunity (NOFO) releasing \$50 million of mitigation funding through the STORM Act's new Revolving Loan Fund program. On Jan 27, 2023, FEMA amended the NOFO to include additional eligible entities. The Infrastructure Investment and Jobs Act (IIJA) became law on Nov. 15, 2021, fully funding the Safeguarding Tomorrow Revolving Loan Fund program by appropriating **\$100 million per year over five years** for a total of \$500 million. This will last through the Fiscal Year 2026. As a new program, FEMA is ensuring that the Safeguarding Tomorrow Revolving Loan Fund (RLF) program development aligns with the intent of the STORM Act.

In other Hazard Mitigation Assistance grant programs, states and federally recognized tribes are pass-through entities that route sub applicant requests to FEMA for review. The STORM Act allows FEMA to empower these entities to make funding decisions and award loans directly. These low interest loans will allow jurisdictions to reduce vulnerability to natural disasters, foster greater community resilience, and reduce disaster suffering. Some allowable uses include activities that mitigate the impact of natural hazards, zoning, and land use planning, building code enforcement, and the non-federal cost-share for other FEMA Hazard Mitigation Assistance grants. FEMA is available to support the development of the revolving loan fund through technical assistance. Ultimately though, it will be a state-managed and state-led program.

4.3.3 Other Federal Funding Opportunities

4.3.3.1 U.S. Economic Development Administration

The U.S. Economic Development Administration (EDA) supports economically distressed areas of the United States by fostering job creation and attracting investments through a variety of grants and loan programs. The EDA has six funding programs that Alabama can use for hazard mitigation projects:

- **Public Work Grants:** These grants are given to public and private non-profit organizations as well as to Indian Tribes for the building or expansion of public facilities that are essential to industrial and commercial growth.
- **Technical Assistance Grants:** Funding is made available through these grants to communities and firms for economic feasibility studies of resource development in the establishment of jobs. The funding also provides on-sight support for innovative economic development techniques.

- **Planning Grants:** Funding is available through planning grants to help to pay for the expertise needed to plan, coordinate, and implement comprehensive economic development programs.
- **University Center Program Grants:** These grants are awarded to colleges and universities to utilize available resources to provide technical assistance to clients and address the economic development problems and opportunities of their service area.
- **Revolving Loan Fund (RLF) Grants:** This funding is aimed at helping depressed areas overcome specific capital market gaps and to encourage greater private sector participation in economic development activities. In concert with private leaders, RLF grantees make fixed asset and/or working capital loans to area businesses.
- **Economic Adjustment Program Grants:** These grants assist state and local governments in solving recent and anticipated severe adjustment problems, resulting in abrupt and serious job losses, and help areas implement strategies to reverse and halt long-term economic deterioration (e.g., natural disasters and military installation closures).

The EDA also has a critical role in disaster recovery by facilitating the delivery of Federal economic development assistance to support long-term community economic recovery planning project implementation, redevelopment, and resiliency. The EDA's FY16 report for Alabama shows significant investments in disaster relief, public works, and economic adjustment assistance, as summarized in Table 4.3.

Table 4.3: FY16 EDA Investments in Alabama

Program	# of Grants	EDA Funds
Disaster Relief	2	\$3,758,725.00
Economic Adjustment Assistance	1	\$2,028,092.00
Partnership Planning	2	\$123,000.00
Public Works	2	\$2,607,093.00
Regional Innovation Strategies	1	\$500,000.00
Technical Assistance	1	\$128,592.00
Total	9	\$9,145,502.00

One of the EDA's Disaster Relief grants listed in the table above is a \$2,912,142 investment made in September 2016 to Mobile Area Chamber of Commerce Foundation, Inc./Mobile Area Chamber of Commerce to create an innovation hub and support entrepreneurial development. This EDA investment funded the acquisition and renovation of the former Threaded Fasteners Building in Mobile to house Innovation PortAL, a high-tech business incubator, and accelerator program. The program included outreach activities in the surrounding distressed communities to promote workforce development initiatives and strengthen innovation and entrepreneurial capacity.

4.3.3.2 U.S. Department of Housing and Urban Development (HUD)

The Department of Housing and Urban Development's (HUD) annual Community Development Block Grant (CDBG) program funds are administered through ADECA and used for community development projects at the local level. Funds support a variety of projects including, but not limited to, public infrastructure improvements, housing, and economic development initiatives.

ADECA reserves a portion of CDBG funds for local planning grants. These grants may be used for developing and updating comprehensive plans. Up to \$50,000 may be awarded to a community. The grant provides a funding mechanism for addressing hazard risks and incorporating hazard mitigation actions into local comprehensive plans.

CDBG funds can also be allocated following a major disaster through the Community Development Block Grant Disaster Recovery (CDGB-DR) program. The Disaster Relief Initiative for Hurricane Katrina Recovery added approximately \$95 million in CDGB-DR funding for recovery and mitigation projects. This funding has gone towards developing long-term community recovery plans for the communities of Mobile County as well as towards providing the required local matching funds for HMGP projects. CDBG-DR funding was also allocated to Alabama following the April 2011 tornadoes and after Hurricane Ivan in 2004.

4.3.3.3 NOAA

NOAA's Office for Coastal Management provides funding for a grant program that is available through DCNR's ACAMP. The grants are awarded annually for coastal management projects located in Alabama's Coastal Area (Baldwin and Mobile Counties) and can relate to, but are not limited to, planning, coastal hazards, wetland protection, and coastal nonpoint source pollution control, and low-cost public access construction improvements or associated land acquisition.

In addition, NOAA also offers the following potential funding programs:

- **Section 303:** This program focuses on the protection of natural resources that mitigate wind and flooding impacts including beaches, dunes, and barrier islands.
- **Section 305:** States developing coastal programs are eligible to receive funding under this section of the Coastal Zone Management Program (CZM).
- **Section 306:** Funding is primarily provided through implementation grants to administer State programs, including staff salaries, equipment purchases, public education and outreach, enhancement of public access, and the undertaking of projects that monitor and/or enhance elements of the regulatory program.
- **Section 309:** This section provides detailed objectives calling for states to prevent or significantly reduce threats in high-hazard areas or manage development in other hazard areas. A portion of this section is the Coastal Zone Enhancement Program (CZEP).
- **Coastal Zone Enhancement Program:** This program allows states to compete for additional funding by creating enhancements to the existing State Coastal Zone Management Program in eight priority areas including coastal hazard mitigation, wetlands protection, and the control of cumulative and secondary impacts of development.

4.3.3.4 US Army Corps of Engineers (USACE)

USACE maintains an active involvement in Alabama activities, particularly waterways and flood control management under its continuing watershed management mission. The State of Alabama can make a unique claim to have more miles of navigable waterways and shorelines than any other state in the continental US. Accordingly, among other natural hazards, it has numerous locations where population development and floodplain locations overlap and evolve into vulnerabilities. The USACE is active throughout the State supervising Federal waterways management components to prevent and reduce hazards as an ongoing part of maintaining navigation channels and drainage in major watersheds. AEMA works in concert with the USACE in some of these activities and promotes funding of hazard mitigation projects through USACE funding sources when it is possible.

The USACE supports state-led Silver Jackets Teams through its Flood Risk Management Program. Silver Jackets teams are interagency teams that facilitate collaborative solutions to state flood risk priorities. The state-led teams bring together multiple federal, state, regional, local and sometimes tribal agencies to learn from one another and work together to reduce the risk of floods and sometimes other natural disasters. By applying their shared knowledge, the teams enhance preparedness, mitigation, resilience, and response and recovery efforts. The state sets the priorities, with each agency member supporting the team using its own programs and resources within the constraints of available budgets and agency authorities.

The Alabama Silver Jackets was reconstituted in 2022 and had its first three meetings within eight months of the team forming. The team plans to meet quarterly to discuss priorities, participate in training, and conduct projects selection and planning. Its leadership is provided by the Flood Risk Management Program Managers from the USACE Mobile and Nashville Districts and the Alabama State NFIP Coordinator. The Alabama team provides a forum where all relevant federal, state, regional, and local agencies come together to collaboratively plan and implement interagency solutions. Through partnerships, the team will optimize the multi-agency utilization of federal resources by leveraging resources, expertise, programs, and perspectives of multiple agencies which can result in more comprehensive and cohesive solutions for flood risk reduction activities.

The Alabama Silver Jackets team participants include state and local agencies with mission areas of hazard mitigation, emergency management, floodplain management, coastal management, building code enforcement, engineering, community planning, and natural resources conservation. Federal participation includes the USACE, Federal Emergency Management Agency, NOAA's National Weather Service and National Water Center, U. S. Geological Survey, as well as the Natural Resource Conservation Service, Environmental Protection Agency, among others. The team has reached out to others and hopes to have more participants from Tribes, academic institutions, regional planning commissions/councils, and non-governmental organizations.

4.3.3.5 US Department of Agriculture (USDA)

In watersheds damaged by severe natural events, the USDA's Natural Resources Conservation Service can help communities through its the Emergency Watershed Protection (EWP) Program. These funds may be used for activities such as debris removal from streams and culverts, reshape and protect eroded banks, correct damaged drainage facilities, prevent erosion through planting, repair levees and structures, and to repair conservation practices. If funds are available, Natural Resource Conservation Service (NRCS) can provide 100 percent of the cost of exigency situations and 80 percent of the cost of non-exigency situations.

Since the previous plan update in 2013, Alabama has utilized over \$3.5 million in NRCS EWP funding to complete projects that removed debris, restored stream corridors, and drainage, and prevented future flooding, as summarized in Table 4.4. Typical EWP projects in Alabama include sediment or debris removal, stream bank stabilization, and gully stabilization.²²⁹

Table 4.4: EWP Recovery Projects in Alabama since 2013

FY	State	NRCS' Investment	Description of Work
2015	Alabama	\$2,933,854.00	A 2014 tornado clogged streams and caused other damage in northern Alabama. Work will help remove debris and prevent future flooding. A 2014 storm with torrential rain caused severe erosion in coastal Alabama, threatening public utilities and infrastructure, and posing water issues. Work will help restore stream corridors, curb erosion, and prevent future flooding.
2016	Alabama	\$522,337.00	A storm in December 2015 brought heavy rains and resulted in a presidentially declared disaster in several counties. The resulting runoff caused deep gullies in residential areas of Dale and Jefferson Counties, and within the cities of Mobile and Prattville, threatening homes and roads. EWP funds will be used to repair the gullies and restore normal drainage.
2017	Alabama	\$129,344	Hurricane Nate was a Category 1 Hurricane that caused erosion and wind damage to South Alabama. Work will help restore stream corridors, curb erosion, and prevent future flooding.
2018	Alabama	\$15,434	Tropical Storm Alberto caused heavy rains in South Alabama. Work was done to prevent future flooding.
2020	Alabama	\$1,026,038	Hurricane Sally was a Category 2 Hurricane that caused erosion and wind damage to Coastal Alabama. Work will help restore stream corridors, curb erosion, and prevent future flooding.

²²⁹ Alabama EWP Recovery Plan 2017

4.3.3.6 Utility Funding

AEMA negotiates with the Alabama Power Company and the Tennessee Valley Authority for utility funds that are required to support off-site emergency planning at their nuclear power plants. These negotiations are based on Federal mandates for emergency preparedness.

4.4 Local Mitigation Policies, Programs, and Capabilities

The State began the process of local mitigation plan development in early 2003 through planning grants ranging from \$10,800 to \$15,000 awarded to county EMAs within the most populated and highest-risk counties. As a result of this effort, the county EMAs have become the central coordinating agencies for local hazard mitigation planning. The following year, the State entered into an agreement with the Alabama Association of Regional Councils to provide funding, training, and technical support for the regional councils to develop the capabilities to support local mitigation planning. Grants were awarded to complete plans for the remaining 47 counties. Since then, many counties are working with the Regional Councils to complete local plan updates. Details on the status of local planning are contained in Appendix C which describes the status of each county plan as well as funding sources for each.

The results of the mitigation plan development program in the State have tremendously increased the capabilities for local mitigation and community awareness. EMA staff across the State have become proficient in administering local planning programs and overseeing the activities of local hazard mitigation planning committees. The Regional Planning Councils continue to provide technical assistance where needed. These improvements in technical and administrative capability are continued throughout the local plan update process.

4.4.1 Local Mitigation Policies

The framers of Alabama's 1901 Constitution designed a system of State government that concentrates power at the State level. Alabama is not a "home rule" state, meaning that local authority must be granted by State acts, special legislation, or constitutional amendments. Due to the restraints placed in the Alabama Constitution, all but seven counties (Jefferson, Lee, Mobile, Madison, Montgomery, Shelby, and Tuscaloosa) in the state have little to no home rule. Instead, most counties in the state must lobby the Local Legislation Committee of the state legislature to get simple local policies such as waste disposal to land use zoning.

Despite the constitutional limitations on home rule, local governments have been able to function adequately. Legislation has been enacted over the years to allow localities with the capabilities to implement planning and regulatory tools for hazard mitigation. In 1935, the State passed legislation that empowered any municipality to establish planning commissions, pursue comprehensive planning, and enforce zoning ordinances and subdivision regulations, among other planning activities. This planning enabling legislation, however, did not include

unincorporated areas of counties. Only Jefferson, Shelby, and Baldwin Counties have authority by special legislation to extend planning and zoning regulations into unincorporated areas of these counties only. By State Act, all local governments have the authority to enact floodplain management ordinances, building codes, and subdivision regulations.

4.4.2 Local Mitigation Programs and Capabilities

The capabilities of the localities to perform local mitigation measures and implement mitigation projects vary significantly among local governments. Beginning with the 2007 state plan update, a table summarizing local capabilities was developed and included as an appendix. Subsequent plan versions review and update local capabilities in this table. For the 2023 plan update, the summary table lists all counties and municipalities of Alabama and notes various criteria for evaluating the capabilities of each of these localities, including the extent to which regulatory powers such as zoning ordinances, comprehensive plans, and building codes have been adopted, as well as the availability of manpower, such as planners and engineers on staff. A complete list of evaluative criteria is included along with the Local Capability Table in Appendix C.

The Local Capability Table in the 2013 plan update indicated that the results of this assessment show a wide disparity in capabilities, and this pattern continues with the 2023 plan update. Generally, jurisdictions with the largest populations and revenues have the most capabilities. For instance, the City of Birmingham, the largest urban jurisdiction in the State, possesses significant capabilities that most other jurisdictions do not. Birmingham has participated in the NFIP since 1978 and maintains Floodplain Management and Disaster Mitigation Services within the city's Planning, Urban Design & Watershed Management Division. This includes having a full-time CFM and at least two full-time support staff, all of whom are responsible for managing the city's flood hazard mitigation efforts that include: ordinance administration, outreach, property acquisitions, FEMA grant administration, and a host of other mitigation activities.²³⁰ The City participated in the development of the Jefferson County hazard mitigation plan, adopted the plan, and supplements the plan with its own Floodplain and Storm Water Management Plan that was funded through an FMA planning grant. Birmingham has a CRS rating of five, which is the lowest of all CRS participating communities in Alabama, although only 14 jurisdictions in the state are CRS-rated.²³¹ It maintains a comprehensive plan and a CIP, administers a zoning ordinance, building codes, and subdivision regulations, and has a staff of professional planners, engineers, and building inspectors. It has extensive experience with FEMA grant programs, having implemented over \$12 million in flood hazard mitigation buyouts of structures in Birmingham. Previously, the USACE completed a \$30 million flood buyout.

²³⁰ Floodplain Management. City of Birmingham, Alabama, 2018. Retrieved at:

<https://www.birminghamal.gov/about/city-directory/planning-engineering-permits/floodplain-management/>.

²³¹ Alabama Top 50 National Flood Insurance Program (NFIP) Policy Count Communities and Community Rating System (CRS) Participation, October 2017.

https://crsresources.org/files/100/maps/states/alabama_crs_map_october_2017.pdf

Similar robust mitigation capabilities are reflected in the other large and well-populated jurisdictions in Alabama. For example, Jefferson County, in which Birmingham is located and which ranks as the most densely populated county in Alabama, reflects similar advantages, having implemented over \$24 million in flood hazard mitigation buyouts in the county. Other large cities in Alabama, such as the City of Huntsville, also closely follow Birmingham's lead in demonstrating local hazard mitigation capabilities.

In contrast to the larger cities, however, many county and municipal jurisdictions in Alabama have rural populations and very limited revenue resources. Consequently, capabilities in rural counties are typically very low. As shown in the Local Capability Table, typical rural Alabama towns rarely employ any planners, engineers, or building inspectors. Further, many cities and towns in Alabama have no comprehensive plans, building codes, zoning ordinances, subdivision regulations, or other regulatory means to implement mitigation measures. Small communities depend on support from their county governments, which, even in rural locations, have greater means to lend some local support to hazard mitigation.

Another nationwide community preparedness program that Alabama communities participate in is the NWS's StormReady Program (SRP). SRP helps communities develop plans to handle all types of severe weather, including, but not limited to tornadoes and tsunamis. By providing emergency managers with clear guidelines on how to improve their hazardous weather operations, SRP encourages communities to take a proactive approach toward improving their weather operations. These guidelines help communities implement procedures that reduce the potential for disastrous, weather-related consequences.

To become a StormReady community, several guidelines must be met. The guidelines include the following:

- Establish a 24-hour warning point and emergency operations center
- Have more than one way to receive severe weather warnings and forecasts and to alert the public
- Create a system that monitors weather local weather conditions
- Promote the importance of public readiness through community seminars and other outreach methods
- Develop a formal hazardous weather plan to include training severe weather spotters and conducting emergency exercises.

Some benefits of being a StormReady community include increased scores on the CRS which in turn can lower NFIP insurance rates, along with maintaining local plans and increased public awareness and preparedness. Counties, communities, and supporters that are StormReady are identified below in Table 4.5.

Table 4.5: StormReady Communities in Alabama²³²

Type of Jurisdiction	Name
County	Autauga
County	Baldwin
County	Blount
County	Calhoun
County	Cherokee
County	Choctaw
County	Clarke
County	Cleburne
County	Coffee
County	Colbert
County	Covington
County	Cullman
County	Dale
County	Dallas
County	Dekalb
County	Elmore
County	Etowah
County	Fayette
County	Franklin
County	Geneva
County	Henry
County	Houston
County	Jackson
County	Jefferson
County	Lauderdale
County	Lawrence
County	Lee
County	Limestone
County	Madison
County	Marion
County	Marshall
County	Mobile
County	Monroe

²³² [StormReady® in Alabama \(weather.gov\)](https://www.weather.gov/stormready)

Type of Jurisdiction	Name
County	Montgomery
County	Morgan
County	Randolph
County	Russell
County	Shelby
County	St. Clair
County	Talladega
County	Tallapoosa
County	Tuscaloosa
County	Winston
Community	Oneonta
University	Alabama A&M University
University	Auburn University
University	Jacksonville State University
University	Oakwood University
University	University of Alabama
University	University of Alabama,
University	University of Alabama, Huntsville
University	University of Montevallo
University	Northeast Alabama Community
University	University of North Alabama
University	University of South Alabama
University	University of West Alabama
Government	Marshall Space Flight Center
Commercial	Huntsville International Airport
Supporters	Camp Laney
Supporters	Eastdale Mall
Supporters	General Electric
Supporters	Huntsville Utilities
Supporters	Nucor Steel
Supporters	Quintard Mall
Supporters	Sci-Quest Hands of Science
Supporters	Sport Authority Field at Mile High
Supporters	Summit Lifestyle Center
Supporters	U.S. Space and Rocket Center
Supporters	Tanager Outlets
Supporters	UMS-Wright Preparatory School
Supporters	Talladega Superspeedway

All StormReady participants must be recertified every three years.

This overall state of capabilities in Alabama points to the need for a strong State program of support to increase the capabilities of these rural communities and sustain and strengthen the capabilities of larger jurisdictions. The State EMA fully recognizes these needs for continuing mitigation planning support and has been actively taking steps to expand its technical support and work with locals to identify funding opportunities. The State intends to increase support for localities to receive professional planning and engineering services for hazard mitigation. This can be accomplished through continuing coordination with county EMAs, increasing participation in NWS's StormReady Program, and working to obtain planning funds (e.g., BRIC, CDBG, HMGP) available to improve and expand local mitigation activities.

4.5 Integration into Other Ongoing State Planning Efforts

4.5.1 Ongoing State Planning Efforts and Integration Process

As noted above, AEMA works closely with several agencies to ensure ongoing planning efforts and integration. The agencies with substantial integration into mitigation planning include the Alabama Association of Floodplain Managers (AAFM), ADECA, DCNR, Geological Survey of Alabama (GSA), and AFC. In previous plan update cycles, the Regional Planning Councils (RPCs) had provided coordination between local hazard mitigation plans and ongoing state mitigation planning efforts. More information regarding the past and present role of RPCs in hazard mitigation planning is available in Appendix C. Other hazard mitigation initiatives by Federal agencies are described in Sections 4.3.2 and 4.3.3. These are primarily funding mechanisms to augment state and local mitigation activities.

4.5.1.1 Alabama Association of Floodplain Managers

Alabama established its own chapter of State Floodplain Managers, the AAFM, in 2008. As demonstrated in the past, the Association offers technical support materials for flood hazard mitigation planning and offers a certification program, the CFM, for State and local officials involved with floodplain management. The AAFM works closely with ADECA OWR to provide training courses and webinars for floodplain managers. The AAFM has also contributed to the development of several ADECA OWR publications, including Alabama's Quick Guide to Floodplain Management (2009). AAFM has hosted an annual conference since 2009 and began to incorporate annual spring workshops into its annual events in 2015. Both events provide a key opportunity to network and gain insights regarding current state and federal flood risk management programs.

4.5.1.2 Alabama Department of Economic and Community Affairs

ADECA-OWR plays a major role in statewide hazard mitigation planning. ADECA-OWR oversees the Drought Management Program, administers the NFIP), maintains the Alabama Energy and Residential Codes Board, and oversees the State's flood mapping program, including Risk MAP, a FEMA program. ADECA's Community and Economic Development Programs Office administers the CDBG program, including the Disaster Recovery Initiative (DRI) and administers grants for local planning activities.

The Alabama Drought Planning and Response Act of 2014 established the ADAPT. The purpose of the ADAPT is to provide guidance and make recommendations on drought-related matters to the Governor and the ADECA-OWR, and to coordinate intergovernmental drought response, management, and implementation of all drought-related activities. ADAPT developed and maintains the Alabama Drought Plan, which establishes state-level operating procedures and a framework for the assessment of drought conditions, assists stakeholders and water managers in mitigating drought conditions, and encourages water conservation practice. Additionally, ADAPT maintains the Alabama Drought Information Center, an online clearinghouse of drought-related information available to the public, including a GIS portal and links to current climactic conditions such as soil moisture, reservoir levels, and stream flows.²³³

4.5.1.3 Alabama Department of Conservation and Natural Resources

The ACAMP is a networked program administered through DCNR and ADEM. DCNR is responsible for grant management, planning, and policy development, and ADEM is responsible for permitting, regulatory, and enforcement.

The DCNR, State Land Division Coastal Section administers the ACAMP, a program designed to balance the preservation, conservation, enhancement, and development of coastal resources while promoting a sustainable economy in coastal areas. An important component of the program is natural hazard mitigation. Considering this, the Commissioner of DCNR is among those designated to participate in the SHMTF by EO 19. Planning efforts are coordinated with DCNR through the:

- Discussions of planning activities and mitigation plans with key staff; and
- Review of the ACAMP.

ACAMP funding, as approved and awarded by NOAA, is eligible to be utilized for development of hazard mitigation plans and plan updates in Baldwin and Mobile Counties. DCNR, State Lands Division-Coastal Section seeks to issue an annual call for proposals for grant subawards. Projects which have potential impacts on Alabama's coastal resources are regulated through the ADEM permitting and enforcement programs. These regulated projects include:

- Construction on Gulf-fronting properties.

²³³ Drought Planning and Management in Alabama. ADECA (2015). Retrieved at: <http://www.adeca.alabama.gov/Divisions/owr/Pages/Drought.aspx>

- Commercial and residential development on properties greater than five acres.
- Projects with impacts on wetlands and/or water bottoms.
- Construction of new or expansion of existing marinas.
- Installation of groundwater wells with a capacity greater than 50 GPM.
- Siting, construction, and operation of energy facilities.
- Shoreline stabilization projects.
- Discharges to coastal waters.

4.5.1.4 Geological Survey of Alabama

The Geological Survey of Alabama (GSA) supports mitigation planning for geological hazards, including sinkholes, earthquakes, landslides, natural radiation, and swelling clays. GSA has developed and maintains maps showing the distribution of known sinkholes, faults, underground mines, landslides, and natural radiation sources. The agency also maintains maps of geologic formations, complete with descriptions of the characteristics, and prepares reports of findings and recommendations. GSA also maintains records of historical earthquakes and monitors current seismic activity. In March of 2010, GSA completed a statewide basement fault map and a soil amplification/liquefaction map. GSA also has provided data to map earthquake epicenters, liquefaction susceptibility, and landslide susceptibility for the 2023 plan update. Both items have been incorporated into the Risk Assessment. The information and technical resources of GSA are critical to the statewide risk assessment included in this plan, as well as the development of mitigation strategies that address pervasive geological hazards across the State. In addition, the GSA conducts public outreach through the distribution of educational brochures on geological hazards.

4.5.1.5 Alabama Forestry Commission

AFC incorporated mitigation elements into its Forestry Resources Handbook. The AFC partnered with several agencies, including AEMA, to complete the handbook. AEMA provided hazard mitigation expertise throughout the development including information from the State Hazard Mitigation Risk Assessment to incorporate into the handbook. AEMA was present during the AFC's strategy development process when the AFC and partnering agencies identified 9 threats, one of which was storms (e.g., catastrophic events, floods, hurricanes). AEMA provided mitigation expertise on the storm section of the Forestry Resources Assessment Handbook. Mitigation was made a priority for both urban and rural settings. In an urban setting, mitigation priorities were to remove debris and incorporate lessons learned from previous plans. In rural settings, mitigation priorities included developing community wildfire mitigation plans and incorporating scalability.

4.5.1.6 Choctawhatchee, Pea and Yellow Rivers Watershed Management Authority

Floods or potential flood conditions that have occurred during the past decades escalated the need for modern enhancements to provide forewarnings of threatening flood conditions to communities that could be subject to flooding conditions during periods of heavy inclement weather. The overall purpose of the Flood Warning System (FWS) in southeast Alabama is to provide timely, reliable, and accurate warnings to persons residing along the Choctawhatchee, Pea, and Yellow Rivers.

The Choctawhatchee, Pea, and Yellow Rivers Watershed Management Authority (CPYRWMA) is a state agency and is funded via state funds and grants. The FWS is a comprehensive computerized system that manages data transmitted from gauging sites; analyzes the data as to the amount of rainfall or river depths and reports all events “in real-time” to the base station. It is the responsibility of the CPYRWMA to operate and maintain all components of the system to ensure it is fully capable of identifying and forecasting potential flood conditions.

This System covers the largest area in the State of Alabama and is the only basin-wide flood warning system installed in the state. It consists of 23 gauging sites located in 8 counties along or near rivers or streams in the previously mentioned river basins. These gauges electronically monitor rainfall in .04-inch increments and stream levels or depths in cubic feet per second. Data is disseminated in real-time to the National Weather Service and local emergency management agencies.

The home base of the Flood Warning System is in the Coffee County Emergency Management Office in New Brockton, Alabama which also contributes funding to the operation and maintenance of the system. During periods of heavy weather that poses a threat of possible flood conditions, the Flood Warning System Specialist monitors the system constantly and distributes data to the National Weather Service (NWS), local EMA offices, as well as other agencies requiring said data.

4.5.1.7 Orion Mobile App and Website

The State of Alabama utilizes the Orion mobile app and website to allow individuals in the field to record information, access tax data information, take pictures, and synchronize all the data into a cloud-based dashboard with GIS mapping. This enables live monitoring at the EOC as information comes in from the field. With the management, tracking, and FEMA form generator, Orion saves its users time and money and allows for interconnectivity between the state and local governments. Another special feature is its ability to allow the state and local governments to track special needs populations, including the cognitively impaired, visually impaired, and hearing impaired. Using this Orion Futurity app, Alabama can track the impacts on human life, including fatalities, missing and unaccounted-for individuals, injured people, evacuations, and more. Alabama uses the app extensively, which gives them an almost instantaneous situational awareness of what is happening during any disaster and the ability to assist local governments more quickly in their response.

Outside of disaster response and recovery, Orion provides invaluable historic data concerning past damages and magnitudes of impacts from events. The State of Alabama provides local governance with access to the system to input damages in detail (to include photos, addresses, latitude/longitude (lat/longs), the timeframe of outages, etc.). Each event is assigned a code with an event description and date(s), and all damages are reported into the system at the local and state level. This allows local and state governance to track events by type. This is of particular importance as local governments can use the historical damages to inform their respective risk assessments. This information enables local and state governments to target mitigation projects to lessen the impacts of future events on critical infrastructure. For example, if a city finds that a particular lift station(s) experienced outages in the past, they could make that a mitigation action for the future. This information will also increase the likelihood that the mitigation action would pass a BCA associated with a possible grant opportunity.

4.5.2 Potential Improvements

The State of Alabama has many opportunities to strengthen or improve the integration of its existing statewide planning initiatives. These opportunities were first identified in the 2007 version of the plan and were included in subsequent plan updates. Several items have been completed which are listed in Section 4.5.3 following this subsection. Below lists the potential improvements and their status:

- Continue to use the Alabama Association of Regional Councils (AARC) to disseminate planning information among local government planning. This agency became the main source of information sharing when the All-Hazards Task Force dissolved in 2010.
 - This agency continues sharing information as of the 2023 state plan update.
- Continue NFIP training and enlarge the scope of training to address other natural hazards. The lead hazard mitigation planning agencies (defined as the Alabama Department of Economic and Community Affairs, Alabama Department of Environmental Management, Forestry Commission of Alabama, Geological Survey of Alabama, and Alabama Department of Conservation and Natural Resources) can improve the coordination and delivery of mitigation planning courses to interested individuals throughout the State. The AARC can also become a partner in enlarging training opportunities along with the Alabama Planning Institute (API). Expanded and coordinated training presents one of the best opportunities to assure the integration of planning initiatives among State, Federal, and other interest groups, and best deliver hazard mitigation planning principles at the local level.
 - There are plans to provide training on NFIP Policy and Reform, Hazus, CRS, Online LOMC, and a Floodplain Management Summary and review in addition to various seminars provided through the Alabama Association of Floodplain Managers conferences.
 - Additional training is also offered through FEMA's Risk MAP program.
 - The AARC works through the state to provide information to local governments. The state is not currently working with API to provide training exercises specific to hazards.

- Additional training for earthquake and hurricane hazards continues:
- Earthquake: There are several counties at risk of earthquakes in Alabama. AEMA works primarily through the Central United States Earthquake Consortium (CUSEC) and FEMA to provide courses to these counties. In the past, seismic courses have also been provided by the Applied Technology Council (ATC). A CUSEC TTX was held in February 2019, and a New Madrid SZ exercise will be held in 2024 with FEMA, CUSEC states, EMAC states, and other federal, state, and local level agencies.
- Hurricane: HURREVAC training was conducted in the coastal counties (Baldwin and Mobile). AEMA is also working with the National Hurricane Center to provide information to inland counties affected by wind. Maintain a clearinghouse and repository of hazard mitigation plans and technical support publications. AEMA can serve this function and maintain documents and materials in a centralized location for printed distribution and access through the internet.
 - An official clearinghouse has not been established due to funding.
- Coordinate outreach services among statewide planning agencies. A coordinated public outreach program should more effectively communicate the complete plan and keep the public informed of risks and statewide efforts underway to mitigate those risks.
 - AEMA's website is the primary public outreach tool. It provides information to the public about the different hazards that impact the state, access to the state and county hazard mitigation plans, links to live weather updates, and resources for disaster assistance. AEMA is also continuously working to revise all the documents available on the AEMA website to make them more user-friendly. For example, the documents will be easy to search and broken down into smaller, more manageable documents (by subject area), when appropriate.
- AEMA should work in conjunction with the DCNR, State Lands Division- Coastal Section during future updates of the ACAMP program document, specifically those parts related to natural hazard mitigation. The resulting information should be incorporated into the State Hazard Mitigation Plan.
- AEMA provided input on hazard mitigation planning, post-disaster mitigation planning, and repetitive flood loss policies including relocations and buyouts.
- The Alabama Sliver Jackets Team will work collaboratively to develop flood risk reduction strategies and projects for Alabama communities.
- On April 26, 2019 FEMA issued a letter to 41 Governors, including the Alabama Governor, regarding the floodplain management of state-owned properties located within Special Flood Hazard Areas (SFHAs) as stated in Title 44 of the Code of Federal Regulations (44 CFR) 60.11. Each state was to provide documentation of state legislative language and authorities adopted to ensure compliance with minimum NFIP standards and the administration of existing floodplain programs. ADECA-OWR will coordinate with the Governor's Office , other state agencies, and the future Floodplain Administrator for state property to develop a program that meets the requirements of the NFIP.
 - The Governor's Office hosted a State agency stakeholder meeting on June 14, 2022, at which representatives from FEMA Region IV addressed the attendees from multiple agencies regarding the requirements stated in the April 26, 2019 letter and the consequences of not complying with them. FEMA addressed questions from

those in attendance and all participants were informed of the need to comply with the regulations.

- ADECA-OWR has been coordinating with the Governor's Office to provide the additional documentation requested for which includes (1) an inventory of state-owned properties with development in the SFHA which identifies whether or not it is compliant with 44 CFR 60; (2) a State regulatory framework that ensure compliant development; and (3) a summary of how the State program is implemented and administered (detail on State Agency coordination, permitting process, compliance verification and tracking, addressing violations, and assurance that the State will enforce provisions in 44 CFR 60.3 for all development in SFHAs). A response will be prepared and submitted to FEMA by the September 2023 deadline.

4.5.3 Completed Improvements

The State of Alabama has worked to complete many of the potential improvements listed above. The following is a list of those accomplishments.

- State Association of Floodplain Managers: The Alabama Association of Floodplain Managers was created in 2008.
- AEMA has continuously added new Certified Floodplain Managers (CFM) to its staff.
- NFIP Training: NFIP seminars are provided through the Alabama Association of Floodplain Managers conference which began in October 2008. There is a spring training and a fall training.
- AEMA website: As of 2009, the AEMA website has become a central location for many hazard related mitigation documents. The State Hazard Mitigation Plan can be found on the website. In addition, there are links to the Alabama NFIP website, benefit-cost guidance, mitigation grant applications, and several other technical assistance documents.

As of the 2018 State Plan Update, all documents are online, but no changes have been made regarding their readability.

- AEMA is using social media outlets, including Facebook and Twitter, to reach and educate the public on hazard mitigation measures.
- Continue the functions of the All-Hazards Task Force among the Regional Planning Councils. The Task Force was formed as a means to exchange mitigation planning information among the RPCs. The Task Force remained active until 2010. As of the 2013 State Plan update, the All-Hazards Task Force has dissolved and is no longer functional. Many of the RPCs are no longer completing mitigation plans, so there is less of a need for a formalized information-sharing network.
- Another important outreach tool is ADECA OWR's flood map viewer: <https://alabamaflood.com/map>. This tool allows the public to determine what flood risk they are exposed to, given their specified location. This web map hosts effective and preliminary flood hazard data as well as a suite of non-regulatory products that are being developed in various counties in Alabama.

- In 2011, DCNR's Coastal Section completed a preparedness guide titled, "Homeowner's Handbook to Prepare for Natural Hazards." The handbook was funded through a Sea Grant and was modeled on the University of Hawaii's version of a similar document. The purpose of the handbook is to reduce the risk of natural hazards on people and property. It provides homeowners with basic guidance on how to prepare for nearly any hazard event, including hurricanes, tsunamis, earthquakes, and several other hazards. The Coastal Section worked directly with AEMA to include information from the Alabama Hazard Mitigation Plan into their handbook. The Coastal Section solicited involvement from other agencies, such as AFC, through the SHMT.

4.6 Integration into Other FEMA Mitigation Programs and Initiatives

4.6.1 Summary

AEMA administers and oversees Federal mitigation grant programs for the State of Alabama that are related to hazard mitigation, emergency management, and disaster relief, and serves as the lead agency for the State in disaster mitigation efforts. Due in part to the agency's dual roles, AEMA has the opportunity to integrate the dissemination of mitigation information with the FEMA grant application process for the programs listed in Section 4.3.2.

The Alabama Office of Water Resources (OWR) administers the NFIP within the State of Alabama, with responsibilities assigned to the State NFIP Coordinator and support staff. The primary responsibilities of the office of the State NFIP Coordinator include facilitating participation in the NFIP among Alabama communities, providing technical support and training to local administrators, and encouraging participation in the CRS Program.

4.6.2 List of Ongoing FEMA Mitigation Programs and Initiatives

FEMA Grant Programs (see Section 4.3.2 for an overview of all FEMA grant programs and initiatives):

HMA Grants provide funding for mitigation activities:

- HMGP – requires a federal disaster declaration
- BRIC
- FMA

In addition, PA funding received following a disaster declaration can be used towards mitigation projects.

- NFIP
- State NFIP Coordination

- CRS
- Risk MAP

Risk MAP is focused on the flood hazard and has several goals including addressing gaps in flood hazard data, public awareness/outreach, mitigation planning, enhanced digital platform, and alignment and synergies of risk analysis program to enhance decision-making capabilities. It is not a grant program though it does provide resources to the states to reach the aforementioned goals.

4.6.3 Integration Process and Potential Improvements

The SHMT first identified and reviewed State of Alabama laws, regulations, policies, and programs pertaining to mitigation and FEMA-sponsored programs and supporting regulations in the 2007 version of this plan. They were reviewed and updated as necessary in subsequent versions.

- FEMA Grant Programs:
 - The Alabama EMA administers all FEMA grant programs. It notifies communities and eligible applicants of the availability of program funds, provides applicant briefings and technical assistance, reviews applications for eligibility and compliance, and recommends funding to FEMA. AEMA serves as the grantee of FEMA grant awards and oversees the implementation of funded projects by subgrantees (communities and other eligible applicants). AEMA should continue to facilitate and monitor grant awards to eligible applicants.
 - AEMA continues to administer and monitor the grant process.
 - Consistency of project applications with local mitigation plans is required by AEMA to assure the integration of local mitigation activities with the hazard mitigation planning process.
 - The grant award process can be improved by adhering to established prioritization criteria presented in the state plan.
 - The grant award process using the prioritization criteria is now adhered to as of the 2007 State Plan update.
 - Beginning with projects for disaster number 4052 (Severe Storms, Tornadoes, Straight-line Winds, and Flooding) which occurred in January 2012, project applications were submitted online. In addition, money was henceforth allocated to counties, and they would be able to decide how to spend their grant money. Previously, applications were used for a variety of projects, but the Governor would decide how most of the money was spent.
- NFIP
 - The NFIP Coordinator should continue to maintain a five-year plan for its community assistance programs.
 - The State NFIP Coordinator and staff should continue to provide statewide support for local participation in the NFIP, facilitating NFIP membership, assisting with flood hazard prevention ordinance development and Federal compliance, providing

training and technical support to local floodplain ordinance administrators, encouraging the floodplain management practices of the NFIP, and promoting flood insurance.

- NFIP guidance and support continue throughout the state.
- The NFIP staff should continue to regularly conduct CAVs among NFIP participating communities throughout the State. During these visits, the staff should not only check for program compliance but offer guidance and support for improved flood hazard mitigation practices.
- The NFIP Coordinator will work with state agencies and the yet to be named floodplain administration agency for state properties to develop a compliant floodplain management program for state-owned and managed properties that meets the requirements of FEMA's April 26, 2019 letter to the Governor of Alabama.

In addition to regular NFIP participation, the State office should encourage CRS program participation by NFIP communities and assist current CRS communities to continually seek higher CRS classifications.

- The NFIP Coordinator should continue working closely with the Alabama EMA to assure strong integration of local flood hazard mitigation practices into local and state hazard mitigation planning policies.
- The OWR should complete its statewide flood map modernization program for the State, including the development of FIRMs that will readily provide flood GIS data for local and statewide risk assessments for hazard mitigation planning.
- The State NFIP Coordinator should continue to conduct formalized training and distribute technical publications to local floodplain administrators, building officials, public works engineers, planners, and state and local officials involved in hazard mitigation. Continue to coordinate with the Alabama Association of Floodplain Managers to build capacity across the state.

5. Mitigation Strategy

5.1 State Mitigation Strategy

The Final Rule (FR) Subsection 201.4 (c) (3) requires the State Hazard Mitigation Plan to include a mitigation strategy. The mitigation strategy serves as the blueprint to reduce the state's risk of losses as identified in the Risk Assessment. The SHMTF reaffirmed Alabama's overall hazard mitigation strategy at the November 2022 Mitigation Strategy Meeting. The goal of the state's mitigation strategy is to:

Reduce vulnerability through collaborative actions and policies that limit the effects of natural hazards on the citizens of Alabama and physical assets.

This section describes the State of Alabama's process for identifying, evaluating, and prioritizing the state's mitigation actions, based on the hazard mitigation goals presented in this section. The SHMTF was provided the opportunity to make recommend additions or changes to goals, objectives, and actions to be included in the plan. Their input resulted in the addition of one new mitigation action.

5.1.1 Mitigation Goals

When the first plan was drafted in 2004, the Planning Team at that time identified six goals supporting the State of Alabama's overall mitigation strategy. These goals are accompanied by objectives and actions that are designed to support the implementation of the goals. A multi-stage process was used to identify, evaluate, and prioritize the goals, objectives, and actions. With each plan update, the Planning Teams revisits the state plan goals. Their review aims to determine if the goals and associated objectives are still valid.

For the 2023 plan update, the SHMTF made several minor changes to the wording and arrangement of the goals and objectives to best reflect the state's intent and continuing update process. The changes were suggested and agreed upon through a process of discussion and voting led by the project consultant at the mitigation strategy meeting in November 2022. One former objective, 1.3, under Goal 1, was deleted pertaining to providing current data regarding RL and SRL properties. AEMA wanted this deleted as they could not provide the information. Objective 2.1 under Goal 2 was also deleted. This objective pertained to state building codes and was requested to be deleted due to AEMA not having authority over state building codes. All subsequent objectives moved up after the deletions.

Goal 1: Enhance the comprehensive statewide hazard mitigation system.

- Objective 1.1** Improve local and state capability to study natural hazards by providing direct technical assistance to local public officials and maintaining qualified state mitigation staff.
- Objective 1.2** Improve the statewide availability of risk information, particularly in GIS format.
- Objective 1.3** Develop hazard mitigation policies that also protect the environment.

Goal 2: Reduce the State of Alabama's vulnerability and increase resilience to hazards to protect people, property, and natural resources.

- Objective 2.1** Encourage local governments to adopt and enforce more stringent building and zoning codes, especially in hazardous areas.
- Objective 2.2** Enforce a program that reduces the statewide number of repetitive loss and severe repetitive loss properties.
- Objective 2.3** Improve the state's ability to prepare for and respond to a natural or technological disaster.
- Objective 2.4** Reduce the impact of hazard events on state departmental functions (i.e., loss of service).

- Objective 2.5** Promote hazard mitigation policies that reduce risk to people and property and protect the environment.

Goal 3: Foster public awareness and understanding of their hazard risks and mitigation opportunities.

- Objective 3.1** Publicize and encourage the adoption of appropriate hazard mitigation actions.
- Objective 3.2** Educate the public about hazards identified in the state plan.

Goal 4: Expand and promote coordination and communication with other government agencies, local governments, and other relevant organizations.

- Objective 4.1** Establish and maintain lasting partnerships that progress hazard mitigation in the state.
- Objective 4.2** Promote and integrate hazard mitigation into the activities of other organizations, especially those that do not currently coordinate with AEMA.
- Objective 4.3** Improve state and local government capability to administer pre- and post-disaster mitigation programs and long-term recovery programs.

As part of the plan update process, the mitigation strategy sections of all available local hazard mitigation plans were reviewed to assure consistency and linkage of local goals, objectives, and mitigation actions with the state's mitigation strategy. In turn, state goals and objectives were determined to be reflective of local goals, objectives, and actions. Table 1.6 in Section 1.2.2, Review and Incorporation into the State Plan Update, provides an overview of the alignment of local mitigation strategies with the state's strategies.

Examples of state mitigation actions related to local plans include, but are not limited to, the following:

- Continue supporting the use of state-of-the-art warning technology and local warning projects with available initiative funds.
- Support local governments' cost-effective requests through available grant opportunities to mitigate repetitive loss properties, with priority given to severe repetitive loss properties and the removal of repetitive loss properties from the regulatory floodway.
- Support cost-effective mitigation activities that minimize damages and/or provide uninterrupted operational capabilities to critical facilities, utilities, and property.

5.1.1.1 How Recent Events Have Influenced Mitigation Actions

The State of Alabama continues to face a variety of natural hazard threats. To the misfortune of countless people in the state, many of these threats transformed into actual disasters. Large-scale disasters play a significant role in shaping the hazard mitigation priorities within Alabama throughout the planning process. Each disaster reveals strengths and weaknesses within the hazard mitigation program, and the State of Alabama must adjust its subsequent mitigation actions to address these weaknesses and reduce the impacts of future disasters.

A complete list of the 86 federal disaster declarations in Alabama since 1961 can be found in Section 3: Risk Assessment. The following are past disasters that have had profound effects on the state's mitigation actions:

- Hurricane Ivan (2004) revealed a lack of sheltering capacity within the coastal counties of Baldwin and Mobile.
- Hurricane Katrina (2005) caused catastrophic damage to counties and parishes bordering the Gulf Coast. In Alabama, the coastline sustained the most damage as it was impacted by near record storm surges and high winds; however, inland flooding and spreading high winds impacted the entire state. The second largest Hazard Mitigation Grant Program (HMGP) obligation was made to the state to address a remarkably diverse group of mitigation projects, including a number of elevation, acquisition, and mitigation reconstruction projects.
- The April 2011 tornadoes had a profound effect on the state, highlighting the need for safe rooms that can withstand an EF-5 tornado event (250-mile-per-hour winds). Nearly \$64 million (2011 dollars) was allocated by FEMA for HMGP funding to build 291 community safe rooms and over 4,000 individual safe rooms.
- Hurricane Sally (2020) caused damage to the majority of the state, with a total Public Assistance obligation of \$258,171,792.
- COVID-19 (2020) This worldwide pandemic caused untold deaths and sickness to millions of people. The total public assistance dollars obligated was \$9,921,596.

