



Glenn County, CA

Multi-Jurisdiction Hazard Mitigation Plan 2025



Glenn County Multi-Jurisdiction Hazard Mitigation Plan

This work was sponsored by Glenn County, California.


The research was conducted by IEM, incorporating data provided by Glenn County, the City of Orland, the City of Willows, and their stakeholders.

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Funding for this project was provided by the California Department of Forestry and Fire Protection as part of the California Climate Investments Program. The Glenn County Multi-Jurisdiction Hazard Mitigation Plan update is part of California Climate Investments, a statewide program that puts billions of Cap-and-Trade dollars to work reducing GHG emissions, strengthening the economy, and improving public health and the environment—particularly in disadvantaged communities. The Cap-and-Trade program also creates a financial incentive for industries to invest in clean technologies and develop innovative ways to reduce pollution. California Climate Investments projects include affordable housing, renewable energy, public transportation, zero-emission vehicles, environmental restoration, more sustainable agriculture, recycling, and much more. At least 35 percent of these investments are located within and benefiting residents of disadvantaged communities, low-income communities, and low-income households across California. For more information, visit the California Climate Investments website at:

www.caclimateinvestments.ca.gov.



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Executive Summary

Throughout history, natural disasters have inflicted significant damage on property, infrastructure, and human life. The economic, psychological, and financial costs of these events have been significant, straining communities during response and recovery efforts. Because of this, the Glenn County Multi-Jurisdiction Hazard Mitigation Plan (MJHMP) has been collaboratively developed by Glenn County, the City of Orland, and the City of Willows (the “participating jurisdictions”), their stakeholders, and the public. The plan seeks to mitigate the impact of natural hazards in the future while respecting the character and requirements of the local community. This section provides a foundational overview of the plan, outlining its background, purpose, and scope.

Background

Each year, in the United States, natural disasters claim the lives of hundreds of individuals and injure thousands more. Taxpayers nationwide bear the burden of the financial impact of such disasters, spending billions of dollars each year on recovery efforts for communities, organizations, businesses, and individuals. Nevertheless, these amounts only partially reflect the true cost of disasters, as additional expenses incurred by insurance companies and nongovernmental organizations are not reimbursed by public funds. It is notable that some natural disasters are foreseeable, and a significant portion of the resulting damage may be avoided or minimized through adequate planning and preparation.

Over the last five decades, many natural disasters have affected the participating jurisdictions. Specifically, since 1964, 20 disasters have been federally declared, including:

- Eight floods,
- Seven storms,
- Two biological events
- One drought,
- One extreme temperature event,
- One hurricane, and
- Two biological events.

The series of coastal storms that occurred between January and March of 1983 had a significant impact on the entire State of California. The inland areas of Northern California were particularly affected by incidents of flooding, landslides, and tornadoes. The flooding was a direct result of the swelling of the Sacramento River, which caused extensive damage to the surrounding areas. These weather events, while not unprecedented, served as a reminder of the importance of preparedness and resilience in the face of natural disasters.¹ More recent events, including significant severe weather events and the massive August Complex fire, emphasize how changing conditions increase the frequency and severity of disaster events. Mitigation planning helps document and address these kinds of hazards.

¹ FEMA, “Natural Hazard Mitigation Saves Interim Report.” https://www.fema.gov/sites/default/files/2020-07/fema_mitsaves-factsheet_2018.pdf

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

This plan was developed in accordance with the Disaster Mitigation Act of 2000 (Public Law 106-390) and associated implementing regulations. These regulations were established by the Interim Final Rule, published in the Federal Register on February 26, 2002 (44 CFR §201.6) and finalized on October 31, 2007. Collectively, these requirements and regulations are referred to as the Disaster Mitigation Act (DMA) or DMA 2000.

The DMA emphasizes the need for coordinated mitigation planning and implementation efforts, while the regulations set forth the requirements that local hazard mitigation plans must meet for local jurisdictions to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288). As Glenn County is exposed to numerous hazards, access to these programs is essential.

Consequently, this plan has been prepared to meet the DMA's requirements and regulations to enhance the participating jurisdictions' resiliency and preparedness. The plan provides a comprehensive overview of the county's hazards, risk assessments, and mitigation strategies, outlining the key roles and responsibilities of stakeholders and outlining a timeline for implementation.

The information in this plan will be a fundamental guide for coordinating mitigation activities and making informed decisions regarding land use policies for Glenn County and the Cities of Orland and Willows. By actively engaging in proactive mitigation planning, these communities can effectively reduce the cost of responding to and recovering from disasters. The plan's implementation will help safeguard crucial community facilities, reduce liability exposure, and minimize overall community impacts and disruptions. Glenn County and the Cities of Orland and Willows remain steadfastly committed to reducing the future impacts of similar hazard events and retaining eligibility for federal funding related to mitigation.

Purpose

The objective of the MJHMP Update is to furnish Glenn County, Orland, and Willows with a comprehensive blueprint for mitigating the impact of natural hazards, thereby promoting the protection of the populace and property of the participating jurisdictions from future natural hazard events. The Glenn County MJHMP serves as the formal declaration of the county's and cities' commitments to guaranteeing a resilient community. It also functions as a tool to lead decision-makers in directing mitigation activities and resources toward the most vulnerable areas, while ensuring that the county and Cities of Orland and Willows remain eligible for federal disaster assistance programs, including the Federal Emergency Management Agency's (FEMA) Pre-Disaster Mitigation (PDM), Hazard Mitigation Grant Program (HMGP), and Flood Mitigation Assistance (FMA) Program. The participating jurisdictions came together to discuss their risks, vulnerabilities, and opportunities to protect life and property through mitigation actions.

Plan Organization and Scope

The MJHMP comprises seven sections that are structured according to the logical sequence of activities undertaken during the plan's development. It encompasses all documentation required to fulfill the necessary criteria for FEMA approval, as outlined in the new [Local Mitigation Planning Policy Guide](#). The MJHMP is a comprehensive framework that offers a strategic and integrated approach to hazard mitigation, enabling multiple jurisdictions to work together in preparing for, responding to, and recovering from various hazard events. The plan includes the following sections:

- **Section 1. Community Profile** provides information on Glenn County's history, geography, climate, population, economy, housing, and land use trends, as well as those of the Cities of Orland and Willows.
- **Section 2. The Planning Process** outlines the approach to creating the MJHMP and the meetings and outreach activities that engaged stakeholders and the public, including vulnerable populations.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

- **Section 3. Risk Assessment** identifies and prioritizes natural hazards in Glenn County, Orland, and Willows and assesses their vulnerability.
- **Section 4. Capabilities Assessment** identifies and analyzes current plans, policies, and resources which can be used for mitigation
- **Section 5. Mitigation Strategy** identifies mitigation goals, assesses the capabilities of Glenn County, Orland, and Willows to implement mitigation actions, and identifies and prioritizes those actions.
- **Section 6. Plan Maintenance** outlines the adoption and implementation of the MJHMP and describes the processes for monitoring, evaluating, updating, and maintaining it. This section also delves into the subject of continued public involvement.
- **Appendix A** provides support plan maintenance, and **Appendix B** provides public outreach risk assessment survey results.
- The **Plan Review Documents**

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

U.S. Department of Homeland Security
FEMA Region 9
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

January 16, 2025

Andy Popper
Principal Planner
Glenn County Planning & Community Development Services Agency
225 North Tehama Street
Willows, CA 95988

Dear Andy Popper:

The Federal Emergency Management Agency (FEMA) has completed its review of the *2024 Glenn County Multi-Jurisdiction Hazard Mitigation Plan* and has determined that this plan is eligible for final approval pending its adoption by Glenn County and all participating jurisdictions. Please see the enclosed list of approvable pending adoption jurisdictions.

Formal adoption documentation must be submitted to FEMA Region 9 by at least one participating jurisdiction within one calendar year of the date of this letter, or the entire plan must be updated and resubmitted for review. FEMA will approve the plan upon receipt of the documentation of formal adoption.

Once the plan is approved, each participating jurisdiction must adopt the plan within five calendar years of the date of the approval. The adoption of the plan by each jurisdiction ensures that jurisdiction's continued eligibility for funding under FEMA's Hazard Mitigation Assistance (HMA) programs. All requests for funding, however, will be evaluated individually according to the specific eligibility, and other requirements of the particular program under which applications are submitted.

If you have any questions regarding the planning or review processes, please contact the FEMA Region 9 Hazard Mitigation Planning Team at fema-r9-mitigation-planning@fema.dhs.gov.

Sincerely,



Alison Kearns
Planning and Implementation Branch Chief
Mitigation Division
FEMA Region 9

Glenn County Hazard Mitigation Plan Approvable Pending Adoption Notice January 16, 2025

Page 2 of 3

Enclosures (2)
Glenn County Plan Review Tool, dated January 16, 2025

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Status of Participating Jurisdictions, dated January 16, 2025

cc: Robyn Fennig, State Hazard Mitigation Officer, California Governor's Office of
Emergency Services
Victoria LaMar-Haas, Hazard Mitigation Planning Chief, California Governor's Office of
Emergency Services

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Glenn County Hazard Mitigation Plan Approvable Pending Adoption Notice January 16, 2025

Page 3 of 3

Status of Participating Jurisdictions as of January 16, 2025

Jurisdictions – Adopted and Approved

#	Jurisdiction	Adoption Receipt Date
1		
2		
3		

Jurisdictions – Approvable Pending Adoption

#	Jurisdiction
1	Glenn County
2	The City of Orland
3	The City of Willows

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Local Mitigation Plan Review Tool

Cover Page

The Local Mitigation Plan Review Tool (PRT) demonstrates how the local mitigation plan meets the regulation in 44 CFR § 201.6 and offers states and FEMA Mitigation Planners an opportunity to provide feedback to the local governments, including special districts.

1. The Multi-Jurisdictional Summary Sheet is a worksheet that is used to document how each jurisdiction met the requirements of the plan elements (Planning Process; Risk Assessment; Mitigation Strategy; Plan Maintenance; Plan Update; and Plan Adoption).
2. The Plan Review Checklist summarizes FEMA's evaluation of whether the plan has addressed all requirements.

For greater clarification of the elements in the Plan Review Checklist, please see Section 4 of this guide. Definitions of the terms and phrases used in the PRT can be found in Appendix E of this guide.

Plan Information	
Jurisdiction(s)	Glenn County, City of Orland, City of Willows
Title of Plan	Glenn County Multi-Jurisdiction Hazard Mitigation Plan
New Plan or Update	Update
Single- or Multi-Jurisdiction	Multi-Jurisdiction
Date of Plan	March, 2024
Local Point of Contact	
Title	Andy Popper
Agency	Glenn County Planning & Community Development Services Agency
Address	225 North Tehama Street Willows, CA 95988
Phone Number	530-934-6540
Email	APopper@countyofglenn.net

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Additional Point of Contact	
Title	Click or tap here to enter text.
Agency	Click or tap here to enter text.
Address	Click or tap here to enter text.
Phone Number	Click or tap here to enter text.
Email	Click or tap here to enter text.

1. Review Information	
2. State Review	
State Reviewer(s) and Title	Jody Newton, Plan Reviewer
State Review Date	3/15/2024, 11/25/2024
FEMA Review	
FEMA Reviewer(s) and Title	Avery M. Frank, Community Planner Kiana Wong, Community Planner
Date Received in FEMA Region	12/11/2024
Plan Not Approved	
Plan Approvable Pending Adoption	1/16/2025
Plan Approved	

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Multi-Jurisdictional Summary Sheet

In the boxes for each element, mark if the element is met (Y) or not met (N).

#	Jurisdiction Name	A. Planning Process	B. Risk Assessment	C. Mitigation Strategy	D. Plan Maintenance	E. Plan Update	F. Plan Adoption	G. HHPD Requirements	H. State Requirements
1	Glenn County	Y	Y	Y	Y	Y			
2	City of Orland	Y	Y	Y	Y	Y			
3	City of Willows	Y	Y	Y	Y	Y			
4									
5									
6									
7									
8									
9									
10									

Plan Review Checklist

The Plan Review Checklist is completed by FEMA. States and local governments are encouraged, but not required, to use the PRT as a checklist to ensure all requirements have been met prior to submitting the plan for review and approval. The purpose of the checklist is to identify the location of relevant or applicable content in the plan by element/sub-element and to determine if each requirement has been “met” or “not met.” FEMA completes the “required revisions” summary at the bottom of each element to clearly explain the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is “not met.” Sub-elements in each summary should be referenced using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each element and sub-element are described in detail in Section 4: Local Plan Requirements of this guide.

Plan updates must include information from the current planning process.

If some elements of the plan do not require an update, due to minimal or no changes between updates, the plan must document the reasons for that.

Multi-jurisdictional elements must cover information unique to all participating jurisdictions.

Element A: Planning Process

Element A Requirements	Location in Plan (section and/or page number)	Met / Not Met
A1. Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement 44 CFR § 201.6(c)(1))		
A1-a. Does the plan document how the plan was prepared, including the schedule or time frame and activities that made up the plan’s development, as well as who was involved?	Schedule: - Pg. 5 - Table 9 Activities: - Pg. 29 Table 9 Who: - Table 10	Met
A1-b. Does the plan list the jurisdiction(s) participating in the plan that seek approval, and describe how they participated in the planning process?	Participants: - Table 10 - Pg. 53 - Pg. 301 - Pg. 325 How: - Table 10	Met

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Element A Requirements	Location in Plan (section and/or page number)	Met / Not Met
A2. Does the plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development as well as businesses, academia, and other private and non-profit interests to be involved in the planning process? (Requirement 44 CFR § 201.6(b)(2))		
A2-a. Does the plan identify all stakeholders involved or given an opportunity to be involved in the planning process, and how each stakeholder was presented with this opportunity?	Stakeholders: - Table 5 How: - Pg. 30	Met
A3. Does the plan document how the public was involved in the planning process during the drafting stage and prior to plan approval? (Requirement 44 CFR § 201.6(b)(1))		
A3-a. Does the plan document how the public was given the opportunity to be involved in the planning process and how their feedback was included in the plan?	Public participation: - Pg. 45-52 Vulnerable populations: - Pg. 48-52 Included how: - Pg. 52	Met
A4. Does the plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement 44 CFR § 201.6(b)(3))		
A4-a. Does the plan document what existing plans, studies, reports and technical information were reviewed for the development of the plan, as well as how they were incorporated into the document?	Existing information: - Pg. 54 NFIP Products: - Pg. 118 - Figure 48-50	Met
ELEMENT A REQUIRED REVISIONS		
Required Revision: Click or tap here to enter text.		

Element B: Risk Assessment

Element B Requirements	Location in Plan (section and/or page number)	Met / Not Met
B1. Does the plan include a description of the type, location, and extent of all natural hazards that can affect the jurisdiction? Does the plan also include information on previous occurrences of hazard events and on the probability of future hazard events? (Requirement 44 CFR § 201.6(c)(2)(i))		
B1-a. Does the plan describe all natural hazards that can affect the jurisdiction(s) in the planning area, and does it provide the rationale if omitting any natural hazards that are commonly recognized to affect the jurisdiction(s) in the planning area?	<p>Natural hazards:</p> <ul style="list-style-type: none"> - Section 3 Risk Assessment <p>Omission:</p> <ul style="list-style-type: none"> - Section 3 Risk Assessment 	Met
B1-b. Does the plan include information on the location of each identified hazard?	<p>Drought:</p> <ul style="list-style-type: none"> - Pg. 81 <p>Extreme Heat:</p> <ul style="list-style-type: none"> - Pg. 103 <p>Flood:</p> <ul style="list-style-type: none"> - Pg. 121 - Figure 48 <p>Geological Hazards:</p> <ul style="list-style-type: none"> - Pg. 148 - Figure 57 - Figure 58 - Figure 64 <p>Severe Weather:</p> <ul style="list-style-type: none"> - Pg. 190 <p>Wildfire:</p> <ul style="list-style-type: none"> - Pg. 203 - Figure 90 	Met
B1-c. Does the plan describe the extent for each identified hazard?	<p>Drought:</p> <ul style="list-style-type: none"> - Pg. 81-86 <p>Extreme Heat:</p> <ul style="list-style-type: none"> - Figure 34 - Figure 38 -39 - Pg. 103- <p>Flood:</p> <ul style="list-style-type: none"> - Pg. 121-124 - Pg. 127 	Met

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Element B Requirements	Location in Plan (section and/or page number)	Met / Not Met
	Geological Hazards: - Pg. 157-160 Severe Weather: - Pg. 190-191 Wildfire: - Pg. 204	
B1-d. Does the plan include the history of previous hazard events for each identified hazard?	Table 12-13 Drought: - Pg. 86 - Figure 28 Extreme Heat: - Pg. 105-106 Flood: - Pg. 129-130 Geological Hazards: - Pg. 160 Severe Weather: - Pg. 192-193 Wildfire: - Pg. 205-208	Met
B1-e. Does the plan include the probability of future events for each identified hazard? Does the plan describe the effects of future conditions, including climate change (e.g., long-term weather patterns, average temperature and sea levels), on the type, location and range of anticipated intensities of identified hazards?	Drought: - Table 18 - Pg. 91 Extreme Heat: - Table 18 - Pg. 106-109 Flood: - Table 18 - Pg. 130-131 Geological Hazards: - Table 18 - Pg. 161-162 Severe Weather: - Table 18 - Pg. 195 Wildfire: - Table 18 - Pg. 208-213	Met
B1-f. For participating jurisdictions in a multi-jurisdictional plan, does the plan describe any hazards that are unique to and/or vary from those affecting the overall planning area?	See annex review tool	Met
B2. Does the plan include a summary of the jurisdiction's vulnerability and the impacts on the community from the identified hazards? Does this summary also address NFIP-		

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Element B Requirements	Location in Plan (section and/or page number)	Met / Not Met
insured structures that have been repetitively damaged by floods? (Requirement 44 CFR § 201.6(c)(2)(ii))		
<p>B2-a. Does the plan provide an overall summary of each jurisdiction's vulnerability to the identified hazards?</p> <ul style="list-style-type: none"> - People - Structures - Systems - Resources - Activities 	<p>Social vulnerability: - Pg. 24-28</p> <p>Drought: - Pg. 93-95</p> <p>Extreme Heat: - Pg. 112-113</p> <p>Flood: - Pg. 131-142</p> <p>Geological Hazards: - Figure 58 - Pg. 163-168</p> <p>Severe Weather: - Pg. 196</p> <p>Wildfire: - Figure 90 - Pg. 214-218</p>	Met
<p>B2-b. For each participating jurisdiction, does the plan describe the potential impacts of each of the identified hazards on each participating jurisdiction?</p> <ul style="list-style-type: none"> - Climate change - Changes in population patterns - Changes in land use and development 	<p>Climate change: - Pg. 18-19</p> <p>Population patterns: - Pg. 19</p> <p>Land use trends: - Pg. 21-24</p> <p>Drought: - Pg. 92-95</p> <p>Extreme Heat: - Pg. 112-113</p> <p>Flood: - Pg. 131-142</p> <p>Geological Hazards: - Pg. 162-168</p> <p>Severe Weather: - Pg. 196</p> <p>Wildfire: - Pg. 213-218</p>	Met
<p>B2-c. Does the plan address NFIP-insured structures within each jurisdiction that have been repetitively damaged by floods?</p>	<p>NFIP repetitively damaged: - Pg. 126</p>	Met
ELEMENT B REQUIRED REVISIONS		
<p>Required Revision:</p> <p>Click or tap here to enter text.</p>		

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Element C: Mitigation Strategy

Element C Requirements	Location in Plan (section and/or page number)	Met / Not Met
C1. Does the plan document each participant's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement 44 CFR § 201.6(c)(3))		
C1-a. Does the plan describe how the existing capabilities of each participant are available to support the mitigation strategy? Does this include a discussion of the existing building codes and land use and development ordinances or regulations?	Capabilities: - Section 4 Building codes: - Section 4	Met
C1-b. Does the plan describe each participant's ability to expand and improve the identified capabilities to achieve mitigation?	Expand/improve: - Table 92	Met
C2. Does the plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement 44 CFR § 201.6(c)(3)(ii))		
C2-a. Does the plan contain a narrative description or a table/list of their participation activities? - Adoption of NFIP - Adoption of FIRM - Implementation and enforcement - Designee - Substantial improvement/damage	NFIP: - Pg. 118 - Table 89	Met
C3. Does the plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement 44 CFR § 201.6(c)(3)(i))		
C3-a. Does the plan include goals to reduce the risk from the hazards identified in the plan?	Goals: - Pg. 253	Met

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Element C Requirements	Location in Plan (section and/or page number)	Met / Not Met
C4. Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement 44 CFR § 201.6(c)(3)(ii))		
C4-a. Does the plan include an analysis of a comprehensive range of actions/projects that each jurisdiction considered to reduce the impacts of hazards identified in the risk assessment?	Comprehensive range of actions: - Table 93 - Table 98	Met
C4-b. Does the plan include one or more action(s) per jurisdiction for each of the hazards as identified within the plan's risk assessment?	See annex review tool	Met
C5. Does the plan contain an action plan that describes how the actions identified will be prioritized (including a cost-benefit review), implemented, and administered by each jurisdiction? (Requirement 44 CFR § 201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))		
C5-a. Does the plan describe the criteria used for prioritizing actions?	Prioritization: - Pg. 261-262	Met
C5-b. Does the plan provide the position, office, department or agency responsible for implementing/administrating the identified mitigation actions, as well as potential funding sources and expected time frame?	Funding: - Table 98 Responsible party: - Table 98	Met
ELEMENT C REQUIRED REVISIONS		
Required Revision: Click or tap here to enter text.		

Element D: Plan Maintenance

Element D Requirements	Location in Plan (section and/or page number)	Met / Not Met
D1. Is there discussion of how each community will continue public participation in the plan maintenance process? (Requirement 44 CFR § 201.6(c)(4)(iii))		
D1-a. Does the plan describe how communities will continue to seek future public participation after the plan has been approved?	Continued public involvement: - Pg. 275	Met
D2. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a five-year cycle)? (Requirement 44 CFR § 201.6(c)(4)(i))		
D2-a. Does the plan describe the process that will be followed to track the progress/status of the mitigation actions identified within the Mitigation Strategy, along with when this process will occur and who will be responsible for the process?	Progress: - Section 6	Met
D2-b. Does the plan describe the process that will be followed to evaluate the plan for effectiveness? This process must identify the criteria that will be used to evaluate the information in the plan, along with when this process will occur and who will be responsible.	Effectiveness: - Section 6	Met
D2-c. Does the plan describe the process that will be followed to update the plan, along with when this process will occur and who will be responsible for the process?	Update: - Section 6	Met
D3. Does the plan describe a process by which each community will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement 44 CFR § 201.6(c)(4)(ii))		
D3-a. Does the plan describe the process the community will follow to integrate the ideas, information and strategy of the mitigation plan into other planning mechanisms?	Integration: - Table 102	Met
D3-b. Does the plan identify the planning mechanisms for each plan participant into which the ideas, information and strategy from the mitigation plan may be integrated?	Mechanisms: - Table 102	Met
D3-c. For multi-jurisdictional plans, does the plan describe each participant's individual process for integrating information from the mitigation strategy into their identified planning mechanisms?	See annex review tool	Met

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

ELEMENT D REQUIRED REVISIONS

Required Revision:

Click or tap here to enter text.

Element E: Plan Update

Element E Requirements	Location in Plan (section and/or page number)	Met / Not Met
E1. Was the plan revised to reflect changes in development? (Requirement 44 CFR § 201.6(d)(3))		
E1-a. Does the plan describe the changes in development that have occurred in hazard-prone areas that have increased or decreased each community's vulnerability since the previous plan was approved?	Changes in development: - Pg. 92, 112, 131, 162, 196, and 213	Met
E2. Was the plan revised to reflect changes in priorities and progress in local mitigation efforts? (Requirement 44 CFR § 201.6(d)(3))		
E2-a. Does the plan describe how it was revised due to changes in community priorities?	Changes in priorities: - Pg. 30	Met
E2-b. Does the plan include a status update for all mitigation actions identified in the previous mitigation plan?	Status update: - Table 94	Met
E2-c. Does the plan describe how jurisdictions integrated the mitigation plan, when appropriate, into other planning mechanisms?	Previous integration: - Table 101	Met
ELEMENT E REQUIRED REVISIONS		
Required Revision:		
Click or tap here to enter text.		

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Element F: Plan Adoption

Element F Requirements	Location in Plan (section and/or page number)	Met / Not Met
F1. For single-jurisdictional plans, has the governing body of the jurisdiction formally adopted the plan to be eligible for certain FEMA assistance? (Requirement 44 CFR § 201.6(c)(5))		
F1-a. Does the participant include documentation of adoption?	Click or tap here to enter text.	Choose an item.
F2. For multi-jurisdictional plans, has the governing body of each jurisdiction officially adopted the plan to be eligible for certain FEMA assistance? (Requirement 44 CFR § 201.6(c)(5))		
F2-a. Did each participant adopt the plan and provide documentation of that adoption?	Click or tap here to enter text.	Not Met
ELEMENT F REQUIRED REVISIONS		
Required Revision: F2-a: After receiving official approvable pending adoption correspondence from the FEMA Region 9 Office please send a signed adoption resolution to FEMA-R9-MITIGATION-PLANNING fema-r9-mitigation-planning@fema.dhs.gov		

Element G: High Hazard Potential Dams (Optional)

HHPD Requirements	Location in Plan (section and/or page number)	Met / Not Met
HHPD1. Did the plan describe the incorporation of existing plans, studies, reports and technical information for HHPDs?		
HHPD1-a. Does the plan describe how the local government worked with local dam owners and/or the state dam safety agency?	Click or tap here to enter text.	Choose an item.
HHPD1-b. Does the plan incorporate information shared by the state and/or local dam owners?	Click or tap here to enter text.	Choose an item.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

HHPD Requirements	Location in Plan (section and/or page number)	Met / Not Met
HHPD2. Did the plan address HHPDs in the risk assessment?		
HHPD2-a. Does the plan describe the risks and vulnerabilities to and from HHPDs?	Click or tap here to enter text.	Choose an item.
HHPD2-b. Does the plan document the limitations and describe how to address deficiencies?	Click or tap here to enter text.	Choose an item.
HHPD3. Did the plan include mitigation goals to reduce long-term vulnerabilities from HHPDs?		
HHPD3-a. Does the plan address how to reduce vulnerabilities to and from HHPDs as part of its own goals or with other long-term strategies?	Click or tap here to enter text.	Choose an item.
HHPD3-b. Does the plan link proposed actions to reducing long-term vulnerabilities that are consistent with its goals?	Click or tap here to enter text.	Choose an item.
HHPD4-a. Did the plan include actions that address HHPDs and prioritize mitigation actions to reduce vulnerabilities from HHPDs?		
HHPD4-a. Does the plan describe specific actions to address HHPDs?	Click or tap here to enter text.	Choose an item.
HHPD4-b. Does the plan describe the criteria used to prioritize actions related to HHPDs?	Click or tap here to enter text.	Choose an item.
HHPD4-c. Does the plan identify the position, office, department or agency responsible for implementing and administering the action to mitigate hazards to or from HHPDs?	Click or tap here to enter text.	Choose an item.
HHPD Required Revisions		
Required Revision: Click or tap here to enter text.		

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Element H: Additional State Requirements (Optional)

Element H Requirements	Location in Plan (section and/or page number)	Met / Not Met
This space is for the State to include additional requirements.		
Click or tap here to enter text.	Click or tap here to enter text.	Choose an item.

Plan Assessment

These comments can be used to help guide your annual/regularly scheduled updates and the next plan update.

Element A. Planning Process

Strengths

- The plan team selected its stakeholder types based on the five stakeholder types found in the [FEMA Local Planning Policy Guide](#). Additionally, the plan used a table format with a column included for stakeholder type to clearly document these stakeholder groups. This helps to strengthen the plan by demonstrating not only alignment with 44 CFR 201.6(b)(2) but also ensures a holistic plan development process that elevates the voices of numerous stakeholders involved in hazard mitigation.
- The planning team used multiple methods of stakeholder engagement including meetings, a dedicated stakeholder digital survey, phone calls, and reviewing the draft plan. This ensures each stakeholder has the opportunity to participate in the plan's development in numerous ways.
- The planning team is commended for increasing public participation in the plan's development along with targeted outreach efforts to vulnerable populations. The plan documented that the 2018 update did not garner any public participation although efforts were made. The current plan update includes not only documentation that the public participated but also how this feedback was incorporated into the plan's development.
- The plan effectively builds upon FEMA Flood Insurance Rate Maps by including the flood zones and critical assets on the same map. This helps to strengthen the plan by not only showing potential hazard areas but the vulnerability of assets in and around those areas.

Opportunities for Improvement

- In future plan updates to build upon the successful practice of documenting jurisdictional participation in the planning process consider adding in either narrative format or table format the agency and title of the consultants that represented the participating jurisdictions throughout the planning process. Additionally consider adding more detail about how the consultants representing the jurisdictions relayed information to city officials. This will help to strengthen the plan by including more details as to how each participating jurisdiction was involved and made decisions in the planning process regardless of consultant representation.
- In future plan updates to build upon the successful practice of reviewing a variety of technical resources to inform the plans development consider including the NFIP regulatory flood mapping products that were used throughout the plan's development in the list of resources documented in the plan.

Element B. Risk Assessment

Strengths

- The plan documented several different types of scales that could be used to assess the anticipated range of intensities for a drought event. These scales include the Vegetation Drought Response Index, Surface Water Supply Index, Palmer Drought Severity Index, and U.S. Drought Monitor. This enhances the plan by examining potential intensities from various perspectives.
- The plan effectively used statewide climate change predictions to apply them on a county level. This demonstrates the planning team's ability to use the data that is accessible to the county to make meaningful predictions about future conditions and the probability of hazard events occurring.
- The planning team used both low and high emissions scenarios where appropriate to evaluate the correlation between climate change and the probability of a given hazard event. This is a helpful analysis method as it provides the jurisdiction with options and the ability to make mitigation actions based on the different scenarios.
- The plan includes impactful real-life photos from previous hazard events. These images help to demonstrate the threat that exists from these hazard events as well as serve as a reminder for why the hazard mitigation plan is so important.

Opportunities for Improvement

- In future plan updates consider using the [National Risk Index](#) to analyze and map a potential hazard. For example, the plan can be enhanced by including the National Risk Index map for drought which will complement the narrative section that states drought can affect the entire county. Additionally, the National Risk Index has valuable information that can add to the risk assessment for each hazard type.
- In future plan updates consider building upon the vulnerabilities assessment by including additional information to support and enhance the overall assessment. For example, the drought vulnerability analysis discusses farm workers but does not provide the total number of farm workers in the county. This information can be obtained through [Census Bureau Data](#) and would help to provide additional context to the analysis.
- In future plan updates consider building upon the impact analysis by including additional information on changes in population patterns and land use and development trends. The plan documents valuable information in the Community Profile section discussing a decline in the population for all participating jurisdictions but it does not connect this decline to the impact analysis. Additionally, the plan documents in the same section the land use and development trends for the County but it does not tie this information back to the impact analysis. The impact analysis for each hazard does touch on these topics but it will help to strengthen the plan if this information is incorporated directly into the impact analysis.

Element C. Mitigation Strategy

Strengths

- The State and Federal Funding Resource Table (table 85) is a valuable tool for documenting the available funding mechanisms outside of the jurisdictions budget. This tool should be used and maintained each plan update cycle and old funding mechanisms that are no longer relevant should be removed.
- The plan included in Table 89 a robust NFIP compliance/capabilities assessment. This table helps to strengthen the plan by not only documenting the county's compliance and current NFIP procedures but also helps to analyze the county's ability to leverage this capability or improve upon it if needed.
- The plan included in Table 93 additional mitigation actions that were considered but not selected for this plan update. This additional information is a useful practice as it provides context for the next plan update cycle and potential mitigation actions that might be more appropriate for the specific update. Additionally, the plan included a comprehensive range of actions including physical projects as well as studies and community outreach programs.
- The plan included a Mitigation Success Story section that highlights effective projects and success stories that have occurred since the last plan updated. This is a beneficial practice for not only documenting what works well but it provides additional context for creating mitigation actions in the future.

Opportunities for Improvement

- In future plan updates consider building upon the successful practice of selecting and prioritizing mitigation actions by reviewing the FEMA [Mitigation Ideas](#) Handbook. This resource has valuable information on mitigation strategies for various natural hazards. The handbook can be particularly helpful in creating potential mitigation activities for hazards that are challenging to plan for such as drought.

Element D. Plan Maintenance

Strengths

- The planning team is commended for creating a plan update schedule that starts 2 years prior to the plan's expiration date. This ensures the planning team has adequate time to collect the necessary information, engage with the public, conduct a risk assessment, and submit the plan for formal review.

Opportunities for Improvement

- [insert comments]

Element E. Plan Update

Strengths

- [insert comments]

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Opportunities for Improvement

- The planning team may consider in future plan updates expanding upon any changes in priorities or available resources/data that influenced the changes in the plan's contents. The plan effectively documents that it was a priority to update the plan in accordance with the most recent FEMA policy guidance, but this section can be enhanced by including additional information on any other changes that have occurred in priorities for the community.

Element G. HHPD Requirements (Optional)

Strengths

- [insert comments]

Opportunities for Improvement

- [insert comments]

Element H. Additional State Requirements (Optional)

Strengths

- [insert comments]

Opportunities for Improvement

- [insert comments]

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Participating Jurisdiction	A1.b. Describe jurisdictional participation in planning process		A2.a. Documentation of Local Stakeholder Groups		A3.a. Documentation of Public Engagement (including underserved and vulnerable populations)		B1.a. Identified Jurisdictional Hazards	
	Met?	Location in Plan	Met?	Location in Plan	Met?	Location in Plan	Met?	Location in Plan
City of Orland	Y	Pg. 301	Y	Table 5 Table 104	Y	Pg. 45-52 and 304-305	Y	Table 106
City of Willows	Y	Pg. 325	Y	Table 5 Table 111 Table 112	Y	Pg. 45-52 and 329-330	Y	Table 114

Participating Jurisdiction	B1.f. Identified Jurisdictional Risk Differences			B2.a. Addressed Specific Vulnerabilities People Structures Systems Resources Activities		B2.b. Addressed Specific Impacts Climate change Changes in pop patterns Changes in land use	
	Met?	Location in Plan	Comments (required)	Met?	Location in Plan	Met?	Location in Plan
City of Orland	Y	Table 106 Figure 49	Strength: The table provided is a useful tool to analyze the unique jurisdictional risks for each hazard type.	Y	Drought: Pg 95, Figure 30, Table 106 Extreme Heat: Pg. 114, Table 106 Flood: Figure 49, Table 37, Table 39, Table 40, Pg 143, Table 106 Geological Hazards: Figure 49, Table 46, Pg. 168, Table 106 Severe Weather: Pg. 197, Table 106 Wildfire: Figure 94, Pg 218, Table 106	Y	Drought: Pg. 92, Table 106 Extreme Heat: Table 106, Pg. 114 Flood: Table 106, pg 131 Geological Hazards: Pg 162 Table 106 Severe Weather: Table 106, pg 196 Wildfire: Table 106, pg 213
City of Willows	Y	Table 114 Figure 50	Strength: The table provided is a useful tool to analyze the unique jurisdictional risks for each hazard type.	Y	Drought: Pg. 95, Table 114 Extreme Heat: Pg. 114, Table 114 Flood: Figure 50, Table 38, Table 39, Table 40, Pg. 143, Table 114 Geological Hazards: Figure 50, Table 46, Pg. 168, Table 114 Severe Weather: Pg. 197, Table 114 Wildfire: Figure 50, Pg. 218-219, Table 114	Y	Drought: Pg. 93, Table 114 Extreme Heat: Table 114, Pg 114 Flood: Table 114, Pg 131 Geological Hazards: Pg 162, Table 114 Severe Weather: Table 114, pg 196 Wildfire: Table 114, pg 213

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Participating Jurisdiction	B2.c. Repetitive Loss Information		C1.a. Mitigation Capabilities Identified		C1b. Expand and Improve Upon Mitigation Capabilities		C2.a. NFIP Program Information Adoption FIRM Implementation Designee Substantial improvement/damage	
	Met?	Location in Plan	Met?	Location in Plan	Met?	Location in Plan	Met?	Location in Plan
City of Orland	Y	Table 106	Y	Section 4	Y	Table 92, Table 107, Pg.315-316	Y	Table 90
City of Willows	Y	Table 114	Y	Section 4	Y	Table 92, Table 115, Pg 340-341	Y	Table 91

Participating Jurisdiction	C4.b. Mitigation actions for each hazard		C5.b. Action Information (Agency, Funding, Timeframe)		D3.c. Process for Integrating with Jurisdictionally Identified Planning Mechanisms (check on jurisdiction's D3.a. & D3.b)		E1.a. Changes in Development	
	Met?	Location in Plan	Met?	Location in Plan	Met?	Location in Plan	Met?	Location in Plan
City of Orland	Y	Table 110	Y	Table 110	Y	Pg. 322	Y	Drought: Pg. 92, Table 106 Extreme Heat: Table 106, Pg. 114 Flood: Table 106, pg 131 Geological Hazards: Pg 162 Table 106 Severe Weather: Table 106, pg 196 Wildfire: Table 106, pg 213
City of Willows	Y	Table 118	Y	Table 118	Y	Pg 347-348	Y	Drought: Pg. 93, Table 114 Extreme Heat: Table 114, Pg 114 Flood: Table 114, Pg 131 Geological Hazards: Pg 162, Table 114 Severe Weather: Table 114, pg 196 Wildfire: Table 114, pg 213

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Participating Jurisdiction	E2.a. Changes in Priorities		E2.b. Status of Previous Actions		E2.c. Past Integration Efforts	
	Met?	Location in Plan	Met?	Location in Plan	Met?	Location in Plan
City of Orland	Y	Pg 323-324	Y	Table 108	Y	Pg 322
City of Willows	Y	Pg 348	Y	Table 116	Y	Pg 347-348

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

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Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

- City of Orland Annex and the **City of Willows Annex** provide jurisdiction-specific applications of the data in this countywide plan for the Cities of Orland and Willows, respectively, to meet mitigation grant eligibility requirements.

Plan Development

The plan development process occurred between November 2023 and March 2024. In the beginning, a broad range of stakeholders and plan participants from the three participating jurisdictions were identified. Three meetings were held to engage the representatives of the jurisdiction and identified stakeholders: a Kickoff meeting, a Risk Assessment/Capability Assessment meeting, and a Mitigation Strategy meeting. Stakeholders were also invited to participate through a digital survey specifically designed to identify how their organizations implemented and were willing to support mitigation actions across the planning area. Other stakeholders also participated in the three meetings, including active participation by representatives of tribes, special districts, agricultural concerns, the California Governor's Office of Emergency Services (Cal OES), the California Department of Forestry and Fire Protection (Cal FIRE), the Bureau of Reclamation, and the Glenn County Resource Conservation District (RCD).

The plan update included a major focus on public outreach and engagement. The participating jurisdictions widely publicized the opportunity to participate in the plan through digital surveys and in-person methods, including outreach to areas where vulnerable populations, such as the elderly, low-income, and Spanish-speaking populations, were likely to visit. Furthermore, the plan was discussed at multiple in-person public meetings and shared by newsletter and television. All information from stakeholders, the public, and plan participants was incorporated into a final draft plan, which was shared with Cal OES and FEMA for review.

Mitigation Goals

Mitigation goals are broad, policy-type statements which reflect the plan participants' vision for hazard mitigation. The participating jurisdictions and stakeholders evaluated the prior plan's mitigation goals at the Mitigation Strategy meeting and decided to make minor changes. These changes emphasized the importance of collaborating with tribal, state, and federal partners to implement mitigation actions and the need for additional data to support decision-making. The goals of this plan are as follows:

1. Reduce or eliminate hazard-related loss of life and injuries.
2. Reduce or eliminate hazard-related damage to critical/essential facilities and public services, infrastructure, and property.
3. Promote collaboration/coordination among jurisdictions, agencies, tribes, and state and federal partners in Glenn County to reduce or eliminate the impacts of natural hazards.
4. Improve and maintain Glenn County's and the cities' capabilities (planning/regulatory personnel capacity, funding accessibility, asset data, etc.) to implement mitigation activities.

Plan Adoption and Implementation

The plan has been reviewed by Cal OES and FEMA. The planning process will be complete when each jurisdiction adopts the final draft plan. Once FEMA determines that the plan has met Approvable-Pending-Adoption status, the participating jurisdictions will adopt the plan. Adoption resolution letters will be shared with Cal OES and FEMA. This will put the plan in good standing with FEMA and ensure that the participating jurisdictions are eligible to receive applicable hazard mitigation grants, including HMGP and Building Resilient Infrastructure and Communities (BRIC) and FMA grants.

Table of Contents

Section 1. Community Profile	1
History.....	1
Geography, Topography, and Climate	2
Socioeconomic Factors	5
Economic Background and Trends	6
Land Use and Development Trends.....	7
Social Vulnerability	10
Section 2. The Planning Process	15
Planning Process.....	15
Planning Team and Stakeholder Engagement.....	15
Public Outreach	31
Planning Process Methodology	38
Section 3. Risk Assessment	42
Hazard Identification	42
Initial Prioritization of Hazards	48
Vulnerability Assessment	52
Section 3.1 Drought.....	63
Regulatory Environment	64
City of Orland Municipal Code 17.85.040.....	66
Location/Geographic Extent	67
Magnitude/Extent.....	67
Past Occurrences	72
Frequency/Probability of Future Occurrences	77
Changes in Development	78
Vulnerability Assessment	79
Jurisdiction-Specific Vulnerabilities	80
Section 3.2 Extreme Heat.....	83
Regulatory Environment	88
Location/Geographic Extent	88
Magnitude/Extent.....	89
Past Occurrences	91
Frequency/Probability of Future Occurrences	92
Changes in Development	98
Vulnerability Assessment	98
Jurisdiction-Specific Vulnerabilities	99
Section 3.3 Flood	101
Regulatory Environment	103
Location/Geographic Extent	107
Localized Flooding.....	111
Repetitive Loss Properties.....	112
Magnitude/Extent.....	113
Flood Warning and Notification	114
Past Occurrences	115
Frequency/Probability of Future Occurrences	116
Changes in Development	117
Vulnerability Assessment	117
Jurisdiction-Specific Vulnerabilities	128
Section 3.4 Geologic Hazards	131

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Regulatory Environment	132
Location/Geographic Extent	134
Magnitude/Extent	143
Past Occurrences	146
Frequency/Probability of Future Occurrences	147
Changes in Development	148
Vulnerability Assessment	149
Jurisdiction-Specific Vulnerabilities	153
Section 3.5 Levee Failure	155
Regulatory Environment	156
Location/Geographic Extent	156
Magnitude/Extent	163
Past Occurrences	163
Frequency/Probability of Future Occurrences	166
Changes in Development	167
Vulnerability Assessment	168
Jurisdiction-Specific Vulnerabilities	168
Section 3.6 Severe Weather	175
Regulatory Environment	176
Location/Geographic Extent	176
Magnitude/Extent	176
Past Occurrences	178
Frequency/Probability of Future Occurrences	181
Changes in Development	182
Vulnerability Assessment	182
Jurisdiction-Specific Vulnerabilities	182
Section 3.7 Wildfire	185
Regulatory Environment	187
Location/Geographic Extent	189
Magnitude/Extent	190
Past Occurrences	191
Frequency/Probability of Future Occurrences	194
Changes in Development	199
Vulnerability Assessment	200
Jurisdiction-Specific Vulnerabilities	203
Section 4. Capabilities Assessment	207
Planning and Regulatory	207
Administrative and Technical	215
Financial	219
Education and Outreach	228
National Flood Insurance Program	231
Opportunities to Expand and Improve Capabilities	237
Section 5. Mitigation Strategy	239
Hazard Mitigation Goals and Objectives	239
Mitigation Actions	239
Mitigation Success Stories	244
Prioritizing Mitigation Actions	247
Mitigation Action Plan	248
Section 6. Plan Maintenance	261
Plan Adoption	261
Continued Public Participation	261

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Plan Integration.....	261
Monitoring, Evaluating and Updating the Plan	263
Appendix A: Plan Maintenance Resources	265
Appendix B: Public Outreach	269
Appendix C: Plan Review Documents	289
City of Orland Annex	318
City of Willows Annex.....	342

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

List of Tables

Table 1: Glenn County Population 2010–2022	5
Table 2: Changes in Housing Units, 2018–2023	6
Table 3: Housing Units by Type in Glenn County, 2018 and 2023	6
Table 4: Results from the Client and Economic Justice Screening Tool	12
Table 5: Stakeholders Given the Opportunity to Participate	17
Table 6: City of Orland Stakeholders	25
Table 7: City of Willows Stakeholders	26
Table 8: Stakeholders That Participated in the Plan Update	28
Table 9: Plan Development Chronology and Milestones	38
Table 10: Summary of Participation	39
Table 11: Updated Crosswalk Review	43
Table 12: Federal Disaster and Emergency Declarations, 1955–2023	45
Table 13: Cal OES Disaster Proclamations and Executive Orders, 2015–2023	46
Table 14: Disasters Declared by the U.S. Department of Agriculture, 2012–2022	47
Table 15: Governor-Proclaimed Disasters for Glenn County or Statewide, October 20, 1991–2023	47
Table 16: “Other Disasters” Identified in the 2018 MJHMP	47
Table 17: Guidelines for Prioritization	48
Table 18: Calculated Priority Risk Index for Glenn County	50
Table 19: Calculated Priority Risk Index for Orland	51
Table 20: Calculated Priority Risk Index for Willows	51
Table 21: Critical Facilities by Community Lifeline and Jurisdiction	53
Table 22: Values of Exposed Buildings and Their Contents, by Occupancy	54
Table 23: CEJST Threshold for Disadvantage Communities	57
Table 24: Executive Orders for Drought in Glenn County	76
Table 25: Excessive Deaths in California, August 31–September 9, 2022	85
Table 26: Excess Deaths in California, August 31–September 9, 2022, with Underlying Cause of Death	85
Table 27: Regions Analyzed during the California Heatwave, August 31–September 9, 2022	86
Table 28: California Heatwave Deaths by Region, August 31–September 9, 2022	87
Table 29: Climate Projections for Glenn County	93
Table 30: Glenn County Dams	101
Table 31: Area in Glenn County Inundated by 100- & 500-Year Floods	110
Table 32: FEMA Flood Declarations	115
Table 33: Exposure of Buildings and Their Contents to Dam Failure	119
Table 34: Community Lifelines within Dam Failure Inundation Boundaries	119
Table 35: Community Lifelines in Flood Hazard Zones by Jurisdiction	122
Table 36: County Critical Facilities in Flood Hazard Zones	122
Table 37: Facilities in a Flood Hazard Zone in Orland	123
Table 38: Critical Facilities in Flood Hazard Zones in Willows	123
Table 39: Hazus 1% Annual Chance Flood Loss Estimates	127
Table 40: Hazus 0.2% Annual Chance Flood Loss Estimates	127
Table 41: Earthquake Magnitude Classes	143
Table 42: Modified Mercalli Scale	143
Table 43: Earthquakes in or near Glenn County, 2023	144
Table 44: Loss Estimate Summary for a Hazus 100-Year Probabilistic Scenario of an M5.8 Earthquake	150
Table 45: Expected Building Damage by Occupancy for a Hazus 100-Year Probabilistic Scenario of an M5.8 Earthquake	150
Table 46: Loss Estimate Summary for a Hazus M6.8 Great Valley Earthquake Scenario	152
Table 47: Expected Building Damage by Occupancy in a Hazus M6.8 Great Valley Earthquake Scenario	152
Table 48: Levee Failures in Glenn County, according to FERIX	165
Table 49: Estimated Losses from State/Fed Levee Failure in Glenn County	170

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Table 50: Critical Facilities in Levee Flood Protection Zones	170
Table 51: Rainfall Intensity Scale	176
Table 52: Federal Disaster and Emergency Declarations by FEMA	178
Table 53: Cal OES Disaster Proclamations and Executive Orders, 2015–2024	179
Table 54: Governor-Proclaimed Disasters for Glenn County, October 20, 1991–Present	179
Table 55: 2018 Multi-Jurisdiction Hazard Mitigation Plan, "Other Disasters"	179
Table 56: Glenn County Storm Events, 1950–2023	180
Table 57: Wildfires in Glenn County, 1953–2023	193
Table 58: Glenn County Fires by Decade	194
Table 59: Vulnerability of Critical Facilities to Wildfire	200
Table 60: Critical Facilities At Risk of Wildfire	201
Table 61: Extent of Wildfire Hazard Areas in Glenn County	202
Table 62: Buildings in Areas of Moderate Fire Hazard Severity	202
Table 63: Buildings in Areas of High Fire Hazard Severity	202
Table 64: Buildings in Areas of Very High Fire Hazard Severity	202
Table 65: Total Building Exposure	202
Table 66: Glenn County Planning Capabilities	207
Table 67: City of Orland Planning Capabilities	208
Table 68: City of Willows Planning Capabilities	209
Table 69: Glenn County Regulatory Capabilities	210
Table 70: City of Orland Planning Capabilities	211
Table 71: City of Willows Planning Capabilities	212
Table 72: Glenn County Regulatory Capabilities	212
Table 73: City of Orland Regulatory Capabilities	214
Table 74: City of Willows Regulatory Capabilities	214
Table 75: Glenn County Administrative Capabilities	215
Table 76: City of Orland Administrative Capabilities	216
Table 77: City of Willows Administrative Capabilities	216
Table 78: Glenn County Technical Capabilities	217
Table 79: City of Orland Technical Capabilities	218
Table 80: City of Willows Technical Capabilities	218
Table 81: State and Federal Agencies That Provide Administrative/Technical Support	219
Table 82: Glenn County Financial Capabilities	219
Table 83: City of Orland Financial Capabilities	221
Table 84: City of Willows Financial Capabilities	223
Table 85: Potential State and Federal Funding Resources	224
Table 86: Glenn County Education and Outreach Capabilities	229
Table 87: City of Orland Education and Outreach Capabilities	230
Table 88: City of Willows Education and Outreach Capabilities	230
Table 89: Glenn County National Flood Insurance Program Capabilities	231
Table 90: City of Orland National Flood Insurance Program Capabilities	234
Table 91: City of Willows National Flood Insurance Program Capabilities	235
Table 92: Opportunities to Expand or Improve Capabilities	237
Table 93: Additional Mitigation Actions Considered	240
Table 94: Mitigation Actions by Glenn County in 2018	242
Table 95: Previous Mitigation Actions by Willows	243
Table 96: Previous Mitigation Actions by Orland	243
Table 97: STAPLEE Method for Evaluating and Prioritizing Mitigation Actions	247
Table 98: Glenn County Mitigation Action Plan	250
Table 99: Orland Mitigation Action Plan	254
Table 100: Willows Mitigation Action Plan	258
Table 101: Previous Plan Integration	262
Table 102: Future Plan Integration Opportunities	262
Table 103: Summary of Public Comments Received	279
Table 104: Stakeholders Who Participated in Planning for Orland	319
Table 105: Calculated Priority Risk Index for Orland	323

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

Table 106: Hazard Profile for Orland	324
Table 107: Mitigation Capabilities and Opportunities for Orland	332
Table 108: Previous Mitigation Actions in Orland	333
Table 109: Considered Mitigation Actions	334
Table 110: 2024 Hazard Mitigation Actions for Orland	335
Table 111: Stakeholders Invited to Participate	343
Table 112: Stakeholders Who Participated in Planning for Willows	344
Table 113: Calculated Priority Risk Index for Willows	348
Table 114: Jurisdiction-Specific Hazard Profiles	349
Table 115: Mitigation Capabilities and Opportunities for Willows	357
Table 116: Previous Mitigation Actions	358
Table 117: Considered Mitigation Actions	359
Table 118: Willows 2024 Hazard Mitigation Actions	360
Table 119: 2024 Mitigation Action Prioritization	364

List of Figures

Figure 1: Glenn County Community Profile Map	1
Figure 2: Location of Glenn County, California	3
Figure 3: Glenn County Land Use Map	8
Figure 4: Orland Land Use Map	9
Figure 5: Willows Land Use Map	10
Figure 6: Glenn County Social Vulnerability Map	11
Figure 7: The Risk Index Rating for Glenn County	13
Figure 8: At-Risk Population of Glenn County	14
Figure 9: Multi-Jurisdiction Hazard Mitigation Planning Process	15
Figure 10: Screenshot of Glenn County Sheriff's Office Facebook Post	33
Figure 11: Screenshot of City of Orland Social Media Post	33
Figure 12: Screenshot of City of Willows Facebook Post	34
Figure 13: Public Outreach Survey Locations	36
Figure 14: Screenshot on the MJHMP from Action 12 News	37
Figure 15: Notes from the Glenn County Emergency Medical Care Council Meeting	38
Figure 16: Glenn County Social Vulnerability Themes	55
Figure 17: Comparison of At-Risk Populations in Willows, Glenn County, and Orland	56
Figure 18: Dependent Age Vulnerability for Glenn County	58
Figure 19: Hispanic or Latino Population and Spanish Speaking in Glenn County	59
Figure 20: Percentage of Glenn County Population with a Disability	60
Figure 21: Glenn County Population below the Poverty Level	61
Figure 22: Types of Droughts and Their Development	63
Figure 23: Drought in the State of California, November 2, 2023	68
Figure 24: Drought Tendency in the United States, November 01, 2023–January 31, 2024	69
Figure 25: Drought Severity in the United States	70
Figure 26: 12-Month Standard Precipitation	71
Figure 27: Vegetation Drought Response Index Region 1, November 05, 2023	72
Figure 28: Drought Monitor Time Series Chart for Glenn County	73
Figure 29: Ground Water Supply Issues in Glenn County, 2022–2023	74
Figure 30: Dry Wells in Glenn County, 2021–2022	74
Figure 31: 20-Year Trends in Groundwater Levels in Glenn County	75
Figure 32: Glenn County Groundwater Conditions, January 2024	76
Figure 33: Orland Area Water Supply Project, Phases 1 & 2	79
Figure 34: Heat Index in Shady Locations	83

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Figure 35: Heat Classification	84
Figure 36: Heat-Related Deaths in California, 2018–2021	84
Figure 37: U.S. Climate Divisions for California	87
Figure 38: NWS HeatRisk Prototype	90
Figure 39: Magnitude and Frequency of Extreme Heat Events, 1950–2021	91
Figure 40: Cal-Adapt Extreme Heat Days per Year for Glenn County, California	93
Figure 41: Cal-Adapt Number of Warm Nights for Glenn County	94
Figure 42: CMRA Annual Days with Maximum Temperature > 105°F in Glenn County	95
Figure 43: Heat Factors in and Near the City of Orland	96
Figure 44: Heat Projections for the City of Orland	96
Figure 45: Heat Factors in and Near the City of Willows	97
Figure 46: Heat Projections for the City of Willows	98
Figure 47: Glenn County Dams in Perspective	102
Figure 48: Glenn County Community Lifelines in Flood Hazard Zones	108
Figure 49: Critical Facilities in Flood Hazard Zones in Orland	109
Figure 50: Critical Facilities in Flood Hazard Zones in Willows	110
Figure 51: State Flood Awareness Zones	111
Figure 52: Community Lifelines in Glenn County with the Extent of Dam Failure	114
Figure 53: Critical Facilities and Potential Dam Inundation in Orland	120
Figure 54: Critical Facilities and Potential Dam Inundation in Willows	121
Figure 55: Hazus 100-Year Scenario: Expected Building Damage by Occupancy	125
Figure 56: Hazus 500-Year Flood Scenario: Building Loss Estimates by Occupancy	126
Figure 57: Glenn County Earthquake Hazard	135
Figure 58: Expansive Soil in Glenn County	136
Figure 59: Expansive Soil in Orland	137
Figure 60: Expansive Soil in Willows	138
Figure 61: Glenn County Shrink–Swell Map	139
Figure 62: Displacement, 2016–2022	140
Figure 63: Glenn County Vertical Displacement, January 2022–January 2023	141
Figure 64: Critical Facilities and Vertical Displacement in Glenn County	142
Figure 65: Earthquakes in and near Glenn County, 07/22/2018–12/20/2023	145
Figure 66: Probability of a Magnitude 5.0–9.2 Earthquake in Glenn County in the Next 50 Years	147
Figure 67: Typical Stream without Levees	155
Figure 68: Typical Stream with Levees	156
Figure 69: Levee Systems Glenn County	157
Figure 70: Glenn County Levee System 2205	158
Figure 71: MA 05 Unit 1 – Butte Creek Left Bank	158
Figure 72: MA 05 Unit 2-Butte Creek Right Bank	159
Figure 73: Sacramento River East Levee – LD 3 Glenn County (Butte, Colusa, Sutter)	160
Figure 74: Sacramento River West Bank (Colusa, Glenn, Yolo)	161
Figure 75: Levee Flood Protection Zones in Glenn County	162
Figure 76: Levee Flood Protection Zones, Small Scale	163
Figure 77: Levee Failures on and near the Border of Butte and Glenn Counties	165
Figure 78: Levee break 03/14/2023 Hambright Creek	166
Figure 79: Diagram of the J Levee along the Sacramento River	171
Figure 80: Aerial Photograph of the J Levee along the Sacramento River	172
Figure 81: Visualizing Atmospheric Rivers	175
Figure 82: Average Number of Days with an Atmospheric River	176
Figure 83: 12-Month Precipitation Values in Glenn County	177
Figure 84: Precipitation Frequency for Glenn County, California	177
Figure 85: CR 45 x CR D Damaged During DR4434	178
Figure 86: A Severe Storm in Willows in February 2024 Overwhelms the City's Drainage Systems	181
Figure 87: Red Mountain Fire Following the August Complex Fire	186
Figure 88: Glenn County Urban Interface	186
Figure 89: Glenn County Fire Protection Districts	188
Figure 90: Fire Hazard Severity Zones, 2022	190

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Figure 91: Jeep near August Complex Fire	192
Figure 92: Historic Fires in Glenn County	193
Figure 93: Glenn County Fire Threat	195
Figure 94: Threat of Wildfires in Orland	196
Figure 95: Risk of Wildfires in Willows	197
Figure 96: Feedback Loop of Fires and Climate	198
Figure 97: Photograph from the Hamilton City Flood Damage Reduction and Ecosystem Restoration Project	245
Figure 98: Levee as part of the Hamilton City Flood Damage Reduction and Ecosystem Restoration Project	245
Figure 99: Photograph from the Walker Street Well Project	246
Figure 100: Giant Reeds at Upper Stony Creek	247
Figure 101: Screenshot of the City of Orland Social Media Post	320
Figure 102: Public Surveys at Orland City Hall	321
Figure 103: Survey Information at the Orland Free Library	321
Figure 104: Photograph from the Walker Street Well Project	340
Figure 105: Screenshot of the City of Willows Facebook Post	346
Figure 106: Survey Posted at Willows Pharmacy	346

Section 1. Community Profile

This section provides an overview of the current conditions, including the history and existing environmental and socioeconomic factors, across Glenn County and in the cities of Orland and Willows. Environmental and socioeconomic considerations, such as geography, topography, climate, population, economy, housing, and land use and development trends, are all taken into account. Figure 1 is a profile map of Glenn County, and it illustrates its location in the State of California.

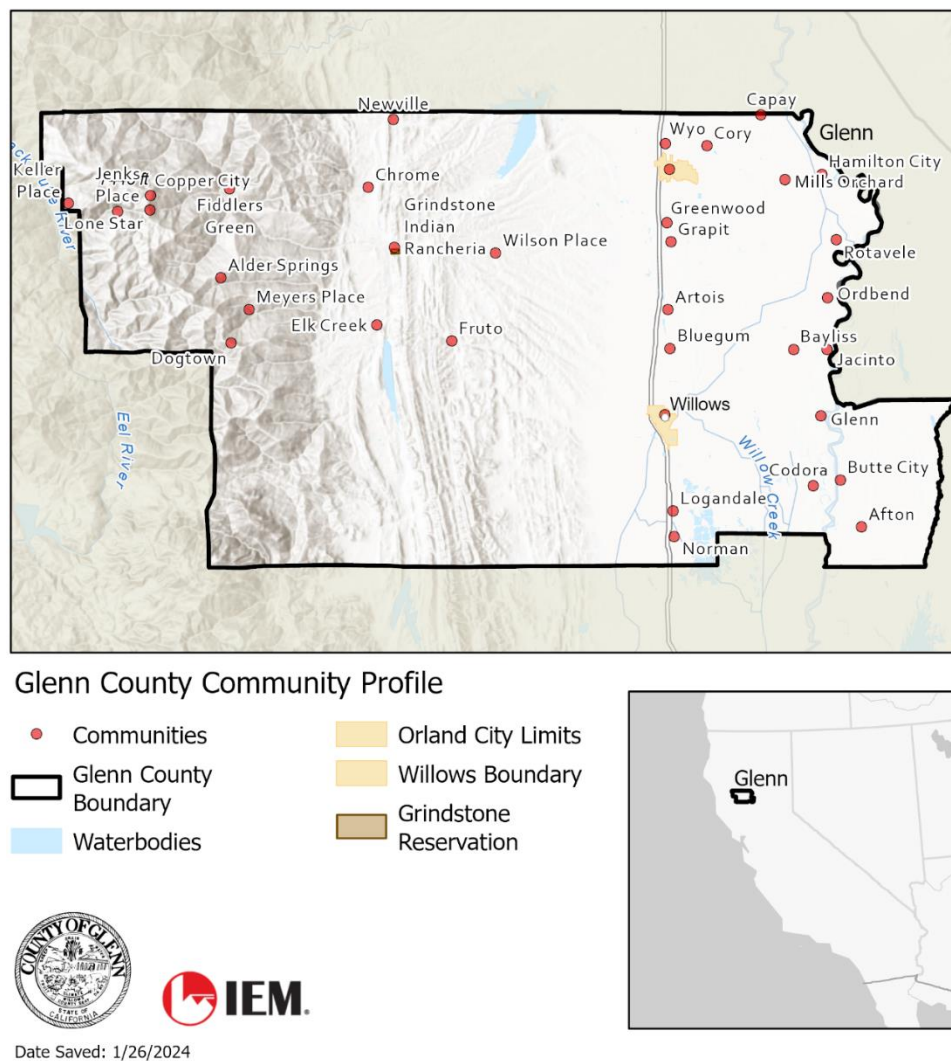


Figure 1: Glenn County Community Profile Map

History

Glenn County is situated in Northern California, halfway between Sacramento and Redding. It is primarily an agricultural community. The county's west is mountainous, while the Sacramento River bounds the east. The Interstate 5 corridor runs through the rich farmland of Glenn County.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

Glenn County's economy relies heavily on agriculture, with over 1,188 farms in the area. The county's major commodities include rice, almonds, milk products, prunes, and livestock. Glenn County, incorporated on March 5, 1891, was formed from the northern part of Colusa County, and named after Dr. Hugh J. Glenn, the largest wheat farmer in the state during his lifetime. He was a prominent figure in California's political and commercial life.²

Orland, situated in the northeast portion of Glenn County, began as a cattle ranch established in the late 1840s by Granville P. Swift. The area saw a shift from cattle ranching to grain production, and by the early 1870s, the Central Pacific Railroad had laid track from Colusa County to Red Bluff. In 1878, the Chamberlain brothers laid out the townsite of Orland, and two years later, the railroad took over its management. The new settlement saw the establishment of stores and warehouses for local ranchers, which attracted other residents. The census of 1880 showed that Orland had grown to 292.

In 1890, farmers in Orland began irrigating their land with water from Stony Creek. However, they soon discovered that the water supply was unreliable, and many farmers shifted to dairying and orchard crops instead. By the 1920s, Orland's population had grown to 1,600, and the town had become more settled, with large and small commercial establishments lining the streets of downtown Orland, which were beginning to be paved. The arrival of the Orland Project and the formation of the Orland Unit Water Users Association (OUWUA) led to the prosperity of many farmers. The OUWUA celebrated its 100th anniversary in 2007. While most of the open ditches used to deliver water have been covered, some outlying areas of the town still use project water for irrigation.³

Willows, which serves as the county seat of Glenn County, was settled in the 1840s and incorporated on January 16, 1886. The city received its name because of the numerous willow trees there. Willows was once a major shipping center for agricultural products and was connected to the state by the Southern Pacific Railway.⁴ The population began to decline in the mid-twentieth century and currently has a population of 6,116. Living in Willows offers residents a suburban feel with plenty of parks. Most residents of Willows own their homes, and the area is popular with families and young professionals.⁵ Willows is a peaceful and rural town with generally mild and pleasant summers, although they can be hot. Winters can be cold, but they bring beautiful snow scenes to enjoy outdoors.⁶

Geography, Topography, and Climate

This section provides succinct descriptions of the county's geography, topography, and climate as a basis for understanding the environmental conditions that could influence the impacts of natural hazards on the county.

Geography

Glenn County is situated in the Northern Sacramento Valley, between the Sacramento River and the eastern foothills and mountains of the Coast Range, approximately 80 miles north of Sacramento (see Figure 2).

² County of Glenn California, "County of Glenn Residents & Visitors." <https://www.countyofglenn.net/residents>

³ City of Orland, CA, "City of Orland History." <https://www.cityoforland.com/city-of-orland-history/>

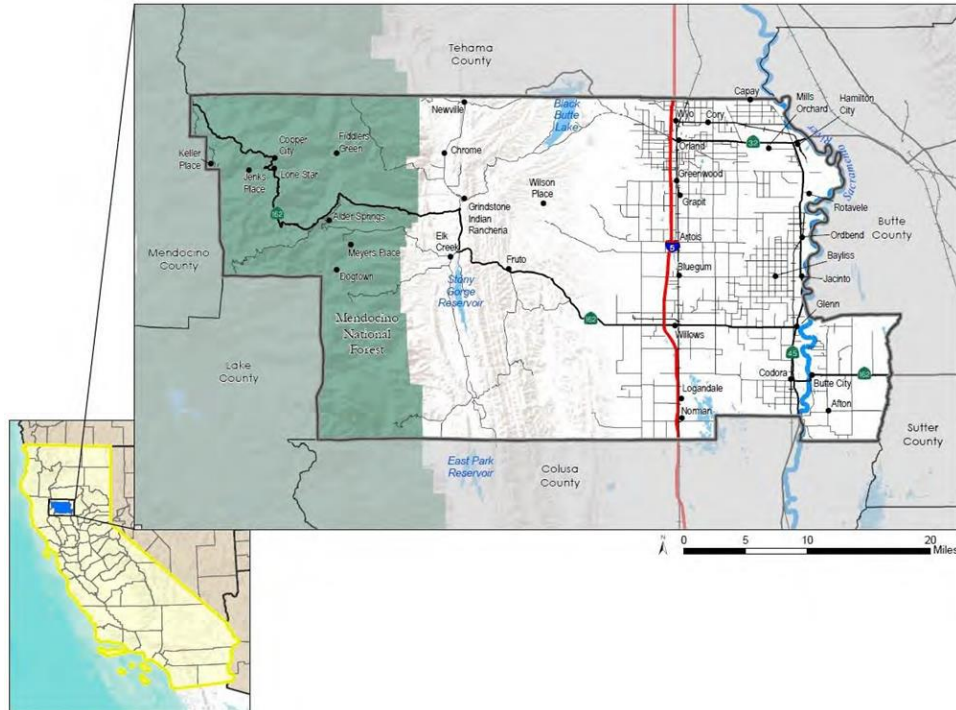
⁴ YouTube, "The History of Willows, (Glenn County) California !!!U.S."

https://www.google.com/search?q=development+of+Willows+california&rlz=1C1GCEU_enUS1080US1081&oq=development+of+Willows+california&gs_lcrp=EgZjaHJvbWUyYjBggAEEUYOTIHCAEQIRigAdIBCDcxNDFqMGo5qAIAAsAIA&sourceid=chrome&ie=UTF-8#fpstate=ive&ip=1&vld=cid:2e3b45c3,vid:KdyRqUWEQSQ,st:0

⁵ NICHE, "Willows." <https://www.niche.com/places-to-live/willows-glenn-ca/#:~:text=Willows%20is%20a%20town%20in,are%20a%20lot%20of%20parks>

⁶ Bestplaces, "Willows, CA." <https://www.bestplaces.net/city/california/willows>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents



Source: County of Glenn, "Glenn County, CA Multi-Jurisdiction Hazard Mitigation Plan."

<https://www.countyofglenn.net/sites/default/files/Planning/Glenn%20County%20MJHMP%20100918.pdf>

Figure 2: Location of Glenn County, California

Glenn County covers around 1,317 square miles and is serviced by four main thoroughfares: one interstate highway and three state routes. Interstate 5, which runs north and south through the valley region of the county, passes through the cities of Orland and Willows. Along the Sacramento River, the California State Route 45 runs north to south along the eastern side of the county. California State Route 162 runs from east to west, crossing through Willows, and California State Route 32 runs from east to west, traversing Orland and the unincorporated community of Hamilton City.

Besides the incorporated cities of Willows and Orland, Glenn County has various unincorporated communities, such as Hamilton City, Ord Bend, Artois, Elk Creek, Butte City, and Glenn, and other smaller settlements. Tehama County demarcates it to the north, Butte County to the east, Colusa County to the south, and Lake and Mendocino Counties to the west.

Topography

Glenn County has a diverse terrain. The western portion of the county, covered by the Mendocino National Forest, is typified by steep terrain, while the eastern portion has relatively flat terrain. This variation in topography is attributed to the county's geological provinces: the Sacramento Valley and the Coast Range. The Sacramento Valley dominates the eastern third of the county, while the Coast Range dominates the western two-thirds, significantly shaping the county's topography. An understanding of the geological provinces is crucial for assessing the topographical features of Glenn County.

The Sacramento Valley comprises nearly level terraces, smooth alluvial fans, narrow flood plains, and water-filled basins. Its elevation varies from approximately 100 feet above mean sea level (MSL) at the Sacramento River to about 300 feet above MSL at the western edge of the valley, which is situated west of Interstate 5. Near Butte City, a small part of southeastern Glenn County is located east of the

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Appendix C: Plan Review Documents

Sacramento River. This region is primarily an area of level floodplains and basins with little noticeable slope.

The Coast Range lies west of the Valley province and consists of two distinct regions: the rolling terrain of the Coast Range foothills and the mountainous Coast Range. The former gradually increases in elevation from the edge of the valley to approximately 2,000 feet. It encompasses smooth terrain, rolling to steep hills and narrow valleys with discernible areas of south-to-north drainage. Conversely, the latter rises to an elevation of almost 7,500 feet above MSL at Black Butte Mountain, with much of the region west of the foothills ranging above 6,000 feet and including part of the crest of the Coast Range. The Coast Range foothills and mountainous Coast Range represent a contrasting topography that offers a unique landscape for academic and business interests alike.

Climate

Climate influences the frequency and severity of natural hazards, resulting in extreme weather conditions, such as drought, flooding, landslides, severe weather, and wildfires. Glenn County experiences a Mediterranean climate, with hot and dry summers and moderate to cool and wet winters. On average, daily maximum temperatures range from the mid-fifties in January to the high nineties in July, while daily minimum temperatures range from the mid-thirties in January to the mid-sixties in July.

Nearly 90 percent of the county's annual rainfall occurs between November and April. It usually comes from frontal systems from the west. Snowfall in the valley is infrequent, and only trace amounts are possible. However, snowfall totals increase to the west, reaching four to eight inches on the lower slopes of the mountains. Normal annual precipitation across the county varies significantly, ranging from 15 inches in the southeast to as much as 50 or 60 inches at the highest elevations. On the valley floor, Willows receives about 17.7 inches of rainfall each year.⁷

The surrounding topography significantly influences the wind patterns in Glenn County. Ventilation is commonly inadequate because of calm winds and frequent temperature inversions. The combination of inversions, light winds, and constructive topography means that air is trapped horizontally and vertically during much of the year. Such occurrences can lead to poor air quality and may have implications for human health, particularly for those with respiratory ailments. Therefore, it is imperative that local authorities consider the implications of the prevailing wind patterns and topography when designing and implementing public health policies.

Climate Change

Glenn County is poised to face several pressing challenges in the years ahead because of climate change, including higher temperatures, droughts, wildfires, and extreme precipitation events. Average temperatures are projected to rise between 1°F and 2.3°F in California.⁸ Moreover, higher temperatures imply a shift in precipitation patterns, with more precipitation falling as rain rather than snow. This can lead to more frequent and extreme precipitation events, causing greater runoff and possible flooding. According to flood risk projections, 62 percent of all properties in Glenn County have a major risk of flooding over the next 30 years. This estimate is based on the level of risk that the properties confront, rather than the proportion of properties at risk.⁹

⁷ County of Glenn California, "Multi-Jurisdiction Hazard Mitigation Plan."

<https://www.countyofglenn.net/resources/plans/multi-jurisdiction-hazard-mitigation-plan>

⁸ Climate Change and Health Profile Report, Glenn County.

https://www.cdph.ca.gov/Programs/OHE/Glenn_County2-23-17.pdf

⁹ Risk Factor: https://riskfactor.com/county/glenn-county-ca/6021_fsid

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Housing stock may be threatened on both sides of the county by increased floods and wildfires, reducing the potential for growth. Glenn County's agricultural industry employs a significant number of farmworkers who are tasked with physically demanding activities, such as soil preparation, tree care, and planting. As temperatures continue to rise, these workers face an increased risk of heatstroke and other heat-related health concerns. These challenges could further increase water demand, especially from agriculture, exacerbating the sector's significant reliance on groundwater. This, in turn, could lead to a further decline in groundwater levels. Furthermore, rising temperatures also contribute to the proliferation of dry vegetation, which elevates the risk of wildfires that threaten the communities in and around Glenn County.¹⁰

Socioeconomic Factors

This section presents a comprehensive account of the population, economic, and housing factors in various areas of Glenn County. An in-depth understanding of these socioeconomic factors is crucial for evaluating the impacts that a natural disaster might have on the county's populace and economy. The population of the county, along with its economic and housing characteristics, plays a pivotal role in determining vulnerability to natural hazards. Therefore, describing these factors in detail is a necessary precondition for developing effective mitigation and preparedness strategies. Moreover, by analyzing the socioeconomic features of different areas of Glenn County, it is possible to identify disparities and vulnerabilities that might exacerbate the consequences of a natural disaster. This information can inform targeted measures that aim to reduce the risk of harm to the county's population, built environment, and economy in the event of a natural hazard occurrence.

Population

As per the 2022 U.S. Census data, Glenn County has 28,339 residents, a decline of 2.0% since 2020. Of this number, 8,217 individuals (or 30%) reside in Orland, which also has experienced a decline in population of 1.1% since 2020. Correspondingly, 6,116 people (22%) reside in Willows, a decline of 2.8% since 2020.¹¹ The data in Table 1 suggest that the population has reached its zenith and is in decline.

Table 1: Glenn County Population 2010–2022

Area	2010 Population	2020 Population	Percent Change (2010–2020)	Estimated Population 2022	Percent Change
Glenn County	28,122 (100%)	29,917 (100%)	6.4%	28,339	-2.0%
Unincorporated	14,609 (51.9%)	15,326 (51.2%)	4.9%	14,006	-8.6%
Orland	7,291 (25.9%)	8,298 (27.7%)	13.8%	8,217	-1.1%
Willows	6,166 (21.9%)	6,293 (21%)	2.06%	6,116	-2.8%

¹⁰ Union of Concerned Scientists, "Climate Change Impacts on California Central Valley: The Warning Shot the US is Ignoring." <https://blog.ucsusa.org/pablo-ortiz/climate-change-impacts-on-california-central-valley-the-warning-shot-the-us-is-ignoring/>

¹¹ United States Census, "Quick Facts Willows City, California; Orland City, California; Glenn County, California." <https://www.census.gov/quickfacts/fact/table/orlandcitycalifornia,glenncountycalifornia/BZA010221>

Housing

A household is defined as a person or a group that resides in a housing unit. As of July 2022, Glenn County had 10,966 households, with 60.9% being under the ownership of occupants in 2021. From 2017 through 2021, the average household size in the county was 2.91 individuals.¹² Among the residents of Glenn County, 71% dwell in single-unit homes, while 17% reside in multi-unit homes. The remaining 12% of the population live in mobile homes.¹³

Most residents of Glenn County live in single-family housing or mobile homes. Mobile homes are more widespread in unincorporated areas. Most single-family detached structures are in the two incorporated cities of Orland and Willows and in the unincorporated communities of Artois, Butte City, Elk Creek, Glenn, and Hamilton City. As one moves away from these community centers, housing becomes secondary to the primary land use of commercial agriculture. According to the California Department of Finance's housing estimates for cities and counties, Glenn County (unincorporated) and Willows experienced a decrease in overall housing units, while Orland experienced a small increase (1.57%)¹⁴. Table 2 shows the projected change in housing units between 2018 and 2023.

Table 2: Changes in Housing Units, 2018–2023

Jurisdiction	Number in 2018	Number in 2023	Percent Change
Glenn County (unincorporated)	5,774	5,542	-4.02%
Orland	2,937	2,983	1.57%
Willows	2,459	2,518	-2.34%

Table 3 shows the Department of Finance's estimates of changes in the types of housing units since the last plan update. Overall, the biggest change was in the number of single detached homes, which decreased from an estimated 7,956 to 7,820.

Table 3: Housing Units by Type in Glenn County, 2018 and 2023

Year	Single Detached	Single Attached	Two to Four Units	Five or More Units	Mobile Homes	Total
2018	7,956	213	822	767	1,412	11,170
2023	7,820	215	792	801	1,415	11,043

Economic Background and Trends

Glenn County's economy is predominantly fueled by the agricultural sector (including farmers, ranchers, and value-added agricultural producers), which boasts over 1,188 farms. Preserving the agricultural prosperity of the county while developing urban areas are important goals of the plan participants. The subsequent major contributors to the region's economy are state and local governments and healthcare.

¹² Ibid.

¹³ Census Reporter, "Glenn County, CA." <https://censusreporter.org/profiles/05000US06021-glenn-county-ca/>

¹⁴ State of California, Department of Finance, E-1 Population Estimates for Cities, Counties and the State with Annual Percent Change — January 1, 2022 and 2023. Sacramento, California, May 2023. <https://dof.ca.gov/forecasting/demographics/estimates-e1/>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

The county's most significant manufacturers include Johns Manville, Sierra Nevada Cheese, and Omega Walnuts, employing over 200 workers each. Healthcare employment will expand to 900 jobs over the next five years, creating new employment opportunities. While transportation and warehousing demonstrated minimal growth from 2016 to 2021, the anticipated addition of an Amazon distribution center in 2022 was expected to create 400 new jobs. During the 2022–2027 forecast period, Glenn County's overall employment is predicted to rise by approximately 700–800 jobs.¹⁵

Economic development is a critical metric of the progress of businesses assisted, job creation, and capital investment annually. In recent years, the Cities and County Economic Development Committee has made significant strides toward improving economic development through collaborative efforts. Given limited resources—financial and staff—the main objective for the Glenn County region is to leverage existing resources, partners, programs, and expertise to focus on opportunities and address the needs and issues of the existing business sectors and emerging market opportunities.

Land Use and Development Trends

This section elucidates the current land use and development trends in Glenn County. This information will help guide and coordinate future mitigation activities and decisions related to local land use policy. It is noteworthy that Glenn County revised its General Plan (GP) in July 2023, which classifies land uses in the unincorporated areas of the county.

The General Agriculture designation identifies areas where upholding agriculture as the primary land use is deemed desirable. This designation intends to preserve lands intended for agricultural use, both currently and in the future, and to safeguard them from the pressures of development. The aim is to perpetuate the viability of such lands for agricultural purposes while ensuring that they are not lost to development.

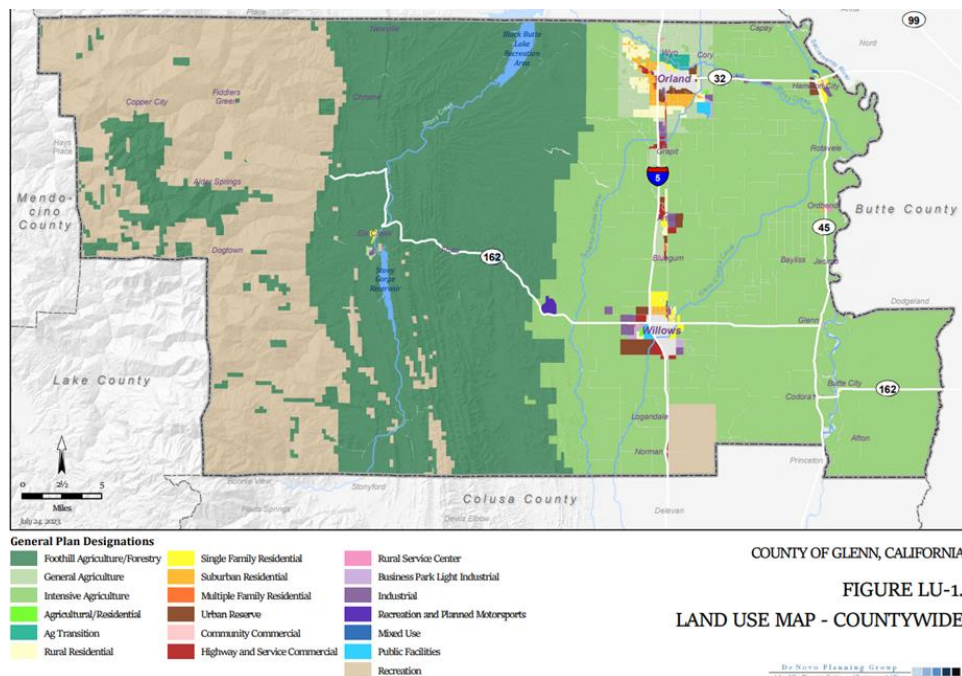
The Intensive Agriculture (IA) designation, which primarily serves the eastern part of Glenn County, identifies areas that are suitable for commercial agriculture and contribute significantly to the county's economic base. Its primary objective is to protect the agricultural community from the encroachment of unrelated agricultural uses that could harm the physical and economic well-being of the community. This designation also signifies lands that are under Williamson Act contracts, and the aim is to preserve both currently and potentially productive agricultural lands that contain state-designated important farmlands or locally significant farmlands.

The Foothill Agriculture/Forestry (FA) designation, most of the land in the western two-thirds of the county, aims to conserve the foothill areas of the county by enabling intensive and extensive agricultural uses, safeguarding grazing lands, preserving timber and forest lands that are economically suitable for logging, and promoting forest land use for multiple purposes, such as preserving wildlife, hunting, hiking, and other compatible activities. This designation is crucial to preserving the foothill regions and ensuring that they remain economically viable while being used for various purposes.

The regions surrounding Orland and Willows are more residential than the rest of Glenn County. These areas mainly feature rural, single-family, suburban residential, and public facilities. A few small sections of land are marked for industrial use near the cities. The City of Orland's General Plan 2008–2028 indicates that the Walker Street corridor (California State Route 32) and the region between Interstate 5 and the railroad tracks are primarily designated for commercial and high-density residential land uses. The eastern region along the Walker Street corridor accommodates mixed purposes. However, Orland predominantly consists of low-density residential uses. Figure 3 illustrates the land use designations and patterns in Glenn County.

¹⁵ Dot.ca, "Glenn County Economic Forecast." <https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/data-analytics-services/transportation-economics/socioeconomic-forecasts/2022/glenn-2022-a11y.pdf>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents



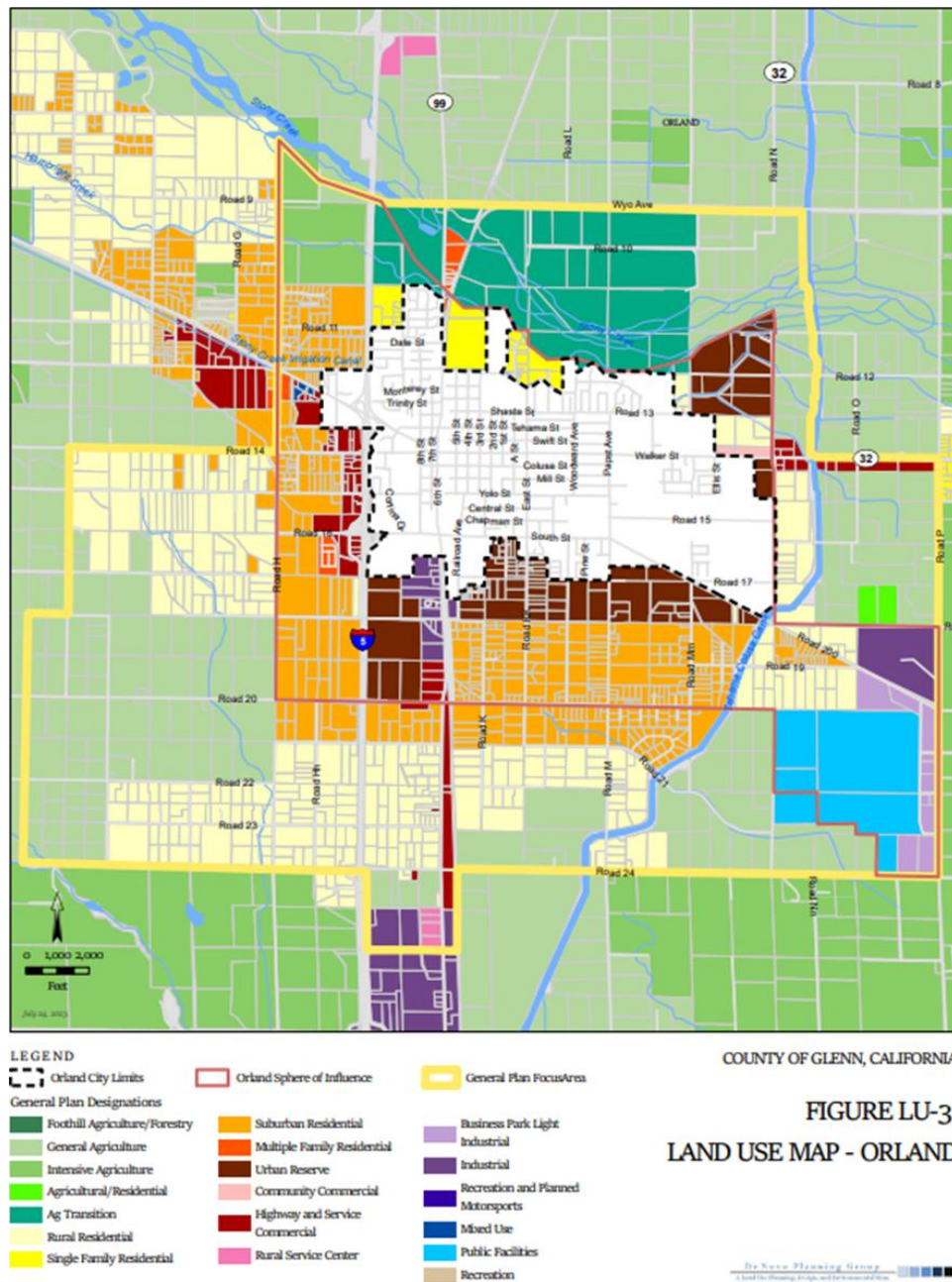
Source: Static 1, "Glenn County General Plan Update."

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Figure 3: Glenn County Land Use Map

In the City of Willows General Plan July 2023, commercial uses are mainly concentrated near Interstate 5 and Wood Street (California State Route 162). Most of the commercial uses in the city are situated along the Tehama Street corridor, while most public facilities and services are located along the Wood Street corridor. The City of Willows is primarily composed of low-density residential uses. Figure 4 shows the land use designations and patterns in Willows, and Figure 5 shows the land use designations and patterns in Orland.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

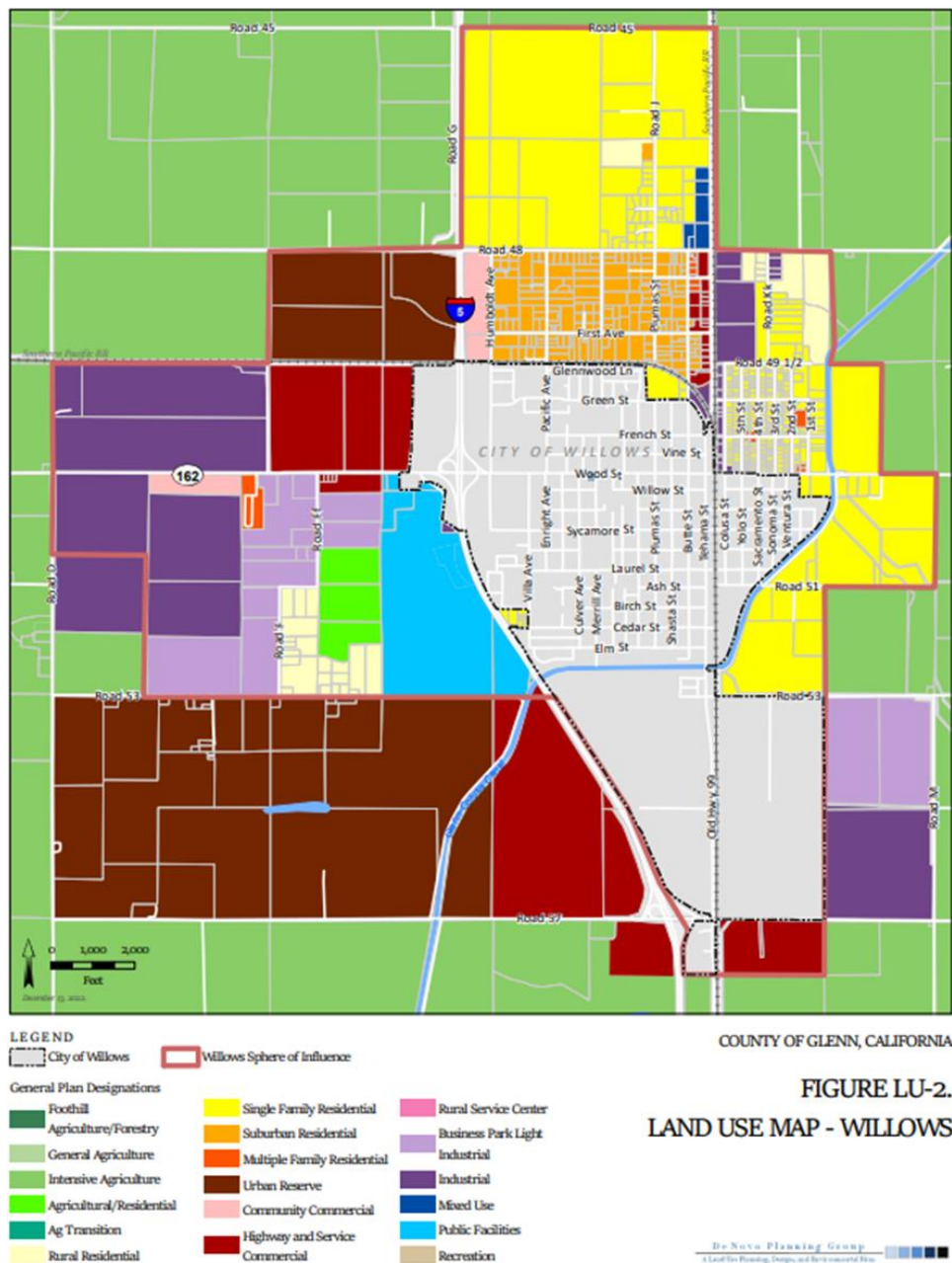


Source: Static 1, "Glenn County General Plan Update."

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Figure 4: Orland Land Use Map

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents



Source: Static 1, “Glenn County General Plan Update.”

https://static1.squarespace.com/static/5c8a73469b7d1510bee16785/t/6501ddc090fa5b221162db04/1694621148151/GlennCounty_General+Plan+Adopted+7-18-23.pdf

Figure 5: Willows Land Use Map

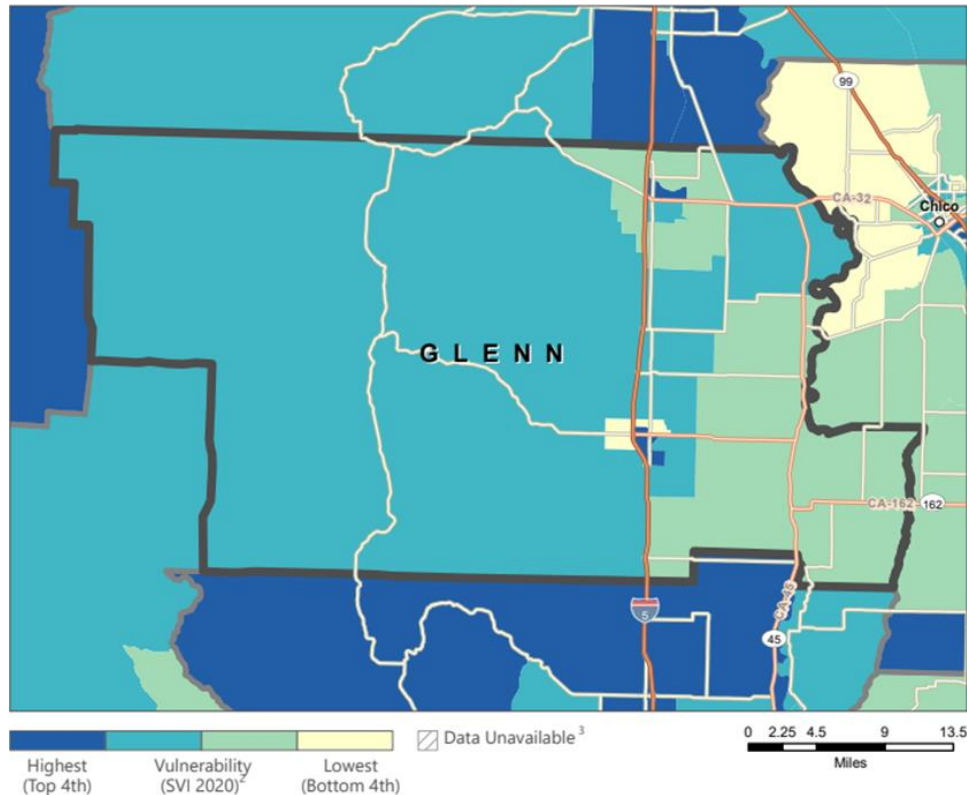
Social Vulnerability

Social vulnerability refers to the potential loss in an individual or social group that is influenced by the individual's or group's ability to prepare, respond, cope, or recover from an event. It is acknowledged that the most vulnerable people often experience the greatest losses to disasters. Vulnerability to certain disasters can be compounded by social vulnerability, such as historic infrastructure deficiencies and individual characteristics. In general, vulnerable populations include the elderly, youth, populations with disabilities, populations with limited English proficiency, people with low socioeconomic status, and

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

individuals experiencing homelessness. Considering social vulnerability helps identify who is at risk of the hazards facing Glenn County and the cities of Willows and Orland. Three different measures for considering social vulnerability were evaluated as part of this plan update: the Social Vulnerability Index, the National Risk Index, and the Climate and Economic Justice Screening Tool.

The CDC/ATSDR Social Vulnerability Index (CDC/ATSDR SVI 2020) 4 County Map illustrates the social vulnerability of communities at the census tract level. It groups 16 census-derived factors into four themes that summarize the extent to which the area is socially vulnerable to disaster. These factors include economic data, education, family characteristics, housing, language ability, ethnicity, and vehicle access. Overall, social vulnerability integrates all these variables to provide a comprehensive assessment. As shown in Figure 6, Glenn County's vulnerability to risk is medium to medium-low.



Source: SVI.CDC, "CDC/ATSDR Social Vulnerability Index 2020."
https://www.atsdr.cdc.gov/placeandhealth/svi/interactive_map.html

Figure 6: Glenn County Social Vulnerability Map

The Climate and Economic Justice Screening Tool¹⁶ (CEJST) helps identify overburdened and underserved census tracts that are considered disadvantaged. To be considered disadvantaged, the tract must meet one or more of the categories of burden and the associated threshold for socioeconomic burden. Tracts that meet the definition of disadvantaged are around Orland, Willows, and Hamilton City in unincorporated Glenn County. Their risks and related percentiles are shown in Table 4. Because of their identified vulnerability, these areas may be eligible for additional federal funding for mitigation.

¹⁶ Screeningtool. geoplatform, "Climate and Economic Justice Screening Tool."
<https://screeningtool.geoplatform.gov/en/#12.35/39.74795/-122.18531>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Table 4: Results from the Client and Economic Justice Screening Tool

Category of Burden	Vulnerability Risk	Orland Percentile	Willows Percentile	Unincorporated Areas Percentile
Climate Change	Expected Agricultural Loss	99th	99th	99th
	Projected Flood Risk	97th	90th	93rd
	Projected Wildfire Risk	92nd		
Energy	PM2.5 in the air	93rd	92nd	95th
Housing	Lack of Green Space			96th
Water and Wastewater	Wastewater Discharge		98th	
Workforce Development	Linguistic Isolation			93rd
	Education Less Than High School	28%	21%	38%
Socioeconomic	Low Income	81st	84th	75th

The National Risk Index (NRI) is an online tool developed by FEMA which helps compare the United States communities most at risk for 18 natural hazards, including many that are profiled in this plan. The NRI calculates a risk index score using the following equation:

<p>Risk Index</p> <p>Expected Annual Loss × Social Vulnerability ÷ Community Resilience = Risk Index</p>

Overall, the Risk Index rating for Glenn County shown in Figure 7 is “Relatively Moderate,” with a higher risk than 95% of the country. The Expected Annual Loss is relatively high—higher than 94% of the country—while Social Vulnerability is “Very High”—higher than 89% of the county—and Community Resilience is “Relatively Low”—lower than 77% of the country.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

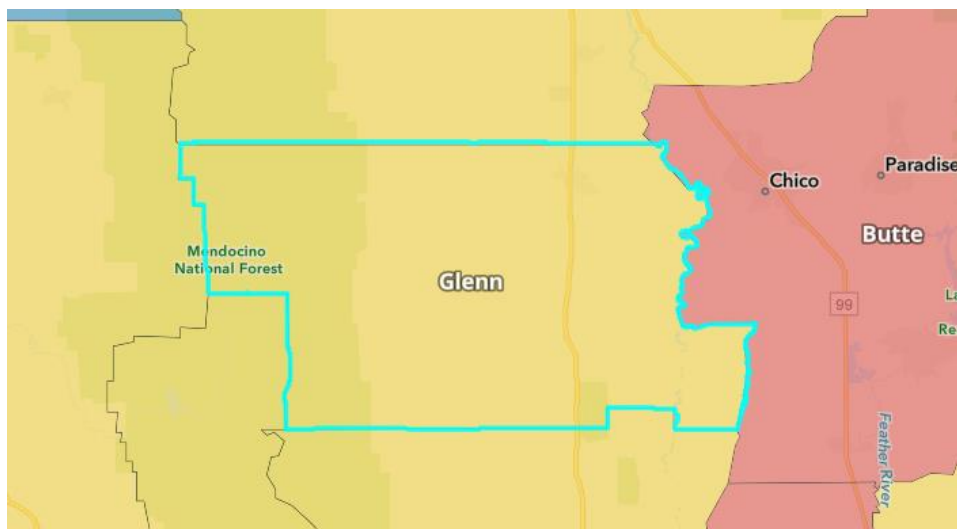


Figure 7: The Risk Index Rating for Glenn County

In addition to these national indices, the participating jurisdictions and stakeholders identified Hamilton City as a major area of concern. Besides the areas vulnerable to multiple hazards identified in this plan, it is home to a large Spanish-speaking population. Engaging the public is a known challenge in this area, and it was identified as a priority during the public outreach portion of this plan update.

Glenn County used Esri's Business Analyst tool to gain additional insight into the demographic profile of the county and the cities of Orland and Willows. This tool summarizes variables from the 2020 census and provides infographics that help with interpreting these characteristics. The At-Risk Population Report from this tool included details on vulnerable populations, such as households with a person with disabilities, households below the poverty level, households with individuals who do not speak English, people over 65, and households without a vehicle. A portion of the At-Risk Population Report is shown in Figure 8. These reports will provide additional insight into the potential impacts of hazards on vulnerable populations.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

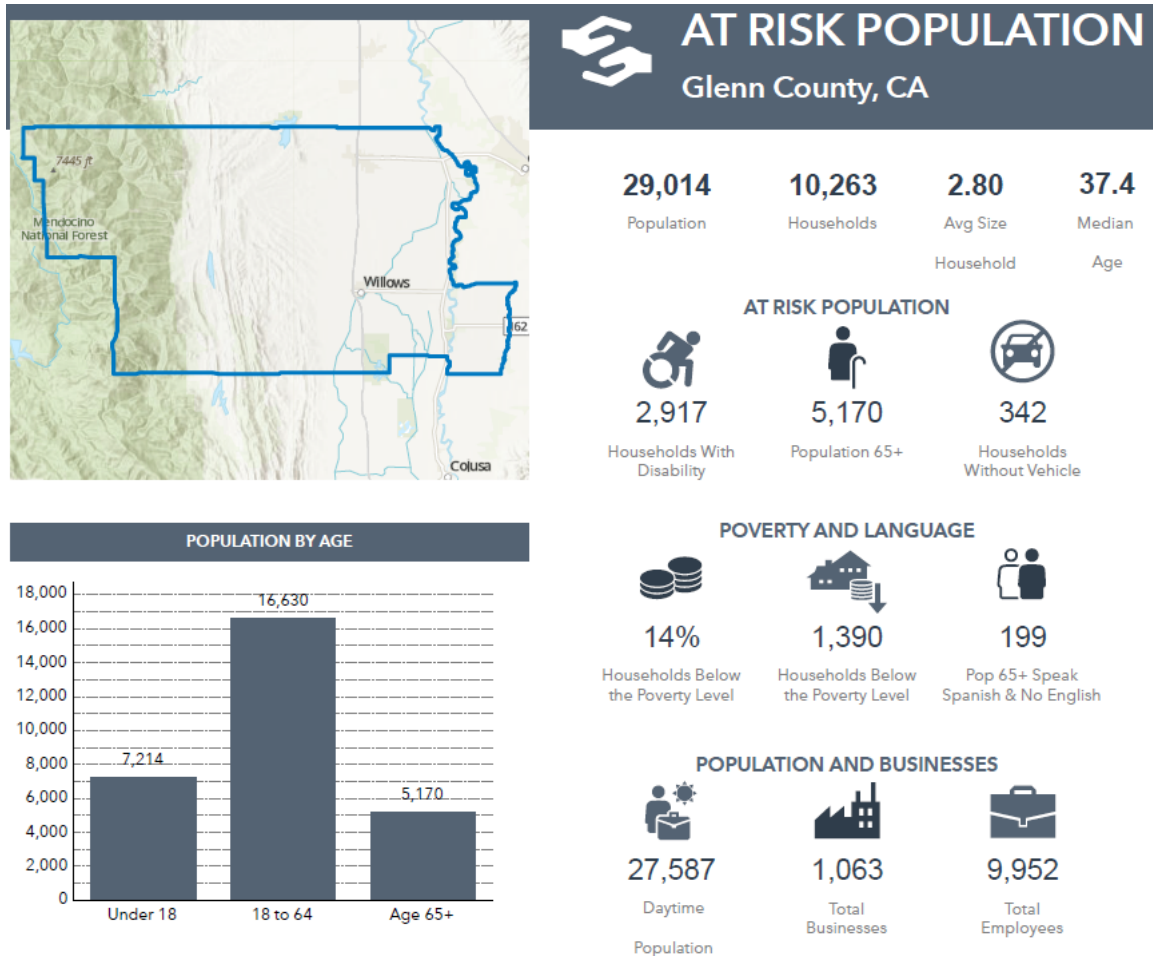


Figure 8: At-Risk Population of Glenn County

Section 2. The Planning Process

Hazard mitigation plans serve as the foundation for developing an effective mitigation program. A robust whole-community planning process is important for gathering vital stakeholder input and building partnerships to implement mitigation actions. An inclusive planning process ensures that local jurisdictions and county-wide participants are involved in the process and have the opportunity to provide meaningful input. By soliciting information from a broad range of stakeholders, the plan update meets the minimum requirements outlined by FEMA in the [Local Mitigation Planning Policy Guide](#) and reflects the unique risks, vulnerabilities, goals, and strategies of the plan participants.