Since the last plan update, severe storms in 2019, 2020, and 2021 caused tornado outbreaks as well as severe flooding across the state, resulting in disaster declarations. Since the 2018 plan update, Alabama has used \$9.5 million in HMGP, and pre-disaster mitigation (PDM) money obligated by FEMA for the construction of 141 community and residential safe room projects.

Being proactive, the State of Alabama does not wish to “chase” the last disaster in terms of identifying and implementing mitigation actions. As a result, when funding has allowed it, the state has pursued a core group of mitigation actions aimed at achieving the goals outlined in the plan. These types of projects include:

- Safe rooms
- Elevation
- Acquisition
- Drainage improvements
- Individual and community shelters
- Siren program, and
- Improved identification of threats through floodplain mapping

5.1.2 Mitigation Action Plan

5.1.2.1 2023 Mitigation Action Plan Development

The structure of the Mitigation Action Plan is meant to serve as a guide to assist state and local officials and administrators in the determination of which mitigation actions could be implemented within the State of Alabama. Additionally, during the time following a natural disaster, this action plan can be a tool for the state in determining which projects should be pursued. With each plan update, the SHMTF is tasked with evaluating the Mitigation Action Plan to determine its effectiveness in meeting the mitigation goals and objectives.

The SHMTF begins this process by reviewing mitigation actions from the previous plan to determine their status of completion. As described in Section 1: Planning Process, the SHMTF team members were emailed the mitigation actions from the 2018 plan that were associated with their particular state agency. Team members provided feedback on each action, describing whether it was completed, ongoing, deferred, or deleted. The following list explains each action status:

- **Completed:** The action is fully implemented and can be removed from the new Mitigation Action Plan.
- **Ongoing:** The action is in progress, including having funding and the appropriate staffing to achieve the goals.
- **Deferred:** The action or project is infeasible, impractical, or undesirable to complete at this time.
- **Deleted:** The action was either previously completed or completed on the 2018 Action Plan or combined with another action to create a more concise action.

The status of the 2018 actions is summarized in Appendix H: Updates to the 2018 Mitigation Action Plan. The table contains a column called 2023 Proposed Action Changes that tracks the changes made to the original action, whether it was reworded, revised, and/or combined with other actions.

For the 2023 plan update, new mitigation actions were created based on the following types of mitigation techniques:

- Local plans and regulations
- Structural projects
- Natural systems protection
- Education programs

Using these categories as a framework, SHMTF members were also asked to provide new actions where applicable and include all necessary supporting information about the actions for this plan update. These new actions have been incorporated into the 2023 Mitigation Action Plan and are presented in 5.1.2.5: Mitigation Action Plan. In addition to the new actions, this table includes the

ongoing and deferred actions identified from the 2018 action plan, some of which have been rewritten or combined with other actions (as explained in Appendix H).

5.1.2.2 Mitigation Action Prioritization

Based on the results of the risk assessment, each mitigation action was prioritized using the Mitigation Action Prioritization Criteria. This process for prioritization includes five criteria categories. For each category, each mitigation action is given a score of 1, 2, or 3, where 1 is the lowest category for the score and 3 is the highest category for the score. The definition and weighting of the categories are identified in the following table. The total score is then used to determine the action's priority category (high, medium, or low), as outlined following the Prioritization Criteria.

Table 5.1: Mitigation Action Prioritization Criteria

Criteria	Weight	Definition
Action Effectiveness	30%	The degree to which the action contributes to mitigating Alabama's risk from natural and technological hazards.
Action Efficiency	30%	The degree to which the action is a wise use of time, cost, and general organizational efficiency.
Multi-Hazard Mitigation	10%	The degree to which the action addresses multiple hazards. 3 = Mitigates against 3+ hazards 2 = Mitigates against 2 hazards 1 = Mitigates against 1 hazard
Addresses Probable Hazard(s)	15%	The degree to which the action addresses the hazard(s) that Alabama is most exposed to. 3 = Highly likely probability 2 = Likely probability 1 = Possible or unlikely probability
Addresses Critical Communications/Critical Infrastructure	15%	The degree to which the action helps to keep Alabama's services running after a hazard event by targeting critical functions.

Table 5.2: Prioritization Score Categorization

Category	Score
Low	0.00–2.00
Medium	2.01–2.70
High	2.71–3.00

5.1.2.3 Timeline for Implementation

The state's mitigation strategy also includes a timeline to implement the different mitigation actions. Since funding can often be one of the largest limiting factors, these criteria were used to evaluate the timeframe in which an action or project could be implemented. Three different temporal phases were used:

- Near-term is for projects that have the potential to be put into action within two years.
- Mid-term actions could be implemented within three to six years.
- Long-term actions are those on the horizon for the state, looking forward to a minimum of seven years for potential execution.

The process of assigning actions to one of the three timeframes should not be considered a final determination of the project's initiation or completion date. This process is fluid, and constraints used in the initial determination change, such as the availability of funding and priorities of the current political climate. Actions can and should be re-evaluated and adjusted. The placement of an action in a mid- or long-term timeframe does not preclude the state or local entities from implementing that action at an earlier time if conditions warrant. Projects can also be deferred from near- and mid-term timeframes if the State so decides.

5.1.2.4 Feasibility

Any state government construction project—regardless of its potential funding source—must be cost-effective, technically feasible, and meet all appropriate federal, state, and local environmental laws and regulations before it is started. State government projects funded by federal hazard mitigation grant programs administered by AEMA must meet specific criteria related to cost-effectiveness, environmental soundness, and technical feasibility.

The cost of many of the actions outlined in this plan is staff time to review measures, provide technical assistance to local communities, or develop internal guidelines and plans. The actions documented in this plan try to encompass a variety of specific projects that could be pursued at the state and local levels. In the Projected Cost column of the following table, some actions include estimated dollar amounts while others include a general description of the costs involved, especially where specific project costs cannot be determined until the project scope has been developed. Following is a table of **2023 Mitigation Actions** developed for this plan.

Table 5.3: 2023 Mitigation Actions

Action#	Action	2023 Goals	Priority	Hazard(s) Addressed	Responsible Agency	Funding Sources	Projected Timeline	Projected Cost	How Action Benefits Mitigation Strategy	Status
1	Establish a schedule to provide state and local offices with current information on past events (including damages).	1.1	Low	All	AEMA	HMA, HMGP	Near-Term	Staff Time	Updating state and local officials with current information will improve future decisions regarding mitigation.	Ongoing. Continuous updating efforts through planning at both the county and state level to identify those past damages that pose the most hazardous threats in the future.
2	Provide funding and technical assistance to state agencies, local governments, and tribes to administer mitigation activities, including preparing hazard mitigation plans.	1.1	Medium	All	AEMA; FEMA	HMA, HMGP	Mid-Term	Staff Time and Project costs TBD by Local/Tribal project scope.	Expanding the number of hazard mitigation initiatives will improve the State's resistance to hazards.	Ongoing. Continuing to provide support as requested.
4	Assist K-12 schools and state colleges and universities develop vulnerability assessments, mitigation plans and mitigation projects to improve safety in their most vulnerable buildings.	1.1	High	All	AEMA; AARC; Local Government	FEMA, local	Long-Term	Staff Time and Project specific costs based on individual regulations.	Providing technical assistance to educational facilities encourages the use of mitigation and strengthens critical facilities.	Ongoing. Provide assistance as requested.
5	Inventory and catalog natural hazards studies, maps, digital data, and other information available from city, county, state, federal, university, private, and other sources.	1.2	Low	All	AEMA	HMGP, HMA	Near-Term	Staff Time	Maintain a comprehensive invoice/catalog will improve the use of the data by agencies.	Ongoing. Continuously gathering information and updating as required

Action#	Action	2023 Goals	Priority	Hazard(s) Addressed	Responsible Agency	Funding Sources	Projected Timeline	Projected Cost	How Action Benefits Mitigation Strategy	Status
6	Adopt a common Geographical Information System (GIS) data system throughout state, county, and local government.	1.2	Low	All	AEMA	Unknown	Near-Term	TBD	Better risk information will improve understanding for decisions to protect lives and property.	Continuing to work with all interested partners to develop a statewide system. AEMA has begun to use WebEOC as a platform for all response activities and is working to increase the use of GIS for all aspects of Emergency Management and Statewide adoption
7	Department of Finance-DCM to review the state building codes against the most recent standards (e.g., IBC for earthquake, wind loads, flood, fire) to identify where state codes require revisions and update accordingly.	2.1	High	All	Alabama Department of Finance-DCM, ADECA- Alabama Residential Energy Code	Operating Budget	Near-Term	Staff Time	Expanding hazard mitigation initiatives will improve the State's resistance to hazards for the future.	Continuously gathering information and updating as required.
9	Implement Legislation Title 11-19-1 through24.	2.2	Medium	All	AAR; ACCA; local government; ADECA-OWR	FEMA, local	Mid-Term	Staff Time	Land use management practices that address mitigation and increase the probability that lives, and property will be protected.	Continuously working to promote mitigation throughout the State
10	Provide regular educational programs to local building and code enforcement officials about minimum standards for construction in hazardous areas (e.g., wind loads, floodplains, earthquake zones).	2.2	Medium	All	AACC, ALM; ADCNR; Local Government	Bonding Funds; ACAMP-CZMA funds	Mid-Term	Staff Time	Improving building inspections will increase the integrity of structures and protect occupants during hazard events.	Continuously working with the State Building Commission to emphasize the importance of mitigation
11	Administer training to local governments about integrating hazard reduction planning into land-use plans and development regulations.	2.2	Medium	All	AEMA; Local Government	Multiple funding sources	Long-Term	Staff Time	Coordinating plans ensures that mitigation	Ongoing. Continuously working with the Department Of Finance-DCM to emphasize the importance of mitigation.

Action#	Action	2023 Goals	Priority	Hazard(s) Addressed	Responsible Agency	Funding Sources	Projected Timeline	Projected Cost	How Action Benefits Mitigation Strategy	Status
12	Promote, strengthen, and coordinate emergency response plans to better identify and mitigate risk to natural and technological disasters.	2.4	Medium	All	AEMA;	Multiple funding sources; state funds	Mid-term	Staff time	Coordinating plans ensures that mitigation efforts are addressed.	Ongoing
13	Continue to work on implementing IPWAS statewide for EAS and WEA alerts through county EMA's.	2.4	Medium	All	AEMA;	EMPG	Mid-Term	Staff Time	Following the IPWAS proficiency testing procedures for each jurisdiction that currently has the capability as an alerting authority using IPAWS.	This action was rewritten and moved forward as a 2023 action..
14	Update contact information in the Departmental Emergency Operation SOP on a regular basis and review and update biannually.	2.5	Low	All	AEMA; All State Agencies	EMPG, Operating Revenue, State funds	Near-Term	Staff Time	Improved and up-to-date information in the SOP will improve mitigation and other planning designed to reduce the impact of hazard events.	The plan is reviewed annually during AEMA Division meetings and updated as needed.
15	Develop and maintain Continuity of Operations plans in response to each hazard for all state agencies including periodic review and updates.	2.5	Medium	All	All State Agencies	Multiple funding sources, Operating Revenue, State funds, ALDOT O&M	Near-Term, Mid-Term (per ALDOT)	Staff Time	Keeping state departmental functions operational during and following hazard events is important to serving clients.	Currently working to locate a COOP site and finalize the plan.

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16	Develop a plan to protect public records.	2.5	Medium	All	All State Agencies	Operating Revenue; State funds	Mid-Term	Staff Time	Protecting public records will ensure that this information is available for future uses.	Completed as of 2010. Continuously reviewing and updating as needed.
174	Develop a plan to protect data.	2.5	High	All	All State Agencies	Operating Revenue; State funds	Mid-Term	Staff Time	Protecting data will ensure that this information is available for future uses.	Currently working to locate a COOP site and finalize the plan.
14	Update continuity of government plans to incorporate the most up to date hazard risk data.	2.5	Medium	All	All State Agencies	Multiple funding sources; State funds	Mid-Term	Staff Time	The planning process involved with the maintenance of continuity of government often reveals mitigation opportunities.	Completed as of 2010. Continuously reviewing and updating as needed.
19	Establish security system within the Gordon Persons Building to ensure that ensure that critical functions remain uninterrupted in the event of terrorist activities.	2.5	High	All	ALEA	Existing operating budget	Long-Term	Project costs TBD by project scope.	Keeping state departmental functions operational during and following hazard events is important to serving the public.	Continuously working with the security team to ensure security measures are followed and updating as needed.
20	Advance provision for electrical generators through FEMA grant programs for critical facilities.	2.6	High	All	AEMA	HMA	Near-Term	Staff Time	Reduces loss of function to critical facilities and operations following natural hazards.	Ongoing. Continuously promote the use of innovative funds through HMGP when available.

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21	Disseminate information about Section 106 of the NHP Act and its ramifications in a disaster.	2.6	Medium	All	AHC	N/A	Mid-Term	Staff Time and production cost	Information will improve decisions to protect cultural resources.	Ongoing. AEMA continuously works with the State Historic Preservation Office to ensure all projects meet requirements. AEMA also attends various meetings to emphasize the importance of historic preservation.
22	Create a communication action plan for informing all stakeholders of the natural and manmade risks identified in the SHMP.	3.2	Medium	All	AEMA	Multiple funding sources	Mid-term	Staff time	Better risk information will improve understanding for decisions to protect lives and property.	Ongoing
23	Develop and conduct outreach campaigns to educate all stakeholders and the public about the hazards identified in the SHMP.	3.2	Medium	All	AEMA; Local Government	HMA	Mid-Term	Staff Time	Better trained local officials and communities will result in safer, more hazard resistant communities.	Ongoing communication methods used to emphasize the various hazards to the private and public sectors. CUSEC funds have been used to communicate earthquake hazards in a brochure and books.
24	Facilitate the coordination of local, state, and federal emergency management activities.	4.1	Medium	All	AEMA; FEMA	Multiple funding sources	Near-Term	Staff Time	Coordination between emergency management activities will reduce the risk from hazards.	Ongoing. Continuous communication with all necessary parties and assistance will be available as needed.
25	Maintain a diverse SHMTF that includes regional, state, and federal organizations.	4.1	Medium	All	AEMA	Multiple funding sources	Near-Term	Staff Time	Promoting hazard mitigation will reduce the impact of hazard events on the state.	Ongoing. Continuous communication with all organizations, maintain updated plans and provide current information.
26	Create a SHMTF maintenance schedule that includes at least one progress report meeting halfway	4.1	Medium	All	AEMA	Multiple funding sources	Near-Term	Staff Time	Promoting hazard mitigation will reduce the	Ongoing. Meetings were held throughout each year at Division, SERC, and LEPC meetings to make any

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	through the five-year cycle to assess the status of all mitigation actions.								impact of hazard events on the state.	necessary updates to plans and provide any changes to HMA. Meetings will continue to be held.
27	Provide the public and forest managers with information about the importance of implementing Best Management Practices on forest land.	4.2	Medium	All	AFC; Local Government; ADCNR	ACAMP-CZMA funds, US Forest Service	Mid-Term	Staff Time	Informing the public on the warning system will increase understanding of what to do when the warning system is used.	Continuous messaging is provided to the public via print, radio, TV, and digital messaging.
28	Provide guidance on incorporating risk and vulnerability assessment findings into state economic and community planning efforts.	4.2	Medium	All	AARC; ALM; ADECA-OWR; AACC	EDA, local planning contracts	Mid-Term	Staff Time	Incorporate hazard mitigation initiatives will increase the community's resistance to hazards.	Continuous communication with all necessary parties and assistance will be available as needed.
29	Integrate mitigation projects into recovery processes (Public Assistance, Individual Assistance, and SBA program) through education of local communities and program applicants.	4.2	Medium	All	AEMA	Multiple funding sources	Mid-Term	Staff Time	Promote hazard mitigation inclusion and funding through other programs, including Public Assistance and SBA, so that more mitigation measures are implemented.	Ongoing. Joint applicant briefings are held with eligible applicants for every Presidentially declared disaster to educate about HMGP and PA. This joint effort will help to promote 406 and 404 mitigation.
30	Establish provisions to ensure that Family Assistance program designed for moving families from dependency to self-sufficiency continue after a natural or man-made disaster.	4.3	Medium	All	ADHR	Existing operating budget	Long-Term	Staff Time	Keeping state departmental functions operational during and	Ongoing. Joint efforts between AEMA and volunteer services are a continuous effort. Meetings are held

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									following hazard events is important to serving the public.	throughout the year to update plans and guidance.
31	Provide local economic and community planners with guidance on risk and vulnerability assessments that will impact their future development plans.	1.1	Medium	All	AARC; ALM; ADECA-OWR; AACC	EDA, local planning contracts	Mid-Term	Staff Time	Incorporate hazard mitigation initiatives will increase the community's resistance to hazards.	This remains viable and ongoing.
32	Provide large employers and local counties with GIS files for hazard-prone areas and encourage them to assess any new planned development or renovations with hazard data to inform development.	1.2	High	All	AEMA; AGIO	Unknown	Near-Term	Staff Time	Better risk information will improve understanding for decisions to protect lives and property.	This remains viable and ongoing.
33	Make hazard mapping tools available online for residents and design professionals to view and download.	1.2	Low	All	AEMA	Unknown	Near-Term	Staff Time	Better risk information will improve understanding for decisions to protect lives and property.	This remains viable and ongoing.
36	Assess proposed new, or planned renovations in, state assets and critical infrastructure against identified hazard-prone areas using GIS assessment to inform development decisions.	2.5	High	All	AEMA; AGIO	Unknown	Mid-Term	Staff Time	Better risk information will improve understanding for decisions to protect lives and property.	This remains viable and ongoing.
37	Create a program to educate local governments about different types of hazard mitigation measures/projects and other available funding sources.	3.1	Medium	All	AEMA	N/A	Mid-Term	Staff Time	Building awareness of mitigation project types and funding will increase	Ongoing. This remains viable and ongoing.

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									the number of projects that are implemented.	
44	Develop and implement a process to continually update the geodatabase as new dams are constructed and as the condition of dams change over time.	1.2	Low	Dam Failure	NA	National Dam Safety Program Grants	Mid-Term	Staff Time	Better risk information will improve understanding for decisions to protect lives and property.	Ongoing.
48	Routinely collect, monitor, and evaluate selected climatic, water-supply and water-use data to identify at an early stage the onset of a drought or potential for drought, geographic extent of the affected area and changes in the drought levels.	1.1	Medium	Drought	ADECA-OWR	State funds	Mid-Term	Staff Time	Obtaining comprehensive data pertaining to drought will improve local and state capabilities response to and mitigation measures against droughts.	Continuously work with ADECA to receive any updates. Information is used to update planning reports, the THIRA, and for mitigation actions.
49	Develop agreements for secondary water sources that may be used during drought conditions.	4.1	Low	Drought	TBD	N/A	Near-Term	Staff Time	Redundancy in water supply will prevent lapses in service during drought conditions.	
50	Partner with the Alabama Cooperative Extension System to educate stakeholders and the public about the resources available through http://drought.aces.edu/ regarding the risk of drought and how to prepare for and mitigate the effects of drought.	3.1	Low	Drought	ADECA; ACES, AGI	State Funds	Mid-Term	Staff Time	Better trained local officials and communities will result in safer, more hazard resistant communities.	New.

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51	Maintain membership and participation in the Central United States Earthquake Consortium.	2.6	Low	Earthquake	AEMA; GSA	Federal, USGS	Near-Term	Approx. \$500.00	Keeping state departmental functions operational during and following hazard events is important to protecting lives and property.	Ongoing. Membership in CUSEC is vital for earthquake planning. Participation in exercises and conferences afford us the opportunity to receive training and updated information that is used for all State emergency plans.
52	Perform research to understand the geologic conditions that cause earthquakes in Alabama.	2.6	Low	Earthquake	GSA	USGS, NEHRP/ FEMA, NSF	Mid-Term	Staff Time	Will enable prediction of areas where earthquakes might originate.	Ongoing mission of GSA. The information that is gathered is used for the THIRA and the SHMP.
53	Study areas having seismic swarms in Alabama.	2.6	Low	Earthquake	GSA	USGS, NEHRP/ FEMA	Mid-Term	Staff Time	Close monitoring of smaller earthquakes may indicate areas likely to have larger earthquakes.	Ongoing mission of GSA. The information gathered is used for the THIRA and the SHMP.
54	Develop standard code language that considers the effects of soil liquefaction in the design of new buildings and infrastructure such as bridges, embankment dams and retaining structures.	2.1	Medium	Earthquake	GSA; USGS ALDOT, Alabama Department of Finance-DCM	USGS, NEHRP/ FEMA	Mid-Term	Staff Time	Stronger local building codes will reduce property and infrastructure damage after earthquakes.	Ongoing. This remains viable and ongoing.
55	Create a seismic safety committee to provide policy recommendations, evaluate and recommend changes in seismic safety standards, and give an annual assessment of local and statewide implementation of seismic safety improvements.	2.1	Medium	Earthquake	GSA, GSGS	USGS, NEHRP/ FEMA	Mid-Term	Unknown	A committee dedicated to earthquake safety will drive mitigation initiatives forward towards completion.	This remains viable and ongoing.

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56	Facilitate outreach to communities in the northwestern part of the state to educate homeowners and homebuilders about methods to strengthen and retrofit non-reinforced masonry buildings and non-ductile concrete facilities that are particularly vulnerable to ground shaking.	3.1	Medium	Earthquake	AEMA; GSA; ACES, USGS	USGS, NEHRP/ FEMA	Mid-Term	Unknown	Stronger building methods prevent damage and losses during earthquakes.	Ongoing. This remains viable and ongoing.
61	Work with local communities to identify and establish new locations for state temporary relief centers for extreme temperature events.	2.4	Low	Extreme Temperature	AEMA	HMGP	Long-Term	Construction costs TBD by project specifications	Creating centers in communities provides a place for the public to go for relief from extreme temperature events. Mitigates loss of life to events.	This remains viable and ongoing.
62	Create an education campaign to raise public awareness of the location of state relief centers for extreme temperature events.	3.2	Low	Extreme Temperature	AEMA	Multiple funding sources; State funds	Mid-Term	Staff Time	Educating the public about hazards in their area builds capacity to complete mitigation projects that increase community resilience.	This remains viable and ongoing.
63	Provide technical assistance (community assistance visits, contacts, workshops and/or publications) to local officials on proper implementation of the NFIP.	1.1	Medium	Flood	ADECA-OWR, CPYRWMA	FEMA CAP and CTP Grants	Near-Term	Staff Time	Well trained local officials in the NFIP will result in safer communities.	The OWR is continuously monitoring flood prone areas and working with those communities to be more resilient. OWR has also helped AEMA manage elevation and buyout projects under HMA.
64	Evaluate community Flood Insurance Studies (FIS's) and Flood Insurance	1.1	Medium	Flood	ADCNR; (data	N/A	Near-Term	Staff Time	Lack of information	The OWR is continuously monitoring flood prone areas

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	Rate Maps (FIRMs) for accuracy in order to prioritize requests for funding from FEMA to update flood studies and maps and create additional risk mapping products.				utilization , but cannot challenge accuracy, ADECA-OWR				on flood vulnerability can inhibit effective flood protection measures.	and working with those communities to be more resilient. OWR has also helped AEMA manage elevation and buyout projects under HMA.
65	Perform outreach to communities to promote the development and maintenance of critical facilities spatial databases to use for hazard mapping and analysis.	1.1	Medium	Flood	ADECA-OWR	No info provided	Near-Term	Staff Time	Lack of maps that include critical facilities can inhibit effective flood protection of these structures.	OWR maintains updated FIRMs and works with communities to promote building outside of the flood zone and implementing measures to mitigation structures already in the flood zone.
66	Support communities in reviewing the preliminary Flood Insurance Studies and Flood Insurance Rate Maps for approval and adoption.	1.1	Low	Flood	ADECA-OWR; Local Government	FEMA CTP Grant	Near-Term	Staff Time	Understanding vulnerability will help to frame discussions by decision makers on how to preserve and protect assets from hazard events.	The OWR is continuously monitoring flood prone areas and working with those communities to become more resilient.
67										
68	Ensure that site-specific risk assessments are available to local officials, as the basis for identifying and prioritizing mitigation actions on a site-specific basis. This action may be accomplished in a number of ways, including AEMA performing risk assessments (either itself or using consultants/ contractors), or continuing to provide training and technical support.	1.3	Medium	Flood	AEMA	Existing State staff: potential outside resources to be determined	Near-Term	Staff time	Flooding is the most significant natural hazard in the State. This information is the basis for implementing numerous FEMA grant programs.	Ongoing. Maintained current plans such as the THIRA, EOP, and SHMP. Each plan is reviewed annually and updated as needed.

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69	Maintain model ordinance for Gulf-fronting communities that requires higher standards for setbacks from waterfront and freeboard.	2.2	High	Flood	ADCNR; SARPC; Local Government	ACAMP-CZMA funds	Mid-Term	Staff Time	Ongoing. Continuously coordinate with the building commission and locals to encourage flood mitigation. Funds provided to local communities as requested, and as available.	
70	Develop and implement a detailed severe repetitive loss mitigation strategy that will qualify the State for 100% cost share under the FEMA SRL program and 90/10 for RLs.	2.3	Medium	Flood	AEMA; Local Government	N/A	Near-Term	Existing Federal and State Resources	Part of the process to initiate SRL program; establishes priorities for State and local jurisdictions to begin	Ongoing. Due to funding and staffing resources, this action is still in the developmental stages. There is constant communication with OWR and the local governments to discuss the best flood mitigation actions and prevent future flooding issues.
71	Conduct community outreach, workshops, and training to increase NFIP participation	2.3	Low	Flood	ADECA-OWR	N/A	Near-Term	Existing State Resources	Allows residents the ability to receive flood insurance claims and maintains eligibility in the FMA program of which flood insurance is a requirement	Ongoing. The State provides technical assistance to local communities to promote flood mitigation actions.
72	Provide updated SRL and RL lists to communities in advance of grant application windows. Include FEMA	2.3	Medium	Flood	AEMA; ADECA-	N/A	Near-Term	Existing State Resources	Retrofitting, elevating, or removing	Ongoing. Updated lists are available to communities as needed and requested.

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	calculated avoided damages for SRL properties, and any State calculated avoided damages for RL properties				OVR; Local Government				repetitive loss properties from known hazard areas protects property and lives as well as preserve personal, state, and federal financial resources	Delete
73	Increase in local agencies' ability to issue flood warnings. (Construct automated stream gauging stations with rainfall measurement devices equipped with telemetry systems) - Choctawhatchee Pea Yellow River Watershed Authority's Flood Warning system in place. Consider expanding the program.	2.4	Low	Flood	AEMA, NOAA, USGS, CPYRWMA	No info provided	Long-Term	TBD based on individual project costs and other specific information	Better information on rainfall data will provide the NWS and state and local agencies with the necessary data to issue flood warnings and protect lives and property.	AEMA has increased its Emergency Alert System by using HMGP funds for FM Alert.
74	Identify channels and ditches that must be improved to provide maximum drainage capacity.	2.6	Medium	Flood	AEMA; ADECA-OVR; ADCNR; Local Government	FEMA CTP Grant; ACAMP-CZMA funds	Mid-Term	Staff Time	Supporting existing efforts to mitigate flood risk will reduce the impact of hazard events.	Ongoing. Continuously working with local communities to improve drainage systems through HMGP and PA programs.
75	Develop regulations that preserve and rehabilitate natural systems to serve natural hazard mitigation functions (i.e., floodplains, wetlands, watersheds, and urban interface areas).	2.6	Medium	Flood	USDA; ADCNR; USACE;	ADCNR-EDRP, NOAA-CRP	Mid-Term	TBD by project scope	Preserving and rehabilitating natural systems will result in the	Ongoing efforts to work with Legislation to develop regulation.

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									production of natural hazard mitigation.	
76	Create technical bulletin that educates local floodplain managers about the benefit of evaluating the hazard posed by the encroachment of non-native plant species into floodways.	3.1	Medium	Flood	USAGE	Unknown	Long-Term	Staff Time	Informing local officials on invasive plant species will contribute to the effective management of wetlands.	Ongoing efforts have been hampered by the lack of funding. National bulletins have been used when needed.
77	Provide 7technical bulletin that educates local floodplain managers to account for and incorporate wetland protection and mitigation sites into the planning process when preparing new studies for watercourses.	3.1	Medium	Flood	EPA; FEMA; ASFPM; ADECACA:	Unknown	Mid-Term	Staff Time	Incorporating wetlands into the planning process will result in effective wetland management.	Ongoing. ASFPM and FEMA have technical guides and ADECA will provide them.
79	Reduce the flooding risk to communities by acquiring property located in the 100- year floodplain and return it to open space.	2.6	Medium	Flood	Local Government	HMA, HMGP grants	Near-Term	Construction costs TBD by project specifics (historically >\$1 million)	Open space will significantly reduce the flooding risk to communities.	Ongoing. HMA programs have been used throughout the state to acquire residential properties for flood mitigation. Flood mitigation is continuously emphasized to all communities.
80	Provide information and guidance to local communities to ensure they utilize flood control measures including the use of retention/detention basins and other stormwater management practices to retard the flow of water and reduce downstream damage.	3.2	Medium	Flood	ADECA-OWR; USACE; ADCNR; Local Government	ACAMP-CZMA funds (In coastal communities: FEMA-HMA	Long-Term	Staff Time	The use of flood control measures will provide protection to properties from floods.	HMA programs have been used throughout the state to improve drainage systems and alleviate flooding..
81	Create education programs that increase community awareness about the process of requesting updated floodplain mapping from FEMA.	3.2	Low	Flood	ADECA-OWR	FEMA CTP Grant	Near-Term	Staff Time, Outreach Materials	Lack of information on flood vulnerability can inhibit effective flood	Continuing efforts by local floodplain managers to update mapping and to educate communities on flood risk vulnerability.

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82	Educate homeowners and renters that live in flood prone areas to purchase flood insurance, especially through the NFIP.	3.2	Low	Flood	ADECA-OWR	No info provided	Mid-Term	Staff Time and production costs for outreach	protection measures. Purchase of flood insurance will increase the awareness of flood mitigation among homeowners.	Continuing efforts by local floodplain managers to encourage the purchase of flood insurance.
83	Increase the number of communities and tribes who participate in the Community Rating System through targeted education and outreach programs.	3.2	Low	Flood	ADECA-OWR	No info provided	Near-Term	Staff Time	Increased CRS scores will result in lower insurance premiums for homeowners and will decrease the flood risk to the community.	Ongoing efforts with OWR to promote flood mitigation actions and to increase flood education and outreach programs.
84	Educate communities and tribes about methods to improve their CRS classification.	3.1	Low	Flood	ADECA-OWR	No info provided	Mid-Term	Staff Time and production costs	Increased CRS scores will result in lower insurance premiums for homeowners and will decrease the flood risk to the community.	Ongoing efforts with OWR to encourage communities to develop flood mitigation plans by utilizing yearly FMA funding

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85	Coordinate activities between the state and local or regional water management authorities.	4.1	Low	Flood	CPYRWMA; AEMA; Alabama Rural Water Association	No info provided	Near-Term	Staff Time	Effective coordination between water management agencies will reduce the risk of future flooding.	Ongoing coordination and participation between AEMA and AL Rural Water Association via exercises and conferences.
86	Create statewide minimum standards of 1-foot freeboard for new and substantially improved buildings.	2.2	Medium	Flood	Alabama Department of Finance-DCM	N/A	Mid-Term	Staff Time	Adding one foot of freeboard, above the mapped base flood elevation, can lower insurance costs on the structure and can better protect it from future flood events.	Ongoing. This remains viable and ongoing.
88	Conduct an awareness campaign that educates the public about hailstorms and methods to protect property from damage.	3.1	Low	Hail	AEMA	N/A	Near-Term	Staff Time	Educating the public about hazards in their area builds capacity to complete mitigation projects that increase community resilience.	This remains viable and ongoing.
89	Plant soil-stabilizing vegetation on steep, publicly owned slopes to prevent roadway damage and traffic disruptions from landslides.	2.5	Medium	Landslide	ALDOT; GSA	USGS, FEMA	Long-Term	Construction costs TBD by project specifications	Planting soil-stabilizing plants on steep slopes will prevent, or lessen the severity of	This remains viable and ongoing.

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									landslides, protecting public roadways and maintaining operations and accessibility.	
90	Retrofit existing state- owned facilities with surge protection systems to protect these facilities against damage from lightning.	2.5	Medium	Lightning	Alabama Department of Finance-DCMM	HMGP	Near-Term	Approx.\$5,000	Protecting state-owned facilities from lightning damage can prevent interruptions of critical services.	Ongoing. This remains viable and ongoing.
91	Coordinate a state education program through the Alabama State Department of Education that teaches school children about the dangers of lightning and how to take safety precautions.	3.2	Low	Lightning	AEMA; ALSDE; NWS	HMGP	Mid-Term	Staff Time	Educating the public about hazards in their area builds capacity to complete mitigation projects that increase community resilience.	This remains viable and ongoing.
92	Develop a Transportation Resilience Plan for the Port of Mobile.	2.4	Medium	Sea Level Rise	AEMA; USACE; NWS, ALDOTDOT	USDOT; NCHRP	Mid-Term	~\$50,000	Understanding vulnerability will help to frame discussions by decision makers on how to preserve and protect assets from hazard events.	This remains viable and ongoing.

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93	Perform a state-wide transportation vulnerability assessment.	2.4	Low	Sea Level Rise	USACE; ALDOT; NWS	USDOT; NCHRP	Long-Term	~\$250,000	Understanding vulnerability will help to frame discussions by decision makers on how to preserve and protect assets from hazard events.	This remains viable and ongoing.
94	Identify areas at risk of subsidence by monitoring changes in groundwater levels.	1.2	Medium	Sinkholes/ Subsidence	GSA, NWS, USGS	N/A, HMA, HMGP	Mid-Term	Staff Time	Risk awareness allows for better planning to prevent loss of life and property.	Ongoing. This remains viable and ongoing.
	Develop a program for monitoring and reporting sinkholes and subsidence rates, or develop a multi-year Lidar analysis	2.3	Medium	Sinkholes/ Subsidence	GSA, AGI, ACES, ADECA	FEMA PDM; FEMA HMGP; HUD CDGB- DR	Long-Term	Contingent on area identified to be covered in program	Program data could serve as leading indicator for potential hazard occurrences	New Action.
97	Educate farmers about groundwater withdrawal and water conservation practices.	3.1	Low	Sinkholes/ Subsidence	Alabama Cooperative Extension System (ACES); GSA	N/A	Near-Term	Staff Time	Educating farmers about groundwater withdrawal conservation practices will diminish the rate of sinkhole formation.	Ongoing. This remains viable and ongoing.
98	Educate design professionals about where to locate information on subsidence rates and familiarize them with maps of these areas.	3.1	Low	Sinkholes/ Subsidence	GSA, USGS	N/A	Near-Term	Staff Time	Better informed design professionals can build safer	This remains viable and ongoing.

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									buildings and infrastructure.	
99	Develop and maintain a statewide real-time or near real-time record or reporting system of sinkhole/subsidence, landslides, and earthquake events throughout the state.	1.2	Medium	Sinkholes/ Subsidence , Landslides and Earthquake s	AEMA; GSA	N/A, HMA, HMGP	Mid-Term	Staff Time	Better risk information will improve understanding for decisions to protect lives and property.	This remains viable and ongoing.
101	Develop an online GIS map that shows tsunami runup areas.	1.2	Low	Tsunami	Alabama Geographic Information Office (AGIO); GSA, NWS	Unknown	Mid-Term	Staff Time	Better risk information will improve understanding for decisions to protect lives and property.	This remains viable and ongoing.
102	Develop and deliver an education program that teaches residents about the risk of submarine landslide induced tsunamis.	3.2	Low	Tsunami	GSA, NWS	N/A	Mid-Term	Staff Time	Educating the public about hazards in their area builds capacity to complete mitigation projects that increase community resilience.	Ongoing. This remains viable and ongoing.
103	Identify communities at risk to wildfire in urban interface; complete a minimum of (1) Community Wildfire Plan in each county	1.1	Low	Wildfire	AFC	US Forest Service, FEMA	Near-Term	\$167,500(\$2,500 per plan x 67 counties)	Engage new development residents and developers in designing wildfire resistant neighborhoods.	Ongoing efforts by the Urban Forestry Strike Team of AL Forestry Commission to identify at risk communities and to encourage Wildfire Plans.
104	Coordinate with neighboring states to offer training courses on wildfire management, compatible with the	1.1	Medium	Wildfire	AFC	N/A	Near-Term	Staff Time	Better trained local officials will result in safer, more	This remains viable and ongoing.

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	National Wildfire Coordinating Ground Incident Command System.								hazard resistant communities.	
105	Develop standard zoning ordinance language that restricts development in wildland-urban interface zones.	2.2	Medium	Wildfire	AFC	State Funds	Mid-Term	Staff Time	Limiting development in the wildland-urban interface zone reduces property damage and loss of life.	Ongoing. This remains viable and ongoing.
106	Educate homeowners about the resources available through the Alabama Forestry Commission website regarding protecting homes and forestland from wildfire. http://www.forestry.alabama.gov/homeowner_resources.aspx	3.2	Low	Wildfire	ADEM, AG & I, AFC	N/A	Near-Term	Staff Time	Educating the public about hazards in their area builds capacity to complete mitigation projects that increase community resilience.	This remains viable and ongoing.
107	Implement a state fuels management program to reduce hazardous vegetative fuels on public lands, new essential infrastructure, or on private lands by working with landowners.	3.1	Medium	Wildfire	ADEM, AG, AFC	US Forest Service, FEMA	Mid-Term	Unknown	Reducing hazardous vegetative fuels reduces the risk of wildfire, especially reducing the risk in the wildland-urban interface zone.	Ongoing. This remains viable and ongoing.
108	Encourage local governments to inventory their urban forests.	1.1	Medium	Wildfire	AFC	US Forest Service	Near-Term	Staff Time	Better asset information will improve understanding for	Ongoing. Ongoing efforts by the UFST of AFC to inventory urban areas of the State. UFST has participated in Hurricane exercises with

Action#	Action	2023 Goals	Priority	Hazard(s) Addressed	Responsible Agency	Funding Sources	Projected Timeline	Projected Cost	How Action Benefits Mitigation Strategy	Status
109	Maintain tornado safe room initiatives statewide.	2.6	Medium	Wind	AEMA; NOAA; Local Government	HMA	Near-Term	Staff Time	decisions to protect lives and property. Continues efforts to reduce tornado risk to citizens Statewide. Tornadoes, included in the "High Wind" hazard, are identified as one of three most significant hazards in the State.	AEMA, identifying vulnerable urban forests in coastal communities. Communities across the State continue to construct individual and community safe rooms utilizing both HMGP and PDM funding initiatives.
110	Create a state rebate or grant program for retrofitting (or modifying) existing residential homes, community critical facilities, and infrastructure to reduce future wind damage.	2.6	High	Wind	AL Insurance Department	State funds	Near-Term	Staff Time and Production costs	Improving the structural integrity of vulnerable homes and securing contents will improve the safety of households that might not be able to afford repairs.	Ongoing project in Tuscaloosa at Druid City Hospital to retrofit windows to reduce future wind damage.
111	Encourage the use of software such as ITREE to both manage and predict tree damage.	2.6	Low	Wind	Department of Forestry	US Forest Service	Near-Term	Staff Time and Software costs	Promoting use of software will assist in risk identification.	AFC continues efforts to encourage the use of software by local officials to manage and predict tree damage.
112	Retrofit state owned public buildings and critical facilities to reduce future wind damage from tornados and hurricanes (per FEMA 361).	2.6	Medium	Wind	AEMA; Local Government	Multiple funding sources	Long-Term	Staff Time	Retrofitting structures can mitigate future damage from wind events.	Ongoing. Continuing efforts to encourage the use of HMGP and BRIC funds to retrofit critical facilities.

Action#	Action	2023 Goals	Priority	Hazard(s) Addressed	Responsible Agency	Funding Sources	Projected Timeline	Projected Cost	How Action Benefits Mitigation Strategy	Status
113	Create a state program to promote the planting of indigenous trees that are more resilient to high wind events.	2.6	Medium	Wind	AFC	US Forest Service	Long-Term	TBD - Cost of trees in critical areas	Proper use of indigenous trees can serve to mitigate damage to structures by shielding from wind. Additionally, they are less likely to result in debris.	AFC and UFST continues to educate local communities on the planting indigenous trees that are more resilient.
114	Encourage the integration of Tree Emergency Plans into the risk assessment portion of all local mitigation plans.	2.6	Medium	Wind	AFC	US Forest Service, FEMA	Mid-Term	Staff Time	Increasing accessibility to the most recently available data and information, such as Tree Emergency Plans, strengthens mitigation planning as trees are a major source of damage during wind events.	Ongoing efforts by AFC and AEMA to encourage local emergency managers to include Tree Emergency Plans into their risk assessment portion of their county and region hazard mitigation plans.
115	Conduct ongoing outreach to communities to inform residents of state-run shelter locations and evacuation routes.	3.2	Medium	Wind	AEMA	N/A	Mid-Term	Staff Time	Educating the public about hazards in their area builds capacity to complete mitigation projects that increase community resilience.	This remains viable and ongoing.

Table 5.4: 2023 Deferred Mitigation Actions

Action#	Action	2023 Goals	Priority	Hazard(s) Addressed	Responsible Agency	Funding Source	Projected Timeline	Projected Cost	How Action Benefits Mitigation Strategy	Status
34	Construct 15 community safe rooms within existing shelters along I-65, following the evacuation route from the coastal area.	2.4	Medium	All	AEMA	HMGP	Long-term	Staff time	Constructing safe rooms along major transportation routes will increase accessibility for the public and prevent loss of life during high wind events.	Deferred due to funding.
38	Work with communities to develop local resiliency plans to assess ability to react to stressors on the jurisdiction.	1.1	Medium	All	NOAA; Local Government; AFC	No info provided	Mid-Term	Staff Time and Project costs TBD by project scope.	The use of erosion control measures will protect farmland and watershed infrastructure from floods.	Deferred due to funding.
39	Review local and county mitigation plans following disasters or serious hazard occurrences to evaluate risk assessments and mitigation priorities.	1.2	Medium	All	AEMA; Local Government	Multiple funding sources	Mid-Term	Staff Time	Reviewing local and county mitigation plans will increase the community's resistance to hazards.	. Deferred due to to funding.
40	Increase state agency accessibility to critical power lines by identifying and prioritizing utility ROWs for tree and brush removal.	2.6	Medium	All	ALDOT	No info provided	Mid-Term	Construction costs TBD by project specifics.	Increasing accessibility to critical power lines will increase the opportunity of repair crews to restore power following a hazard event.	Deferred due to funding.
41	Develop an inventory of the number of radio	2.6	High	All	AFC	No info provided	Near-Term	Staff Time	Backup communication	Deferred due to funding.

Action#	Action	2023 Goals	Priority	Hazard(s) Addressed	Responsible Agency	Funding Source	Projected Timeline	Projected Cost	How Action Benefits Mitigation Strategy	Status
	repeater sites and dispatch centers currently without backup electricity								will keep the AL Forestry Commission operational during a hazard event	
42	Create a state dam safety program that will reduce the overall number of unsafe dams.	2.4	Medium	Dam Failure	To Be Determined	Federal Funds	Long-Term	Staff Time and Construction costs TBD by project specifics.	Reducing the number of unsafe State dams will protect lives and property in the downstream floodplain.	Deferred. State continues to review options as it relates to State Dam Safety Program
44	Develop and implement a process to continually update the geodatabase as new dams are constructed and as the condition of dams change over time.	1.2	Low	Dam Failure	To Be Determined	Federal Funds	Mid-Term	Staff Time	Better risk information will improve understanding for decisions to protect lives and property.	Deferred. State continues to review options as it relates to State Dam Safety Program
45	Develop Emergency Action Plans for all high hazard dams, including the development of inundation maps.	2.4	Low	Dam Failure	To Be Determined	National Dam Safety Program Grants	Long-Term	Staff Time	Prepares communities for an emergency, increasing awareness of hazard areas, and ultimately saving lives.	Deferred. State continues to review options as it relates to State Dam Safety Program D.
46	Educate dam owners on the importance of dam safety, especially with regards to public access to dams and dam maintenance.	3.1	Low	Dam Failure	To Be Determined	National Dam Safety Program Grants	Mid-Term	Staff Time	Better trained local officials will result in safer, more hazard resistant communities.	Deferred. State continues to review options as it relates to State Dam Safety Program ity.
47	Coordinate an education campaign to notify the public about dam inundation areas and	3.2	Medium	Dam Failure	To Be Determined	Federal Funding	Mid-Term	Staff Time	Educating the public about hazards in their area	Deferred. State continues to review options as it relates

Action#	Action	2023 Goals	Priority	Hazard(s) Addressed	Responsible Agency	Funding Source	Projected Timeline	Projected Cost	How Action Benefits Mitigation Strategy	Status
	explain to them their risk.								builds capacity to complete mitigation projects that increase community resilience.	to State Dam Safety Program y
57	Upgrade the State's monitoring capabilities for earthquakes.	2.6	Medium	Earthquake	AEMA; GSA	USGS, NEHRP/ FEMA	Long-Term	Individual Project costs associated with Map Production and Seismic monitoring equipment	Resulting maps indicate areas of greatest risk. Such maps can lead to wiser use of land and substantial savings to the State and its citizens.	Deferred due to funding.
58	Establish a system of six short-band seismic stations within the state.	2.6	Low	Earthquake	AEMA; GSA, USGS	USGS, NSF	Long-Term	Individual project costs associated with each short-band seismic station	Provides a system of 6 short-band seismic stations to monitor seismic activity within the State that may indicate areas at risk for larger quakes.	Deferred due to funding.
59	Develop an emergency preparedness and response plan about earthquakes, landslides, and sinkholes/subsidence for the state's Boards of Education to use in each school system.	2.4	High	Earthquake; Landslides; Sinkholes/ Subsidence	AEMA; GSA, NWS	USGS, FEMA, HMA, HMGP, PDM	Long-Term	Staff Time and production costs TBD by scope for each school system	Prepares citizens for an emergency. Avoids panic and saves lives.	Deferred due to funding.
60	Develop an earthquake, landslide, and sinkhole/subsidence	4.2	Low	Earthquake s;	GSA	USGS, FEMA,	Mid-Term	Staff Time and	Prepares citizens for an emergency.	Ongoing. Deferred due to funding.