This section describes each stage of the planning process used to develop the 2025 Glenn County MJHMP. This planning process provided a framework for document development. The planning process included organizing resources, assessing risk, developing the mitigation plan, drafting the plan, reviewing and revising the plan, and adopting and submitting the plan for approval.

Planning Process

Hazard mitigation planning in the United States is guided by the statutory regulations described in DMA 2000 and implemented through 44 Code of Federal Regulations (CFR) Part 201 and 206. FEMA's guidelines outline a four-step planning process for developing and approving hazard mitigation plans.

To develop the MJHMP, a planning process was created based on the various federal guidance documents and regulations, including FEMA's [Local Mitigation Planning Handbook](#). Figure 9 shows that the MJHMP planning process includes four core components: organizing resources, assessing risk, developing the mitigation action strategy, and adopting and implementing the plan.



Figure 9: Multi-Jurisdiction Hazard Mitigation Planning Process

Planning Team and Stakeholder Engagement

The 2025 Glenn County MJHMP update was developed with support from many agencies, organizations, and individuals. Cal FIRE's Wildfire Prevention Grants Program provided funding for this plan update.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

Glenn County hired Innovative Emergency Management, Inc. (IEM) to update the 2018 plan. IEM provided technical and outreach assistance throughout the planning process, including updating the base plan, facilitating meetings, and developing and incorporating forms to garner stakeholder input. Glenn County was joined by the Cities of Willows and Orland. Other tribal and special district stakeholders were offered the opportunity to participate, but they decided not to fully join the plan update at this time but to develop their own annexes and corresponding mitigation actions.

A crucial priority of this plan update was submitting the plan for FEMA approval as soon as possible, since the five-year approval period of the previous plan had expired prior to the start of this plan update. Another priority was updating the plan to meet the mitigation planning requirements outlined in FEMA's [Local Mitigation Planning Policy Guide](#), including an increased emphasis on stakeholder engagement, evaluating the impacts and potential mitigation measures for community lifelines, addressing climate change, and expanding mitigation actions to address all hazards profiled in the plan. In particular, the County wanted to further analyze the hazards of Drought and Wildfire given recent disaster events.

One of the first steps of the planning process was to identify and invite key agencies and stakeholders to participate in the plan update. Per the Local Mitigation Planning Policy Guide, stakeholders were categorized in the following ways:

1. Local and regional agencies involved in hazard mitigation activities.
Examples include public works, emergency management, local floodplain administration, and Geographic Information Systems (GIS) departments.
2. Agencies that have the authority to regulate development.
Examples include zoning, planning, community, and economic development departments, building officials, planning commissions, or other elected officials.
3. Neighboring communities.
Examples include adjacent local governments, including special districts, such as those affected by similar hazard events or may share a mitigation action or project that crosses boundaries. Neighboring communities may be partners in hazard mitigation and response activities or where critical assets, such as dams, are located.
4. Representatives of businesses, academia, and other private organizations.
Examples include private utilities or major employers that sustain community lifelines.
5. Representatives of nonprofit organizations, including community-based organizations, which work directly with and/or support underserved communities and socially vulnerable populations, among others.
Examples include housing, healthcare, and social service agencies.¹⁷

Another factor that was considered while developing the list of participants to engage in this plan update was community lifelines. Community lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function¹⁸. A thorough understanding of lifelines allows decision-makers to identify key priorities, understand the root causes of the issues, and implement effective measures to reduce risk and respond to a catastrophic incident.

For this plan update, each jurisdiction was asked to identify internal and external stakeholders who could support the plan update. The IEM team also helped identify a list of stakeholders, including those representing underserved and vulnerable populations. These stakeholders were provided multiple opportunities to participate through meetings, a dedicated stakeholder digital survey, phone calls, and reviewing the draft plan. Finally, IEM conducted meetings directly with the participating jurisdictions to

¹⁷ FEMA, "Local Mitigation Planning Policy Guide." https://www.fema.gov/sites/default/files/documents/fema_local-mitigation-planning-policy-guide_042022.pdf

¹⁸ FEMA, Community Lifelines Implementation Toolkit Version 2.0, <https://www.fema.gov/sites/default/files/2020-05/CommunityLifelinesToolkit2.0v2.pdf>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

ensure that all information to include in the plan was identified. A list of stakeholders provided the opportunity to participate is included in Table 5. The stakeholder types have been adapted to preserve space and/or improve clarity.

Table 5: Stakeholders Given the Opportunity to Participate

Jurisdiction/Agency/ Organization	Type of Stakeholder	Description
US Army Corps of Engineers (USACE) – Sacramento District	Local/regional agency	Multifaceted: Responsible for regulation, management, and engineering of projects of waterways/ lakes/streams/rivers
4-E Water District	Neighboring community	One of the many special water districts in Glenn County's water enterprise system
Action News Now	Business	A news brand shared by KHSL, KNVN, the CW, and Telemundo in Chico–Redding. Provides live, local news, weather coverage, and programming from major networks
Amateur Radio Emergency Service (ARES)	Community-based organization (CBO)	A community of amateur radio enthusiasts living in Glenn County, who volunteer their time and services for emergencies and disaster response
American Red Cross	Nonprofit organization	Coordinates with federal, state, and local agencies to provide disaster assistance services
Ampla Health Care	CBO	Offers a wide range of health care services to all people regardless of their ability to pay. Serves Butte, Colusa, Glenn, Sutter, Tehama, and Yuba Counties
Appeal Democrat	Business	News organization
Artois Fire District	Neighboring community	Provides fire protection and emergency response services
Bob's Plumbing	Business	Plumbing and construction company, Willows
Brickyard Gym	Business	Family-friendly, locally owned gym that provides a fun, safe, and welcoming atmosphere for people of all ages to work toward their health and fitness goals
Bureau of Land Management (BLM), Ukiah Field Office	Local/regional agency	Responsible for all BLM-managed public lands in Colusa, Glenn, Lake, Napa, Marin, Solano, Sonoma, and Yolo Counties and Mendocino (south of the City of Willits)
Butte City Community Services District	Neighboring community	Provides water services
Butte County	Neighboring community	Borders Glenn County to the East
Butte County Mosquito & Vector Abatement District (Hamilton City)	Neighboring community Special District	Main function is to control the threat of mosquito/vector-borne diseases in Butte County and Hamilton City

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Jurisdiction/Agency/ Organization	Type of Stakeholder	Description
Butte County Public Health Department	Local/regional agency	Runs over 50 programs serving children, mothers, families, adults, small businesses, animals, and the environment and provides informational brochures for the clinics in 3 languages
Butte Creek Drainage District (District 100 of Butte County)	Neighboring community	Provides irrigation and stormwater drainage services to the fledgling rice industry
Butte–Glenn Community College District	Academic organization	Provides quality education, services, and workforce training
Cal Water-Willows	Local/regional agency	Provides water utility/customer care services
California Department of Conservation (DOC) Division of Land Protection	Local/regional agency	Administers and supports several programs to promote orderly growth in coordination with agricultural endeavors
DOC Division of Oil, Gas, and Geothermal Resources – now known as the Geologic Energy Management Division (CalGEM)	Local/regional agency	Oversees the drilling, operation, maintenance, and plugging and abandonment of oil, natural gas, and geothermal energy wells
California Department of Fish and Wildlife – North Central Region	Local/regional agency	Responsible for fish & wildlife management for Alpine, Amador, Butte, Calaveras, Colusa, El Dorado, Glenn, Lake, Nevada, Placer, Plumas, Sierra, Sutter, and Yuba counties; Sacramento and San Joaquin Counties (east of I-5); and Yolo County (north of I-80)
California Dept. of Forestry and Fire Protection (Cal FIRE – Tehama-Glenn Unit)	Local/regional agency	Focuses on integrating fire protection, natural resource management, and fire prevention under a single mission on behalf of the state and local communities Provides cost-effective planning, prevention, support, and emergency services
California Governor's Office of Emergency Services (Cal OES)	State agency	Responsible for mitigating the effects of disasters and for protecting Californians' lives and property
Cal OES Mitigation Planning	Local/regional agency	Responsible for maintaining, implementing, and updating California's State Hazard Mitigation Plan and supporting and reviewing Local Hazard Mitigation Plans
California Highway Patrol (CHP) – Willows	Local/regional agency	Offers several services to support educating and protecting the community
California Northern Railroad (CFNR)	Local/regional agency	Mainly responsible for transporting agricultural commodities
California State Parks	Neighboring community	Oversees state parks and provides equitable access to the outdoors

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Jurisdiction/Agency/ Organization	Type of Stakeholder	Description
California Tribal Temporary Assistance for Needy Families (TANF)	Neighboring community	Focuses on assisting the Indian tribes of California by providing the funding, tools, and resources necessary for each tribe or consortium to administer its own tribal TANF program
CalRecycle	Local/regional agency	Responsible for the reduction, reuse, and recycling of California resources, environmental education, and disaster recovery
Caltrans	Local Regional Agency	Manages California's highway and freeway lanes and provides inter-city rail services
Capay Fire Protection District	Local/regional agency	Provides fire protection and Basic Life Support (BLS) pre-hospital emergency medical services (EMS) to a rural service area in Yolo County
Central Valley Flood Protection Board (regulatory agency)	Local/regional agency	Issues encroachment permits and works with other agencies to improve flood protection structures.
Central Valley Regional Water Quality Control Board	Local/regional agency	Responsible for preserving and restoring the quality of the Central Valley's water resources
Coffman's Landscaping	Business	Reliable landscape construction company in Chico, creating "Happy Places" for customers through koi ponds, waterfalls, custom landscapes, and outdoor living spaces
Colusa Basin Drainage District	Neighboring community	Special District to address flooding and winter drainage in the basin
Colusa County	Neighboring community	Borders Glenn County to the south
Colusa Indian Community Council Cachil Dehe Band of Wintun Indians	Neighboring community	A federally recognized sovereign nation
Department of Social Services	Local/regional agency	Provides information, resources, and emergency assistance to people of all ages including vulnerable populations.
Department of Housing and Urban Development (HUD) – San Francisco Regional Office	Federal agency	Provides community planning and development services
Division of Drinking Water	Local/regional agency	Regulates public drinking water systems
Dream Catcher Ranch	Business	Produce market and events center, Hamilton City
Elk Creek Fire Protection District	Neighboring community	Provides fire protection services
Enloe Medical Center (now Enloe Health)	CBO	Provides a wide range of specialized healthcare
Enloe Medical Center, EMS	CBO	Provides 24-hour ambulance & emergency services to Glenn and Colusa Counties

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Jurisdiction/Agency/ Organization	Type of Stakeholder	Description
Far Northern Regional Center	CBO	Works with healthcare agencies, providers, and residential care facilities to provide various healthcare services
First Care Medical (Colusa Medical Center)	CBO	Offers a wide range of services, including adult medical and surgical care, emergency medicine, long-term skilled nursing care, laboratory services, imaging and radiographic services, physical rehabilitation, home health, and palliative care
Garden Gleanings	Business	Small nursery specializing in David Austin roses, cottage garden perennials, heirloom tomatoes, and ready-made container and fairy gardens
Glenn Amateur Radio Society (GARS)	Nonprofit organization	A society of amateur radio enthusiasts who help broadcast information during an emergency or disaster
Glenn County Business Association	Business organization	Focuses on helping create economic & business development and retention for Glenn County
Glenn County Community Action Administrative Services (under Glenn County Health & Human Services Agency (HHSA))	Local/regional agency	Manages various grant-funded programs, including emergency services, housing services, income, and employment. Also offers community services and development for low-income seniors, youth, and families. Lead Agency for the Colusa–Glenn–Trinity Community Action Partnership.
Glenn County District 3	Local/regional agency	One of 5 districts in Glenn County
Glenn County District Attorney's Office	Local/regional agency	Focuses on prosecuting criminal violations of law with integrity and support and protect the rights of victims of crime in Glenn County
Glenn County Farm Bureau	Nonprofit organization	Promotes and protects agricultural interests in California and finds solutions to problems the rural community faces
Glenn County Fire Chiefs Association	Nonprofit organization Local/regional agency	Supports local community efforts and provides educational scholarships to support careers in emergency services
Glenn County HHSA	Local/regional agency	Provides services in the four major divisions of healthcare: social, behavioral health, public health, and community action including to vulnerable populations.
Glenn County Levee District #1	Neighboring community	Responsible for land reclamation and levee maintenance
Glenn County Levee District #2	Neighboring community	Responsible for land reclamation and levee maintenance
Glenn County Mosquito and Vector Control District – Willows	Neighboring community	Main function is to control the threat of mosquito/vector-borne diseases in Glenn County

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Jurisdiction/Agency/ Organization	Type of Stakeholder	Description
Glenn County Office of Education (GCOE)	Academic organization	Located in Willows, has various educational & community programs for all ages & levels, including those with exceptional needs Conducts adult education, senior nutrition, and substance abuse prevention programs
Glenn County Personnel Department	Local/regional agency	Glenn County Human Resources
Glenn County Resource Conservation District (RCD)	Local/regional agency	Coordinates with local, state, and federal agencies, focuses on soil health and conservation of resources, develops & implements educational programs in the community
Glenn County RCD – Tehama–Glenn Fire Safe Council	Local/regional agency	Helps the community manage natural resources and manages fire safety procedures
Glenn County Sheriff's Department	Local/regional agency	Responsible for law enforcement services and emergency response in the unincorporated areas of the county and in the City of Willows
Glenn Golf & Country Club	Business	Open to the public Tuesday through Sunday; offers a variety of services
Glenn Medical Center	CBO	Serves the Communities of Willows, Elk Creek, Maxwell, Orland, Princeton, and Stonyford with 24/7 emergency care and other medical services
Glenn–Colusa Fire Protection District	Local/regional agency	Provides fire protection and emergency response services
Glenn–Colusa Irrigation District	Neighboring community	Provides reliable, affordable water supplies to its landowners and water users Implementing a regional water management plan
Grindstone Indian Rancheria	Neighboring community	Reservation/tribal headquarters of the Wintun–Wailaki Indians of California
Hamilton City Community Services District	Neighboring community	Provides government services for Hamilton City
Hamilton City Fire Protection District	Neighboring community	Provides fire protection and emergency services to residents and businesses Funding sources may vary, and the size and scope of a fire district depend on the area it serves.
Hamilton Unified School District	Neighboring community	Provides educational services for diverse ages: pre-school, high school, adult ed, alternative ed
Helping Hands United 2020	Business	In Hamilton City, provides the community with products, resources, and materials to grow, build, and rebuild together
Home Health Care Management Inc.	Business	Specializes in comprehensive care & case management for older adults, children, and those living with disabilities in Northern California

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Jurisdiction/Agency/ Organization	Type of Stakeholder	Description
Kanawha Fire Protection District	Neighboring community	Provides fire protection and emergency response services
Kanawha Water District	Neighboring community	Provides project water service from the Sacramento River Division
Lake County Sheriff OES	Local/regional agency	Lead agency for local emergency management for the County of Lake
Local Agency Formation Commission (LAFCO)	Local/regional agency	Independent regulatory body that oversees changes to the boundaries of cities and special districts.
Mechoopda Indian Tribe of Chico Rancheria	Neighboring community	A federally recognized sovereign nation
Mendocino County	Neighboring community	Borders Glenn County to the west
Mendocino National Forest	Local/regional agency	Provides fire management, emergency response, public information, and fire education
Mendocino National Forest/ Grindstone Ranger District U.S. Department of Agriculture (USDA) – Forest Service	Local/regional agency	Responsible for fire and resource management in this area
Natural Resources Conservation Service, (USDA)	Federal local/regional agency	Addresses natural resource conservation on private lands
NE Willows Community School District (CSD)	Local/regional agency	Oversees municipal services in the community
Northern Valley Indian Health	CBO	Provides healthcare services to Native Americans and all community members
Ord Fire Protection District	Local/regional agency	Provides fire protection services
Orland Area Chamber of Commerce	Business organization	Provides a platform to unite businesses and individuals to improve the economy and build a better community
Orland Fire Department	Local/regional agency	Volunteer department that works in partnership with the Orland Rural Fire Protection District to provide emergency fire services
Orland Free Library	Local/regional agency	Allows people to borrow books and other resources for free
Orland Grange	Nonprofit organization	In Orland; promotes and supports activities which benefit the local community
Orland Police Department	Local/regional agency	Provides policing and emergency services
Orland Rural Fire Protection District	Local/regional agency	Provides fire protection and emergency response services
Orland Unit Water Users' Association (OUWUA)	Neighboring community	Assumed responsibility for the care, operation, and maintenance of the Orland Project in 1954

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Jurisdiction/Agency/ Organization	Type of Stakeholder	Description
Orland–Artois Water District	Neighboring community	Provides surface water deliveries to almost 29,000 acres in Glenn County
Pacific Gas and Electric (PG&E)	Business	Provides natural gas and electric service to residential and business
Para Transit	Nonprofit organization	Volunteer medical transport program designed to meet the needs of the elderly, those with permanent disability, or low-income residents in Glenn County who cannot provide for their transportation to and from medical appointments outside the fixed-route bus system and subsidized taxi service areas
Paskenta Band of Nomlaki Indians	Neighboring community	A federally recognized sovereign nation
Princeton–Codora–Glenn Irrigation District	Neighboring community	Oversees water supply & distribution for irrigation of agricultural land and wetlands
Provident Irrigation District	Neighboring community	Oversees water supply/diversion for some of the irrigable land in Glenn and Colusa Counties
Reclamation District #2047 Part of the Association of California Water Agencies (ACWA)	Neighboring community	To provide management of safe drinking water and other water resources under sustainable practices
Reclamation District #2106	Neighboring community	Currently working with neighboring districts in the Butte Sub Basin to create structures that comply with sustainable groundwater management
Reclamation District #2140	Neighboring community	Located in Hamilton City, owns and maintains levee construction projects
Roots Catering	Business	Catering company dedicated to providing the freshest food and finest service
Sacramento National Wildfire Refuge (NWR)	Local/regional agency	Offers recreation, hiking opportunities, and wildlife viewing
Salty Hereford	Business	Western home décor that uses leather and hides to create unique and beautiful pieces
Sierra–Sacramento Valley Emergency Medical Services (S-SV EMS)	CBO	The designated local EMS agency (LEMSA) for Butte, Colusa, Glenn, Nevada, Placer, Shasta, Siskiyou, Sutter, Tehama, & Yuba Counties Provides EMT education and training
S-SV EMS Region 3	CBO	EMS agency for Butte, Colusa, Glenn, Nevada, Placer, Shasta, Siskiyou, Sutter, Tehama, & Yuba Counties
St. Monica Parish	Nonprofit organization	Catholic Parish, Willows
Stony Creek Water District	Neighboring community	Water district serving the western portion of the county
Tehama County	Neighboring community	Borders Glenn County to the north

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Jurisdiction/Agency/ Organization	Type of Stakeholder	Description
Tehama-Colusa Canal Authority (TCCA)	Local/regional agency	A Joint Powers Authority comprising 17 Central Valley Project water contractors. The service area spans Tehama, Glenn, Colusa, and Yolo Counties along the west side of the Sacramento Valley
Thunder Hill Raceway Park	Business	Motorsports complex that hosts the longest car race in the US, the 25 Hours of Thunderhill
Tri Counties Community Action Partnership	CBO representative.	Partners with communities to promote wellness and prosperity through education and advocacy and provides support to underserved & socially vulnerable people
University of California Cooperative Extension – Glenn County	Academic organization	Provides education, outreach, and research activities to the county
US Bureau of Reclamation (California Great Basin)	Local/regional agency	Oversees the Central Valley Project (CVP), a complex, multi-purpose network of dams, reservoirs, canals, hydroelectric powerplants, and other facilities
USDA Natural Resources Conservation Services	Local/regional agency	In Willows, focuses on local/community resource protection and development, soil health and water efficiency
Valley Mirror	Business	Newspaper advertising department in Willows
Vintage Nest	Business	Antique store, Willows
West Haven Senior Living	CBO	Senior assisted-living facility.
Western Agricultural Processors Association (WAPA)	Local/regional agency	Provides representation and expertise in critical compliance areas, such as air pollution, food safety, and safety services
Western Canal Water District	Neighboring community	Oversees water supply & distribution of approximately 59,000 acres of irrigable land
Westside Ambulance	CBO	Community ambulance service for Stanislaus & Merced Counties and the community of Orland
Willows Care Center	Business	Rural nursing facility offering short-stay rehabilitation, long-term care, and subacute care
Willows Chamber of Commerce	Business organization	Serves the community to create a viable resource for businesses and citizens
Willows Ink Well	Business	Office supply store in Willows
Willows Library	Local/regional agency	Allows people to borrow books and other resources for free
Willows Post-Acute	Business	Licensed long-term care and skilled nursing facility providing rehabilitation services after a stay in an acute care hospital
Willows Rural Fire District	Local/regional agency	Provides a vast range of emergency services, strong public relations, and fire safety education

The stakeholders from Orland are listed in Table 6, and those from Willows are listed in Table 7.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Table 6: City of Orland Stakeholders

Name	Type of Stakeholder	Description
Community Action Administrative Services under Glenn Co. Health & Human Services Agency (HHSA)	Local/regional agency	Manages a variety of grant-funded programs including emergency services, housing services, income, and employment Offers community services and development for low-income seniors, youth, and families. Lead Agency for the Colusa–Glenn–Trinity Community Action Partnership
Department of Social Services	Community Based Organization (CBO)	Oversees a wide range of social services and support for families and individuals in the community
First Care Medical (Colusa Medical Center)	CBO	Offers a wide range of services, including adult medical and surgical care, emergency medicine, long-term skilled nursing care, laboratory services, imaging and radiographic services, physical rehabilitation, home health, and palliative care
Glenn County Fire Chief Association	Local/regional agency	Advocates for unity and collaboration in Glenn County Fire Service
Glenn County HHSA	Local/regional agency	Provides services in the four major divisions of healthcare: social, behavioral health, public health, and community action
Grindstone Indian Rancheria	Neighboring community	Reservation/tribal headquarters of the Wintun–Wailaki Indians of California
Orland Area Chamber of Commerce	Business organization	Voluntary organization of the business community, uniting the efforts of business and professional individuals to improve the economy and build a better community. Serves as Orland’s business voice.
Orland Fire Department	Local/regional agency	Works in partnership with the Orland Rural Fire Protection District to provide emergency fire services
Orland Police Department	Local/regional agency	Enforces the law and provides emergency response
Orland Rural Fire Protection District	Local/regional agency	Provides fire protection and emergency response services
Orland Unit Water Users’ Association (OUWUA)	Local/regional agency	Assumed responsibility for the care, operation, and maintenance of the Orland Project in 1954
Orland–Artois Water District	Neighboring community	Part of the larger Glenn–Colusa Irrigation District Area
University of California Cooperative Extension – Glenn County	Academic organization	Provides education, outreach, and research activities to the county

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Table 7: City of Willows Stakeholders

Name	Type of Stakeholder	Description
Cal Water-Willows	Local/regional agency	Provides water utility/customer care services
California Highway Patrol – Willows	Local/regional agency	Provides safety and security services to a diverse population
Colusa Basin Drainage District	Neighboring community	Special District to address flooding and winter drainage in the basin
Glenn County Business Association	Local/regional agency	Focus on helping create economic & business development and retention for Glenn County
Glenn County District 3	Local/regional agency	One of 5 districts in Glenn County
Glenn County District Attorney's Office	Local/regional agency	Focus on prosecuting criminal violations of law with integrity and to support and protect the rights of victims of crime in Glenn County.
Glenn County HHSA	Local/regional agency	Provides services in the four major divisions of healthcare: social, behavioral health, public health, and community action
Glenn County Levee District #1	Local/regional agency	Land reclamation and levee maintenance
Glenn County Levee District #2	Local/regional agency	Land reclamation and levee maintenance
Glenn County Mosquito and Vector Control District – Willows	Local/regional agency	Main function is to control the threat of mosquito/vector-borne diseases in Glenn County
Glenn County Office of Education (GCOE)	Academic organization CBO	Located in Willows, GCOE has various educational & community programs at all ages & levels, including adult education, senior nutrition, and substance abuse prevention programs.
Glenn County Personnel Department	Local/regional agency	Glenn County Human Resources
Glenn County Resource Conservation District (RCD)	Local/regional agency	Various educational projects and programs engage farmers, ranchers, and the community in protecting resources. We continue to address natural resource concerns and pursue opportunities that benefit Glenn County
Glenn County RCD – Tehama–Glenn Fire Safe Council	Local/regional agency	Assists the community in managing natural resources and manages fire safety procedures
Glenn County Sheriff's Department	Local/regional agency	Responsible for law enforcement services and emergency response in the unincorporated areas of the county and in the City of Willows
Glenn Medical Center	CBO	Serves the Communities of Willows, Elk Creek, Maxwell, Orland, Princeton, and Stonyford with 24/7 emergency care and other medical services

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Name	Type of Stakeholder	Description
Glenn–Colusa Irrigation District	Local/regional agency	Committed to maintaining sustainable practices for managing water supply and preserving and protecting the environment
Kanawha Fire Protection District	Neighboring community	Provides fire protection services
Local Agency Formation Commission (LAFCO)	Agency with authority to regulate development	A state-mandated local agency that oversees boundary changes to cities and special districts, the formation of new agencies, including the incorporation of new cities, and the consolidation of existing agencies
Mendocino National Forest	Local/regional agency	Provides fire management, emergency response, public information, and fire education
Mendocino National Forest/ Grindstone Ranger District (USDA – Forest Service)	Local/regional agency	Responsible for fire and resource management in this area
NE Willows Community School District (CSD)	Local/regional agency	Oversees municipal services in the community
Northern Valley Indian Health	CBO	Provides healthcare services to Native Americans and all community members
Pacific Gas and Electric (PG&E)	Business	An investor-owned utility company that provides natural gas and electricity to 5.2 million households in the northern two-thirds of California
Provident Irrigation District	Neighboring community	Serves 120 landowners of predominantly rice-crop agriculture to oversee irrigation water supply
Sacramento National Wildfire Refuge (NWR)	Local/regional agency	Part of the Sacramento NWR Complex offering recreation, hiking opportunities, and wildlife viewing
Tehama–Colusa Canal Authority	Agency with authority to regulate development	A Joint Powers Authority comprising 17 Central Valley Project water contractors. The service area spans Tehama, Glenn, Colusa, and Yolo Counties along the west side of the Sacramento Valley
US Bureau of Reclamation (California Great Basin)	Agency with authority to regulate development	Its mission is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.
USDA Natural Resources Conservation Services – Willows	Local/regional agency	Services to help conserve natural resources to maintain healthy ecosystems, some of which include air, soil, water, plants, land, wildlife habitat
Willows Care Center	Business	A rural nursing facility offering short-stay rehabilitation, long-term care, and subacute care
Willows Chamber of Commerce	Business organization	Serves the community to create a viable resource for businesses and citizens

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Name	Type of Stakeholder	Description
Willows Post-Acute	Business	A licensed long-term care and skilled nursing facility providing rehabilitation services after a stay in an acute care hospital
Willows Rural Fire District	Local/regional agency	Provides a vast range of emergency services, strong public relations, and fire safety education

While a multitude of stakeholders were given the opportunity to participate, not all were able to. The stakeholders listed in Table 8 participated directly in the plan by attending meetings, completing the digital stakeholder survey, and/or reviewing the draft plan. This stakeholder outreach was considered a success because of the broad range of stakeholders that participated and their active engagement and participation in the planning process.

Table 8: Stakeholders That Participated in the Plan Update

Name	Title	Agency/Jurisdiction	Type of Stakeholder
Reuben Armenta	Emergency Services Coordinator (ESC)	Cal Office of Emergency Services (OES), Inland Region	Local/regional agency
Andrew Bambauer	Senior Engineer	Cal Dept. of Water Resources (DWR) – Oroville Field Division	Local/regional agency
Brad Bartholomew	Program Manager	IEM	Contractor
Belita Bass	Disaster Recovery Specialist	IEM	Contractor
Hannah Bergen-Ziyadinova	Emergency Preparedness Analyst	Glenn County Health & Human Services Agency (HHSA) – Public Health	Community-Based Organization (CBO) Representative
Joe Bettencourt	Community Development & Services Director	City of Willows	Local/regional agency
Travis Beynon	District Manager, Willows	California Water Service (Cal Water)	Local/regional agency
Laverne Bill	Tribal Historic Preservation Officer (THPO)	Paskenta Band of Nomlaki Indians	Neighboring community
Carson Blodow	Environmental Scientist	Central Valley Regional Water Quality Control Board, Storm Water Program	Neighboring community
Greg Conant	Forest Health	Glenn County Resource Conservation District (RCD)	Local/regional agency
Alyssa Cordova	Environmental Program Manager	Glenn County Agriculture Department	Local/regional agency

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Name	Title	Agency/Jurisdiction	Type of Stakeholder
Hilary Crosby	Nonprofit Administrator	Butte Glenn VOAD (Volunteer Orgs Active in Disasters)	Nonprofit organization Representative
Paula Daneluk	Director	Butte County Development Services	Neighboring community
David Dolezal	Firefighter	BLM Ukiah Field Office	Local/regional agency
Scott Friend	City Planner	City of Orland	Local/regional agency
Casey Garnett	Lead Hazard Mitigation Planner	IEM	Contractor
Katie Gilman	Water Quality Certifications Engineering Geologist	Central Valley Water Board	Agency with the authority to regulate development
Sateur Ham	Planning and Environmental Specialist	Bureau of Land Management	Local/regional agency
Jillian Hughes	Staff Services	Glenn County Sheriff's Office	Local/regional agency
Lisa Hunter	Water Resource Coordinator	Glenn County	Local/regional agency
John Hutchings	Fire Coordinator	Bureau of Reclamation	Agency with authority to regulate development
Dan James	Volunteer Firefighter	Ord Bend Volunteer Fire Department	Local/regional agency
Tod Kimmelshue	Supervisor	Butte County	Neighboring community
Victoria LaMar-Haas	Program Manager	Cal OES Local Mitigation Planning	Local/regional agency
Beth Lefebvre	Contact Representative	Bureau of Land Management	Local/regional agency
Gabriel Leggieri		USACE Regulatory Division	Local/regional agency
Wendy Longwell	Programs Manager	Disability Action Center	CBO Representative
Sabrina Lunsford	Hazard Mitigation Planner	IEM	Contractor
Kandi Manhart-Belding	Executive Officer	Glenn County RCD	Local/regional agency
Angie Mannel	Admin Analyst II	Butte County OEM	Neighboring community
Evan Markey	District Manager	California Water Service	Agency with the authority to regulate development
Shannon McGovern	Administrative Executive	Community & Government Affairs – Cal Water	Local/regional agency
Travis Mclver	Emergency Coordinator	Northern Regional Center	CBO Representative
Jason Morris	Division Chief	Cal FIRE	Local/regional agency

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Name	Title	Agency/Jurisdiction	Type of Stakeholder
Jody Newton	Local Mitigation Planning	Cal OES	Local/regional agency
Kyle Noderer	Emergency Services Coordinator (ESC)	Cal OES, Inland Region	Local/regional agency
Robyn Nygard	Program and Administrative Coordinator	Glenn County Community Action	CBO Representative
Nannette Pfister	Staff Services Manager	Glenn County Public Works	Local/regional agency
Curt Pierce	Area Irrigation & Water Resources Advisor	UC Davis Cooperative Extension – Irrigation & Water Resources	Local/regional agency
Matt Plotkin	Sr. Program Manager	United Way of Northern California	Nonprofit organization Representative
John Poland	Executive Director	S-SV EMS Agency	CBO Representative
Julie Polley	Administrative Assistant	Elk Creek Community Services District	CBO Representative
Andy Popper	Principal Planner	Glenn County Planning and Community Development Services Agency (PCDSA)	Local/regional agency
Lorri Pride	Glenn County Fire Coordinator/Glenn County Resource Conservation District (RCD)	Glenn County Farm Credit Administration/ Glenn County RCD	Local/regional agency
Constantin Raether	Associate Environmental Planner	Cal OES	Local/regional agency
Rosalía Rentería	District Assistant	3CORE Business & Economic Development	Nonprofit organization Representative
Talia Richardson	Deputy Director	Glenn County Public Works Agency (PWA)	Local/regional agency
Don Rust	Director	Glenn County PWA	Local/regional agency
Ian Sanders	Engineer Assistant	Oroville Field Division, DWR	Neighboring community
Marcie Skelton	Air Pollution Control Officer/Certified Unified Program Agency (CUPA) Director	Glenn County	Local/regional agency
Kate Smith	Hazard Mitigation Planner/GIS	IEM	Contractor
Cindy Snelgrove	Chief Clinical Services Officer	Ampla Healthcare	CBO Representative.
Miranda Steffler	LHMP Reviewer	Cal OES	Local/regional agency
Sharla Stockton	GIS	Glenn County	Local/regional agency

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Name	Title	Agency/Jurisdiction	Type of Stakeholder
Stroud Dawson	Regional Planner Liaison	Caltrans District 3	Agency with authority to regulate development
Amy Stultz	Site Manager	Northern Valley Indian Health	CBO Representative
Patricia Tam	Emergency Services Coordinator	Cal OES Local Mitigation Planning Unit	Local/regional agency
Mary Thomas	Emergency Preparedness Coordinator	Glenn County HHSA – Public Health	CBO Representative
Mardy Thomas	Director	Glenn County PCDSA	Local/regional agency
Amy Travis	Deputy Director of Emergency Services	OEM	Local/regional agency
Joe Vlach	Chief of Police	Orland Police Department	Local/regional agency
Terrance Washington	Senior Emergency Services Coordinator	Cal OES Mitigation Planning	Local/regional agency
Aaron Wright	Superintendent	CA State Parks	Local/regional agency

The stakeholder survey differed from the public survey in that it specifically requested information on the types of mitigation the stakeholder's agency was involved in and willing to support. All the stakeholders listed in Table 5 were invited to participate in the survey. Moreover, the Glenn County Office of Emergency Services (OES) shared the stakeholder survey with all 721 individuals on the county's contact list. As a result, the survey was delivered to 99% of those recipients with a 20% open rate. This digital approach to engaging stakeholders received 16 responses, including from 5 who work in Glenn County (unincorporated), 6 in the City of Willows, 2 in the City of Orland, and 3 in other. Most of the stakeholders that completed the draft survey elected to remain anonymous but some participants included the Glenn County Business Association, BLM, First Care Medical Associates, Orland City Council, Orland Volunteer Fire Department, Ampla Health, and Hamilton City Medical. The survey results were discussed at the Risk Assessment/Capabilities Assessment and Mitigation Strategy Meetings, and the participating jurisdictions were provided with a copy of the results.

Key takeaways from the stakeholder survey included similar concerns and support for mitigation projects as those discussed by the public, while the vulnerable populations that were considered most at risk in the planning area were the elderly (aged 65 or older) followed by people living with a disability and low-income populations. Multiple plans to integrate into this plan and suggestions for engaging the public were captured. Further, participants considered the actions their own agency had taken to reduce their own risk and suggested mitigation action ideas for the plan participants. The areas of mitigation interest included Stony Creek, particularly the homes in the Wildland Urban Interface between Stony Creek and the City of Orland; levees in the Hamilton City area; levees that have been decertified/Sacramento River Levees; areas in the southeast county where there is chronic flooding of roads; the North East Willows Area and Hambright Creek east of the City of Orland for flooding; railroad flooding; and domestic wells.

Public Outreach

Public outreach is a major and required component of the MJHMP planning process. From the very beginning, public outreach was a high priority and discussed at each meeting. At the Kickoff Meeting, the plan participants brainstormed ways to maximize public involvement in the MJHMP planning process. It was noted that no one attended the public workshops for the last plan update. The participating jurisdictions observed that getting public participation, in general, was challenging, and they anticipated similar results with the public workshops for this plan update. Instead, participants suggested using social media (particularly Facebook) and local gathering places where people would likely be, such as local

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

businesses. Further, it was suggested that any digital survey should be short, reducing the time needed to participate in the plan update. The participating jurisdictions also requested Spanish translations of the outreach materials to reach vulnerable populations in the community. In the following Risk Assessment/Capabilities Assessment Meeting, plan participants discussed suggestions for newsletter outreach and in-person information soliciting. There was additional discussion from a resident of Hamilton City about the difficulties in getting participation from this part of the community. All this stakeholder input helped inform and direct the approach used for public outreach.

Digital Surveys

The planning team drafted and shared two public surveys in English and Spanish. Each participating jurisdiction reviewed and shared these surveys on multiple occasions and in different formats. The first survey on the Risk Assessment asked the public about their hazards of concern, assessed their understanding of the assets at risk, and solicited information on what areas or community assets are more vulnerable. The Mitigation Strategy survey engaged the public on what they are doing in terms of mitigation, what mitigation actions they would support the community undertaking, and any specific suggestions for mitigation actions.

Glenn County shared the digital surveys on the Glenn County homepage and Planning Division website, the county OES webpage, the Sheriff's Office Facebook page (which has over 10,000 followers; see Figure 10), and the Health & Human Services Agency (HHSA) Facebook page (3000 followers). The survey was also posted on the Glenn County OES Twitter account. Orland shared the survey on the City of Orland Facebook page (with 4,600 followers; see Figure 11) and at the Orland Volunteer Fire Department 69th Annual Spaghetti Feed. Willows shared the survey on its website and on its Facebook page (with 1,800 followers; see Figure 12) and on the What's Going on in Willows Facebook group, which has over 8,300 members and reaches across Glenn County.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

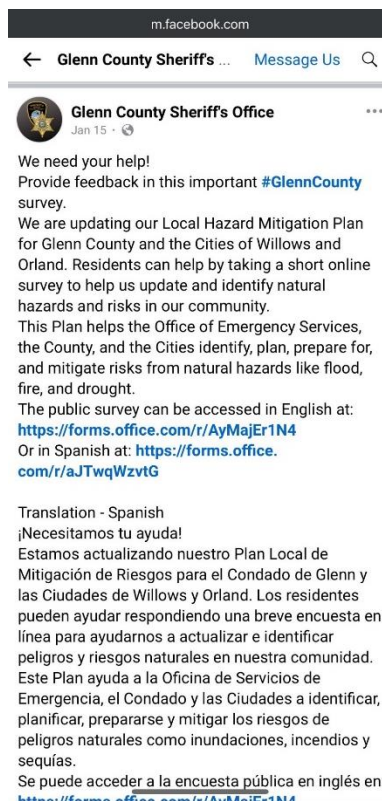


Figure 10: Screenshot of Glenn County Sheriff's Office Facebook Post



Figure 11: Screenshot of City of Orland Social Media Post

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

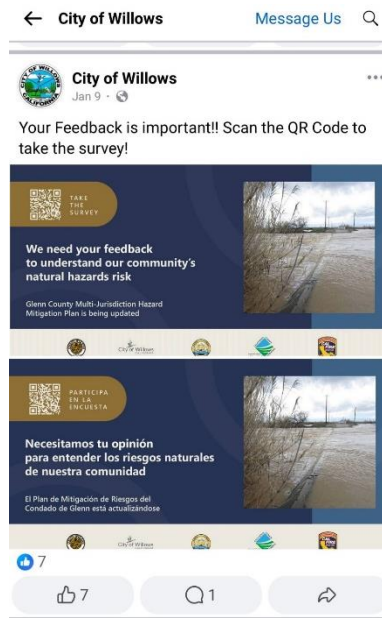


Figure 12: Screenshot of City of Willows Facebook Post

In addition to online outreach, the plan participants solicited feedback by sharing the surveys at in-person locations. These locations were selected because of the ongoing local traffic there and to engage more vulnerable populations. Glenn County collaborated with the Glenn County HHSA to identify additional survey locations, email listservs, and case workers who could provide information on the needs of vulnerable populations in the planning area. Additional outreach was completed by sharing the survey with the Butte–Glenn Healthcare Coalition and Butte–Glenn Voluntary Agencies Active in Disasters (VOAD). Stakeholders were also encouraged to share the digital surveys.

Vulnerable populations of particular concern in the planning area including the elderly and Spanish-speaking populations. The Hamilton City Community Service District often shares information in Hamilton City, where a high percentage of Spanish-speaking population lives. It was invited to participate in the planning process but did not reply. Reaching the Spanish-speaking population is an ongoing challenge for local governments. It was acknowledged that there have been challenges connecting to the Spanish-speaking public, especially in the Hamilton City area, but it was hoped that by providing them access to translated surveys—which took minimal time to complete at accessible locations—this engagement may be achieved.

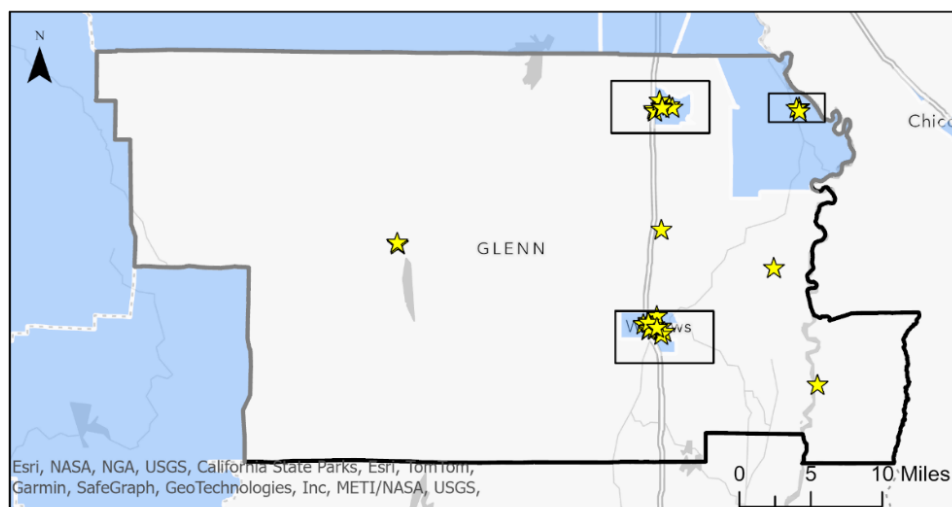
Multiple methods to reach the elderly including sharing the survey at senior housing apartment complexes and distributing them at Glenn County Senior Nutrition congregate sites in both Orland and Willows, which offer seniors nutritious meals. The survey was shared at the locations identified on Figure 13. Vulnerable areas on this map correspond to the disadvantaged communities identified by the Climate and Economic Justice Screening Tool (CEJST). The locations included:

1. PSCDA Building – Location of the Glenn County Planning & Community Development Services Agency, including where the public applies for permits.
2. GC Records Office – Glenn County location where the public comes for real estate transactions and vital records.
3. GC Board of Supervisors Display Case – Location where the Glenn County Board of Supervisors, the policy making body of the County of Glenn, makes decisions.
4. GC Finance Hall Display Case - Location where Finance Department of Glenn County operates.

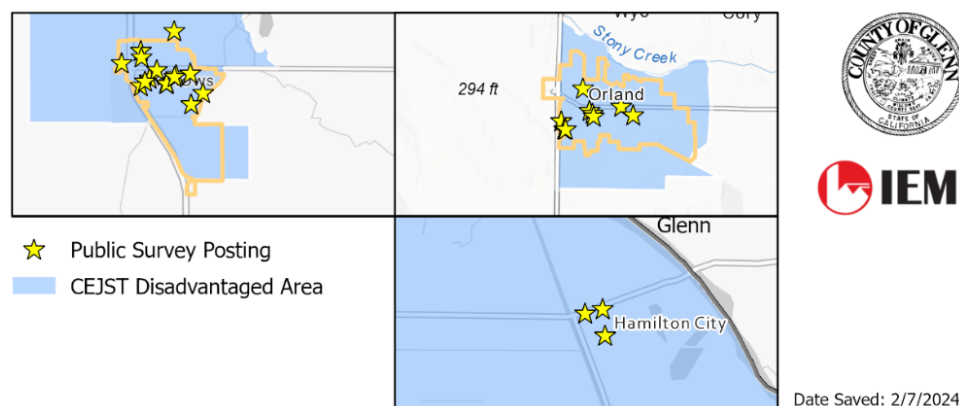
Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

5. Glenn County Health and Human Services Agency – Location of HHSA which offers services to employers, business owners, and community members including children, elders, and those who are disabled.
6. GC Glenn Grows/Success Square – Centrally located conference center made available to the community.
7. Butte City Post Office – USPS location open in Butte City.
8. Artois Market – Local grocery store in Artois.
9. Glenn Ride Bus Stop – Public transit location.
10. Elk Creek Community Library – Local public library located in Elk Creek.
11. Hamilton City Chester Walker Memorial Library – Local public library located in Hamilton City.
12. Bayliss Public Library – Local public library located in Bayliss.
13. Cedar Hills Manor – a low-income apartment complex and the largest residential apartment complex in Willows.
14. Glenn Medical Center – a “Critical Access Hospital” (a hospital more than 35 miles from any other hospital) in Willows, which offers inpatient, outpatient, and rural health clinic services to residents of Glenn County and surrounding areas.
15. Eskaton Manor – a low-rent apartment which offers support for older adults and people with disabilities.
16. Mar-Val Food Stores – the largest local grocery store.
17. Sycamore Ridge – an affordable housing apartment complex located near bus stops, schools, Walmart, and the Glenn Medical Center.
18. Walmart Pharmacy – one of two local pharmacies in Willows.
19. Willows Acute Care – a nursing home in Willows.
20. Willows Food Bank – a food bank providing food to low-income Glenn County residents.
21. Willows Pharmacy – one of two local pharmacies in Willows.
22. Willows Public Library – a public library with free public computers and Wi-Fi which serves the communities of Willows and the surrounding Glenn County area.
23. Willow Springs Senior Apartments – a senior apartment complex offering housing support to senior English- and Spanish-speaking residents.
24. Orland Free Library – A free public library in the heart of Orland offering access to Wi-Fi and other resources.
25. Orland Arbor Apartments – Local apartment complex offering USDA RD Affordable Housing.
26. Grocery Outlet – Local discount grocery store near I-5.
27. Blue and White Laundromat – Laundromat in Orland near I-5.
28. Mill Street Apartments – Apartment complex in Orland.
29. La Perla de Occidente Market – Local Mexican owned grocery store serving Mexican food.
30. Los Tres Potrillos – Local family-owned Mexican restaurant.
31. Mariscos La Perla del Pacifico – Local seafood restaurant.
32. El Toro Loco – Local grocery store.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents



Glenn County Public Outreach in Disadvantaged Communities



CEJST = The Climate and Economic Justice Screening

Figure 13: Public Outreach Survey Locations

At the final stakeholder meeting, it was noted that additional participation by those with access and functional needs (AFN) could be solicited next time. However, the individual who brought this up did not have time to participate. The county identified that a new Butte–Glenn AFN Committee could help facilitate this next update.

News Report

Action 12 News promoted the opportunity to participate in the MJHMP update on their website and in a news report (see Figure 14). Action 12 News is viewed by nearly 175,000 Northern California households and has over 2 million monthly mobile and online page views. It also includes the region’s only local Spanish newscast on Telemundo. In their report, they asked the public for their opinions of the hazard mitigation plan. One resident shared that it was comforting to know work is being done, particularly to address floods and fire. The report also demonstrated how to find and complete the digital survey.

Glenn County seeks public input on Hazard Mitigation Plan Update

By: Janelli Pedroza Jan 16, 2024 Updated 14 hrs ago

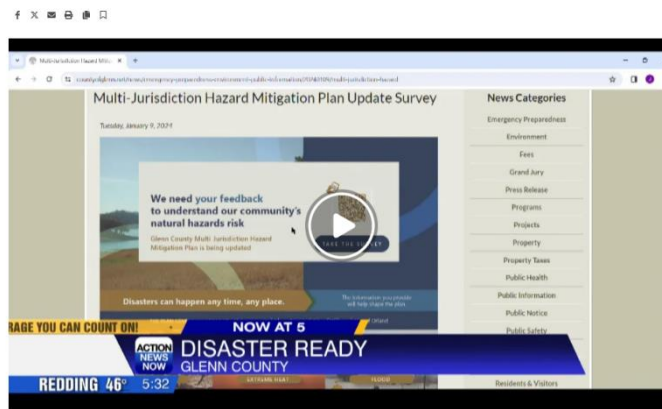


Figure 14: Screenshot on the MJHMP from Action 12 News

Newspaper

Information on the MJHMP update for Glenn County, Willows, and Orland was shared through *The Sacramento Valley Mirror*, an independent newspaper company serving all of Glenn County. This newspaper is sold locally across the participating jurisdictions, giving individuals in the planning area information on how to participate in the plan update.

Public Presentations

The public was given the opportunity to participate in public presentations on the draft plan update. The MJHMP update process was presented at the Glenn County Emergency Medical Care Council Meeting in Orland on December 13, 2023, and hosted by Amy Travis, Deputy Director of the OES (see Figure 15). The plan update process was shared in Orland at the Planning Commission meeting on January 18th, 2024. In Willows, the process was shared at the Glenn County Planning Commission meeting on February 21st, 2024. While these meetings were advertised online, no members of the public attended specifically regarding the plan.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

Glenn County Emergency Medical Care Council	
MINUTES	December 13 th , 2023 1000-1130 hours Nova Conference Room
MEETING CALLED BY	Amy Travis (GCSO-OES)
NOTE TAKER	Mary Thomas (GCPH-EP)
ATTENDEES	Amy Travis (GCSO-OES), Mary Thomas (GCPH-EP), Kristina Button (WestHaven), Dulce Perez-Palomares (DA Victim Witness), Reuben Armenta (CalOES), Angie Mannel (Butte County OEM), Mara Rouse (ARC), Scott Studybaker (Westside Ambulance), Laura Medina (GCHSA-PH), Lauren Still (Glenn Medical Center), Tom Arnold (GCBOS), Philip Zabell (ARES), Nate Monck (WFD), Aaron Wright (CA State Parks), Patti Carter (Region III RDMHS, SSV-EMS)
DISCUSSION	<ul style="list-style-type: none"> - Amy Travis discussed the Local Hazard Mitigation Plan process and extended invitations to anyone wishing to participate in the process. Next meeting is January 18. This plan is housed with Planning Department and focuses on natural hazards. IEM (consultant group) has been hired to write the plan. Mitigation projects need to be identified and prioritized. - Mary Thomas discussed the Butte-Glenn Emergency Preparedness Healthcare Coalition AFN Sub-Committee and extended an invitation to anyone wishing to participate. Next meeting is December 18 at 2 pm via Teams.

Figure 15: Notes from the Glenn County Emergency Medical Care Council Meeting

Feedback Received

Public feedback was received from both the Risk Assessment and Mitigation Strategy surveys. The jurisdictions had the opportunity to review and discuss the survey results at each subsequent meeting and online between meetings through forms shared by the consulting team. This feedback prompted important discussions at the meetings, particularly on the locations at risk of flooding. Appendix B summarizes the comments received and how this feedback was incorporated into the plan.

Planning Process Methodology

Updating an MJHMP requires coordination among agencies, other stakeholders, and the general public. A practical and ongoing hazard mitigation planning process is crucial to ensuring that all stakeholders can meaningfully participate, and that the mitigation program meets the needs of the whole community—including socially vulnerable and underserved populations. It was also important to make sure the plan would be updated in a timely manner.

IEM, in consultant with the participating jurisdictions, developed a planning schedule with specific milestones and activities (see Table 9). This schedule was followed closely throughout the planning process and ensured that information was provided and incorporated into the draft plan on time.

Table 9: Plan Development Chronology and Milestones

Date	Event	Description
November 1, 2023	Introductory Meeting	Meeting of Glenn County and IEM to discuss plan update approach.
November 30, 2023	Kickoff Meeting	Meeting of participating jurisdictions and stakeholders to discuss MJHMP updates, hazard identification, and priorities.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Date	Event	Description
January 18, 2024	Risk Assessment/Capabilities Assessment Meeting	Meeting of participating jurisdictions and stakeholders to discuss the status of the plan update, public outreach results, hazard profiles, and risk and capability assessment forms.
February 1, 2024	Mitigation Strategy Meeting	Meeting of participating jurisdictions and stakeholders to discuss the goals, objectives, and actions of the plan, as well as plan maintenance and plan review

Each jurisdiction actively participated in the plan update. Both Orland and Willows are smaller cities with limited staffing. Some departmental positions are staffed by consultants working as on-site contract employees. Moreover, one staff person may perform multiple functions in the government. Unlike larger cities, Orland and Willows do not have numerous government departments available to be involved in the local planning process. Because of the limited staffing capacity, Orland was primarily represented on the MJHMP Steering Committee by its contract planning consultants, who report to the City Manager. The City Managers were also kept informed of progress and provided opportunity to participate.

The IEM team worked with each participating jurisdiction throughout the planning process to identify hazards of concerns and mitigation actions specific to each jurisdiction. The city representatives worked with available city staff, as appropriate, outside of meetings to obtain feedback and provide input about specific concerns, capabilities, and actions for each of these jurisdictions. Table 10 shows the levels of involvement by the participating jurisdictions.

Table 10: Summary of Participation

Community	Meetings Attended	Forms Completed
Glenn County	Meeting with Consultant 11/1/2023 GIS Meeting with Consultant 11/14 Kickoff Meeting 11/30/2023 Risk Assessment/Capabilities Assessment Meeting 1/18/2024 Meeting with Consultant 1/25/2024 Mitigation Strategy Meeting 2/1/2024 Meeting with Consultant 2/8/2024	Existing Contact Information; Risk Assessment; Capabilities Assessment; Mitigation Strategy
City of Orland	Meeting with Consultant 12/13/2023 GIS meeting with consultant 11/16/2023 Kickoff Meeting 11/30/2023 Risk Assessment/Capabilities Assessment Meeting 1/18/2024 Meeting with Consultant 2/1/2024 Mitigation Strategy Meeting 2/1/2024 Meeting with Consultant 2/8/2024	Capability Assessment; Mitigation Strategy
City of Willows	Kickoff Meeting 11/30/2023 Risk Assessment/Capabilities Assessment Meeting 1/18/2024 Meeting with Consultant 1/31/2024 Mitigation Strategy Meeting 2/1/2024 Meeting with Consultant 2/8/2024	Contact Information; Risk Assessment; Capability Assessment; Mitigation Strategy

Organizing Resources

The first step of the Glenn County MJHMP planning process was Organizing Resources. It outlines the MJHMP Project Team and includes information on the development of the MJHMP Steering Committee. As part of this step, the IEM team reviewed and incorporated, as appropriate, various existing plans, studies, reports, and other technical data/information into the MJHMP document. Suggestions for important data to include were collected from the participating jurisdictions and stakeholders. Relevant information from the following documents and other sources has been incorporated in the MJHMP, especially in the hazard profiles.

- 2018 Glenn County Multi-Jurisdiction Hazard Mitigation Plan
- 2023 California State Hazard Mitigation Plan
- California's Fourth Climate Change Assessment
- City of Orland General Plan
- City of Willows General Plan
- Glenn County and City of Orland Local GIS Data
- Glenn County Community Wildfire Protection Plan (CWPP)
- Glenn County General Plan Safety Element
- Glenn County General Plan Update Existing Conditions Report
- Sacramento Valley Regional Water Management Plan
- California's Fourth Climate Change Assessment Sacramento Valley Region Report
- California Water Service 2020 Urban Water Management Plan. Willows District
- Sacramento River Watershed Program, Stony Creek Watershed, Lower Stony Creek
- Inspection and Local Maintaining Agency Report of the Central Valley State-Federal Flood Protection System
- Bute City Small Communities Flood Risk Reduction Feasibility Study – Levee Districts 1, 2, 3
- RD 2140 Reclamation District in Hamilton City – Levee project studies

Assessing Risk

Per FEMA requirements, this step of the MJHMP planning process identified and prioritized the natural hazards affecting Glenn County and assessed the vulnerability to those hazards. Results from this step in the planning process formed the foundation for the subsequent identification of appropriate actions for reducing risk and losses in Glenn County. Besides the hazards profiled in earlier plans, the participating jurisdictions identified one new hazard: Extreme Heat. The IEM team supported the development of hazard profiles, which helped determine which areas in Glenn County are vulnerable to specific hazard events. The vulnerability assessment included overlaying geographical information system (GIS) data for all geographically defined hazards. Using these methodologies, community lifelines impacted by natural hazards were determined. Detailed information on each hazard vulnerability assessment is provided in Section 3. Risk Assessment.

Developing a Mitigation Strategy

The MJHMP is the explicit strategy that provides the blueprint for reducing the potential losses identified in the risk assessment, which is based on existing authorities, policies, programs, and resources and the ability of Glenn County, Orland, and Willows to expand on and improve their existing tools. The mitigation plan involved developing a capabilities assessment, identifying goals, and identifying and prioritizing mitigation actions. The participating jurisdictions completed a Capabilities Assessment or comprehensive review of the various mitigation capabilities currently available to implement the mitigation actions, as described in Section 4. Capabilities Assessment. Next, the participating jurisdictions and stakeholders evaluated their prior mitigation goals. They decided to update the language of a few actions to better reflect the wide variety of stakeholders with whom the participating jurisdictions want to collaborate and the need for better input to inform data-driven decision-making. No additional goals were selected at this time, but one objective was added to identify the information that would be important to gather. Finally, the participating jurisdictions and stakeholders worked together to identify and develop mitigation actions that would reduce the vulnerability of the planning area. These mitigation actions were then compiled into a Mitigation Action Plan and prioritized. This step of the MJHMP planning process is detailed in Section 5. Mitigation Strategy.

Adopting and Implementing the Plan

Finally, the participating jurisdictions reviewed the draft plan and identified how to keep it current. The plan went through multiple rounds of review, including stakeholder and public reviews. Once the draft passed stakeholder and public review, it was sent to Cal OES for review. Once Cal OES approval is achieved, the plan will be sent to FEMA for review.

After the plan receives Approvable-Pending-Adoption (APA) status, it will be adopted by Glenn County and the Cities of Orland and Willows within one year of FEMA conditional approval. The plan is not complete until it is adopted. The final plan adoption resolutions will be submitted to FEMA for final approval. Once the plan is adopted, it will be in good standing with Cal OES and FEMA again.

Section 3. Risk Assessment

Assessing the risks from natural hazards measures their potential impacts on life, property, and the economy. The intent of risk assessment is to identify, as much as practicable, given the data available, the qualitative and quantitative vulnerabilities of a community. A risk assessment provides a better understanding of the impacts of natural hazards on the community. It provides a foundation on which to develop and prioritize mitigation actions (see Section 5. Mitigation Strategy). The aim is to reduce damage from natural disasters through increased preparedness and response times and to allocate resources to areas of greatest vulnerability.

This risk assessment followed the methodology described in the FEMA Local Mitigation Planning Handbook 2023, which outlines a five-step process:

1. *Identify hazards:* This step helps clarify what hazards may occur in the planning area.
2. *Describe hazards:* This step includes gathering more information about the hazards. It looks at where they can happen, how impactful they have been in the past, and how often and with what intensity they might occur in the future.
3. *Identify community assets:* This step examines which assets are most vulnerable to loss during a disaster. It must include changes in development that have taken place since the previous plan was created.
4. *Analyze impacts:* This step describes how each hazard could affect the assets of each community.
5. *Summarize vulnerability:* This step brings all the analysis together. It uses the risk assessment to draw conclusions. From these conclusions, the planning team can develop a strategy to increase the resilience of residents, businesses, the economy, and other vital assets.

Hazard Identification

According to FEMA guidance, identifying hazards is the first step in developing a risk assessment. The Glenn County MJHMP Planning Team reviewed previous hazard mitigation plans and relevant documents to determine the natural hazards that could affect the county. Table 11 is a crosswalk of hazards identified in the California State Hazard Mitigation Plan (HMP), the County's General Plan and Emergency Operations Plan (EOP), the General Plans of Orland and Willows, and the HMPs of neighboring counties.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Table 11: Updated Crosswalk Review

Hazard	CA State HMP 2023	Glenn County General Plan	Glenn County EOP	Orland General Plan	Willows General Plan 2022	Butte County 2019 HMP	Lake County 2023 HMP	Mendocino County 2021 HMP	Tehama County 2018 HMP	Plumas County 2020 HMP	Colusa County 2018 HMP
Climate Change						•	•			•	
Dam Failure	•		•		•	•	•	•	•	•	
Disease Outbreak/ Pandemic/Epidemic			•				•	•		•	
Drought	•	•	•	•		•	•	•	•	•	•
Earthquake	•	•	•	•	•	•	•	•	•	•	•
Extreme Cold or Freeze	•		•		•	•				•	
Extreme Heat	•		•		•	•	•			•	
Hazardous Materials Incidents			•		•	•	•	•			
Insect Pests/ Invasive Species						•	•	•			
Landslide, Debris Flow, and Other Mass Movements	•	•	•			•	•	•	•	•	•
Levee Failure	•		•		•	•	•			•	
Riverine, Stream, and Alluvial Flood	•	•	•	•	•	•	•	•	•	•	•
Flooding	•	•	•	•	•	•	•	•	•	•	•
Severe Wind, Weather, and Storms	•		•		•	•	•	•	•	•	
Snow Avalanche	•								•	•	
Subsidence	•	•		•			•				

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Hazard	CA State HMP 2023	Glenn County General Plan	Glenn County EOP	Orland General Plan	Willows General Plan 2022	Butte County 2019 HMP	Lake County 2023 HMP	Mendocino County 2021 HMP	Tehama County 2018 HMP	Plumas County 2020 HMP	Colusa County 2018 HMP
Tornado			•		•	•					
Tree Mortality							•			•	
Tsunami	•							•			
Volcano	•		•		•	•	•			•	
Wildfire	•	•	•		•	•	•	•	•	•	•

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Twenty-one hazards were identified based on a thorough document review. The crosswalk was used to develop a preliminary list of hazards to provide a framework for the MJHMP Steering Committee and stakeholders to begin thinking about which hazards were truly relevant to Glenn County. For example, rising sea levels and tsunamis were of little relevance to Glenn County, while flood, severe weather, and wildfires were indicated in almost all hazard documentation.

The analysis included a review of past hazard events. This involved examining historical records of hazards that previously affected the county and/or the cities. Information about federal and state disaster declarations in Glenn County and declarations from other sources was compiled into Table 12 through Table 16. These tables do not provide all the instances of hazards in Glenn County, but they offer a solidified account of the types and extent of disasters that have affected the county since 1955. Large regional incidents have affected Glenn County, including floods that covered entire regions of the county. Most recently, severe winter storms in Glenn County during the 2023 winter season caused extensive damage. The disaster declarations in these tables provide a baseline for consideration in the hazard prioritization process.

Table 12: Federal Disaster and Emergency Declarations, 1955–2023

Disaster Number	Declaration Date	Incident Subcategory	Description
Federal Declarations			
4699	04/03/2023	Severe Storm	Winter storms, straight-line winds, flooding, landslides, and mudslides
4683	01/14/2023	Winter Storms	Flooding, landslides, and mudslides.
4434	05/17/2019	Severe Storm	Winter storms, flooding, landslides, and mudslides
4308	05/17/2019	Severe Storm	Severe winter storms, flooding, mudslides
1203	02/09/1998	Severe Storm	Winter storms and flooding
1155	01/04/1997	Severe Storm	Flooding
1046	03/12/1995	Severe Storm	Winter storms, flooding, landslides, mud flows
1044	01/10/1995	Severe Storm	Winter storms, flooding, landslides, mud flows
894	02/11/1991	Freezing Temperature	Severe Freeze
758	02/21/1986	Flood	Severe storms and flooding
677	02/09/1983	Coastal Storm	Coastal storms, floods, slides, & tornadoes
412	01/25/1974	Flood	Severe storms, flooding
283	01/27/1970	Flood	Heavy winds, storms, and flooding
183	12/24/1964	Flood	Heavy rains & Flooding
145	02/26/1963	Flood	Flooding & Rainstorms
82	04/04/1958	Flood	Heavy rains & Flooding
47	12/23/1955	Flood	Flooding
Emergency Declarations			
3592	03/10/2023	Flood	Winter Storms, Flooding, Landslides, and Mudslides
3591	01/09/2023	Flood	Winter Storms, Flooding, and Mudslides
3428	03/13/2020	Biological	COVID-19

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Disaster Number	Declaration Date	Incident Subcategory	Description
3248	09/13/2005	Hurricane	Hurricane Katrina Evacuation
3023	01/20/1977	Drought	Drought

Source: FEMA, "Disaster Declarations for States and Counties." <https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties>

Table 13: Cal OES Disaster Proclamations and Executive Orders, 2015–2023

Cal OES Disaster Proclamation/ Executive Order Number	Date	Incident Subcategory	Information
N-6-23, N-7-23, N-9-23, N-10-23	February–March 2023	Winter storms	Flooding, power outages, downed trees, hazardous debris flows, mudslides, landslides, waterway swelling, dam overflows, and levee failures.
N-1-23, N-2-23, N-10-23 (statewide)	December 2022–January 2023	Winter storms	Flooding, power outages, downed trees, hazardous debris flows, mudslides, landslides, waterway swelling, dam overflows, and levee failures.
N-15-22, N-14-22(Statewide)	08/31/2022	Extreme Heat	Dangerous, record-setting heat, significant demand, "warm shutdowns," and strain on the energy grid
Executive Order	03/23/22 (October 2021 storms)	Storms	Flooding, erosion, debris flows, roads, and infrastructure damage.
N-22-21	08/18/2020	Extreme Heat/ Lightning/Fires	Fires, damage to homes and infrastructure, evacuations, record-breaking temperatures, red-flag warnings, and lightning strikes.
Executive Order (statewide)	03/17/2017	Atmospheric River Storm	High winds, flooding, erosion, mud and debris flow, and damage to roads and highways.
Executive Order (statewide)	10/30/2015	Drought	Tree mortality, invasive pest infestations.

Source: Cal OES Governor's Office of Emergency Services, "Open State of Emergency Proclamations." <https://www.caloes.ca.gov/office-of-the-director/policy-administration/legal-affairs/emergency-proclamations/>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Table 14: Disasters Declared by the U.S. Department of Agriculture, 2012–2022

Agency	Date	Event
USDA	07/26/2022 (February–April 2022)*	Freeze
USDA	05/03/2012 (January 16–17, 2012)**	Freeze
USDA	05/03/2012 (January 16–17, 2012)**	Freeze

Sources:

* County of Glenn, “Due to Freeze: USDA Designates Glenn County as Disaster Area.”

<https://www.countyofglenn.net/news/public-information/20220726/due-freeze-usda-designates-glenn-county-disaster-area>

** FarmProgress, “Glenn County designated natural disaster area.”

https://www.farmprogress.com/management/glenn-county-designated-natural-disaster-area?ag_brand=westernfarmpress.com

Table 15: Governor-Proclaimed Disasters for Glenn County or Statewide, October 20, 1991–2023

Date	Event
February–March 2023	Severe winter storms
December 27, 2022–January 2023 (statewide)	Severe winter storms
October 2021	Storms
October 2021	Drought
May 10, 2021	Drought
August 2020 (statewide)	Fires
October 27, 2019 (statewide)	High winds and fires
January–February 2019	Winter storms
January 2014 (statewide)	Drought
January 2008	Extreme winds, heavy rains
January 2007 (statewide)	Freeze
February 02, 1998	El Niño
December 1996–January 1997	Floods
February 1995 (57 of 58 counties)	Late winter storms
January 1995	Severe winter storms

Source: California State Board of Equalization, “Chronological List of Governor-Proclaimed Disasters for Property Tax Purposes.” <https://www.boe.ca.gov/proptaxes/disaster-list.htm>

Table 16: “Other Disasters” Identified in the 2018 MJHMP

Date	Event	Description
10/26/1982	Severe Storms	Rains causing agricultural losses
03/05/1980	Severe Storms	Rain, Winds, Mudslides, & Flooding

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Date	Event	Description
02/1973	Storms/flooding	N/A
02/26/1958	Flood	Heavy rains and flooding
05/20/1957	Heavy rains	State of Emergency for producing areas of Northern California
11/21/1950	Flood	Statewide flooding

The Planning Team identified seven hazards with a high potential of occurring in the county based on a review of similar documents, previous incidents, historical knowledge, recent events across the state, and developing trends. These were: drought, extreme heat, flood, geologic hazards (earthquake, expansive soils, and subsidence), levee failure, severe weather, and wildfires.

Initial Prioritization of Hazards

After the risk assessment meeting, each participating jurisdiction was responsible for prioritizing the identified hazards. Considerations included examining the probability of future occurrences and the spatial extents of each hazard, if measurable. The jurisdictions added “Response Capacity” as a factor to consider when prioritizing hazards. Response capacity is particularly important for smaller rural communities, which may not have the same resources to respond to hazards as larger jurisdictions. This prioritization reflects the fact that vulnerability can differ across jurisdictions. Table 17 through 20 present the results of the hazard prioritization process, also known as the Calculated Risk Priority Index (CPRI). Each jurisdiction ranked the hazards on a worksheet based on perceived notions of the probability of future occurrences, spatial extent of the hazard, and historical events.

Table 17: Guidelines for Prioritization

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
Probability of Future Events	1	Unlikely	Less than 1% probability of occurrence in the next year or a recurrence interval of greater than every 100 years.	30%
	2	Occasional	1%–10% probability of occurrence in the next year or a recurrence interval of 11–100 years.	
	3	Likely	11%–90% probability of occurrence in the next year or a recurrence interval of 1–10 years.	
	4	Highly Likely	91%–100% probability of occurrence in the next year or a recurrence interval of less than 1 year.	
Spatial Extent (Geographic Coverage): <i>How large of an area could be affected by the specific hazard?</i>	1	Limited	Less than 10% of the planning area could be impacted.	10%
	2	Small	10%–25% of the planning area could be impacted	
	3	Significant	25%–50% of the planning area could be impacted.	

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
	4	Extensive	50%–100% of the planning area could be impacted.	
Severity of Life/Property Impact	1	Negligible	Less than 5% of the affected area's critical and non-critical facilities and structures are damaged/destroyed. Only minor property damage and minimal disruption of life. Temporary shutdown of critical facilities.	30%
	2	Limited	5%–25% of property in the affected area is damaged/destroyed. Complete shutdown of critical facilities for more than one day but less than one week.	
	3	Critical	25%–50% of property in the affected area is damaged/destroyed. Complete shutdown of critical facilities for more than one week but less than one month.	
	4	Catastrophic	Over 50% of critical and non-critical facilities and infrastructure in the affected area are damaged/ destroyed. Complete shutdown of critical facilities for more than one month.	
Warning Time: <i>The time between the moment a warning is issued for an impending threat or disaster and when the threat or disaster occurs. More warning time allows for better emergency preparations and dissemination of public information.</i>	1	Self-defined	More than 24 hours	10%
	2	Self-defined	12–24 hours.	
	3	Self-defined	6–12 hours.	
	4	Self-defined	Less than 6 hours.	
Duration: <i>The time local, state, and/or federal assistance will be needed to prepare for, respond to, and recover from a potential disaster event.</i>	1	Brief	Up to 6 hours.	10%
	2	Intermediate	Up to one day.	
	3	Extended	Up to one week.	
	4	Prolonged	More than one week.	
Response Capacity: <i>The local resources and capability to respond to this kind of event.</i>	1	High	Significant resources and capability to respond to this kind of event; staff are trained, experience, and ready.	10%
	2	Medium	Some resources and capability to respond to this kind of event; some staff may be trained, experienced, and ready while others may need additional support.	

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Risk Index Factor	Degree of Risk Level		Criteria	Factor Weight for Degree of Risk Level
	3	Low	Limited resources and capability to respond to this kind of event; additional staff or staff training needed.	
	4	None	No resources and capability to respond this kind of event; additional outside support required.	

The following equation was used to calculate the total Risk Factor (RF) Value for each jurisdiction:

Risk Factor Equation $\text{RF Value} = [(\text{Probability} \times .30) + (\text{Spatial Extent} \times .10) + (\text{Severity of Life/Property Impact} \times .30) + (\text{Warning Time} \times .10) + (\text{Duration} \times .10) + (\text{Response Capacity} \times .10)]$
--

Hazards with a risk factor value of 2.5–4.0 are considered high risk. Those with values of 2.0–2.4 are considered moderate, and those with values less than 2.0 are considered low risk.

Table 18: Calculated Priority Risk Index for Glenn County

Type of Hazard Event	Probability of Future Events	Spatial Event	Severity of Life/Property Impact	Warning Time	Duration	Response Capacity	Risk Factor Value
Drought	Likely (3)	Significant (3)	Negligible (1)	>24 hours (1)	Prolonged (4)	Medium (2)	Moderate (2.2)
Extreme Heat	Highly Likely (4)	Extensive (4)	Negligible (1)	>24 hours (1)	Extended (3)	Medium (2)	High (2.5)
Flood	Occasional (2)	Extensive (4)	Critical (3)	>24 hours (1)	Prolonged (4)	Medium (2)	High (2.6)
Geographic Hazards (Earthquake/ Expansive Soils/Land Subsidence)	Unlikely (1)	Small (2)	Limited (2)	<6 hours (4)	Brief (1)	Medium (2)	Low (1.8)
Levee Failure	Occasional (2)	Small (2)	Critical (3)	>24 hours (1)	Prolonged (4)	Medium (2)	Moderate (2.4)
Severe Weather - Heavy Rain	Likely (3)	Significant (3)	Negligible (1)	>24 hours (1)	Prolonged (4)	Medium (2)	Moderate (2.2)

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Type of Hazard Event	Probability of Future Events	Spatial Event	Severity of Life/Property Impact	Warning Time	Duration	Response Capacity	Risk Factor Value
Wildfire	Likely (3)	Small (2)	Limited (2)	<6 hours (4)	Prolonged (4)	Low (3)	High (2.8)

Table 19: Calculated Priority Risk Index for Orland

Hazard Type	Probability of Future Occurrence	Spatial Extent	Magnitude/severity of Life/Property Impact	Warning time	Duration	Total
Drought	Likely (3)	Significant (3)	Negligible (1)	>24 hours (1)	Prolonged (4)	11
Extreme Heat	Highly Likely (4)	Extensive (4)	Negligible (1)	>24 hours (1)	Extended (3)	12
Flood	Occasional (2)	Extensive (4)	Critical (3)	>24 hours (1)	Prolonged (4)	14
Geologic Hazards	Unlikely (1)	Small (2)	Limited (2)	<6 hours (4)	Brief (1)	10
Levee Failure	Occasional (2)	Small (2)	Critical (3)	>24 hours (1)	Prolonged (4)	12
Severe Weather – Heavy Rain	Likely (3)	Significant (3)	Negligible (1)	>24 hours (1)	Prolonged (4)	12
Wildfire	Occasional (2) (	Small (2)	Limited (2)	<6 hours (4)	Extended (3) (	13

Table 20: Calculated Priority Risk Index for Willows

Type of Hazard Event	Probability of Future Events	Spatial Event	Severity of Life/Property Impact	Warning Time	Duration	Response Capacity	Risk Factor Value
Drought	Likely (3)	Limited (1)	Negligible (1)	>24 hours (1)	Prolonged (4)	Medium – very depended on Glenn County OES (2)	Moderate (2)
Extreme Heat	Highly Likely (4)	Extensive (4)	Negligible (1)	>24 hours (1)	Prolonged (4)	Medium (2)	High (2.6)
Flood	Likely (3)	Extensive (4)	Catastrophic (4)	6 to 12 hours (3)	Extended (3)	Low – very depended on Glenn County OES (3)	High (3.4)

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Type of Hazard Event	Probability of Future Events	Spatial Event	Severity of Life/Property Impact	Warning Time	Duration	Response Capacity	Risk Factor Value
Geologic Hazards (Earthquake/ Expansive Soils/Land Subsidence)	Likely (3)	Significant (3)	Critical (3)	<6 hours (4)	Prolonged (4)	Low – very depended on Glenn County OES (3)	High (3.2)
Levee Failure	Unlikely (1)	Extensive (4)	Catastrophic (4)	<6 hours (4)	Prolonged (4)	Low (3)	High (3)
Severe Weather - Heavy Rain	Likely (3)	Extensive (4)	Limited (2)	>24 hours (1)	Prolonged (4)	Low – very depended on Glenn County OES (3)	High (2.7)
Wildfire	Likely (3)	Small (2)	Limited (2)	<6 hours (4)	Extended (3)	Low – very dependent on other organizations (3)	High (2.7)

Vulnerability Assessment

A vulnerability assessment offers a detailed representation of the losses that a community may incur in the event of a disaster. This is particularly valuable for county and city personnel and other decision-makers who must balance the costs of mitigation with the potential harm to residents and property. The assessment provides a standardized method to measure a community's exposure to natural hazards and helps identify which hazards and regions should be prioritized for disaster resilience efforts. Based on evaluating the assets at risk, hazard mitigation resources can be allocated where they are most needed, using the information provided in the hazard profiles.

For an effective vulnerability assessment, hazard mitigation analysts must be given both quantitative and qualitative information for each hazard. Quantitative data are obtained through an exposure analysis that provides the number of assets at risk of a particular hazard. For hazards that lack measurable data, qualitative data help describe how a hazard could impact the region, offering insights beyond the numbers of assets at risk. By combining these types of data, analysts can gain a comprehensive understanding of the risks associated with each hazard and develop appropriate mitigation strategies.

The hazard exposure analysis was developed using the most reliable and up-to-date data available and adheres to the methodology outlined in FEMA Local Mitigation Planning Handbook, May 2023.¹⁹ This guidebook provides a comprehensive framework for identifying and evaluating hazards, estimating potential losses, and developing strategies for mitigating risks. The analysis was conducted with utmost precision and rigor to ensure its validity and accuracy.

A comprehensive vulnerability assessment was conducted for each of the hazards delineated in Section 3.1 through Section 3.7. Geospatial data were indispensable in determining the assets exposed to specific hazards. In this regard, geospatial analysis can be conducted by overlaying the natural hazard's

¹⁹ FEMA, "Local Mitigation Planning Handbook." https://www.fema.gov/sites/default/files/documents/fema_local-mitigation-planning-handbook_052023.pdf

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

spatial footprint on a map of people and assets. Notably, Glenn County’s hazards, including dam failure, flood, wildfire, and geologic hazards, such as earthquakes, expansive soil, subsidence, and levee failure, have known geographic extents. The spatial information on these hazards is crucial in determining the areas of exposure and vulnerability of the assets.

To conduct a vulnerability analysis, access to data from several sources is required. This study used asset data from the county and cities to provide a snapshot of the impacts of the natural hazards on the assets. The term “asset data” refers to critical infrastructure in the county and cities, such as utilities, owned facilities, bridges, schools, and other community facilities that are necessary for residents (see Table 21). The MJHMP Project Team compiled a list of critical facilities various of sources, including datasets owned and maintained by the county and cities, state and federal governments, and private industry. The critical facilities were described in terms of the basic critical functions they serve for the community. They were also categorized according to FEMA’s community lifelines so that results could be filtered accordingly.

Table 21: Critical Facilities by Community Lifeline and Jurisdiction

Lifeline	County	Orland	Willows	Total
Communications	3	0	0	3
Energy	3	0	0	3
Food, Hydration, Shelter	1	2	0	3
Hazardous Materials	2	1	1	4
Health and Medical	3	4	4	11
Safety and Security	31	24	19	74
Transportation	4	4	2	10
Water Systems	29	6	17	52
Total	76	41	43	160

Hazus 6.0 was used to estimate potential losses for four hazard scenarios: 100-year flood, 500-year flood, an M5.8 Probabilistic Earthquake, and an M6.8 Great Valley Fault scenario earthquake. The models estimate the amount of damage that could be expected for different building occupancies, critical facilities, transportation systems, and utilities from these events. Table 22 shows the total value of exposed buildings in Orland, Willows and Glenn County, grouped by the building occupancy type. These values can be compared with the results in the flood and earthquake hazard profiles to understand the impact of the projected losses.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

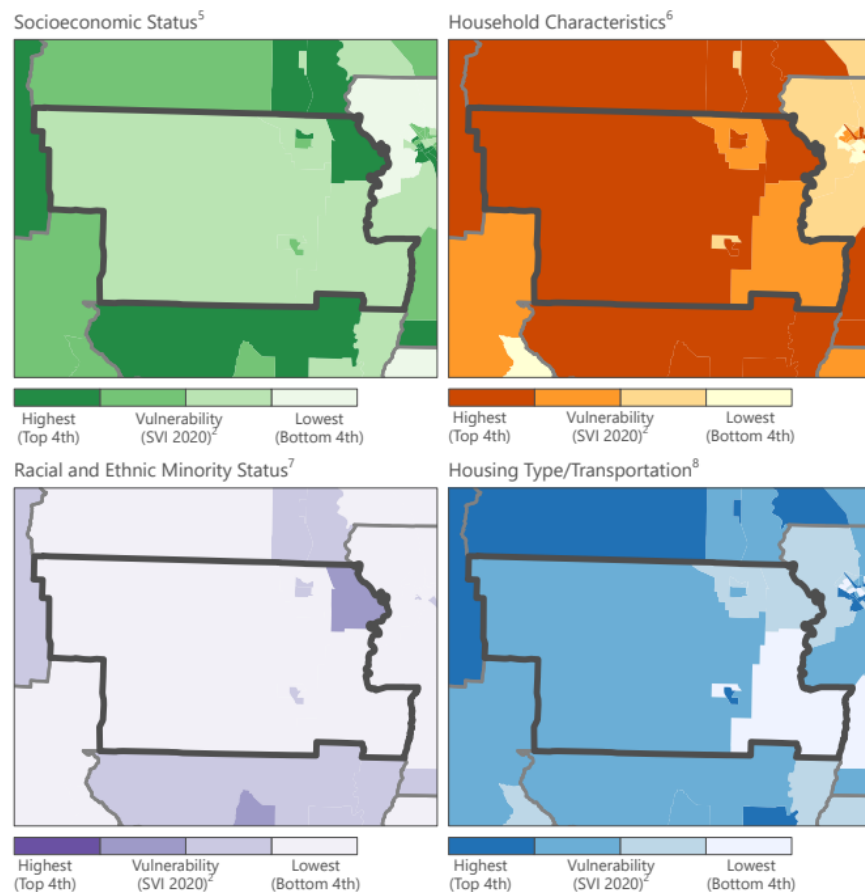
Table 22: Values of Exposed Buildings and Their Contents, by Occupancy

	Residential	Commercial	Industrial	Agriculture	Religious	Government	Education	Total Exposure
Orland	\$974,377,000	\$898,093,000	\$173,811,000	\$7,798,000	\$70,322,000	\$48,855,000	\$184,694,000	\$2,357,950,000
Willow	\$839,310,000	\$759,713,000	\$86,139,000	\$16,576,000	\$86,074,000	\$167,937,000	\$183,972,000	\$2,139,721,000
County	\$2,371,513,000	\$923,552,000	\$1,506,164,000	\$2,330,638,000	\$98,324,000	\$137,857,000	\$159,932,000	\$7,527,980,000
Total	\$4,185,200,000	\$2,581,358,000	\$1,766,114,000	\$2,355,012,000	\$254,720,000	\$354,649,000	\$528,598,000	\$12,025,651,000

Vulnerable Populations

Socioeconomic and demographic characteristics affect how people are impacted by disasters and their ability to access the resources needed to recover. These factors can include age (both children and elderly), gender, income, disabilities, housing conditions, English-speaking proficiency, racial and ethnic background, and access to transportation. People who exhibit one or more of these vulnerability characteristics often experience more severe effects from a disaster. To better understand the impacts of hazards on different demographic groups in Glenn County, a variety of tools and data were used.

A convenient way to get an overall understanding of vulnerability is to use an index, which summarizes a series of variables into a simplified value. The Social Vulnerability Index (SVI) summarizes 16 variables in four themes: Socioeconomic Status, Household Characteristics, Racial and Ethnic Minority Status, and Housing Type/Transportation. These data can be displayed in tabular form or by geographic distribution in a map, as shown in Figure 16. The northwest corner of the county near Hamilton showed higher vulnerability in socioeconomic, household, and racial/ethnic minority status. Orland and Willows showed moderately high to high vulnerability in all four themes. Unincorporated areas in the western area of the county showed higher vulnerability in household characteristics and housing type/transportation. These trends are considered when discussing possible impacts on the population in each hazard profile.



Source: CDC/ATSDR Social Vulnerability Index, 2020.

https://svi.cdc.gov/Documents/CountyMaps/2020/California/California2020_Glenn.pdf

Figure 16: Glenn County Social Vulnerability Themes

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

In addition to the SVI, a series of demographic reports were developed using the Environmental Systems Research Institute, Inc. (Esri) Business Analyst Tool, including At-Risk Populations (Figure 17). A series of maps showing individual vulnerability characteristics were generated using 2020 Census and American Community Survey (ACS) demographic variables, published in the Esri Demographics gallery.²⁰ These include characteristics such as age, language, disability, and income. The results of some of these variables are shown in Figure 18 through Figure 21.

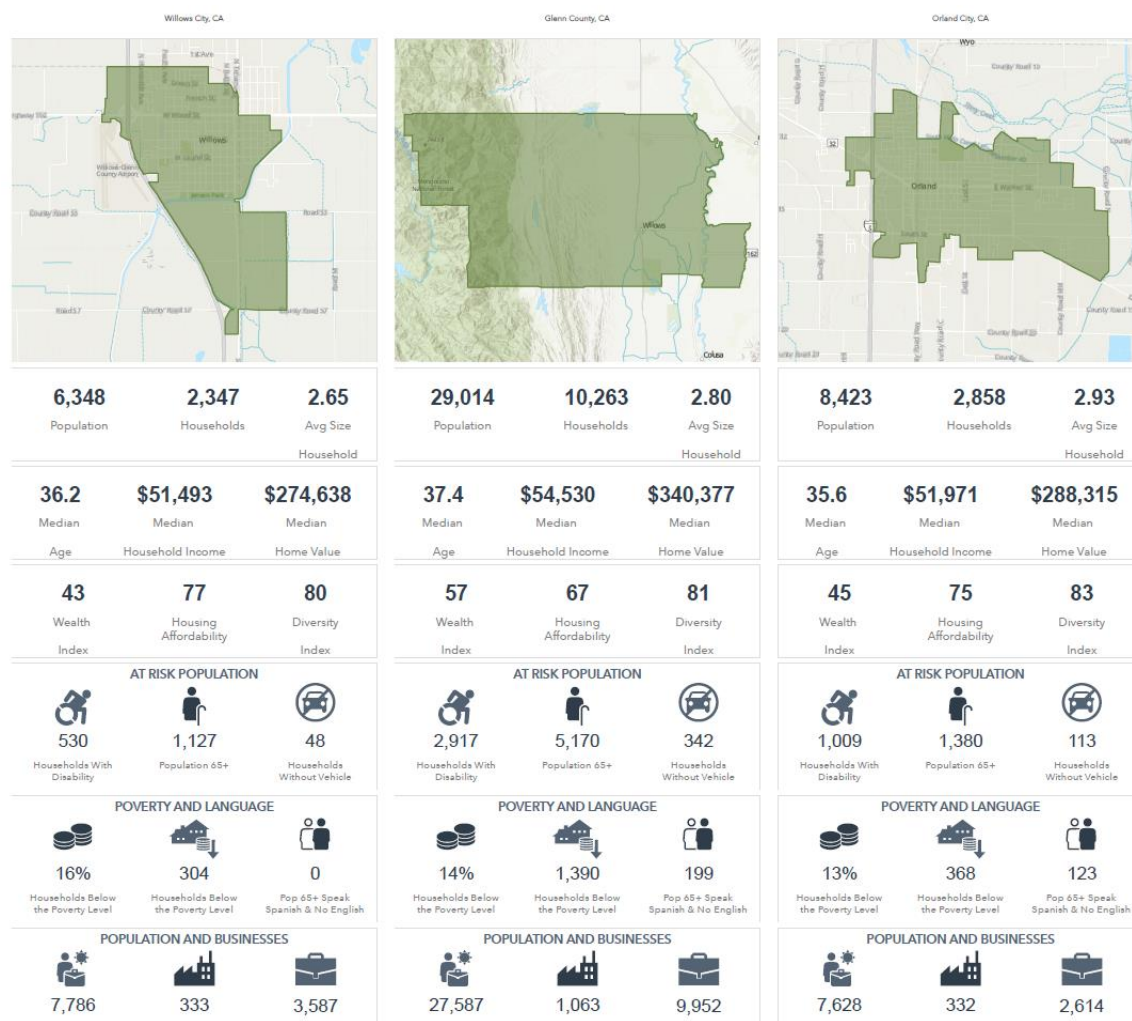


Figure 17: Comparison of At-Risk Populations in Willows, Glenn County, and Orland

The Climate and Economic Justice Screening Tool (CEJST) is a tool from the Council on Environmental Quality to identify communities that are experiencing burdens in one or more of eight categories: climate change, energy, health, housing, legacy pollution, transportation, water and wastewater, and workforce development. The tool was originally designed to identify communities that could benefit from investments in climate, clean energy, and other resources as part of the Justice40 initiative. However, it also serves as a reference for communities which are overburdened and underserved and which might experience

²⁰ Esri Demographics.

https://www.arcgis.com/home/search.html?restrict=false&sortField=relevance&sortOrder=desc&searchTerm=owner%3A%22esri_demographics%22#content

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

disadvantages in relation to natural hazards. The climate change threshold includes several indicators related to natural hazards, such as flooding, wildfire, and agricultural losses.

CEJST identified three census tracts in Glenn County as disadvantaged. These areas are considered disadvantaged because they meet one or more burden threshold and the associated socioeconomic threshold. Table 23 identifies the burdens met for each of these communities.

Table 23: CEJST Threshold for Disadvantage Communities

Orland	Willows	Hamilton
Agricultural loss rate	Agricultural loss rate	Agricultural loss rate
Projected flood risk	Projected flood risk	Projected flood risk
PM2.5 in the air	PM2.5 in the air	PM2.5 in the air
Wildfire risk		
	Wastewater discharge	
		Lack of green space
		Linguistic Isolation
High school education	High school education	High school education
Low income	Low income	Low income
<p>Agricultural loss: Economic loss in agricultural value from natural hazards each year.</p> <p>Projected flood risk: Risk to properties from projected floods in the next 30 years.</p> <p>Projected wildfire risk: Risk to properties from wildfire from fire fuels, weather, humans, and fire movement in the next 30 years.</p> <p>PM2.5 in the air: Inhalable particles, 2.5 micrometers or smaller.</p> <p>Lack of green space: The amount of land, not including crop land, covered with artificial materials, such as concrete and pavement.</p> <p>Wastewater discharge: Modeled toxic concentrations at stream segments within 500 meters, divided by distance in kilometers.</p> <p>Linguistic isolation: The share of households where no one over age 14 speaks English very well.</p> <p>High school education: Percent of people aged 25 years or older without a high school diploma.</p> <p>Low income: People in households where income is less than or equal to twice the federal poverty level.</p>		

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

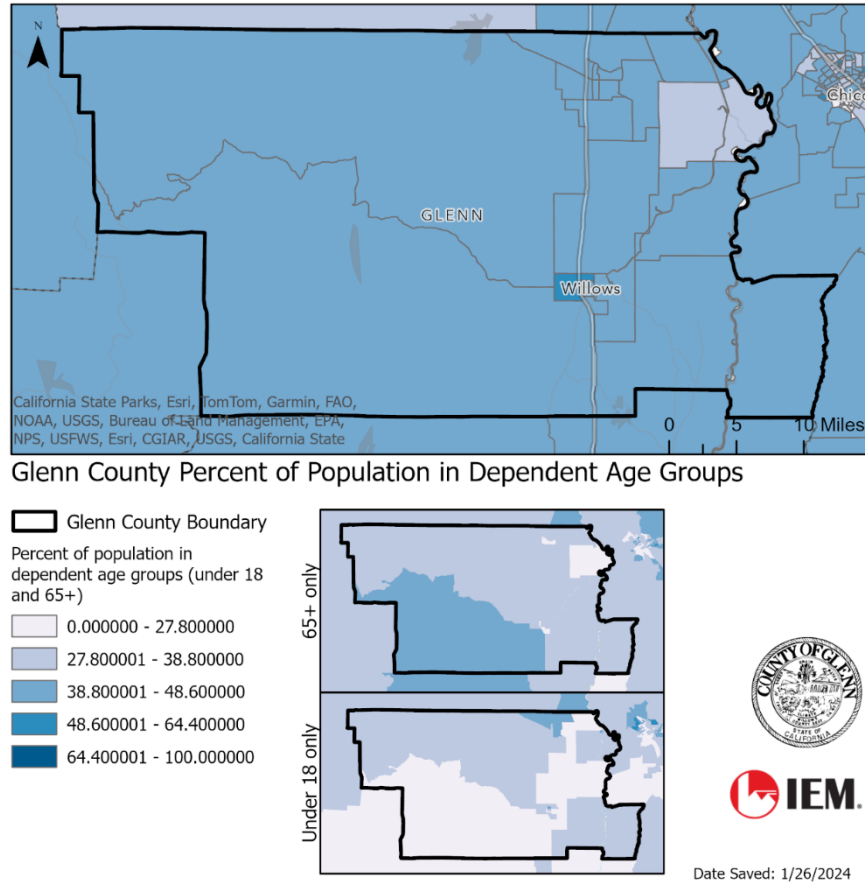


Figure 18: Dependent Age Vulnerability for Glenn County

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

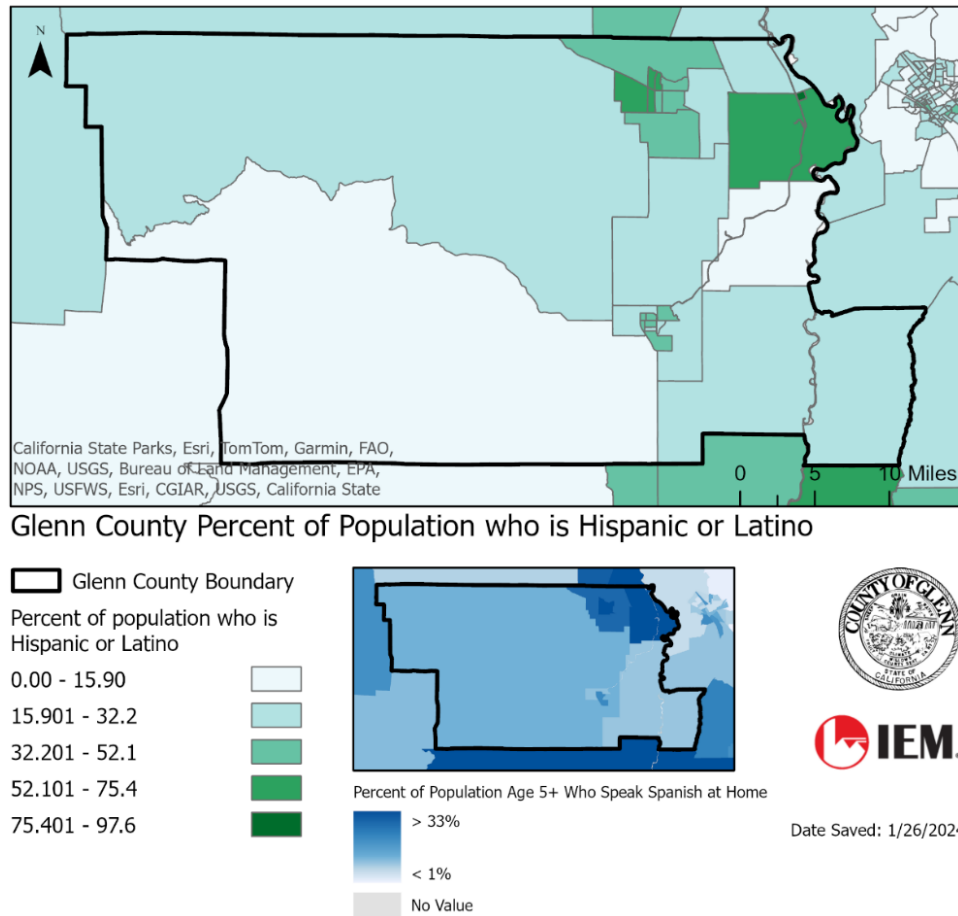


Figure 19: Hispanic or Latino Population and Spanish Speaking in Glenn County

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

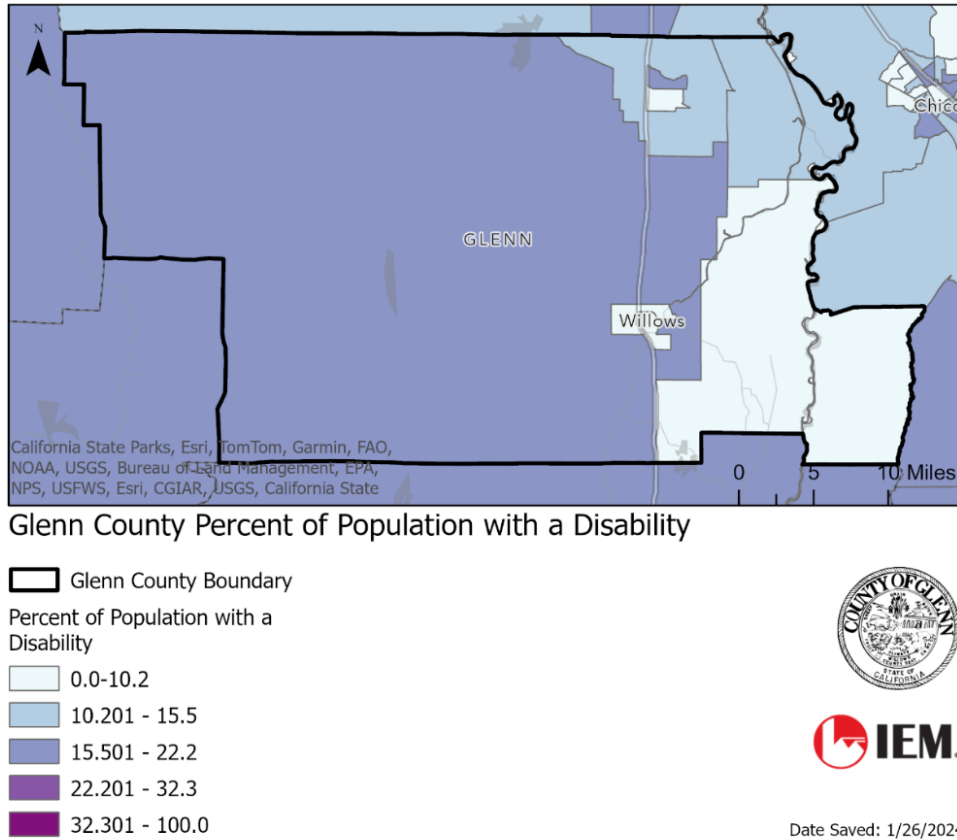


Figure 20: Percentage of Glenn County Population with a Disability

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

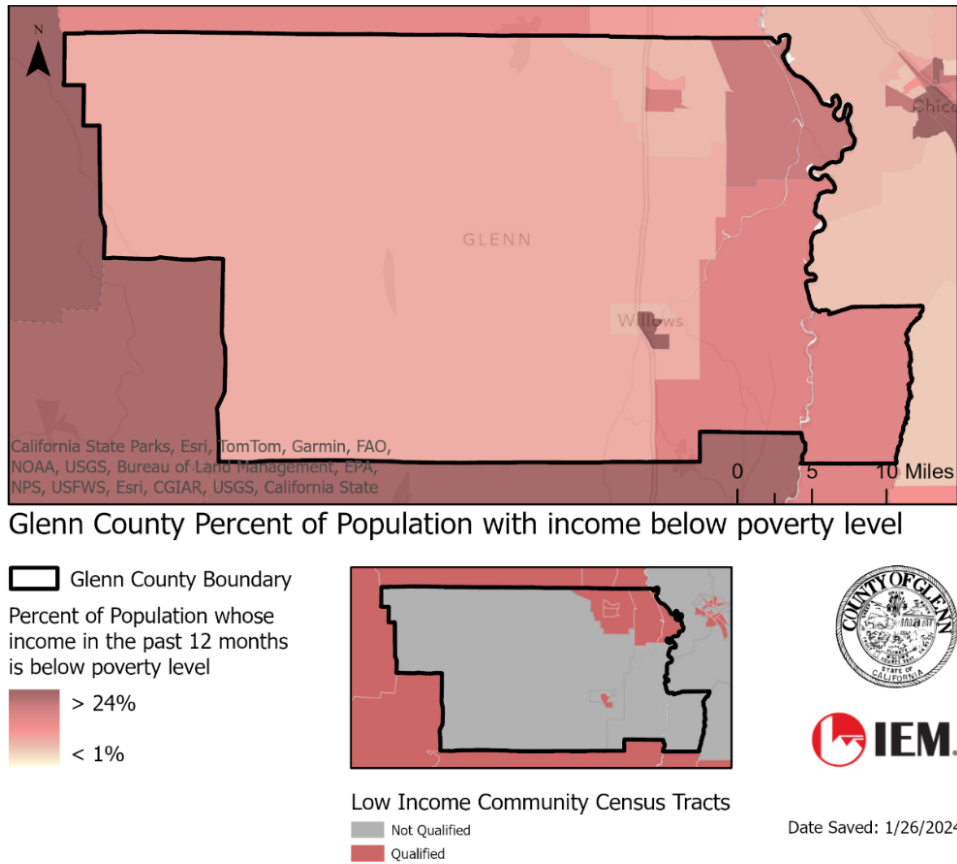


Figure 21: Glenn County Population below the Poverty Level

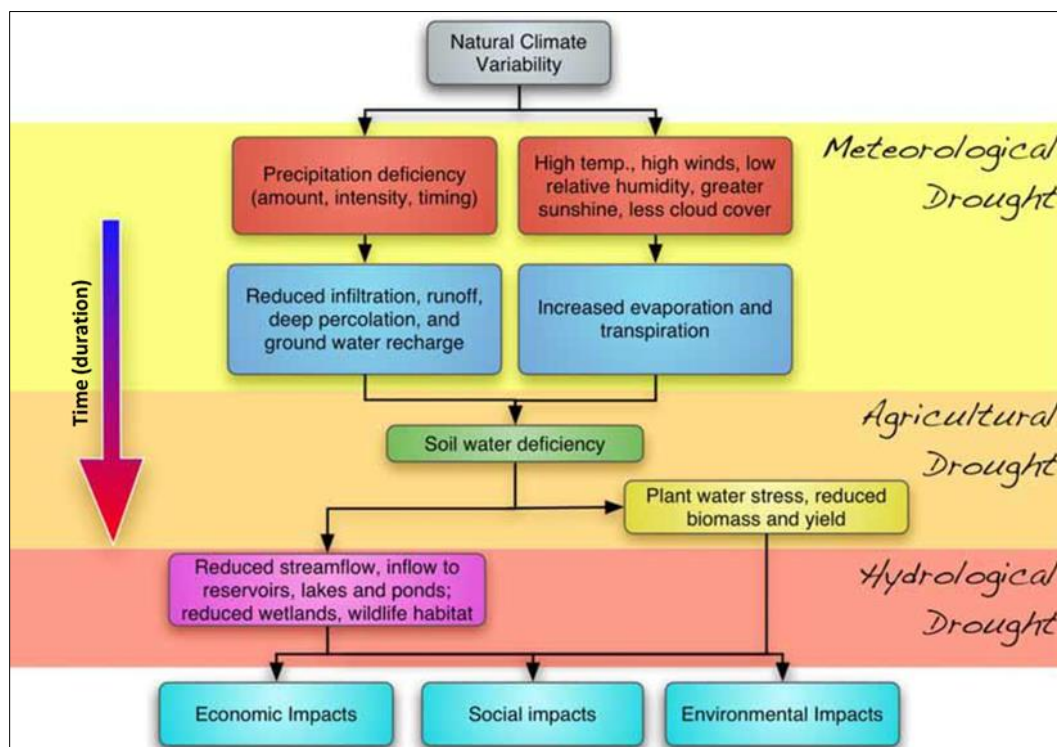
Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

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Section 3.1 Drought

Drought is an intrinsic cyclic feature of the climate that prevails across most geographical regions, albeit with varying degrees of severity and characteristics. The magnitude of its impact is contingent on a myriad of factors, such as duration, intensity, geographic extent, and demands on the regional water supply by humans, livestock, and vegetation. Climatic factors, such as prolonged high winds and low relative humidity, can exacerbate the severity of drought.