Action#	Action	2023 Goals	Priority	Hazard(s) Addressed	Responsible Agency	Funding Source	Projected Timeline	Projected Cost	How Action Benefits Mitigation Strategy	Status
	education program for the state's Boards of Education to use in each school system.			Landslides; Sinkholes/ Subsidence		HMA, HMGP		production costs	Avoids panic and saves lives.	
87	Identify erosion control projects to protect state assets and critical infrastructure from floods and implement as identified (e.g., reshape fields, reestablish terrace systems, stabilize active gullies and watercourses, removed sediment bars and debris in channels and stabilize channel banks.)	2.5	Medium	Flood	ADCNR, CPYRWMA; Local Government,	None	Long-Term	Construction costs TBD by project specifics	The use of erosion control measures will protect farmland and watershed infrastructure from floods.	Deferred due to funding
100	Construct five safe houses for district offices and purchase one 5KW generator for each safe house.	2.5	Medium	Tornadoes	ADCNR	FEMA HMA	Near-Term	Pending bids by contractors	Provides safe sheltering place	Deferred due to funding.
116	Develop and incorporate a new standard in all state- wide building codes that requires a standard system to be incorporated into window design and protection for all new construction.	2.1	High	Wind	AACC; ALM	N/A	Long-Term	Staff Time	Improving building inspections will increase the integrity of structures and protect occupants during hazard events.	Deferred due to funding.
117	Create teams of Arborists to assist in performing damage assessments and recommend mitigation projects.	4.2	Low	Wind	Department of Forestry	US Forest Service	Mid-Term	Staff Time	Coordinating with specialists prior to a disaster will aid in the implementation of mitigation actions	Deferred due to funding.

Action#	Action	2023 Goals	Priority	Hazard(s) Addressed	Responsible Agency	Funding Source	Projected Timeline	Projected Cost	How Action Benefits Mitigation Strategy	Status
118	Develop design criteria for marinas, piers, and other coastal structures with respect to storm resistance.	2.1	Medium	Wind; Floods	Alabama Department of Finance-DCM; Local Government	Operating Budget	Mid-Term	Staff Time	following a disaster. Developing design criteria will reduce the probability that these structures will be affected by hazards.	Deferred due to funding.
119	Establish capacity to purchase and utilize remotely sensed imagery as a tool to develop localized risk models to mitigate storm damaged forest hazards.	1.1	Medium	Wind; Storm Surge; Wildfire	AFC	US Forest Service, FEMA	Near-Term	\$19,386 (ERDAS IMAGINEPro 10 software license; 3-yr maintenance contract)	By implementing collaborative AFC and local agency strategies to mitigate potential damage, injuries, and costs related to storm damaged urban and interface trees and forests.	Deferred due to funding.

5.1.3 Strategy for Mitigating Repetitive Loss (RL) and Severe Repetitive Loss (SRL) Properties

Mitigating risk to repetitive loss (RL) and severe repetitive loss (SRL) properties is a high priority for the State of Alabama. In conjunction with FEMA initiating the SRL program, the state is presently re-emphasizing its commitment to mitigating losses to flood-prone properties through a range of actions, including the following:

- Develop, adopt, and implement the RL/SRL mitigation appendix to the State Hazard Mitigation Plan.
- Promulgate the most current guidance and requirements to local municipalities. The guidance includes plan review criteria so that jurisdictions with RL and SRL properties clearly understand the importance of having an approved plan regarding qualifying for FEMA mitigation grant program funding.
- Perform a detailed study of the risks and costs of mitigating properties and identify the most at-risk and most cost-effective properties to mitigate.
- Re-emphasize the need for counties and local communities to include RL and SRL properties in their mitigation plans and provide guidance and technical assistance on methods to accomplish this.
- Develop criteria related to RL and SRL properties in the county and local mitigation plans.
- Implement a mitigation project ranking methodology that gives higher priority to projects that mitigate risk to RL and SRL properties (by assigning higher scores to projects that do so).
- In the state HMP, assign high priority to actions that mitigate SRL and RL properties.
- Provide training and technical assistance to the jurisdictions with the greatest numbers of RL and SRL properties. This effort includes providing the same level of training to the top SRL and RL counties in the state as FEMA provided to Alabama when the agency initiated the SRL program. The state will incorporate the most current FEMA guidance and training when it delivers training and assistance.
- Provide local and regional jurisdictions with annual updates to SRL and RL lists, FEMA actuarial calculations of the potential benefits of mitigation actions for SRL and RL properties, and, to the extent possible, risk estimates for RL properties.

As part of implementing this RL/SRL strategy, the state is establishing Mobile and Baldwin Counties as priorities in its ongoing efforts to mitigate flood risks to such properties. However, there is a wide distribution of these properties across the state, so although these counties may be the state's priority areas, in many cases there may be highly cost-effective projects in other areas. The state will always consider mitigation projects on a case-by-case basis.

5.1.3.1 Strategy to Encourage Local Communities to Mitigate RL and SRL Properties

The State of Alabama has a well-established and effective system for supporting local communities in developing mitigation projects. AEMA intends to increase emphasis on mitigating SRL and RL properties at the local level through the following actions, many of which are already part of existing procedures:

1. Continue to support local communities with technical training related to mitigation, including risk assessment, benefit-cost analysis (BCA), and environmental compliance.
2. Provide communities with the most current lists of SRL and RL properties, including (when possible) preliminary risk calculations to allow communities to prioritize their actions.
3. Increase the emphasis on mitigating SRL and RL properties during applicant briefings.
4. Issue planning guidance to counties, reiterating FEMA's and the state's emphasis on RL/SRL.
5. Make communities aware that the state is implementing a project ranking procedure that emphasizes mitigating SRL and RL properties by assigning higher scores to projects that mitigate such risks.

5.1.3.2 Actions in the Mitigation Strategy that Address RL and SRL Properties

The following actions specific to reducing the number of RL and SRL properties statewide were developed by AEMA, reviewed by the SHMTF, and incorporated into the 2023 plan update. The goals, objectives, and actions addressed in the mitigation strategy have been created to focus on the mitigation of RL and SRL properties.

Goal 1: Enhance the comprehensive statewide hazard mitigation system.

Action	Obtain periodic updates of RL and SRL lists from FEMA/NFIP and ensure that appropriate officials have access to the data to the extent possible. The state can provide number of properties, but not addresses
Priority	Low
Hazard(s) addressed	Flood
Responsible agency	AEMA; ADECA; FEMA
Funding source	N/A
Projected timeline	Ongoing
Projected cost	Staff time
How action contributes to mitigation strategy	Flooding (particularly repetitive losses) is the single most significant natural hazard in the state, in terms of monetary losses and disruptions. The overall state mitigation strategy is focused on reducing these damages by various means, including FEMA grant programs. These programs rely on sound information as the basis for prioritizing actions.

2023 status	Ongoing
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Goal 2: Reduce the State of Alabama’s vulnerability and increase resilience to hazards to protect people, property, and natural resources.

Objective 2.3: Enforce a program that reduces the statewide number of repetitive loss and severe repetitive loss properties.

Action	Develop and implement a detailed severe repetitive loss mitigation strategy that will qualify the state for 90-10 cost share under the FEMA SRL program.
Priority	Medium
Hazard(s) addressed	Flood
Responsible agency	AEMA
Funding source	N/A
Projected timeline	Near-term
Projected cost	Existing federal and state resources
How action contributes to mitigation strategy	It is part of the process to initiate an SRL program; it establishes priorities for state and local jurisdictions to begin.
2023 status	Ongoing

Action	Provide updated SRL and RL lists (to the extent allowed) to communities in advance of grant application windows. Include FEMA-calculated avoided damages for SRL properties and any state-calculated avoided damages for RL properties.
Priority	Medium
Hazard(s) addressed	Flood
Responsible agency	AEMA
Funding source	N/A
Projected timeline	Near-term
Projected cost	Existing state resources
How action contributes to mitigation strategy	Retrofitting, elevating, or removing repetitive loss properties from known hazard areas protects property and lives, and preserves personal, state, and federal financial resources.
2023 status	Ongoing

5.2 Prioritization of Funding

The prioritization of funding for mitigation projects in communities and local jurisdictions includes consideration of the following criteria, which will be discussed in further detail in these sections:

- Jurisdictions with the Highest Risk
- Repetitive Loss Properties
- Development Pressure
- Cost-Benefit Review

Applicants must demonstrate that their risk is sufficient to merit grant funds, particularly when compared to the project cost, but there is often considerable uncertainty in risk determinations. For this and other reasons, the state considers a variety of factors in addition to risk and BCA in determining its priorities for mitigation grants.

There was no official grant evaluation process in Alabama prior to 2005. In 2005, following the state's HMGP allocation after Hurricane Katrina (Federal Disaster Declaration 1605), AEMA developed a process to evaluate grants and prioritize funding. Relevant criteria, such as jurisdictions with the highest risk and a BCA, were considered, and the specific process can be found in previous versions of the plan. However, prior to the DR-1971 April Tornadoes event, the state had not been faced with a situation in which the amount of money requested exceeded the amount received. As a result, the process was revised and is now referred to as the Hazard Mitigation Grant Program Implementation Process. Details of this three-phase implementation process have been captured in Appendix G.

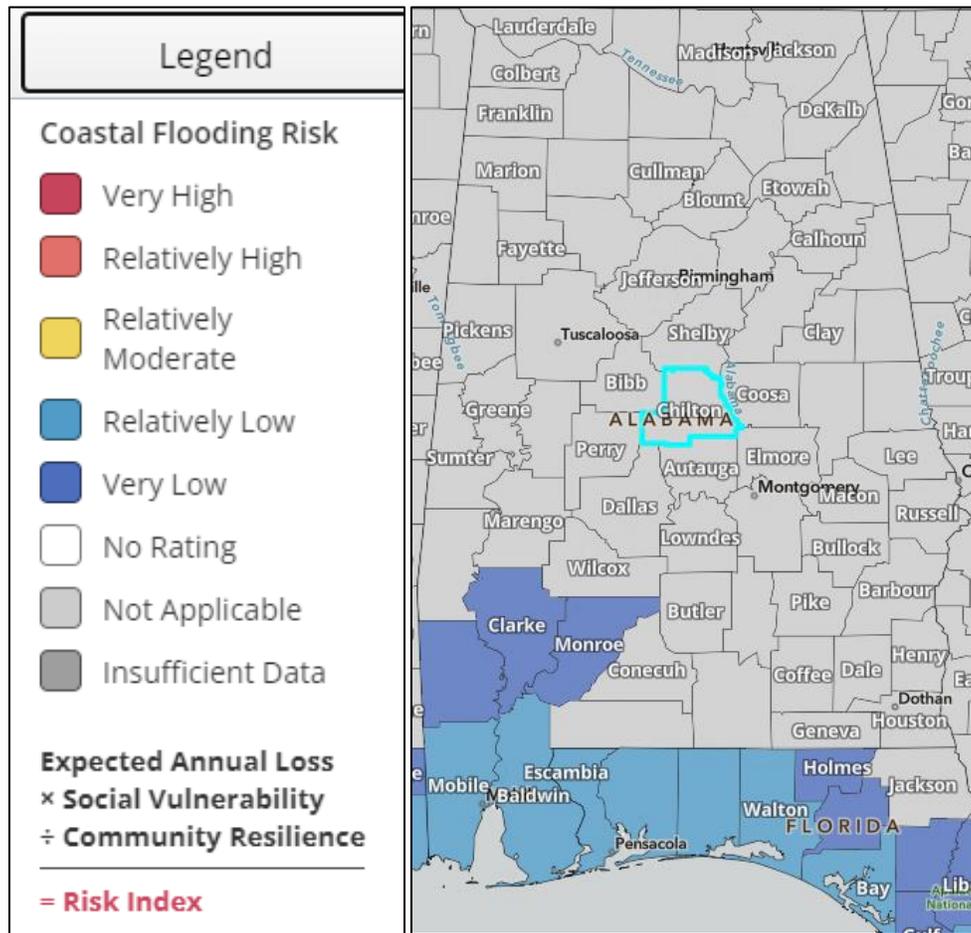
For hazard mitigation plan development grants specifically, the current process is for AEMA to request and divide the funds among the counties that request them, thus serving as the grantee and subgrantee. Those counties whose plans expire first are given the highest priority for funds.

5.2.1 Jurisdictions with the Highest Risk

One of the primary purposes of this plan is to identify the areas within Alabama with the highest risk of damage from natural hazards. Section 3 of this plan contains the Vulnerability Assessment and Loss Estimation for Alabama's three most significant hazards. FEMA sponsors the National Risk Index (NRI), which combines Social Vulnerability, Estimated Annual Loss, and Community Resilience. The formula is $\text{Expected Annual Loss} \times \text{Social Vulnerability} \div \text{Community Resilience} = \text{Risk Index}$. The lower the social vulnerability and the higher the community resilience, the better the ranking. The state's top three hazards of concern are shown in the following three figures.

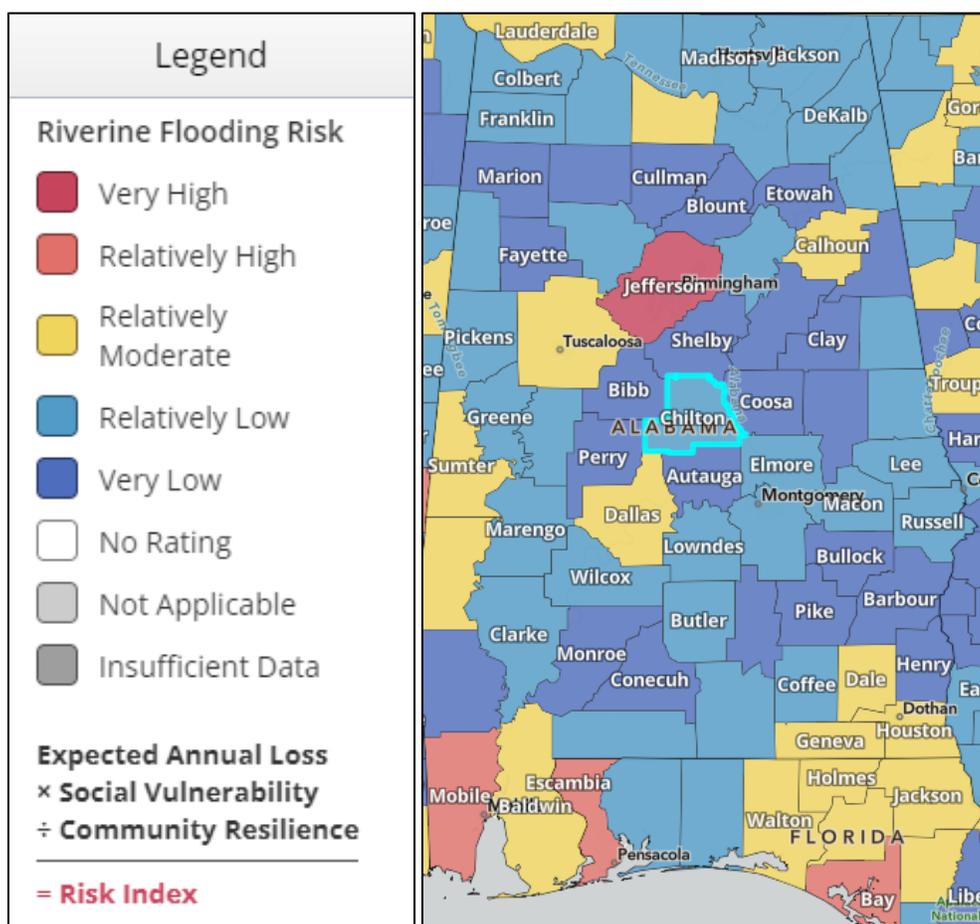
This ranking should be considered only a general indication of risk statewide. As noted elsewhere in this plan, accurate risk assessments and information about the performance and costs of mitigation measures (including policy changes) are the primary basis of mitigation planning. Risk assessments must be highly localized, often addressing a single asset or operation, to be truly accurate. Because of this, the state-level risk assessment should be considered only a guide that identifies where the most risk is at the county level.

Figure 5.1: FEMA’s National Risk Index for Coastal Flooding in Alabama



In Figure 5.1, Mobile and Baldwin Counties have the highest risk of coastal flooding. The following figure shows Jefferson County as having a very high risk for riverine flooding, followed by Mobile County, which have a relatively high risk for riverine flooding. Figure 5.1 shows the coastal flooding risk to be “relatively low” for Baldwin and Mobile Counties.

Figure 5.2: FEMA’s National Risk Index for Riverine Flooding in Alabama



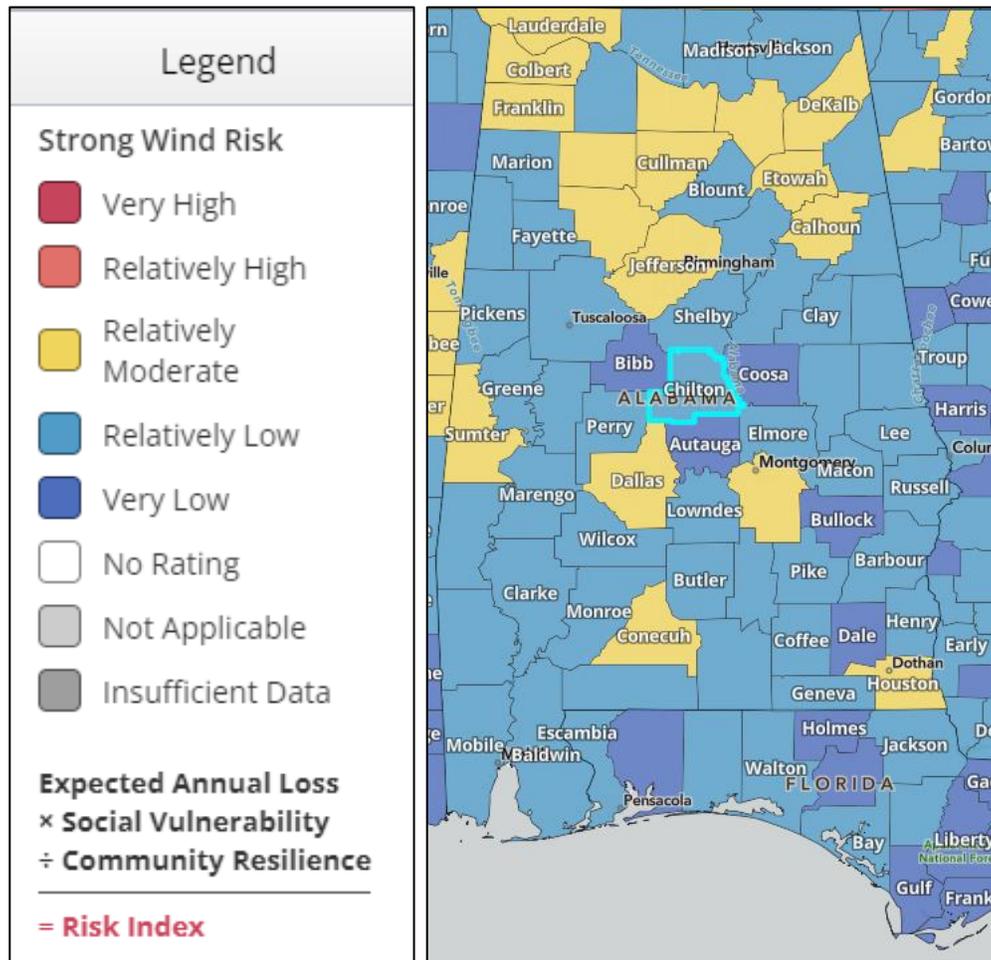
In addition to FEMA’s National Risk Index for flooding, its NFIP report of premiums and claims for the time period of 1978 through 2022 is also indicative of communities at the greatest risk. The following table identifies the top five counties in Alabama for total claims since 1978. For the state, since 1978, there have been 45,317 claims, and paid claims stand at \$1,194,929,808.

Table 5.5: NFIP Report of Claims from 1978 through 2022

County	Total Claims Since 1978	Total Paid Since 1978
Baldwin	21,106	\$674,278,723
Mobile	15,256	\$367,195,429
Jefferson	2,836	\$46,891,936
Shelby	750	\$17,312,372
Coffee	583	\$17,291,006

The following three illustrate Alabama’s vulnerability strong winds, tornadoes, and hurricanes.

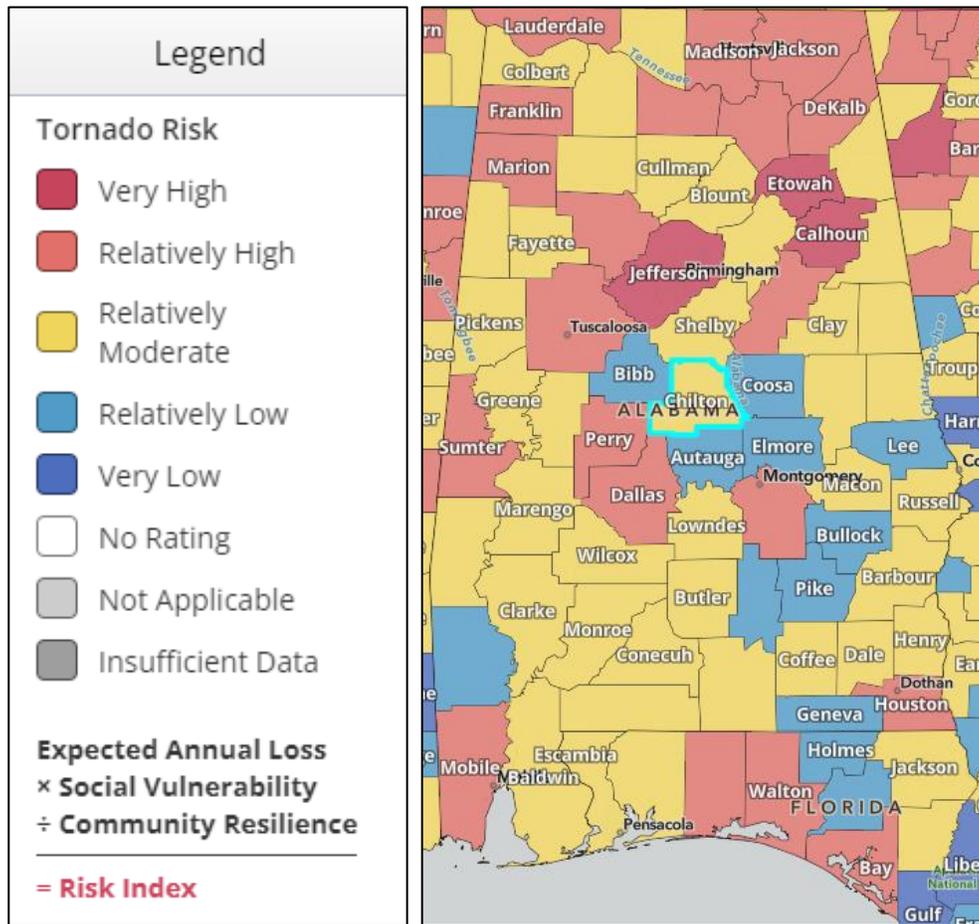
Figure 5.3: FEMA’s National Risk Index for Alabama due to Strong Winds



While there are no counties considered to be at very high or relatively high risk of strong winds, quite a few are at a relatively moderate risk: Conecuh, Houston, Montgomery, Dallas, Jefferson, Cullman, Calhoun, Etowah, DeKalb, Franklin, Colbert, Sumter, and Lauderdale, to name a few.

The following figure shows the tornado risk for Alabama, with Etowah, Calhoun, and Jefferson Counties showing a very high risk for tornadic activity.

Figure 5.4: FEMA’s National Risk Index for Alabama due to Tornadoes



The following figure shows Alabama’s risk index due to hurricanes. Mobile County has a relatively high risk, with a relatively moderate risk for counties to the immediate north and inland.

time, further incentivizing the need for mitigating structures. Those who refuse mitigation assistance would incur the long-term losses associated with living in high-risk areas.

The two coastal counties, Mobile and Baldwin, have the largest total payments for RL and SRL, followed by the inland counties of Jefferson and Shelby. The state will prioritize these counties for outreach to educate local officials on how to pursue funding for property mitigation.

5.2.3 Most Intense Development Pressure

Development pressure is clearly a potential factor in any risk determination; however, development undertaken in accordance with effective comprehensive planning and plan implementation tools—such as building codes, zoning ordinances, subdivision regulations, floodplain management ordinances, and capital improvement programming—should, in many cases, be less risky than development in existing developed areas. The state recognizes that increased development does cause new population settlements, the construction of new buildings, and the expansion of infrastructure. These development pressures could increase the exposure of population, buildings, and infrastructure to the risks of natural hazards. Although development and growth are not risks in themselves, the state carefully considers these factors. Local mitigation planning is fully integrated into a community's comprehensive planning and the regulatory program can reduce the exposure of new development to natural hazard risks. A community's planning responses to managing growth and development are essential to effective local mitigation, and the state carefully considers these factors in its project review process.

5.2.4 Maximizing Benefits According to the Benefit-Cost Review of Local Projects

The regulations that apply to all FEMA mitigation grant programs require all mitigation projects to be cost-effective. Under some pre-established conditions, certain projects may be exempt from this regulation, but in most cases, projects are provided with a BCA, either prior to submission to AEMA and FEMA for funding consideration or during the grant evaluation process.

For all Hazard Mitigation Assistance grant programs (HMGP, BRIC, and FMA), the regulations require only that proposed mitigation projects are cost-effective, not that they are the most cost-effective projects that the state or FEMA is considering. In most cases, grant applications are either accompanied by a BCA, or else AEMA or FEMA performs one in accordance with FEMA and OMB regulations. Projects that do not achieve the required 1.0 benefit-cost ratio and are not exempt from BCA are rejected from funding consideration. However, some projects utilize the calculated benefit cost, a streamlined methodology in which FEMA calculates predetermined cost-effectiveness values. Using these benefits eliminates the requirement for applicants to conduct separate BCAs for eligible projects. This methodology reduces the time and resources needed to complete and review the cost-effectiveness of projects. Some projects to which this can apply are acquisitions for RL and SRL properties and residential safe rooms. Regardless of which method is available, a BCA must be done and have a benefit-cost ratio of 1 or more.

5.3 Mitigation Successes

Alabama continues to successfully implement mitigation projects throughout the state that address a variety of hazards. FEMA's HMGP has been a primary source of funding to complete these mitigation projects. To date, over \$211 million has been obligated toward mitigation projects pursued by the State of Alabama using HMGP. A little over 53% of these funds have been used to finance community and individual safe room projects across the state. In addition, Alabama has successfully secured several FEMA PDM/BRIC grants to fund several hazard mitigation plan updates and flood mitigation projects, as seen in Table 5.6.

While all mitigation projects, big and small, have contributed to the effectiveness of Alabama's recovery and mitigation efforts, several projects have been highlighted as Alabama's "Success Stories" in the section below in 5.3.2.

Table 5.6: Federal Funds Obligated for Alabama, 2004–2018

Disaster Number	Declaration Date	Event	Acquisition	Elevation	Feasibility, Engineering, and Design Studies	Flood Control	Flood Proofing	Generators	Hazard Mitigation Plan	Infrastructure Protective Measures	Mitigation Reconstruction	Relocation	Retrofitting	Safe Room	Stabilization Storm Water Management	Utility Protective Measures	Warning Systems	Total	
DR-1549	9/15/2004	Hurricane Ivan	\$9,159,077	\$553,375	6,070,229	\$0	\$0	\$2,318,670	\$640,055	\$69,041	\$0	\$0	\$472,886	\$8,320,773	\$0	\$1,340,107	\$6,655,911	\$2,280,423	\$37,880,547
DR-1593	7/10/2005	Hurricane Den	\$0	\$58,526	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$888,750	\$0	\$0	\$947,276
DR-1605	8/29/2005	Hurricane Katrina Severe Storms and	\$5,384,969	\$1,038,386	7,138,580	\$0	\$844,825	\$4,035,864	\$2,815,004	\$205,258	\$1,053,149	\$17,650	\$5,938,385	\$22,082,257	\$0	\$5,144,372	\$1,092,158	\$3,858,847	\$60,649,704
DR-1687	3/3/2007	Tornadoes	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$690,000	\$813,000	\$0	\$0	\$0	\$0	\$1,503,000
DR-1789	9/10/2008	Hurricane Gustav Severe Storms and Flooding Associated With	\$0	\$0	\$0	\$0	\$0	\$0	\$152,277	\$0	\$0	\$0	\$0	\$0	\$1,294,528	\$0	\$0	\$0	\$1,446,805
DR-1797	9/26/2008	Severe Storms Flooding, Tornadoes, & Straight-Line Winds	\$0	\$37,223	\$0	\$0	\$0	\$0	\$63,750	\$0	\$0	\$0	\$0	\$158,804	\$0	\$1,546,125	\$0	\$105,105	\$1,911,007
DR-1835	4/28/2009	Severe Storms Flooding, Tornadoes, & Straight-Line Winds	\$582,168	\$271,819	\$0	\$0	\$0	\$290,001	\$149,762	\$33,410	\$0	\$0	\$0	\$1,478,829	\$0	\$0	\$377,538	\$867,375	\$4,050,902
DR-1836	5/8/2009	Severe Storms, Flooding, Tornadoes, and Straight-Line Winds	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$550,269	\$0	\$0	\$0	74,164	\$624,433
DR-1842	6/3/2009	Tropical Storm Ida	\$0	\$0	\$0	\$554,347	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$187,588	\$0	\$690,143	\$0	\$0	\$1,432,078
DR-1866	12/22/2009	Storms and Flooding	\$543,366	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1,067,298	\$0	\$0	\$0	\$93,300	\$1,703,964
DR-1908	5/3/2010	Severe Storms, Tornadoes, Straight-Line Winds, and	\$5,717,219	\$0	\$0	\$60,672	\$0	\$669,803	\$0	\$0	\$0	\$0	\$0	\$1,145,350	\$0	\$0	\$318,310	\$58,236	\$7,969,590
DR-1971	4/28/2011	Severe Storms, Tornadoes, Straight-Line Winds, and	\$0	\$216,318	\$0	\$0	\$0	\$3,325,580	\$1,221,695	\$0	\$0	\$0	\$1,435,711	\$64,218,827	\$0	\$0	\$0	\$3,153,834	\$73,571,965
DR-4052	2/1/2012	Severe Storms, Tornadoes, Straight-Line Winds, and	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$146,221	\$0	\$0	\$0	\$0	\$146,221
DR-4082	9/21/2012	Hurricane Isaac Severe Storms, Tornadoes, Straight-Line Winds, and	\$0	\$0	\$0	\$0	\$0	\$23,099	\$0	\$0	\$0	\$0	\$1,573,107	\$1,018,297	\$0	\$22,500	\$0	\$43,300	\$2,680,303
DR-4176	5/2/2014	Severe Storms, Tornadoes, Straight-Line Winds, and Flooding	\$307,939	\$67,726	\$0	\$0	\$147,263	\$73,427	\$0	\$0	\$0	\$0	\$0	\$6,313,781	\$0	\$53,624	\$0	\$802,500	\$7,766,260
DR-4251	1/21/2016	Severe Storms, Tornadoes, Straight-Line Winds, and	\$0	\$0	\$0	\$0	\$0	\$1,295,830	\$0	\$0	\$0	\$0	\$0	\$1,698,084	\$0	\$0	\$0	\$227,700	\$3,221,614
Total through 2018 Plan			\$21,694,738	\$2,243,373	\$13,208,809	\$615,019	\$992,088	\$12,032,274	\$5,089,633	\$307,709	\$1,053,149	\$17,650	\$10,110,089	\$111,647,077	\$0	\$9,753,777	\$8,465,186	\$11,700,334	\$208,930,905

Table 5.7: Federal Funds Obligated for Alabama, 2018–2020

Disaster Number	Declaration Date	Event	Acquisition	Elevation	Feasibility, Engineering, and Design Studies	Flood Control	Flood Proofing	Generators	Hazard Mitigation Plan	Infrastructure Protective Measures	Mitigation Reconstruction	Relocation	Retrofitting	Safe Room	Stabilization Storm Water Management	Utility Protective Measures	Warning Systems	Total	
DR-4362	4/26/2018	Severe Storms,		\$0	\$0	\$0	\$0	\$50,701.00	\$441,987	\$0	\$0	\$0	\$0	\$699,815	\$0	\$0	\$0	\$0	\$1,192,503
DR-4406	11/5/2018	Hurricane Michael		\$0	\$143,487	\$0	\$0	\$225,405	\$144,000	\$0	\$0	\$0	\$164,125	\$0	\$0	\$0	\$0	\$0	\$677,017
DR-4419	3/5/2019	Severe Storms, Straight-line Winds,		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$661,101	\$0	\$0	\$0	\$0	\$661,101
DR-4426	4/17/2019	Severe Storms, Straight-line Winds,		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$124,956	\$0	\$0	\$0	\$0	\$124,956
DR-4546	5/21/2020	Severe Storms and		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$314,090	\$0	\$0	\$0	\$0	\$314,090
DR-4554-4632	not obligated.		Totals:	\$143,487	\$0	\$0	\$0	\$276,106	\$585,987	\$0	\$0	\$0	\$164,125	\$1,799,962	\$0	\$0	\$0	\$0	\$2,969,667

Table 5.8 Open PDM/BRIC Grants by Type, 2018–Present

Project Type	Total Project Amount	Count of Projects
Community Safe Rooms	\$10,516,375	8
Mitigation Plans	\$286,954	4

Note: PDM was replaced by BRIC; and this table shows only the open projects.

5.3.1 Mitigating RL and SRL Properties

Alabama has a successful record of implementing projects that mitigate damage to repetitive and severe RL properties. These include mitigation actions for individual sites, including elevations, acquisitions, demolitions, and relocations. Project funds were provided through various FEMA mitigation grant programs.

Over the past 20 years, the State of Alabama and FEMA have also funded numerous flood control projects statewide, and these presumably mitigate the risk of repetitive and severe RL properties. However, neither FEMA nor the state maintains readily accessible or detailed records of specific RL or SRL properties that are protected by these projects. The state has consistently met FEMA requirements for proving the cost-effectiveness of the mitigation actions it funds, so presumably many of the properties within the areas protected by these projects are in fact RL or SRL properties.

5.3.2 Success Stories

5.3.2.1 Poarch Creek Flume Redesign

Willow Creek, a housing subdivision on the Poarch Creek Indian Reservation near Atmore, experienced frequent flooding events from a nearby drainage basin. This put the residents of Willow Creek, including 30 elderly or disabled citizens, and an adjacent utility building at significant risk. Using accurate risk and mitigation studies, the reservation identified an opportunity to rebuild an inadequately designed flume at the mouth of the basin. Using funds awarded from AEMA, Poarch Creek completed the project in 2002 for a total cost of \$60,000, saving the reservation hundreds of thousands of dollars in potential damages over the years.

The mitigation actions presented can be input directly into FEMA's Mitigation Action Tracker, and ADECA's Office of Water Resources (OWR) can provide support to the communities to advance these opportunities. Additionally, the mitigation opportunities can be utilized to assist in mitigation planning in the form of grant applications for action advancement funding. OWR plans to produce a similar report for future watersheds as part of the Risk MAP program.

5.3.2.2 Dauphin Island

Several homes in the Town of Dauphin Island, situated in Mobile County between Mobile Bay and the Gulf of Mexico, were regularly inundated by the storm surges that frequently accompany hurricanes. After Hurricane Ivan in 2004, the town partnered with AEMA to acquire three of these homes. For less than \$525,000, most of which was funded by FEMA's HMGP, the town removed the RL structures and built community parks in their place. Today, these parks—featuring playground equipment, benches, and a habitat for native birds are enjoyed by the whole community.

Buyout programs like this provide a cost-effective and long-term solution for both the community and property owners by replacing at-risk structures with flood-resistant projects like parks or natural spaces.

5.3.2.3 Risk MAP

Risk MAP is a FEMA program that builds on the flood maps and flood hazard data produced by the Flood Map Modernization Program. Risk MAP continues to provide flood data to communities but focuses on risk communication. Like Map Mod, ADECA's OWR is responsible for implementing the Risk MAP program within the state. There are five goals of the program: addressing flood hazard gaps, public awareness and outreach, hazard mitigation planning, an enhanced digital platform, and the alignment and synergies of risk analysis programs.

FEMA undertook a multi-year engineering analysis and mapping effort in cooperation with ADECA's OWR to assess the risk of riverine and coastal flooding in Mobile and Baldwin Counties. Phase 1, Scoping, identified 33 riverine miles and 100 coastal miles in Mobile and 55 riverine miles and 111 coastal miles in Baldwin for a new detailed engineering study. After the preliminary flood insurance study (FIS) and Flood Insurance Rate Maps (FIRMs) were completed in Phase 2, Phase 3 was completed with the distribution of the effective FIS and FIRMs on June 5, 2020 for Mobile County and April 19, 2019, for Baldwin County. Together, these new detailed flood studies will more accurately portray present-day flood risk in these counties' riverine and coastal communities and will aid decision-makers and homeowners in making decisions about methods to mitigate risk and plan for the future.

Watershed studies are scheduled to occur throughout Alabama, and some are underway. Six (6) watershed studies have been completed as of March 2023. Watershed planning transcends political boundaries to study risk and vulnerability in the entire hazard area. Ultimately, Risk MAP will help local officials make more informed decisions with regard to mitigation using these enhanced products and risk communication.

5.3.2.4 Alabama Safe Rooms

Severe storms hit Alabama between April 27 and 30, 2014, and again on January 20 and 21, 2016, causing widespread tornado outbreaks and disaster declarations in both cases. The 2014 severe weather outbreak also caused very severe flooding when 20–26 inches of rain fell in Baldwin County. As a result of these disasters, \$8 million was obligated by FEMA through the HMGP to fund community and residential safe room projects in the state. The obligation of these funds is a mitigation success for Alabama because these safe rooms continue to help reduce lives lost in tornado events.

Alabama continues to offer funding for residential safe rooms and has put \$622,915 of HMGP funding into its safe room program since the last plan update in 2018.

6. Plan Maintenance

6.1 Method for Monitoring, Evaluating, and Updating the Plan

6.1.1 Background

As directed by Executive Order No. 19, the Alabama Emergency Management Agency (AEMA) is responsible for maintaining the State Hazard Mitigation Plan, including all monitoring, evaluation, and update activities.

As part of the 2023 plan update process, AEMA reviewed the strategy detailed in the previous plan versions for monitoring, evaluating, and updating the plan and compared it to the plan maintenance activities that occurred since plan adoption. It has been modified over the years to best meet the needs of the state and the Planning Team. Beginning in 2007, the plan update called for AEMA to conduct an annual review of the plan and provide a summary of this review to the Planning Team, indicating whether an update was warranted. For the 2010 plan update, this process remained but was adjusted to provide only a summary of the review to the Planning Team if a change was warranted. In addition, the Planning Team will be reconvened only if an update to the state plan is warranted or after a major disaster. If an update is warranted, it will be at AEMA's discretion to determine if it is necessary to reconvene the entire team. Further, AEMA is committed to tracking mitigation action progress for the next plan update. This section of the plan describes how the plan's maintenance activities will be accomplished. As part of the 2023 Plan Update, the SHMTF agreed to continue use the monitoring, evaluating, and updating process used in previous planning cycles.

6.1.2 Method for Monitoring the Plan

Regular plan monitoring will be led by AEMA to track mitigation actions with the SHMTF. These activities are described in Sections 6.2 through 6.4.

6.1.3 System for Evaluating the Plan

AEMA will conduct an annual evaluation of the plan, generally in April. The evaluation will consider several basic factors, including the following:

- Changes in the level of risk to the State of Alabama and its citizens.
- Changes in laws, policies, or regulations at the state or local levels.

- Changes in state agencies or their procedures will affect how mitigation programs or funds are administered.
- Significant changes in funding sources or capabilities.
- Changes in the composition of the SHMTF.
- Progress on mitigation actions (including project closeouts) and new mitigation actions that the State is considering.
- Major changes to local or multi-jurisdictional hazard mitigation plans.

To track mitigation actions, AEMA will email SHMTF members each year, at a minimum, to determine if there are any changes in status for the mitigation actions. The SHMTF will also be encouraged to submit new mitigation actions. If an agency reports changes or submits a new action, AEMA will be responsible for incorporating those changes into the state plan.

Additionally, as described separately in Appendix C, AEMA will contact the Regional Planning Councils and local Emergency Management Agency (EMA) directors (or other individuals and organizations as appropriate) to determine if updates have been made to certain elements of the local plans as part of the annual review process. The purpose of this effort is to ensure that local information about risk, goals, projects, and mitigation strategies included in the state plan remains current.

If any party indicates that an update is warranted, then AEMA, in conjunction with the SHMTF, will initiate the plan update process.

The SHMTF will also be informed about disaster events via email. AEMA continues to advise agencies on how to incorporate mitigation into their planning efforts. Further, AEMA maintains contact with several members of the SHMTF, including ADECA-OWR, ADEM, and the state's NFIP administrators. This ongoing communication and relationship will facilitate information sharing between agencies regarding mitigation activities.

6.1.4 System for Updating the Plan

The plan will be updated and resubmitted to FEMA for reapproval every five years, as required by law. The plan may also be subject to interim updates if any of the following conditions apply:

- At the request of the Governor.
- When significant new risks or vulnerabilities are identified; or
- If the findings of the annual/post-disaster review and evaluation warrant.

The following two sections describe the procedures for interim and five-year updates, respectively.

6.1.4.1 Updates Resulting from Interim Evaluations

The nature of plan updates will be determined by the evaluation process described above. In general, AEMA will notify the SHMTF that it is initiating an interim plan update and describe the circumstances that created the need for the update. AEMA will determine if the full SHMTF should be consulted regarding the potential changes. If it is determined that the SHMTF should be involved, the nature of the involvement will be at the discretion of AEMA. When interim updates are completed, AEMA will advise all SHMTF members that the plan has been updated and describe the nature of the update.

6.1.4.2 Updates Related to the Required Five-Year Plan Review

As required by law, every five years the plan will be updated for resubmission and reapproval by FEMA. In those years, the evaluation process will be substantially more rigorous and will examine all aspects of the plan in detail. It is anticipated that several meetings of the SHMTF will be required and that the plan will be formally readopted by the state. Between 6 and 12 months prior to the update deadline, AEMA will initiate the plan update process by contacting SHMTF members and other appropriate agencies and organizations to determine a schedule and process for updating the plan.

The update process will entail a detailed and structured re-examination of all aspects of the original plan, followed by recommended updates. The recommendations will be presented to the SHMTF for consideration and approval. It is expected that the director of AEMA will approve the plan and adopt it on behalf of the Governor.

6.2 System for Monitoring Mitigation Measures and Project Closeouts

AEMA uses the following system for monitoring mitigation measures and project closeouts. AEMA reviewed this system as part of the 2023 plan update and determined that it is still effective and is still the preferred method for monitoring mitigation measures and project closeouts. Therefore, no changes have been made to the system.

6.2.1 Monitoring Mitigation Measures

Mitigation projects are monitored as follows:

- Each mitigation project or activity (such as planning) has an established period of performance that AEMA and FEMA monitor throughout the development and execution of the activity.
- AEMA conducts kickoff meetings for newly approved grants in cases where the subgrantee does not have much grant administration experience, or upon request, to discuss grant administration procedures and processes to request reimbursement.

- AEMA regularly meets with representatives from FEMA Region IV to coordinate project monitoring activities.
- Every calendar quarter, AEMA sends letters to all subgrantees with open projects (i.e., ones that have been funded but are not completed), requesting a project progress update.
- Each of the subgrantees responds to the AEMA request by preparing a standard report that details progress on individual mitigation projects and indicates the percentage completed.
- AEMA performs quarterly site visits on all open mitigation projects.
- AEMA compiles the subgrantee progress reports and produces a consolidated quarterly report that is sent to FEMA Region IV for review.

6.2.2 Monitoring Project Closeouts

Mitigation project closeouts occur in the following sequence. These procedures were established in accordance with FEMA HMGP guidelines as set out in the HMGP Desk Reference and the State of Alabama HMGP Administrative Plan.

- Subgrantee indicates in a quarterly project progress report that a mitigation project is 100% complete.
- AEMA reconciles the FEMA SmartLink account for the project (by disaster).
- AEMA initiates an internal financial audit of the project.
- AEMA resolves any issues discovered in the audit.

AEMA sends FEMA Region IV a closeout letter that identifies the final eligible cost of the project and delineates any de-obligations that are required, as well as any monies that will be recovered from the subgrantee.

6.3 System for Reviewing Progress on Achieving Goals

In order to track progress on achieving the goals identified in this plan, AEMA will ensure that both the annual and five-year plan evaluations include a review and analysis of the goals and the various actions that are intended to achieve them. This process will be substantially more rigorous and detailed during the formal plan update process. Section 5 of the plan describes four hazard mitigation goals and includes a detailed table that lists the actions that the state is undertaking to address the goals. This table includes a column indicating the status of the various actions and a general indication of progress.

The system for reviewing progress on achieving goals will remain the same, as it has proved successful over the last five years.

6.4 System for Reviewing Progress on Activities and Projects in the State Mitigation Strategy

As part of the annual evaluation, AEMA will email the SHMTF to determine if there are any changes to the mitigation actions listed in the mitigation strategy section. In addition, members of the SHMTF will be encouraged to submit new actions at this time.

As part of the five-year update to the plan, AEMA will initiate a more detailed review and evaluation of all activities and projects noted in the mitigation strategy. AEMA will report its findings to the SHMTF at meetings held as part of the plan update process. The results of these findings will be included in the table of mitigation goals and actions included in Section 5. If requested by FEMA, AEMA will prepare a summary report describing the results of the review.

Appendix A: Approval and Implementation

The purpose of hazard mitigation is to implement actions that eliminate the risk from hazards or reduce the severity of the effects of hazards on people and property. Mitigation actions are sustained actions that are both short-term and long-term activities that reduce the cause or occurrence of hazards; reduce exposure to hazards; or reduce the effects of hazards through various means, including preparedness, response, and recovery measures.

This plan applies to all state agencies, boards, commissions, and departments assigned mitigation responsibilities and to others as designated by the Governor or Director of the Alabama Emergency Management Agency.

The State of Alabama Hazard Mitigation Plan was prepared in compliance with Public Law 106390, the Disaster Mitigation Act of 2000, as amended. This plan implements hazard mitigation measures intended to eliminate or reduce the effects of future disasters throughout Alabama and was developed in a joint and cooperative venture by members of the State Hazard Mitigation Task Force and the agencies identified in Executive Order No. 19.

The State of Alabama will comply with all applicable federal statutes and regulations in effect with respect to the periods for which it receives grant funding, in compliance with 44 Code of Federal Regulations (CFR) 13.11c. The State of Alabama will amend its plan whenever necessary to reflect changes in state and/or federal laws and statutes as required in 44 CFR, 13.11d. At a minimum, the State will review and, if necessary, update the Plan every five years from the date of approval in accordance with 44 CFR, 201.3(c)(2) and (3) in order to continue program eligibility.

In accordance with the Alabama Emergency Management Act of 1955, dated March 1, 2002, as amended, and as the Director of the Alabama Emergency Management Agency, in order to protect the lives and property of the citizens of Alabama, I hereby adopt this plan in accordance with the powers delegated to me and accept this plan for implementation.

15 August 2023

Date

Jeff Smitherman

Jeff Smitherman

Director

Alabama Emergency Management Agency

Appendix B: Glossary of Acronyms and Terms

Acronym	Term
AAFM	Alabama Association of State Floodplain Managers
AAL	Average Annualized Loss
AARC	Alabama Association of Regional Councils
ACAMP	Alabama Coastal Area Management Program
ADAPT	Alabama Drought Assessment and Planning Team
ADECA	Alabama Department of Economic and Community Affairs
ADECA-CEDP	ADECA Community and Economic Development Programs
ADECA-OWR	ADECA Office of Water Resources
ADEM	Alabama Department of Environmental Management
ADPH	Alabama Department of Public Health
AEMA	Alabama Emergency Management Agency
AFC	Alabama Forestry Commission
AGI	Alabama Department of Agriculture & Industry
AHTF	All-Hazards Task Force
ALDOI	Alabama Department of Insurance
ALDOT	Alabama Department of Transportation
ALEA	Alabama Law Enforcement Agency
ALNG	Alabama National Guard
ALSDE	Alabama State Department of Education
AoMI	Areas of Mitigation Interest
API	Alabama Planning Institute
ASCE	American Society of Civil Engineers
ASDSO	Association of State Dam Safety Officials
ATC	Applied Technology Council
ATRC	Alabama-Tombigbee Regional Commission
BC	Benefit-Cost Analysis
BW	Biggert-Waters Flood Insurance Reform Act of 2012
CAP-SSSE	Community Assistance Program State Support Services Element
CARPDC	Central Alabama Regional Planning Development Commission
CAV	Community Assistance Visit

Acronym	Term
CCL	Construction Control Line
CDBG	Community Development Block Grants
CERI	University of Memphis Center for Earthquake Research and Information
CFM	Certified Floodplain Managers
CFR	Code of Federal Regulations
CIAP	Alabama Coastal Impact Assistance Program
CIKR	Critical Infrastructure and Key Resources
CMIP5	Coupled Model Intercomparison Project Phase 5
COG	Council of Governments
CPG	Comprehensive Preparedness Guide
CRS	Community Rating System
CUSEC	Central United States Earthquake Consortium
CZEP	Coastal Zone Enhancement Program
CZMP	Coastal Zone Management Program
DCNR	Alabama Department of Conservation & Natural Resources
DFIRM	Digital Flood Insurance Rate Map
DHR	Alabama Department of Human Resources
DMA2K	Disaster Mitigation Act of 2000
DMP	Alabama Drought Management Plan
DORM	Alabama Division of Risk Management
DR	Disaster Recovery
DRI	Disaster Recovery Initiative
EAP	Emergency Action Plan
EARPDC	East Alabama Regional Planning and Development Commission
EDA	United States Economic Development Administration
EF	Enhanced Fujita
EMA	Emergency Management Agency
EMAP	Emergency Management Accreditation Program
EMC	Emergency Management Coordinator
EMPG	Emergency Management Performance Grant
EO 19	Executive Order 19
EOP	Emergency Operations Plan
ESF	Emergency Support Function
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMA	Flood Mitigation Assistance

Acronym	Term
GIS	Geographic Information System
GSA	Geological Survey of Alabama
HMGP	Hazard Mitigation Grant Program
HMPC	Hazard Mitigation Planning Committee
HUD	United States Department of Housing and Urban Development
ICC	International Code Council
ISO	Insurance Services Office
LEPC	Local Emergency Planning Committee
LRCOG	Lee-Russell Council of Governments
MMI	Modified Mercalli Intensity
NACOLG	Northwest Alabama Council of Local Governments
NARCOG	North-Central Alabama Regional Council of Governments
NCEI	National Centers for Environmental Information
NDMC	National Drought Mitigation Center
NFIP	National Flood Insurance Program
NFIRA	National Flood Insurance Reform Act
NHC	National Hurricane Center
NID	National Inventory of Dams
NIMS	National Incident Management System
NLCD	National Land Cover Database
NLDN	National Lightning Detection Network
NOAA	National Oceanic and Atmospheric Administration
NRP	National Response Plan
NVUE	New, Validated, or Updated
NWLON	National Water Level Observation Network
NWS	National Weather Service
OCRM	Ocean and Coastal Resource Management
OMB	United States Office of Management and Budget
PA	Public Assistance Grant Program
PDM	Pre-Disaster Mitigation
PDSI	Palmer Drought Severity Index
PGA	Peak Ground Acceleration
PNP	Private Non-Profit
PSC	Alabama Public Service Commission
RCP	Representative Concentration Pathways
RD	USDA Rural Development
RF	Risk Factor

Acronym	Term
RFC	Repetitive Flood Claims
Risk MAP	Risk Mapping, Assessment, and Planning
RL	Repetitive Loss
RLF	Revolving Loan Fund
RPC	Regional Planning Council
RPCGB	Regional Planning Commission of Greater Birmingham
RSL	Relative Sea Level
SARPC	South Alabama Regional Planning Commission
SCADC	South Central Alabama Development Commission
SEARPDC	Southeast Alabama Regional Planning and Development Commission
SEI	Structural Engineering Institute
SERCC	Southeast Regional Climate Center
SFHA	Special Flood Hazard Area
SGSF	Southern Group of State Foresters
SHMT	State Hazard Mitigation Team
SLD	State Lands Division
SLOSH	Sea, Lake, and Overland Surges from Hurricanes
SOG	Standard Operating Guideline
SRL	Severe Repetitive Loss
SRP	StormReady Program
TAC	Technical Advisory Committee
TAG	Tennessee-Alabama-Georgia
TARCOG	Top of Alabama Regional Council of Governments
UCAR	University Corporation for Atmospheric Research
UCS	Union of Concerned Scientists
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USDA-RMA	USDA Risk Management Agency
USFS	USDA Forest Service
USGS	United States Geological Survey
WARC	West Alabama Regional Commission
WFO	Weather Forecast Office

Appendix C: Coordination of Local Planning

CFR Requirements for Coordination of Local Mitigation Planning

44 CFR 201.4 (c) (4) requires the State Hazard Mitigation Plan to include a section on the coordination of local mitigation planning.²³⁴ This includes information that describes the following:

- (i) A description of the State process to support, through funding and technical assistance, the development of local mitigation plans.
- (ii) A description of the State process and timeframe by which the local plans will be reviewed, coordinated and linked to the State Mitigation Plan.
- (iii) Criteria for prioritizing communities and local jurisdictions that would receive planning and project grants under available funding programs, which should include consideration for communities with the highest risks, repetitive loss structures, and the most intense development pressures. Further, for non-planning grants, a principal criterion for prioritizing grants will be the extent to which benefits are maximized according to a cost-benefit review of proposed projects and their associated costs.

Further, 44 CFR 201.4 (d) requires that the State Hazard Mitigation Plan be updated to reflect changing conditions in the state.²³⁵ This means that the Plan Update should include the following:

(d) *Review and updates.* The plan must be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities and resubmitted for approval to the appropriate Regional Administrator every 5 years. The Regional review will be completed within 45 days after receipt from the State, whenever possible. We also encourage a State to review its plan in the post-disaster timeframe to reflect changing priorities, but it is not required.

This appendix describes how the 2023 plan update satisfies the first two requirements of 44 CFR 201.4 (c) (4). The third requirement is satisfied as described in Section 5.2 (Prioritization of Funding). The requirements outlined by 44 CFR 201.4 (d) are addressed in Section 1.1 (State Mitigation Strategy) and Section 2 (Current and Future Conditions).

²³⁴ § 201.4 - Standard State Mitigation Plans. GovRegs.com.
https://www.govregs.com/regulations/title44_chapter1_part201_section201.4

²³⁵ § 201.4 - Standard State Mitigation Plans. GovRegs.com.
https://www.govregs.com/regulations/title44_chapter1_part201_section201.4

Development and Update of Local Mitigation Plans

This section describes the ongoing state efforts to assist in the completion and update of local mitigation plans.

Development of Local Hazard Mitigation Plans

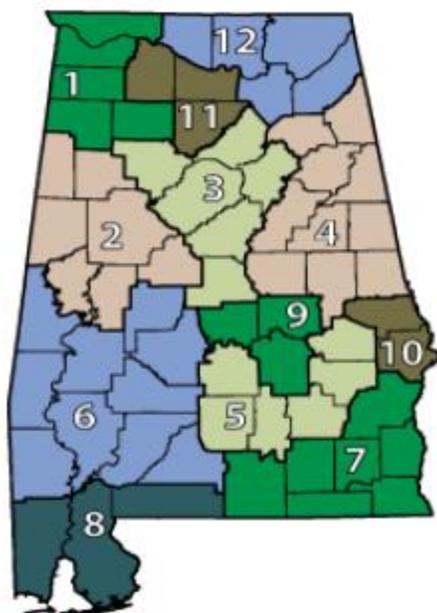
AEMA's involvement in assisting counties with local plan development includes the following:

- Distributing federal funds to aid counties in the development of plans;
- Providing technical assistance;
- Coordinating with FEMA;
- Reviewing plans for state compliance; and
- Partnering with local EMAs.

Alabama's 12 Regional Planning Councils (RPCs) traditionally assumed the latter responsibility, although the 2018 plan update saw the RPCs not doing as many counties within their region as before. However, the 2023 plan update saw this trend moving in a different direction, with the RPCs actually being very involved in local HMP development and updates since the 2018 plan update.

Regional Planning Councils

RPCs were originally chosen by the counties to assist in the initial local plan development process because of their established planning expertise, knowledge of local and regional issues within their jurisdictions, and rapport with the local county and city representatives and stakeholders. Due to a lack of funding, most RPCs became less active in the plan development processes; however, this trend has changed. The historical role of the RPCs in coordinating the development of the local HMP is described further below.

Figure 1: The 12 RPCs of Alabama

The jurisdictions of the 12 RPCs cover all 67 counties within the state. The following table identifies the 12 regions covered by the RPCs.

Table 3: Regional Planning Councils

Region	Regional Planning Council
Region 1	Northwest Alabama Council of Local Governments (NACOLG)
Region 2	West Alabama Regional Commission (WARC)
Region 3	Regional Planning Commission of Greater Birmingham (RPCGB)
Region 4	East Alabama Regional Planning and Development Commission (EARPDC)
Region 5	South Central Alabama Development Commission (SCADC)
Region 6	Alabama-Tombigbee Regional Commission (ATRC)
Region 7	Southeast Alabama Regional Planning and Development Council (SEARPDC)
Region 8	South Alabama Regional Planning Commission (SARPC)
Region 9	Central Alabama Regional Planning Development Commission (CARPDC)
Region 10	Lee-Russell Council of Governments (LRCOG)
Region 11	North-Central Alabama Regional Council of Governments (NARCOG)
Region 12	Top of Alabama Regional Council of Governments (TARCOG)

Historically, the RPCs were heavily involved in the initial local plan development as well as local plan updates. For the development of the 2004 State Hazard Mitigation Plan, AEMA recruited assistance from the 12 RPCs within the State of Alabama, represented by the AARC. The RPCs

had agreements in place with AEMA to develop local hazard mitigation plans for some counties within their jurisdictions. Since 2004, AEMA has provided considerable technical support and training to RPC planners to gain proficiency in hazard mitigation planning. Several of the RPCs have retained a mitigation planner on staff to provide ongoing planning services to all jurisdictions within their respective regions.

The RPCs completed 47 county-level plans from 2004 to 2005. In 2006, AEMA provided additional funding to seven of the twelve RPCs to update 34 plans across the state. In the 2018 update, the RPCs continued to be involved in mitigation planning; but for the most recent updates, the RPCs have contributed to only 22 of the 67 currently approved county-level plans. As noted in the 2013 and 2018 plan updates, this number has been decreasing, while an increasing number of counties are using consultants to complete the plan updates. This decline can be attributed to a lack of funding. The recent trend has some RPCs developing regional HMPs on behalf of some or all the counties within that RPC. Examples of regional HMPs developed recently include those for the counties in NACOLG, ATRC, SEARPDC, and LRCOG.

RPCs have also traditionally been involved in other planning activities with local jurisdictions (counties, cities, and towns) and other local or regional interest groups, either by directly developing and updating or assisting with the development of local comprehensive plans. With a thorough knowledge of hazard mitigation planning and a strong partnership with AEMA, the RPCs work with the local agencies to integrate hazard mitigation planning into local and regional comprehensive planning initiatives. AEMA continues to improve and solidify this process.

The RPCs have often worked in conjunction with the Alabama Planning Institute (API) to provide regular training to local planning officials and planners throughout Alabama. The Alabama Planning Institute, housed within the University of North Alabama Center for Continuing Education, is sponsored by the Alabama Chapter of the American Planning Association. The institute has a long-standing and successful record of achievement, and its courses are always in high demand.

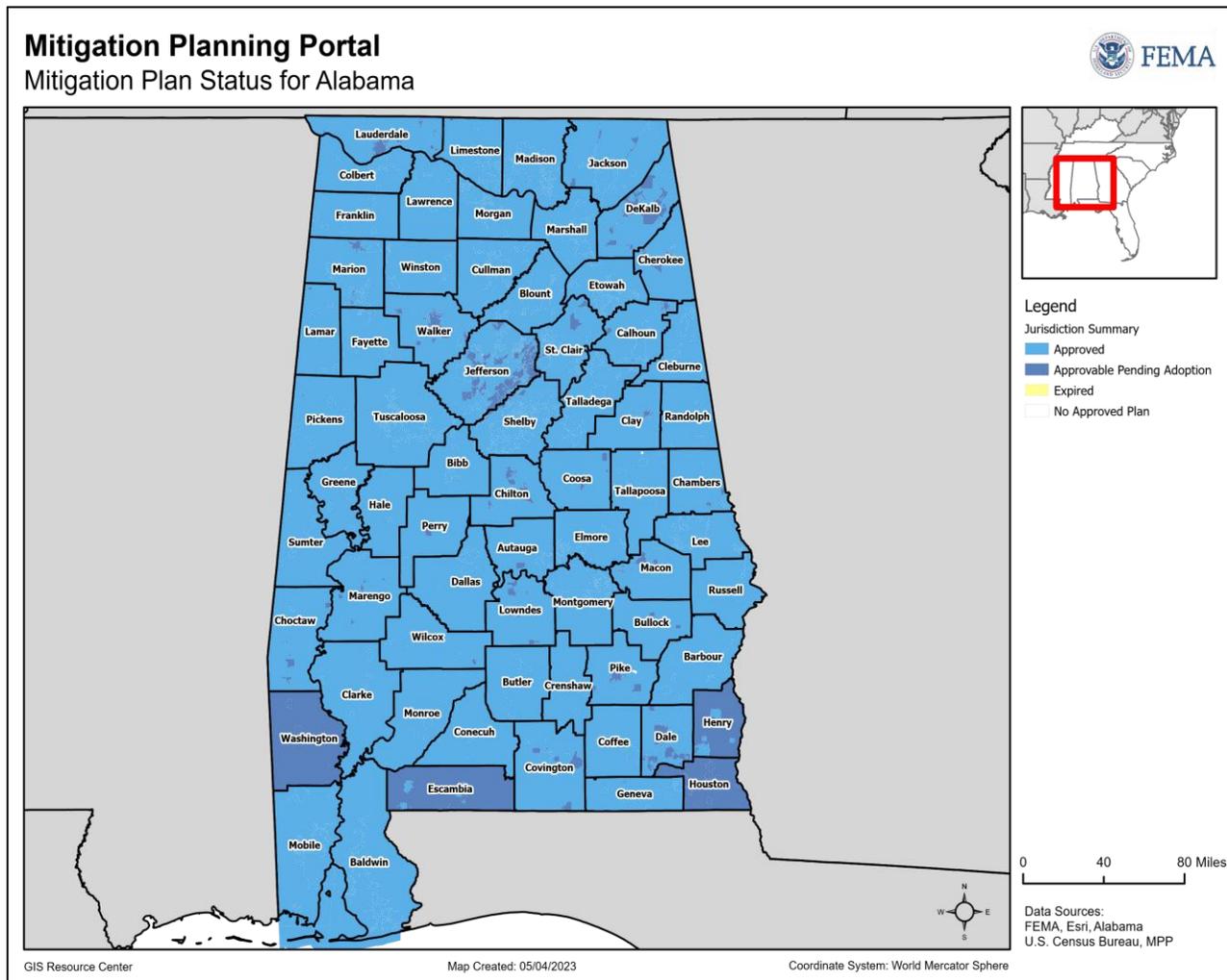
Topics in hazard mitigation have been recently added to the API courses, and AEMA continues to expand these course offerings to emphasize the integration of hazard mitigation planning into local and regional comprehensive planning processes.

Local Plan Status

At the time that the initial state plan was approved and adopted in 2004, no local hazard mitigation plans had been completed. For the 2023 plan update, 67 counties have approved updates in place. Four counties are in an “approved pending adoption” status.

The following map shows the plan status for each county in Alabama.

Figure 2: Mitigation Plan Status for Counties in Alabama as of May 5, 2023



The following tables show the planning divisions in the state, as well as the counties that fall within those divisions.

Table 4: AEMA Division A Plan Status and Funding Source

AEMA Division Number	Regional Planning Commissions	Counties	Funded Through	Date of Plan Approval	Expiration Date
A Phase 1	Alabama-Tombigbee Regional Commission (ATRC)	Clarke, Conecuh	HMGP	May 11, 2021	May 10, 2026
A Phase II	Alabama-Tombigbee Regional	Monroe, Washington	HMGP	May 11, 2021	May 10, 2026

AEMA Division Number	Regional Planning Commissions	Counties	Funded Through	Date of Plan Approval	Expiration Date
	Commission (ATRC)				
	South Alabama Regional Planning Commission (SARPC)	Baldwin, Escambia, Monroe	HMGP	May 11, 2021	May 10, 2026

Choctaw County - see Figure 10

Figure 3: AEMA Division A Counties

Alabama Emergency Management Division A

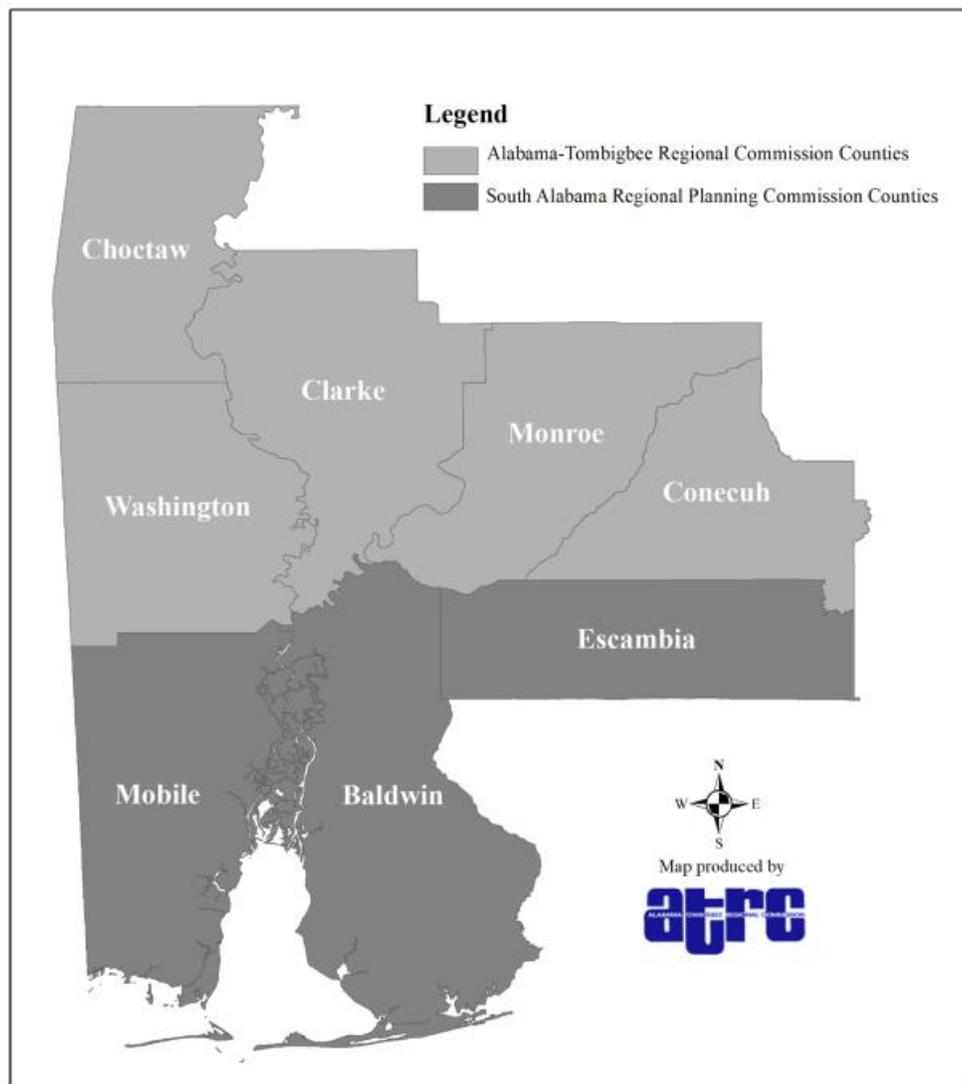


Table 5: AEMA Division B Counties

AEMA Division Number	Regional Planning Commissions	Counties	Funded Through	Date of Plan Approval	Expiration Date
B, Version 1	Southeast Alabama Regional Planning and Development Council (SEARPDC)	Barbour, Butler, Coffee, Covington, Geneva, Henry, Houston	HMGP, counties	November 9, 2021	November 8, 2026
B, Version II	Southeast Alabama Regional Planning and Development Council (SEARPDC)	Crenshaw, Dale, Pike	HMPG, counties	Updated into Division B plan upon local plan expirations.	November 8, 2026

Figure 4: AEMA Division B Counties



Table 6: AEMA Division C and D Counties

AEMA Division Number	Regional Planning Commissions	Counties	Funded Through	Date of Plan Approval	Expiration Date
C	Alabama-Tombigbee Regional Commission (ATRC)	Bibb, Dallas, Greene, Hale, Marengo, Perry, Pickens, Tuscaloosa, Sumter, Wilcox	HMPG	March 24, 2021	March 23, 2026
D	Lee-Russell Council of Governments (LRCOG)	Autauga, Chambers, Chilton, Coosa, Elmore, Lee, Lowndes, Macon, Montgomery, Russell, Tallapoosa	HMGP	December 01, 2020	November 30, 2025

Bullock County - See Figure 10

Figure 5: AEMA Division C Counties



Figure 6: AEMA Division D Counties



Table 7: AEMA Division E Counties

AEMA Division Number	Regional Planning Commissions	Counties	Funded Through	Date of Plan Approval	Expiration Date
E	Northwest Alabama Council of Local	Colbert, Franklin, Lamar, Lawrence,	HMGP, counties, NACOLG	January 19, 2021	January 18, 2026

AEMA Division Number	Regional Planning Commissions	Counties	Funded Through	Date of Plan Approval	Expiration Date
	Governments (NACOLG)	Marion, Walker, Winston			

Fayette County and Lauderdale County - See Figure 10

Figure 7: AEMA Division E Counties



Table 8: AEMA Division F Counties

AEMA Division Number	Regional Planning Commissions	Counties	Funded Through	Date of Plan Approval	Expiration Date
F, Phases I and II	Top of Alabama Regional Council of Governments (TARCOG)	Blount, Cherokee, Cullman, DeKalb, Etowah, Jackson, Limestone, Madison, Morgan	HMGP, counties, in-kind	March 17, 2021	March 16, 2026

Marshall County - See Figure 10

Figure 8: AEMA Division F Counties

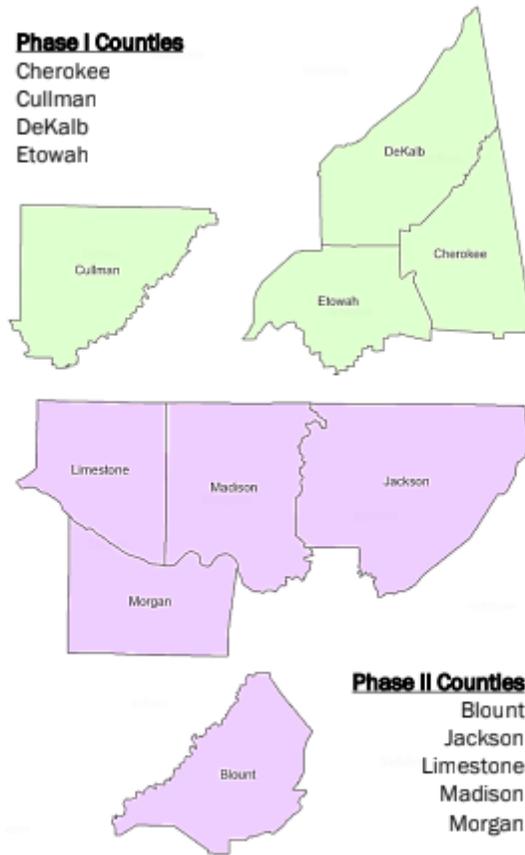


Figure 1.3 | Division F Subregion I (Green) and Subregion II (Purple)

Table 9: AEMA Division G, Phase I Counties

AEMA Division Number	Regional Planning Commissions	Counties	Funded Through	Date of Plan Approval	Expiration Date
G, Phase I	East Alabama Regional Planning and Development Commission (EARPDC)	St. Clair, Randolph	HMGP, Randolph and St. Clair Counties	12/17/2020	12/16/2025

Table 10: AEMA Division G, Phase II Counties

AEMA Division Number	Regional Planning Commissions	Counties	Funded Through	Date of Plan Approval	Expiration Date
G, Phase II	East Alabama Regional Planning and Development Commission (EARPDC)	Calhoun, Jefferson	HMGP, Calhoun and Jefferson Counties	12/17/2020	12/16/2025

Table 11: AEMA Division G, Phase III Counties

AEMA Division Number	Regional Planning Commissions	Counties	Funded Through	Date of Plan Approval	Expiration Date
G, Phase III	East Alabama Regional Planning and Development Commission (EARPDC)	Cleburne	HMGP, Cleburne County	12/17/2020	12/16/2025

Table 12: AEMA Division G, Phase IV Counties

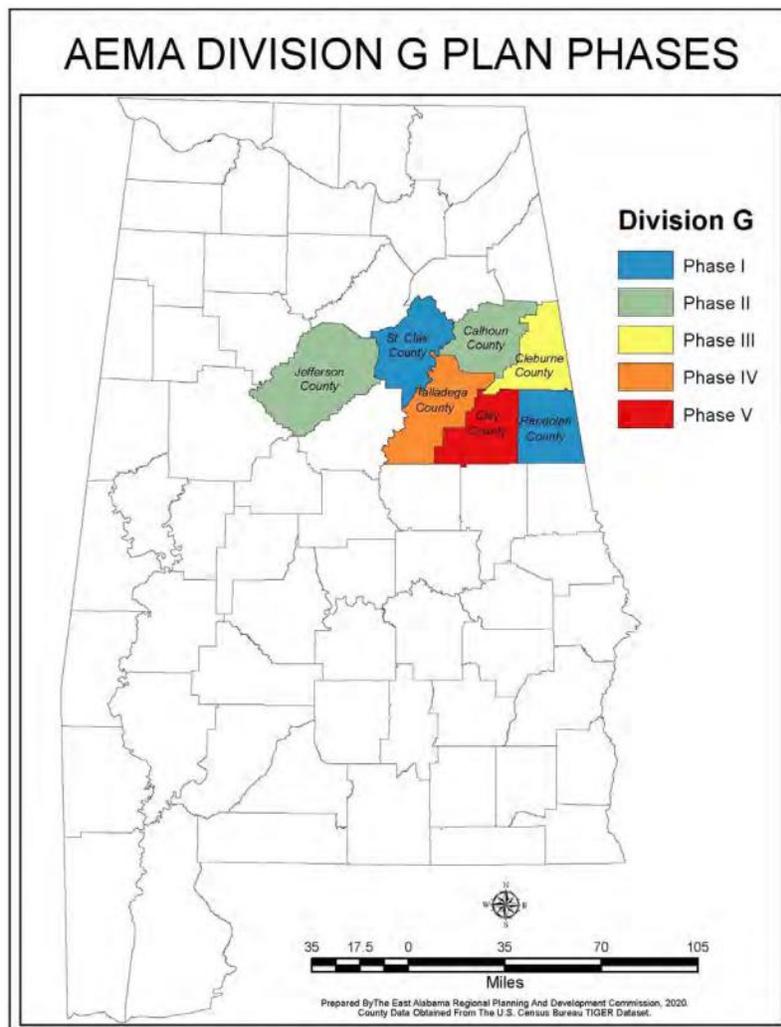
AEMA Division Number	Regional Planning Commissions	Counties	Funded Through	Date of Plan Approval	Expiration Date
G, Phase IV	East Alabama Regional Planning and Development Commission (EARPDC)	Talladega	HMGP, Talladega County	12/17/2020	12/16/2025

Table 13: AEMA Division G, Phase V Counties

AEMA Division Number	Regional Planning Commissions	Counties	Funded Through	Date of Plan Approval	Expiration Date
G, Phase V	East Alabama Regional Planning and Development Commission (EARPDC)	Clay	HMGP, Clay County	12/17/2020	12/16/2025

Shelby County - See Figure 10

Figure 9: Division G Counties



Source: EARPDC; Census Bureau

The following Counties and Tribal Nation elected to pursue their own hazard mitigation plans.

Figure 10: County Multi-Jurisdictional Hazard Mitigation Plan Status

County	Date Approved	Expiration Date
Bullock	September 16, 2021	September 15, 2026
Choctaw	October 06, 2020	October 05, 2025
Fayette	June 30, 2022	June 29, 2027
Marshall	August 27, 2021	August 26, 2026
Lauderdale	April 14, 2023	April 13, 2028
Poarch Band of Creek Indians	December 16, 2019	December 15, 2004
Shelby	June 13, 2022	June 12, 2027

Technical Assistance for Local Hazard Mitigation Plans

Throughout the development, review, and update process, AEMA serves as a liaison between FEMA and the local jurisdictions. AEMA's involvement includes providing significant technical assistance to local plan preparers.

As part of the effort to assure linkage between the local plans and the State Plan, AEMA shares risk assessment data and mitigation priorities with local governments for their plan updates by providing a copy of the most recent State Plan and other data sources with the local planning leads.

The timeframe for sharing these resources is dependent on where local governance is in the planning process. Typically, the data sources provided are updated periodically. As such if a data source is due to be updated then the information may be delayed slightly to provide the most up to date information.

The AEMA uses several avenues to enhance information sharing. The state utilizes its web portal to disseminate policy, guidance, and funding opportunities. Additionally, the web portal has a test site with complete samples of various subapplication types to assist subapplicants with subapplication development. The AEMA Hazard Mitigation staff also attend and provide information at quarterly meetings with the seven AEMA Divisions. The AEMA HM division also makes available webinars and other electronically available training on a variety of platforms. Web-based, Zoom, Microsoft Teams, etc. Information is also shared via our EOC EMCs. We also use a damage assessment tool called Orion that provides documented prior damage histories to any local governance.

AEMA representatives also provided technical assistance via telephone to the RPC and local EMA staff to answer questions and explain the Disaster Mitigation Act of 2000 guidelines and the hazard mitigation planning process. In addition, the AEMA Recovery Plans Chief worked with

RPCs and counties to develop regional hazard mitigation plans, including NACOLG, ATRC, SEARPDC, and the LRCOG.

AEMA also has a state review process and timeframe in place for local plan development. The state reviews each of the county plans for applicability to the CFR requirements prior to FEMA's formal review. The process and timeframe employed by the state for review are summarized in the following table.

Table 14: Process and Timeframe Used by the State for Review of Local HMPs

Step	Process
1	The initial draft of a local county plan is sent to AEMA for review within a 30-day timeframe. If required, revisions are sent back to the county for corrections. If no revisions are required, the draft is submitted to FEMA for review and approval.
2	The county has a 30-day period to address AEMA's review comments and submit a corrected draft to AEMA.
3	AEMA has 30 days to review the revisions. If required, revisions are sent back to the county. If all revisions are correct, AEMA submits the plan to FEMA for review and approval.
4	FEMA completes its review within 45 days and forwards its comments to AEMA. AEMA immediately forwards AEMA and FEMA review comments to the county.
5	The county has a 30-day period to address any FEMA comments. The county submits the corrected final draft to AEMA.
6	Within 30 days, AEMA checks the corrected final draft and forwards it to FEMA for review of the corrections.
7	FEMA completes its second review within 45 days, and if all comments were satisfactorily addressed in the corrected final draft of the plan, a letter stating that the plan is approvable pending adoption (APA) is mailed to AEMA.. In cases where comments have not been satisfactorily addressed, the county again addresses the comments and repeats the process, thereby delaying the timeframe for approval and adoption.
8	The plan is then formally adopted by all participating jurisdictions within the county within a reasonable period that allows for local review, public participation, legal notices, public hearings, and governing body adoptions. The local adoption process should be completed within a 30- to 60-day timeframe.
9	The plan is officially approved. The timeframe from the county's submission of the initial draft plan to the adoption of the final, approved plan can take over 210 days to complete.

Notes:

- In the case of Division/Regional HMPs, the plan developer will be contacted.
- Local hazard mitigation plan adoption resolutions will be discussed before, during, and after the HMP review process to improve adoption resolution submission.

Funding for Local Hazard Mitigation Projects and Planning

Since the 2018 plan update to the SHMP, the state has provided funding assistance to most of the regional/county plans through four federal funding programs: Pre-Disaster Mitigation (PDM) Grants up until BRIC 2020, Building Resilient Infrastructure and Communities (BRIC), Hazard Mitigation Grant Program (HMGP), and Community Development Block Grants (CDBG). AEMA continues to administer federal funding when it is available and works with counties and regions to identify potential funding sources.

AEMA uses several factors in determining the prioritization of subapplication selections. These factors include subapplication completeness, quality, cost effectiveness, being in a declared county and the social vulnerability Index rating. Subapplications that obtain the highest rankings when these factors are applied will be prioritized in order accordingly. Exceptions exist such as a county or division hazard mitigation plan update.

Barriers to Updating, Adopting and Implementing Local Hazard Mitigation Plans

The development of local hazard mitigation plans is often beset by a number of barriers. In states with large rural areas, such as Alabama, there is frequently a lack of human capital in smaller jurisdictions. As discussed in the Capability Assessment (Section 4), the majority of local jurisdictions in Alabama are rural, with small populations and low public revenue streams. As a result, many jurisdictions lack the human capital to effectively monitor hazards, collect and analyze the datasets, and build updated plans. The COVID-19 pandemic and the multiple disasters described act as barriers to local hazard mitigation plan updates and adoption in many cases.

The Local Capability Table (see Table 15), which is based on an analysis of the most recent local hazard mitigation plan updates for all 67 of Alabama's counties indicates that only 26 counties employ a full-time planner or have a municipality within their bounds that employs a full-time planner. In some cases, the county engineer serves as the engineer for all municipalities within that county and sometimes takes on additional roles such as a planner or building inspector. It is difficult for a one- or two-person staff to take on a project with the scope and size of a hazard mitigation plan update.

In many cases, even if the workforce existed to support a plan update, smaller and more rural counties may also lack an adequate existing regulatory infrastructure within which mitigation actions may be implemented. For example, of the 526 counties, cities, towns, and tribal lands in Alabama represented by the 67-county hazard mitigation plan updates since 2013, only a little

more than half (267) of the jurisdictions have a zoning ordinance in place. Even fewer jurisdictions have adopted building codes, subdivision regulations, or comprehensive plans.

Another barrier that jurisdictions sometimes encounter while building local mitigation plans is the scarcity of complete, high-quality data. This is often the case when researching the extent of or historical occurrences of certain hazards. For example, some hazards, such as sea level rise, have only been recognized as a threat in the last two decades and consequently have not been tracked for as long as other hazards. In the case of sea level rise, as discussed in Section 3, there are only two sources of measurement of sea level along Alabama's coast with sufficient datasets for analysis. As discussed above, some counties simply do not have the personnel to monitor, record, and publish data for all hazards. In the extreme case, there simply is no relevant historic dataset for threats that occur extremely infrequently, such as a tsunami. Even in cases where an abundance of data exists, such as for flooding events or hurricanes, some data sources may offer incongruent, incomplete, or conflicting data regarding a particular event.

AEMA recognizes that local hazard mitigation planning is often limited by the barriers discussed above and understands its role in helping jurisdictions overcome those barriers. As discussed above, AEMA provides technical assistance to jurisdictions through Hazard Mitigation Planning Workshops. These workshops provide the personnel responsible for local plan development access to AEMA's expertise on planning requirements as set forth by the CFR and can help local planners identify statewide mitigation programs into which local mitigation action may integrate. AEMA also reviews each county plan for applicability to the CFR requirements before FEMA's formal review. This review occurs according to a well-defined process and timeframe for local plan development, as outlined above. During the next 5 years (and beyond), several initiatives will be employed/refined in an effort to remove potential barriers and assist local governments in updating, adopting, and implementing FEMA-approved local mitigation plans.

- Provide access to ORION (AEMA Damage Assessment Portal) to Local Governments for Easier Access to Historical, High Quality-Damage Data.
- Prepare Presentations for Division Meeting to promote the Local HMP Update, Adoption and Implementation Process.
- Work with local EMA (via meetings, phone calls, and disaster-related opportunities) to identify local HMP training needs.
- Work with Divisional and Stand-Alone Plan Developer to identify HMP training needs.
- Coordinate Training Session with FEMA for State and Local Delivery.
- Develop procedures to assist APA Jurisdictions with the Local HMP Adoption Process in a Timely Manner.
- Prioritize HMGP Funding Outreach Efforts According to Current Local HMP Expiration Dates.

As documented in this plan, AEMA invites and welcomes local stakeholders into the State Hazard Mitigation Plan update process as well, to better familiarize local planners with the State Plan update. Appendix E of this plan identifies the local stakeholders present at the Risk Assessment Meeting, the Mitigation Strategy Meeting, and the Plan Review Meeting during the development of this document.

AEMA understands that regional collaboration can also be useful for many understaffed jurisdictions. In the past, AEMA has conducted outreach to jurisdictions through the RPCs; some of these RPCs, such as the NACOLG and SEARPDC, build local hazard mitigation plan updates as regional documents. For this update, as discussed in Section 1.2.2.5, AEMA leveraged its internal geographic divisions to distribute information about the state planning process. For example, as described in the Outreach Strategy (Section 1.2.3.2), AEMA distributed a monthly mitigation newsletter to its local stakeholders through its geographic divisions. While these newsletters provided updates on the state planning process, they also profiled common hazards and innovative mitigation actions, with links and directions to relevant data and more information. This helps bridge the capability gap some counties encounter in accessing complete, high-quality data during their own plan development process.

Finally, as funding is often a limiting factor for local plan updates, AEMA channels grant funding from FEMA to some jurisdictions that leverage HMGP or BRIC grants to support the update of the local planning process. The Mitigation Strategy (Section 5) describes the process through which AEMA directs these funding sources.

Local Capability Table

The following table summarizes the local mitigation capabilities of each jurisdiction within each county in Alabama. This information is collected from the most recent update of each county's local hazard mitigation plan. The table assesses capabilities across the following dimensions:

- **HMP:** Has the jurisdiction adopted a hazard mitigation plan that has been approved by FEMA?
- **NFIP:** Is the jurisdiction a regular member of the National Flood Insurance Program?
- **CRS:** Does the jurisdiction participate in the Community Rating System Program, and if so, what is its class?
- **ZONE:** Does the jurisdiction administer a zoning ordinance?
- **SUB REG:** Does the jurisdiction administer subdivision regulations?
- **BLDG CODE:** Does the jurisdiction administer building codes?
- **BCEGS:** What is the ISO classification of the jurisdiction under the Building Code Effectiveness Grade Schedule?
- **PPC:** What is the ISO classification of the jurisdiction under the Property Protection Classification for fire protection?