Drought arises from a lack of precipitation that persists for an extended period, typically one or more seasons, and can culminate in a water shortage for specific activities, groups, and environmental sectors. Drought is a multifaceted natural hazard that is commonly described through four distinct definitions and represented in Figure 22.



Source: Semantic Scholar, "Methodology for development of drought severity-duration-frequency (SDF) Curves."

[https://www.semanticscholar.org/paper/Methodology-for-development-of-drought-\(SDF\)-Curves-Rahmat/dfd51bf8969149b75ee6f15fcd39380f79bdd8fd](https://www.semanticscholar.org/paper/Methodology-for-development-of-drought-(SDF)-Curves-Rahmat/dfd51bf8969149b75ee6f15fcd39380f79bdd8fd)

Figure 22: Types of Droughts and Their Development

- **Agricultural Drought:** A naturally occurring phenomenon that arises when the moisture levels of the soil fall below the water requirements of plant life and dehydrate crops. It is a significant concern for farmers and businesses, as it can have far-reaching consequences for agricultural yields, food security, and overall economic stability.
- **Hydrological Drought:** This is related to the impact of precipitation shortfalls on stream flows and water levels in reservoirs, lakes, and groundwater. This phenomenon is characterized by a significant shortage of rainfall, leading to a reduction in the availability of water resources. The effects include a decrease in the quantity and quality of available water, which can have serious implications for various sectors, including agriculture, forestry, and public health.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

- **Meteorological Drought:** A weather phenomenon characterized by the degree of dryness. It is the departure from the average or normal precipitation based on monthly, seasonal, or annual time frames. It is a significant concern for businesses and academic institutions, as it can severely impact agriculture, water resources, and the environment.
- **Socioeconomic Drought:** An economic phenomenon whereby the supply and demand of economic goods or services become imbalanced because of meteorological, hydrological, and agricultural droughts. This type of drought is characterized by a weather-related shortfall in the water supply, leading to a situation where the demand for water exceeds its supply. This is often called a water management drought, as it requires effective management practices to ensure the proper allocation and distribution of water resources. The implications of socioeconomic drought can be far-reaching, impacting various sectors of the economy, including agriculture, industry, and urban water supply.

Although climate is a primary contributor to hydrological drought, other factors, such as changes in land use (e.g., deforestation), land degradation, and dam construction, all affect the basin's hydrological characteristics. Since hydrologic systems interconnect regions, the impact of meteorological drought may extend well beyond the borders of precipitation-deficient areas. Similarly, changes in land use upstream may alter hydrologic characteristics, such as infiltration and runoff rates, resulting in a more variable streamflow and a higher incidence of hydrologic drought downstream. Land use change is one of the ways in which human actions alter the frequency of water shortages, even when no change in the frequency of meteorological drought has been observed.

Because of its multi-dimensional nature, drought represents a significant challenge in terms of defining it and conducting comprehensive risk assessments. Drought differs from other natural hazards in three fundamental ways. First, the onset and conclusion of a drought are difficult to determine because of the event's slow accumulation and lingering effects after its apparent end. Second, the lack of an exact and universally accepted definition adds to the confusion about its existence and severity. Third, in contrast to other natural hazards, the impact of drought is less obvious and may be spread over a larger geographic area. These attributes have made it difficult for many governments to prepare and implement drought contingency or mitigation plans.

Drought should not be perceived merely as a physical or natural phenomenon. Rather, its impact on society comes from the interaction between natural climatic variability, which manifests as less precipitation than anticipated, and a greater demand for water. Human activities further exacerbate the impact of drought. Recent droughts in both developing and developed countries, with their economic and environmental repercussions and personal hardships, have underscored the vulnerability of all societies to this "natural" hazard. Droughts can cause a lack of water for household and industrial consumption, hydroelectric power, recreation, and navigation. Water quality also may deteriorate, and the number and severity of wildfires may rise. Severe droughts may result in the loss of agricultural crops and forest products, undernourished wildlife and livestock, lower land values, and higher unemployment.

Regulatory Environment

Several regulatory requirements and documents have been developed in Glenn County to address drought planning. These include the 2012 Groundwater Coordinated Resource Management Plan, the 2006 Northern Sacramento Valley Four County Regional Water Management Group, the 2015 Glenn County Water Advisory Committee, the 2023 Glenn County General Plan Update, a Drought Taskforce established by the Glenn County Board of Supervisors in 2021, and the 2015 Glenn County Emergency Operations Plan.

These documents and requirements are of great importance to Glenn County's ability to prepare for and respond to drought conditions. They provide a framework for managing and conserving water resources, and they help ensure that emergency plans are in place to protect residents and businesses during times of drought. Therefore, it is essential that these regulatory requirements and documents are regularly

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

reviewed and updated to reflect changes in the local landscape and to ensure that they remain effective in promoting drought resilience and preparedness.

2012 Glenn County Groundwater Coordinated Resource Management Plan Update

The drought issue in Glenn County has been addressed by implementing the 2012 Groundwater Coordinated Resource Management Plan. The Board of Supervisors has acknowledged that safeguarding groundwater resources for use in the county is necessary to ensure its residents' health, welfare, and safety. Furthermore, the Board has emphasized the critical role of maintaining a safe yield of groundwater in supporting the county's economy. As such, it is imperative to ensure the continued availability of groundwater while strictly adhering to the principles of safe yield, which prohibit extracting groundwater beyond its capacity, degrading groundwater quality, and land subsidence.

Inadequate management and monitoring of groundwater resources may have adverse impacts. These negative effects include resource depletion, contamination, and water quality degradation. To ensure the sustainable use of groundwater resources, it is imperative to establish and maintain a robust monitoring system that tracks the quality and quantity of the resources over time. By doing so, stakeholders can identify potential issues early and take corrective measures to mitigate any negative impacts on the resource, such as the following:

1. Lowering groundwater levels leads to increased energy consumption, the cost of deepening existing wells, and the prospect that new wells will have to be deeper and more costly than would otherwise be required.
2. Damage to public roads, bridges, canals, and other structures caused by land subsidence can create substantial costs to the public treasury.
3. Drying up of surface and subsurface flows leads to the potential loss of critical riparian and wetland habitats.
4. Degradation of groundwater quality leads to increased salinity or higher concentrations of contaminants.
5. The water needs of county residents, the vibrancy of the agricultural economy, and the rural lifestyle are challenged.

The purpose and intent of this management plan is to establish an effective policy on groundwater and coordinated resource management. The goal is to ensure that the county's overall health, welfare, safety, economy, and environment are not negatively impacted. To accomplish this objective, the plan aims to establish strategies to promote efficient resource management while minimizing the potential environmental impacts of such activities. Furthermore, this plan seeks to provide clear guidelines for managing groundwater as a valuable resource, recognizing the importance of conserving it for future generations.

Through this approach, the county can maintain a sustainable balance between using its natural resources and preserving its ecological health. Implementing this plan will require the cooperation and coordination of all stakeholders, including government officials, industry representatives, and the public.²¹

²¹ County of Glenn, "Title 20 Water."
https://www.countyofglenn.net/sites/default/files/resources/County_Code_Directory/Title%2020.pdf

City of Orland Municipal Code 17.85.040

Chapter 17.85, Section 4 of the Municipal Code of Orland stipulates that all newly introduced vegetation must consist of native, drought-tolerant species that are compatible with the predominant natural setting of the project area. This indicates that the region has recognized the drought affecting the southwestern portion of the United States and has begun to implement measures to cope effectively by requiring drought-tolerant vegetation to be planted in areas of new vegetation.

2009 Northern Sacramento Valley Four County Regional Water Management Group

The counties of Butte, Colusa, Glenn, and Tehama have a long-standing collaboration on resource management issues. This partnership was made official through the Four County Memorandum of Understanding (Four County MOU) in early 2006. The group is now known as the Four County Group. Over time, three addendums were added to the MOU, which clearly outlined the working relationship between these four counties and added Sutter County to the group in 2009.²² This document was created in response to the California Department of Water Resources Regional Acceptance Process (RAP), as described in the guidelines published in December 2008, to define the way that neighboring and/or overlapping integrated regional water management plans (IRWMPs) will work together in the management of water and other natural resources in the State of California.

Since its inception, the Four County Group has been actively meeting with other IRWMP groups in the Sacramento River Hydrologic Area to coordinate their efforts to ensure optimal resource management in the larger region. The Four County Group is a continuously evolving planning effort that is constantly changing and adapting to new situations. While the Butte County plan serves as a foundational document, it also represents the starting point for a more extensive and inclusive regional approach to resource planning. This approach aims to satisfy the needs and desires of all five counties and other interested groups and organizations in the planning region. As the process has evolved, additional partnerships have formed, with some IRWMPs undergoing changes and consolidations, much like the expansion of the Four County Group.

2015 Glenn County Water Advisory Committee

The Glenn County Water Advisory Committee was established in response to pressing drought issues in the region. The committee is responsible for ensuring an adequate, affordable, and sustainable supply of good-quality water to cater to the needs of the agricultural, industrial, recreational, environmental, residential, and municipal users in the county, both now and in the future. The committee's mandate is to ensure that all stakeholders have access to a reliable water supply that meets the highest standards of quality and affordability, thereby promoting the sustainable development of the region.

Sustainable Groundwater Management Act (SGMA)

The Sustainable Groundwater Management Act (SGMA) requires local Groundwater Sustainability Agencies (GSAs) in high- and medium-priority basins to develop and implement Groundwater

²² County of Glenn, "Northern Sacramento Valley Four County Group Integrated Regional Water Management Regional Acceptance Process 2009 Application."
https://www.countyofglenn.net/sites/default/files/Water_Advisory_Committee/FourCountyRAP042609_000.pdf

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

Sustainability Plans (GSPs).²³ These plans provide a roadmap for how groundwater basins will reach long-term sustainability. Glenn County includes three subbasin GSAs: Butte, Colusa, and Corning. These agencies have authority to manage groundwater to avoid chronic lowering of groundwater levels, reduction of groundwater storage, seawater intrusion, degraded water quality, land subsidence, and depletions of interconnected surface water.²⁴

2023 Glenn County General Plan

The 2023 Glenn County General Plan addresses drought in policies COS 6-5, COS-3d, and LU 4-7c as part of the discussion of the Groundwater Sustainability Plan.²⁵ The GSP also states that local priorities should be established for water use and placed in the general plan. Staff should be assigned to monitor drought-related actions at the state and federal levels.

Location/Geographic Extent

Drought can adversely affect the entire state of California and can occur in any region of the country, regardless of location or time. The water supply in Glenn County is particularly susceptible to the adverse effects of drought. The scarcity of precipitation in the Sierra Nevada, coupled with the depletion of groundwater levels, can significantly impact the water supply in the county. This is primarily based on the county's dependence on the Upper Sacramento River and Coast Range watersheds for its water supply. Drought has no defined geographic boundaries. All of Glenn County, including the cities of Orland and Willows, is subject to drought.

Magnitude/Extent

There is no commonly accepted return period or non-exceedance probability for defining the risk of drought (such as the 100-year or one percent annual chance of flood). The magnitude of drought is typically measured based on the time of its occurrence and the severity of the hydrologic deficit. However, several resources are available to evaluate drought status and forecast expected conditions.

The National Integrated Drought Information System (NIDIS) Act of 2006 (Public Law 109-430) ensures an interagency approach to drought monitoring, forecasting, and early warning. The U.S. Drought Portal is a web-based platform that provides access to several drought-related resources, including the U.S. Drought Monitor (USDM), Figure 23, and the U.S. Seasonal Drought Outlook (USSDO), as shown in Figure 24. These resources can help in evaluating drought conditions and making informed decisions to mitigate its impact.

As shown by the red oval in Figure 23, Glenn County was not experiencing drought conditions at when this report was being drafted. However, historic records available in the USDM show that extreme and exceptional droughts have occurred in Glenn County in the past 10 years. This is discussed further in the section on Past Occurrences.

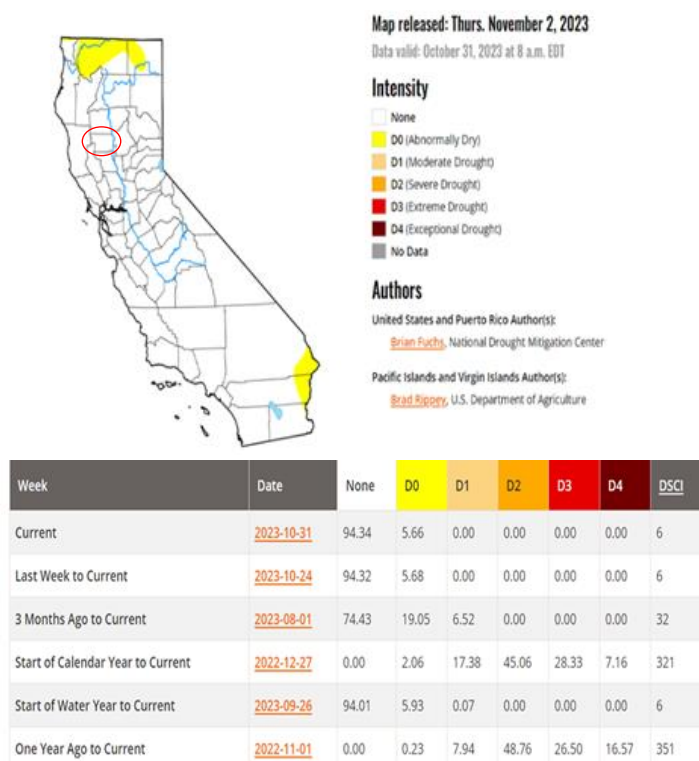
²³ California Department of Water Resources Groundwater Sustainability Plans.
<https://water.ca.gov/Programs/Groundwater-Management/SGMA-Groundwater-Management/Groundwater-Sustainability-Plans>

²⁴ County of Glenn Water Resources, Sustainable Groundwater Management Act.
<https://www.countyofglenn.net/dept/planning-community-development-services/water-resources/sustainable-groundwater-management-4>

²⁵https://static1.squarespace.com/static/5c8a73469b7d1510bee16785/t/6501ddc090fa5b221162db04/1694621148151/GlennCounty_General+Plan+Adopted+7-18-23.pdf

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Appendix C: Plan Review Documents



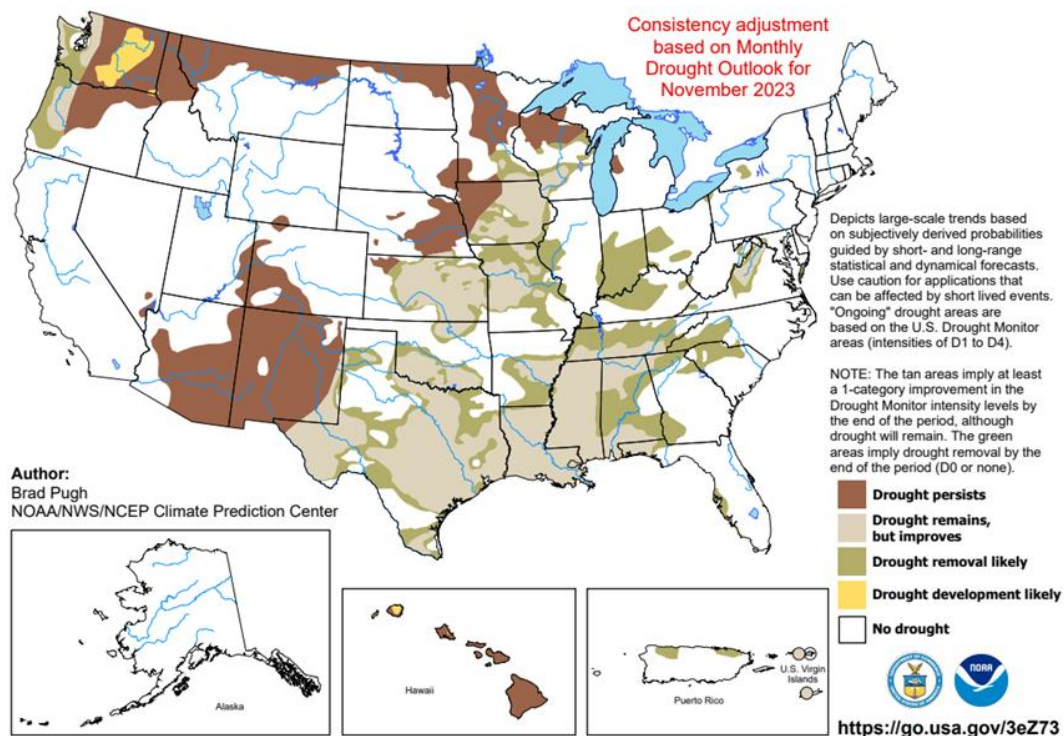
Source: U.S. Drought Monitor, "California."
<https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?CA>

Figure 23: Drought in the State of California, November 2, 2023

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

The US Seasonal Drought Outlook (USSDO) in Figure 24 projects potential drought conditions for the next three months. Currently, California is not experiencing drought.

Several indices measure how much precipitation for a given period deviates from historically established norms. The primary indicator for the USDM and USSDO for the western United States is the Palmer Drought Severity Index (PDSI, see Figure 25). The PDSI is widely used by the U.S. Department of Agriculture (USDA) to determine when to grant emergency drought assistance to affected areas. This new experimental implementation of the PDSI is updated every five days using the high-resolution gridMET gridded research dataset and data from the USDA State Soil Geographic Database (STATSGO). The PDSI is a standardized index based on a simplified soil water balance and estimates relative soil moisture conditions. The magnitude of the PDSI indicates the severity of the departure from normal conditions. A PDSI value >4 represents very wet conditions, while a PDSI <-4 represents an extreme drought.

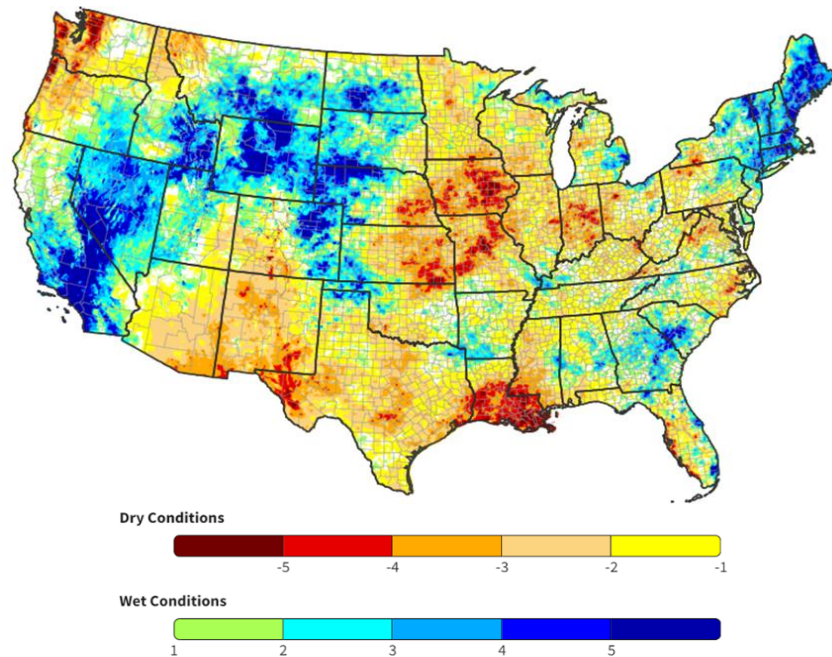


Source: U.S. Drought Monitor, "California."

<https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?CA>

Figure 24: Drought Tendency in the United States, November 01, 2023–January 31, 2024

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

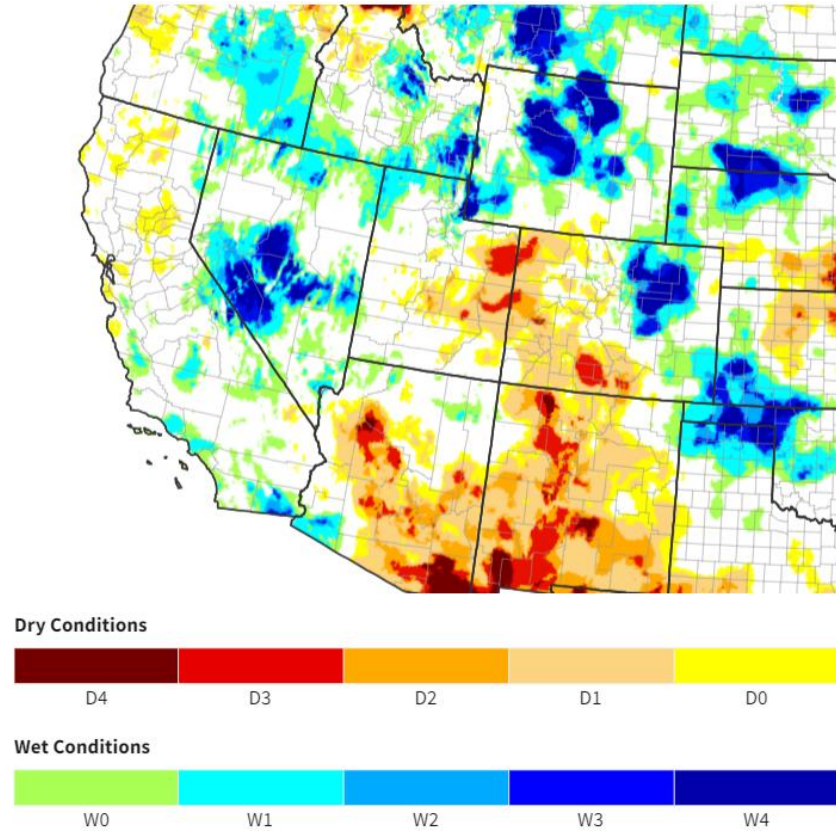


Source: National Integrated Drought Information System, "U.S. Gridded Palmer Drought Severity Index (PDSI) from gridMET." <https://www.drought.gov/data-maps-tools/us-gridded-palmer-drought-severity-index-pdsi-gridmet#:~:text=The%20PDSI%20is%20a%20standardized,4%20represents%20an%20extreme%20drought>

Figure 25: Drought Severity in the United States

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

For western states with mountainous terrain and complex regional microclimates, it is also useful to supplement PDSI values with other indices, such as the Surface Water Supply Index and the Standardized Precipitation Index (SPI). The Surface Water Supply Index takes snowpack and other unique conditions into account. The National Drought Mitigation Center (NDMC) uses the SPI to identify emerging drought months sooner than the PDSI does. It is computed on various time scales to monitor moisture supply conditions. The SPI is the number of standard deviations in the precipitation value that deviate from the long-term mean. As shown in Figure 26, the SPI through January 2024 for Glenn County is currently neither drier nor wetter than normal.

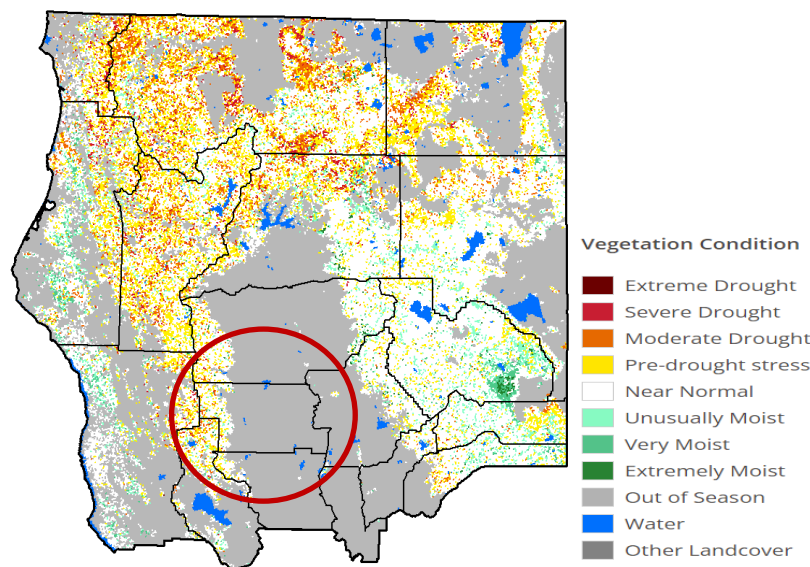


Source: <https://www.drought.gov/data-maps-tools/us-gridded-standardized-precipitation-index-spi-nclimgrid-daily>

Figure 26: 12-Month Standard Precipitation

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

The Vegetation Drought Response Index (VegDRI) is a weekly indicator of vegetation stress across the contiguous United States. It provides fine-resolution (1 km²) data based on remote sensing information, which considers climate and biophysical data to determine the underlying cause of vegetation stress. The NDMC, the U.S. Geological Survey's National Center for Earth Resources Observation and Science, and the High Plains Regional Climate Center have collaborated to develop the VegDRI map and associated products. Figure 27 presents the VegDRI results for California Region 1 on November 5, 2023, with Glenn County circled in red.



Source: <https://vegdrv.unl.edu/Home/VegDRIQuad.aspx?CA,1>

Figure 27: Vegetation Drought Response Index Region 1, November 05, 2023

Past Occurrences

Glenn County has experienced 13 instances of drought since 1977, one of which was declared a federal disaster. Figure 28 is a graph from the Drought Monitor Index of several periods of drought since 2000. Although record-breaking storms in 2022 and early 2023 brought substantial rain and snow to California, the area has yet to fully recover because of heat waves, evaporation, and lack of available water. Moreover, atmospheric thirst, a phenomenon in which warm air holds more moisture, further contributes to drought, as it absorbs water from lakes, plants, and soil, exacerbating the depletion of water supplies. The lack of replenishment in water sources from the previous drought has impeded the full recovery of parched land. Despite this, drought conditions have eased across most of the state.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

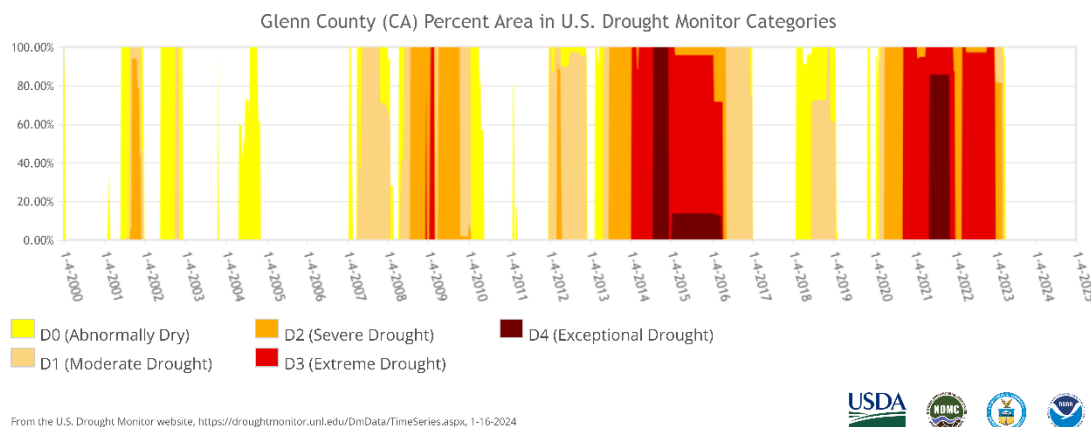


Figure 28: Drought Monitor Time Series Chart for Glenn County

A major drought affected California from 2012 to 2016, when there was extremely low precipitation, below-average snowpack, and record low PDSI values. In sharp contrast, the Sacramento Valley experienced its wettest year on record in 2016–2017, with an above-average number of atmospheric rivers.

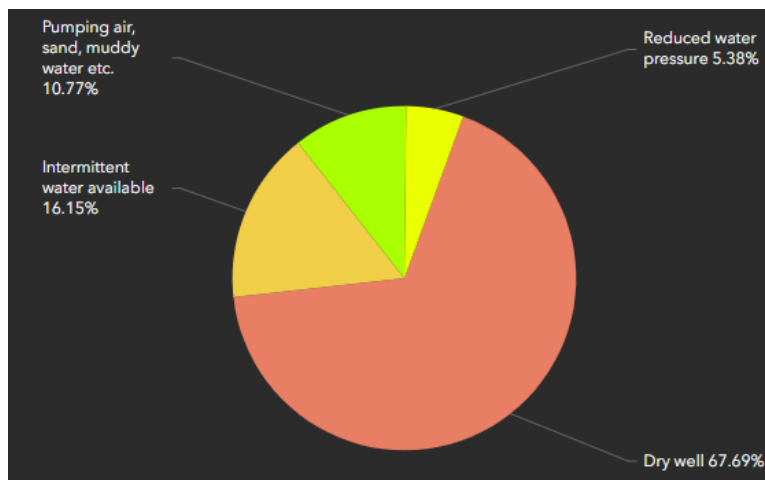
In early 2021, Glenn County and the entire state of California entered a drought period. Because of critically low rainfall and water storage supplies, Glenn County proclaimed a local drought emergency. Most water shortages were reported in Tehama and Glenn Counties. In July 2021, 58 well water shortages in Glenn County were reported. In July, state officials analyzed 175 wells in Glenn County and found that about 84% had reached historically low levels. Of these wells, 31% had reached their lowest levels recorded for that month, while 53% were in the lowest 10th percentile compared to historic levels.

An additional 178 wells were not included in the analysis because no historical or recent measurements were available.²⁶ Glenn County also implemented a survey for residents to report dry wells and is tracking well conditions with a dashboard, including results, as shown in Figure 29. Figure 30 shows where dry wells were reported, with the greatest number occurring near Orland.

²⁶ Cal Matters, “California enacted a groundwater law 7 years ago. But wells are still drying up-and the threat is spreading.” <https://calmatters.org/environment/2021/08/california-groundwater-dry/>

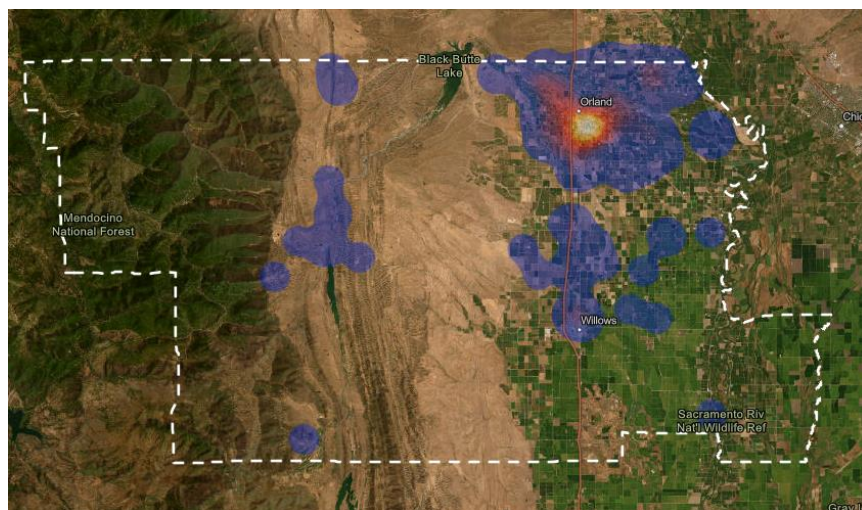
Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Appendix C: Plan Review Documents



Source: Planning and Community Development Services, “Well Incident Data Summary.” <https://storymaps.arcgis.com/stories/d24176a9a1974ffd8b6e4e51deff8540?fbclid=IwAR1Gg7QIbFSF6fVmY4URVmSAdFFDnCcHi4BfshszxggB2FMVq7TbUtDKuo8>

Figure 29: Ground Water Supply Issues in Glenn County, 2022–2023



Source: Planning and Community Development Services, “Well Incident Data Summary.” <https://storymaps.arcgis.com/stories/d24176a9a1974ffd8b6e4e51deff8540?fbclid=IwAR1Gg7QIbFSF6fVmY4URVmSAdFFDnCcHi4BfshszxggB2FMVq7TbUtDKuo8>

Figure 30: Dry Wells in Glenn County, 2021–2022

The California Division of Water Resources maintains multiple tools for tracking groundwater trends over time. Groundwater basins act as buffers between wet and dry periods by providing additional supply during dry years. Eighty-five percent of Californians rely on groundwater for some portion of their water supply. Groundwater levels serve as a proxy for groundwater storage and provide valuable information on seasonal fluctuations, long-term changes, and trends in groundwater storage. These data show that water levels respond differently to precipitation at the regional and local levels. The supply depends on a complex interaction of water recharge and management, precipitation, the use of surface and recycled

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

water, and groundwater pumping.²⁷ Figure 31 shows that numerous wells in Glenn County have had declining groundwater levels over the past 20 years and Figure 32 shows current groundwater conditions.

The drought that started in the summer of 2020 and lasted until spring 2021 was caused by a lack of rain over four consecutive seasons. The driest summer on record occurred in 2020, with extremely dry conditions in August. From winter 2020 to spring 2021, drought conditions worsened because of the development of La Niña in the tropical Pacific Ocean. Over decades, variability in the Pacific Ocean also contributed to the drought in the southern region by making the cool season drier over the last twenty years. Moreover, there is evidence that human-driven climate change is causing the southern region to become drier in the spring. In conclusion, the drought was caused by a combination of internal atmospheric variability, interannual climate variability, natural decadal variability, and human-driven climate change.²⁸

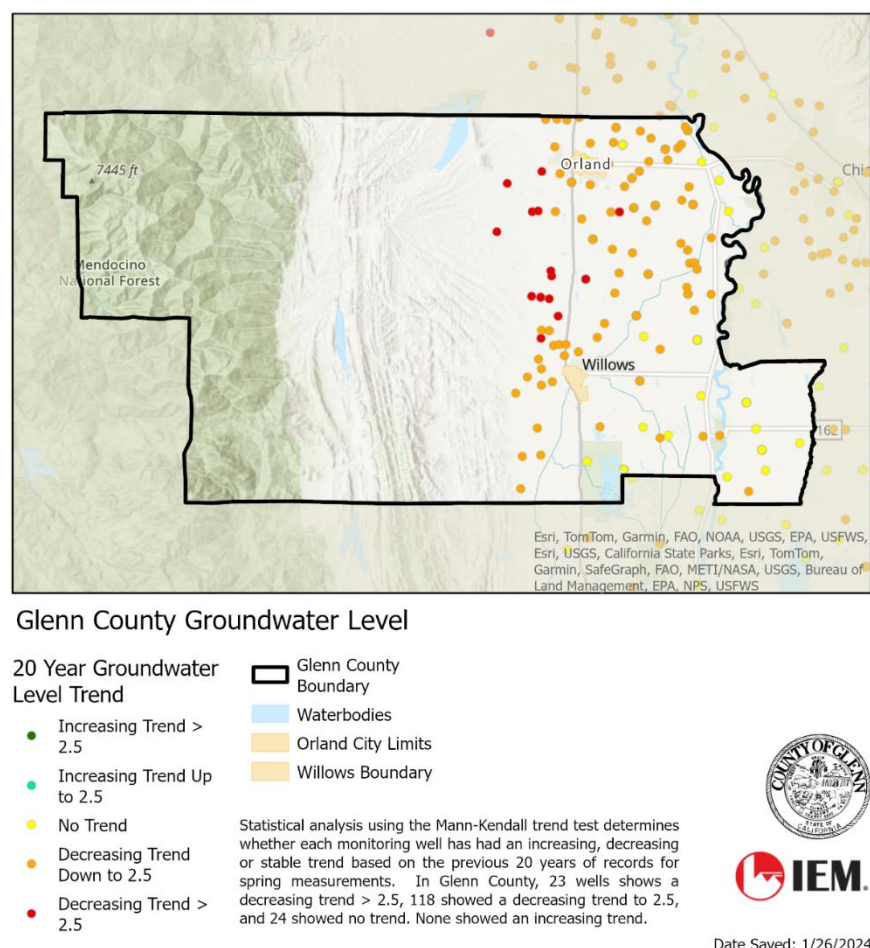


Figure 31: 20-Year Trends in Groundwater Levels in Glenn County

²⁷ California Department of Water Resources. "California Groundwater Conditions Update," 2021. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Data-and-Tools/Files/Maps/Groundwater-Level-Change/DOTMAP_Reports/Spring-2021-Groundwater-DOTMAP-Report.pdf

²⁸ NOAA, "What Caused the Summer 2020 to Spring 2021 Drought in Southwestern North America?" <https://cpo.noaa.gov/what-caused-the-summer-2020-to-spring-2021-drought-in-southwestern-north-america/>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

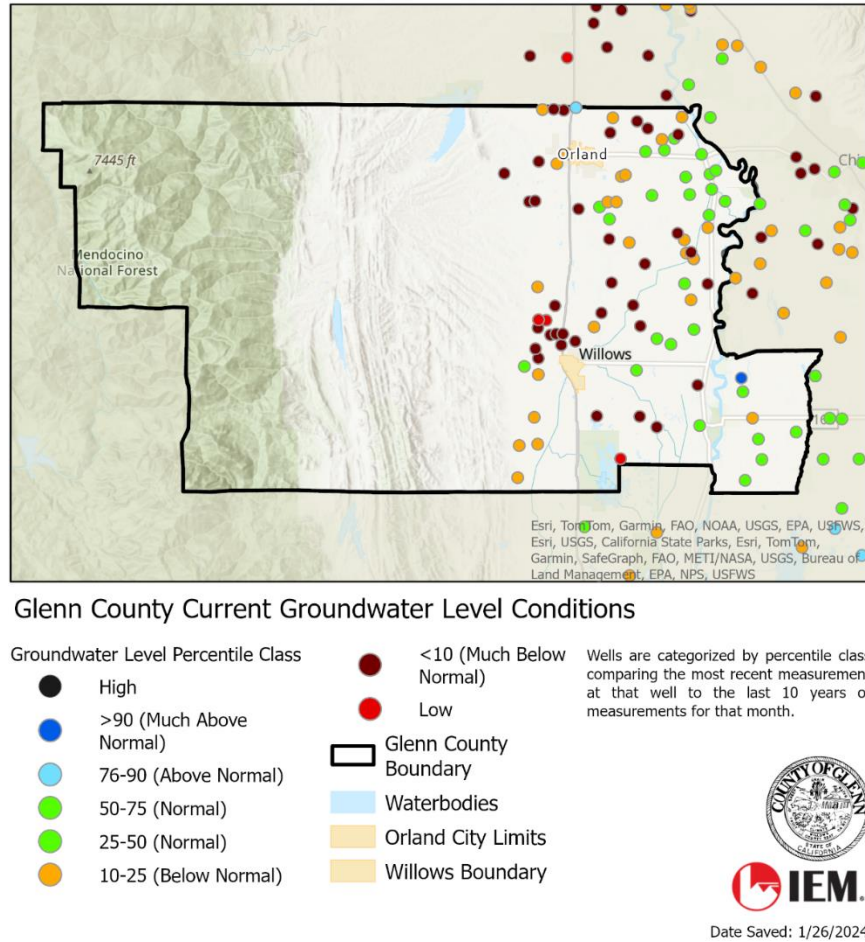


Figure 32: Glenn County Groundwater Conditions, January 2024

Table 24 lists the agencies that have declared droughts in Glenn County.

Table 24: Executive Orders for Drought in Glenn County

Agency	Executive Order Date	Executive Order #
FEMA ³	January 20, 1977	EM-3023
State of California ¹	May 26, 1990	D-85-90
State of California ¹	February 01, 1991	W-3-91
State of California ¹	June 4, 2008	S-06-08
State of California ¹	June 19, 2009	S-11-09
Board of Supervisors, Glenn County California ²	June 01, 2021	2021-032
State of California ¹	July 08, 2021	N-10-21
U.S. Department of Agriculture ²	October 1, 2021	USDA S5146
State of California ¹	March 28, 2022	N-7-22

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Agency	Executive Order Date	Executive Order #
U.S. Small Business Administration ²	December 08, 2022	17389
State of California ¹	February 13, 2023	N-3-23
State of California ¹	March 10, 2023	N-4-23
State of California ¹	March 24, 2023	N-5-23

Sources:

¹ California State Library, "Executive Orders and Proclamations." <https://www.library.ca.gov/government-publications/executive-orders/?SelectedType=2&TranscriptFilter=DROUGHT&pageNo=3>

² State Water Resource Control Board, "Drought Orders, Proclamations, Notices, and Letters." https://www.waterboards.ca.gov/drought/drought_orders_proclamations.html

³FEMA, "Disaster Declarations for States and Counties." <https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties>

Frequency/Probability of Future Occurrences

The USDM provides short-term predictability for future droughts, but long-term drought forecasting is a complex challenge, given the intricacies of the Earth's climate. The severity of droughts and the number of dry years are anticipated to rise, even if precipitation remains stable or increases. Warming air temperatures are expected to cause moisture loss from soils, creating drier seasonal conditions despite increases in precipitation.²⁹

The snowpack in California's mountains is a crucial source of surface and groundwater for the state. However, the snowpack is expected to decline by more than a third by 2050 and by more than half by 2100 because of rising temperatures. Climate change is having a significant impact on water availability. When winters are warmer, less snow falls in regions such as the Sierra Nevada of California. The reduced snowpack can cause problems for water management systems that rely on spring snowmelt. Moreover, snow has a reflective surface, so a decrease in snow cover increases surface temperatures, which can exacerbate drought.

Several climate models predict that a warming climate will increase precipitation variability, leading to more frequent periods of extreme precipitation and drought. This means that there will be a greater need for expanded water storage to prepare for drought years. However, there will also be an increased risk of flooding and dam failure during times of extreme precipitation.³⁰ These changes will occur even if annual precipitation levels remain constant.

The National Risk Index (NRI) lists 1,337 drought event-days that have occurred in Glenn County. Based on the number of event-days per year over the period of record (21.8 years).³¹ This equates to an annualized frequency of 60.77. Thirteen events since 1977 were severe enough to result in Executive Orders or disaster declarations, an annualized frequency of 27%. This figure was considered to be a more accurate indicator of the future probability of Drought for the planning area.

²⁹ California Climate Adaption Strategy, "Summary of Projected Climate Change Impacts on California." <https://climateresilience.ca.gov/overview/impacts.html#:~:text=However%2C%20there%20is%20high%20confidence,extreme%20precipitation%20events%20may%20occur>

³⁰ Center for Climate and Energy Solutions. "Drought and Climate Change." <https://www.c2es.org/content/drought-and-climate-change/#:~:text=How%20climate%20change%20contributes%20to,would%20be%20in%20cooler%20conditions>.

³¹National Risk Index, "Drought." <https://hazards.fema.gov/nri/drought>

Changes in Development

California's Fourth Climate Change Assessment for the Sacramento Valley Region addresses anticipated changes in future conditions related to drought. The report describes anticipated changes to climate patterns, including more intense droughts and floods combined with less predictability. Dry years are expected to become even drier, and wet years will become even wetter. More extreme droughts place greater water demands for crop and landscaping uses.

Agriculture is a critical component of the Glenn County economy. Since the last plan, Glenn County farms have had to adapt to drought and water shortages even further. For example, in 2022, rice growers planted only half as much grain as was normal.³² This led to lower annual growth and fewer employment opportunities than expected. However, by the end of 2023, because of storm events and snow melt, the county no longer experienced the drought, and farm employment has generally been restored. Nevertheless, it can be assumed that the county's vulnerability to this hazard has not changed.

City of Orland

Orland's vulnerability to drought has been balanced since the last plan update because of changes in development. As emphasized in the city's general plan, the agricultural land surrounding the city is a significant natural resource, and development should be directed away from it. Little area remains in the city to develop. Smart growth principles are promoted to help reduce urban sprawl. This means preventing the loss of green space and agricultural land and building livable communities in the already built environment. These principles focus on infill development, more concentrated development, and more redevelopment.

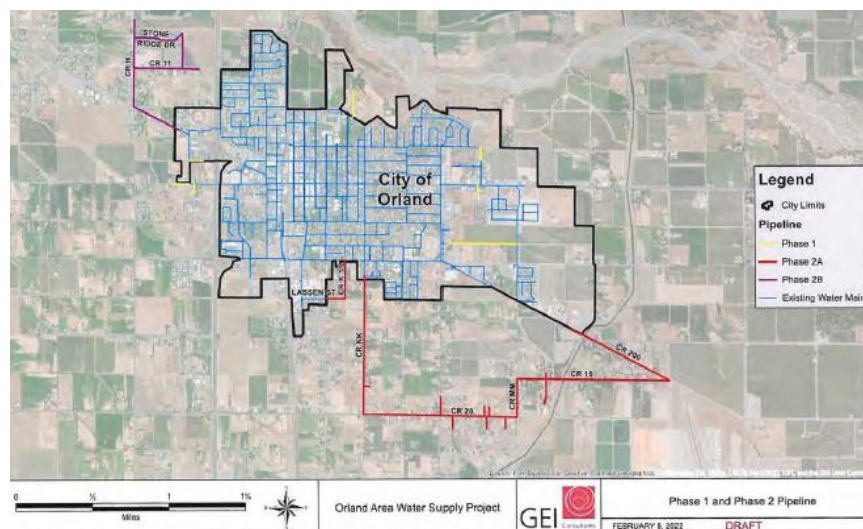
Although Orland is not experiencing drought conditions, it has had extended periods of drought, resulting in residential wells in the area drying up. To prevent future water shortages, and with a careful evaluation of the location of all dry wells that were reported to Glenn County in November and December 2021, the Orland Area Water Supply Project is implementing a pipeline extension from the city's water system to residential properties outside city limits (Figure 33). This will provide owners of dry and at-risk wells with a reliable supply of municipal water. This project also includes increasing the capacity of Orland's municipal water system with a new well, storage tank, and booster pump. This project will help reduce the city's vulnerability to drought.

Besides extending municipal water service to well users in the city and into the county, the final phase of the project includes replacing an 80,000-gallon water storage tank with a 1-million gallon tank, which will not only store water for residences and businesses but will significantly increase the city's firefighting capacity.³³

³² Caltrans, "Glenn County Economic Forecast" <https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/data-analytics-services/transportation-economics/socioeconomic-forecasts/2023/2023-pdf/glenn-2023-a11y.pdf>

³³ "Orland Begins First Phase ..." <https://www.mynspr.org/news/2023-10-04/orland-begins-first-phase-of-bringing-residents-with-dry-wells-relief>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents



Source: Orland Area Water Supply Project <https://www.cityoforland.com/wp-content/uploads/2022/02/Orland-Area-Water-Project-Press-Release.pdf>

Figure 33: Orland Area Water Supply Project, Phases 1 & 2

City of Willows

No significant changes in development have occurred which would influence Willow's vulnerability to this hazard. Willows is a slow-growing community with modest development. Cal Water Willows District reported that new services to the area have increased at only 0.3% per year.³⁴ New residential structures comprise most of this increase. The district has been able to meet the needs of its service area despite recent droughts, and it anticipates having a sufficient supply under normal, single dry, and multiple dry year conditions.

Vulnerability Assessment

The National Risk Index ranks drought risk in Glenn County as very high. The Climate Mapping for Resilience and Adaptation (CMRA) Tool projects climate trends for the early, mid-, and late centuries for different emissions levels.³⁵ Drought projections for Glenn County show an expected increase in the number of days per year with no precipitation, and the maximum number of consecutive dry days.

Droughts can occur anywhere in the county and may affect the entire county or a portion at a time. The entire population of 28,399 is potentially vulnerable to the effects of drought. Water is a critical resource for everyday use in drinking, cleaning, cooking, farming, manufacturing, and habitat.

Drought is not expected to have direct health consequences for individuals, but it might have indirect effects. Particularly during persistent drought, conditions can cause mental and physical stress on people, reduce the number of farm-labor days, and deteriorate air and water quality. Prolonged drought may require restrictions in water use. Economic losses from drought may affect the livelihoods of residents employed in the agricultural sector. Alternating extremely wet and dry years can promote the spread of vector-borne diseases, such as West Nile Virus and Valley Fever, particularly in agricultural areas.

³⁴ Willows District, "2020 Urban Water Management Plan"
https://www.calwater.com/docs/uwmp2020/WIL_2020_UWMP_FINAL.pdf

³⁵ Climate Mapping for Resilience & Adaptation Assessment Tool. <https://livingatlas.arcgis.com/assessment-tool/home/>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Appendix C: Plan Review Documents

While its impacts on the built environment are not as dramatic as those from other hazards, drought can have significant effects on buildings and infrastructure. In areas with expansive soils, reduced soil moisture during droughts can damage the foundations of buildings if it results in soil compaction. Municipal water supply and distribution systems, wastewater systems, wells, and parks and recreational facilities could be affected by restrictions or reductions in water supply during a drought.

Urban areas tend to fare better during droughts than rural less populated areas. By encouraging or invoking water conservation measures during droughts, public municipal water systems can reduce residential and industrial demand for water. Rural areas depend much more on water for irrigation for agricultural production. Landowners in rural or less-populated areas are reliant on individual, privately owned wells as a drinking water sources.

Low water levels resulting from drought have a significant impact on ecosystems. Drought can reduce rangeland forage production and wildlife habitats. When water levels are low in lakes, rivers, and other water bodies, their ability to flush out contaminants diminishes, causing increases in waterborne pollutants. Reduced plant growth, local species reduction or extinction, and landscape-level transitions, such as forest conversion to non-forested vegetation, which may in turn reduce water retention in soils, may occur. In addition, freshwater ecosystems may change flow regimes, increase water temperature, and deteriorate water quality, which may result in fish kills, reduced opportunities for recreation, and decreased hydropower production.

The Sacramento River National Wildlife Refuge is a natural resource that provides a wide variety of habitats for birds, fish, and other wildlife. Drought may further limit sensitive habitats in this area. The refuge works with partners to manage and restore wetlands, uplands, and riparian areas, and it promotes high-quality habitats. Water management is critical to providing the proper habitat to specific species at different times of the year.

Drought can occur in conjunction with extreme heat, which is also a hazard of concern in Glenn County. Extreme heat increases evaporation, leading to reduced water availability in soils and surface water. Drought can cause extreme heat because of a lack of water in the atmosphere, soils, and rivers, where decreased water availability in the system reduces the amount of evaporation happening at the surface, quickly increasing temperatures. Extreme heat can also increase the demand for water, leading to reduced water supplies. These hazards occurring together can compound human health impacts and negative impacts on ecosystems.

Drought can also increase the risk of wildfires. Decreased soil moisture during a drought stresses vegetation and increases plant mortality, which provides fuel for wildfires. When combined with extreme heat, more extreme wildfires are possible.

Jurisdiction-Specific Vulnerabilities

Glenn County

The National Risk Index score for drought in Glenn County is very high, in the 99th percentile. Agriculture and related practices are the predominant land use in Glenn County. They depend on a reliable water supply and, therefore, are very vulnerable to drought. Annual agricultural/crop losses from drought in Glenn County are estimated at almost \$58 million per year.

Drought may reduce groundwater in response to increased water demands. As noted in the Sacramento Valley Region Climate Change Assessment, agricultural efforts to mitigate the risks of climate-related drought could include investing in precision agriculture and water sensors and planting drought-tolerant crop varieties. Water conservation, improving water-use efficiency, water storage solutions, and increased stormwater capture also can have a significant impact on drought resilience.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

Homes in the county also tend to be older; many were built before 1990. This means they are less likely to be fitted with federally compliant plumbing fixtures.

The Glenn Groundwater Authority, formed by 10 agencies including Glenn County, the City of Orland, the City of Willows, and 7 water and irrigation districts, encourages water conservation. The Glenn County Drought Taskforce is an ad-hoc committee that identifies available resources that may assist residents and businesses impacted by drought and promotes public awareness of water-saving activities.

City of Orland

Drought is a regional hazard with no defined boundaries; thus, drought conditions in Orland are on par with the rest of the county. Less land is used for agriculture in the cities. However, employment in the farming industry could still be reduced, impacting local jurisdictions. Significant drought events have affected California (and the rest of the United States) throughout history. Orland obtains a large portion of its water from deep wells, which are in Orland and surrounding areas in Glenn County. New wells are often drilled in the region during intense drought. The City of Orland Public Works department maintains the city water system from well production.