- **COMP PLAN:** Has the jurisdiction adopted a comprehensive plan to guide the community's long-term (10- to 25-year) growth and development within the last five years, or is its preparation or update still in progress?
- **CIP:** Does the jurisdiction program its annual capital expenditures on a multi-year capital improvements plan?
- **MIT PROJ EXP:** What is the jurisdiction's level of experience with mitigation projects funded through a FEMA grant program? (0 = no experience, 1 = limited experience, 2 = moderate experience, 3 = significant experience)
- **PLNR:** Does the jurisdiction have a full-time professional planner on staff?
- **ENGR:** Does the jurisdiction have a full-time professional engineer on staff?
- **CFM:** Does the jurisdiction have a Certified Floodplain Manager on staff to administer its floodplain management ordinance?
- **BLDG INSP:** Does the jurisdiction have a full-time building inspector on staff?
- **CAPAB RAT:** What are the community's overall capabilities to carry out mitigation activities, based on the above criteria? (1 = very limited capabilities, 2 = limited capabilities, 3 = moderate capabilities, 4 = substantial capabilities, 5 = very substantial capabilities)

Where information is available, most fields have been filled either with a "Y" in the case that the jurisdiction possesses that capability, or with an "N" in the case that the jurisdiction does not possess that capability. Other selected fields in the table are populated with the following abbreviations:

- **A:** Adopted, not implemented
- **E:** Exempt
- **NA:** Not applicable
- **NM:** Not mapped
- **R:** Rescinded
- **S:** Sanctioned

Table 15: Local Capability Table by RPC, by County

JURISDICTION	TYPE	REG	HMP	NFIP	CRS	ZONE	SUB REG	BLDG CODE	BCEGS	PPC	COMP PLAN	CIP	MIT PROJ EXP	PLNR	ENGR	CFM	BLDG INSP	CAPAB RAT
Region 1: Northwest Alabama Council of Local Governments																		
Colbert County																		
Unincorporated	County	1	Y	Y	NA	N	N	N				Y			Y			N
Cherokee	City	1	Y	Y	NA	Y	N	Y			Y	Y						N
Leighton	Town	1	Y	Y	NA	Y	N	N			N	Y						N
Littleville	Town	1	Y	Y	NA	N	N	N			N	Y						N
Muscle Shoals	City	1	Y	Y	NA	Y	Y	Y			Y	Y		Y				N
Sheffield	City	1	Y	Y	NA	Y	Y	Y			N	Y						N
Tuscumbia	City	1	Y	Y	NA	Y	Y	Y			N	Y						N
Franklin County																		
Unincorporated	County	1	Y	Y	NA	N	N	N				Y						N
Hodges	Town	1	Y	Y	NA	Y	N	N			N	Y						N
Phil Campbell	Town	1	Y	Y	NA	Y	N	N			N	Y						N
Red Bay	City	1	Y	Y	NA	N	N	N			N	Y						N
Russellville	City	1	Y	Y	NA	Y	Y	Y			N	Y						N
Vina	Town		Y								N	Y						N

JURISDICTION	TYPE	REG	HMP	NFIP	CRS	ZONE	SUB REG	BLDG CODE	BCEGS	PPC	COMP PLAN	CIP	MIT PROJ EXP	PLNR	ENGR	CFM	BLDG INSP	CAPAB RAT
Lauderdale County																		
Unincorporated	County	1	Y	Y	NA	N	Y	N			N	N		Y	Y	N		
Anderson	Town	1	N	Y	NA	Y	NA	N			N	N		N	N	N		
Florence	City	1	N	Y	NA	Y	Y	Y			Y	N		Y	Y	N	Y	
Killen	Town	1	N	Y	NA	N	Y	Y			Y	N		N	N	N		
Lexington	Town	1	N	Y	NA	N	N	N			N	N		N	N	N		
Rogersville	Town	1	N	Y	NA	Y	N	N			N	N		N	N	N		
St. Florian	Town	1	N	Y	NA	N	Y	Y			Y	N		Y	N	N		
Waterloo	Town	1	N	Y	NA	N	Y	Y			N	N		N	N	N		
Marion County																		
Unincorporated	County	1	Y	Y	NA	N	N	N			Y	N					N	
Bear Creek	Town	1	Y	N	NA	N	N	N			Y	N					N	
Brilliant	Town	1	Y	N	NA	N	N	N			Y	N					N	
Guin	City	1	Y	Y	NA	N	N	N			Y	N					N	
Gu-Win	Town	1	N	N	NA	N	N	N			Y	N					N	
Hackleburg	Town	1	N	N	NA	N	N	N			Y	N					N	
Hamilton	City	1	Y	Y	NA	Y	N	Y			Y	N					N	
Twin	Town	1	Y	Y	NA	N	N	N				Y					N	

JURISDICTION	TYPE	REG	HMP	NFIP	CRS	ZONE	SUB REG	BLDG CODE	BCEGS	PPC	COMP PLAN	CIP	MIT PROJ EXP	PLNR	ENGR	CFM	BLDG INSP	CAPAB RAT
Winfield	City	1	Y	Y	NA	Y	Y	N			Y	Y				N		
Winston County																		
Unincorporated	County	1	Y	Y	NA	N	N	N				Y				N		
Addison	Town	1	Y	Y	NA	N	N	N			Y	Y				N		
Arley	Town	1	Y	N	NA	N	N	N			N	Y				N		
Double Springs	City	1	Y	N	NA	Y	N	N			N	Y				N		
Haleyville	City	1	Y	Y	NA	Y	Y	Y			Y	Y				N		
Lynn	Town	1	Y	N	NA	N	N	N			Y	Y				N		
Natural Bridge	Town	1	Y	N	NA	N	N	N			N	Y				N		

Table 16: Region 2: West Alabama Regional Commission

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT
Region 2: West Alabama Regional Commission																		
Bibb County																		
Unincorporated	County	2	Y	Y	NA	N		Y			N	N			Y	N		

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT
Brent	City	2	Y	Y	NA	Y		N			N	N				N		
Centreville	City	2	Y	Y	NA	Y		Y			N	N				N		
Vance	Town	2	Y	Y	NA	Y		Y			N	N				N		
West Blocton	Town	2	Y	Y	NA	Y		N			N	N				N		
Woodstock	Town	2	Y	Y	NA	Y		Y			N	N				N	Y	
Fayette County																		
Unincorporated	County	2	Y	Y	NA	N	N	N			N	Y			N	N	N	
Belk	Town	2	Y	Y	NA	N	N	N			N	Y			N	N	N	
Berry	Town	2	Y	Y	NA	Y	N	N			N	Y			N	N	N	
Fayette	City	2	Y	Y	NA	Y	Y	Y			Y	Y			Y	N	Y	
Glen Allen	Town	2	Y	Y	NA	N	N	N			N	Y			N	N	N	
Greene County																		
Unincorporated	County	2	Y	Y	NA	N	N	N			Y	Y		Y		N		
Boligee	Town	2	Y	Y	NA	N	N	N			N	N				N		
Eutaw	City	2	Y	Y	NA	Y	N	Y			N	N				Y		
Forkland	Town	2	Y	N	NA	N	N	N			N	N				N		
Union	Town	2	Y	N	NA	N	N	N			N	N				N		
Hale County																		
Unincorporated	County	2	Y	Y	NA	N	N	N			N	N			Y	N		

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT
Akron	Town	2	Y	N	NA	Y	N	Y			N	Y				N		
Greensboro	City	2	Y	Y	NA	Y	N	Y			N	N				N		
Moundville	City	2	Y	Y	NA	Y	N	Y			Y	N				Y		
Newbern	Town	2	Y	N	NA	Y	N	N			N	N				N		
Lamar County																		
Unincorporated	County	2	Y	Y	NA	N	N	N			N	N			Y	N		
Beaverton	Town	2	Y	Y	NA	N	N	N			N	N				N		
Detroit	Town	2	Y	Y	NA	N	N	N			Y	N				N		
Kennedy	Town	2	Y	Y	NA	N	Y	Y			Y	N				N		
Millport	Town	2	Y	Y	NA	Y	Y	N			Y	Y				N		
Sulligent	City	2	Y	Y	NA	N	N	N			N	N				N		
Vernon	City	2	Y	Y	NA	Y	Y	Y			N	Y				N		
Pickens County																		
Unincorporated	County	2	Y	Y	NA	N	N	N			N	N			Y	N		
Aliceville	City	2	Y	Y	NA	Y	N	Y			Y	N				N		
Carrollton	Town	2	Y	Y	NA	Y	N	Y			N	N				N		
Ethelsville	Town	2	N	N	NA	N	N	N			N	N				N		
Gordo	Town	2	Y	Y	NA	Y	N	Y			N	Y				N		
McMullen	Town	2	N	N	NA	N	N	N			N	N				N		

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT
Memphis	Town	2	N	N	NA	N	N	N			N	N				N		
Pickensville	Town	2	Y	Y	NA	N	N	N			N	N				N		
Reform	Town	2	Y	Y	NA	Y	N	Y			N	N				N		
Tuscaloosa County																		
Unincorporated	County	2	Y	Y	NA	N	Y	N			N	N		N	Y	Y	N	
Brookwood	Town	2	Y	Y	NA	Y	Y	Y			N	N		N	N	N	Y	
Coaling	Town	2	Y	Y	NA	Y	Y	Y			N	N		N	N	N	Y	
Coker	Town	2	Y	Y	NA	N	N	N			N	N		N	N	N	N	
Lake View	Town	2	Y	Y	NA	Y	N	N			N	N		N	N	N	N	
Northport	City	2	Y	Y	NA	Y	Y	Y			Y	Y		Y	Y	N	Y	
Tuscaloosa	City	2	Y	Y	8	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Vance	Town	2	Y	Y	NA	Y	Y	Y			N	N		N	N	N	Y	
Region 3: Regional Planning Commission of Greater Birmingham																		
Blount County																		
Unincorporated	County	3	Y	Y	NA	N	Y	N			N	N		Y	Y	Y	N	
Allgood	Town	3	Y	NM	NA	N	N	N			N	N		N	N	Y	N	
Blountsville	Town	3	Y	Y	NA	Y	N	N			N	N		N	N	Y	N	
Cleveland	Town	3	Y	Y	NA	N	N	N			N	N		N	N	Y	N	
Hayden	Town	3	Y	NM	NA	N	N	N			N	N		N	N	Y	N	

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT	
Highland Lake	Town	3	Y	Y	NA	Y	Y	Y			N	N		N	N	Y	Y		
Locust Fork	Town	3	Y	N	NA	N	Y	N			N	N		N	N	Y	N		
Nectar	Town	3	Y	N	NA	N	N	N			N	N		N	N	Y	N		
Oneonta	City	3	Y	Y	NA	Y	Y	Y			N	N		N	Y	Y	Y		
Rosa	Town	3	Y	Y	NA	N	N	N			N	N		N	N	Y	N		
Snead	Town	3	Y	Y	NA	N	N	N			N	N		N	N	Y	N		
Susan Moore	Town	3	Y	Y	NA	Y	N	N			N	N		N	N	Y	N		
Chilton County																			
Unincorporated	County	3	Y	Y	NA	N	N	N			N	N		N	Y	Y	N		
Clanton	City	3	Y	Y	NA	Y	N	Y			Y	N		N	Y	Y	N		
Jemison	City	3	N	Y	NA	Y	Y	Y			Y	N		N	Y	N	N		
Maplesville	Town	3	N	Y	NA	N	N	N			N	N		N	Y	Y	N		
Thorsby	Town	3	N	Y	NA	Y	Y	Y			Y	N		N	Y	Y	N		
Jefferson County																			
Unincorporated	County	3	Y	Y	NA												Y		
Adamsville	City	3	N	Y	NA	Y	Y	Y			Y	Y		N	N	N	N		
Bessemer	City	3	Y	Y	NA	Y	Y	Y			Y	N		N	Y	Y	Y		
Birmingham	City	3	Y	Y	5	Y	Y	Y			Y	Y		Y	Y	Y	Y		
Brighton	City	3	N	Y	NA	Y					N					N			

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT
Brookside	Town	3	N	Y	NA	Y	Y	Y			Y	Y		N	N	N	N	
Center Point	City	3	N	Y	NA	Y	Y	Y			Y	Y		N	N	N	Y	
Clay	City	3	N	Y	NA	Y	Y	Y			Y	N		N	N	N	Y	
County Line	Town	3	Y	NM	NA	Y	N	N			N	N		N	N	N	N	
Fairfield	City	3	N	Y	NA	Y	N	N			N	Y		Y	N	N	Y	
Fultondale	City	3	N	Y	NA	Y	Y	Y			Y	Y		Y	Y	N	Y	
Gardendale	City	3	Y	Y	NA	Y	Y	Y			Y	Y		N	Y	N	Y	
Graysville	City	3	Y	Y	NA	Y	Y	Y			Y	Y		N	N	N	N	
Homewood	City	3	N	Y	9	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Hoover	City	3	N	Y	8	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Hueytown	City	3	N	Y	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Irondale	City	3	N	Y	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Kimberly	Town	3	Y	Y	NA	Y	Y	Y			N	N		N	N	N	N	
Leeds	City	3	N	Y	NA	Y	Y	Y			N	N		Y	N	Y	Y	
Lipscomb	City	3	N	Y	NA	Y					N					N		
Midfield	City	3	N	Y	NA	Y	Y	Y			N	Y		N	N	N	Y	
Morris	Town	3	Y	Y	NA	Y	Y	Y			N	N		N	N	N	N	
Mountain Brook	City	3	N	Y	NA	Y	Y	Y			Y	Y		Y	N	N	Y	

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT
Mulga	Town	3	N	Y	NA	Y	Y	Y			Y	N		N	N	N	N	
Pinson	City	3	Y		NA	Y	Y	Y			Y	Y		N	N	N	N	
Pleasant Grove	City	3	N	Y	NA	Y	Y	Y			Y	Y		N	Y	N	Y	
Sylvan Springs	Town	3	Y	S	NA	Y	Y	Y			N	N		N	N	N	N	
Tarrant	City	3	Y		NA	Y					N					N		
Trafford	Town	3	Y	Y	NA	Y	N	Y			Y	Y		N	N	N	N	
Trussville	City	3	N	Y	NA	Y	Y	Y			Y	N		N	Y	Y	Y	
Vestavia Hills	City	3	N	Y	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Warrior	City	3	N	Y	NA	Y	Y	Y			Y	N		N	Y	N	Y	
West Jefferson	Town	3	N	S	NA	Y	N	Y			N	Y		N	N	N	N	
Shelby County																		
Unincorporated	County	3	Y	Y	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Alabaster	City	3	Y	Y	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Calera	City	3	Y	Y	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Chelsea	City	3	Y	Y	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Columbia	City	3	Y	Y	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Harpersville	Town	3	Y	Y	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Helena	City	3	Y	Y	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y	

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT
Indian Springs Village	Town	3	Y	Y	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Montevallo	City	3	Y	Y	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Pelham	City	3	Y	Y	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Vincent	Town	3	Y	Y	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Westover	Town	3	Y	Y	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Wilsonville	Town	3	Y	Y	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Wilton	Town	3	Y	N	NA	Y	Y	Y			N	Y		Y	Y	Y	Y	
St. Clair County																		
Unincorporated	County	3	Y	Y	NA	N	N	N			Y	N		Y	Y	Y	N	
Argo	City	3	Y	Y	NA	Y	Y	N			Y	N		N	N	N	N	
Ashville	City	3	N	Y	NA	Y	Y	N			Y	N		N	N	N	N	
Margaret	City	3	N	Y	NA	Y	Y	N			Y	N		N	N	N	Y	
Moody	City	3	Y	Y	NA	Y	Y	N			Y	N		N	N	N	N	
Odenville	City	3	Y	Y	NA	Y	Y	N			Y	N		N	N	Y	N	
Pell City	City	3	Y	Y	8	Y	Y	N			Y	N		N	Y	Y	Y	
Ragland	Town	3	Y	Y	NA	Y	N	N			Y	N		N	N	N	N	
Riverside	City	3	Y	Y	NA	Y	Y	N			Y	N		N	N	Y	N	
Springville	City	3	Y	Y	NA	Y	Y	Y			Y	Y		N	N	Y	Y	

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT
Steele	Town	3	N	Y	NA	Y	N	N			Y	N		N	N	N	N	
Walker County																		
Unincorporated	County	3	Y	Y	NA	Y	Y	Y			Y	N		N	N	N	Y	
Carbon Hill	City	3	N	Y	NA	Y	N	N			N	N		N	Y	N	N	
Cordova	City	3	N	Y	NA	N	N	N			N	N		N	Y	N	N	
Dora	City	3	Y	Y	NA	N	N	N			N	N		N	N	N	Y	
Eldridge	Town	3	N	Y	NA	N	N	N			N	N		N	N	N	N	
Jasper	City	3	N	Y	NA	Y	N	N			N	N		Y	N	N	N	
Kansas	Town	3	N	Y	NA	N	N	N			N	N		N	N	N	N	
Nauvoo	Town	3	Y	Y	NA	N	N	N			N	N		N	N	N	N	
Oakman	Town	3	N	Y	NA	N	N	N			N	N		N	Y	N	N	
Parrish	Town	3	N	Y	NA	N	N	N			N	N		N	N	N	N	
Sipsey	Town	3	N	Y	NA	N	N	N			N	N		N	N	N	N	
Sumiton	City	3	N	Y	NA	Y	N	N			N	N		N	N	N	N	
Region 4: East Alabama Regional Planning and Development Commission																		
Calhoun County																		
Unincorporated	County	4	Y	Y	NA	N	N	N			Y	N		Y	Y	N	N	
Anniston	City	4	Y	Y	NA	Y	N	Y			Y	Y		N	N	Y	N	
Hobson	City	4	N	Y	NA	N	N	N			N	N		N	N	N	N	

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT	
Jacksonville	City	4	Y	Y	NA	Y	N	Y			N	N		Y	N	Y	N		
Ohatchee	Town	4	N	Y	NA	Y	N	N			N	N		N	N	N	N		
Oxford	City	4	Y	Y	NA	Y	N	Y			Y	N		Y	Y	Y	N		
Piedmont	City	4	N	Y	NA	Y	N	Y			N	N		N	N	N	Y		
Weaver	City	4	N	Y	NA	Y	N	Y			N	N		N	N	Y	Y		
Chambers County																			
Unincorporated	County	4	Y	Y	NA	N	Y	N			N	N		Y	Y	Y	N		
Cusseta	Town	4	N	NM	NA	N	N	N			N	N		Y	N	N	N		
Five Points		4	Y	S	NA	N	N	N			N	N		Y	N	Y	N		
Fredonia	Town	4	N	NM	NA	N	N	N			N	N		Y	N	N	N		
LaFayette	City	4	N	Y	NA	Y	N	Y			N	N		Y	N	Y	Y		
Lanett	City	4	N	Y	NA	Y	N	Y			N	N		Y	N	Y	Y		
Valley	City	4	Y	Y	NA	Y	N	Y			Y	N		Y	N	Y	Y		
Waverly	Town	4	Y	NM	NA	Y	Y	N			N	N		Y	N	N	N		
Cherokee County																			
Unincorporated	County	4	Y	Y	NA	N	N	N			N	N		N	Y	N	N		
Cedar Bluff	Town	4	N	Y	NA	Y	N	Y			Y	N		N	N	N	N		
Centre	City	4	N	Y	NA	Y	N	Y			N	N		N	N	N	N		
Gaylesville	Town	4	Y	Y	NA	N	N	N			N	N		N	N	N	N		

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT	
Leesburg	Town	4	N	Y	NA	N	N	N			N	N		N	N	Y	N		
Sand Rock	Town	4	N	Y	NA	N	N	N			N	N		N	N	N	N		
Clay County																			
Unincorporated	County	4	Y	NM	NA	N	N	N			N	N		N	Y	N	N		
Ashland		4	Y	NM	NA	Y	Y	N			N	N		N	N	N	N		
Lineville		4	Y	NM	NA	Y	Y	N			N	N		N	N	N	N		
Cleburne County																			
Unincorporated	County	4	Y	N	NA	N	N	N			N	N		N	Y	N	N		
Edwardsville	Town	4	Y	N	NA	N	N	N			N	N		N	N	N	N		
Fruithurst	Town	4	Y	N	NA	N	N	N			N	N		N	N	N	N		
Heflin	City	4	Y	Y	NA	Y	N	Y			Y	Y		N	Y	N	N		
Ranburne	Town	4	Y	N	NA	N	N	N			Y	N		N	N	N	N		
Coosa County																			
Unincorporated	County	4	Y	Y	NA	N	N	N			N	N		N	Y	N	N		
Goodwater		4	N	Y	NA	N	N	N			Y	N		N	N	N	N		
Kellyton		4	N	NM	NA	Y	N	N			N	N		N	N	N	N		
Rockford		4	N	N	NA	N	N	N			N	N		N	N	N	N		
Etowah County																			
Unincorporated	County	4	Y	Y	NA									Y	Y	N			

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT	
Altoona	Town	4	Y	Y	NA						N					N			
Attalla	City	4	Y	Y	NA						N				Y	N			
Boaz	City	4	Y	Y	NA	Y	Y	Y			Y	N		N	N	N	N		
Gadsden	City	4	Y	Y	NA						N					N			
Glencoe	City	4	Y	Y	NA						N					N	Y		
Hokes Bluff	City	4	Y	Y	NA						N					N			
Rainbow City	City	4	Y	Y	NA						Y				Y	Y			
Reece City	Town	4	Y	Y	NA						N					N			
Ridgeville	Town	4	Y	E	NA						N					N			
Southside	City	4	Y	Y	NA						N					N			
Walnut Grove	Town	4	Y	Y	NA						N					N			
Randolph County																			
Unincorporated	County	4	Y	Y	NA	N	N	N			Y	Y		N	Y	N	N		
Roanoke	City	4	Y	Y	NA	Y	N	N			Y	Y		N	N	N	N		
Wadley	Town	4	Y	Y	NA	Y	N	N			Y	Y		N	N	N	N		
Wedowee	Town	4	Y	Y	NA	N	N	N			Y	Y		N	N	N	N		
Woodland	Town	4	Y	N	NA	N	N	N			Y	Y		N	N	N	N		
Talladega County																			
Unincorporated	County	4	Y	Y	NA	N	N	N			N	N		Y	Y	Y	N		

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT	
Talladega County	City	4	Y	Y	NA	Y	N	Y			N	Y		N	N	Y	N		
Childersburg	City	4	Y	Y	NA	Y	N	Y			Y	N		N	N	Y	N		
Sylacauga	City	4	Y	Y	NA	Y	N	Y			Y	Y		N	N	Y	N		
Lincoln	City	4	Y	Y	NA	Y	N	Y			Y	N		N	N	N	N		
Munford		4	Y	Y	NA	Y	N	N			N	N		N	N	Y	N		
Oak Grove	Town	4	Y	N	NA	Y	N	Y			Y	N		N	N	N	N		
Tallapoosa County																			
Unincorporated	County	4	Y	Y	NA	N	N	Y			Y	Y		N	Y	Y	N		
Alexander City	City	4	Y	Y	NA	Y	N	Y			N	N		N	N	Y	N		
Camp Hill	Town	4	Y	Y	NA	Y	N	Y			Y	N		N	N	Y	N		
Dadeville	Town	4	Y	Y	NA	Y	N	Y			Y	N		N	N	Y	N		
Goldville	Town	4	Y	Y	NA	N	N	N			N	N		N	N	N	N		
Jackson's Gap	Town	4	Y	Y	NA	Y	N	Y			N	N		N	N	N	N		
New Site	Town	4	Y	Y	NA	Y	N	Y			N	N		N	N	N	N		
Tallassee	City	4	Y	Y	NA	Y	N	Y			Y	N		N	N	Y	N		
Region 5: South Central Alabama Development Commission																			
Bullock County																			
Unincorporated	County	5	Y	Y	NA	N	N	N			Y	Y		Y	Y	N	Y		

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT	
Union Springs	City	5	N	Y	NA	Y	N	Y			Y	Y		Y	Y	N	Y		
Midway	Town	5	N	Y	NA	N	N	N			Y	Y		Y	Y	N	Y		
Butler County																			
Unincorporated	County	5	Y	Y	NA	N	Y	N			N	N		N	Y	N	N		
Georgiana	City	5	Y	Y	NA	Y	N	Y			N	N		N	N	N	Y		
Greenville	City	5	Y	Y	NA	Y	N	N			N	N		N	N	N	N		
McKenzie	Town	5	Y	Y	NA	N	N	N			Y	N		N	N	N	N		
Crenshaw County																			
Unincorporated	County	5	Y	Y	NA	N	N	N			N	N		N	Y	N	N		
Luverne	City	5	Y	Y	NA	Y	N	Y			N	N		N	Y	N	N		
Brantley	Town	5	Y	Y	NA	Y	N	N			N	N		N	N	N	N		
Rutledge	Town	5	Y	N	NA	Y	N	N			N	N		N	N	N	N		
Dozier	Town	5	Y	Y	NA	N	N	N			N	N		N	N	N	N		
Glenwood	Town	5	Y	Y	NA	N	N	N			N	N		N	N	N	N		
Peltrey	Town	5	Y	N	NA	N	N	N			N	N		N	N	N	N		
Lowndes County																			
Unincorporated	County	5	Y	Y	NA	NA	Y	N			N	N		NA	Y	Y	Y		
Benton	Town	5	N	Y	NA	N	N	N			N	N		N	N	N	N		
Fort Deposit	Town	5	N	Y	NA	Y	Y	Y			N	N		Y	N	N	N		

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT	
Gordonville	Town	5	N	N	NA	N	N	N			N	N		N	N	N	N		
Hayneville	Town	5	N	Y	NA	Y	Y	N			Y	N		N	N	N	N		
Lowndesboro	Town	5	N		NA	Y	Y	N			Y	N		Y	N	N	N		
Mosses	Town	5	N	Y	NA	Y	Y	N			Y	N		Y	N	N	N		
White Hall	Town	5	N	Y	NA	N	N	N			N	N		N	N	N	N		
Macon County																			
Unincorporated	County	5	Y	Y	NA	Y	N	N			Y	N		N	Y	Y	N		
Franklin	Town	5	N	N	NA	N	N	N			N	N		N	N	Y	N		
Notasulga	Town	5	Y	Y	NA	Y	N	N			Y	N		N	N	Y	N		
Shorter	Town	5	N	Y	NA	Y	N	N			Y	N		N	N	Y	N		
Tuskegee	City	5	N	Y	NA	Y	N	N			Y	N		N	N	Y	N		
Pike County																			
Unincorporated	County	5	Y	Y	NA	N	N	N			N	N		N	Y	N	N		
Banks	Town	5	N	N	NA	N	N	N			N	N		N	N	N	N		
Brundidge	City	5	N	Y	NA	N	N	N			Y	N		N	N	N	N		
Goshen	Town	5	N	Y	NA	N	N	N			N	N		N	N	N	N		
Troy	City	5	N	Y	NA	Y	N	N			Y	N		N	N	N	N		
Region 6: Alabama-Tombigbee Regional Commission																			
Choctaw County																			

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT	
Unincorporated	County	6	Y	Y	NA	N		N			N				Y	N	N		
Butler	Town	6	Y	Y	NA	N		N			N					N	N		
Gilbertown	Town	6	N	Y	NA	N		N			N					N	N		
Lisman	Town	6	Y	E	NA	N		N			N					N	N		
Needham	Town	6	N	E	NA	N		N			N					N	N		
Pennington	Town	6	N	Y	NA	N		N			N					N	N		
Silas	Town	6	Y	E	NA	N		N			N					N	N		
Toxey	Town	6	N	E	NA	N		N			N					N	N		
Clarke County																			
Unincorporated	County	6	Y	Y	NA	N	N	N			N				Y	N			
Coffeeville	Town	6	Y	Y	NA	N	N	N			N				N	N			
Fulton	Town	6	Y	Y	NA	N	N	N			N				N	N			
Grove Hill	Town	6	Y	Y	NA	Y	Y	Y			Y				N	N			
Jackson	City	6	Y	Y	NA	Y	Y	Y			Y				N	N			
Thomasville	City	6	Y	Y	NA	Y	Y	Y			Y				N	Y	Y		
Conecuh County																			
Unincorporated	County	6	Y	Y	NA	N	N	N			N				Y	N			
Castleberry	Town	6	Y	Y	NA	N	Y	Y			N				N	N			
Evergreen	City	6	Y	Y	NA	Y	N	Y			Y				N	N			

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT
Repton	Town	6	Y	Y	NA	N	N	Y			N				N	N		
Dallas County																		
Unincorporated	County	6	Y	Y	NA	N	N	Y			N			N	Y	N		
Orrville	Town	6	Y	Y	NA	Y	N	N			N			N	N	N		
Selma	City	6	Y	Y	NA	Y	Y	N			Y			Y	Y	N		
Valley Grande	City	6	Y	Y	NA	N	Y	Y			N			N	N	N		
Marengo County																		
Unincorporated	County	6	Y	Y	NA	N	N	N			N				Y	N	N	
Dayton	Town	6	N	E	NA	N	N	N			N					N	N	
Demopolis	City	6	Y	Y	NA	N	N	N			N					N	N	
Faunsdale	Town	6	N	E	NA	N	N	N			N					N	N	
Linden	City	6	N	Y	NA	N	N	N			N					N	N	
Myrtlewood	Town	6	N	E	NA	N	N	N			N					N	N	
Providence	Town	6	N	Y	NA	N	N	N			N					N	N	
Sweetwater	Town	6	N	E	NA	N	N	N			N					N	N	
Thomaston	Town	6	N	E	NA	N	N	N			N					N	N	
Monroe County																		
Unincorporated	County	6	Y	Y	NA	N	N	N			N					N	N	
Beatrice	Town	6	Y	N	NA	N	N	N			N					N	N	

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT
Excel	Town	6	Y	N	NA	N	N	N			N					N	N	
Frisco City	Town	6	Y	N	NA	N	N	N			N					N	N	
Monroeville	City	6	Y	Y	NA	N	N	N			Y					N	N	
Vrdenburgh	Town	6	Y	N	NA	N	N	N			N					N	N	
Perry County																		
Unincorporated	County	6	Y	N	NA	N	N	N			N				Y	N		
Marion	City	6	N	Y	NA	Y	Y	Y			N					N		
Uniontown	City	6	Y	N	NA	Y	N	Y			N					N		
Sumter County																		
Unincorporated	County	6	Y	Y	NA	N	N	N			Y				Y	N		
Cuba	Town	6	Y	Y	NA	Y	N	Y			Y					N		
Emelle	Town	6	Y	NM	NA	N	N	N			N					N		
Epes	Town	6	Y	Y	NA	N	N	N			N					N		
Gainesville	Town	6	Y	N	NA	N	N	N			N					N		
Geiger	Town	6	Y	Y	NA	N	N	N			N					N		
Livingston	City	6	Y	Y	NA	Y	N	Y			Y					N		
York	City	6	Y	Y	NA	Y	N	Y			Y					N		
Washington County																		
Unincorporated	County	6	Y	Y	NA	N	N	Y			N				Y	N		

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT
Chatom	Town	6	Y	Y	NA	Y	Y	N			N				N	N		
McIntosh	Town	6	N	N	NA	Y	N	N			N				N	N		
Millry	Town	6	N	Y	NA	N	N	N			N				N	N		
Wilcox County																		
Unincorporated	County	6	Y	Y	NA	N	N	N			Y				Y	N		
Camden	City	6	Y	Y	NA	Y	N	Y			Y					N		
Oak Hill	Town	6	Y	Y	NA	N	N	N			N					N		
Pine Apple	Town	6	N	Y	NA	N	N	N			N					N		
Pine Hill	Town	6	Y	Y	NA	Y	N	N			Y					N		
Yellow Bluff	Town	6	Y	Y	NA	N	N	N			N					N		
Region 7: Southeast Alabama Regional Planning and Development Council																		
Barbour County																		
Unincorporated	County	7	Y	Y	NA	N	Y	N			N	N		N	Y	N	N	
Baker	Town	7	Y	N	NA	Y	N	N			N	N		N	N	N	N	
Blue Springs	Town	7	Y	Y	NA	N	N	N			N	N		N	N	N	N	
Clayton	City	7	Y	Y	NA	Y	N	N			N	N		N	N	N	N	
Clio	City	7	Y	Y	NA	Y	N	N			N	N		N	N	N	N	
Eufaula	City	7	Y	Y	NA	Y	N	N			Y	N		N	N	N	N	
Louisville	Town	7	Y	Y	NA	N	N	N			N	N		N	N	N	N	

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT	
Coffee County																			
Unincorporated	County	7	Y	Y	NA	N	N	N			N	N		N	Y	N	N		
Elba	City	7	Y	Y	NA	Y	N	N			N	N		N	Y	Y	N		
Enterprise	City	7	Y	Y	NA	Y	Y	Y			Y	N		N	Y	Y	N		
Kinston	Town	7	Y	Y	NA	N	N	N			N	N		N	N	N	N		
New Brockton	Town	7	Y	Y	NA	Y	N	N			N	N		N	N	N	N		
Covington County																			
Unincorporated	County	7	Y	Y	NA	N	N	N			N	N		N	N	N	N		
Andalusia	City	7	Y	Y	NA	Y	N	Y			Y	N		N	N	N	N		
Babbie	Town	7	Y	N	NA	N	N	N			N	N		N	N	N	N		
Carolina	Town	7	N	N	NA	N	N	N			N	N		N	N	N	N		
Floral	City	7	N	Y	NA	Y	N	N			Y	N		N	N	N	N		
Gantt	Town	7	Y	Y	NA	N	N	N			N	N		N	N	N	N		
Heath	Town	7	N	N	NA	N	N	N			N	N		N	N	N	N		
Horn Hill	Town	7	N	N	NA	N	N	N			N	N		N	N	N	N		
Libertyville	Town	7	N	N	NA	N	N	N			N	N		N	N	N	N		
Lockhart	Town	7	N	N	NA	N	N	N			N	N		N	N	N	N		
Onycha	Town	7	N	N	NA	N	N	N			N	N		N	N	N	N		
Opp	City	7	N	Y	NA	Y	N	N			Y	N		Y	N	N	N		

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT	
Red Level	Town	7	Y	Y	NA	N	N	N			N	N		N	N	N	N		
River Falls	Town	7	N	Y	NA	N	N	N			N	N		N	N	N	N		
Sanford	Town	7	N	N	NA	N	N	N			N	N		N	N	N	N		
Dale County																			
Unincorporated	County	7	Y	Y	NA	N	N	N			N	N		N	Y	N	N		
Ariton	Town	7	N	Y	NA	N	N	N			N	N		N	N	N	N		
Clayhatchee	Town	7	N	Y	NA	N	N	N			N	N		N	N	N	N		
Daleville	City	7	N	Y	NA	Y	Y	N			N	N		N	N	N	N		
Grimes	Town	7	N	N	NA	N	N	N			N	N		N	N	N	N		
Level Plains	Town	7	N	Y	NA	N	N	N			N	N		N	N	N	N		
Midland City	Town	7	N	Y	NA	N	N	N			N	N		N	N	N	N		
Napier Field	Town	7	Y	N	NA	N	N	N			N	N		N	N	N	N		
Newton	Town	7	N	Y	NA	N	N	N			N	N		N	N	N	N		
Ozark	City	7	N	Y	NA	Y	Y	Y			Y	Y		N	N	N	Y		
Pinckard	Town	7	N	Y	NA	N	N	N			N	N		N	N	N	N		
Geneva County																			
Unincorporated	County	7	Y	Y	NA	N	Y	N			N	N		N	Y	N	N		
Black	Town	7	Y	Y	NA	N	N	N			N	N		N	N	N	N		
Coffee Springs	Town	7	N	Y	NA	N	N	N			N	N		N	N	N	N		

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT
Geneva	City	7	Y	Y	NA	Y	N	Y			N	N		N	N	N	N	
Hartford	City	7	Y	Y	NA	Y	N	Y			N	N		N	N	N	N	
Malvern	Town	7	Y	Y	NA	N	N	N			N	N		N	N	N	N	
Samson	City	7	Y	Y	NA	Y	N	Y			N	N		N	N	N	N	
Slocomb	City	7	Y	Y	NA	Y	N	Y			Y	N		N	N	N	N	
Henry County																		
Unincorporated	County	7	N	Y	NA	N	N	N			N	N		N	Y	N	N	
Abbeville	City	7	Y	Y	NA	Y	N	Y			Y	N		N	N	N	N	
Haleburg	Town	7	Y	N	NA	N	N	N			N	N		N	N	N	N	
Headland	City	7	Y	Y	NA	Y	N	Y			Y	N		N	N	N	N	
Newville	Town	7	Y	Y	NA	N	N	N			N	N		N	N	N	N	
Houston County																		
Unincorporated	County	7	N	Y	NA	N	Y	N			N	N		N	Y	N	N	
Ashford	City	7	N	Y	NA	Y	N	Y			N	N		N	N	N	N	
Avon	Town	7	N	Y	NA	N	N	N			N	N		N	N	N	N	
Columbia	Town	7	N	Y	NA	N	N	N			N	N		N	N	N	N	
Cottonwood	Town	7	N	Y	NA	N	N	N			N	N		N	N	N	N	
Cowarts	Town	7	N	Y	NA	Y	N	Y			N	N		N	N	N	N	
Dothan	City	7	N	Y	NA	Y	N	Y			Y	N		N	N	N	N	

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT
Gordon	Town	7	N	Y	NA	N	N	N			N	N		N	N	N	N	
Kinsey	City	7	N	Y	NA	Y	N	N			N	N		N	N	N	N	
Madrid	Town	7	N	Y	NA	N	N	N			N	N		N	N	N	N	
Rehobeth	Town	7	N	Y	NA	Y	N	Y			N	N		N	N	N	N	
Taylor	City	7	N	Y	NA	N	N	N			N	N		N	N	N	N	
Webb	Town	7	N	Y	NA	N	N	N			N	N		N	N	N	N	
Region 8: South Alabama Regional Planning Commission																		
Baldwin County																		
Unincorporated	County	8	Y	Y	7	Y	Y	Y			Y	N		Y	Y	Y	Y	
Minette	City	8	Y	Y	NA	Y	N	Y			N	Y		N	N	Y	Y	
Daphne	City	8	Y	Y	NA	Y	Y	Y			N	N		Y	Y	Y	Y	
Elberta	Town	8	Y	Y	NA	Y	Y	Y			Y	N		N	N	Y	Y	
Fairhope	City	8	Y	Y	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Foley	City	8	Y	Y	8	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Gulf Shores	Town	8	Y	Y	8	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Loxley	Town	8	Y	Y	NA	Y	N	Y			Y	N		N	N	Y	Y	
Magnolia Springs	Town	8	Y	Y	NA	Y	Y	Y			Y	N		Y	Y	N	Y	
Orange Beach	City	8	Y	Y	7	Y	Y	Y			Y	Y		Y	Y	Y	Y	

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT	
Perdido Beach	Town	8	Y	Y	NA	Y	Y	Y			Y	N		Y	Y	Y	Y		
Robertsdale	City	8	Y	Y	NA	Y	Y	Y			Y	N		N	Y	Y	Y		
Silverhill	Town	8	Y	Y	NA	Y	N	Y			N	N		N	N	N	Y		
Spanish Fort	City	8	Y	Y	NA	Y	Y	Y			Y	N		Y	Y	Y	Y		
Summerdale	Town	8	Y	Y	NA	Y	Y	Y			N	N		Y	N	Y	Y		
Escambia County																			
Unincorporated	County	8	N	Y	NA	N	N	N			Y	Y					N		
Atmore	City	8	Y	Y	10	Y	N	Y			Y	N					N	Y	
Brewton	City	8	Y	Y	NA	Y	N	Y			Y	N					N	Y	
East Brewton	City	8	N	Y	NA	Y	N	Y			N	N					N		
Flomaton	Town	8	N	Y	NA	N	N	N			N	N					N		
Pollard	Town	8	N	Y	NA	N	N	N			N	N					N		
Riverview	Town	8	N	Y	NA	N	N	N			N	N					N		
Poarch Band of Creek Indians	Tribe	8	Y	Y	NA	N	N	N			Y	N					N		
Mobile County																			
Unincorporated	County	8	Y	Y	NA	N	Y	Y			N	N		N	Y	Y	Y		
Bayou La Batre	Town	8	Y	Y	NA	Y	Y	Y			N	N		N	N	Y	Y		

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT
Chickasaw	Town	8	Y	Y	NA	Y	Y	Y			Y	N		N	N	N	Y	
Citronelle	Town	8	Y	Y	NA	Y	Y	Y			N	N		N	N	Y	Y	
Creola	Town	8	Y	Y	NA	Y	Y	Y			Y	N		N	N	N	Y	
Dauphin Island	Town	8	Y	Y	7	Y	Y	Y			N	N		N	N	N	Y	
Mobile	City	8	Y	Y	10	Y	Y	Y			Y	Y		Y	Y	Y	Y	
Mt. Vernon	Town	8	Y	Y	NA	Y	Y	Y			Y	Y		N	N	N	Y	
Prichard	Town	8	Y	Y	NA	Y	Y	Y			N	Y		N	N	N	Y	
Saraland	Town	8	Y	Y	NA	Y	Y	Y			N	Y		N	N	N	Y	
Satsuma	Town	8	Y	Y	NA	Y	Y	Y			N	Y		N	N	N	Y	
Semmes	Town	8	Y	N	NA	N	Y	Y			Y	Y		N	N	Y	Y	
Region 9: Central Alabama Regional Planning Development Commission																		
Autauga County																		
Unincorporated	County	9	Y	Y	NA	N	Y	N			N	N		N	N	N	N	
Autaugaville	Town	9	N	Y	NA	N	N	N			Y	N		N	N	N	N	
Billingsley	City	9	N	Y	NA	N	N	N			N	N		N	N	Y	N	
Prattville	City	9	Y	Y	NA	Y	Y	Y			Y	N		N	N	Y	N	
Elmore County																		
Unincorporated	County	9	Y	Y	NA	N	Y	N			N	N		N	Y	N	N	
Coosada	Town	9	Y	Y	NA	Y	Y	Y			Y	N		N	N	N	N	

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT
Deatsville	Town	9	Y	N	NA	N	Y	N			N	N		N	N	N	N	
Eclectic	Town	9	Y	Y	NA	Y	Y	Y			Y	N		N	N	N	N	
Elmore	Town	9	Y	Y	NA	Y	Y	Y			Y	N		N	N	N	N	
Millbrook	City	9	Y	Y	NA	Y	Y	Y			Y	N		N	N	N	N	
Prattville	City	9	Y	Y	8	Y	Y	Y			Y	N		N	N	Y	N	
Tallassee	City	9	Y	Y	NA	Y	Y	Y			Y	N		N	N	Y	N	
Wetumpka	City	9	Y	Y	10	Y	Y	Y			N	N		N	N	N	N	
Montgomery County																		
Unincorporated	County	9	Y	Y	NA	Y	N	Y			Y	Y		N	Y	N	N	
Montgomery	City	9	Y	Y	NA	Y	N	Y			Y	Y		N	N	N	N	
Pike Road	Town	9	Y	Y	NA	Y	N	Y			Y	Y		N	N	Y	N	
Region 10: Lee-Russell Council of Governments																		
Lee County																		
Unincorporated	County	10	Y	Y	NA	Y	Y	N			Y	N		N	Y	N	Y	
Auburn	City	10	Y	Y	8	Y	Y	N			Y	N		N	N	Y	N	
Opelka	City	10	Y	Y	NA	Y	Y	N			Y	N		N	Y	Y	Y	
Smith's Station	City	10	Y	Y	NA	Y	Y	N			Y	N		N	N	N	N	
Loachapoka	Town	10	Y	N	NA	N	N	N			N	N		N	N	N	N	
Russell County																		

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT
Unincorporated	County	10	Y	Y	NA	Y	Y	Y			Y	N		Y	Y	Y	Y	
Hurtsboro	Town	10	Y	Y	NA	N	N	N			N	N		N	N	Y	N	
Phenix City	City	10	Y	Y	NA	Y	Y	Y			Y	N		Y	Y	Y	Y	
Region 11: North-Central Alabama Regional Council of Governments																		
Cullman County																		
Unincorporated	County	11	Y	Y	NA	Y	Y	Y			Y	Y		N	Y	N	N	
Baileytown	Town	11	Y	N	NA	Y	Y	Y			Y	Y		N	N	N	N	
Colony	Town	11	Y	Y	NA	Y	Y	Y			Y	Y		N	N	N	N	
Cullman	City	11	Y	Y	NA	Y	Y	Y			Y	Y		N	N	Y	N	
Dodge City	Town	11	Y	Y	NA	Y	Y	Y			Y	Y		N	N	N	N	
Fairview	Town	11	Y	N	NA	Y	Y	Y			Y	Y		N	N	N	N	
Garden City	Town	11	Y	Y	NA	Y	Y	Y			Y	Y		N	N	N	N	
Good Hope	Town	11	Y	Y	NA	Y	Y	Y			Y	Y		N	N	N	N	
Hanceville	City	11	Y	Y	NA	Y	Y	Y			Y	Y		N	N	N	N	
Holly Pond	Town	11	Y	Y	NA	Y	Y	Y			Y	Y		N	N	N	N	
South Vinemont	Town	11	Y	Y	NA	Y	Y	Y			Y	Y		N	N	N	N	
West Point	Town	11	Y	Y	NA	Y	Y	Y			Y	Y		N	N	N	N	
Lawrence County																		

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT	
Unincorporated	County	11	Y	Y	NA	N	Y	N			N	N			Y	N			
Courtland	Town	11	Y	Y	NA		Y	Y			Y	N			N	N			
Hillsboro	Town	11	Y	Y	NA		NA	N			Y	N			N	N			
Moulton	City	11	Y	Y	NA	Y	Y	Y			N	N		Y	Y	N	Y		
North Courtland	Town	11	Y	Y	NA		N	Y			Y	N			N	N			
Town Creek	Town	11	Y	Y	NA		Y	Y			N	N		Y	N	N			
Morgan County																			
Unincorporated	County	11	Y	N	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y		
Decatur	City	11	Y	Y	10	Y	Y	Y			Y	Y		Y	Y	Y	Y		
Eva	Town	11	Y	N	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y		
Falkville	Town	11	Y	Y	NA	Y	Y	Y			Y	Y		Y	Y	N	Y		
Hartselle	City	11	Y	Y	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y		
Priceville	Town	11	Y	N	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y		
Somerville	Town	11	Y	N	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y		
Trinity	Town	11	Y	Y	NA	Y	Y	Y			Y	Y		Y	Y	Y	Y		
Region 12: Top of Alabama Regional Council of Governments																			
Dekalb County																			
Unincorporated	County	12	Y	Y	NA	N	N	N			N	N		N	Y	N	Y		

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT	
Collinsville	Town	12	Y	Y	NA	N	N	N			N	N		N	N	N	N		
Crossville	Town	12	N	S	NA	N	N	N			N	N		N	N	N	N		
Fort Payne	City	12	N	Y	NA	N	Y	N			N	N		N	N	N	N		
Fyffe	Town	12	N	Y	NA	N	N	N			N	N		N	N	N	N		
Geraldine	Town	12	N	S	NA	N	N	N			N	N		N	N	N	N		
Hammondville	Town	12	N	Y	NA	N	N	N			N	N		N	N	N	N		
Hengar	City	12	Y	Y	NA	N	N	N			N	N		N	N	N	N		
Ider	Town	12	Y	S	NA	N	N	N			N	N		N	N	N	N		
Lakeview	Town	12	N	S	NA	N	N	N			N	N		N	N	N	N		
Mentone	Town	12	Y	S	NA	N	N	N			N	N		N	N	N	N		
Pine Ridge	Town	12	N	S	NA	N	N	N			N	N		N	N	N	N		
Powell	Town	12	N	Y	NA	N	N	N			N	N		N	N	N	N		
Rainsville	City	12	N	Y	NA	N	N	N			N	N		N	N	N	N		
Shiloh	Town	12	N	S	NA	N	N	N			N	N		N	N	N	N		
Sylvania	Town	12	Y	Y	NA	N	N	N			N	N		N	N	N	N		
Valley Head	Town	12	N	Y	NA	N	N	N			N	N		N	N	N	N		
Jackson County																			
Unincorporated	County	12	Y	Y	NA	N	Y	N			Y	N		Y	Y	Y	N		
Bridgeport	City	12	Y	Y	NA	N	N	N			Y	N		N	N	N	N		

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT
Dutton	Town	12	Y	Y	NA	N	N	N			Y	N		N	N	N	N	
Hollywood	Town	12	Y	Y	NA	N	N	N			Y	N		N	N	N	N	
Hytow	Town	12	N	NA	NA	N	N	N			Y	N		N	N	N	N	
Langston	Town	12	Y	Y	NA	N	N	N			Y	N		N	N	N	N	
Paint Rock	Town	12	Y	SU	NA	N	N	N			Y	N		N	N	N	N	
Pisgah	Town	12	Y	S	NA	N	N	N			Y	N		N	N	N	N	
Pleasant Groves	Town	12	Y	NA	NA	N	N	N			Y	N		N	N	N	N	
Scottsboro	City	12	Y	Y	NA	Y	N	Y			Y	N		N	Y	Y	N	
Section	Town	12	Y	S	NA	N	N	N			Y	N		N	N	N	N	
Skyline	Town	12	Y	NA	NA	N	N	N			Y	N		N	N	N	N	
Stevenson	City	12	Y	Y	NA	N	N	N			Y	N		N	N	N	N	
Woodville	Town	12	N	Y	NA	N	N	N			Y	N		N	N	N	N	
Limestone County																		
Unincorporated	County	12	Y	Y	NA	Y	Y	N			Y	N			Y	N		
Ardmore	Town	12	Y	Y	NA	N	N	N			N	N				N		
Athens	City	12	Y	Y	10	Y	Y	Y			N	Y				Y		
Elkmont	Town	12	Y	N	NA	N	N	N			N	N				N		
Lester	Town	12	N	N	NA	N	N	N			N	N				N		

Jurisdiction	Type	REG	HMP	NFIP	CRS	Zon	Sub Reg	Bldg Code	BCEGS	PPC	Comprehensive Plan	CIP	Mit Proj EXP	Planner	Engineer	CFM	BLDG INSP	CAPAB RAT	
Mooresville	Town	12	N	Y	NA	N	N	N			N	N				N			
Madison County																			
Unincorporated	County	12	Y	Y	8	Y	N	Y			N	N		N	N	Y	N		
Huntsville	City	12	Y	Y	8	Y	N	Y			Y	Y		Y	Y	Y	N		
Madison	City	12	Y	Y	NA	Y	N	Y			Y	Y		N	N	Y	N		
New Hope	Town	12	Y	Y	NA	Y	Y	Y			Y	N		N	N	Y	N		
Gurley	Town	12	Y	Y	NA	Y	N	Y			Y	Y		Y	N	Y	N		
Owens Cross Roads	City	12	Y	Y	NA	N	N	Y			N	N		N	N	Y	N		
Triana	Town	12	Y	Y	NA	N	N	Y			N	N		N	N	N	N		
Marshall County																			
Unincorporated	County	12	Y	Y	NA	N	Y	N			N	N		N	Y	N	N		
Albertville	City	12	Y	Y	NA	Y	Y	Y			Y	N		N	N	N	N		
Arab	City	12	Y	Y	NA	Y	Y	Y			Y	N		N	N	N	N		
Boaz	City	12	Y	Y	NA	Y	Y	Y			N	N		N	N	N	N		
Douglas	Town	12	Y	N	NA	N	Y	N			Y	N		N	N	N	N		
Grant	Town	12	Y	Y	NA	Y	Y	N			Y	N		N	N	N	N		
Guntersville	City	12	Y	Y	NA	Y	Y	Y			Y	N		N	N	N	Y		
Union Grove	Town	12	Y	Y	NA	N	Y	N			N	N		N	N	N	N		

Appendix D: Comments Received from SHMTF and FEMA

SHMTF Member	Comments/recommendations
<p>1. Karl D. Frost 2/24</p>	<p>There is not much of an update from the Energy Division regarding the following. State building codes are determined by Finance's Division of Construction Management. Lee Desmond at (334) 242-4082 or by lee.desmond@realproperty.alabama.gov is the contact. Additional updates to Appendix H Actions 7,8, 31, 28, 90.</p> <ul style="list-style-type: none"> • Appendix H, page 438 – Action #2.1.2: Ensure all State codes and standards ensure the protection of life... (Also see page 320, related action #7 and page 321, related action #10 in the 2018 MAP.) <ul style="list-style-type: none"> ○ No changes in the update except there is a plan to update the State's energy codes. ○ This is also administered by Finance's Div of Construction Management. • Appendix H, page 447 – Action #3.1.2: Require the incorporation of natural hazard mitigation measures in all new public construction... (Also see page 321, action #8 and page 326, related action #31 in the 2018 MAP.) <ul style="list-style-type: none"> ○ #8 - No changes in the update except there is a plan to update the State's energy codes. ○ #8 - This is also administered by Finance's Div of Construction Management ○ #31 – Continued communication with all necessary parties and assistance will be available as needed. • Appendix H, Page 457 – Action #6.1.3: Ensure hazard mitigation programs are included in all State and local economic development and community planning... (Also see page 325, related action #28 in the 2018 MAP.) <ul style="list-style-type: none"> ○ Status is the same for us. • Appendix H, Page 465 – New Action: Retrofit existing state-owned facilities with surge protection systems to protect these facilities against damage from lightning... (Also see page 344, action #90 in the 2018 MAP.) <ul style="list-style-type: none"> ○ This is determined by Finance's Div of Construction Management. I would remove ADECA from this.

<p>2. Paul Smelley 2/28</p>	<p>Per ADHR representatives and the AEMA Steering Committee, please make the change discussed in the email thread below. In summary:</p> <ul style="list-style-type: none"> The priority ranking needs to be changed to “Medium” in the 2023 version of Appendix H and the 2023 MAP for the ADHR mitigation action listed in 2018 Appendix H, page 453 – Action #4.2.2: Establish provisions to ensure that Family Assistance programs designed for moving families from dependency to self-sufficiency continue after a natural or a manmade disaster... [Also see page 326, action #30 in the 2018 Mitigation Action Plan (MAP).] <p>I agree that Low is not accurate. Yes, please change to Medium.</p>
<p>3. Beverly Shields ADHR 3/15/23</p>	<p>Good Afternoon,</p> <p>I don't have any notes or any previous calculations, as I have not been involved in reviewing this before. However, in my opinion, I suggest a “Medium” priority ranking. Others who have been involved before might have some additional comments. Thanks.</p>
<p>4. Alicia Reed Recovery Plans Section Chief AEMA</p>	<p>Please include/incorporate the changes listed below...</p> <p><u>Recovery List:</u></p> <ul style="list-style-type: none"> Appendix H, page 425 – Action #1.1.2: Inventory and catalog natural hazards studies, maps, digital data, and other information available from city, county, state, federal, university, private, and other sources... (Also see page 320, related action #5 in the 2018 MAP.) Ongoing Appendix H, page 425 – Action #1.1.3: Establish a schedule to provide state and local offices with current information on past events (including damages)... (Also see page 319, action #1 in the 2018 MAP.) Ongoing Appendix H, page 427 – Action #1.2.4: Provide a prioritized list of the natural risks to all Departmental facilities and remote monitoring sites... (Also see page 320, related action #5 and page 324, related action #22 in the 2018 MAP.) Ongoing Appendix H, page 428 – Action #1.2.5: Review local and county mitigation plans following disasters or serious hazard occurrences in order to evaluate risk assessments and mitigation priorities... (Also see page 328, action #39 in the 2018 MAP.) Ongoing Appendix H, page 429 – Action #1.4.1: Identify channels and ditches that must be improved to provide maximum drainage capacity... (Also see page 339, action #74 in the 2018 MAP.) Ongoing Appendix H, page 431 – Action #1.4.15: Reduce the flooding risk to communities by acquiring property located in the 100-yr floodplain and return it to open space... Also see page 341, action #79 in the 2018 MAP.) Ongoing

	<ul style="list-style-type: none">• Appendix H, page 436 – Action #1.9.1: Obtain periodic updates of RL and SRL lists from FEMA/NFIP and ensure that appropriate officials have access to the data... (Also see page 336, action #67 in the 2018 MAP.) Deleted• Appendix H, page 437 – Action #1.9.2: Ensure that site-specific risk assessments are available to local officials as the basis for identifying and prioritizing mitigation actions on a site-specific basis. This action may be accomplished a number of ways... (Also see page 337, action #68 and page 328, related action #37 and #39 in the 2018 MAP.) Ongoing• Appendix H, page 439 – Action #2.1.5: Maintain tornado safe room initiatives statewide... (Also see page 348, action #108 in the 2018 MAP.) Ongoing• Appendix H, page 439 – Action #2.1.6: Expand the number of local governments that include hazard reduction planning into their land-use plans and development regulations... (Also see page 321, action #11 in the 2018 MAP.) Ongoing• Appendix H, page 440 – Action #2.1.7: Assist K-12 schools and state colleges and universities develop vulnerability assessments, mitigation plans, and mitigation projects to improve safety in their most vulnerable buildings... (Also see page 319, action #4 in the 2018 MAP.) Ongoing• Appendix H, page 441 – Action #2.2.12: Develop model ordinance for Gulf-fronting communities requiring additional setbacks for Gulf-fronting properties... (Also see page 337, action #69 in the 2018 MAP.) Ongoing• Appendix H, page 442 – Action #2.2.5: Advance provision for electrical generators through FEMA grant programs... (Also see page 323, action #20 in the 2018 MAP.) Ongoing• Appendix H, page 443 – Action #2.2.8: Encourage homeowners to retrofit their homes for category F-0 to F-2 tornadoes by providing information materials (handouts, booklets, and videos)... (Note: This action was not carried over to the 2018 MAP for AEMA---It was transferred to a related DOI action item.) Ongoing• Appendix H, page 443 – Action #2.2.9: Encourage homeowners to retrofit their homes for category 1 – 3 hurricane winds... (Note: This action was not carried over to the 2018 MAP for AEMA---It was transferred to a related DOI action item.) Ongoing• Appendix H, page 444 – Action #2.3.2: Preserve and rehabilitate natural systems to serve natural hazard mitigation functions (i.e., floodplains, wetlands, watersheds, and urban interface areas)... (Also see page 339, action #75 in the 2018 Mitigation Action Plan.) Ongoing
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	<ul style="list-style-type: none"> • Appendix H, page 444 – Action #2.3.4: Encourage local floodplain managers to evaluate the increased hazard posed by the encroachment of non-native plant species into floodways... (Also see page 340, action #76 in the 2018 MAP.) <ul style="list-style-type: none"> ○ Remove AEMA from the list of responsible agencies. ○ Maybe DCNR or AG&I... Discuss this with them. • Appendix H, page 445 – Action #2.3.5: Encourage local floodplain managers to continue to account for and incorporate wetlands protection and mitigation sites into the planning process when preparing new studies for watercourses... (Also see page 340, action #77 in the 2018 MAP.) Ongoing • Appendix H, page 445 – Action #2.4.1: Develop and implement a detailed SRL mitigation strategy that will qualify the State for a 90-10 cost share under the FEMA SRL program... (Also see page 338, action #70 in the 2018 MAP.) Ongoing but SRLs are funded at 100/0. RLs are funded at 90/10. • Appendix H, page 446 – Action #2.4.2: Conduct community outreach, workshops, and training to increase NFIP participation... (Also see page 338, action #71 in the 2018 MAP.) Ongoing ADECA • Appendix H, page 446 – Action #2.4.3: Provide updated SRL and RL lists to communities in advance of grant application windows. Include FEMA calculated avoided damages... (Also see page 338, action #72 in the 2018 MAP.) Deleted • Appendix H, page 449 – Action #3.2.3: Inform land and resource managers, including those engaged in planning and zoning, about potential hazards in their jurisdictions... (Also see page 324, related action #22 in the 2018 MAP.) Ongoing • Appendix H, page 450 – Action #3.2.8: Encourage retrofit... (Also see page 344, related action #90 and page 348, related action #111 in the 2018 MAP.) Ongoing • Appendix H, page 450 – Action #3.2.9: Look at critical facilities to determine which can be brought to FEMA 361 retrofit... (Also see page 348, related action #111 in the 2018 MAP.) Ongoing • Appendix H, page 451 – Action #4.1.1: Provide funding and technical assistance to State agencies and Local and Tribal governments to prepare hazard mitigation plans... (Also see page 319, action #2 in the 2018 MAP.) Ongoing • Appendix H, page 451 – Action #4.1.2: Improve the State's capability to administer pre- and post-disaster mitigation programs... (This was not carried over to the 2018 MAP, but see page 326, related action #29.) Ongoing
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	<ul style="list-style-type: none"> • Appendix H, page 453 – Action #4.2.4: Provide training for local officials in mitigation activities... (Combined with Action #4.1.1) Ongoing • Appendix H/Page 453 – Action # 5.1.1: Develop a public outreach and awareness campaign to educate stakeholders on the hazards identified in the State’s Hazard Mitigation Plan... (Also see page 324, action #23 in the 2018 MAP.) Ongoing • Appendix H/Page 454 – Action # 5.1.3: Develop an earthquake, landslide, and sinkhole education program for the State’s Boards of Education to use in each school system... (Also see page 333, action #60 in the 2018 MAP.) <ul style="list-style-type: none"> ○ Remove AEMA from the list of responsible agencies. ○ Maybe GSA... Discuss this with GSA. • Appendix H/Page 456 – Action # 5.2.6: Conduct hazard mitigation education and awareness workshops for local government officials and the private sector... (Also see page 324, action #23 and page 321, related action #11 in the 2018 MAP.) Ongoing • Appendix H, page 457 – Action #6.1.4: Expand the use of the State Hazard Mitigation Team by adding representatives from other state, regional and federal organizations... (Also see page 325, action #25 in the 2018 MAP.) <ul style="list-style-type: none"> ○ Change SHMT to SHMTF for the 2023 Update. Ongoing • Appendix H, page 458 – Action #6.1.5: Establish a schedule to update the SHMT on existing and upcoming hazard mitigation activities throughout the state... (Also see page 325, action #26 in the 2018 MAP.) <ul style="list-style-type: none"> ○ Change SHMT to SHMTF for the 2023 Update. Ongoing • Appendix H, page 458 – Action #6.2.1: Integrate mitigation projects into the Recovery process through Public Assistance, Individual Assistance, and SBA programs... (Also see page 326, action #29 in the 2018 MAP.) Ongoing • Appendix H, page 459 – Action #6.2.2: Integrate mitigation projects through education of local community and Public Assistance applicants... (Combined with Action #6.2.1) (Also see page 324, action #24 and page 326, action #29 in the 2018 MAP.) Ongoing • Appendix H, page 461 – New Action: Construct 15 community safe rooms within existing shelters along I-65, following the evacuation route from the coastal area... (Also see page 327, action #34 in the 2018 MAP.) Deferred • Appendix H, page 461 – New Action: Purchase a back-up generator for the Alabama Emergency Operations Center... (Also see page 327, action #35 in the 2018 MAP.) Completed • Appendix H, page 463 – New Action: Develop standard ordinance language that considers the effects of soil liquefaction in the design of new buildings and
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	<p>infrastructure such as bridges, embankment dams, and retaining structures... (Also see page 332, action #54 in the 2018 MAP.)</p> <ul style="list-style-type: none"> ○ Remove AEMA from the list of responsible agencies. <ul style="list-style-type: none"> • Appendix H, page 464 – New Action: Facilitate outreach to communities in the northwestern part of the State to educate homeowners and homebuilders about methods to strengthen and retrofit non-reinforced masonry buildings and nonductile concrete facilities that are particularly vulnerable to ground shaking... (Also see page 322, action #56 in the 2018 MAP.) Ongoing • Appendix H, page 464 – New Action: Create statewide minimum stands of 1-foot freeboard for new and substantially improved buildings... (Also see page 342, action #86 in the 2018 MAP.) <ul style="list-style-type: none"> ○ Remove AEMA from the list of responsible agencies. ○ Discuss this with ADECA. • Appendix H, Page 465 – New Action: Retrofit existing state-owned facilities with surge protection systems to protect these facilities against damage from lightning... (Also see page 344, action #90 in the 2018 MAP.) <ul style="list-style-type: none"> ○ Remove AEMA from the list of responsible agencies. Ongoing • Appendix H, page 466 – New Action: To prevent property loss, acquire and demolish or relocate buildings and infrastructure in high-risk area... (Also see page 345, action #95 in the 2018 MAP.) <ul style="list-style-type: none"> ○ Done at local level. Delete • Appendix H, page 466 – New Action: Educate design professionals about where to locate information on subsidence rates and maps... (Also see page 345, action #97 in the 2018 MAP.) <ul style="list-style-type: none"> ○ Remove AEMA from the list of responsible agencies. ○ Maybe GSA... Discuss this with GSA. • Appendix H, page 466 – New Action: “Monitoring” areas at risk to subsidence by remaining aware of changes in groundwater levels... (Also see page 345, action #94 in the 2018 MAP.) <ul style="list-style-type: none"> ○ Remove AEMA from the list of responsible agencies. ○ Maybe GSA... Discuss this with GSA. • Appendix H, page 467 – New Action: Develop standard zoning ordinance language that restricts development in wildland-urban interface zones... (Also see page 347, action #104 in the 2018 MAP.) <ul style="list-style-type: none"> ○ Remove AEMA from the list of responsible agencies. • Appendix H, page 468 – New Action: Implement a State fuels management program to reduce hazardous vegetative fuels on public lands, new essential infrastructure, or on private lands by working with landowners... (Also see page 347, action #106 in the 2018 MAP.) <ul style="list-style-type: none"> ○ Remove AEMA from the list of responsible agencies.
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	<ul style="list-style-type: none"> ○ Maybe ADEM or AG & I... Discuss this with ADEM & AG & I. • Appendix H/Page 468 – New Action: Retrofit at least 3 regional shelters to withstand Category 4 wind loads that are located along the I-65 evacuation route from coastal areas... (This was not carried over to the 2018 MAP.) Deferred <p><u>Response & Recovery List:</u></p> <ul style="list-style-type: none"> • Appendix H, page 456 – Action #6.1.1: Facilitate the coordination of all State and Federal emergency management activities... (Also see page 324, action #24 in the 2018 MAP.) Ongoing • Appendix H, page 457 – Action #6.1.2: Facilitate the coordination of all State and Local emergency management activities... (Also see page 324, action #24 in the 2018 MAP.) Ongoing • Appendix H, page 462 – New Action: Coordinate an education campaign to notify the public about dam inundation areas and explain to them their risk... (Also see page 330, action #47 in the 2018 MAP--- Reassigned to ADECA.) <ul style="list-style-type: none"> ○ Remove AEMA from the list of responsible agencies. ○ ADECA should be listed as one of the responsible agencies. • Appendix H, page 462 – New Action: Educate dam owners on the importance of dam safety, especially with regards to public access to dams and dam maintenance... (Also see page 329, action #46 in the 2018 MAP--- Reassigned/transferred to ADECA.) <ul style="list-style-type: none"> ○ Remove AEMA from the list of responsible agencies. ○ ADECA should be listed as one of the responsible agencies. • Appendix H, page 462 – New Action: Partner with the AL Cooperative Extension System to educate stakeholders and the public about the resources available... regarding the risk of drought and how to prepare for and mitigate the effects of a drought... (Also see page 331, related action #50 in the 2018 MAP.) <ul style="list-style-type: none"> ○ Remove AEMA from the list of responsible agencies. ○ ADECA should be listed as one of the responsible agencies. • Appendix H, page 465 – New Action: Create a State education program through the AL State Department of Education that teaches school children about the dangers of lightning and how to take safety precautions... (Also see page 344, action #91 in the 2018 MAP.) <ul style="list-style-type: none"> ○ Change the word “Create” to the word “Coordinate.” ○ Possibly include the NWS as one of the responsible agencies. Discuss this with NWS/Can’t think of a state agency responsible for this.
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	<ul style="list-style-type: none"> • Appendix H, page 466 – New Action: Educate farmers about groundwater withdrawal and water conservation practices... (Also see page 345, action #96 in the 2018 MAP.) <ul style="list-style-type: none"> ○ Remove AEMA from the list of responsible agencies. ○ Ag & Industries and ADECA should be included as responsible agencies... Discuss this with ADECA & AG & I. • Appendix H, page 467 – New Action: Educate homeowners about the resources available through the Alabama Forestry Commission website... (Also see page 347, action #105 in the 2018 MAP.) <ul style="list-style-type: none"> ○ Remove AEMA from the list of responsible agencies. ○ Forestry should be listed as the responsible agency. • Appendix H, page 467 – New Action: Develop and deliver an education program that teaches residents about the risk of submarine landslide induced tsunamis... (Also see page 346, action #101 in the 2018 MAP.) <ul style="list-style-type: none"> ○ Remove AEMA from the list of responsible agencies. ○ Possibly include the NWS as one of the responsible agencies... Maybe GSA... Discuss this with NWS & GSA.
<p>5. Paul Smelley, MPA, CPM Director, EWS/Safety Alabama DHR – Field Administration 2/28</p>	<p>Per ADHR representatives and the AEMA Steering Committee, please make the change discussed in the email thread below. In summary:</p> <ul style="list-style-type: none"> • The priority ranking needs to be changed to “Medium” in the 2023 version of Appendix H and the 2023 MAP for the ADHR mitigation action listed in 2018 Appendix H, page 453 – Action #4.2.2: Establish provisions to ensure that Family Assistance programs designed for moving families from dependency to self-sufficiency continue after a natural or a manmade disaster... [Also see page 326, action #30 in the 2018 Mitigation Action Plan (MAP).]
<p>6. Michael Johnson State Hazard Mitigation Officer 3/6</p>	<p>Sign In (orioncentral.com)</p> <p>Company link: Damage Assessments - Futurity IT</p>
<p>7. Alicia Reed 3/6</p>	<p>In addition to the Orion material that Michael provided (Be sure the discussion includes how Orion is a resource for Local staff/how the State supports Local staff efforts/how we share data...), please see the comments below and the attached reference.</p> <ul style="list-style-type: none"> • Change the column label of the far-right hand side of the MAP (Section 5) to “Status”. Right now, it’s labeled as a second “Timeline” entry. “Status” data is important for plan approval, and we need to label it clearly.

	<ul style="list-style-type: none"> • Revisit Element S8 – New capability requirements, especially part a.3 and a.4. • Revisit Local Plan “roll-up.” • Revisit these Elements: <ul style="list-style-type: none"> ○ S6.b (risk assessment contributions from local plans) ○ S7.a (changes in development – redevelopment areas) ○ S10 (how local strategies link to state strategy) ○ S12 (narrative of the status of each action) ○ S16 (process to integrate local risk assessments and actions into the state plan) • CRS Documentation <ul style="list-style-type: none"> ○ Specific details need to be included... ○ Describe how other agencies work with ADECA... ○ Address the updated NFIP requirements... • Revisit what’s required (by the PRT)...
<p>8. Eric D. Sipes Assistant State Archaeologist</p>	<p>I have reviewed the sections that specifically mention our agency and I am generally ok with that language. On page 16, I would specify that the State Historic Preservation Officer/Alabama Historical Commission, since specific agencies are specified elsewhere within that list.</p> <p>Will the SHMP be sent through a technical editor prior to publication? I started to edit last week, but quickly realized that I was making comments on almost every other page regarding grammar and/or content. I would like to have had more time to do a thorough edit for you, but my schedule just doesn’t permit it this week.</p>
<p>9. Alicia Reed 3/10</p>	<p>Please see the attached document for additional AEMA comments. Again, AEMA (and SHMTF) reviews are not “exhaustive” reviews---AEMA is relying on IEM’s technical review process and IEM’s QA/QC process for the 2023 Alabama State Hazard Mitigation Plan Update. We are looking forward to the revised draft that you are preparing with your technical writers/editors and other IEM staff.</p> <p>Here’s a “footer review” for the attached document</p> <p>The Section 3 footer is:</p> <ul style="list-style-type: none"> ○ Labeled as Section 2 on pages 53 – 66 ○ Uses “Assessmente” instead of “Assessment” on pages 152 – 176 ○ Uses “Rick” instead of “Risk” on pages 177 – 184 ○ Labeled as Section 5 and uses “Mitigtaion” instead of “Mitigation” on pages 252 – 296 <ul style="list-style-type: none"> • The Section 4 Footer is:

	<ul style="list-style-type: none"> ○ Labeled as Section 5 and uses “Mitigtaion” instead of “Mitigation” on pages 297 – 336 • The Section 5: <ul style="list-style-type: none"> ○ Uses “Mitigtaion” instead of “Mitigation” on pages 337 – 381 • Section 6— <ul style="list-style-type: none"> ○ Section 6 Footer is labelled as Section 5 and uses “Mitigtaion” instead of “Mitigation” on pages 382 – 386 <p>Should the first 6 pages of the Executive Summary be numbered? (Page 7 is numbered.) Don’t forget to check the numbering on all the Figures and Tables. I’ll send comments for the body of the plan in a separate email message. Note: AEMA (and SHMTF) reviews are not “exhaustive” reviews---AEMA is relying on IEM’s technical review process and IEM’s QA/QC process for the 2023 Alabama State Hazard Mitigation Plan Update.</p>
<p>9. Sandy Ebersole Geologic Investigations Prog. Director</p>	<p>Please see the below corrections for 331.</p> <p>The Geological Survey of Alabama (GSA) supports mitigation planning for geological hazards, including sinkholes, earthquakes, landslides, natural radiation, and swelling clays. GSA has developed and maintains maps showing the distribution of known sinkholes, faults, underground mines, landslides, and natural radiation sources. The agency also maintains maps of ecologic (this should be “geologic”) formations, complete with descriptions of the characteristics, and prepares reports of findings and recommendations. GSA also maintains records of historical earthquakes and monitors current seismic activity. In March of 2010, GSA completed a statewide basement fault map and a soil amplification/liquefaction map. GSA also has provided data to map earthquake epicenters, liquefaction susceptibility, and landslide susceptibility for the 2023 Plan update. Both items have been incorporated into the Risk Assessment. The information and technical resources of GSA are critical to the statewide risk assessment included in this plan, as well as the development of mitigation strategies that address pervasive geological hazards across the State. In addition, the GSA conducts public outreach through the distribution of educational brochures on geological hazards.</p>
<p>10. Chris Darden 3/15</p>	<p style="text-align: right;">□</p> <p>From: Chris Darden - NOAA Federal <chris.darden@noaa.gov> Sent: Wednesday, March 15, 2023 2:14 PM To: Alicia Reed <Alicia.Reed@ema.alabama.gov> Cc: LaTonya Stephens <LaTonya.Stephens@ema.alabama.gov>; Michael Johnson <Michael.Johnson@ema.alabama.gov> Subject: Re: NOAA's Information in Section 4---FW: Draft Hazard Mitigation Plan</p> <p>EXTERNAL EMAIL - This message originated from outside of AEMA</p> <p>Alicia,</p>

	<p>I talked this over with John and his thoughts were that the Tsunami (though very low probability) and Lightning topics were within our areas. The Geological would not be.</p> <p>Certainly, the sinkholes issue might be a notable one in certain areas but we aren't the SME for that.</p>
<p>11. Pratt, Thomas L 3/10</p>	<p>I have finally found the time to look over your plan and your questions. I have the following comments:</p> <p>Figure 3.22, which shows earthquake hazard in Alabama, does not have a scale bar other than “highest hazard” and “lowest hazard.” All of the hazard is relatively low compared to some other areas of the U.S., but this is not reflected in the figure. The term “highest hazard” could be interpreted as meaning that there are high hazard areas. Perhaps put the qualifier “relatively higher hazard”?</p> <p>You also use the term “high earthquake hazard” a number of times, such as in section 3.3.2.1. This could be misleading in that a reader could assume that there is a high earthquake hazard in some areas (i.e. like in California), whereas the earthquake hazard is quite low throughout the state. One solution could be to use the term “higher relative earthquake hazard.”</p> <p>Item 58 on page 353 mentions “short band” seismic stations. The proper term is “short-period.” Also note that there are already 7 seismic stations in Alabama as part of the USGS Advanced National Seismic System (ANSS) and the Central and Eastern U.S. Seismic Network (http://www.usarray.org/ceusn).</p> <p>Responses to your specific queries (responses in blue):</p> <ul style="list-style-type: none"> • Appendix H, page 463 – New Action: Develop standard ordinance language that considers the effects of soil liquefaction in the design of new buildings and infrastructure such as bridges, embankment dams, and retaining structures... (Also see page 332, action #54 in the 2018 MAP.) • OK, the proper wording is not a topic I am especially familiar with, so I would need to check into what such wording would be. CUSEC has been especially active in this area, so you might want to check with them as well. This is primarily an engineering question, though, so you might also check with the Earthquake Engineering Research Institute (EERI) and the International Code Council. • If you have not already done so, see: https://www.fema.gov/emergency-managers/risk-management/earthquake/seismic-building-codes • Appendix H, page 463 – New Action: Create a seismic safety committee to provide policy recommendations, evaluate and recommend changes in seismic safety standards, and give an annual assessment of local and statewide implementation of seismic safety improvements... (Also see page 332, action #55 in the 2018 MAP.) • OK, we would certainly be supportive of this. You might look to Missouri as an example, as they have a Seismic Safety Commission. It requires effort to

	<p>sustain this, however, and Missouri has had some problems keeping this effort alive. You might discuss this with Jeff Briggs, who is the Missouri Earthquake Program Manager.</p> <ul style="list-style-type: none"> • Appendix H, page 464 – New Action: Facilitate outreach to communities in the northwestern part of the State to educate homeowners and homebuilders about methods to strengthen and retrofit non-reinforced masonry buildings and nonductile concrete facilities that are particularly vulnerable to ground shaking... (Also see page 322, action #56 in the 2018 MAP.) • CUSEC has a lot of resources for doing this sort of outreach. The main avenue for doing this is building codes, but I do not know the status of the adoption of building codes in Alabama. Again, you might look to other states to see how they are doing this, with CUSEC being a good resource to find out. Once again, though, building retrofits are a building code issue - you might check with the city of Charleston, SC, on this, as I believe they have a pretty active effort on retrofitting older buildings. • Appendix H, page 466 – New Action: Develop and maintain a statewide real-time or near real-time record or reporting system of sinkhole, land subsidence, and earthquake events throughout the state... (Also see page 345, action #98 in the 2018 MAP.) <ul style="list-style-type: none"> ○ We expect to remove USGS from the list of the responsible agencies for this action unless you object. (GSA will be included as one of the responsible agencies for this action.) • I'm not sure that you need to remove USGS entirely from this, as the USGS National Earthquake Information Center is the main source of earthquake information, and the USGS "Did-You-Feel-It" (DYFI) system already exists for citizens to report earthquakes that they feel. I don't see a need for Alabama to set up an earthquake reporting system like DYFI when the USGS already has such a system that is working well. I don't know whether the USGS Gulf Coast Water Science Center wants to be involved in the sinkhole or subsidence reporting. I agree, though, that a reporting system within the state does sound like a state function, and in this case the State Geological Survey. • Appendix H, page 466 – New Action: "Monitoring" areas at risk to subsidence by remaining aware of changes in groundwater levels... (Also see page 345, action #94 in the 2018 MAP.) <ul style="list-style-type: none"> ○ We expect to remove USGS from the list of the responsible agencies for this action unless you object.. (GSA will be included as one of the responsible agencies for this action.) • Again, I am not sure whether the USGS Gulf Coast Water Science Center is already doing some of this. You might want to discuss it with them if you have not already done so. <p><u>Suggested Addition:</u></p>
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	<ul style="list-style-type: none"> • Appendix H, page 436 – Action #1.6.6: Establish a system of 6 short-band seismic stations within the state. (Also see page 333, action #58 in the 2018 MAP.) <ul style="list-style-type: none"> ○ We would like to include USGS as one of the responsible agencies for this action unless you object. • USGS certainly supports having better earthquake monitoring efforts. Given our funding, however, we have been cutting funding to local networks of late, so there is not a lot of USGS money for increasing the monitoring in relatively low-hazard areas like Alabama. As I mentioned above, there are already 7 seismic stations in Alabama that the USGS uses in locating earthquakes, which we feel is adequate to detect and locate any damaging earthquake in the state (magnitude 2.5 or greater). These are not enough stations, however, to locate small, shallow earthquakes that might be felt locally (magnitude less than about 2.5). One thing to be aware of is that the cost of the equipment to set up a seismic station is a small part of the total cost. Much of the cost is the communications with the station (internet or cell phone), the long-term maintenance, and especially the cost of using the data that the station provides. Who would routinely use the data from these stations to locate the earthquakes and provide information to the affected communities? The USGS already does this to some extent, so I feel like this would be duplicating some of the USGS function. I'm not sure if we would use the data from such a network, as we have rigid technical specifications for the seismic instruments we use, to ensure that the amplitudes and timing are correctly calibrated, and that the data are properly archived. Having Alabama set up a network of additional stations is not a problem on our part, but I think you need to evaluate what would be gained from adding these stations. You might reach out to the state of Oklahoma to find out their experience with this, as they have relatively recently implemented a seismic network. The easiest way to do this might be to have Alabama pay for the installation and maintenance of the seismic stations, and then have the "Center for Earthquake Research and Information" at the University of Memphis do the actual monitoring, since they already do this for the East TN seismic zone and the New Madrid seismic zone. They thus already have the systems in place for such a monitoring effort. I suspect, though, that they would want some funding to support this additional effort on their part. Also note that the USGS "Advanced National Seismic System" has specific areas of responsibility for various local networks (what we refer to as their "polygons"), with the local network being responsible for earthquake location and information within their area. I'm not sure where Alabama falls within these network jurisdictions, but a regional network cannot just start monitoring and reporting on earthquakes outside of their designated polygon; such a network would therefore need to be discussed with the USGS as to how to incorporate it within the ANSS system.
<p>12. Corey Garyotis, P.E., CFM</p>	<p>Sorry for not getting this to you last week as promised. I did the best I could with all the other commitments I had going last week. I worked yesterday and today to get the attached sections finished and submitted. I'm attaching the following sections to address the Dam Failure and Flooding hazards:</p>

<p>State NFIP Coordinator</p> <p>3/15</p>	<ul style="list-style-type: none"> • 3.2.1 – Dam Failure • 3.2.5 – Flooding • 3.3.1 – Methodology • 3.3.3 – Flooding • 4.2 – Laws, Regulations, Policies, and Programs for Pre- and Post-Disaster Hazard Management • 4.3.2 - FEMA Funding Opportunities & 4.3.3 – Other Federal Funding Opportunities • 4.5 - Integration into Other Ongoing State Planning Efforts & 4.6 – Integration into Other FEMA Mitigation Programs and Initiatives • 5.0 – Mitigation Strategy <p>I submitted Section 3.2.2 - Drought last week.</p> <p>I am also attaching a table from Stanford University’s National Performance of Dams Program, Dam Incident Database that lists some additional dam failures for your consideration to be added to the table of dam failures in Alabama. I did do a write up for the Walter Bouldin failure in 1975 that definitely should be included.</p> <p>Monday morning I will send a copy of the FY23 Risk MAP Business Plan that is referenced in Section 4.2.4.1 so that you can copy the map from the business plan to include in that section.</p> <p>Please let me know if you have any questions or need clarification on any of the comments/additions.</p>
<p>13. Barrett, Christy</p> <p>Senior Disaster Program Manager</p> <p>American Red Cross Alabama and Mississippi Region</p> <p>3/10</p>	<p>Hi Alicia and Leroy,</p> <p>Goal 3- The Red Cross mission to does focus on public education on hazards. How do you see us being incorporated into this plan as a support?</p> <p>Objective 1.2 Improve the statewide availability of risk information, particularly in GIS format.</p> <p>Goal 3: Foster public awareness and understanding of their hazard risks and mitigation opportunities.</p> <p>Objective 3.1 Publicize and encourage the adoption of appropriate hazard mitigation actions.</p> <p>Objective 3.2 Educate the public about hazards identified in the state plan.</p> <p>Goal 4: Expand and promote coordination and communication with other government agencies, local governments, and other relevant organizations.</p> <p>Objective 4.1 Establish and maintain lasting partnerships that progress hazard mitigation in the state.</p> <p>Objective 4.2 Promote and integrate hazard mitigation into the activities of other organizations, especially those that do not currently coordinate with AEMA.</p>

<p>14. Abney, Vernon 3/20</p>	<p>Alicia,</p> <p>Below is a quick summation of EWP funds from 2017.</p> <p>Ben</p> <p>From: Abney, Vernon - FPAC-NRCS, AL <vernon.abney@usda.gov> Sent: Monday, March 20, 2023 2:45 PM To: Malone, Ben - FPAC-NRCS, AL <ben.malone@usda.gov>; Smith, Bill - FPAC-NRCS, AL <bill.smith@usda.gov>; Allen, Craig - FPAC-NRCS, AL <Craig.Allen@usda.gov> Cc: Musser, Stephen - FPAC-NRCS, AL <Stephen.Musser@usda.gov> Subject: RE: [External Email]USDA's Information in Section 4---FW: Draft Hazard Mitigation Plan</p> <p>Ben,</p> <p>See information below:</p> <p>Hurricane Nate(2017) \$129,344</p> <p>Hurricane Nate was a Category 1 Hurricane that caused erosion and wind damage to South Alabama. . Work will help restore stream corridors, curb erosion, and prevent future flooding.</p> <p>Tropical Storm Alberto(2018) \$15,434</p> <p>Tropical Storm Alberto caused heavy rains in South Alabama. Work was done to prevent future flooding.</p> <p>Hurricane Sally(2020) \$ 1,026,038</p> <p>Hurricane Sally was a Category 2 Hurricane that caused erosion and wind damage to Coastal Alabama. Work will help restore stream corridors, curb erosion, and prevent future flooding.</p> <p>Vernon Abney, P.E. State Conservation Engineer USDA-NRCS 3381 Skyway Drive Auburn, AL 36830-6443 Voice: 334-887-4536 Fax2mail 855-292-1671</p>
<p>15. Alicia Reed Recovery Plans Section Chief</p>	<p>I am attaching additional SHMP comments-Part 1 of 2 from Michael and his staff. (Please touch base with Michael regarding inaccurate historical tornado damage data in the SHMP.)</p>

<p>AEMA 3/10</p>	<p>I am attaching Additional AEMA Comments-Part 2 of 2 from Michael and his staff. (Reminder: AEMA (and SHMTF) reviews are not “exhaustive” reviews---AEMA is relying on IEM’s technical review process and IEM’s QA/QC process for the 2023 Alabama State Hazard Mitigation Plan Update.)</p>
<p>16. Jeb Hargrove Chief Information Officer Alabama EMA 3/1</p>	<p>Sorry for the delay in responding to this email. Both actions listed are still valid however on action 13 we are no longer implementing Alert FM in the state we are continuing to work on implementing IPWAS statewide for EAS and WEA alerts through our County EMA’s. We are following the IPWAS proficiency testing procedures for each jurisdiction that currently has the capability as an alerting authority using IPAWS.</p> <p>Integrated Public Alerting and Warning System (IPAWS)</p>
<p>17. Sandy Ebersole, PG, GISP Geo. Investigations Prog. Director</p>	<p>Hello Kate and all,</p> <p>It’s great to see others using HAZUS! We’ve enjoyed using it for some of our quake projects in the past and have enjoyed it. For your questions – below are a few thoughts.</p> <p>Alabama actually is affected by three different seismic zones, each with its own interesting history and probabilities and magnitudes. For the probabilistic model – what seismic zone is it most based on? I’m guessing either New Madrid Seismic Zone and East Tennessee Seismic Zone? The New Madrid Zone has a history of large events (and the most detailed records of occurrence), but of course, Alabama is a distance away. When we’ve run HAZUS previously for New Madrid scenarios, typically there is light to moderate damage in northwestern Alabama.</p> <p>The Southern Appalachian Seismic Zone (i.e., East Tenn. Seismic Zone), however, is the zone with which most of our Alabama earthquakes are associated, including the 4.9/4.6 magnitude earthquake in Fort Payne/Mentone and the 5.2 magnitude in Irondale/Birmingham area. An alternative to running probabilistic or history-based scenarios would be to run define your own scenario with an epicenter in one of those locations.</p> <p>Another consideration for whatever scenario is chosen: Running HAZUS as a level one on default geologic data typically underestimates damage because HAZUS default settings assume all geology is the same and that there are no areas susceptible to liquefaction or seismic amplification; the opposite is true. The Central US Earthquake Consortium geologists group generated GIS files for these layers a few years ago though, and I still have the data for this. That, along with the building/infrastructure data, could bring you close to a level 3 scenario.</p> <p>I’m out of the office today, but tomorrow or Thursday, I could send you some of our past reports in which we ran HAZUS scenarios, and some additional descriptions/summaries of the seismic zones. Those might be of help too.</p>

	<p>I'll think a little further on this, and perhaps you could think about some of the above too, and we could get together/Zoom to discuss?</p>																				
<p>18. Chris Darden - NOAA Federal</p>	<p>Alicia,</p> <p>I talked this over with John and his thoughts were that the Tsunami (though very low probability) and Lightning topics were within our areas. The Geological would not be.</p> <p>Certainly, the sinkholes issue might be a notable one in certain areas but we aren't the SME for that.</p>																				
<p>19. Alicia Reed</p>	<p>I am attaching additional SHMP comments-Part 1 of 2 from Michael and his staff. . (Please touch base with Michael regarding inaccurate historical tornado damage data in the SHMP.)</p> <p>Thanks!</p>																				
<p>20. Paul Smelly 3/15/23</p>	<p>RE: Draft Hazard Mitigation Plan</p> <p> Smelley, Paul To Burnett, Elizabeth; Alicia Reed (Alicia.Reed@ema.alabama.gov) Cc Heath, Douglas; Beasley, Hollie; Messick, Melody</p> <p> This message is part of a tracked conversation. Click here to find all related messages or to open the o</p> <p>Hello Elizabeth and Alicia:</p> <p>For page 346, ADHR is not the only Responsible Agency:</p> <p>Alabama State Hazard Mitigation Plan</p> <table border="1"> <thead> <tr> <th>Action#</th> <th>Action</th> <th>2018 Obj.</th> <th>Priority</th> <th>Hazard(s) Addressed</th> <th>Responsible Agency</th> <th>Funding Source</th> <th>Projected Timeline</th> <th>Projected Cost</th> <th>How Action Contributes to Mitigation Strategy</th> </tr> </thead> <tbody> <tr> <td>19</td> <td>Establish security system within the Gordon Persons Building to ensure that critical functions remain uninterrupted in the event of terrorist activities.</td> <td>2.5</td> <td>High</td> <td>All</td> <td>ADHR</td> <td>Existing operating budget</td> <td>Long-Term</td> <td>Project costs TBD by project scope.</td> <td>Keeping state departmental functions operational during and following hazard events is important to serving the public.</td> </tr> </tbody> </table> <ul style="list-style-type: none"> • ADHR Leases space in the GPB from the Alabama Finance Department. • Finance manages the private sector security guard contract for the GPB. • Finance is currently upgrading security improvements for the GPB. The work is being • Alabama Revenue Department and ADHR have an MOU with ALEA to provide two ad <p>Please let me know if additional information is needed.</p>	Action#	Action	2018 Obj.	Priority	Hazard(s) Addressed	Responsible Agency	Funding Source	Projected Timeline	Projected Cost	How Action Contributes to Mitigation Strategy	19	Establish security system within the Gordon Persons Building to ensure that critical functions remain uninterrupted in the event of terrorist activities.	2.5	High	All	ADHR	Existing operating budget	Long-Term	Project costs TBD by project scope.	Keeping state departmental functions operational during and following hazard events is important to serving the public.
Action#	Action	2018 Obj.	Priority	Hazard(s) Addressed	Responsible Agency	Funding Source	Projected Timeline	Projected Cost	How Action Contributes to Mitigation Strategy												
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<p>21. Alicia Reed</p>	<p>I am attaching Additional AEMA Comments-Part 2 of 2 from Michael and his staff. (Reminder: AEMA (and SHMTF) reviews are not “exhaustive” reviews---AEMA is relying on IEM’s technical review process and IEM’s QA/QC process for the 2023 Alabama State Hazard Mitigation Plan Update.)</p>
<p>21. Department of Finance/DCM Actions</p>	<p>Department of Finance/DCM's Action It... Download View in OneDrive</p> <p>Department of Finance/DCM's Action Items in the 2018 State Hazard Mitigation Plan</p> <p> Alicia Reed <Alicia.Reed@ema.alabama.gov> To: Thompson, Leroy; Bunting, Jeanne Cc: LaTonya Stephens <LaTonya.Stephens@ema.alabama.gov>; Michael Johnson <MichaelJohnson@ema.alabama.gov></p> <p> </p> <p>2 attachments (22 MB) Save all to OneDrive - IEM Download all</p> <p>Hi Leroy and Jeanne,</p> <p>Please see the attached Department of Finance/Division of Construction Management’s information for inclusion/incorporation into the 2023 SHMP Update---The pages in question have comments.</p> <p>Thanks!</p> <p>Alicia R. Reed Recovery Plans Section Chief Alabama Emergency Management Agency 898 County Road 41 P.O. Drawer 2160 Tarrant, AL 35046 904-389-3330</p>

Appendix E: Planning Process Documents

See additional attachments for Appendix E.

Appendix F: Technological Hazards

Much of the information in this section was taken from the State of Alabama Emergency Operations Plan (EOP), since the SHMP profiles the hazards included in that document. Other resources, when reviewed for additional information to add to this section, were cited and included as footnotes.²³⁶

F.1 Biological Incident

F.1.1 Description

A biological incident includes naturally occurring biological diseases (communicable and non-communicable) in humans and animals, as well as diseases occurring as the result of intentional transmission or release of disease-causing biological agents during terrorist events.

This definition also includes biological agents found in the environment or zoonotic diseases, which are found in animals and may be transmitted to humans. Incidents that are restricted to animal, plant, or food health or safety are reviewed in other appendices.

Bioterrorism acts against the civilian population may occur and be identified in different ways. An attack may be surreptitious, in which case the agent is first identified as having been disseminated when it shows up in humans or animals. Identification may be determined either in clinical case reports to domestic or international public health authorities, or when domestic or international surveillance systems detect unusual patterns of symptoms or encounters with a disease or agent.

- A terrorist-induced infectious disease outbreak may initially be indistinguishable from a naturally occurring outbreak. Moreover, depending on the particular agent and associated symptoms, several days could pass before public health and medical authorities suspect that terrorism may be the cause of the outbreak. In such cases, criminal intent may not be apparent until after an illness is recognized.
- Surveillance systems, such as the National Electronic Disease Surveillance System (NEDSS), are used by public health agencies to help detect the presence of a biological agent in the environment and may trigger a response by public health, medical, and law enforcement before the first clinical cases appear, or activate a rapid response after the first clinical cases are identified.
- Other cooperating departments and agencies may detect acts of bioterrorism or biological incidents during their normal operations and surveillance efforts. In such cases, approved

²³⁶ State of Alabama, State of Alabama Emergency Operations Plan, <https://alabamaema.files.wordpress.com/2017/11/alabama-eop-11-basic-plan-final.pdf#>, March 2022, accessed December 1, 2022.

interagency response protocols will be used to notify the appropriate health and law enforcement authorities following a notification assessment process described in this appendix.

F.1.2 Probability of Future Events

In today's climate, it is difficult to estimate the probability of a biological incident. A terrorist or agri-terrorist attack is possible, given that Western nations are seeing an increase in incidences. Another note of concern is homegrown terrorism, which is also growing. It is not outside the realm of possibility to see a biological incident within the next 10 years. It is also highly probable that a naturally occurring biological incident could occur within the next 10 years.

F.1.3 Consequence Analysis

The information in Table 17 provides the consequence analysis of potential for detrimental impacts of a biological incident done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 17: Consequence Analysis: Biological Incident

Subject	Ranking	Impacts/Influenza/Pandemic
Health and Safety of Persons in the Area of the Incident	Severe	Depending on the type of outbreak and whether it is communicable, the impact over a widespread area could be severe. Casualties are dependent on warning systems, warning times, and the availability of vaccines, antidotes, and medical services.
Responders	Severe	The impact on responders could be severe, especially if they reside in the area and or are exposed during the response. With proper precautions and safety nets in place, the impact is lessened.
Continuity of Operations	Minimal	Continuity of Operations will be greatly dependent on the availability of healthy individuals. COOP is not expected to be exercised.
Property, Facilities, and Infrastructure	Minimal	Access to facilities and infrastructure could be affected until decontamination is completed.
Delivery of Services	Minimal to severe	Delivery of services could be affected minimally if there are roadblocks or mass hysteria of any level. Supply chain issues could be severe, as witnessed during COVID. If due to terrorism, the same applies.
Environment	Severe	Depending on the source of the outbreak, the impact could be severe for the immediately impacted area. The impact could have far-reaching implications if

Subject	Ranking	Impacts/Influenza/Pandemic
		the disease is transferable between humans and animals or to wildlife.
Economic Conditions	Severe	Impacts on the economy could be severe if the disease is communicable. If due to terrorism or natural causes, the loss of tourism, revenue, and business as usual will greatly affect the local economy and the state as a whole.
Public Confidence in Jurisdiction's Governance	Minimal to Severe	Response and recovery will be in question if they are not timely and effective. If the incident is due to terrorism, did the government monitor any activity, or were they caught unaware? The availability of medical supplies, vaccines, and treatments will come into question.

F.2 Influenza and Pandemic

F.2.1 Description

Infectious diseases affecting humans may be caused by viruses, bacteria, parasites, and fungi that may be spread in several ways:

- Through direct contact with an infected person or animal
- By ingesting contaminated food or water
- Through vectors such as mosquitoes or ticks
- Through contact with contaminated surroundings, such as animal droppings, infected respiratory droplets, or by aerosolization

Alabama's public health and healthcare communities must be prepared to rapidly identify and contain a wide range of biological agents. Each year, local public health departments and the Alabama Department of Public Health investigate the outbreaks of diseases such as food-borne illnesses, sexually transmitted diseases, and vaccine-preventable diseases.

While several infectious diseases are commonly reported among Alabama residents, this appendix will focus on influenza pandemic.

F.2.1.1 Influenza

Influenza (or the flu) is a viral infection of the nose, throat, bronchial tubes, and lungs. There are two primary virus types, A and B. Each includes different strains that tend to change each year. In Alabama, influenza occurs most often in the winter months. It is highly contagious and easily transmitted through contact with droplets from the nose and throat of an infected person during coughing and sneezing. Tracking the incidence of influenza is so vital that the Centers for Disease Control and Prevention (CDC) produces a surveillance report titled "FluView" that provides weekly

updates. Likewise, the Alabama Department of Public Health produces a “Weekly Influenza Report” and Influenza Surveillance Map identifying disease trends by region across the state.²³⁷

Typical flu symptoms include headache, fever, chills, cough, and body aches. Although most affected persons are ill for only a few days, others may develop secondary infections, such as pneumonia, and need to be hospitalized. All populations are affected by influenza, but conditions are typically more serious in children, the elderly, people with weak immune systems, and those affected by chronic illnesses and conditions, such as cancer, emphysema, and diabetes.