As shown in Figure 30, Orland and its immediate surroundings have numerous dry wells. As discussed earlier, Orland is undertaking a Municipal Water Extension Project to connect the owners of dry wells outside the city limits to the municipal water system. However, some owners outside of the city cannot be connected at this time because their properties are too far from the project and funding limitations make these connections cost prohibitive.

City of Willows

Willows will likely experience drought at the same or lower frequency than the rest of the county. However, as a municipality with less agricultural land and without the same dependency on private wells as the county, Willows is not as vulnerable to this hazard. Cal Water, which serves Willows residents, implemented Stage 2 of its Water Shortage Contingency Plan on May 23, 2022. It limited outdoor watering to two days per week between 6 p.m. and 8 a.m. Similar shortages in the future are likely, which could require additional restrictions. Cal Water has taken steps to mitigate drought in Willows, including replacing, repairing, and upgrading infrastructure to minimize water loss; identifying, and correcting system leaks; and developing rebate programs. The Climate Change Risk Assessment and Adaptation Framework includes mitigation strategies based on the vulnerability and risk of climate change to water resources. Cal Water has also educated local residents about water-saving strategies using the “Imagine a Day Without Water” campaign.³⁶

Worsening drought conditions require continued conservation, public education, and infrastructure investment to reduce the impact of drought.

³⁶ Glenn County Transcript. “Cal Water continues water conservation efforts in Willows,” 2021. https://www.appeal-democrat.com/glenn_county_transcript/cal-water-continues-water-conservation-efforts-in-willows/article_4600aeac-369e-11ec-8cd1-af91a53b4e88.html

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

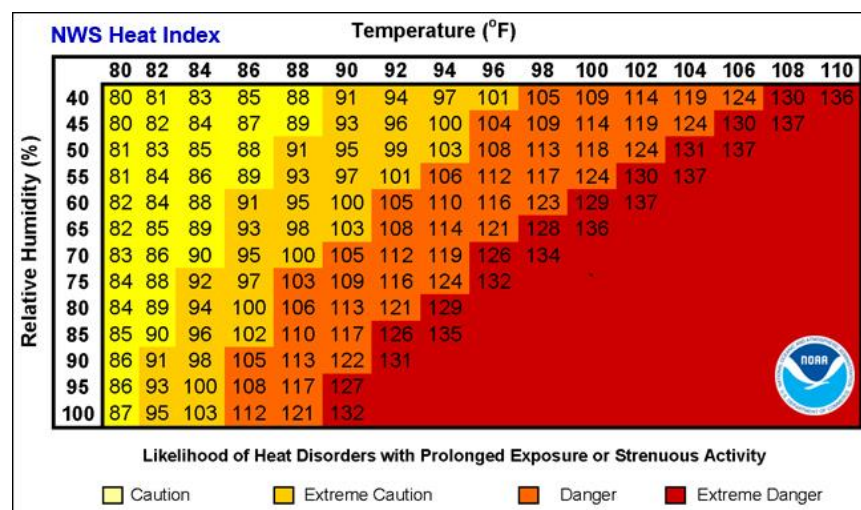
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Section 3.2 Extreme Heat

Extreme heat occurs when conditions are substantially hotter and/or more humid than average for a location at that time of year. According to the Federal Emergency Management Agency (FEMA), extreme heat is characterized by temperatures exceeding 90 ° Fahrenheit combined with humidity—which substantially increases the heat index—for two to three consecutive days for most of the United States.³⁷ In California, particularly in drier areas like the Central Valley—San Joaquin Valley and Sacramento Valley, which includes Glenn County—extreme heat is defined as three successive days over 100°F .

Heat is the primary cause of weather-related fatalities in the United States, and it can significantly impact the human body. Individuals at higher risk of heat-related illnesses include infants and young children, pregnant women, and individuals with chronic medical conditions. The relationship between humidity and heat can influence the severity of extreme heat events. Prolonged exposure to excessive heat can have negative consequences for agrarian systems, including crop damage, livestock harm, and increased risk of wildfires. Furthermore, extended periods of extreme heat can lead to power outages, as the heavy demand for air conditioning taxes the power grid.

The heat index, also called the apparent temperature, measures how hot it feels to the human body when relative humidity is combined with air temperature. This index is particularly important in hot and humid climates, as high humidity levels can make the air feel much hotter than it is. In such conditions, the human body may not be able to cool itself efficiently through sweating, leading to a range of heat-related illnesses, such as heat cramps, heat exhaustion, and heat stroke. Therefore, monitoring the heat index is crucial for ensuring the safety and well-being of individuals exposed to high temperatures and humidity levels, such as outdoor workers, athletes, and the elderly. Figure 34 presents the likelihood of heat disorders based on the heat index, and Figure 35 describes the effect on the body of different temperatures.



Source: National Weather Service, "What is the Heat Index?"

<https://www.weather.gov/ama/heatindex>

Figure 34: Heat Index in Shady Locations

³⁷ FEMA, "Extreme Heat." <https://community.fema.gov/ProtectiveActions/s/article/Extreme-Heat#:~:text=In%20most%20of%20the%20United,on%20the%20hazard's%20Information%20Sheet>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

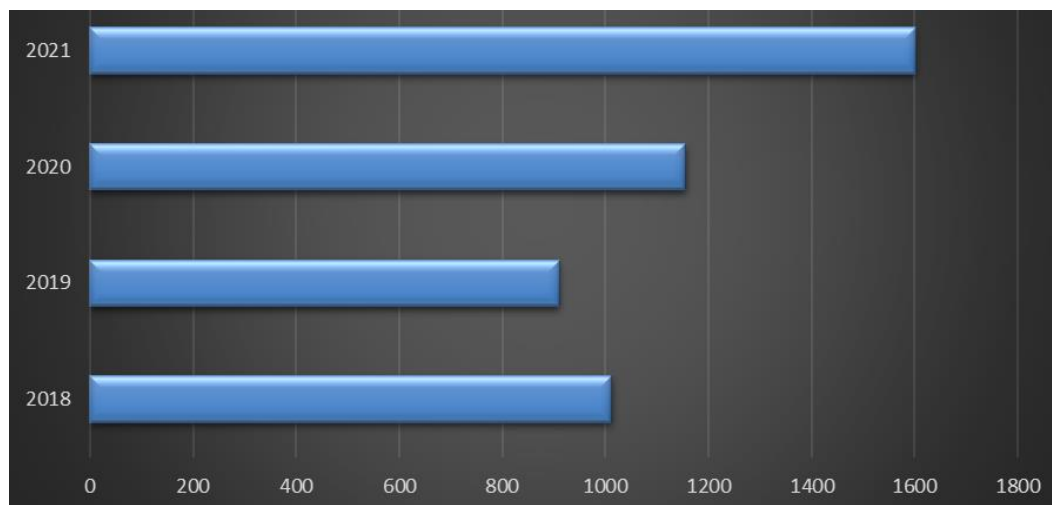
Classification	Heat Index	Effect on the body
Caution	80°F - 90°F	Fatigue possible with prolonged exposure and/or physical activity
Extreme Caution	90°F - 103°F	Heat stroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity
Danger	103°F - 124°F	Heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity
Extreme Danger	125°F or higher	Heat stroke highly likely

Source: National Weather Service, "What is the Heat Index?"
<https://www.weather.gov/ama/heatindex>

Figure 35: Heat Classification

The phenomenon of extreme heat has worsened over the last few decades, with increasing frequency, length, and intensity linked to climate change. The summer of 2023 was particularly severe, with escalating incidents of extreme heat and air quality events around the globe and across the United States. For instance, June 2023 was the hottest June ever documented globally, and over 60 million individuals in the U.S. affected by air pollution caused by smoke from Canadian wildfires, which were driven by heat related to climate change. Then, in August, prolonged dry conditions and high winds in Hawai'i led to wildfires that caused massive destruction on the island of Maui and other areas, leading to the most significant loss of life because of wildfires in contemporary U.S. history.

According to the Community Resilience Estimates (CRE) for Heat tool, a quarter of individuals in the U.S. are socially vulnerable if exposed to extreme heat, considering factors such as transportation exposure, housing quality, and financial hardship. Heatwaves are responsible for more deaths than any other weather event, and fatality rates have risen each year since 2018, except in 2019, when there was a slight reduction. A total of 4,681 heat-related deaths were reported between 2018 and 2021 (see Figure 36). Nevertheless, studies suggest that this figure is a significant underestimation, and other evidence suggests that extreme heat is associated with higher mortality rates from all causes.³⁸



Source: KFF, "Continued Rises in Extreme Heat and Implications for Health Disparities."
<https://www.kff.org/racial-equity-and-health-policy/issue-brief/continued-rises-in-extreme-heat-and-implications-for-health-disparities/>

Figure 36: Heat-Related Deaths in California, 2018–2021

³⁸ KFF, "Continued rises in Extreme Heat and implications for Health Disparities." <https://www.kff.org/racial-equity-and-health-policy/issue-brief/continued-rises-in-extreme-heat-and-implications-for-health-disparities/>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Between August 31 and September 9, 2022, California experienced an unprecedented heat wave that broke temperature records in around 1,500 locations. Much of the state was also under excessive heat warnings during this period. The following statistics analyze the increase in deaths, or excess mortality, in California during the heat wave, based on death certificates from California vital statistics.

During the 10-day heat wave, there were 8,324 deaths in California. This number is higher than the 7,929 deaths that occurred during the same timeframe in the summer of 2022 (as shown in Table 25). In other words, there were 395 excess deaths during the heat wave, which represents a 5.0 percent increase in deaths compared to what would be expected; if we include the additional three days, the estimated number of excess deaths rises to 441, an increase of 4.0 percent.

Table 25: Excessive Deaths in California, August 31–September 9, 2022

Time Frame	10-Day Heat Wave	+3 Days
Expected Number of Deaths (based on the reference period in Summer 2022)	7,929	10,296
Number of Deaths, 2023	8,324	10,737
Excess Deaths	395	441
Rate Ratio	1.05	1.04

Source: California Department of Public Health, “Excess Mortality During the September 2022 Heat Wave in California.” <https://www.cdph.ca.gov/Programs/OHE/CDPH%20Document%20Library/Climate-Health-Equity/CDPH-2022-Heat-Wave-Excess-Mortality-Report.pdf>

Deaths in excess were noted across all disease categories, with heat-related illnesses and external causes exhibiting statistically significant trends (as shown in Table 26). The highest rate ratio was observed in cases where heat-related illness was directly listed as the underlying cause of death, with a rate ratio of 5.00.

Table 26: Excess Deaths in California, August 31–September 9, 2022, with Underlying Cause of Death

ICD-10#	Deaths During Heatwave	Expected Number of Deaths	Excess Deaths	Rate Ratio
Heat Illness	20	4	16	5.00
Cardiovascular Deaths	2,310	2,210	100	1.05
Respiratory Deaths	545	521	24	1.05
Endocrine Deaths	451	438	13	1.03
Genitourinary/Renal Deaths	194	175	19	1.11
Digestive	351	332	19	1.06
Musculoskeletal	37	32	5	1.15
External Causes	817	724	93	1.13
Mental/Behavioral	242	232	10	1.04

Source: California Department of Public Health, “Excess Mortality During the September 2022 Heat Wave in California.” <https://www.cdph.ca.gov/Programs/OHE/CDPH%20Document%20Library/Climate-Health-Equity/CDPH-2022-Heat-Wave-Excess-Mortality-Report.pdf>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

An analysis grouped counties into climate regions based on where the deaths occurred. These regions comprise specific counties, as listed in Table 27. They were adapted from the U.S. Climate Divisions for California, shown in Figure 37.

**Table 27: Regions Analyzed during the California Heatwave,
August 31–September 9, 2022**

Central Coast	Central Valley	North Central	North Coast	South Coast	Southeast Desert/Inland Empire
Alameda	Amador	Alpine	Del Norte	Los Angeles	Imperial
Contra Costa	Calaveras	Butte	Humboldt	Orange	Inyo
Monterey	Fresno	Colusa	Lake	San Diego	Riverside
San Benito	Kern	El Dorado	Marin	Santa Barbara	San Bernardino
San Francisco	Kings	Glenn	Mendocino	Ventura	
San Luis Obispo	Madera	Lassen	Napa		
San Mateo	Mariposa	Modoc	Solano		
Santa Clara	Merced	Mono	Sonoma		
Santa Cruz	Placer	Nevada	Trinity		
	Sacramento	Plumas			
	San Joaquin	Shasta			
	Stanislaus	Sierra			
	Tulare	Siskiyou			
	Tuolumne	Sutter			
		Tehama			
		Yolo			
		Yuba			

Source: California Department of Public Health, "Excess Mortality During the September 2022 Heat Wave in California." <https://www.cdph.ca.gov/Programs/OHE/CDPH%20Document%20Library/Climate-Health-Equity/CDPH-2022-Heat-Wave-Excess-Mortality-Report.pdf>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

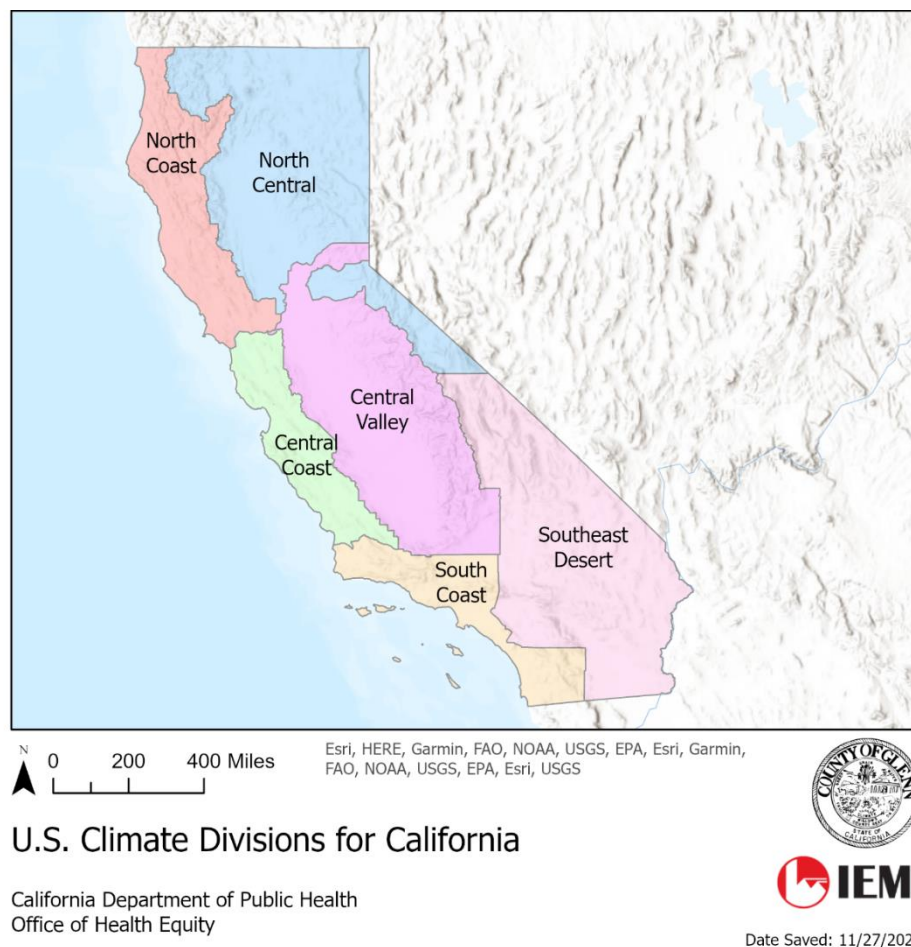


Figure 37: U.S. Climate Divisions for California

Deaths from extreme heat increased in all regions except the North Coast. However, only the South Coast Region showed a statistically significant increase in deaths during the heatwave. The North Central Region, including Glenn County, had minimal excess deaths during this period (see Table 28).

Table 28: California Heatwave Deaths by Region, August 31–September 9, 2022

Region	Deaths During Heatwave	Expected Number of Deaths	Excess Deaths	Rate Ratio
Central Coast	1,354	1,315	39	1.03
Central Valley	1,445	1,425	20	1.01
Desert/Inland Empire	1,042	1,006	36	1.04
North Central*	331	327	4	1.01
North Coast	372	390	-18	0.95
South Coast	3,779	3,462	317	1.09

*Glenn County Region. Source: California Department of Public Health, "Excess Mortality During the September 2022 Heat Wave in California." <https://www.cdph.ca.gov/Programs/OHE/CDPH%20Document%20Library/Climate-Health-Equity/CDPH-2022-Heat-Wave-Excess-Mortality-Report.pdf>

Regulatory Environment

California Heat Study: Advisory Committee (AB 1643)

Governor Gavin Newsom signed AB 1643 (Robert Rivas, Chapter 263, Statutes of 2022) into law on September 9, 2022. It established an advisory committee to study and evaluate the effects of heat on California's workers, businesses, and the economy by July 1, 2023. The committee developed a study that addresses topics related to data collection, economic losses, injuries and illnesses, and methods of minimizing the impact of heat on workers. The committee comprised representatives from various state agencies, labor and business entities, and academia, including the Division of Occupational Safety and Health (Cal/OSHA), which was responsible for convening the advisory committee.

The Labor Workforce Development Agency will convene an advisory committee to recommend a study's scope and issue its findings to the Legislature by January 1, 2026.

The advisory committee's objectives were to recommend a study that addressed the following:

- How to improve data collection on worker injuries, illnesses, and deaths and losses to businesses and the economy from heat-related issues to capture these cases more accurately.
- Time away from work and lost wages because of heat.
- The frequency of different types of occupational injuries and illnesses at different temperatures and humidity levels, including those not directly related to heat exposure.
- Instances of underreporting of heat illnesses and injuries covered by workers' compensation, especially among low-income employees, including underreporting of occupational heat exposure with long-term effects on workers after their shifts.
- Evidence-based ways to minimize the impact of heat on workers.³⁹

State of California Department of Industrial Relations

Cal/OSHA's Heat Illness Prevention (HIP) Regulation applies to all outdoor places of employment in agriculture, construction, and landscaping. The HIP Network is a voluntary partnership between public and private entities that aims to increase employers' and employees' awareness of the dangers of heat illness and the importance of preventive measures to avoid fatalities and serious illnesses in California workplaces.

The HIP Network collaborates closely with Cal/OSHA to provide crucial information to employers and employees, thus helping to prevent heat illness in workplaces all over California.⁴⁰

Location/Geographic Extent

Data show that heat waves have been increasing in every state since the 1970s. Even Maine, Montana, and Wyoming, which are known for their lower temperatures, have experienced a rise in extreme heat

³⁹ Department of Industrial Relations, "AB 1643-California Heat Study: Advisory Committee." <https://www.dir.ca.gov/dosh/doshreg/Heat-Advisory-Committee/#:-:text=On%20September%209%2C%202022%2C%20Governor,or%20before%20July%201%2C%202023>.

⁴⁰ Department of Industrial Relations, "Heat Illness Prevention." <https://www.dir.ca.gov/dosh/heatillnessinfo.html>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

days per year. From 9 in the 1980s, it has gone up to 13 in the 2010s across all counties in each state. Montana and Wyoming have recorded their hottest years on record in the last decade.⁴¹

Very hot days have temperatures over 90°F , and Glenn County experiences an average of 85.1 such days each year, making it hotter than most places in California.⁴² There may be slight variations in temperature and humidity in different areas of the county because of differences in terrain. Nonetheless, the danger of extreme heat has no geographical limits and could impact the entire planning area.

Urban areas, characterized by expanses of concrete and asphalt, tend to have higher temperatures than surrounding rural areas. This phenomenon is known as the urban heat island effect. Cities with dense populations, extensive infrastructure, and minimal green spaces trap heat, exacerbating the effects of extreme heat events. Metropolitan areas such as Los Angeles, New York, and Phoenix experience elevated temperatures because of the concentration of buildings, vehicles, and industrial activities. Therefore, urban planning and incorporating green spaces have become crucial strategies for mitigating the urban heat effect.

Magnitude/Extent

Extreme heat (temperatures over 100°F) has become more common in California since 1950. The number and intensity of extreme heat events have significantly risen in most locations studied. Heat waves, two or more consecutive heat events, vary yearly but have become more frequent in the last decade. One way to measure the extent of heat-related impacts is through the NWS HeatRisk Prototype (see Figure 38). This color-coded risk forecast by the National Weather Service helps identify risk over a 24-hour period.

Since 1950, the frequency and magnitude of nighttime extreme heat events have increased more than daytime heat events. The maps in Figure 39 display trends in the magnitudes and frequencies of daytime and nighttime extreme heat events at selected locations between April and October. These events occur when the temperature exceeds a location-specific historical temperature threshold, set at the 95th percentile of daily maximum for daytime extreme events and daily minimum temperatures for nighttime events between 1960 and 1990. The frequency and magnitude of the rates of change are presented using hexagons and ovals, with asterisks indicating statistically significant trends. The maps' outlines show the boundaries of the 11 climate regions defined by the Western Regional Climate Center.

⁴¹ USA Facts: <https://usafacts.org/articles/how-frequent-are-heat-waves-in-the-us/>

⁴² Best Places, "Climate in Glenn County, CA." <https://www.bestplaces.net/climate/county/california/glenn>

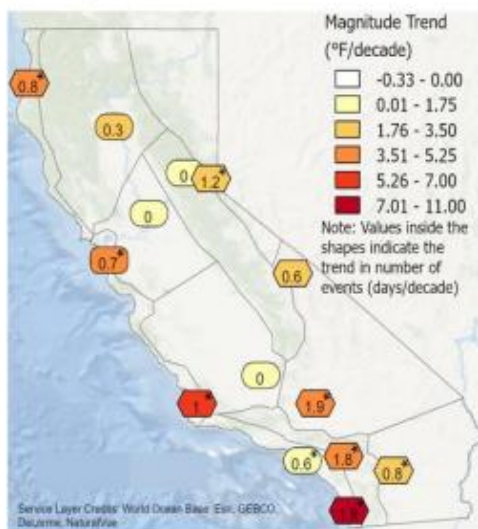
Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Category	Risk of Heat-Related Impacts
Green 0	Little to no risk from expected heat.
Yellow 1	Minor - This level of heat affects primarily those individuals extremely sensitive to heat, especially when outdoors without effective cooling and/or adequate hydration.
Orange 2	Moderate - This level of heat affects most individuals sensitive to heat, especially those without effective cooling and/or adequate hydration. Impacts possible in some health systems and in heat-sensitive industries.
Red 3	Major - This level of heat affects anyone without effective cooling and/or adequate hydration. Impacts likely in some health systems, heat-sensitive industries and infrastructure.
Magenta 4	Extreme - This level of rare and/or long-duration extreme heat with little to no overnight relief affects anyone without effective cooling and/or adequate hydration. Impacts likely in most health systems, heat-sensitive industries and infrastructure.

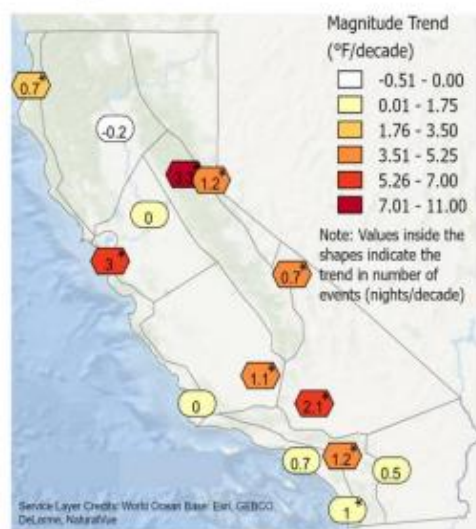
Source: NOAA, "NWS HeatRisk Prototype" <https://www.wrh.noaa.gov/wrh/heatrisk/>

Figure 38: NWS HeatRisk Prototype

A. Daytime extreme heat events



B. Nighttime extreme heat events



Source: Cal-Adapt, 2018, Dunn 2019, and RCC-ACIS, 2021

An extreme heat event occurs between April and October when the temperature is at or above a location-specific historical temperature threshold, set at the 95th percentile of daily maximum for daytime extreme events (Figure 1A), or of daily minimum temperatures for nighttime events (Figure 1B), during the 1960-1990 reference period.

The rate of change (per decade) in **frequency**, the total number of extreme heat events each year, is the value in each shape (hexagon or oval); an asterisk indicates a statistically significant trend ($p \leq 0.05$). The rate of change (per decade) in **magnitude**, the annual sum of daily exceedances above the historical temperature threshold, in degrees Fahrenheit (°F), is presented using the fill colors (see legend); a hexagon denotes a trend that is statistically significant ($p \leq 0.05$), while an oval is not significant. The outlines on the map show the boundaries of the eleven climate regions, as defined by the Western Regional Climate Center.

Source: Office of Environmental Health Hazard Assessment, "Indicators of Climate Change in California (2022)." <https://oehha.ca.gov/media/epic/downloads/02extremeheat.pdf>

Figure 39: Magnitude and Frequency of Extreme Heat Events, 1950–2021

Past Occurrences

In California's Sacramento Valley, unlike the national average, extreme heat is characterized as high heat and humidity, with temperatures 100°F for two to three consecutive days. These temperatures can harm human health, the environment, and ecosystems. Thirty years ago, there were 11 days in which temperatures exceeded 100°F in Glenn County, while this year, there have been such 22 days. It is anticipated that in 30 years, there will be an estimated 37 days of extreme heat days in Glenn County each year.⁴³

Eight heat or excessive heat events have been recorded in the Storm Events Database for regions including Glenn County. On July 1–2, 2023, record-breaking temperatures and major heat risk were recorded for the Central Sacramento Valley. Daytime highs across this zone were in the 100 to 110-

⁴³ Risk Factor, "Does Glenn County Have Heat Risk?" https://riskfactor.com/county/glenn-county-ca/6021_fsid/heat

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

degree range, and overnight lows were in the mid-70s to low 80s. Similar conditions occurred in the region on July 15–16, 2023, July 21–22, 2023, and August 8–17, 2023.⁴⁴

“Cooling Zones” in public buildings have been implemented throughout the county.⁴⁵ Cool zone facilities include libraries, community centers, and senior centers. Over the last few years, they have been employed regularly to keep people cool, despite the heat and summer power outages. A Public Safety Power Shutoff (PSPS), often a result of severe weather and to prevent wildfire, is one of the biggest reasons for establishing cooling zones. Extreme heat is no surprise in Glenn County. However, these PSPSs present a real concern, as residents can no longer cool themselves at home. Schools are also at risk from the impacts of PSPSs, including delayed start times and missed days. So far, there has been an estimated one death from heat in the last 13 years. However, it can be assumed that other injuries and illnesses are related to extreme heat events.

Frequency/Probability of Future Occurrences

The National Risk Index has recorded 49 heat wave events for Glenn County over 16 years (2005-2021), which is an annualized frequency of 3 events per year. The planning area will likely continue to experience Extreme Heat on an annual basis in the future. California faces many environmental issues, such as droughts, wildfires, and extreme weather conditions, and the situation is predicted to get worse as climate change increases. Greenhouse gases, released primarily from human activities like transportation and industrial processes, trap heat radiating from the Earth’s surface and enhance the atmospheric greenhouse effect. This leads to a further rise in global temperatures. As a result, the average summer temperatures in California have already increased by about 3°F (1.8 ° Celsius) since 1896, with more than half of this increase occurring since the early 1970s. The probability of future occurrences of Extreme Heat will likely be influenced by the changing climate.

Annual temperature increases in most parts of California have already exceeded 1°F, and some areas have experienced increases over 2°F . By mid-century, the daily maximum average temperature, which indicates extreme temperature changes, is projected to rise by 4.4°F –5.8°F . By the end of the century, it may rise by 5.6°F –8.8°F . Heat-Health Events (HHEs), which are better predictors of risk to populations vulnerable to heat, are expected to worsen significantly across the state. By mid-century, the Central Valley is expected to experience HHEs that last for two more weeks each year on average, while the Northern Sierra region could experience HHEs 4 to 10 times more often than usual.

If we continue to emit greenhouse gases at the current rate, the temperature is expected to rise even more in the coming years. By 2040, the State of California is likely to experience a further increase in temperature of more than 2°F , more than 4°F by 2070, and more than 6°F by 2100. This warming will be most noticeable during short periods of extreme heat, such as days exceeding 106.6°F .

If current emissions continue, by 2099, Glenn County will likely experience a +3.5°F increase in temperature for low-emissions scenarios and a + 6.2°F increase for high-emissions scenarios.⁴⁶ The Northern Central Valley Region, in which Glenn County is situated, is expected to see temperatures increase from 1990 to 2100, as shown in Table 29.

⁴⁴ NOAA NCEI Storm Events Database. www.ncdc.noaa.gov/stormevents

⁴⁵ Glenn County Office of Emergency Services. <https://www.countyofglenn.net/dept/sheriff/office-emergency-services/summer-heat-and-power-outages>

⁴⁶ California Department of Public Health, “Climate Change and Health Profile Report Glenn County.” https://www.cdph.ca.gov/Programs/OHE/CDPH%20Document%20Library/CHPRs/CHPR021Glenn_County2-23-17.pdf

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Table 29: Climate Projections for Glenn County

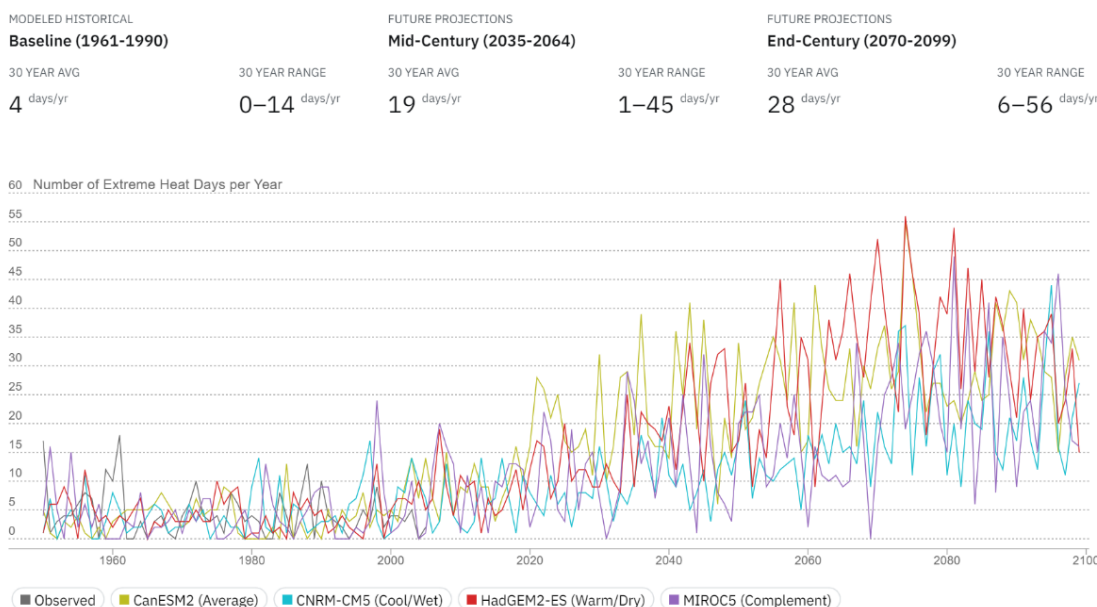
Change	Ranges
Temperature Change between 1990 and 2100	By 2050, high carbon emissions will raise average temperatures in January by 4°F to 6°F and in July by 6°F to 7°F . By 2100, these increases could reach 8°F to 12°F and 12°F to 15°F , respectively.
Heat Wave	A heat wave is a period of prolonged, abnormally hot weather, typically, lasting two or more days. In the eastern mountainous regions, the temperature range is 102°F to 105°F . By 2050, two to three more heat waves are expected to occur per year, and by 2100, they could increase to five to eight more heat waves per year.

Source: California Department of Public Health, "Climate Change and Health Profile Report Glenn County." https://www.cdph.ca.gov/Programs/OHE/CDPH%20Document%20Library/CHPRs/CHPR021Glenn_County2-23-17.pdf

Cal-Adapt provides tools to compare multiple climate projections, or estimates of future climate. These models can give insight into what to expect from the climate, based on the changing atmospheric concentration of greenhouse gases. Figure 40 includes a time series of project numbers of extreme heat days for Glenn County from individual downscaled global climate models (GCMs). The historical data are represented by a gray line from 1950 to 2006. This model indicates that Glenn County may have an average of 19 extreme heat days per year by mid-century. Figure 41 is a similar visualization. It represents a time series of the numbers of warm nights, and it also projects significant increases over time.

Glenn County, California

Projected changes in **Number of Extreme Heat Days per Year** when **daily maximum temperature** is above **100.9 °F** under a **Medium Emissions (RCP 4.5) Scenario**.



Source: Cal-Adapt, Extreme Heat Days. <https://cal-adapt.org/tools/extreme-heat/>

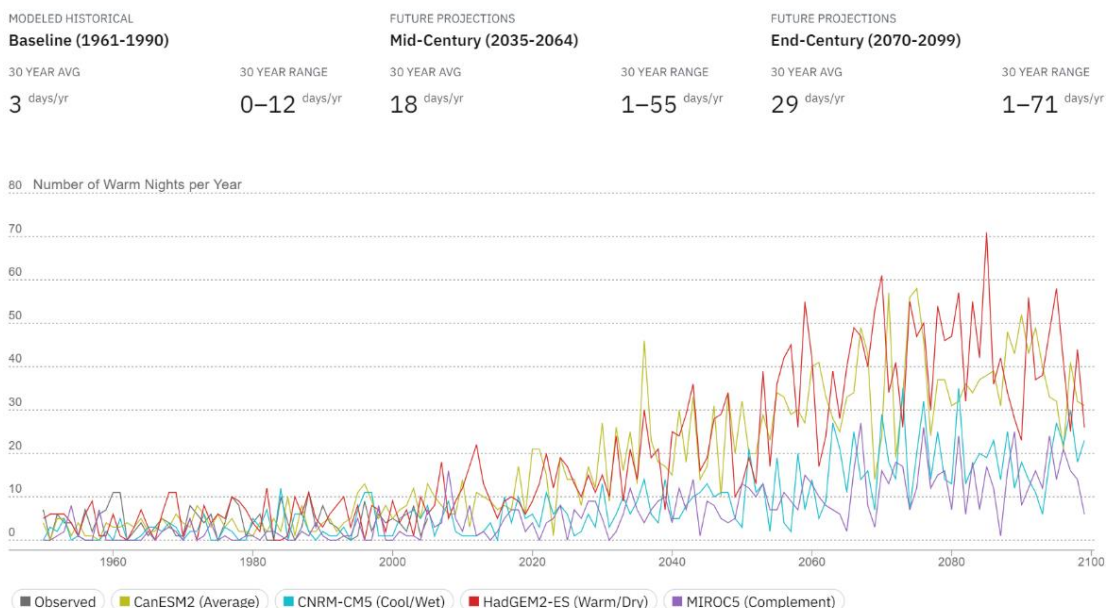
Figure 40: Cal-Adapt Extreme Heat Days per Year for Glenn County, California

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Appendix C: Plan Review Documents

Glenn County, California

Projected changes in **Number of Warm Nights per Year** when daily minimum temperature is above 64.4 °F under a **Medium Emissions (RCP 4.5) Scenario**.



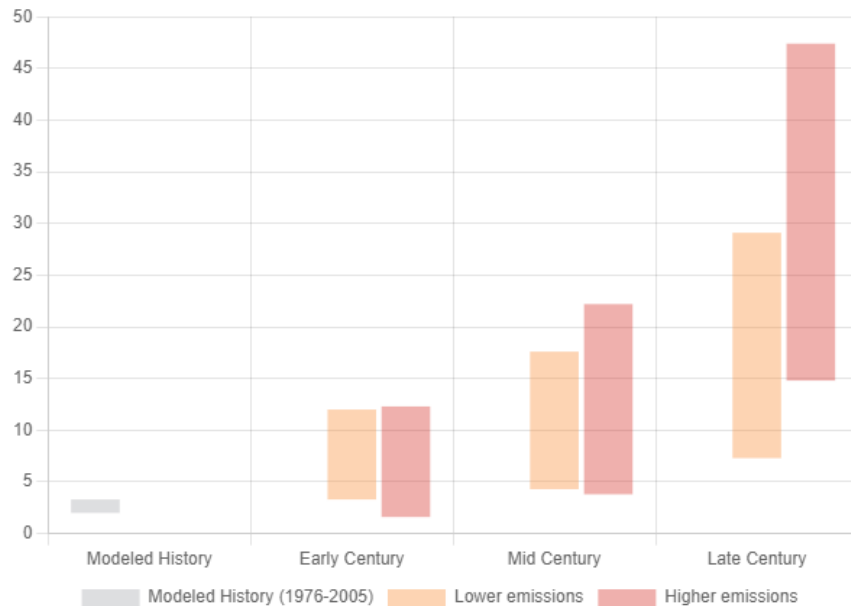
Source: Cal-Adapt. Data: LOCA Downscaled CMIP5 Climate Projections (Scripps Institution of Oceanography), Gridded Observed Meteorological Data (University of Colorado Boulder), LOCA Derived Products (Geospatial Innovation Facility).

Source: Cal-Adapt, Extreme Heat Days. <https://cal-adapt.org/tools/extreme-heat/>

Figure 41: Cal-Adapt Number of Warm Nights for Glenn County

The Climate Mapping for Resilience & Adaptation (CMRA) Tool is another model that projects climate conditions for the early, mid-, and late century, based on lower and higher emissions scenarios. CMRA anticipates increases for all time periods in both lower and higher emissions scenarios for annual days with a maximum temperature over 100°F and 105°F (see Figure 42). It also projects increases in the highest maximum temperature, the highest temperature averaged over 5 days, and the number of cooling degree-days which measure the demand for energy to cool homes and businesses.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents



Source: Climate Mapping & Resilience Tool: Extreme Heat.

<https://livingatlas.arcgis.com/assessment-tool/explore/details>

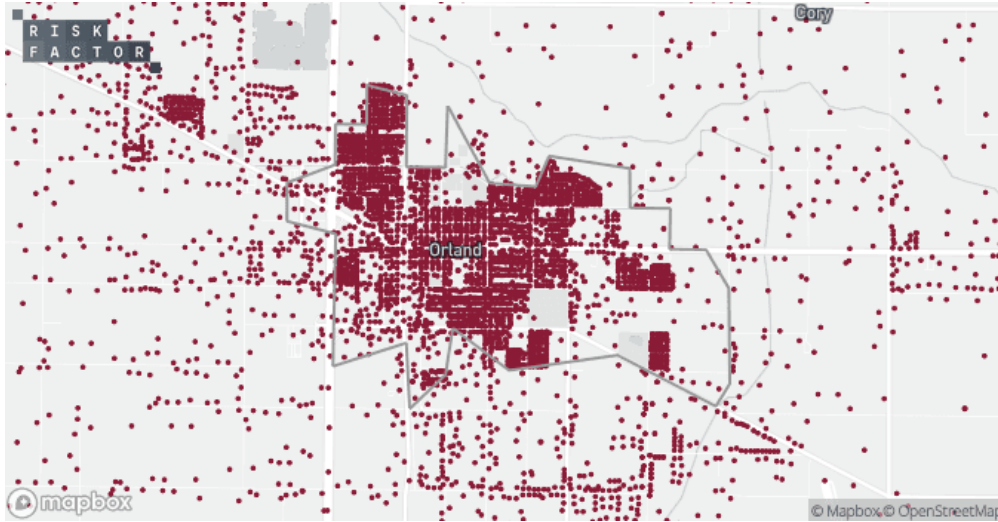
Figure 42: CMRA Annual Days with Maximum Temperature > 105°F in Glenn County

City of Orland

Annual average temperatures in Orland are projected to increase steadily. Orland's average annual maximum temperature, based on data from 1961 to 1990, was 74.9°F (Cal-Adapt, 2017). Under a medium emissions scenario (RCP 4.5), Orland's average annual maximum temperature will rise from the historical average baseline of 74.9°F to 78.8°F by 2064 and to 79.9°F by 2099 (Cal-Adapt, 2017). Under a high emissions scenario (RCP 8.5), Orland's average annual maximum temperature will rise from 74.9°F to 79.6°F by 2064 and to 83.1°F by 2099 (Cal-Adapt, 2017). Increased average temperatures are expected to lead to secondary climate change impacts, including increases in the frequency, intensity, and duration of extreme heat days and multi-day heat waves in California. Cal-Adapt defines the extreme heat day threshold for Orland as 105°F. Orland has a historical average of four extreme heat days per year. Under a medium emissions scenario (RCP 4.5), Orland is expected to experience 16 extreme heat days annually by 2064 and 23 a year by 2099 (Cal-Adapt, 2017). Under a high-emissions scenario (RCP 8.5), Cal-Adapt predicts that Orland will experience 22 extreme heat days annually by 2064 and 46 such days per year by 2099 (Cal-Adapt, 2017).

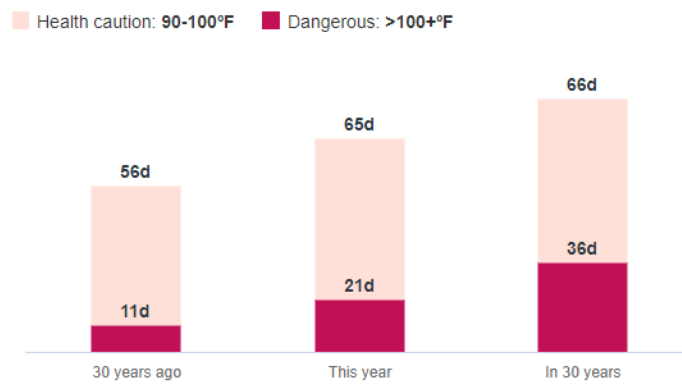
Figure 43 shows the heat factors for Orland, and Figure 44 shows the change over the last 30 years and projections for the next 30 years.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

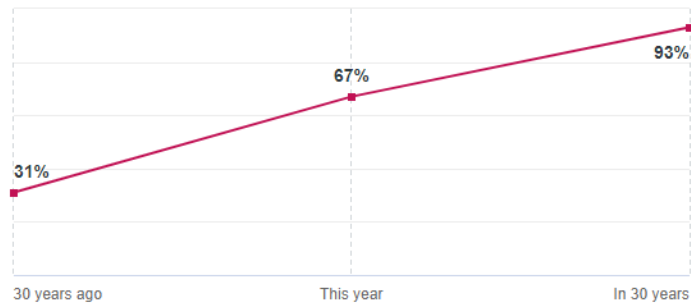


Source: Risk Factor. Does Orland Have Heat Risk? https://riskfactor.com/city/orland-ca/654274_fsid/heat

Figure 43: Heat Factors in and Near the City of Orland



Likelihood of 3+ Day Heatwave

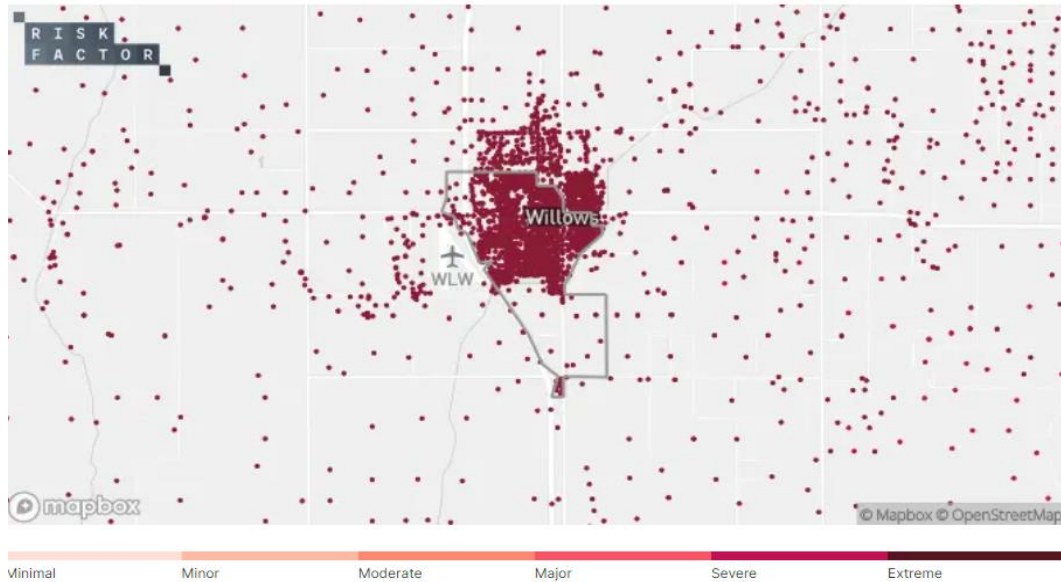


Source: Risk Factor. Does Orland Have Heat Risk? https://riskfactor.com/city/orland-ca/654274_fsid/heat

Figure 44: Heat Projections for the City of Orland

City of Willows

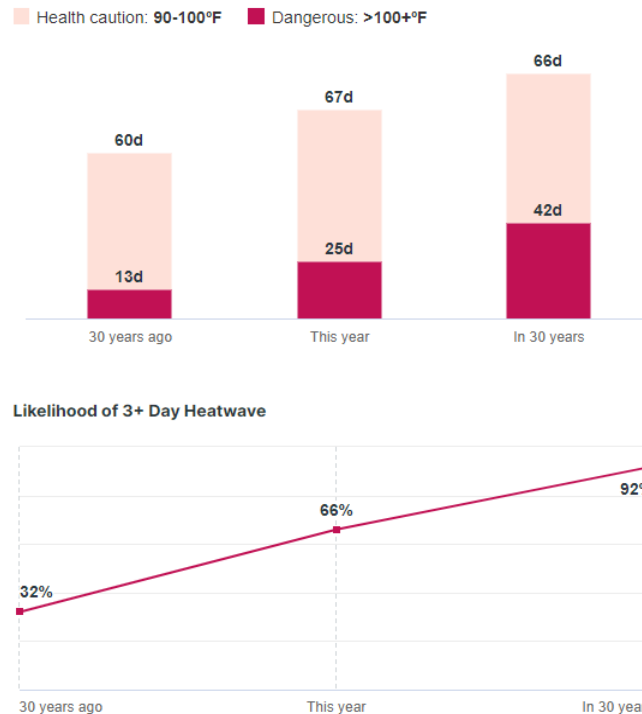
Because of increasing “feel-like” temperatures, 100% of the homes in Willows have severe heat factors (see Figure 45). As temperatures continue to rise, the probability of dangerously hot days and heatwaves with temperatures above 100°F pose a serious health threat to everyone. Willows is projected to have 7 hot days with a “feels like” temperature of 106°F this year, and with climate change, it is expected to have 16 such hot days per year 30 years from now (see Figure 44).



Source: Risk Factor, Does Willows Have Heat Risk? https://riskfactor.com/city/willows-ca/685684_fsid/heat

Figure 45: Heat Factors in and Near the City of Willows

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents



Source: Risk Factor, Does Willows Have Heat Risk?
https://riskfactor.com/city/willows-ca/685684_fsid/heat

Figure 46: Heat Projections for the City of Willows

Changes in Development

California's Fourth Climate Change Assessment, Sacramento Valley Region, indicates an increased risk of extreme heat events resulting from climate change. Climate change has increased both average temperatures and the frequency and intensity of extreme heat events. Local increases that affect neighborhoods and ecosystems are far more variable and often of greater magnitude than global temperature increases. Warming may be greater inland than in coastal regions. Heat waves are expected to have both higher daytime and nighttime temperatures with longer durations and geographic extents.⁴⁷

This may result in more heat-related illnesses; an increase in disease-causing pathogens, such as West Nile Virus, Valley Fever, and algal blooms; and exposure to ozone and other air pollution. All three participating jurisdictions are likely to be more vulnerable to extreme heat. While broader changes to the climate may increase extreme heat, there has not been significant changes in development since the last plan update which would impact Glenn County's vulnerability to extreme heat .

Vulnerability Assessment

Because extreme heat does not have a defined geographic extent, spatial analysis to identify assets at risk are not practical. A qualitative assessment of potential impacts on the planning area is as follows.

⁴⁷ California's Fourth Climate Change Assessment: Sacramento Valley Region. 2018.
https://www.energy.ca.gov/sites/default/files/2019-11/Reg_Report-SUM-CCCA4-2018-002_SacramentoValley_ADA.pdf

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Extreme heat can be harmful to human health, particularly to the elderly and those with chronic conditions, such as respiratory or cardiovascular diseases. Heat-related illnesses arise when the body is unable to regulate temperature. Illnesses can range from mild dehydration to hospitalization or death from heat stroke. Outdoor workers, older persons, infants and children, pregnant women, and individuals with low incomes are among those most vulnerable to prolonged heat. Older adults are less able to regulate body temperature and are more likely to have underlying medical conditions. Outdoor workers may lack a location to get relief from high temperatures. Avoiding work in the heat of the day may reduce heat-related illnesses but can lead to overall loss of productivity.

Lower-income households may not have access to air conditioning or other means of maintaining comfortable indoor temperatures. Cooling centers or other facilities that provide air-conditioned spaces for residents who lack cooling at home improve comfort and reduce mortality during extreme heat events.

Those suffering from heat-related illnesses might not recognize the symptoms and seek proper treatment. While the preceding health risks are significant, it is important to note that heat-associated deaths and illnesses can be reduced through the prevention and management of individual and community exposure.

All of the critical facilities in Glenn County, the City of Orland, and the City of Willows are in a geographic area exposed to extreme heat. However, extreme heat does not typically cause direct damage to critical facilities or other structures. Prolonged extreme heat may put extra strain on power resources for cooling systems. This may strain their ability to provide adequate cooling, and it increases the potential for power outages. In some parts of the country, extreme heat has contributed to cracking and buckling of pavement on roadways, which can result in road closures for emergency repairs, but there have been no reports of this in Glenn County.

Urban heat island conditions can retain high temperatures at night. Although Glenn County is predominantly rural, community efforts to reduce heat island effects could contribute to the protection of public health. Adaptation measures, such as planting trees, developing reflective surfaces on roofs, and greenspaces, may reduce risks of extreme heat.

Prolonged high temperatures can impact crop yields. Specific measures of potential impacts on agriculture in Glenn County were not identified.

Extreme heat can contribute to an increased risk of wildfire. Prolonged heat draws moisture out of the ground and dries out vegetation and other wildfire fuels. Warmer and dryer conditions can contribute to more extreme fire behavior and a longer and more active fire season.

Jurisdiction-Specific Vulnerabilities

Glenn County

Residents in the unincorporated areas of the county are less densely concentrated, and many are located farther away from public facilities where they could seek relief from the heat. Some populations may be more sensitive, or negatively affected to a greater degree by extreme heat.

Land use in the county is primarily related to agriculture, forestry, and recreation. These sectors are more likely to employ workers who are exposed to extreme heat in outdoor work. Prolonged heat may directly impact the health of crops and livestock and could reduce crop yields.

Extreme heat can occur simultaneously with drought. Drought can make a hot day feel hotter, and a heat wave can make dry conditions even drier. Both conditions also worsen the risk of wildfires. Much of the county is at high risk of all three hazards.

The Cities of Willows and Orland

Compared to more rural or less-populated areas, a number of variables can worsen the effects of heat in specific areas, particularly more urban settings, creating what are known as heat islands. Daytime maximum temperatures in a heat island can differ by as much as 7°F from the area surrounding it. Second, they can retain heat through the night, which can increase the cost of cooling for homes and businesses. Some of the most notable causes of the heat island effect include man-made construction materials, such as concrete and asphalt, which capture and radiate heat long after sunset. Layouts that might trap heat but prevent airflow also can contribute to higher temperatures. On the other hand, proximity to open vegetation and bodies of water has the opposite effect. It helps to lower surrounding temperatures. Finally, the use of motor vehicles and industrial machinery contributes to rising temperatures. Both Willows and Orland have characteristics that contribute to the “heat island effect.”

Because both cities have higher-than-average populations below the poverty line, those who are socioeconomically disadvantaged will experience even greater budget problems to meet the increased cost of cooling because of higher temperatures sustained over longer times.

These communities also have higher percentages of people in the at-risk age categories of under 18 and over 65. These individuals may be more dependent on others for their care. Very young people may be less able to regulate their body temperatures. Older individuals are more likely to have underlying health conditions that make them more susceptible to heat-related illnesses.

In sync with a higher demand for electricity for air-conditioning is a greater strain on the electrical grid, which can lead to significant outages when overburdened.

Section 3.3 Flood

Flood refers to a general and temporary condition of partial or complete inundation of normally dry land. Flood reduction, prevention, and mitigation are major challenges for Glenn County residents and floodplain managers. Many areas of the county are vulnerable to flooding, especially property near drainage channels and along the county's creeks and the Sacramento River. This is because of heavy seasonal rainfall, flat terrain, and an intricate network of canal and levee systems. Glenn County has three types of flooding: pluvial, riverine, and dam failure. Most of the county's flood-prone properties are subject to inundation because of heavy rainfall and the overflowing of streams and drainage canals.

Pluvial flooding is localized flooding that occurs during heavy seasonal rainfall, independent of an overflowing water body. This occurs when ground becomes saturated and rainfall runoff volumes exceed the design capacity of drainage or stormwater facilities, flood control structures are not sufficient, or maintenance in drainage areas causes pinch points in flood control structures.

Riverine or fluvial flooding occurs when streams or rivers exceed their carrying capacity because of heavy seasonal rainfall, which typically occurs from December through February. Flood risk is intensified along the Sacramento River where the largest volumes of water flow. Both fluvial and riverine flooding can cause significant damage to structures, transportation systems, and other critical community assets.

Flooding can also occur when dams fail or levees are breached. Dams fail when the constructed barrier can no longer contain water as intended, leading to the sudden flooding of a large area. Levees are embankments built to prevent rivers, and streams from overflowing. Flood risk is increased by levee breaches or dam failures caused by severe storms, accumulation of melted snow, debris jams, landslides, volcanic eruptions, or fires. Earthquake activity also can damage dams and lead to their failure.

Dams are classified in three ways:

- High Hazard – Dam failure would probably cause loss of life and major damage to property.
- Significant Hazard – Dam failure could cause some loss of life and property damage.
- Low Hazard – Dam failure is unlikely to cause loss of life or damage to property.

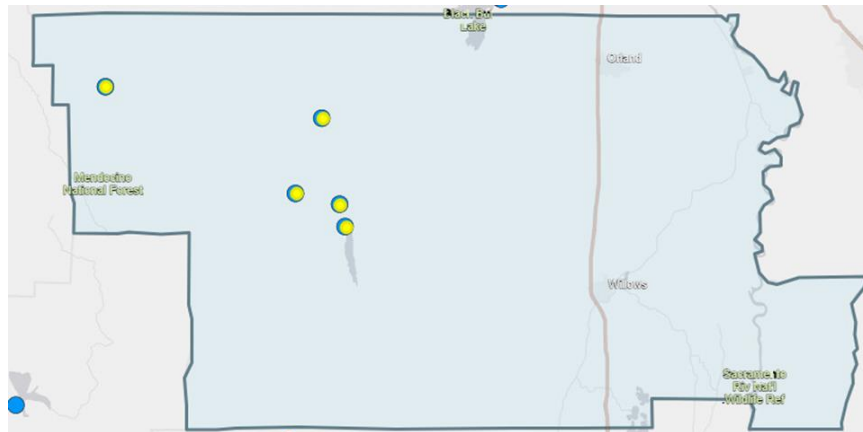
Table 30 lists dams in Glenn County, and Figure 47 shows dam locations.

Table 30: Glenn County Dams

Name	Hazard Classification	Condition	Emergency Action Plan	Owner	Last Inspection
E.A. Wright	Significant	Satisfactory	No	Private Entity	02/22/2022
Hamilton	Low	Satisfactory	Not Required	Private Entity	01/24/2022
Sanhedrin Ranch	Low	Satisfactory	Not Required	Private Entity	02/22/2022
Stony Gorge	High	Not Available	Yes	Reclamation	06/11/2020
Upper Plaskett	Low	Not Rated	Not Required	U.S. Forest Service	06/09/2014

Source: <https://www.usbr.gov/projects/index.php?id=373>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents



Source: National Inventory of Dams, “Glenn, California.”
<https://nid.sec.usace.army.mil/#/dams/search/sy=@countyState:Glenn,%20California&viewType=map&resultsType=dams&advanced=false&hideList=false&eventSystem=false>

Figure 47: Glenn County Dams in Perspective

In addition, there are four dams outside of Glenn County that could affect both waterways and properties in the county:⁴⁸

- Black Butte Dam
- East Park Dam
- Oroville Dam
- Shasta Dam

On February 7, 2017, the Oroville Dam service spillway ran at a flow rate of approximately 52,500 cubic feet per second (cfs). Suddenly, a section of the concrete slab about halfway down the chute failed, rapidly eroding the foundation and adjacent ground. The erosion caused progressive failure and removal of the chute slab in both the upstream and downstream directions. To prevent further damage to the chute while managing the water level of the reservoir, adjustments were made to the chute flow. However, major storms in the large watershed caused the reservoir to rise until the crest of the emergency spillway was overtopped for the first time in its history, four days after the chute damage was first observed. Although the maximum flow at the emergency spillway reached only about 12,500 cfs (less than 4% of its design capacity), the hillside eroded and rapid headcutting occurred because of the overflow. (Headcutting is rapid erosion where the depth of a stream or channel changes, often at the beginning—the head—of the waterway.) This posed the risk that the small barrier (known as a weir) at the crest of the emergency spillway could be undermined and fail because it is overturned or moved, leading to downstream flooding from the uncontrolled release of the reservoir.

Because of this risk, the gates for the service spillway were opened to increase the chute flow, lower the reservoir level, and facilitate the evacuation of approximately 188,000 people. Because of the very large size of the dam and spillways and the number of people at risk, this was one of the most serious dam safety incidents in United States history, and the estimated cost for repairs and recovery was about \$1.1 billion.⁴⁹

⁴⁸ County of Glenn, “Did you know that there are multiple dams in Glenn County?”
<https://www.countyofglenn.net/dept/sheriff/office-emergency-services/preparedness>

⁴⁹ Association of State Dam Safety Officials, “Case Study: Oroville Dam (California, 2017).”
<https://damfailures.org/case-study/oroville-dam-california-2017/>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

Before this incident, there was no requirement for a dam under state jurisdiction to have an Emergency Action Plan. Under Senate Bill 92, based on their hazard classifications, all state dams must submit such plans to the California Governor's Office of Emergency Services (OES) for review and approval.⁵⁰

To assist Butte County, Glenn County activated the Oroville Dam spillway incident. Law enforcement was prepared to provide mutual aid for evacuations, closures, and patrols. Shelter operations were ready in Glenn County for evacuated Butte County residents. Healthcare facilities in Glenn County were ready to address a medical surge or to treat anyone displaced from facilities in Butte County. This response cost Glenn County approximately \$100,000.

Regulatory Environment

The regulatory landscape for flood control is often characterized by its complexity, multi-level governance structures, disparate regulations that apply to flood control structures and water bodies, and local participation in state and federal programs. This section examines the regulatory frameworks employed by Glenn County and the Cities of Orland and Willows to govern floodplain development. It also provides insights into the latest requirements from the State of California and the National Flood Insurance Program (NFIP).

Local Building Codes

Glenn County and the Cities of Orland and Willows have implemented a comprehensive set of building codes and construction best management practices aimed at reducing the flood risk of newly constructed buildings. As the designated floodplain administrator for the county, the Building Official is vested with the authority to administer, implement, and enforce the Glenn County Flood Plain Management Zone Code by granting development permits only if they comply with the provisions of the code.

Local Floodplain Delineation

Upon application for a building permit in Glenn County, the Building Inspection Division undertakes a thorough review of the submitted application and accompanying plans to assess the site of the proposed structure for its proximity to a Special Flood Hazard Area (SFHA) as designated by the Federal Emergency Management Agency (FEMA) on regulatory Flood Insurance Rate Maps (FIRMs). It is noteworthy that FEMA's flood hazard areas are subject to periodic updates to reflect changes in the risk of flooding. Therefore, it is imperative to stay up to date with the regulatory maps to ensure compliance. More detailed information on FEMA flood hazard areas can be found in the section on Location/Geographic Extent.

In the context of new construction and significant improvements, fully enclosed areas below the lowest floor, which are susceptible to flooding, must be designed in a manner that enables the automatic balancing of hydrostatic flood forces on exterior walls. This can be achieved by allowing for the entry and exit of floodwater. It is imperative to note that these measures are necessary to ensure the safety and structural integrity of the building and to mitigate the risks and damage associated with flooding. Therefore, it is recommended that professionals in the construction industry adhere strictly to these guidelines and regulations to ensure compliance with the required standards and to minimize the risk of damage or loss.

⁵⁰ YouTube, "Cal OES's Hazard Mitigation Chief Jose Lara Remembers Oroville Spillway Incident for 5th Anniversary." <https://www.youtube.com/watch?v=65o2uiUGRyM&t=205s>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

On November 8, 2022, Willows adopted its Floodplain Management Plan. New construction, including manufactured homes, must be anchored to prevent movement or collapse because of floods. It must use flood-resistant materials and utility equipment and have proper drainage paths. The lowest floor of residential structures must be elevated to or above the base flood elevation. The elevation of the lowest floor must be verified by a civil engineer or land surveyor and confirmed by the building inspector.

New nonresidential construction or significant improvements to existing structures must be elevated or floodproofed below the recommended elevation and have structural components that can resist hydrostatic and hydrodynamic loads and buoyancy effects. Flood openings must be designed to equalize hydrostatic flood forces and allow for the entry and exit of floodwater. Garages and low-cost accessory structures must be adequately anchored, constructed with flood-resistant materials, and designed to allow for the automatic entry of floodwaters.⁵¹

National Flood Insurance Program

The NFIP is a federal initiative that offers flood insurance to homeowners, renters, and business proprietors in communities that participate in the program. As part of their participation in the NFIP, Glenn County and the Cities of Orland and Willows are committed to protecting homes with policies currently in force. As is customary in most communities, FEMA has undertaken a detailed flood insurance study for selected areas in Glenn County. Such studies include water surface elevations for various flood magnitudes, such as the 1 percent annual chance of flood (the 100-year flood) and the 0.2 percent annual chance of flood (the 500-year flood). FIRMs display the base flood elevations and the limits of the 100- and 500-year floodplains. The Location/Geographic Extent section provides additional information.

Glenn County joined the NFIP on September 3, 1980, and it is committed to regulating development in the floodplain areas that fall under FEMA's purview in accordance with the criteria of the NFIP. Before issuing permits for development in floodplain areas, the county requires that two fundamental criteria be met to ensure compliance with the NFIP's guidelines. These requirements promote the safety and well-being of the county's residents:

- All new buildings and development undergoing substantial improvements must, at a minimum, be elevated to protect against damage from 100-year floods.
- New floodplain development must not aggravate existing flood problems or increase damage to other properties.

Structures that were authorized or erected in Glenn County before the NFIP requirements were implemented are commonly referred to as "pre-FIRM" structures. (The regulatory requirements were later integrated into the county's ordinances.) For unincorporated regions of Glenn County, pre-FIRM structures are those that were authorized or constructed before September 3, 1980. The FIRMs for Glenn County, Orland, and Willows are current as of August 5, 2010.

Both Orland and Willows are active participants in the NFIP. Willows joined the program on June 4, 1980, and Orland joined on September 16, 2011. To comply with the NFIP, Orland adopted Ordinance No. 2011-03 on September 6, 2011. This ordinance effectively adopted the flood insurance study and flood insurance rate maps for Glenn County. Furthermore, the City of Orland Municipal Code, Chapter 17.68, established a floodway conservation zone to protect life and property in floodways. This zone is applied to lands near streams and drainage channels that are periodically inundated or will be inundated by a design flood. The specific design flood for each floodway zone is defined on the zone map. The regulations set forth in this chapter aim to provide for the reasonably unrestricted passage of a design flood and offer reasonable measures for protecting life and property in floodway areas.

⁵¹ Code Publishing, "Chapter 15.65 Floodplain Management."
<https://www.codepublishing.com/CA/Willows/html/Willows15/Willows1565.html>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Chapter 15.65 of the Willows Municipal Code outlines the city's Floodplain Management Ordinance. It includes regulations to do the following:

1. Restrict or prohibit uses which are dangerous to health, safety, and property because of water or erosion hazards or which result in damaging increases in erosion or flood heights or velocities;
2. Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
3. Control the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters;
4. Control filling, grading, dredging, and other developments that may increase flood damage; and
5. Prevent or regulate the construction of flood barriers that will unnaturally divert floodwaters or which may increase flood hazards in other areas.

Central Valley Flood Protection Plan

State bond legislation spearheaded by the California Department of Water Resources (DWR) to provide protection to people and property in areas especially prone to flooding was enacted in 2007. The legislative requirements give Glenn County planning responsibilities for local floodplain management (general plans, zoning ordinances, development agreements, tentative maps, and other actions).

This legislation imposed certain statewide requirements, while other provisions are complementary and extend to lands in the Sacramento–San Joaquin Valley. Additional legislation applies to lands in the Sacramento–San Joaquin Drainage District, which encompasses Glenn County.

The Central Valley Flood Protection Plan (CVFPP) is a strategic blueprint that California has designed to manage flood risk in the Central Valley. The DWR prepared this plan in accordance with the Central Valley Flood Protection Act of 2008 (Act), and the Central Valley Flood Protection Board adopted it in June 2012. The CVFPP must be updated every five years and the most recent update was adopted on 12/16/2022.⁵² The plan has the following aims:

- Prioritize the investment in flood management by the state over a 30-year planning horizon.
- Promote multi-benefit projects.
- Integrate and enhance ecosystem functions associated with flood-risk-reduction projects.

Despite considerable improvements in flood management in the Central Valley since the 2007 legislation and passage of the Act in 2008, this vast region still faces significant flood risk, particularly under the urgent threat of climate change. Investments worth about \$4.1 billion were made between 2007 and 2021 to reduce flood risks, improve operation and maintenance, and enhance ecosystems in the Central Valley. However, flood risk in the region continues to grow because of increased extreme weather events caused by climate change. This risk highlights the significance of the CVFPP and its recommended actions. The pace and scale of implementation must increase to meet the challenges of flood management that arise from accelerating climate change. These risks include the following:

- Communities in the Central Valley are threatened by the current and future effects of climate change on hydrology, such as extreme precipitation events and loss of snowpack. Extreme events, such as floods and droughts, are expected to increase in frequency and intensity.

⁵² The State of California Central Valley Flood Protection Board, "Central Valley Flood Protection Plan." <https://cvfpb.ca.gov/cvfpp/>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

- Flood risks for over 1.3 million Central Valley residents remain high and are set to increase with projected growth. Without the recommended flood system investments, estimates show that over a 50-year period (2022–2072), the annual lives lost more than doubles in the Sacramento River Basin and quadruples in the San Joaquin River Basin.
- More than \$223 billion of structures and their contents are at risk, according to 2021 data.
- Agriculture-based communities and the \$17 billion agricultural economy could be significantly affected, and flood events during the growing season could disrupt national and international food supplies.
- Socially vulnerable populations bear a disproportionate share of the adverse effects of flooding, yet recovery spending underserves the populations that need it the most.
- Despite significant recent investments in repair, rehabilitation, and replacement, a backlog of deferred maintenance continues to increase, creating the need for new and more expensive capital improvements.
- Although projects have been implemented to improve environmental conditions at specific locations, the configuration and management of the flood system and other factors, such as infrastructure and land uses adjacent to rivers, continue to obstruct natural processes, fragment riverine habitats, and contribute to the decline of native species.⁵³

The Mid & Upper Sacramento River Regional Flood Management (MUSR RFM) Plan is a locally driven assessment of regional flood management issues. This follow-up to the 2012 CVFPP informed the 2017 update of the CVFPP. It outlined the long-term vision for flood management in the region, described current flood management conditions, identified opportunities for improving flood management, and prioritized project needs. The flood protection system includes reservoirs with active flood control space, hundreds of miles of levees, multiple weirs, an outfall structure, diversion channels, massive bypasses, and drainage facilities, which pump interior runoff and seepage from levee-protected areas back into flood control channels. These structural elements work together to contain high flows in the main river channel and, when necessary, divert water from the main river channel into the bypass system.⁵⁴ However, this plan lacks strong governance to implement the needed risk-reduction projects.

Government Code 65302

Under this code, cities and counties are authorized to incorporate local hazard mitigation plans into the safety elements of their general plans. While the code does not mandate the adoption of such plans, it allows for their implementation, providing local governments with the flexibility to undertake measures that address potential hazards in their communities. Compliance with the Federal Disaster Mitigation Act of 2000 further underscores the importance of such plans, as it helps mitigate the effects of natural disasters and other events that may pose significant risks to public safety and welfare.

The Glenn County 2023 updated Safety Element addresses flood to ensure that construction and new development projects do not have any adverse impacts on existing properties and flood control and drainage structures. New structures must be located outside the 100-year floodplain, unless otherwise mitigated. All new development in a special flood hazard area must be built according to FEMA standards. The plan also encouraged and accommodated multipurpose flood control projects that incorporate recreation, resource conservation, preservation of natural riparian habitats, and the scenic

⁵³ The State of California Central Valley Flood Protection Board, “Central Valley Flood Protection Plan Update 2022 Highlights.” https://cvfppb.ca.gov/wp-content/uploads/2023/01/a0000-CVFPP_U22_layout_Highlights_vFINAL_online.pdf.

⁵⁴ Mid & Upper Sacramento River Regional Flood Management Plan, 2014. https://musacrmp.com/wp-content/uploads/2014/11/MUSR_RFMP_Executive_Summary_111014.pdf

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

values of drainages, creeks, and detention ponds. Where appropriate and feasible, water detention facilities should be used as groundwater recharge facilities. The General Plan also prioritized flood control measures that respect natural drainage features, vegetation, and natural waterways while providing adequate flood control and protection. Any development activity that requires a grading permit must be designed and built to drain properly to minimize drainage issues, erosion, and sedimentation. Finally, these new policies must ensure that new development and infrastructure improvements do not contribute to potential flooding.⁵⁵

Government Code 8685.9

Pursuant to Government Code 8685.9, the state's allocation of financial resources for eligible projects under the California Disaster Assistance Act is restricted to 75% of state-eligible costs. This limit can be exceeded only if the local agency is in a city and/or county that has incorporated a local hazard mitigation plan in accordance with the Federal Disaster Mitigation Action (DMA) 2000 as part of the safety element of its general plan. If the local jurisdiction/agency has adopted a local hazard mitigation plan, the Legislature may consider providing a state share of local costs that exceed 75% of state-eligible costs.

Location/Geographic Extent

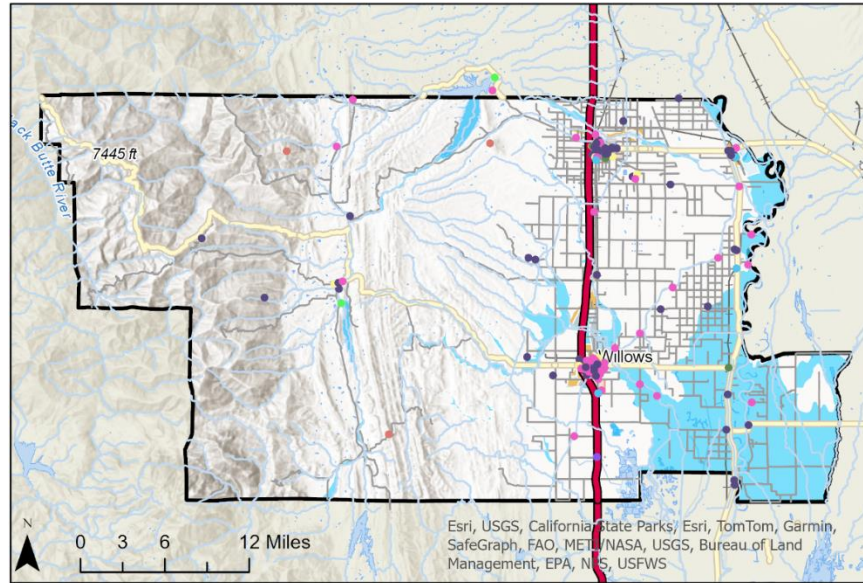
Two major watershed basins of the Sacramento River Watershed extend across Glenn County: Glenn–Colusa and Shasta–Tehama. They pose significant flood risks from natural and human-made factors in their respective floodways. Most of the flood risk in Glenn County is specifically subject to inundation from heavy rainfall and the overflowing of streams and drainage canals. In the unincorporated portions of the county, most flood risk is near the drainage canals used to collect local runoff and areas close to regional watershed floodways, such as the Sacramento River. Areas adjacent to Hambright Creek and Stony Creek near Orland also are at risk of flooding. Willows could be impacted by flooding along Walker Creek, Wilson Creek, and South Fork Willow Creek.

Various regulatory agencies employ Special Flood Hazard Areas (SFHAs) to evaluate vulnerability and risk in flood-prone communities. An SFHA is determined by the extent of flooding associated with a one-percent annual probability of occurrence (the base flood or 100-year flood). Flood hazard maps (Figure 48 through Figure 50) illustrate the 100-year and 500-year floodplains, which represent estimated inundation areas based on floods with one percent (100-year) and 0.2 percent (500-year) chances of occurring during a given year. Experience has shown that FEMA maps of rural areas of the county are not always accurate. FEMA flood insurance data do not always indicate flood losses, as not every property that floods has flood insurance.

The FEMA FIRM for Glenn County has identified over 140,000 acres of flood hazard areas. Figure 48 shows these areas, and Table 31 lists the amounts of land in 100-year and 500-year flood hazard areas. This information makes it possible to identify the location and extent of flooding in areas across Glenn County. These findings are particularly useful in assessing vulnerability and risk in flood-prone communities.

⁵⁵ Static 1, "Glenn County General Plan Update."
https://static1.squarespace.com/static/5c8a73469b7d1510bee16785/t/6501ddc090fa5b221162db04/1694621148151/GlennCounty_General+Plan+Adopted+7-18-23.pdf

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents



Glenn County Flood Hazard

Glenn County Lifelines

- Communications
- Energy
- FoodHydrationShelter
- HazardousMaterials
- HealthAndMedical
- SafetyAndSecurity
- Transportation
- WaterSystems

- Railroads
- Orland_Boundary
- Willows_Boundary
- Waterbodies
- Glenn County Boundary

Special Flood Hazard Zones

- A
- AE
- AH
- AO
- X
- Minimal flood hazard
- AE - Floodway



Date Saved: 1/10/2024

Figure 48: Glenn County Community Lifelines in Flood Hazard Zones

Emergency Services

- Chemical - Fertilizer
- Childcare
- Emergency Medical Services
- Emergency Services
- Emergency Services - LE
- Emergency Services Communications
- Emergency Services County EOC
- Emergency Services Jail
- Energy Sector
- Government

Government

- Government - Schools
- Government - Tribal
- Healthcare
- Hospital
- Major Transportation
- Major Transportation - Airport
- Other
- School
- Shelter Site
- Water - Dams
- Water - flood control
- Water and Waste Water

Natural Features

- Well
- Bus Stops
- Bridges
- Runway
- GlennRide Bus Route
- Streams
- Railroads
- AE - Floodway
- Orland_Boundary
- Willows_Boundary
- Waterbodies
- Glenn County Boundary

Special Flood Hazard Zones

Flood Zone

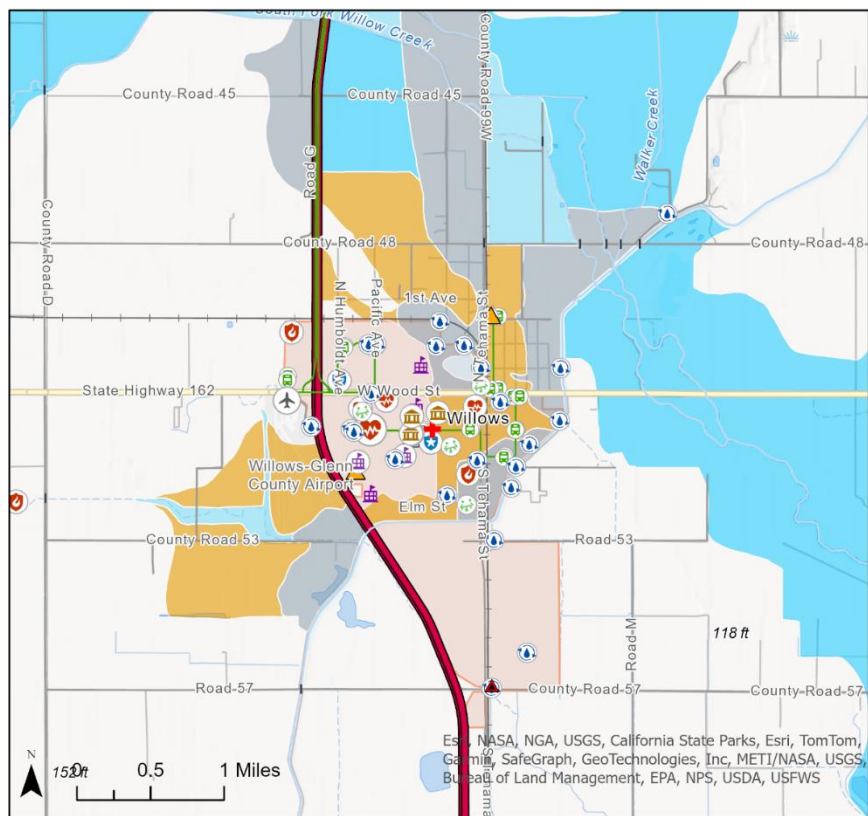
- A
- AE
- AH
- AO
- X
- Minimal flood hazard



Date Saved: 1/10/2024

Figure 49: Critical Facilities in Flood Hazard Zones in Orland

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents



Date Saved: 1/10/2024

Willows Flood Hazard

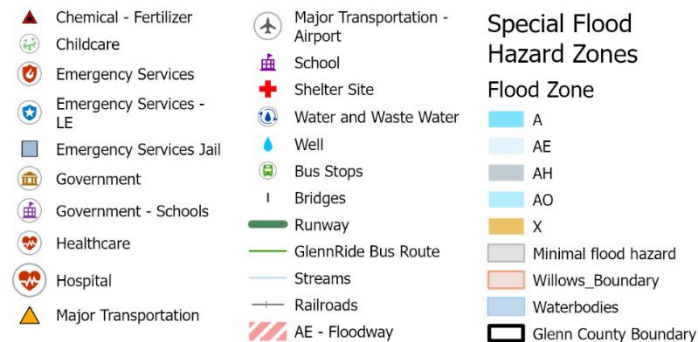


Figure 50: Critical Facilities in Flood Hazard Zones in Willows

Table 31: Area in Glenn County Inundated by 100- & 500-Year Floods

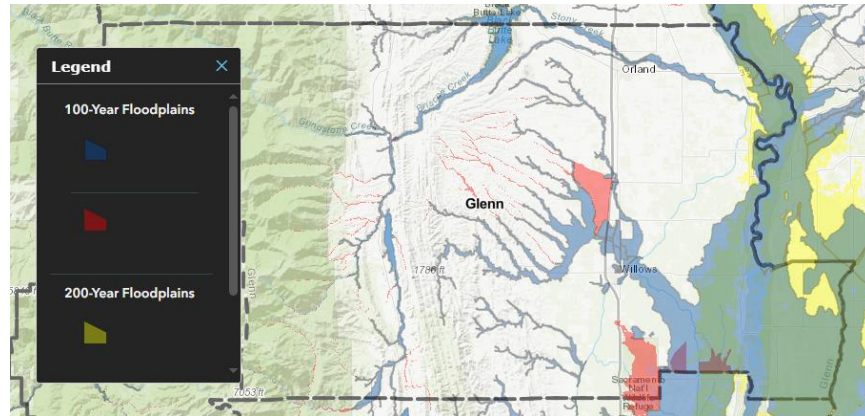
Hazard	Square Miles	Acres
100-Year Flood	211.6	135,411
500-Year Flood	7.5	4,801.7
Total	219.10	140,212.7

Source: FEMA, "FEMA Flood Map Service Center: Welcome."

<https://msc.fema.gov/portal/home>

State Flood Awareness Zones

DWR created State Flood Awareness Zones after analyzing floodways and future projections for population growth and development in California. The goal was to conduct floodplain studies in areas where future growth and development might be expected. These efforts were concentrated in areas currently shown on FEMA's Digital FIRMs (DFIRMs) as Zone X, which has no apparent flood risk. DWR made significant efforts to conduct basic flood studies in Zone X in each county in California to identify overlooked flood-prone areas before any development starts. The concept and final mapping products are meant to be used by local governments to control development and protect floodplains in identified awareness zones (see Figure 51). FEMA's Special Flood Hazard Areas (SFHAs) and State Flood Awareness Zones together provide a comprehensive understanding of flood risk in California.



Source: Best Available Map, Glenn County California
<https://gis.bam.water.ca.gov/bam/>

Figure 51: State Flood Awareness Zones

Localized Flooding

Besides FEMA special planning and hazard areas and State Flood Awareness Zone, the Steering Committee of the Multi-Jurisdictional Hazard Mitigation Plan identified areas that flooded because of heavy rains and inadequate stormwater infrastructure. Several of these were identified by responses to the public outreach survey, including the following:

- SR 162 east of Willows
- Hwy 99 between Orland and Willows (between Road 48 and 45) has experienced frequent flooding, leading to road closures,
- Dips on Broadway and 2nd Street in Hamilton City
- Los Robles and 1st Avenue in Hamilton City
- Hambright Creek bank failures have led to home damages nearby. The creek needs ongoing maintenance to clear vegetation and strengthen banks.
- The "S" turn on Road 39
- Flooding of Wood Street near Walmart in Willows which limits access between Willows and Elk Creek
- Modoc Street in Orland
- County Road 200 (Newville Rd) outside of Orland

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

- The trailer park south of Hwy 162 west of Willows
- Erosion of Stony Creek and possible flooding near Stoney Creek Dr. and Woodhaven Court
- Insufficient drainage near County Rd 28 near the TC canal
- Hwy 306 past Neville needs repairs and flood prevention
- Concern for bridges near Ord Bend and Grindstone Rancheria

Repetitive Loss Properties

Glenn County, Orland, and Willows are required to assemble a flood management plan that addresses claims for repetitive loss (RL) and severe repetitive loss (SRL), as prescribed by the NFIP. It is important to understand the difference between a repetitive loss property and a repetitive loss area, as both are important for analysis.

FEMA has designated a specific category of insured properties as RL properties. Such properties have filed two or more claims of over \$1,000 each in a rolling 10-year period since 1978. The term “rolling 10-year period” means that claims can be made less than 10 years apart, but they must be at least 10 days apart. Properties may be classified as SRL properties when they have involved four or more claims of at least \$5,000 each or at least two claims that cumulatively exceed the reported value of the building. It is important to note that properties that experience repeated flooding may or may not appear on Glenn County’s RL property list for reasons, such as the following:

- Not everyone is required to carry flood insurance. Structures in Glenn County that carry federally backed mortgages in an SFHA must carry flood insurance.
- Owners who have completed the terms of the mortgage or who have purchased their property outright may choose not to carry flood insurance and bear the costs of recovery on their own.
- The owner of a flooded property that does carry flood insurance may choose not to file a claim.
- Even insured properties flooded regularly with filed claims might not meet the \$1,000 minimum threshold to be recognized as RL properties.
- The owner adopted mitigation measures that reduce the impact of flooding on the structure, removing it from the RL threat and the RL list (in accordance with FEMA’s mitigation reporting requirements).

The properties that appear on FEMA’s RL inventory have flood insurance and received two or more claims. Such properties reflect the repetitive flooding problem that the entire community faces, and they can be used to identify areas of mitigation interest. To maintain the NFIP as a viable program, efforts are made to reduce flood risk in the community and to develop mitigation measures to lower insurance payouts. Extensive NFIP databases track claims for every participating community, including Glenn County, Orland, and Willows. DWR, which is responsible for floodplain management for the state, coordinates with FEMA to obtain the RL and SRL numbers, although a discrepancy between the numbers used by FEMA and the state has been noted. However, for the purposes of this plan, the following numbers have been pulled from PIVOT and are likely to be correct:

- Unincorporated area in Glenn County has 13 RL properties and 1 SRL property. The last plan update reported only 11 RL properties, indicating an increase in RL/SRL properties. All the properties are residential and have not yet been mitigated. Three are outside the high-risk flood zone on the current FIRMs, and only one is a post-FIRM structure. In total, they received \$523,778 for building payments and \$171,121 for contents.
- Willows has nine RL properties—single-family homes that have not yet been properly protected. Of these properties, only two were insured. This has cost NFIP \$238,205 in building payments

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

and \$13,753 in content claims. Since the last plan update, the NFIP has paid an additional \$63,003 for these properties.

- Orland does not have any RL or SRL properties.

It is not necessary for a property to have an active flood insurance policy to be considered an RL or SRL property. Homes in certain communities that do not have flood insurance are still on the RL list. The RL designation stays with a property from owner to owner, even if there is no insurance policy in place or after the property has been mitigated. If a property has an insurance policy and makes claims that meet the RL criteria, it is added to the RL list. Furthermore, even if the policy on a property has expired or has been terminated, the property remains on Glenn County's RL list.

The Privacy Act of 1974 (5 U.S.C. 522a) restricts the disclosure of certain types of data to the public. Flood insurance policies and claims data are among the types of information that are restricted. FEMA is authorized to release such data to state and local governments only if they are used for floodplain management, mitigation, or research purposes. Therefore, this plan does not contain information on RL properties or claims data for individual properties. Only generalized locations of the county's RL properties are included.

Magnitude/Extent

Floods are described in terms of the area affected, the depth of floodwaters, and the probability of occurrence. Flood studies often use historical records, such as streamflow gauges, to determine the probability of occurrence of floods of different magnitudes. This probability is expressed in percentages as the chance of a flood of a specific extent occurring in a given year. Probability of flooding is measured as the average recurrence interval of a flood of a given size and place. It is defined as the percent chance that a flood of a certain magnitude or greater will occur at a particular location in a given year.⁵⁶

The annual probabilities calculated for flood hazards fall into the following categories:

- A 10-year flood has a 10% chance of occurring in a given year.
- A 50-year flood has a 2% chance of occurring in a given year.
- A 100-year flood has a 1% chance of occurring in a given year. This category is used as the standard for floodplain management in the United States and is referred to as a base flood.
- A 500-year flood has a 0.2% chance of occurring in a given year.

The Glenn–Colusa and Shasta–Tehama watersheds pose inherent flood risks to the region owing to their natural and human-made features. Specifically, much of the flood risk in Glenn County comes from heavy rainfall that leads to the overtopping of streams and drainage canals. In the unincorporated areas of the county, flooding is most likely from drainage canals that collect regional runoff and in areas near regional watershed floodways, including the Sacramento River. According to the hazard priority ranking exercise, there is a significant flood risk in the unincorporated areas and in Orland and Willows.

Almost a fourth of the county could be subject to flooding if the Black Butte Dam failed. The risk lies primarily along the eastern area of the county, roughly parallel to the Sacramento River and extending almost to Interstate-5 (see Figure 52).

⁵⁶ The 100-Year Flood. USGS, 29018. <https://www.usgs.gov/special-topics/water-science-school/science/100-year-flood>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

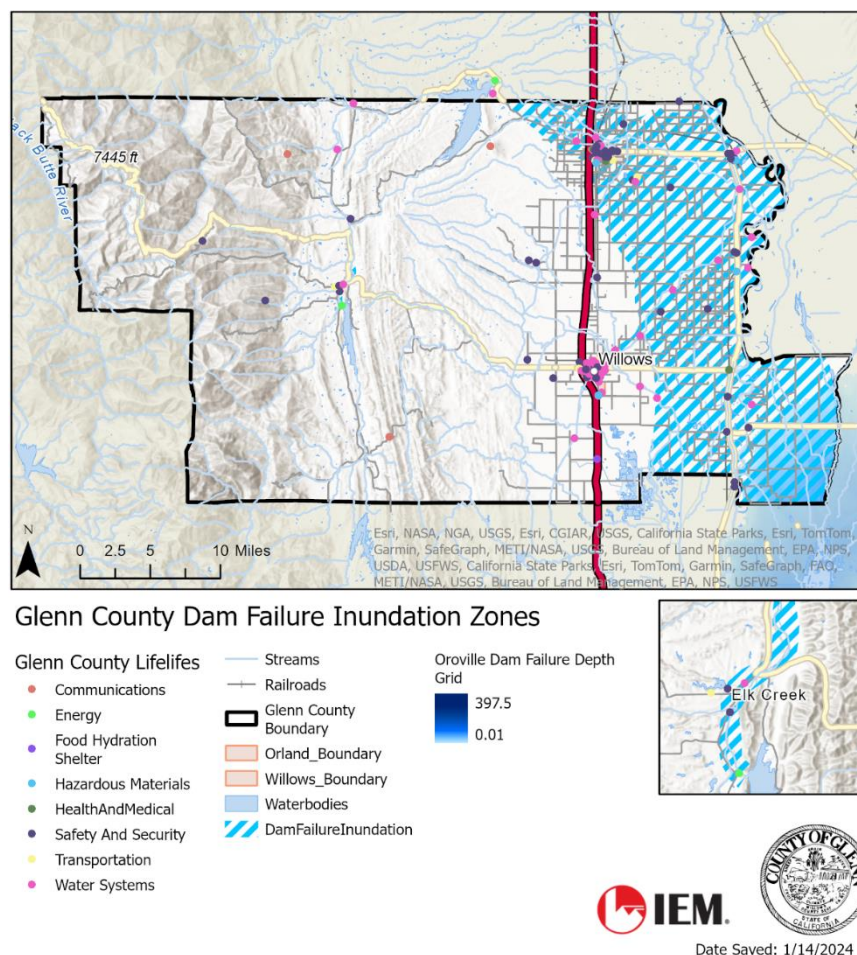


Figure 52: Community Lifelines in Glenn County with the Extent of Dam Failure

Flood Warning and Notification

The damage from flooding can be mitigated through longer warning times and proper notifications before floodwaters arrive. Read Sturgess and Associates (2000) found that communities that are warned at least 12 hours in advance have been prepared enough to reduce flood damage by approximately 40% compared to unprepared communities. Advancements in flood warning and notification systems have led to seasonal notifications for flooding, which has helped enhance the awareness of at-risk citizens. When communicated effectively, advance notifications can reach target audiences on a large scale. The following sections elaborate on Glenn County's and the State of California's flood warning and flood notification systems.

Warning times for dam failures can vary based on the conditions leading to the failure. When a dam is approaching capacity and risks overtopping or shows other signs of deterioration, officials may closely monitor conditions and warn those downstream to take protective action. However, in the case of a sudden unexpected failure, warning times may be very limited for those in the inundation areas, particularly those closest to the breach.

DWR Awareness Zone Notification

DWR's Levee Flood Protection Zones (LFPZs) include levees that are both accredited and disaccredited under NFIP. DWR LFPZ maps are used to determine which property owners will receive notices. The

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

LFPZs include portions of Butte, Colusa, Fresno, Glenn, Lake, Madera, Merced, Placer, Plumas, Sacramento, San Joaquin, Solano, Stanislaus, Sutter, Tehama, Yolo, and Yuba Counties.

The intent of the Awareness Floodplain Mapping project was to identify by 2015 the flood hazard areas that are not mapped under NFIP and to give communities and residents another tool for understanding potential flood hazards not on regulated floodplains. Awareness Floodplain Maps identify the 100-year flood hazard areas using approximate assessment procedures. These floodplains are shown simply as flood-prone areas without specific depths or other flood hazard data. Additional maps will be added as they become available. In 2017, the California Legislature passed a law mandating inundation maps and emergency action plans for all dams under state jurisdiction, except low-hazard dams.

DWR has launched the Flood Risk Notification Program to reduce the physical and financial impacts of flooding. Under state law adopted in 2007 (Water Code Section 9121), a flood risk notice must be sent each year to owners of properties located behind a state–federal levee and in an LFPZ. Nearly 275,000 Central Valley property owners in 17 counties received a “Flood Risk Notice” to raise flood risk awareness and encourage preventative actions to reduce flood damage and minimize losses.

Property owners may enter their addresses at the program’s interactive website at www.water.ca.gov/myfloordrisk to get more-detailed information about their flood risk, including the sources of flooding and potential flood depths for their properties. This website includes frequently asked questions that may help inform affected property owners.

Past Occurrences

Many areas in the county have a prolonged history of seasonal flooding, frequently causing significant damage. Floodwaters are frequent in communities in and near the lowlands of creeks and rivers. Typically, wintertime storm floodwaters are contained within predetermined limits by levees, dykes, and open lowlands, so they cause little or no damage. Dams such as Black Butte, Shasta, and Stony Gorge also help control floodwaters. However, on rare occasions, the combination of frequent storms, prolonged heavy rain, and melting snow causes floodwaters to surpass normal high-water boundaries, leading to significant damage.

State Emergency Disaster Proclamations, prompted by flood damage from severe storms and heavy rains, have been issued eight times from 1964 to March 2023. For Glenn County, eight Federal Flood Disaster Declarations have been specifically identified and documented (see Table 32). The MUSR RFMP also notes that major floods occurred on the Sacramento River in 1982–1983, 1986, 1995, 1997, and 2006. A major dam failure has not occurred in Glenn County, but one in the region would have a significant impact on the county. Additional details about some flooding events follow the table.

Table 32: FEMA Flood Declarations

Event	Declaration Date	Disaster Number
Severe Winter Storms, Flooding, Landslides, and Mudslides	March 10, 2023	3592
Severe Winter Storms, Flooding, Landslides, and Mudslides	January 14, 2023	4683
Severe Winter Storms, Flooding, Landslides, and Mudslides	January 9, 2023	3591
Severe Winter Storms, Flooding, Landslides, and Mudslides	April 1, 2017	4308
Severe Storms and Flooding	February 21, 1986	758
Severe Storms and Flooding	January 25, 1974	412

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Event	Declaration Date	Disaster Number
Severe Storms and Flooding	February 16, 1970	283
Heavy Rains and Flooding	December 24, 1964	183

Source: FEMA, "Disaster Declarations for States and Counties." <https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties>

March 2023: Approximately \$400,000 was spent on county public works-related response and recovery efforts because of significant damage to infrastructure. The response included closing approximately 30 roadways to ensure public safety, rescuing stranded motorists in flooded roadways, erecting a temporary structure of sandbags and muscle wall to contain a breach of Hambright Creek, and damage to six roads.

January 2023: The winter storms and flood of January 6–20, 2023, caused significant damage to infrastructure, which cost approximately \$5.5 million for county public works-related response and recovery efforts. These included closing approximately 40 roadways to ensure public safety, rescuing stranded motorists in flooded roadways, closing the County Road 306 bridge over Salt Creek for nearly 9 months, and addressing the failure of a bank of Hambright Creek, debris flows in the August Complex Burn Scar (Forest Highway (FH) 7 and CR 309), and damage to 30 roads, including the collapse of CR 309.

September 2022: Severe storms impacted Northern California on September 18–22, 2022, bringing excessive rainfall, flash flooding, debris flows, and rock and mud slides. They had a significant impact on the area of the August Complex burn scar on the west side of the county, damaged county infrastructure and road systems, estimated at \$1 million, and caused significant debris flows on CR 309 and FH7, which eroded the roadways and clogged more than 90 culverts.

October 2021: An atmospheric river impacted northern California on October 22–25, 2021, bringing high winds, excessive rainfall, flash flooding, debris flows, and rock and mud slides. The storms damaged county infrastructure, including CRs 309, 313, 303, and the Glenn County Landfill, at a cost of \$300,000.

2019: Response included closing more than 40 roadways to ensure public safety, taking emergency protective actions to protect the J-Levee system on the Sacramento River in Hamilton City, rescuing stranded motorists in flooded roadways and in remote snowed-in areas of the mountains. The damages cost approximately \$300,000.

2017: The response to a winter storm and floods February 1–23, 2017, included closing approximately 40 roadways to ensure public safety, taking emergency protective actions to protect the J-Levee system on the Sacramento River in Hamilton City, and rescuing stranded motorists in flooded roadways. Glenn County Public Works experienced issues with the VHF radio system because of a power outage. The generator did not have enough water and could not auto-start, causing a loss of power to the repeater. The damages were approximately \$300,000.

Frequency/Probability of Future Occurrences

According to the National Risk Index, the annualized frequency of riverine flooding is 0.5 events per year, based on 13 events over 24 years. The 100-year flood recurrence interval has traditionally been used as a reference level for flood probability. There is a high probability of flooding occurring in Glenn County. Based on meteorological patterns and the effects of climate change, it is anticipated that the county will face flooding annually, with a higher probability of inundation events in its unincorporated areas, and that the likelihood of flooding is expected to increase.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Climate change is altering other aspects of the occurrence of extreme events. These changing patterns of hazards increase the likelihood of unexpected weather that will overwhelm capacity and create cascading impacts. Climate change is also increasing the frequency of many sudden-onset hazards. Warmer air holds more moisture, which increases the likelihood of extreme rainfall and leads to flooding and other consequences. The number of floods and other hydrological events has quadrupled since 1980, while climatological events, such as extreme temperatures, droughts, and forest fires, have more than doubled since 1980. As the frequency of these hazards increases, it is more likely that hazards will strike simultaneously or in closer succession, compounding and cascading the impacts from such events.

Based on the 8 FEMA declared flood events in Glenn County, and at least 3 others described in the narrative, flooding has an annualized frequency of 0.183 or an average of almost 1 every 5 years. This indicated that probability of future events is likely.

Changes in Development

The California Fourth Climate Assessment: Sacramento Valley Region addresses several changing conditions that may affect flood hazards. More-frequent severe storms and floods are expected. This could place increased stress on levee systems and increase the need to expand flood bypasses, levees, and flood storage, such as reservoirs. The report identified a risk of disruptions to the housing market in response to unmitigated flooding and concomitant economic impacts that disproportionately affect particular sociodemographic groups. It is also anticipated that future wet seasons will produce more rain than snow because of higher temperatures. This may shift the timing of streamflow into the Sacramento Valley from spring to winter. This could also contribute to higher surface runoff and less groundwater recharge, which may require additional stormwater or reservoir capture. No significant changes since the last plan update to the population or land use which would impact Glenn County, the City of Orland, or the City of Willow's vulnerability to this hazard.

Vulnerability Assessment

The vulnerabilities and impacts of flooding can vary widely, depending on the size, extent, and magnitude of the event. A general description of flood impacts follows, and specific impacts on the population, structures, critical facilities and infrastructure, economy, and environment in Glenn County are elaborated later in this section.

Injury or death can occur if people are caught in floodwaters, and floodwaters can create other public health concerns by spreading infectious diseases and exposure to chemicals and hazardous materials, including pollutants that can be stored in sediment. Flooding can cause extensive damage to structures depending on its depth and velocity, the construction types of buildings, and other factors. Increased development can accelerate the risk of flooding in urban areas. Impervious surfaces, such as concrete and asphalt, shed water at a faster rate than undeveloped areas. Storm drains may back up because of excessive volume or blockages by debris.

Water and wastewater systems can become contaminated by floodwaters, and flooding can damage electrical and communication systems, disrupting important services to affected areas. Transportation routes, including roads, railways, bridges, and other systems, are at risk of inundation, pavement deterioration, and scour damage, requiring costly and sometimes time-consuming repairs.

Floodwaters can become contaminated with chemicals, wastewater, and other hazardous materials that can pollute the natural environment. Stream bank erosion, channel migration, and landslides impact the natural environment. Although some aspects of ecosystems can benefit from the spread of organic material and nutrients and the replenishment of sediment and water, a large-scale flood can injure or kill plants and animals and drastically change habitats.

Dam Failure

A total of 72 critical facilities are in potential dam inundation zones in Glenn County, as shown in 34. Figure 52 shows the locations of these facilities grouped by community lifelines. Many of these facilities are in or near Orland. Depth grids were not available for the Black Butte and Stony Gorge dams, and Hazus was not used to estimate potential losses. However, GIS overlay analysis determined which facilities and other community assets were in possible inundation zones and the exposure values of the general building stock in those areas. Residences make up most of the building exposure values, followed by agriculture and commercial structures. Total building exposure values in dam inundation boundaries are \$6.8 billion. An earthquake centered close to a dam may cause the dam to fail.

The inundation boundary of Oroville Dam in neighboring Butte County covers a portion of the southeast corner of Glenn County. No critical facilities are in the potential inundation area from Oroville Dam, but State Highway 162, and County Roads Y, Z, ZZ, 67, and 69 could experience flooding from a failure of the Oroville dam.