A CDC study on estimated disease burden revealed that during the 1990s, seasonal flu-related deaths in the United States ranged from an estimated 17,000 during the mildest season to 52,000 during the most severe season (36,000 on average). According to a study published in 2016, influenza-associated deaths in the United States ranged from a low of 12,000 to a high of 56,000 for the years 2010–2014. The 2020–2021 influenza season saw unusually low infection and death rates and only one pediatric death, the latter being attributed to comorbidity with COVID-19. The CDC reminds the community that 70–85% of flu-related deaths occur in people 65 years of age and older, and this group also accounts for 50–70% of flu-related hospitalizations.²³⁸ Shortlister, a firm that provides company wellness resources, shared the following national statistics describing the country’s influenza economic burden:

- Annual direct costs in the United States for treating influenza, including hospital and doctor’s office visits and prescribed medications, total an estimated \$10.4 billion.
- Roughly 60% of employers provide onsite seasonal flu vaccinations.
- The flu causes U.S. workers to lose up to 17 million workdays.
- The flu costs employers an estimated \$7 billion a year in employee absences due to sick days and lost productivity.
- The average lost wages are roughly \$855.68 per worker, or four days of work.
- During the period 2019–2020, an estimated 14 million workers came down with the flu, resulting in roughly \$13 billion in productivity losses.²³⁹

F.2.1.2 Pandemic

Pandemics are caused by novel virus strains to which people have little or no immunity. A virus spreads from person to person, causes serious illness, and may sweep across the country or spread worldwide in a short time. The CDC and the World Health Organization (WHO) work toward improving surveillance systems and support for pandemic planning, preparation, and management.²⁴⁰

²³⁷ Alabama Department of Public Health, Influenza (Flu): Data and Surveillance, <https://www.alabamapublichealth.gov/flu/data.html>, accessed December 13, 2022.

²³⁸ Influenza (Flu): Adults 65 Years and Older. Centers for Disease Control and Prevention. <https://www.cdc.gov/flu/highrisk/65over.htm>, accessed December 13, 2022.

²³⁹ Shortlister, Health Benefits and Perks, *Flu Statistics and Facts in 2023*, <https://www.myshortlister.com/insights/flu-statistics>, accessed December 13, 2022.

²⁴⁰ Pandemic. Britannica. <https://www.britannica.com/science/pandemic>

A severe pandemic could result in high levels of illness, death, social disruption, and economic loss. Impacts could range from school and business closings to the interruption of basic services, such as public transportation, health care, and the delivery of food and essential medicines. Because of the process utilized to prepare vaccines and secure their approval from the federal Food and Drug Administration, it is not possible to prepare vaccines ahead of time to prevent pandemics. Some of the human and financial costs stem from the lag time to develop and distribute a vaccine to prevent the future spread of the novel virus. In some cases, current vaccines may have limited activity against novel strains. With the introduction of mRNA vaccines during COVID-19, there have been improvements in lag time and other limitations.

The most recent pandemic, Coronavirus Disease-2019 (COVID-19), or SARS-CoV-2, is believed to have originated in China. Some studies suggest that the disease stems from open marketplaces affected by infected wildlife, but other medical specialists believe the disease was caused by a leak from China's Wuhan Institute of Virology.²⁴¹ Regardless of the disease's origins, it spread worldwide, led to millions of hospitalizations and deaths, and caused a significant reduction in the global economy. At the time of this writing, the pandemic is ongoing. It has been suggested that the coronavirus will become, or already is, endemic. The virus has been compared to the virulent 1918 pandemic (H1N1 virus), called the Spanish Flu, which caused over 21 million deaths. It was thus named because news coverage became more extensive after the Spanish king, Alfonso XII, was affected, so it was assumed that the virus originated in Spain.²⁴²

F.2.2 Probability of Future Events

With ever-increasing worldwide travel and globalization, future pandemics are highly likely. Gain-of-function virus research is also being conducted, which leaves the door open for the accidental release of potential viruses that can do great harm to society.

F.2.3 Consequence Analysis

The information in Table 18 provides the consequence analysis of the potential for detrimental impacts of influenza/pandemic done for accreditation with the Emergency Management Accreditation Program (EMAP).

²⁴¹ U.S. Senate Committee on Health Education, Labor, and Pensions, *An Analysis of the Origins of the COVID-19 Pandemic, Interim Report*, October 2022, accessed December 13, 2022.

²⁴² Evan Andrews, The History Channel, *Why Was It Called the 'Spanish Flu'*, original publication January 12, 2016, updated March 27, 2020, accessed December 14, 2023.

Table 18: Consequence Analysis: Influenza/Pandemic

Subject	Ranking	Impacts/Influenza/Pandemic
Health and Safety of Persons in the Area of the Incident	Severe	Impact over a widespread area could be severe, depending on the type of outbreak and whether it is a communicable disease. Casualties are dependent on warning systems, warning times, and the availability of vaccines, antidotes, and medical services.
Responders	Severe	The impact on responders could be severe, especially if they reside in the area and or are exposed during the response. With proper precautions and safety nets in place, the impact is lessened.
Continuity of Operations	Minimal	Continuity of Operations will be greatly dependent on the availability of healthy individuals. COOP is not expected to be exercised.
Property, Facilities, and Infrastructure	Minimal	Access to facilities and infrastructure could be affected until decontamination is completed.
Delivery of Services	Minimal to severe	Delivery of services could be affected (minimally) if there are roadblocks or mass hysteria of any level. Supply chain issues could be severe, as witnessed during COVID-19 pandemic.
Environment	Severe	Depending on the source of the outbreak, the impact could be severe for the immediately impacted area. The impact could have far-reaching implications if the disease is transferable between humans and animals or to wildlife.
Economic Conditions	Severe	Impacts on the economy could be severe if the disease is communicable. Loss of tourism, revenue, and business as usual will greatly affect the local economy and the state as a whole.
Public Confidence in Jurisdiction's Governance	Minimal to Severe	Response and recovery will be in question if they are not timely and effective. Availability of medical supplies, vaccines, and treatments will come into question.

F.3 Cybersecurity Incident

F.3.1 Description

A cybersecurity incident is an occurrence that is assessed as having actual or potential adverse effects on an information system. It is important to distinguish between problems that stem from

mistakes or miscommunications and true cybersecurity incidents involving malicious intent or intent to circumvent security measures, including policies, standards, and procedures.

The first step in incident reporting is determining if the event is a cybersecurity incident. In general, an incident is a violation of computer security policies, acceptable use policies, or standard computer security practices. Cybersecurity incidents may include, but are not limited to, the following events (regardless of platform or computing environment):

- Unauthorized access to a network, system, and/or data
- Repeated attempts at unauthorized access (from either internal or external sources)
- System changes not authorized by or known to the system owner
- Denial of Service (DoS) attack or other disruptions to service
- Evidence of tampering with the removal of, or loss of, data
- Website defacement
- Social engineering incidents
- Non-accidental physical damage to information systems (or the threat of) malware attacks adversely affecting servers or workstations
- Evidence of inappropriate use or other noncompliance with policies or standards
- Other incidents that may compromise the integrity of the state's information systems and the alert levels used to communicate potential or actual threats

Per its EOP, the state will adopt the National Cyber Risk Alert Levels based on the U.S. DHS National Cyber Incident Response Plan.

Table 19: Cyber Risk Alert Levels

Level	Label	Description of Risk	Level of Response
1	Severe	Highly disruptive levels of consequence occurring or imminent	Response functions are overwhelmed. Top-level engagement and federal assistance are essential.
2	Substantial	Observed or imminent degradation of critical function with a moderate to significant level of consequences, possibly coupled with indicators of higher levels of consequences impending	The (federal) Department of Homeland Security is engaged, and the Alabama Cybersecurity Incident Response Team (CSIRT) is activated. AEMA, ALEA, ALNG, and AFC are activated as support agencies for disaster response.
3	Elevated	Early indication of, or the potential for but no indicators of, moderate to severe levels of consequences	An upward shift in precautionary measures occurs and responding personnel can manage incidents/events within the parameters of a normal or slightly enhanced operational posture.

Level	Label	Description of Risk	Level of Response
4	Guarded	The baseline of risk acceptance	Baseline operations, regular information sharing, preparedness exercises, reporting, and mitigation continue without undue disruption or resource allocation.

F.3.1.1 History of Cybersecurity Incidents in Alabama

Alabama is not immune to cybersecurity incidents, as reflected in Table 20.

Table 20: Cyberattacks in Alabama

Date	Event
November 28, 2017	Montgomery Public Schools (Montgomery County) Montgomery Public Schools gave few details of the cyberattack. Many suspected a phishing email containing malware was opened. The IT department repaired the system. The payroll system remained unaffected.
October 5, 2017	Morgan County Schools (Morgan County) A malicious phishing email launched an aggressive virus on the Morgan County School network. Emotet, a Trojan horse virus, rendered school Internet access unavailable for a week. Technicians isolated the infected network.
September 18, 2017	Montgomery County Government (Montgomery County) All county computer-based systems were locked. The probate office was the most impacted. 911 was not affected because it was on its own network. County commissioners authorized paying a \$32,000 ransom. Montgomery had seven days to pay the ransom before the hackers destroyed all data. The data of concern was estimated to be worth over \$5 million. A ransom was paid, and no data was believed to have been compromised.

F.3.2 Probability of Future Events

There is a high likelihood of a cybersecurity incident in the state within the next 3 years.

F.3.3 Consequence Analysis

The information in Table 21 provides the consequence analysis of the potential for detrimental impacts of a cyber incident done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 21: Consequence Analysis: Cybersecurity Incident

Subject	Ranking	Impacts/Cybersecurity Incident
Health and Safety of Persons in the Area of the Incident	Minimal to severe	Depending on the type of cybersecurity incident, the impact over a widespread area could be severe. A ransomware attack can disable or destroy software systems, which can affect hospital patients, utilities, fuel, and our infrastructure.
Responders	Minimal to severe	Depending on the incident, the impact on responders could be severe. An attack on our infrastructure and communication systems could impact the response, creating even more destruction.
Continuity of Operations	Minimal to severe	Continuity of Operations will be greatly dependent on the type and severity of the incident.
Property, Facilities, and Infrastructure	Minimal to severe	Facilities and infrastructure could be affected depending on the incident. A cybersecurity attack can take down power, fuel, and supply distribution.
Delivery of Services	Minimal to severe	Delivery of services could be affected, and the effects could be severe, depending on the type of incident. Supply chain issues could be severe if a cybersecurity attack affects critical lines.
Environment	Minimal	The impact on the environment is expected to be minimal.
Economic Conditions	Severe	Impacts on the economy could be severe if a cybersecurity attack takes down critical lines and big and small businesses.
Public Confidence in Jurisdiction's Governance	Severe	Response and recovery will be in question if they are not timely and effective.

F.4 Radiological Event

F.4.1 Description

A radiological attack is the intentional spread of radioactive material with the intent to cause harm. Radioactive materials are used every day in laboratories, medical centers, and food irradiation plants, and they are used for industrial purposes. If stolen or otherwise acquired, many of these

materials could be used in a radiological dispersal device (RDD), otherwise known as a “dirty bomb.”²⁴³

- Radiological attack: Low risk/high impact
- Radiological fixed facilities attack: Low risk/medium impact
- Radiological transportation attack: Low risk/low impact

Table 22: Radiological Attack Impacts and Risk/Vulnerability

Radiological Event	Impact	Low Risk/ Vulnerability
Radiological Attack		
People	High	X
Property	High	X
Environment	High	X
SEOC Operations	High	X
Radiological (Fixed Facility)		
People	Medium	X
Property	Medium	X
Environment	Medium	X
SEOC Operations	Medium	X
Radiological (Transportation)		
People	Low	X
Property	Low	X
Environment	Low	X
SEOC Operations	Low	X

F.4.1.1 History of Radiological Events in Alabama

Radiological events that are intentional attacks are fairly rare in Alabama. While other radiological incidents happen, such as in hospitals, on highways, and so forth, a purposeful attack has not been recorded in the state. The following table shows two typical radiological incidents in the state that were the result of human error and equipment malfunction.

Table 23: Radiological Events

Date	Description
March 9, 1985	Browns Ferry Nuclear Power Plant (Lauderdale County)

²⁴³DHS, Communicating in a Crisis; Radiological Attack. [Communicating in a Crisis: Radiological Attack \(dhs.gov\)](https://www.dhs.gov/communicating-in-a-crisis/radiological-attack)

Date	Description
September 15, 1984	Instrumentation systems malfunctioned during startup, convincing the Tennessee Valley Authority to suspend operations at all three Browns Ferry Units. Browns Ferry Nuclear Power Plant (Lauderdale County) Safety violations, operator error, and design problems forced a 6-year outage at Browns Ferry Unit 2.

F.4.2 Probability of Future Events

It is highly likely that Alabama will experience the accidental release of radioactive materials (as described below). The intentional release of radioactive materials, however, is low.

F.4.2.1 Transportation of Radioactive Materials

- The U.S. Department of Energy (DOE) transports shipments of radioactive waste material through the State of Alabama. Incidents may occur during transport and cause the release of radioactive materials. This could happen at any point during transport and may require state agencies to implement response actions to protect the health and safety of the population.
- Radiological incidents may not be immediately recognized as such until radioactive material is detected, or the effects of radiation exposure are manifested in the population.
- Response to motor vehicle accidents involving radiological materials requires detection equipment and trained personnel to detect, contain, and limit the continued spread of contaminated materials.
- Radioactive materials shipped/transported by private carriers have markings but can still pose a hazard.
- Transportation of U.S. Department of Defense (DOD) radioactive materials is not announced, but transport of these materials includes the use of armed escorts who are authorized to use deadly force if necessary.

F.4.2.2 Shipments by the Department of Defense (DOD)

- The shipments of nuclear materials are classified, and incident responses are managed by DOD.
- DOD notifies other agencies when a shipment has been involved in an incident. AEMA will notify the Alabama Law Enforcement Agency (ALEA), Alabama Department of Public Health (ADPH), and county Emergency Management Agencies (EMAs).

F.4.2.3 Commercial Radiological Shipments

- For commercial transportation incidents involving radioactive material, the State Emergency Operations Center (SEOC) and ADPH will be notified.

- The owner of the radioactive material is responsible for the cleanup, which will be overseen to ensure that it meets established standards. Cooperation and coordination of these actions will also take place between the local EMA and AEMA.

F.4.2.4 Foreign, Unknown, or Unlicensed Radioactive Materials

- ALEA is the primary agency for an incident involving foreign, unknown, or non-licensed radiological shipments.
- ALEA's Preventive Radiological/Nuclear Detection (PRND) group will assess the on-scene incident and notify ADPH if radiological material is detected.
- ADPH will provide personnel to support the incident if requested.
- Radioactive materials may come from several other sources: imported materials with radioactive contamination; foreign spacecraft, aircraft, and ships; shipments of foreign-owned radioactive materials; and unknown sources (referred to as orphan sources) that include abandoned radioactive materials.
- Unknown types of radiological incidents may not be recognized immediately until responders and/or the general public have been exposed.
- ALEA's Critical Response Team (CRT) is the lead response agency under the PRND program for incidents involving foreign, unknown, or unlicensed radiological sources that have actual, potential, or perceived radiological consequences on land and waterways.
- CRT will assess the incident scene and notify ADPH if radiological assistance is needed.

F.4.2.5 Nuclear Power Plants

The nature of a radiological incident requires advanced technical knowledge and civil action judgment. Alabama has two nuclear power plants, with a total of five reactors. These plants generate 32% of the electricity in the state. Nuclear power is a major source of electricity, ranking fourth among all generators in the country.²⁴⁴ While there have not been any incidents involving terrorism or homegrown disorder, the state conducts yearly exercises to ensure that the plants and the state comply with emergency response protocols and are able to act quickly, should an incident occur.

²⁴⁴ Nuclear Power in Alabama. <https://www.trioplantbased.com/nuclear-power-in-alabama/>

Figure 5: Nuclear Power Plant Locations



Further information can be found in the State of Alabama EOP.²⁴⁵

F.4.3 Consequence Analysis

The information in Table 24 provides the consequence analysis of the potential for detrimental impacts of a radiological event done for accreditation with the Emergency Management Accreditation Program (EMAP).

²⁴⁵ AEMA, State of Alabama Emergency Operations Plan, March 2022, <https://alabamaema.files.wordpress.com/2017/11/alabama-eop-11-basic-plan-final.pdf#>, accessed December 19, 2022.

Table 24: EMAP Consequence Analysis: Radiological Event

Subject	Ranking	Impacts/Radiological Event
Health and Safety of Persons in the Area of the Incident	Severe	The impact is expected to be severe for persons within the incident area. Protection capabilities and warning times will greatly affect the severity.
Responders	Severe	The impact on responders could be severe if they are not trained and properly equipped. The impact on properly trained and equipped responders will be low to moderate.
Continuity of Operations	Minimal to severe	Temporary relocation could be necessary if government facilities are in close proximity to the incident area. Depending on the extent of the cleanup, this temporary relocation could become significant.
Property, Facilities, and Infrastructure	Minimal to severe	The impact within the incident area could be severe on property, facilities, and infrastructure.
Delivery of Services	Minimal to severe	Delivery of services could be affected within and around the affected area.
Environmental	Severe	Localized impacts within the incident area could be severe to native plants, wildlife, and natural habitats. Cleanup and remediation will be required.
Economic Conditions	Minimal to severe	Economic conditions could be adversely affected, depending on the time and extent of cleanup and investigation.
Public Confidence in Jurisdiction's Governance	Minimal to severe	The impact will be dependent on whether or not the incident could have been avoided by government or non-government entities, the length of cleanup and investigation times, and the outcomes.

F.5 Terrorist Incident

F.5.1 Description

Terrorist incidents are violent, criminal acts committed by individuals and/or groups to further ideological goals stemming from domestic influences, such as those of a political, religious, social, racial, or environmental nature. The Federal Bureau of Investigation (FBI) defines terrorism as “the unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives.” Terrorism can be physical force, violent acts, or cyberterrorism (involving malicious infiltration of computer systems).

According to the Southern Poverty Law Center, in 2021, there were 733 hate groups in the United States, of which 13 are in Alabama.²⁴⁶ Following are the hate groups being tracked in Alabama:

- Alabama Knights of the Ku Klux Klan
- Israel United in Christ (two chapters)
- Israelites Saints of Christ
- National of Islam (three chapters)
- Proud Boys
- Great Millstone
- Israelites School of Universal Practical Knowledge
- League of the South
- Occidental Dissent
- Southern Cultural Center

Figure 6: Hate Groups in Alabama

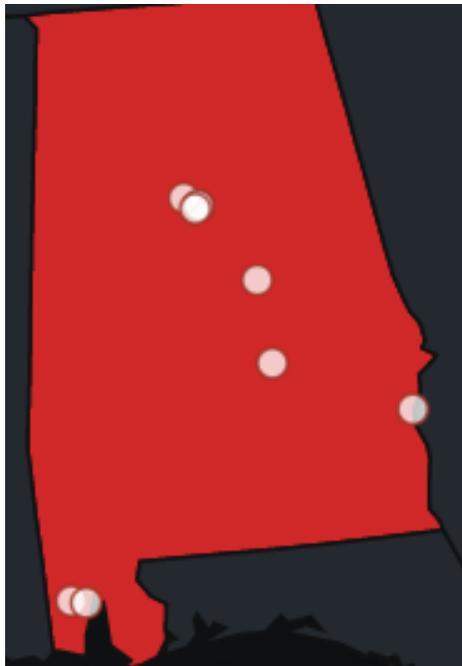


Table 25: Terrorist Incident Impacts and Risk/Vulnerability

Terrorism	Impact	Low Risk/ Vulnerability
People	High	X

²⁴⁶ Southern Poverty Law Center. In 2021, 13 Hate Groups Were Tracked in Alabama. <https://www.splcenter.org/states/alabama>

Terrorism	Impact	Low Risk/ Vulnerability
Property	High	X
Environment	High	X
SEOC Operations	High	X
Cyberterrorism		
People	High	X
Property	High	X
Environment	High	X
SEOC Operations	High	X

F.5.2 Probability of Future Events

Based on globalization, homegrown terrorism, and the scorn many have for the Western world, this hazard is possible. Terrorism is on the increase, and the threat is there.

F.5.3 Consequence Analysis

The information in Table 26 provides the consequence analysis of the potential for detrimental impacts of a terrorist incident done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 26: Consequence Analysis: Terrorist Incident

Subject	Ranking	Impacts/Terrorist Incident
Health and Safety of Persons in the Area of the Incident	Severe	The impact could be severe for persons in the incident area.
Responders	Minimal to severe	The impact on responders could be severe if they are not trained and properly equipped. The impact on properly trained and equipped responders will be low to moderate.
Continuity of Operations	Minimal to severe	Depending on the damage to facilities/personnel in the incident area, relocation may be necessary, as may lines of succession.
Property, Facilities, and Infrastructure	Severe	An explosion could have a severe impact within the incident area and a moderate to low impact on HAZMATs.
Delivery of Services	Minimal to severe	Delivery of services could be affected within and around the affected area, especially if

Subject	Ranking	Impacts/Terrorist Incident
Environment	Minimal to severe	communications, roads, railways, and facilities incur damage. Depending on the type of human-caused incident, localized impact within the incident area could be severe.
Economic Conditions	Minimal to severe	Economic conditions could be adversely affected, depending on the time and extent of cleanup and investigation.
Public Confidence in Jurisdiction's Governance	Minimal to severe	The impact will be dependent on whether or not the incident could have been avoided by government or non-government entities, the length of cleanup and investigation times, and the outcomes.

F.6 Civil Disturbance

F.6.1 Description

In the United States, civil disorder has been most commonly associated with urban areas and college campuses, particularly in the 1960s, around the issues of civil rights and the Vietnam War. Civil disorder is a term that generally refers to groups of people purposely choosing not to observe a law, regulation, or rule, usually in order to bring attention to their cause, concern, or agenda. According to U.S. Code (18 U.S.C. §232), civil disorder is “any public disturbance involving acts of violence by a group of three or more persons causing immediate danger, damage, or injury to the property or person of another individual.” Civil disorder is recognized as a societal hazard because of the associated potential for injury, loss of life, property damage, and economic disruption. Civil disorder can take the form of small gatherings or large groups impeding access to a building or disrupting normal activities by generating noise and intimidating people. It can range from a peaceful sit-in to a full-scale riot. Even in its more passive forms, a group that blocks roadways, sidewalks, or buildings interferes with public order. In the 1990s, abortion clinics, for example, were targets for these disruptive-type activities. Civil disturbance refers to acts of violence and disorder detrimental to maintaining public law and order. It includes deeds such as riots, acts of violence, insurrections, unlawful obstructions or assemblages, and related incidents. It also includes all domestic conditions requiring or likely to require the use of federal armed forces.

F.6.1.1 Types of Crowds

Crowds can be classified into four general categories:

- **Casual crowd:** A casual crowd is merely a group of people who happen to be in the same place at the same time. Examples of this type include shoppers and sightseers. The likelihood of violent conduct is almost nonexistent.

- **Cohesive crowd:** A cohesive crowd consists of members who are involved in some type of unified behavior. Members of this group are involved in some type of common activity, such as worshipping, dancing, or watching a sporting event. Although they may have intense internal discipline (e.g., rooting for a team), they require substantial provocation to spur action.
- **Expressive crowd:** An expressive crowd is one held together by a common commitment or purpose. Although they may not be formally organized, they are assembled as an expression of common sentiment or frustration. Members wish to be seen as having a formidable influence. One of the best examples of this type is a group assembled to protest something.
- **Aggressive crowd:** An aggressive crowd is made up of individuals who have assembled for a specific purpose. This crowd often has leaders who attempt to arouse the members or motivate them to action. Members are noisy and threatening and will taunt authorities. They tend to be impulsive and highly emotional and require only minimal stimulation to arouse them to violence. Examples of this type of crowd include demonstrators and strikers.²⁴⁷

F.6.1.2 Types of Mobs

A mob can be defined as a large, disorderly crowd or throng. Mobs are usually emotional, loud, tumultuous, violent, and lawless. Like crowds, mobs have different levels of commitment and can be classified into four categories: aggressive, escaping, acquisitive, or expressive.

Although members of mobs have differing levels of commitment, as a group, they are far more committed than members of a crowd. As such, a “mob mentality” sets in, which creates a cohesiveness and sense of purpose that is generally lacking in crowds.

Table 27 shows the impact and risk/vulnerability to civil disturbance for different sectors.

Table 27: Civil Disturbance Impacts and Risk/Vulnerability

Civil Disturbance	Impact	Low Risk/ Vulnerability
People	Low	X
Property	Low	X
Environment	Low	X
SEOC Operations	Low	X

²⁴⁷ Types of Crowds. <https://www.sociologydiscussion.com/social-groups/crowd-types-4-main-types-of-crowd/2814>

F.6.1.3 History of Civil Disturbance in Alabama

Table 28: Civil Disturbances

Date	Description
May/June 2020	Protests (Jefferson, Montgomery, and Tuscaloosa Counties) Otherwise, peaceful protests resulted in property damage in response to the murder of George Floyd.
November 2018	Protests (Jefferson County) Peaceful protests were held in response to the fatal shooting of Emantic Bradford, Jr., at the Riverchase Galleria Mall.
July 2013	Protests (Jefferson, Montgomery, and Tuscaloosa Counties) Peaceful protests were held in response to the verdict in the Trayvon Martin case.

F.6.2 Probability of Future Events

There is a high likelihood of civil disturbance in the state of Alabama.

F.6.3 Consequence Analysis

When rioting breaks out, law enforcement authorities generally find it difficult to promptly stop the violence. The rules of constitutional law set stringent limits on how police officers can behave toward the people they try to arrest. Restraint also plays a crucial part in avoiding any action that “fans the flames.” Initial police presence is often undermined because forces may be staffed below the peak loads needed to bring things back under control. As a result, the riot may continue until enough state police or National Guard units arrive to bolster the arrest process and subsequently restore order. In many cases, damage to life and property may already be extensive.

The information in Table 29 provides the consequence analysis of the potential for detrimental impacts of a civil disturbance done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 29: Consequence Analysis: Civil Disturbance

Subject	Ranking	Impacts/Terrorism
Health and Safety of Persons in the Area of the Incident	Severe	The impact could be severe for persons in the incident area.

Subject	Ranking	Impacts/Terrorism
Responders	Minimal to severe	The impact on responders could be severe if they are not trained and properly equipped. The impact on properly trained and equipped responders will be low to moderate.
Continuity of Operations	Minimal to severe	Depending on the damage to facilities/personnel in the incident area, relocation may be necessary, as may lines of succession.
Property, Facilities, and Infrastructure	Severe	Impact within the incident area could be severe if the disturbance escalates to violence.
Delivery of Services	Minimal to severe	Delivery of services could be affected within and around the affected area, especially if communications, roads, railways, and facilities incur damage.
Environment	Minimal to severe	Depending on the type of human-caused incident, localized impact within the incident area could be severe.
Economic Conditions	Minimal to severe	Economic conditions could be adversely affected, depending on the time it takes law enforcement to gain control and the extent of cleanup and investigation.
Public Confidence in Jurisdiction's Governance	Minimal to severe	The impact will be dependent on whether or not the incident could have been avoided by government or non-government entities, the length of cleanup and investigation times, and the outcomes.

F.7 Energy Crisis

F.7.1 Description

An energy crisis is a great bottleneck in an economy's supply of energy resources. Energy resources are used at a certain time and place, particularly those that supply national electricity grids or serve as fuel for vehicles. There has been an enormous increase in the global demand for energy in recent years as a result of industrial development and population growth, and the present demand for energy is greater than the supply.

Table 30: Energy Crisis Impacts and Risk/Vulnerability

Energy Crisis	Impact	Medium Risk/Vulnerability
People	Medium	X
Property	Medium	X

Energy Crisis	Impact	Medium Risk/ Vulnerability
Environment	Medium	X
SEOC Operations	Medium	X

Alabama is reviewing ways to mitigate potential threats to the natural gas and electrical grid that provide Alabama with needed power.

In the State of Alabama, there are currently 6,823 miles of natural gas transmission pipelines and 31,916 miles of natural gas distribution pipelines. Over time, these pipelines have become corroded, and a leak may occur at a weak point if the pipe is not replaced. Outside forces may also affect distribution, such as when there is interference at a point in the delivery chain that hinders the flow of natural gas to the customer. The state has 12 natural gas processing facilities and 5 liquid natural gas (LNG) facilities.²⁴⁸

The current electrical grid is vulnerable to many different hazards that range from natural hazards like severe weather to non-natural hazards like a car striking a power pole and knocking out the power to an area. Some of the elements that have affected the electrical grid in the past and can affect it in the future include the following:

- Animals
- Faulty equipment/human error
- Overdemand
- Vehicle accidents
- Weather/falling trees
- Intentional damage

F.7.1.1 History of Energy Crisis in Alabama

The history of the energy crisis hazard in Alabama is as long as the list of weather events and other natural hazard events. An energy crisis is usually a cascading event that is caused by a storm, sabotage, and so on. The following table shows one such crisis.

²⁴⁸ U.S. Department of Energy (DOE), Office of Cybersecurity, Energy Security, and Emergency Response (CESE), State of Alabama Sector Energy Risk Profile, <https://www.energy.gov/sites/default/files/2021-09/Alabama%20Energy%20Sector%20Risk%20Profile.pdf>, accessed December 19, 2022.

Table 31: Energy Crisis Incident

Date	Description
May 7, 2021	<p>Colonial Pipeline Shutdown (Shelby County)</p> <p>The Colonial Pipeline Company was forced to halt pipeline operations for six days, resulting in reported fuel shortages in the Southeast, including Alabama.</p>

Energy infrastructure is also vulnerable to earthquakes and severe weather. Electrical power systems are among the most at risk of earthquakes. Because such systems are also among the most essential utilities, even a short-term loss can trigger a major community setback. The loss of electric power during an earthquake may result in there being no water to fight fires or use as drinking water; there would be no power to use for lighting or heating, for communications, or to pump sewage and petroleum. Gas shortages may also occur.

F.7.2 Probability of Future Events

The probability of a future energy infrastructure crisis is highly likely, due, for example, to weather and infrastructure age.

F.7.3 Consequence Analysis

The information in Table 32 provides the consequence analysis of the potential for detrimental impacts of an energy crisis done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 32: Consequence Analysis: Energy Crisis

Subject	Ranking	Impacts/Energy Crisis
Health and Safety of Persons in the Area of the Incident	Minimal to severe	Depending on the length of failure and time of year, the localized impact will be moderate to severe for persons with functional and access needs, as well as the elderly.
Responders	Minimal	The impact on responders will be minimal if they are properly trained and equipped.
Continuity of Operations	Minimal	Due to the nature of the hazard, the COOP plan is not expected to be activated; however, if the recovery time is excessive, then temporary relocation may become necessary.
Property, Facilities, and Infrastructure	Minimal	The impact is dependent on the nature of the incident (electric, water, sewage, gas, communication disruptions, etc.).

Subject	Ranking	Impacts/Energy Crisis
Delivery of Services	Minimal	Delivery of services could be affected within and around the affected area.
Environment	Minimal	The impact on the environment is expected to be minimal.
Economic Conditions	Minimal	Economic conditions could be adversely affected depending on the damages suffered, the extent of the damages, etc.
Public Confidence in Jurisdiction's Governance	Minimal	The impact will be dependent on the timeliness and effectiveness of the government's or non-government entities' response, recovery, and planning.

F.8 HAZMAT Incident

F.8.1 Description

HAZMAT is an abbreviation for “hazardous materials,” or substances in quantities or forms that may pose a risk to health, property, or the environment. HAZMAT incidents involve substances such as toxic chemicals, fuels, nuclear waste products, and biological, chemical, and radiological agents. HAZMATs may be released as liquids, solids, gases, or a combination of all three, including dust, fumes, gas, vapor, mist, and smoke.

HAZMAT spills have resulted in health issues, injuries, and deaths in people and animals, as well as damage to buildings, homes, property, and the environment. Given the potential for dire consequences, it is reasonable to conclude that one may not encounter HAZMATs on a daily basis. The truth, however, is that many products containing hazardous chemicals are routinely used and stored in homes and are transported every day on the nation's highways, railroads, and waterways, as well as through pipelines. Table 33 shows the impacts and vulnerability to people, property, and other aspects of civilization.

Table 33: HAZMAT Incident Impacts and Risk/Vulnerability

HAZMAT	Impact	Low Risk/ Vulnerability
HAZMAT (Fixed Facility)		
People	Medium	X
Property	Medium	X
Environment	Medium	X
SEOC Operations	Medium	X
HAZMAT (Transportation)		

HAZMAT	Impact	Low Risk/ Vulnerability
People	Low	X
Property	Low	X
Environment	Low	X
SEOC Operations	Low	X

Table 34: HAZMAT Incidents

Event	Date	Description
HAZMAT Fixed Facility	September 26, 2019	<p>Colonial Pipeline Gasoline Release (Shelby County) An estimated 100,000 gallons of free product accumulated in a small pond (aka Pond 2) at the headwaters of Peel Creek; the pond was not discharging. The adjacent pond (aka Pond 3) collected no visible free product but was contaminated with dissolved gasoline constituents. A large area of soil leading from the pipeline, through a small ravine to Pond 2, was contaminated with the product.</p>
HAZMAT Transportation	September 28, 2017	<p>3,800-Gallon Diesel Fuel Spill (Shelby County) The release occurred during a grade crossing accident involving a freight train and a tractor-trailer truck. The freight train had two engines containing 1,900 gallons of diesel fuel each, for a total of 3,800 gallons. After debris removal was completed, 3,234 gallons of diesel fuel were recovered from the engines' fuel tanks. The total amount of diesel fuel spilled on site was 566 gallons, of which 200 gallons were recovered by vacuum truck the same day. Six hundred forty (640) tons of contaminated soil were removed.</p>
HAZMAT Transportation	November 8, 2013	<p>Train Derailment (Pickens County) Twenty-six (26) railcars carrying crude oil derailed at a wooden trestle in a wetland area near the county road. An intense fire occurred, which delayed some oil spill response activities until crew safety could be ensured.</p>

F.8.2 Probability of Future Events

The probability of a HAZMAT event occurring in Alabama is highly likely. Whether due to road conditions, train derailments, or home or work accidents, HAZMAT incidents will occur.

F.8.3 Consequence Analysis

This hazard could have a significant impact on public health, the environment, private property, and the economy. The impact of a HAZMAT disaster will likely be localized to the immediate area surrounding the incident. The initial concern will be for people, followed by the environment.

Table 35 provides the consequence analysis of the potential for detrimental impacts of a HAZMAT incident done for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 35: Consequence Analysis: HAZMAT Incident on Fixed Facility or Transportation

Subject	Ranking	Impacts/Terrorism
Health and Safety of Persons in the Area of the Incident	Minimal to severe	The localized impact will be severe within the plume/spill area, depending on the type of chemical/material released. As distance is increased from the plume area, the impact will become minimal to moderate.
Responders	Minimal to severe	The impact on responders could be severe if they are not trained and properly equipped. The impact on properly trained and equipped responders will be minimal to moderate.
Continuity of Operations	Minimal to severe	Temporary relocation could be necessary if government facilities are in close proximity to the incident area. This temporary relocation could become significant depending on the extent of the cleanup.
Property, Facilities, and Infrastructure	Minimal to severe	The impact is generally expected to be minimal for actual structural properties, facilities, and infrastructure; however, if an igniting device is involved, the impact could be severe.
Delivery of Services	Minimal to severe	Delivery of services could be affected within and around the plume/spill area.
Environment	Severe	The localized impact within the plume/spill area could be severe for native plants, wildlife, and natural habitats. Cleanup and remediation will be required.
Economic Conditions	Minimal to severe	Economic conditions could be adversely affected depending on whether agriculture is affected, what type of material is released, if the company is a major employer, etc.
Public Confidence in Jurisdiction's Governance	Minimal	The impact will be dependent on whether or not the release could have been avoided by government or non-government entities, the length of cleanup and investigation times, and the outcomes.

F.9 Transportation (Air/Sea/Rail) Incident

F.9.1 Description

Transportation is the movement of items to another location. It can be affected by road closures, dangerous weather, and unforeseeable actions caused by people.

Table 36: Transportation Incident Impacts and Risk/Vulnerability

Transportation	Impact	Medium Risk/ Vulnerability
People	Medium	X
Property	Medium	X
Environment	Medium	X
SEOC Operations	Medium	X

F.9.1.1 Department of Transportation

During a HAZMAT incident that occurs while material is being transported, the Alabama Department of Transportation will quickly assess the incident's consequences and develop and implement sustainable short- and long-term strategies for effectively addressing the impacts.

F.9.1.2 Potential Impacts on Transportation Systems

- Damage to transportation systems may severely hamper recovery efforts following an earthquake. The loss or impairment of major rail, highway, and bridge links serving the city may significantly increase the difficulty of rescue and relief efforts and may also have a long-term disruptive effect on regional and national commerce.
- Riverport cities built on alluvial soil may sustain substantial damage to their infrastructure that limits the usefulness of the facilities during relief efforts.
- Partial or limited availability of airport facilities is expected following an earthquake.
- Facilities that rely on electrical power (i.e., navigation aids and runway lighting) may be out of commission for some time, even if emergency power is available. Runways may be available, at least for limited use, even in severely affected areas.
- Ingress and egress routes may not be usable.
- Debris removal may be a major problem.
- In the event that rubble and debris resulting from an earthquake prevent access to the affected area for a prolonged time, helicopters and alternate forms of transportation may be necessary to bring search and rescue teams to the area.
- Transportation routes, including roads and bridges, may be destroyed or damaged. This may include road buckling and misalignment, reducing roadways to rubble.

- Bridges that appear to be structurally sound may need structural reinforcement before they can be used again. Additional modes of transportation—including rail, navigable waterways and ports, and airport runways—may sustain damage that renders them unusable.
 - Transportation system damage may complicate recovery efforts in the wake of a severe weather event. The loss or impairment of major rail and highway links serving a region may hamper rescue and relief efforts and could potentially cause long-term disruptions to regional and statewide commerce.
 - Partial or limited availability of airport facilities is expected following a severe weather event. Facilities that rely on electrical power—for example, navigation aids and runway lighting—may be out of commission for some time, even if emergency power is available. Runways may be available for limited use in severely affected areas.
 - Debris removal may be a problem following even less severe weather incidents.

F.9.1.3 History of Transportation Incidents in Alabama

Table 37: Transportation Incidents

Date	Description
2014	<p>The 1-65 NB Delta River Bridge at Middle River incurred significant fire damage due to an accident on the bridge (Mobile County).</p> <p>1-65 NB was closed for two days, and then only one lane was open to traffic until crossover work was completed to divert traffic to the SB bridge.</p> <p>1-65 NB was closed from June 20 until July 4 for repairs to the bridge girder and deck.</p>
2014	<p>The on-ramp from the causeway to 1-10 EB at Midday had significant damage from a tanker accident on the bridge (Baldwin County). The ramp was closed for 111 days for repairs.</p>

There are five regions throughout the state to serve the public through project development, implementation, and maintenance to provide a safe, efficient, and environmentally sound intermodal transportation system. Regional offices plan, design, and construct projects. They implement projects from pre-construction through completion and provide on-site management for ongoing projects. Working with state and local officials to meet project goals, they assist with securing agreements with property owners, utilities, and businesses. North, West Central, East Central, Southwest, and Southeast are the regions that comprise the State of Alabama.

North: In 2021, ALDOT's North Region focused on projects focused on capacity-building, particularly in Huntsville and the surrounding areas, which in the past decade have experienced meteoric growth in population, commerce, and industry.

West Central: During fiscal year 2021, this region continued to implement major projects designed to improve safety, mobility, and commerce.

East Central: During fiscal year 2020, the completion of the I-59/20 Central Business District bridges brought a renewed focus on the spaces underneath the bridges known as City Walk Birmingham (BHAM). Many other such projects were recently completed or are under construction.

Southeast: This region covers roughly 3,000 centerline miles in 19 counties and includes the cities of Montgomery and Troy. It also covers the area from Dallas County, located in the middle of the state, north to the Georgia state line and down through the Wiregrass region, which stretches along the coastal plain from southern Georgia and northern Florida into nine counties of southeastern Alabama to the Florida state line.

Southwest: This region overcame COVID-19-induced industry-wide labor and material shortages and completed several major projects in 2021. It also started and completed additional major projects that will shape the roadway infrastructure landscape for the near future. The region has for a long time wanted to connect rural western Alabama to other parts of the state by creating a four-lane highway. Despite the unfavorable impacts of COVID-19, the pandemic also bolstered the spirit of resiliency and determination in the region and the local transportation community, both of which continued to provide meaningful, safer, and innovative improvements to its transportation network.

The Southwest Region experienced a tumultuous fall of 2020 and an unusually active hurricane season. Hurricane Sally and Hurricane Zeta struck the Gulf Coast within just over one month of each other, both causing damage, debris, and impassable roadways. Hurricane Sally made landfall as a Category 2 event on September 16, 2020, requiring recovery well into the 2021 fiscal year. This slow-moving storm brought 105 mph winds that caused significant damage and power outages. Large trees were toppled onto power lines and into roadways, and many traffic signals were inoperative. Signal crews worked diligently and restored traffic signals within a week of the storm.

ALDOT contractors completed debris pickup operations in mid-January 2021 and collected over 700,000 cubic yards of debris across Mobile, Baldwin, Escambia, and Conecuh Counties. On October 28, 2020, Hurricane Zeta made landfall in Louisiana as a Category 2 event with sustained winds of 110 mph. The storm moved northeastward, missing coastal Alabama but significantly affecting the Grove Hill area, which lies southeast of Montgomery and northeast of Mobile, or roughly 80 miles north of Mobile Bay. The storm downed trees across Washington, Clarke, Monroe, Wilcox, Choctaw, and Marengo Counties, requiring extensive debris collection efforts by ALDOT contractors.

F.9.2 Probability of Future Events

Transportation is the lifeblood of civilization. It supplies goods, services, and necessities to all. The probability of an event that includes transportation is highly likely.

F.9.3 Consequence Analysis

Table 37a: Consequence Analysis: Transportation (Air, Sea, Rail) Incident

Subject	Ranking	Impacts/Transportation
Health and Safety of Persons in the Area of the Incident	Minimal to severe	The impact to transportation could range from minimal to severe. Large-scale disruptions that reduce the ability of first responders to bring medicine, medical treatment, and transportation to hospitals may delay delivery of lifesaving care and result in casualties. Assuming there are multiple routes leading to medical institutions, the impact could be minimal if only one route to medical care is cut off.
Responders	Minimal to severe	The loss or impairment of major transportation routes could severely impact the ability of responders to quickly reach the crisis location depending on the availability of air, sea, or rail transportation.
Continuity of Operations	Minimal to severe	Temporary relocation of emergency management operations may become necessary if government facilities are near the incident area. Relocation could become a significant disruption to operations depending on the extent of damage to one or more transportation systems.
Property, Facilities, and Infrastructure	Minimal to severe	The impact could be severe depending on the nature of the hazard. An earthquake or tornado may greatly impact property, facilities, and infrastructure, including waterways, roadways, airports, and rail service.
Delivery of Services	Minimal to severe	Delivery of services could be affected within and around the area(s) in which transportation systems are located, as well as the number of systems affected.
Environment	Severe	Localized impact may range from minimal to severe. An earthquake, tornado, or winter storm could decimate the built and natural environments and cause the release of chemicals harmful to the environment, people, and wildlife.
Economic Conditions	Minimal to severe	Economic conditions may be adversely affected depending on the extent of the disaster. If transportation routes are severely impacted, the economy will suffer.
Public Confidence in Jurisdiction's Governance	Minimal	The level of confidence on the part of the citizenry in their government will be affected by how quickly governmental and non-government entities are able to respond to the crisis at hand; the length of time it takes to conclude response and recovery efforts; and how quickly the affected population receives needed assistance.

Appendix G: Hazard Mitigation Grant Program Implementation Process

Specific details of the three-phase Hazard Mitigation Grant Program (HMGP) Implementation Process and items considered in the review are presented below.

Phase I: HMGP Funds Allocation/Application Submittal:

- A Disaster Declaration is issued.
- HMGP briefings are performed in conjunction with Public Assistance (PA) applicant briefings to announce the availability of HMGP – general program overview.
- 30 days:
 - The initial estimate for HMGP is received.
 - The state establishes the initial procedure for fund allocation.
- 90 days:
 - FEMA issues a 90-day lock-in for the HMGP funding amount (which can increase or decrease).
 - The state finalizes the funding projections and issues a Notice of Funding Availability (NOFA) to the county Emergency Management Agency (EMA) office, with instructions to convene the local HMP Committee to complete a Letter of Inquiry (LOI) by the established deadline.
 - The LOI deadline is set for 30 days from NOFA receipt.
 - ◆ The LOI must be coordinated and prioritized through the local mitigation planning committee and signed by the county EMA director and all affected applicants.
 - The state schedules application workshops.
- 180 days:
 - The full application is due.

Phase II – Project Reviews and Submittals:

- Applications completed by the requesting jurisdiction (city, county, or agency) are sent to the county EMA.
- The county EMA keeps a copy and sends the original to AEMA by the deadline.
- AEMA planners review and address any correspondence to the listed point of contact (and copy the county EMA director and AEMA field coordinator).
- In the event of a lack of communication with the applicant, the planner will speak with the county EMA director.

During Phase II, the state reviews projects for a variety of factors, including jurisdictions with the highest risk, repetitive loss properties, and development pressures.

Phase III – Project Approval and Implementation Procedures:

- Upon FEMA approval, an approval package is mailed to the subgrantee.
- The State-Subgrantee Agreement is executed and returned to the state.

A kickoff meeting is held with AEMA, the subgrantee, and the county to discuss implementation and the closeout procedure.

Appendix H: Updates to the 2018 Mitigation Action Plan

2018 Action #	Action	2018 Obj.	Priority	Hazard(s) Addressed	Responsible Agency	Funding Source	Projected Timeline	Projected Cost	How Action Contributes to Mitigation Strategy	Status	2023 Proposed Action Changes Status
1	Establish a schedule to provide state and local offices with current information on past events (including damages).	1.1	Low	All	AEMA	Unknown HMA, HMGP, PDM	Near-term	Staff time	Updating state and local officials with current information will improve future decisions regarding mitigation.	Ongoing	Revised and moved forward as a 2023 mitigation action.
2	Provide funding and technical assistance to state agencies, local governments, and tribes to administer mitigation activities, including preparing hazard mitigation plans.	1.1	Medium	All	AEMA; FEMA	HMA, HMGP, PDM	Mid-term	Staff time and project costs TBD by local/tribal project scope	Expanding the number of hazard mitigation initiatives will improve the state's resistance to hazards.	Ongoing	Revised and moved forward as a 2023 mitigation action. None
3	Develop and update a comprehensive record of	1.1	Low	All	ADEM	State funds	Near-term	Staff time	Maintaining a comprehensive record of assets	Ongoing	Delete

	ADEM's assets and operations.									and operations will improve accessibility and expand their use.	
4	Assist K-12 schools and state colleges and universities to develop vulnerability assessments, mitigation plans, and mitigation projects to improve safety in their most vulnerable buildings.	1.1	High	All	AEMA; AARC; local government	FEMA, local	Long-term	Staff time and project specific costs based on individual regulations	Providing technical assistance to educational facilities encourages the use of mitigation and strengthens critical facilities.	Ongoing	Revised and moved forward as a 2023 mitigation action.
5	Inventory and catalog natural hazards studies, maps, digital data, and other information available from city, county, state, federal, university, private, and other sources.	1.2	Low	All	AEMA	Unknown HMGP, HMA, PDM	Near-term	Staff Time	Maintain a comprehensive invoice/catalog will improve the use of the data by agencies.	Ongoing	Revised and moved forward as a 2023 mitigation action.
6	Adopt a common Geographical Information System (GIS) data system throughout state, county, and local government.	1.2	Low	All	AEMA	Unknown	Near-term	TBD	Better risk information will improve understanding for decisions to protect lives and property.	Ongoing	Revised and moved forward as a 2023 mitigation action.
7	Alabama State Building Commission to review the state building	2.1	High	All	Bldg. Code Commission	Operating budget	Near-term	Staff time	Expanding hazard mitigation initiatives will	Ongoing	Revised and moved forward as a 2023

	codes against the most recent standards (e.g., IBC for earthquake, wind loads, flood, and fire) to identify where state codes require revisions and update accordingly.									improve the state's resistance to hazards for the future.	mitigation action.	
9	Implement Legislation Title 11-19-1 through 11-19-24.	2.2	Medium	All	ADECA; AAR; ACCA	FEMA, local	Mid-term	Staff Time		Land use management practices that address mitigation and increase the degree to which the state is able to protect lives and property .	Ongoing	Revised and moved forward as a 2023 mitigation action.
10	Provide regular educational programs to local building and code enforcement officials about minimum standards for construction in hazardous areas (e.g., wind loads, floodplains, earthquake zones).	2.2	Medium	All	AACC; ALM;ADCNR; local government	Bonding funds; ACAMP -CZMA funds	Mid-term	Staff time		Improving building inspections will increase the integrity of structures and protect occupants during hazard events.	Ongoing	Revised and moved forward as a 2023 mitigation action.
11	Administer training to local governments about integrating hazard reduction planning into	2.2	Medium	All	AEMA; local government	Multiple funding sources	Long-term	Staff time		Coordinating plans ensures that mitigation efforts are addressed.	Ongoing	Revised and moved forward as a 2023 mitigation action.

land-use plans and development regulations.

1 2	Promote, strengthen, and coordinate emergency response plans to better identify and mitigate risk to natural and technological disasters.	2.4	Medium	All	AEMA; ADEM, HMA, HMGP, PDM	Multiple funding sources; state funds	Mid-term	Staff time	Coordinating plans ensures that mitigation efforts are addressed.	Ongoing	Delete
1 3	Create a statewide training system to evaluate the capability of local emergency managers in activating the Emergency Alert Systems.	2.4	Medium	All	AEMA; local government	EMPG	Mid-term	Staff time	Expanding the number of hazard mitigation initiatives to include reverse 911 systems will increase the community's resistance to hazards.	Ongoing	Delete
1 4	Update contact information in the Departmental Emergency Operation SOP on a regular basis and review and update biannually.	2.5	Low	All	AEMA; all state agencies	EMPG, operating revenue, state funds	Near-term	Staff time	Improved and up-to-date information in the SOP will improve mitigation and other planning designed to reduce the impact of hazard events.	Ongoing	Delete
1 5	Develop and maintain Continuity of Operations plans in response to	2.5	Medium	All	All state agencies	Multiple funding sources, operating revenue	Near-term, Mid-term (per ALDOT)	Staff time	Keeping state departmental functions operational during and	Ongoing	Language revised because each hazard requires

	each hazard for all state agencies including periodic review and updates.					, state funds, ALDOT O&M			following hazard events is important to serving clients.	a different COOP	
16	Develop a plan to protect public records.	2.5	Medium	All	All State Agencies	Operating revenue ; state funds	Mid-term	Staff time	Protecting public records will ensure that this information is available for future uses.	Ongoing	Revised and moved forward as a 2023 mitigation action.
17	Develop a plan to protect data.	2.5	High	All	All State Agencies	Operating revenue ; state funds	Mid-term	Staff time	Protecting data will ensure that this information is available for future use.	Ongoing	Revised and moved forward as a 2023 mitigation action.
18	Update continuity of government plans to incorporate the most up-to-date hazard risk data.	2.5	Medium	All	All state agencies	Multiple funding sources; state funds	Mid-term	Staff time	The planning process involved with the maintenance of continuity of government often reveals mitigation opportunities.	Ongoing	Revised and moved forward as a 2023 mitigation action.
19	Establish security system within the Gordon Persons Building to ensure that critical functions remain uninterrupted in the event of	2.5	High	All	ADHR	Existing operating budget	Long-term	Project costs TBD by project scope	Keeping state departmental functions operational during and following hazard events is important to serving the public.	Ongoing	Revised and moved forward as a 2023 mitigation action.

	terrorist activities.										
20	Advance provision for electrical generators through FEMA grant programs for critical facilities.	2.6	High	All	AEMA	HMA	Near-term	Staff time	Reduces loss of function to critical facilities and operations following natural hazards.	Ongoing	Revised and moved forward as a 2023 mitigation action.
21	Disseminate information about Section 106 of the NHP Act and its ramifications in a disaster.	2.6	Medium	All	AHC	N/A	Mid-term	Staff time and production cost	Information will improve decisions to protect cultural resources.	Ongoing	Revised and moved forward as a 2023 mitigation action.
22	Create a communication action plan for informing all stakeholders of the natural and manmade risks identified in the SHMP.	3.2	Medium	All	AEMA; ADEM	Multiple funding sources	Mid-term	Staff time	Better risk information will improve understanding for decisions to protect lives and property.	Ongoing	Delete
23	Develop and conduct outreach campaigns to educate all stakeholders and the public about the hazards identified in the SHMP.	3.2	Medium	All	AEMA; local government	HMA	Mid-term	Staff time	Better-trained local officials and communities will result in safer, more hazard-resistant communities.	Ongoing	Revised and moved forward as a 2023 mitigation action.
24	Facilitate the coordination of local, state, and federal emergency management activities.	4.1	Medium	All	AEMA; FEMA	Multiple funding sources	Near-term	Staff time	Coordination between emergency management activities will reduce the risk from hazards.	Ongoing	Revised and moved forward as a 2023 mitigation action.

25	Create a diverse state hazard mitigation team that includes regional, state, and federal organizations.	4.1	Medium	All	AEMA	Multiple funding sources	Near-term	Staff time	Promoting hazard mitigation will reduce the impact of hazard events on the state.	Ongoing	Changed group name to the State Hazard Mitigation Task Force
26	Create an SHMTF maintenance schedule that includes at least one progress report meeting halfway through the five-year cycle to assess the status of all mitigation actions.	4.1	Medium	All	AEMA	Multiple funding sources	Near-term	Staff time	Promoting hazard mitigation will reduce the impact of hazard events on the state.	Ongoing	Revised and moved forward as a 2023 mitigation action.
27	Provide the public and forest managers with information about the importance of implementing best management practices on forest land.	4.2	Medium	All	AFC; OWR; local government; ADCNR	ACAMP -CZMA funds, US Forest Service	Mid-term	Staff time	Informing the public on the warning system will increase understanding of what to do when the warning system is used.	Ongoing	Revised and moved forward as a 2023 mitigation action.
28	Provide guidance on incorporating risk and vulnerability assessment findings into state economic and community planning efforts.	4.2	Medium	All	AARC; ALM; ADECA; AACC	EDA, local planning contracts	Mid-term	Staff time	Incorporating hazard mitigation initiatives will increase the community's resistance to hazards	Ongoing	Revised and moved forward as a 2023 mitigation action.
29	Integrate mitigation projects into recovery processes	4.2	Medium	All	AEMA	Multiple funding sources	Mid-term	Staff time	Promotes hazard mitigation inclusion and	Ongoing	Revised and moved forward as a 2023 mitigation action.

(Public Assistance, Individual Assistance, and SBA program) through education of local communities and program applicants.

funding through other programs, including Public Assistance and SBA, so that more mitigation measures are implemented.

30	Establish provisions to ensure that the Family Assistance program, designed for moving families from dependency to self-sufficiency, continues after a natural or human-made disaster.	4.3	Low	All	ADHR	Existing operating budget	Long-term	Staff time	Keeping state departmental functions operational during and following hazard events is important to serving the public.	Ongoing	Revised and moved forward as a 2023 mitigation action.
31	Provide local economic and community planners with guidance on risk and vulnerability assessments that will impact plans for future development.	1.1	Medium	All	AARC; ALM; ADECA; AACC	EDA, local planning contracts	Mid-term	Staff time	Incorporating hazard mitigation initiatives will increase the community's resistance to hazards.	Ongoing	Revised and moved forward as a 2023 mitigation action.
32	Provide large employers and local counties with GIS files for hazard-prone areas and encourage them to assess any new planned development or	1.2	High	All	AEMA; AGIO	State Funds	Near-term	Staff Time	Better risk information will improve understanding for decisions to protect lives and property.	Ongoing	Revised and moved forward as a 2023 mitigation action.

	renovations with hazard data to inform development.											
33	Make hazard mapping tools available online for residents and design professionals to view and download.	1.2	Low	All	AEMA	State Funds	Near-term	Staff time	Better risk information will improve understanding for decisions to protect lives and property.	Ongoing	Revised and moved forward as a 2023 mitigation action.	
34	Construct 15 community safe rooms within existing shelters along I-65, following the evacuation route from the coastal area.	2.4	Medium	All	AEMA	HMGP	Long-term	Staff time	Constructing safe rooms along major transportation routes will increase accessibility for the public and prevent loss of life during high wind events.	Ongoing	Revised and moved forward as a 2023 mitigation action.	
35	Purchase a backup generator for the Alabama Emergency Operations Center.	2.4	High	All	AEMA	HMGP	Near-term	Staff time	A backup power supply will allow for the Alabama EOC to remain fully operational during extended power outages.	Ongoing	Revised and moved forward as a 2023 mitigation action.	
36	Assess proposed new or planned renovations to state assets and critical infrastructure against	2.5	High	All	AEMA; AGIO	State Funds	Mid-term	Staff time	Better risk information will improve understanding for decisions to protect	Ongoing	Revised and moved forward as a 2023 mitigation action.	

	identified hazard-prone areas using GIS data and assessments to inform development decisions.									lives and property.	
37	Create a program to educate local governments about different types of hazard mitigation measures/projects and other available funding sources.	3.1	Medium	All	AEMA	Operating Budget	Mid-term	Staff time	Building awareness of mitigation project types and funding will increase the number of projects that are implemented.	Ongoing	Revised and moved forward as a 2023 mitigation action.
38	Work with communities to develop local resiliency plans to assess ability to react to stressors on the jurisdiction.	1.1	Medium	All	NOAA; local government; AFC	Operating Budget	Mid-term	Staff time and project costs TBD by project scope	The use of erosion control measures will protect farmland and watershed infrastructure from floods.	Deferred due to lack of funding	Revised and moved forward as a 2023 mitigation action.
39	Review local and county mitigation plans following disasters or serious hazard occurrences to evaluate risk assessments and mitigation priorities.	1.2	Medium	All	AEMA; local government	Multiple funding sources	Mid-term	Staff time	Reviewing local and county mitigation plans will increase the community's resistance to hazards.	Ongoing Deferred due to lack of funding	Revised and moved forward as a 2023 mitigation action.
40	Increase state agency accessibility to critical power lines by identifying and prioritizing utility Right of Ways for tree	2.6	Medium	All	ALDOT	Operating Budget	Mid-term	Construction costs TBD by project specifics	Increasing accessibility to critical power lines will increase the opportunity of repair	Deferred due to lack of funding	Revised and moved forward as a 2023 mitigation action.

	and brush removal.								crews to restore power following a hazard event.		
4 1	Develop an inventory of the number of radio repeater sites and dispatch centers currently without backup electricity.	2.6	High	All	AFC	Operating Budget	Near-term	Staff time	Backup communication will keep the Alabama Forestry Commission operational during a hazard event.	Deferred due to funding	Revised and moved forward as a 2023 mitigation action.
4 2	Create a state dam safety program that will reduce the overall number of unsafe dams.	2.4	Medium	Dam failure	ADECA-OWR	National Dam Safety Program Grants	Long-term	Staff time and construction costs TBD by project specifics	Reducing the number of unsafe state dams will protect lives and property in the downstream floodplain.	Ongoing	Action remains viable.
4 3	Develop a statewide geodatabase and map of all dams in the state, including a status update of their condition.	1.2	Medium	Dam failure	ADECA-OWR	National Dam Safety Program Grants	Mid-term	Staff time	Better risk information will improve understanding for decisions to protect lives and property.	Ongoing	Deferred Revised and moved forward as a 2023 mitigation action.
4 4	Develop and implement a process to continually update the geodatabase as new dams are constructed	1.2	Low	Dam failure	ADECA-OWR	National Dam Safety Program Grants	Mid-term	Staff time	Better risk information will improve understanding for decisions to protect	Ongoing	Revised and moved forward as a 2023 mitigation action.

	and as the condition of dams changes over time.									lives and property.	
45	Develop Emergency Action Plans for all high hazard dams, including the development of inundation maps.	2.4	Low	Dam failure	ADECA-OWR	National Dam Safety Program Grants	Long-term	Staff time	Prepares communities for an emergency, increasing awareness of hazard areas and ultimately saving lives.	Ongoing	Revised and moved forward as a 2023 mitigation action.
46	Educate dam owners on the importance of dam safety, especially with regard to public access to dams and dam maintenance.	3.1	Low	Dam failure	ADECA-OWR	National Dam Safety Program Grants	Mid-term	Staff time	Better-trained local officials will result in safer, more hazard-resistant communities.	Ongoing	Revised and moved forward as a 2023 mitigation action.
47	Coordinate an education campaign to notify the public about dam inundation areas and explain to them their risk.	3.2	Medium	Dam failure	ADECA-OWR	National Dam Safety Program Grants	Mid-term	Staff time	Educating the public about hazards in their area builds capacity to complete mitigation projects that increase community resilience.	Ongoing	Revised and moved forward as a 2023 mitigation action.
48	Routinely collect, monitor, and evaluate selected climatic, water-supply and water-use data to identify at an early stage the onset of a drought or potential for	1.1	Medium	Drought	ADECA OWR	Multiple funding sources	Mid-term	Staff time	Obtaining comprehensive data pertaining to drought will improve local and state capabilities for responding to and	Ongoing	Revised and moved forward as a 2023 mitigation action.

	drought, geographic extent of the affected area, and changes in the drought levels.									taking mitigation measures against droughts.	
49	Develop agreements for secondary water sources that may be used during drought conditions.	4.1	Low	Drought	ADEM	Operating Budget	Near-term	Staff time		Redundancy in water supply will prevent lapses in service during drought conditions.	Ongoing Delete
50	Partner with the Alabama Cooperative Extension System (ACES) to educate stakeholders and the public about the resources available through http://drought.aces.edu/ regarding the risk of drought and how to prepare for and mitigate its effects.	3.1	Low	Drought	ACES; ADECA	State funds	Mid-term	Staff time		Better-trained local officials and communities will result in safer, more hazard-resistant communities.	Ongoing Revised and moved forward as a 2023 mitigation action.
51	Maintain membership and participation in the Central United States Earthquake Consortium.	2.6	Low	Earthquake	AEMA; GSA	Federal, USGS, NEHRP	Near-term	~\$500		Keeping state departmental functions operational during and following hazard events is important to protecting lives and property.	Ongoing Revised and moved forward as a 2023 mitigation action.

52	Perform research to understand the geologic conditions that cause earthquakes in Alabama.	2.6	Low	Earthquake	GSA	USGS, NEHRP/ FEMA, NSF	Mid-term	Staff time	Will enable prediction of areas where earthquakes might originate.	Ongoing	Revised and moved forward as a 2023 mitigation action.
53	Study areas having seismic swarms in Alabama.	2.6	Low	Earthquake	GSA	USGS, NEHRP/ FEMA	Mid-term	Staff time	Close monitoring of smaller earthquakes may indicate areas likely to have larger earthquakes.	Ongoing	Revised and moved forward as a 2023 mitigation action.
54	Develop standard ordinance language that considers the effects of soil liquefaction in the design of new buildings and infrastructure such as bridges, embankment dams, and retaining structures.	2.1	Medium	Earthquake	GSA; AEMA; ALDOT	USGS, NEHRP/ FEMA	Mid-term	Staff time	Stronger local building codes will reduce property and infrastructure damage after earthquakes.	Ongoing	Include Building Code Commission as a responsible agency
55	Create a seismic safety committee to provide policy recommendations, evaluate and recommend changes in seismic safety standards, and give an annual assessment of local and statewide implementation	2.1	Medium	Earthquake	GSA; AEMA	USGS, NEHRP/ FEMA	Mid-term	Unknown	A committee dedicated to earthquake safety will drive mitigation initiatives forward toward completion.	Ongoing	Revised and moved forward as a 2023 mitigation action.

	of seismic safety improvements.										
56	Facilitate outreach to communities in the northwestern part of the state to educate homeowners and homebuilders about methods to strengthen and retrofit non-reinforced masonry buildings and non-ductile concrete facilities that are particularly vulnerable to ground shaking.	3.1	Medium	Earthquake	AEMA; GSA; ACES	USGS, NEHRP/FEMA	Mid-term	Unknown	Stronger building methods prevent damage and losses during earthquakes.	Ongoing	Revised and moved forward as a 2023 mitigation action.
57	Upgrade the state's monitoring capabilities for earthquakes.	2.6	Medium	Earthquake	AEMA; GSA	USGS, NEHRP/FEMA	Long-term	Individual project costs associated with map production and seismic monitoring equipment	Resulting maps indicate areas of greatest risk. Such maps can lead to wiser use of land and substantial savings to the state and its citizens.	Deferred due to lack of funding	Revised and moved forward as a 2023 mitigation action.
58	Establish a system of six short-band seismic stations within the state.	2.6	Low	Earthquake	AEMA; GSA	USGS, NSF	Long-term	Individual project costs associated with each short-band seismic station.	Provides a system of six short-band seismic stations to monitor seismic activity within the	Deferred due to lack of funding	Revised and moved forward as a 2023 mitigation action.

									state that may indicate areas at risk for larger quakes.		
59	Develop an emergency preparedness and response plan for earthquakes, landslides, and sinkholes/subsidence for the state's Boards of Education to use in each school system.	2.4	High	Earthquake; landslides; sinkholes/subsidence	AEMA; GSA, HMA, HMGP, PDM	USGS, FEMA	Long-term	Staff time and production costs TBD by scope for each school system	Prepares citizens for an emergency . Prevents panic and saves lives.	Deferred due to lack of funding	Revised and moved forward as a 2023 mitigation action.
60	Develop an earthquake, landslide and sinkhole/subsidence education program for the state's Boards of Education to use in each school system.	4.2	Low	Earthquakes ; landslides; sinkholes/subsidence	; GSA, HMA. HMGP	USGS, FEMA	Mid-term	Staff time and production costs	Prepares citizens for an emergency . Avoids panic and saves lives.	Deferred due to lack of funding	Revised and moved forward as a 2023 mitigation action.
61	Work with local communities to identify and establish new locations for state temporary relief centers for extreme temperature events.	2.4	Low	Extreme temperature	AEMA	HMGP	Long-term	Construction costs TBD by project specifications	Creating centers in communities provides a place for the public to go for relief from extreme temperature events. Mitigates loss of life to events.	Ongoing	Revised and moved forward as a 2023 mitigation action.
62	Create an education campaign to raise public awareness of the location of state relief centers for	3.2	Low	Extreme temperature	AEMA	Multiple funding sources; state funds	Mid-term	Staff time	Educating the public about hazards in their area builds capacity to complete	Ongoing	Revised and moved forward as a 2023 mitigation action.

	extreme temperature events.									mitigation projects that increase community resilience.		
63	Provide technical assistance (community assistance visits, contacts, workshops, and/or publications) to local officials on proper implementation of the NFIP.	1.1	Medium	Flood	OWR	FEMA CAP and CTP Grants	Near-term	Staff time		Well-trained local officials in the NFIP will result in safer communities.	Ongoing	Revised and moved forward as a 2023 mitigation action.
64	Evaluate community Flood Insurance Studies (FISs) and Flood Insurance Rate Maps (FIRMs) for accuracy in order to prioritize requests for funding from FEMA to update flood studies and maps and create additional risk mapping products.	1.1	Medium	Flood	ADCNR; OWR	FEMA CTP Grant	Near-term	Staff time		Lack of information on flood vulnerability can inhibit effective flood protection measures.	Ongoing	Revised and moved forward as a 2023 mitigation action.
65	Perform outreach to communities to promote the development and maintenance of critical facility spatial databases to use for hazard	1.1	Medium	Flood	OWR	FEMA HMGP	Near-term	Staff time		Lack of maps that include critical facilities may inhibit effective flood protection of these structures.	Ongoing	Revised and moved forward as a 2023 mitigation action.

	mapping and analysis.										
66	Support communities in reviewing the preliminary FISs and FIRMs for approval and adoption.	1.1	Low	Flood	OWR; local government	FEMA CTP Grant	Near-term	Staff time	Understanding vulnerability will help to frame discussions by decision makers on how to preserve and protect assets from hazard events.	Ongoing	Revised and moved forward as a 2023 mitigation action.
67	Obtain periodic updates of RL and SRL lists from FEMA/NFIP and ensure that appropriate officials have access to the data.	1.3	Low	Flood	AEMA; ADECA; FEMA	Operating Budget	Near-term	Staff time	Flooding (particularly repetitive losses) is the single most significant natural hazard in the state, in terms of monetary losses and disruptions. The overall state mitigation strategy is focused on reducing these damages by various means, including FEMA grant programs. These programs rely on sound information as the basis for	Ongoing	Revised and moved forward as a 2023 mitigation action.

									prioritizing actions.		
68	Ensure that site-specific risk assessments are available to local officials as the basis for identifying and prioritizing mitigation actions on a site-specific basis. This action may be accomplished in a number of ways, including by having AEMA perform risk assessments (either itself or using consultants/contractors) or by continuing to provide training and technical support.	1.3	Medium	Flood	AEMA	FEMA HMGP, BRIC, Operating Budget	Near-term	Staff time	Flooding is the most significant natural hazard in the State. This information is the basis for implementing numerous FEMA grant programs.	Ongoing	Revised and moved forward as a 2023 mitigation action.
69	Develop model ordinance for Gulf-fronting communities that requires higher standards for setbacks from waterfront and freeboard.	2.2	High	Flood	AEMA; ADCNR; SARPC; local government	ACAMP -CZMA funds	Mid-term	Staff time	Increased setbacks will reduce property damage from storm surge.	Ongoing	Revised and moved forward as a 2023 mitigation action.
70	Develop and implement a detailed severe repetitive loss mitigation strategy that will qualify the state for 100/0 cost share under the	2.3	Medium	Flood	AEMA	Operating Budget	Near-term	Existing federal and state resources	Part of the process to initiate SRL program; establishes priorities for state and local jurisdictions to begin.	Ongoing	Revised and moved forward as a 2023 mitigation action.

FEMA SRL program.											
7 1	Conduct community outreach, workshops, and training to increase NFIP participation.	2.3	Low	Flood	AEMA; ADECA	FEMA CTP Grant, State and Local Funds	Near-term	Existing state resources	Allows residents the ability to receive flood insurance claims and maintains eligibility in the FMA program, which requires flood insurance.	Ongoing	Revised and moved forward as a 2023 mitigation action.
7 2	Provide updated SRL and RL lists to communities in advance of grant application windows. Include FEMA-calculated avoided damages for SRL properties and any state-calculated avoided damages for RL properties.	2.3	Medium	Flood	AEMA	Operating Budget	Near-term	Existing state resources	Retrofitting, elevating, or removing RL properties from known hazard areas protects property and lives, as well as personal, state, and federal financial resources.	Deleted	This action is deleted, communities will need to contact FEMA this information.
7 3	Increase state and local agencies' ability to issue flood warnings. (Construct automated stream gauging stations with rainfall measurement devices equipped with telemetry systems.) Choctawhatchee Pea Yellow	2.4	Low	Flood	OWR	State Funds	Long-term	TBD based on individual project costs and other specific information	Better rainfall data will provide the NWS and state and local agencies with the necessary information to issue flood warnings and protect lives and property.	Ongoing	Revised and moved forward as a 2023 mitigation action.

River Watershed Authority's flood warning system is in place. Consider expanding the program.

74	Identify channels and ditches that must be improved to provide maximum drainage capacity.	2.6	Medium	Flood	AEMA; ADECA; ADCNR	FEMA CTP Grant; ACAMP -CZMA funds	Mid-term	Staff time	Supporting existing efforts to mitigate flood risk will reduce the impact of hazard events.	Ongoing	Revised and moved forward as a 2023 mitigation action.
75	Develop regulations that preserve and rehabilitate natural systems to serve natural hazard mitigation functions (i.e., floodplains, wetlands, watersheds, and urban interface areas).	2.6	Medium	Flood	USDA; ADCNR; USACE; AEMA	ADCNR -EDRP, NOAA-CRP	Mid-term	TBD by project scope	Preserving and rehabilitating natural systems will result in the production of natural hazard mitigation.	Ongoing	Revised and moved forward as a 2023 mitigation action.
76	Create technical bulletin that educates local floodplain managers about the benefit of evaluating the hazard posed by the encroachment of non-native plant species into floodways.	3.1	Medium	Flood	OWR; AEMA	FEMA CTP Grant, State Funds	Long-term	Staff time	Informing local officials on invasive plant species will contribute to the effective management of wetlands.	Ongoing	Revised and moved forward as a 2023 mitigation action.
77	Create technical bulletin that	3.1	Medium	Flood	OWR; AEMA	FEMA CTP Grant,	Mid-term	Staff time	Incorporating wetlands	Ongoing	Revised and moved forward as a 2023

	educates local floodplain managers to account for and incorporate wetland protection and mitigation sites into the planning process when preparing new studies for watercourses.					State Funds			into the planning process will result in effective wetland management.		mitigation action.
78	Modernize and improve access to flood gates for levee systems.	2.6	Medium	Flood	OWR; USACE	State Funds	Long-term	Construction costs TBD by project specifics.	The modernization of flood control systems, such as floodgates for levee systems, will reduce the flooding hazard to lives and property.	Ongoing	Revised and moved forward as a 2023 mitigation action.
79	Reduce the flooding risk to communities by acquiring property located in the 100-year floodplain and returning it to open space.	2.6	Medium	Flood	AEMA; OWR; local government	HMA, HMGP grants	Near-term	Construction costs TBD by project specifics (historically >\$1 million)	Open space will significantly reduce the flooding risk for communities.	Ongoing	Revised and moved forward as a 2023 mitigation action.
80	Provide information and guidance to local communities to ensure they utilize flood control measures, including retention/detention basins and other stormwater	3.2	Medium	Flood	OWR; USACE; ADCNR; local government	ACAMP -CZMA funds	Long-term	Staff time	The use of flood control measures will protect properties from floods.	Ongoing	Revised and moved forward as a 2023 mitigation action.

	management practices, to retard the flow of water and reduce downstream damage.										
81	Create education programs that increase community awareness about the process of requesting updated floodplain mapping from FEMA.	3.2	Low	Flood	ADECA's OWR	FEMA CTP Grant	Near-term	Staff time, outreach materials	Lack of information on flood vulnerability can inhibit effective flood protection measures.	Ongoing	Revised and moved forward as a 2023 mitigation action.
82	Educate homeowners and renters who live in flood-prone areas about flood insurance, and encourage them to purchase it, especially through the NFIP.	3.2	Low	Flood	OWR	FEMA CTP Grant	Mid-term	Staff time and production costs for outreach	Purchase of flood insurance will increase homeowners' awareness of flood mitigation.	Ongoing	Revised and moved forward as a 2023 mitigation action.
83	Increase the number of communities and tribes that participate in the Community Rating System (CRS) through targeted education and outreach programs.	3.2	Low	Flood	OWR	FEMA CTP Grant	Near-term	Staff time	Increased CRS scores will result in lower insurance premiums for homeowners and decreased flood risk for the community.	Ongoing	Revised and moved forward as a 2023 mitigation action.

84	Educate communities and tribes about methods to improve their CRS classification.	3.1	Low	Flood	OWR	FEMA CTP Grant	Mid-term	Staff time and production costs	Increased CRS scores will result in lower insurance premiums for homeowners and decreased flood risk for the community.	Ongoing	Revised and moved forward as a 2023 mitigation action.
85	Coordinate activities between the state and local or regional water management authorities.	4.1	Low	Flood	OWR	Operating Budget	Near-term	Staff time	Effective coordination between water management agencies will reduce the risk from future flooding.	Ongoing	Revised and moved forward as a 2023 mitigation action.
86	Create statewide minimum standards of 1-foot freeboard for new and substantially improved buildings.	2.2	Medium	Flood	ADECA; Alabama Building Commission	Operating Budget	Mid-term	Staff time	Adding 1 foot of freeboard above the mapped base flood elevation can lower insurance costs on the structure and better protect it from future flood events.	Ongoing	Revised and moved forward as a 2023 mitigation action.
87	Identify erosion control projects to protect state assets and critical infrastructure from floods and implement as identified (e.g., reshape fields, reestablish	2.5	Medium	Flood	OWR; ADCNR; local government	Operating Budget	Long-term	Construction costs TBD by project specifics.	The use of erosion control measures will protect farmland and watershed infrastructure from floods.	Deferred due to lack of funding	Revised and moved forward as a 2023 mitigation action.

terrace systems, stabilize active gullies and watercourses, remove sediment bars and debris in channels, and stabilize channel banks).

88	Conduct an awareness campaign that educates the public about hailstorms and methods to protect property from damages.	3.1	Low	Hail	AEMA	Operating Budget	Near-term	Staff time	Educating the public about hazards in their area builds capacity to complete mitigation projects that increase community resilience.	Ongoing	Revised and moved forward as a 2023 mitigation action.
89	Plant soil-stabilizing vegetation on steep, publicly owned slopes to prevent roadway damage and traffic disruptions from landslides.	2.5	Medium	Landslide	ALDOT; GSA	USGS, FEMA	Long-term	Construction costs TBD by project specifications	Planting soil-stabilizing plants on steep slopes will prevent, or lessen the severity of landslides, protecting public roadways and maintaining operations and accessibility.	Ongoing	Revised and moved forward as a 2023 mitigation action.
90	Retrofit existing state-owned facilities with surge protection systems to protect these	2.5	Medium	Lightning	AEMA; Alabama Department of Economic and Community Affairs	HMGP	Near-term	~\$5,000	Protecting state-owned facilities from lightning damage	Ongoing	Revised and moved forward as a 2023 mitigation action.

	facilities against damage from lightning.									can prevent interruptions of critical services.		
91	Coordinate a state education program through the Alabama State Department of Education that teaches school children about the dangers of lightning and how to take safety precautions.	3.2	Low	Lightning	AEMA; ALSDE; NWS	HMGP	Mid-term	Staff time		Educating the public about hazards in their area builds capacity to complete mitigation projects that increase community resilience.	Ongoing	Revised and moved forward as a 2023 mitigation action.
92	Develop a Transportation Resilience Plan for the Port of Mobile.	2.4	Medium	Sea level rise	AEMA; USACE; NWS	USDOT; NCHRP	Mid-term	~\$50,000		Understanding vulnerability will help to frame discussions by decision makers on how to preserve and protect assets from hazard events.	Ongoing	Revised and moved forward as a 2023 mitigation action.
93	Perform a statewide transportation vulnerability assessment.	2.4	Low	Sea level rise	AEMA; USACE; ALDOT; NWS	USDOT; NCHRP	Long-term	~\$250,000		Understanding vulnerability will help to frame discussions by decision makers on how to preserve and protect assets from hazard events.	Ongoing	Revised and moved forward as a 2023 mitigation action.

94	Identify areas at risk to subsidence by monitoring changes in groundwater levels.	1.2	Medium	Sinkholes/subsidence	GSA; AEMA, HMA, HMGP	Operating Budget, State Funds	Mid-term	Staff time	Risk awareness allows for better planning to prevent loss of life and property.	Ongoing	Revised and moved forward as a 2023 mitigation action.
95	To prevent property loss, acquire, demolish, or relocate state-owned buildings and infrastructure in high-risk areas experiencing sinkhole-related structural damage. Address need of damaged private property as feasible.	2.3	Medium	Sinkholes/subsidence	GSA; AEMA	FEMA PDM; FEMA HMGP; HUD CDGB-DR	Long-term	Contingent on number of the building and infrastructure projects.	Relocating at-risk properties outside of hazardous areas prevents future loss of life and property.	Ongoing	Revised and moved forward as a 2023 mitigation action.
96	Develop a program for monitoring and reporting sinkholes and subsidence rates, or develop a multi-year Lidar analysis	2.3	Medium	Sinkholes/subsidence	AEMA; GSA	FEMA PDM; FEMA HMGP; HUD CDGB-DR	Long-Term	Contingent on area identified to be covered in program.	Program data could serve as leading indicator for potential hazard occurrences	New Action	Build on existing studies

97	Educate farmers about groundwater withdrawal and water conservation practices.	3.1	Low	Sinkholes/ subsidence	ACES; GSA; AFC; AG&I	Operating Budget	Near-term	Staff time	Educating farmers about groundwater withdrawal conservation practices will diminish the rate of sinkhole formation.	Ongoing	Revised and moved forward as a 2023 mitigation action.
98	Educate design professionals about where to locate information on subsidence rates and familiarize them with maps of these areas.	3.1	Low	Sinkholes/ subsidence	AEMA; GSA	Operating Budget	Near-term	Staff time	Better-informed design professionals can build safer buildings and infrastructure.	Ongoing	Revised and moved forward as a 2023 mitigation action.
99	Develop and maintain a statewide real-time or near real-time record or reporting system of sinkhole/ subsidence, landslides, and earthquake events throughout the state.	1.2	Medium	Sinkholes/ subsidence; landslides; earthquakes	AEMA; GSA, HMA, HMGP	State Funds, Operating Budget	Mid-term	Staff time	Better risk information will improve understanding for decisions to protect lives and property.	Ongoing	Revised and moved forward as a 2023 mitigation action.
1000	Construct five safe houses for district offices and purchase one 5 kW generator for each safe house.	2.5	Medium	Tornadoes	ADCNR	FEMA HMA	Near-term	Pending bids by contractors	Provides safe sheltering place.	Deferred due to lack of funding	Revised and moved forward as a 2023 mitigation action.
1001	Develop an online GIS map that shows	1.2	Low	Tsunami	Alabama Geographic Information	State Funds	Mid-term	Staff time	Better risk information will improve	Ongoing	Revised and moved forward as a 2023

	tsunami run-up areas.				Office (AGIO); GSA				understand ing for decisions to protect lives and property.		mitigation action.
102	Develop and deliver an education program that teaches residents about the risk of submarine landslide-induced tsunamis.	3.2	Low	Tsunami	AEMA; GSA	Operatin g Budget	Mid-term	Staff time	Educating the public about hazards in their area builds capacity to complete mitigation projects that increase community resilience.	Ongoing	Revised and moved forward as a 2023 mitigation action.
103	Identify communities at risk to wildfire in urban interface; complete a minimum of one Community Wildfire Plan in each county.	1.1	Low	Wildfire	AFC	US Forest Service, FEMA	Near-term	\$167,500 (\$2,500 per plan x 67 counties)	Engage new developme nt residents and developers in designing wildfire-resistant neighborho ods.	Ongoing	Revised and moved forward as a 2023 mitigation action.
104	Coordinate with neighboring states to offer training courses on wildfire management compatible with the National Wildfire Coordinating Ground Incident Command System.	1.1	Medium	Wildfire	AFC	Operatin g Budget	Near-term	Staff time	Better-trained local officials will result in safer, more hazard-resistant communitie s.	Ongoing	Revised and moved forward as a 2023 mitigation action.
105	Develop standard zoning ordinance	2.2	Medium	Wildfire	AEMA; AFC	State funds	Mid-term	Staff time	Limiting developme nt in the wildland-	Ongoing	Revised and moved forward as a 2023

	language that restricts development in wildland-urban interface zones.								urban interface zone reduces property damage and loss of life.		mitigation action.
106	Educate homeowners about the resources available on the Alabama Forestry Commission's website for protecting homes and forestland from wildfire.	3.2	Low	Wildfire	ADECA; AG&I	Operating Budget	Near-term	Staff time	Educating the public about hazards in their area builds capacity to complete mitigation projects that increase community resilience.	Ongoing	Revised and moved forward as a 2023 mitigation action.
107	Implement a state fuels management program to reduce hazardous vegetative fuels on public lands, new essential infrastructure, or private lands by collaborating with landowners.	3.1	Medium	Wildfire	AEMA; AFC	US Forest Service, FEMA	Mid-term	Unknown	Reducing hazardous vegetative fuels reduces the risk of wildfire, especially in the wildland-urban interface zone.	Ongoing	Revised and moved forward as a 2023 mitigation action.
108	Encourage local governments to inventory their urban forests.	1.1	Medium	Wind	AFC	US Forest Service	Near-term	Staff time	Better asset information will improve understanding for decisions to protect lives and property.	Ongoing	Revised and moved forward as a 2023 mitigation action.

109	Maintain tornado safe room initiatives statewide.	2.6	Medium	Wind	AEMA; NOAA; local government	HMA	Near-term	Staff time	Continues efforts to reduce tornado risk to citizens statewide. Tornadoes, included in the "High Wind" hazard, are identified as one of the three most significant hazards in the state.	Ongoing	Revised and moved forward as a 2023 mitigation action.
110	Create a state rebate or grant program for retrofitting (or modifying) existing residential homes, critical community facilities, and infrastructure to reduce future wind damage.	2.6	High	Wind	AL Insurance Department	State funds	Near-term	Staff time and production costs	Improving the structural integrity of vulnerable homes and securing contents will improve the safety of households that might not be able to afford repairs.	Ongoing	Revised and moved forward as a 2023 mitigation action.
111	Encourage the use of software such as ITREE to both manage and predict tree damage.	2.6	Low	Wind	Department of Forestry	US Forest Service	Near-term	Staff time and software costs	Promoting use of software will assist in risk identification.	Ongoing	Revised and moved forward as a 2023 mitigation action.
112	Retrofit state owned public buildings and critical facilities to reduce future wind damage from tornadoes and	2.6	Medium	Wind	AEMA; local government	FEMA HMGP, BRIC	Long-term	Staff time	Retrofitting structures can mitigate future damage from wind events.	Ongoing, Move to 2023 Action	Revised and moved forward as a 2023 mitigation action.

hurricanes (per FEMA 361).											
1 1 3	Create a state program to promote the planting of indigenous trees that are more resilient to high wind events.	2.6	Medium	Wind	AFC	US Forest Service	Long-term	Cost of trees in critical areas TBD	Proper use of indigenous trees can serve to mitigate damage to structures by shielding from wind. Additionally, they are less likely to result in debris.	Ongoing	Revised and moved forward as a 2023 mitigation action.
1 1 4	Encourage the integration of Tree Emergency Plans into the risk assessment portion of all local mitigation plans.	2.6	Medium	Wind	AFC	US Forest Service, FEMA	Mid-term	Staff time	Increasing accessibility to the most recently available data and information, such as Tree Emergency Plans, strengthens mitigation planning as trees are a major source of damage during wind events.	Ongoing	Revised and moved forward as a 2023 mitigation action.
1 1 5	Conduct ongoing outreach to communities to inform residents of state-run shelter locations and evacuation routes.	3.2	Medium	Wind	AEMA	Operating Budget	Mid-term	Staff time	Educating the public about hazards in their area builds capacity to complete mitigation projects that increase	Ongoing	Revised and moved forward as a 2023 mitigation action.

										community resilience.		
116	Develop and incorporate a new standard in all statewide building codes that requires a standard system be incorporated into window design and protection for all new construction.	2.1	High	Wind	AACC; ALM	Operating Budget	Long-term	Staff time		Improving building inspections will increase the integrity of structures and protect occupants during hazard events.	Deferred due to funding	Revised and moved forward as a 2023 mitigation action.
117	Create teams of arborists to assist in performing damage assessments and recommending mitigation projects.	4.2	Low	Wind	Department of Forestry	US Forest Service	Mid-term	Staff time		Coordinating with specialists prior to a disaster will aid in the implementation of mitigation actions following a disaster.	Deferred due to funding	Revised and moved forward as a 2023 mitigation action.
118	Develop design criteria for marinas, piers, and other coastal structures for storm resistance.	2.1	Medium	Wind; floods	Building Code Commission; OWR; local government	Operating Budget	Mid-term	Staff time		Developing design criteria will reduce the probability that these structures will be affected by hazards.	Deferred due to funding	Revised and moved forward as a 2023 mitigation action.
119	Establish capacity to purchase and utilize remotely sensed imagery as a tool to develop localized risk models to mitigate storm-damaged forest hazards.	1.1	Medium	Wind; storm surge; wildfire	AFC	US Forest Service, FEMA	Near-term	\$19,386 (ERDAS IMAGINE Pro 10 software license: three-year maintenance contract)		Implementing collaborative AFC and local agency strategies to mitigate potential damage, injuries, and costs related to storm-	Deferred due to funding	Revised and moved forward as a 2023 mitigation action.

damaged
urban and
interface
trees and
forests.

Deleted 2018 Mitigation Actions

2018 Action #	Action	2018 Obj.	Priority	Hazard(s) Addressed	Responsible Agency	Funding Source	Projected Timeline	Projected Cost	How Action Contributes to Mitigation Strategy	2023 Status	2023 Proposed Action Changes Status
3	Develop and update a comprehensive record of ADEM's assets and operations	1.1	Low	All	ADEM	State Funds	Near-term	Staff Time	Maintaining a comprehensive record of assets and operations will improve accessibility and expand their use	Ongoing	Delete
8	Develop state regulations that require local governments to incorporate natural hazard mitigation measures into all new public construction projects.	2.1	High	All	Bldg. Code Commission; local government	Operating budget	Long-term	TBD by project scope	Incorporating natural hazard mitigation into new public construction reduces vulnerabilities and protects lives and property.	Ongoing	Delete
12	Promote, strengthen, and coordinate emergency response plans to better identify and mitigate risk to natural and technological disasters	2.4	Medium	All	AEMA, ADEM, HMA, HMGP, PDM	Multiple funding sources, state funds	Mid-term	Staff Time	Coordinating plans ensures that mitigation efforts are addressed	Ongoing	Delete
13	Create a statewide training system to evaluate the capability of local emergency managers in activating the Emergency Alert Systems	2.4	Medium	All	AEMA, Local Government	EMPG	Mid-term	Staff Time	Expanding the number of hazard mitigation initiatives to include reverse 911 systems will increase the community's resistance to hazards	Ongoing	Delete

14	Update contact information in the Departmental Emergency Operation SOP on a regular basis and review and update biannually	2.5	Low	All	AEMA, All state agencies	EMPG, Operating revenue, State funds	Near-term	Staff Time	Improved and up-to-date information in the SOP will improve mitigation and other planning designed to reduce the impact of hazard events	Ongoing	Delete
22	Create a communication action plan for informing all stakeholders of the natural and manmade risks identified in the SHMP	3.2	Medium	All	AEMA, ADEM	Multiple funding sources	Mid-term	Staff Time	better risk information will improve understanding for decisions to protect lives and property	Ongoing	Delete
49	Develop agreements for secondary water sources that may be used during drought conditions	4.1	Low	Drought	ADEM	Operating Budget	Near-term	Staff Time	Redundancy in water supply will prevent lapses in service during drought conditions	Ongoing	Delete
67	Obtain periodic updates of RL and SRL lists from FEMA/NFIP and ensure that appropriate officials have access to the data.	1.3	Low	Flood	AEMA; ADECA; FEMA	Operating Budget	Near-term	Staff time	<p>Flooding (particularly repetitive losses) is the single most significant natural hazard in the state, in terms of monetary losses and disruptions. The overall state mitigation strategy is focused on reducing these damages by various means, including FEMA grant programs. These programs rely on sound information as the basis for prioritizing actions.</p>	Delete	Deleted
72	Provide updated SRL and RL lists to communities in advance of grant application windows. Include FEMA-calculated	2.3	Medium	Flood	AEMA	Operating Budget	Near-term	Existing state resources	Retrofitting, elevating, or removing RL properties from known hazard areas protects property and lives, as well as	Deleted	This action is deleted, communities will need to contact FEMA for

	avoided damages for SRL properties and any state-calculated avoided damages for RL properties.								personal, state, and federal financial resources.	this information.
78	Modernize and improve access to flood gates for levee systems.	2.6	Medium	Flood	USACE	No info provided	Long-Term	Construction costs TBD by project specifics	The modernization of flood control systems, such as flood gates for levee systems, will reduce the flooding hazard to lives and property.	Deleted. This is a Federal responsibility.

Completed 2018 Mitigation Actions

2018 Action #	Action	2018 Obj.	Priority	Hazard(s) Addressed	Responsible Agency	Funding Source	Projected Timeline	Projected Cost	How Action Contributes to Mitigation Strategy	2023 Status	2023 Proposed Action Changes Status
35	Purchase a backup generator for the Alabama Emergency Operations Center.	2.4	High	All	AEMA	HMGP	Near-term	Staff time	A backup power supply will allow for the Alabama EOC to remain fully operational during extended power outages.	Completed	Action completed.

43	Develop a statewide geodatabase and map of all dams in the state, including a status update of their condition.	1.2	Medium	Dam failure	ADECA-OWR	National Dam Safety Program Grants	Mid-term	Staff time	Better risk information will improve understanding for decisions to protect lives and property.	Completed	Action completed
95	To prevent property loss, acquire, demolish, or relocate state-owned buildings and infrastructure in high-risk areas experiencing sinkhole-related structural damage. Address need of damaged private property as feasible.	2.3	Medium	Sinkholes/ subsidence	AEMA; GSA	FEMA PDM; FEMA HMGP; HUD CDGB-DR	Long-term	Contingent on number of the building and infrastructure projects.	Relocating at-risk properties outside of hazardous areas prevents future loss of life and property.	Action completed	Action Complete