Figure 53 and Figure 54 show the critical facilities and potential dam inundation areas in Orland and Willows, respectively.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

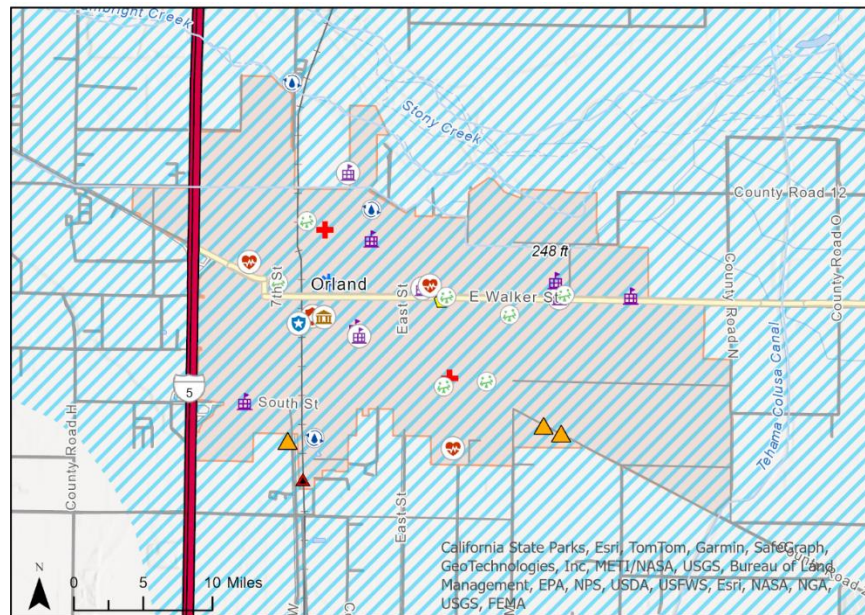
Table 33: Exposure of Buildings and Their Contents to Dam Failure

	Residential	Commercial	Industrial	Agriculture	Religious	Government	Education	Total Exposure
Orland	\$974,377,000	\$898,093,000	\$173,811,000	\$7,798,000	\$70,322,000	\$48,855,000	\$184,694,000	\$2,357,950,000
Willows	0	0	0	0	0	0	0	0
County	\$1,727,258,000	\$570,862,000	\$342,915,000	\$1,525,800,000	\$66,148,000	\$71,602,000	\$139,092,000	\$4,443,677,000
Total	\$2,701,635,000	\$1,468,955,000	\$516,726,000	\$1,533,598,000	\$136,470,000	\$120,457,000	\$323,786,000	\$6,801,627,000

Table 34: Community Lifelines within Dam Failure Inundation Boundaries

Lifeline	County	Orland	Willows	Total
Communications	0	0	0	0
Energy	1	0	0	1
Food, Hydration, Shelter	0	2	0	2
Hazardous Materials	2	1	0	3
Health and Medical	1	4	0	5
Safety and Security	14	24	1	39
Transportation	0	4	0	4
Water Systems	7	6	5	18
Total	25	41	6	72

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents



Orland Dam Failure Hazard

Glenn County Critical Facilities

- ▲ Chemical - Fertilizer
- ⚕ Childcare
- ⚕ Emergency Medical Services
- ⚕ Emergency Services
- ⚕ Emergency Services - LE

- ⚕ Emergency Services Communications
- ⚕ Emergency Services County EOC
- ⚕ Emergency Services Jail
- ⚕ Energy Sector
- ⚕ Government
- ⚕ Government - Schools
- ⚕ Government - Tribal
- ⚕ Healthcare

- ⚕ Hospital
- ▲ Major Transportation
- ⚕ Major Transportation - Airport
- ⚕ Other
- ⚕ School
- ⚕ Shelter Site
- ⚕ Water - Dams
- ⚕ Water - flood control
- ⚕ Water and Waste Water

- Streams
- Railroads
- Glenn County Boundary
- Orland_Boundary
- Willows_Boundary
- Waterbodies
- DamFailureInundation



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Figure 53: Critical Facilities and Potential Dam Inundation in Orland

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

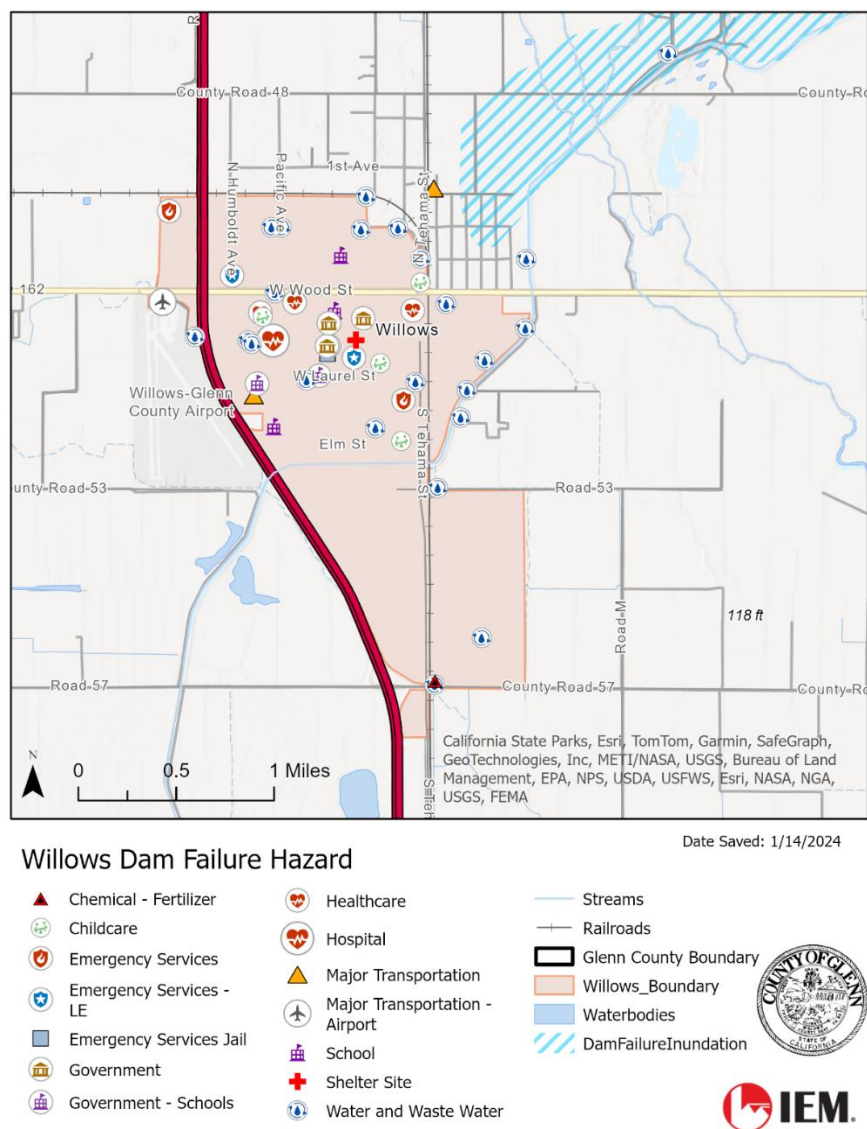


Figure 54: Critical Facilities and Potential Dam Inundation in Willows

Riverine Flooding

The National Risk Index ranks Glenn County as relatively moderate for flooding, with a score of 59.8 on the national percentile with an expected annual loss of \$546,856. The relatively low value of past flood losses has impacted the overall flood risk score. However, because of the large area in flood hazard zones and the population and structures potentially exposed, the flood risk is believed to be more significant.

Multiple approaches were used to analyze riverine flood hazards. First, the National Hazard Flood Layer for Glenn County was downloaded from FEMA's Map Service Center. GIS overlay analysis was used to determine which critical facilities and other assets were in special flood hazard Zones A. These results are summarized in Table 35 through 38.

In addition, Hazus 6.0 Level 1 analysis was run for both 100-year and 500-year return periods. Hazus uses a digital elevation model to generate flood depth grids and then uses these depth grids, general

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

building stock data, and damage functions to estimate the level of damage to structures and other social and economic impacts on the region. These results are summarized in Table 39 and 40.

Table 35: Community Lifelines in Flood Hazard Zones by Jurisdiction

Lifeline	County	Orland	Willows
Communications	0	0	0
Energy	1	0	0
Food, Hydration, Shelter	0	0	0
Hazardous Materials	1	0	0
Health and Medical	1	1	1
Safety and Security	8	0	6
Transportation	0	0	1
Water Systems	5	1	13
Total	16	2	21

Table 36: County Critical Facilities in Flood Hazard Zones

Facility	Jurisdiction	Description	FEMA Community Lifeline	Flood Zone
Artois Fire District	Artois	Emergency Services	Safety And Security	Zone X
California Water Service Company – Water Station	Hamilton City	Water and Waste Water	Water Systems	Zone X
DWR – Ord Water Gauge	Glenn	Water and Waste Water	Water Systems	Zone A
Glenn–Cordera Fire Protection District	Glenn	Emergency Services	Safety And Security	Zone A
Glenn Growers Radio Voter Site	NA	Emergency Services Communications	Safety And Security	Zone A
Glenn–Colusa Fire District (Butte City)	Butte Creek	Emergency Services	Safety And Security	Zone A
Grindstone Rancheria	Elk Creek	Government – Tribal	Safety And Security	Zone A
Hamilton City Community Service District	Hamilton City	Government	Safety And Security	Zone X
Hamilton City Fire District	Hamilton City	Emergency Services	Safety And Security	Zone X
Hamilton Union High State Preschool	Hamilton City	Childcare	Safety And Security	Zone X
Levee District 1 – Ord Ferry	Glenn	Water – Flood Control	Water Systems	Zone A
Levee District 3 – Butte City	Butte	Water – Flood Control	Water Systems	Zone A
Nutrien Ag Solutions	Hamilton City	Chemical – Fertilizer	Hazardous Materials	Zone X

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Facility	Jurisdiction	Description	FEMA Community Lifeline	Flood Zone
RD 2140 – HC Levee	Hamilton City	Water and Waste Water	Water Systems	Zone AE
Riverside Assisted Living Facility	Glenn	Healthcare	Health and Medical	Zone A
Stony Gorge Hydroelectric	Elk Creek	Energy Sector	Energy	Zone A

Table 37: Facilities in a Flood Hazard Zone in Orland

Facility	Jurisdiction	Description	FEMA Community Lifeline	Flood Zone
Walgreens Pharmacy	Orland	Healthcare	Health and Medical	Zone X
City of Santa Clara Water	Orland	Water and Waste Water	Water Systems	Zone X

Table 38: Critical Facilities in Flood Hazard Zones in Willows

Facility	Description	FEMA Community Lifeline	Flood Zone
Willows Pharmacy	Healthcare	Health and Medical	Zone X
Willows Fire Department	Emergency Services	Safety and Security	Zone AH
County Administration Memorial Hall	Shelter Site	Safety and Security	Zone X
Glenn County Planning Department	Government	Safety and Security	Zone X
Joyful Noise Preschool	Childcare	Safety and Security	Zone X
Butte St Head Start	Childcare	Safety and Security	Zone AH
Tehama St Children's Center	Childcare	Safety and Security	Zone AH
Glenn County Public Works Agency – Willows Yard	Major Transportation	Transportation	Zone X
North Willows CSD – Glenwood Pump	Water and Waste Water	Water Systems	Zone AH
North Willows CSD – French Street Pump	Water and Waste Water	Water Systems	Zone AH
North Willows CSD – Cherry Street Pump	Water and Waste Water	Water Systems	Zone AH
North Willows CSD – Cemetery Pump	Water and Waste Water	Water Systems	Zone X
California Water Service Company	Water and Waste Water	Water Systems	Zone AH
California Water Service Company	Water and Waste Water	Water Systems	Zone X
California Water Service Company – Water Station	Water and Waste Water	Water Systems	Zone AH
California Water Service Company – Well	Water and Waste Water	Water Systems	Zone X

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Facility	Description	FEMA Community Lifeline	Flood Zone
City of Willows – Sewer Lift Station	Water and Waste Water	Water Systems	Zone AH
Glenn–Colusa Irrigation District (GCID)	Water and Waste Water	Water Systems	Zone AH
GCID	Water and Waste Water	Water Systems	Zone A
GCID	Water and Waste Water	Water Systems	Zone A
GCID – Office	Water and Waste Water	Water Systems	Zone AH

Of the 167 bridges in Glenn County, 91 are in Flood Zones A, AE, AH, or AO. No bridges are in Zone X (shaded), which has 0.2% annual chance of flooding. Of the 1,590 culverts in the county, 325 are in A zones, and 8 are in Zone X (shaded). A very large number of these are in the southeast corner of the county. State Highway 45 and State Highway 162, numerous county roads, and approximately 13 miles of railroad segments are in a flood zone A.

Hazus

Hazus estimates that the 12,296 buildings in the region have a total replacement value of \$6.5 billion (excluding contents). Hazus 6.0 references Census 2020 data, which state that 28,889 people reside in Glenn County.

100-Year Return Period Scenario

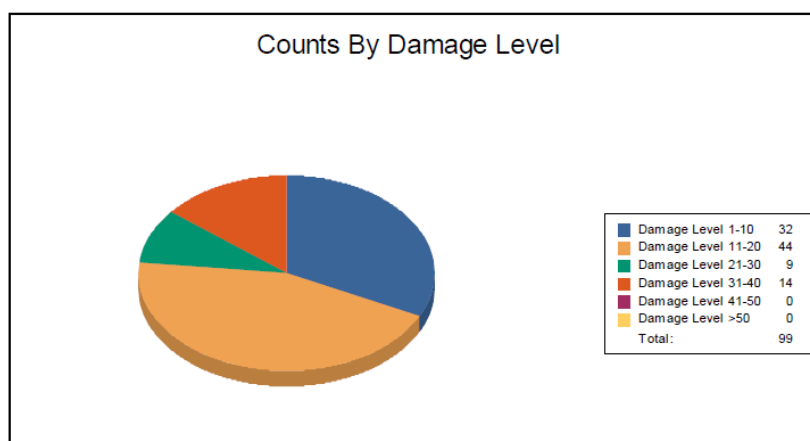
Hazus estimated that about 67 buildings would be at least moderately damaged by a 100-year flood (see Figure 55). Total building losses for this scenario, including structure, contents, and inventory, total \$84.74 million, or 62% of the estimated losses. Business interruption losses, such as relocation costs, income losses, rental income losses, and wage losses, account for 37% of the losses. These losses are summarized by jurisdiction in Table 39.

In addition to building and indirect losses, Hazus estimates damage to other critical facilities and infrastructure. For the 100-year scenario, the report showed no estimated losses to essential facilities, such as fire stations, police stations, hospitals, emergency operations centers, and schools. A total of 24 bridges are projected to be damaged, with estimated costs of \$431,400. The model did not project any losses for utility facilities or systems. However, flooding could generate 1,066 tons of debris.

Damage to residences accounted for 25% of the loss and left 1,054 people displaced, with 147 of those seeking public shelter.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

Occupancy	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	16	100	0	0	0	0	0	0	0	0	0	0
Commercial	1	33	2	67	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	1	100	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	2	100	0	0	0	0	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	14	18	40	52	9	12	14	18	0	0	0	0
Total	32		44		9		14		0		0	



**Figure 55: Hazus 100-Year Scenario:
Expected Building Damage by Occupancy**

500-Year Return Period Scenario

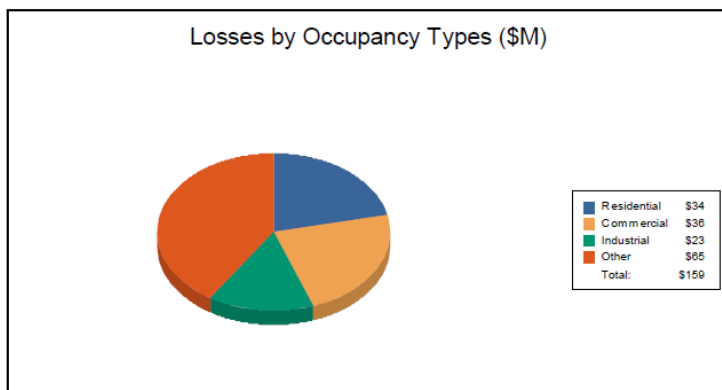
Building losses and business interruption losses for a 500-year scenario are shown in Figure 56 and summarized in 40. The total building-related losses were \$93.23 million; 59% of losses were direct building losses (including contents and inventory), and 41% were related to business interruption. Flooding could generate 1,066 tons of debris.

Residences comprised 21% of the losses, which caused an estimated 1,019 people to be displaced and 145 to seek shelter from 340 affected households.

Again, the model did not estimate any losses for essential facilities or utilities. Because the overlay analysis shows facilities in the flood plain, additional analysis may be needed to understand the potential loss impacts of flooding on those structures.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	14.52	3.12	4.35	5.32	27.31
	Content	7.54	8.04	13.62	18.69	47.89
	Inventory	0.00	1.94	2.18	13.92	18.04
	Subtotal	22.07	13.10	20.15	37.92	93.23
Business Interruption						
	Income	0.37	9.31	0.88	7.20	17.76
	Relocation	7.86	3.02	0.74	3.14	14.76
	Rental Income	2.81	2.22	0.33	0.20	5.56
	Wage	0.87	8.81	1.36	16.33	27.37
	Subtotal	11.92	23.35	3.30	26.88	65.44
ALL	Total	33.99	36.45	23.45	64.80	158.68



**Figure 56: Hazus 500-Year Flood Scenario:
Building Loss Estimates by Occupancy**

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Table 39: Hazus 1% Annual Chance Flood Loss Estimates

	Building Loss	Contents Loss	Inventory Loss	Relocation Loss	Income Loss	Rental Income Loss	Wage Loss	Total Loss	Loss Ratio
Orland	\$3,742,000	\$2,464,000	\$23,000	\$1,094,000	\$471,000	\$371,000	\$207,000	\$8,372,000	0.36%
Willows	\$518,000	\$946,000	\$212,000	\$445,000	\$1,207,000	\$327,000	\$563,000	\$4,218,000	0.2%
County	\$22,147,000	\$40,311,000	\$14,381,000	\$10,769,000	\$14,175,000	\$4,230,000	\$16,765,000	\$122,778,000	1.63%
Total	\$26,407,000	\$43,721,000	\$14,616,000	\$12,308,000	\$15,853,000	\$4,928,000	\$17,535,000	\$135,368,000	1.13%

Table 40: Hazus 0.2% Annual Chance Flood Loss Estimates

	Building Loss	Contents Loss	Inventory Loss	Relocation Loss	Income Loss	Rental Income Loss	Wage Loss	Total Loss	Loss Ratio
Orland	\$626,000	\$400,000	\$3,000	\$552,000	\$247,000	\$180,000	\$1,295,000	\$3,303,000	0.14%
Willows	\$600,000	\$1,150,000	\$278,000	\$510,000	\$1,268,000	\$364,000	\$724,000	\$4,894,000	0.23%
County	\$26,082,000	\$46,337,000	\$17,758,000	\$13,695,000	16,240,000	\$5,016,000	\$25,353,000	\$150,481,000	1.99%
Total	\$27,308,000	\$47,887,000	\$18,039,000	\$14,757,000	\$17,755,000	\$5,560,000	\$27,372,000	\$148,678,000	1.24%

Jurisdiction-Specific Vulnerabilities

Glenn County

According to the Glenn County General Plan Existing Conditions Report, the planning area is subject to flooding problems along the natural creeks and drainages that traverse the area. The primary flood hazard is the Sacramento River and its tributaries. The 100-year flood plain is largely confined to the southern and eastern portions of the county and along tributaries of the Sacramento River. Moreover, the 500-year flood plain generally includes developed portions of the county, including the Artois, Bluegum, Hamilton City, Orland, and Willows planning areas.

Glenn County's primary drainages are Stony (and Hambright) Creek, Walker Creek, Willow Creek, and the Sacramento River. Stony Creek flows from the mountainous uplands through the foothills and enters the Sacramento Valley just west of the Orland Buttes. It runs southwesterly into the Sacramento River about five miles southeast of Hamilton City. Walker Creek and Willow Creek drain the foothills west of Stony Creek. Walker Creek flows southeasterly, joining Willow Creek east of Willows. Willow Creek continues into Colusa County, eventually entering the Colusa Basin Drainage District. The Sacramento River, which is the chief source of surface irrigation water in the county, flows southward through the center of the Sacramento Valley, joins the San Joaquin River in the delta, and then flows into San Francisco Bay and the Pacific Ocean. Other streams draining Glenn County include French Creek, Hunter Creek, Logan Creek, and Wilson Creek. For additional information on water resources, see Chapter 5.0 (Conservation), and for additional information on local drainage and flood infrastructure, see Chapter 3.0 (Community Services and Facilities).

Some areas of the county adjacent to local waterways are subject to flooding during heavy rainfall. The largest floodplain consists of a narrow area parallel to the Sacramento River. Many old meander scars and oxbow lakes are found near the river. Dams control the flow of Stony Creek and the Sacramento River, preventing severe flooding. Annual flooding occurs in the levee system that borders the river.⁵⁷

The county has two main basin areas, the Colusa Basin and the Butte Sink, which lie east of the river. Both areas experience occasional flooding in winter because their terrain is nearly level and the soils drain poorly. In many places, they contain excess salts and alkali, and their water tables are high from time to time. In large areas, drainage ditches have been constructed, and the soils have been partly reclaimed. However, agricultural and other modifications to local drainage may increase localized flooding.

Most of the mountains and foothills drain well, but parts of the intervening valleys drain poorly. The Black Butte River, Corbin Creek, and many other streams drain the area west of the crest of the Coast Ranges. These streams flow into the Eel River, one of the major streams draining the northern part of the Coast Ranges.

Small creeks drain the mountains east of the crest of the Coast Range. These creeks empty into Stony Creek, which flows northeast through the foothills into Black Butte Lake and then the Sacramento Valley drainage basin. The foothills are drained by French, Hunter, Logan, Walker, Willow, and Wilson Creeks and by streams that flow only during the wet winter and spring months. These streams flow east and southward into the Colusa Basin.

⁵⁷ Glenn County General Plan Update Existing Conditions Report. 2020.
<https://static1.squarespace.com/static/5c8a73469b7d1510bee16785/t/5e556b56c253f84cdc287783/1582656403698/GlennCounty-ECR-Final-Feb2020.pdf>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Appendix C: Plan Review Documents

The Glenn County Public Works Agency manages special districts for flood control, stream cleaning, and street lighting. These measures are designed to control floods and the flow of storm water in designated areas of the special districts to protect the land, properties, facilities, and people in the county from damage.

Dam failures could impact a significant area of Glenn County; 25 critical facilities and over \$6 billion in buildings are in potential dam inundation areas.

City of Orland

Areas adjacent to Stony Creek and Hambright Creek are subject to flooding during heavy rainfall. Severe flooding is prevented in the Orland Planning Area by flood control dams on Stony Creek and the Sacramento River. A designated floodway has been mapped and adopted by the State Reclamation Board for Stony Creek. The state's jurisdiction in this designated floodway supersedes local control.

According to the FIRMs, most of the northwest portion of the city and areas along its northern edge are in either Flood Zone A or Flood Zone X (Shaded), which means the area may be subject to flooding. Areas directly adjacent to Stony Creek and Hambright Creek are in Flood Zone A, which is defined as in the 100-year floodway. Areas north and south of Stony and Hambright creeks, but not immediately adjacent to them, are generally designated as being in Flood Zone X, which is in the 500-year floodway. Flood Zone X covers part of the northwest corner of Orland. It should be noted that FIRMs are designed to determine flood insurance needs and do not necessarily show all areas subject to flooding.

In extremely wet years, the capacity of the Lely Aquatic Park may be exceeded, and stormwater flows southeasterly on and along County Road 200. Localized flooding occurs when Orland's storm drainage system is operating at capacity. It can also be attributed to obstructions or blockages in the system, sometimes caused by illegal dumping. Localized flooding can be an unintended result of flood irrigation of adjacent agricultural land. The amount of flooding varies depending on the difference in road and field elevations, but it can be a temporary hazard to traffic.

As a result of proximity, dam inundation maps show that the risk of dam failure is more severe in Orland than in Willows and other parts of Glenn County. All of Orland is subject to flooding should the Black Butte Dam fail. Maps from the U.S. Army Corps of Engineers show a three-hour contour line just east of the city, which advises that inundation is expected to occur within three hours of dam failure. Forty-one critical facilities and \$2.35 Billion in building values are in the potential inundation area of Orland.

City of Willows

Willows has hot, dry summers with cool winters, similar to Orland. The mean annual rainfall is approximately 19 inches, and the mean annual rainfall in the drainage area of Willow Creek is approximately 20 inches. Storms causing flooding occur in the winter seasons, generally from December through February. In storms of 100-year frequency, water from the South Fork Willows Creek and Wilson Creek ponds north of the city and then flows south along Highway 99 and southeast along Willow Creek. The 100-year frequency flows from the South Fork of Willows Creek, Walker Creek, and Wilson Creek Pond behind the levee of the Glenn-Colusa Canal northeast of the city and flows southward, causing flooding between Ventura Street to the west, the Glenn Colusa Canal to the east, and Walnut Street to the south. Local drainage from direct runoff has been a problem in the city's eastern section and in areas north of French Street, between Butte and Lassen Streets. The existing storm drain system carries this flow into the Glenn Colusa Canal. The canal traverses south along the eastern portion of Willows and is higher than the surrounding elevation (when full). Winter flood waters may be pumped in to the canal in the winter when it is empty; e.g. not irrigating. These areas are both subject to 100-year storm frequency ponding and shallow flows from the South Fork Willows Creek.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

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Section 3.4 Geologic Hazards

Geologic hazards in Glenn County include earthquakes, expansive soils, and subsidence. These are profiled in the following subsections.

Earthquake

An earthquake occurs when two blocks of the earth suddenly slip past one another. The surface where they slip is called the fault or fault plane.⁵⁸ Most major active faults in Glenn County are strike-slip faults, in which one side of a fault line slides past the other. The rupture from this type of fault extends almost vertically into the ground.

Earthquakes are a concern to Glenn County, though no earthquake greater than a magnitude 5.5 (M5.5) has occurred in the county in over 200 years. Glenn County sits on two notable faults: Cleveland Hills and Sierra Nevada,⁵⁹ and it is seismically active because it is situated on the boundary between two tectonic plates. Earthquakes can cause serious structural damage to buildings, overlying aqueducts, transportation facilities, and utilities, leading to loss of life. Earthquakes can cause ground shaking, soil liquefaction, landslides, fissures, avalanches, fires, and tsunamis, depending on their magnitude, intensity, and duration; the local geology; the time of day that they occur; building and industrial plant design and materials; and the risk-management measures put in place.⁶⁰ Seismic shaking is the greatest cause of damage from an earthquake in Glenn County, followed by liquefaction.

Expansive Soils

Expansive soils are characterized by a high clay content, which swells with increased moisture content and contracts during dry periods. This change in volume, usually associated with seasonal changes, can damage building foundations, roads, and concrete pavement. On slopes, it can bury or break utility poles. Expansive soil types have been associated with landslide risk and rockfall, as the increased volume of expansive soil layers on slopes can create ground shifts and downslope movement of materials. Such soils expand in wetter months and contract over the summer. With regard to warning time, maps that show expansive soils can guide future building and development on this potential hazard.

Subsidence

Land subsidence refers to the gradual or sudden sinking of the Earth's surface caused by the displacement or removal of subsurface materials. The primary causes of land subsidence include the compaction of aquifer systems from withdrawing groundwater, drainage of organic soils, underground mining activities, and natural compaction or collapse, such as sinkholes and thawing permafrost.⁶¹ Land subsidence can lead to several issues, including changes in the elevations and slopes of streams, canals, and drains and damage to bridges, roads, railroads, storm drains, sanitary sewers, canals, levees, and

⁵⁸ United States Geological Survey, "The Science of Earthquakes." <https://www.usgs.gov/programs/earthquake-hazards/science-earthquakes>

⁵⁹ California Earthquake Authority. "Understanding the Earthquake Risk Where You Live." <https://www.earthquakeauthority.com/California-Earthquake-Risk/Faults-By-County>

⁶⁰ World Health Organization, "Earthquakes." https://www.who.int/health-topics/earthquakes#tab=tab_1

⁶¹ United States Geological Survey, "Sinking Earth." <https://www.usgs.gov/mission-areas/water-resources/science/land-subsidence#:~:text=Land%20subsidence%20is%20a%20gradual,drainage%20of%20organic%20soils>

private and public buildings. Moreover, the forces generated by the compaction of fine-grained materials in aquifer systems can cause well casings to fail.⁶²

Regulatory Environment

Earthquake

Numerous building and zoning codes exist at the state and local levels to decrease the impacts of earthquakes on residents and infrastructure. These codes include the Alquist–Priolo Earthquake Fault Zoning Act of 1972, the Seismic Hazards Mapping Act of 1990, the 2022 California Standards Building Code (CSBC), and the 2023 Glenn County General Plan (GP). To protect lives and infrastructure in Glenn County, Orland, and Willows, the Building Division of each jurisdiction ensures that codes regarding hazards are met.

The 1971 San Fernando Earthquake destroyed numerous structures in its path and led to the passage of the Alquist–Priolo Earthquake Fault Zoning Act. This Act prohibits the construction of buildings for human occupancy across active faults in the State of California. Similarly, extensive damage caused by ground failures during the 1989 Loma Prieta Earthquake focused attention on decreasing the impacts of landslides and liquefaction. This led to the creation of the Seismic Hazards Mapping Act. This Act increased construction standards at locations where ground failures during earthquakes are probable. Active faults in Glenn County have been included under the Alquist–Priolo Geologic Hazards Zones Act and the Seismic Hazards Mapping Act.

The CSBC is based on the International Building Code, which is widely used in the United States. CSBC was modified for California’s conditions to include more detailed and stringent building requirements. Glenn County uses the CSBC to regulate the infrastructure in the county. This includes unreinforced masonry buildings. Glenn County includes earthquake safety provisions for new buildings, with enhancements for essential services buildings, hospitals, and public schools.

The 2023 Glenn County General Plan (GP) includes the following policies for lowering the impacts of earthquakes on infrastructure in the county:

- Promote sound agricultural soil and development practices that conserve soil resources and avoid or mitigate the impacts from erosion.
- Require erosion control plans for development proposed on sloping land.
- Require a site-specific geological investigation before development in areas of high landslide risk.
- Monitor gas and water well production to evaluate subsidence activity.
- Enforce the requirements of the Uniform Building Code for all development to protect people, property, and improvements from seismic and other geologic hazards.
- Require geotechnical investigation of buildings meant for public occupancy in earthquake fault zones.
- Require geotechnical evaluation and recommendations for new development in moderate or higher-earthquake fault zones.

⁶² United States Geological Survey, “Land Subsidence from Ground-Water Pumping.”
<https://geochange.er.usgs.gov/sw/changes/anthropogenic/subside/#:~:text=Land%20subsidence%20causes%20many%20problems,from%20forces%20generated%20by%20compaction>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

- Require new development to incorporate project features that avoid or minimize the impacts of earthquakes.

The 2021 City of Orland GP Safety Element 4.0 includes the following policies for lowering the impacts of earthquakes on infrastructure:

- Policy 4.6.A.1: The city may require that a soil report, prepared by a licensed soil engineer, be required for all projects in areas of identified soil limitations; soil reports shall evaluate the shrink-swell and liquefaction potential of sites and recommend measures to minimize unstable soil hazards.
- Policy 4.6.A.2: Public buildings and areas designed for assembly will be constructed to meet seismic standards.
- Policy 4.6.A.3: Work with existing building owners to encourage structural improvements to meet current seismic standards.
- Policy 4.6.A.4: Consider funding options to assist property owners with costs related to seismic safety structural improvements.
- Policy 4.6.B: The city shall work with landowners and interested parties to address seismic safety concerns for older and historic buildings in the downtown area.
- Policy 4.6.B.1: Explore options to amend existing development codes where feasible to facilitate the reuse and development of existing structures in the downtown area relative to seismic safety standards.
- Policy 4.6.C: The city shall require applications for projects that extract groundwater, oil, or gas to include a report evaluating the potential for subsidence. Reports shall discuss appropriate mitigation measures to reduce the potential for subsidence.⁶³

Expansive Soils

The Safety Element of the 1993 Glenn County GP and the 2010 City of Orland GP address risks associated with seismically induced surface rupture, ground movement, ground failure, slope instability leading to mudslides and landslides, erosion, and soil expansion. The policies it lists to cope with these issues include the following:

- PSP-28: Promote sound agricultural soil and development practices, which conserve soil resources and avoid or mitigate impacts associated with erosion.
- PSP-29: Protect valley stream courses from the effects of erosion.
- PSP-30: Require erosion control plans for development proposed on sloping land.
- PSP-31: Require a site-specific geological investigation before development in areas of high landslide risk.
- PSP-33: Enforce the requirements of the Uniform Building Code for all development to protect people, property, and improvements from seismic and other geologic hazards.
- Policy 4.6.A: The city shall consider the potential for expansive soils and earthquake-related hazards when reviewing applications for development.

⁶³ City of Orland, "4.0 Safety Element." <https://www.cityoforland.com/wp-content/uploads/2022/04/GPA-2021-01-Safety-Element.pdf>

Subsidence

The 1993 Glenn County GP and the 2010 City of Orland GP state that geologic hazards in the county include the potential for landslides, erosion, and subsidence. The associated policies to deal with these hazards are as follows:

- PSP-30: Require erosion control plans for development proposed on sloping land.
- PSP-31: Require a site-specific geological investigation before development in areas of high landslide risk.
- PSP-32: Monitor gas and water well production to evaluate subsidence activity.
- PSP-33: Enforce the requirements of the Uniform Building Code for all development to protect people, property, and improvements from seismic and other geologic hazards.
- Policy 4.6.C: The city shall require applications for projects that extract groundwater, oil, or gas to include a report evaluating the potential for subsidence. Reports shall discuss appropriate mitigation measures to reduce the potential for subsidence.

Location/Geographic Extent

Earthquake

Fault zones are areas around active faults where future movement is likely to occur and where most earthquakes originate. The Pacific Rim Region, including California, is one of the Earth's most seismically active areas. Glenn County, in particular, is at risk of earthquakes. California's geographic features are dominated by the juncture of two tectonic plates: the North American and Pacific plates. The San Andreas Fault runs the entire length of the state, north to south. the San Andreas Fault is not the only fault system that can cause considerable loss of life and property and environmental damage.

Six earthquake fault systems exist in and near Glenn County. These fault systems have produced or have the potential to produce seismic events of moderate to major impact. The longest of these are the Bartlett Springs (Coast Range) Fault and the Great Valley (Willows) Fault. The Bartlett Springs Fault runs generally north and south beyond the western side of Glenn County in the Mendocino National Forest, a small portion is visible in the lower left corner of the map in Figure 57. The Bartlett Springs Fault System contains several faults running through the western portions of Glenn County, Tehama County, and the eastern portions of Lake and Mendocino Counties. The Great Valley Fault enters the county at the southern end and traverses the county in a north-westerly direction, just west of Highway 5.

This system has several small fracture faults, including the Stony Creek Fault, which is parallel to the reservoir and tributary of the same name and terminates in the town of Stonyford. The Corning Fault branches off from the Willows Fault, where the two pass under the Colusa Canal, and the Corning Fault continues up along the central part of the county, following the path of Highway 5.

In the south-eastern region of the county, Indian Valley and Resort Faults have been inactive for more than 50 years but are significant enough in potential to be cause for concern. The last major seismic activity affecting Glenn County, the Oroville Dam Earthquake, occurred in the Oroville Dam area on August 1, 1975. This earthquake was an M5.7 and produced only minor damage in Glenn County.

Figure 57 shows the ground shaking potential for Glenn County, based on California Geological Survey Map Sheet 48, which shows the relative intensity of ground shaking in California from anticipated future earthquakes. Shaking potential is calculated as the level of ground motion that has a 2% chance of being exceeded in 50 years. Considerations also include historic earthquakes, slip rates on major faults and deformation in the region, and potential for wave amplification by surface geology. The figure also includes fault lines from the California Geological Survey Fault Activity Map.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

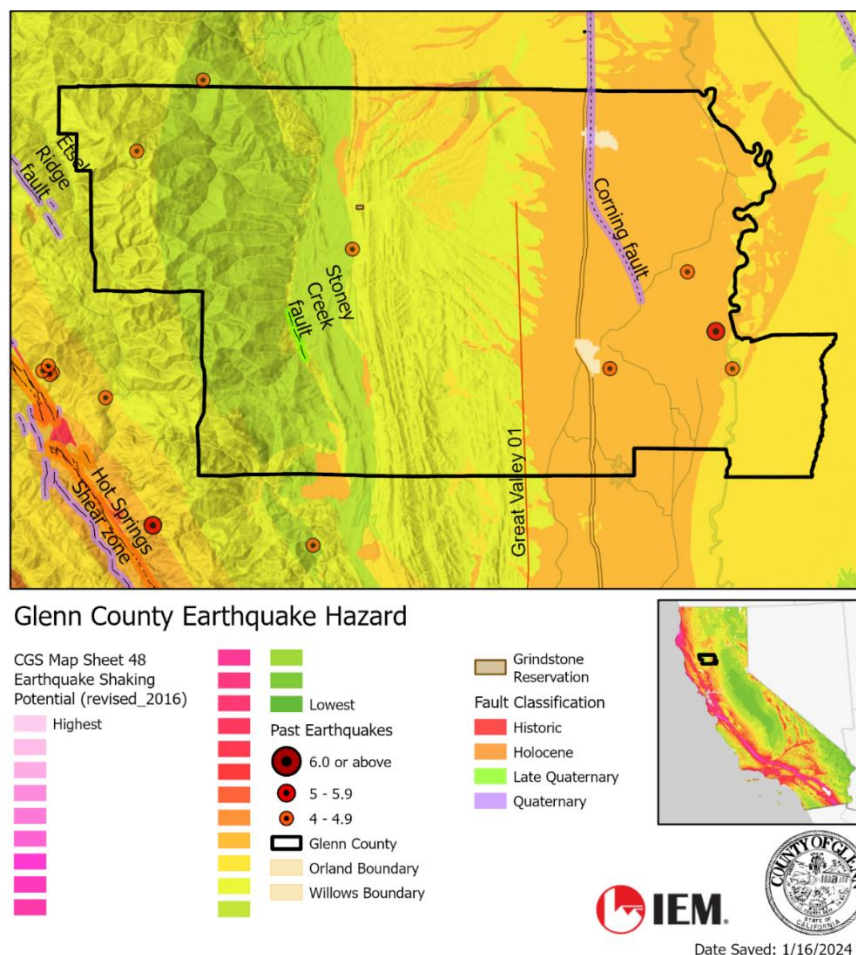
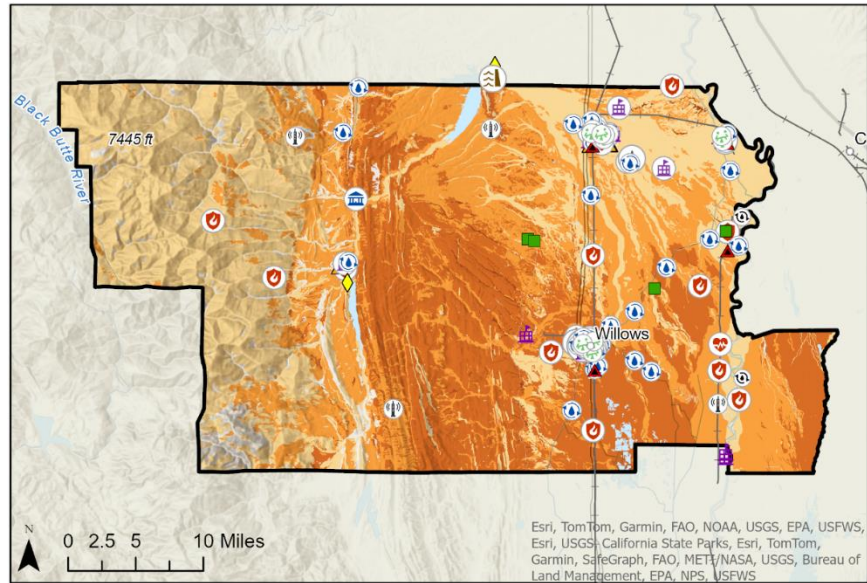


Figure 57: Glenn County Earthquake Hazard

Expansive Soils

Soils rich in clay undergo volume changes in response to variations in moisture content. This phenomenon is known as shrink–swell, and it considerably impacts the stability of structures built on such soils. Specifically, swelling pressures can cause heave, lifting structures, and shrinkage can lead to settlement or subsidence, which may be nonuniform. Therefore, it is important to account for shrink–swell effects when designing structures on clay-rich soils to ensure longevity and safety. Glenn County contains soils with low, medium, and high shrink–swell potential, as shown in Figure 58. As Figure 59 shows, Orland has soils with predominantly low to medium shrink–swell potential, while Willows contains soils with higher expansive potential (see Figure 60). Figure 61 shows the shrink–swell potential for all of Glenn County.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents



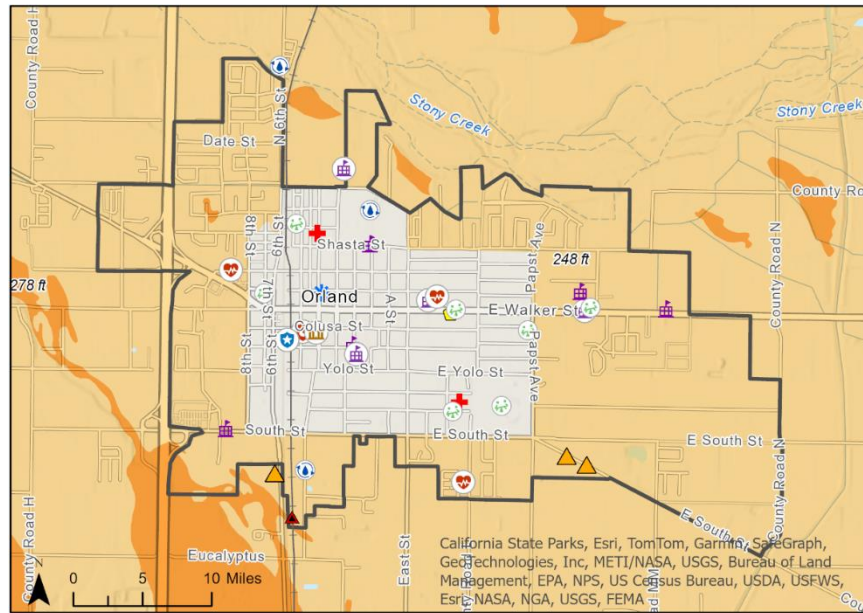
Glenn County Expansive Soils



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Figure 58: Expansive Soil in Glenn County

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents



Orland Expansive Soils

Glenn County Critical Facilities

- Chemical - Fertilizer
- Childcare
- Emergency Medical Services
- Emergency Services
- Emergency Services - LE
- Emergency Services Communications

- Emergency Services County EOC
- Emergency Services Jail
- Energy Sector
- Government
- Government - Schools
- Government - Tribal
- Healthcare
- Hospital
- Major Transportation
- Major Transportation - Airport

- Other
- School
- Shelter Site
- Water - Dams
- Water - flood control
- Water and Waste Water
- Railroads
- Glenn County Boundary
- Waterbodies
- Orland City Limits
- Willows Boundary

Expansive Soil Hazard

Lateral Earth Pressure

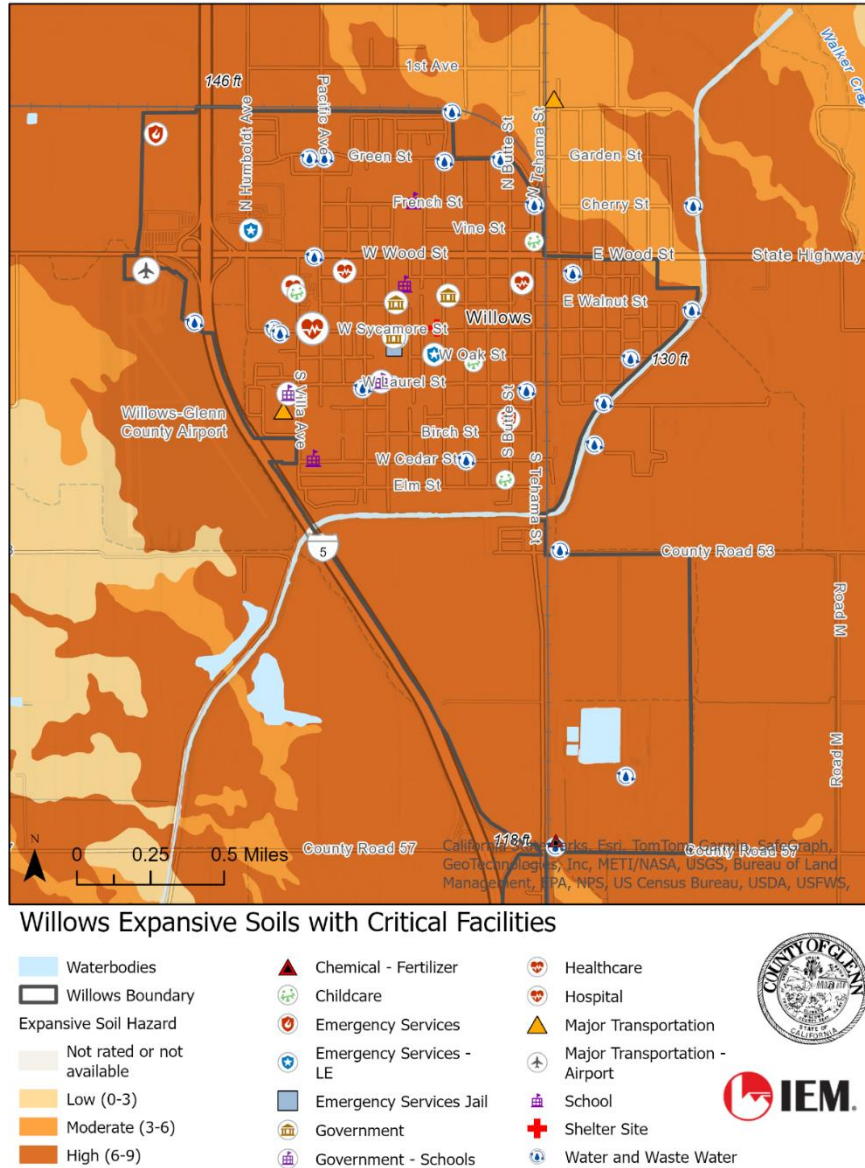
- Not rated or not available
- Low (0-3)
- Moderate (3-6)
- High (6-9)
- Very High (9 or Higher)



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Figure 59: Expansive Soil in Orland

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents



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Figure 60: Expansive Soil in Willows

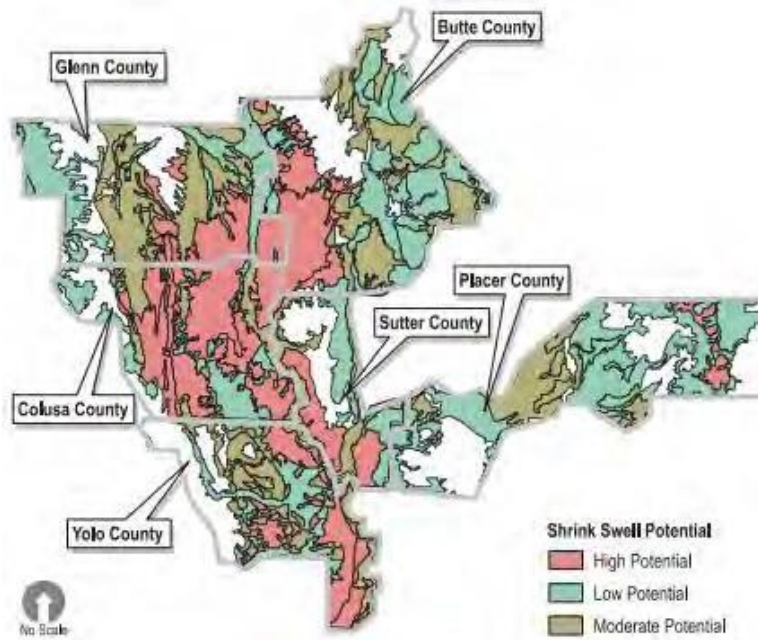


Figure 61: Glenn County Shrink–Swell Map

Subsidence

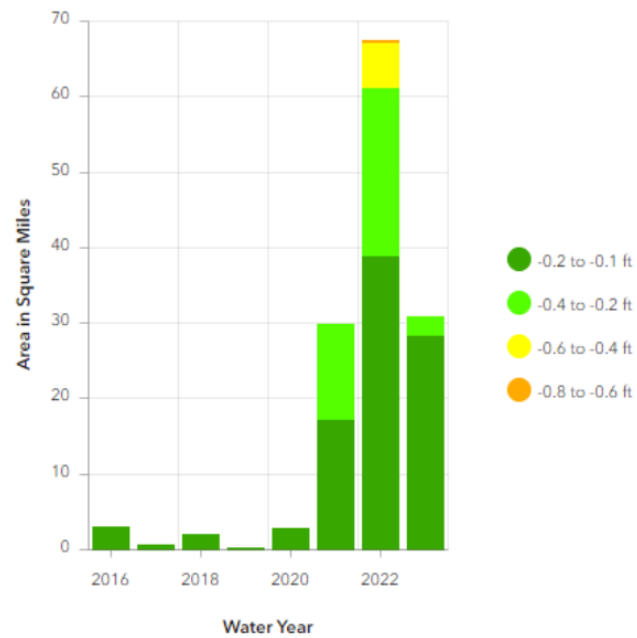
The geological makeup of the land in southern, central, and eastern Glenn County is mainly a mixture of old and new alluvium and old stream channels and fan deposits. Because of this, the soil is not well consolidated and hence prone to strong ground surface subsidence and displacement. As Figure 62 shows, there was a significant increase in vertical displacement in 2021–2022, when Glenn County experienced drought conditions. It was the sixth driest county in California from December 2021 to November 2022.

Vertical displacement estimates are derived from Interferometric Synthetic Aperture Radar data, a remote sensing technique that can detect small changes in surface elevation. Figure 63 shows where land subsidence occurred from January 2022 to January 2023. It also includes wells where the depth of groundwater is measured. Groundwater conditions can contribute to subsidence. Many of the wells have been on a decreasing trend over the last 20 years.

Figure 64 shows the same vertical displacement data at a smaller scale to show details of roads and facilities in the area where displacement has occurred.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

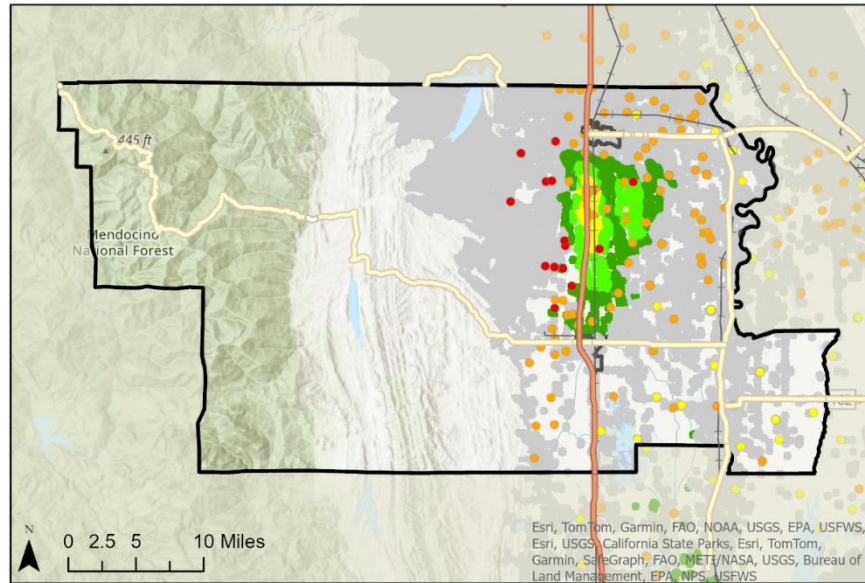
Area in Square Miles by Annual Vertical Displacement Rate



Source: City of Orland, "4.0 Safety Element." <https://www.cityoforland.com/wp-content/uploads/2022/04/GPA-2021-01-Safety-Element.pdf>

Figure 62: Displacement, 2016–2022

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents



Glenn County Vertical Displacement Jan 2022 - Jan 2023



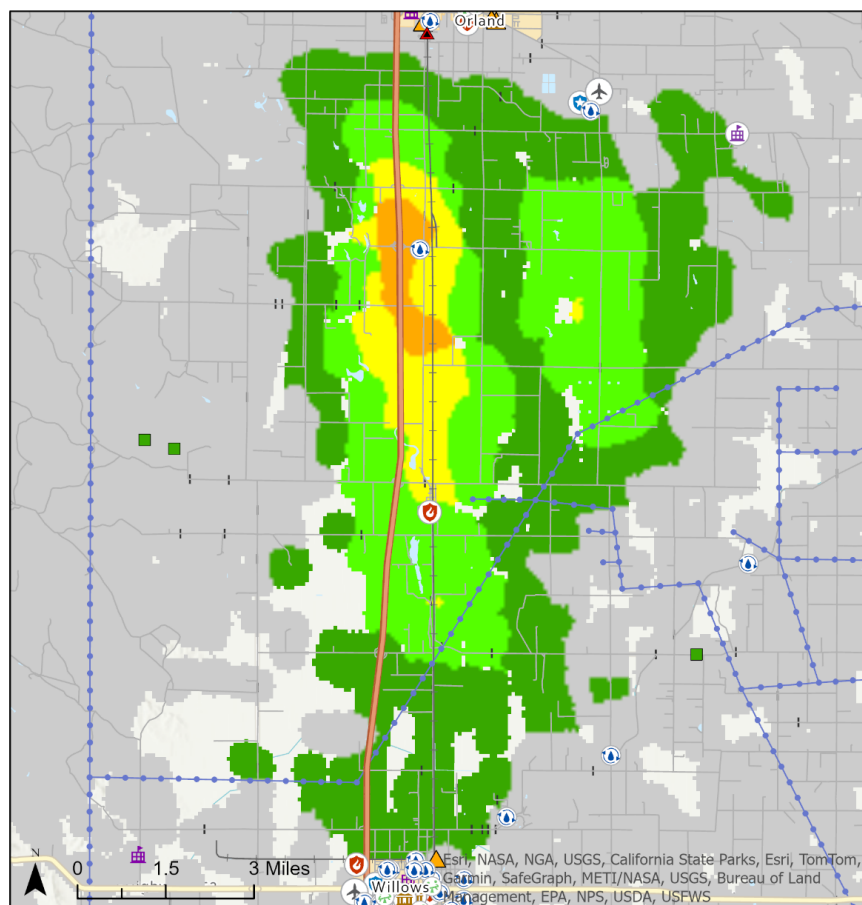
Date Saved: 2/5/2024

Source: California Department of Water Resources, California's Groundwater Live, InSAR Land Subsidence Remote Sensing Data.

Figure 63: Glenn County Vertical Displacement, January 2022–January 2023

Figure 64 indicates where critical facilities are located relative to areas of subsidence.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents



Glenn County Subsidence with Critical Facilities



Date Saved: 1/16/2024

Source: California Department of Water Resources, California's Groundwater Live, InSAR Land Subsidence Remote Sensing Data.
<https://storymaps.arcgis.com/stories/41574a6d980b4e5d8d4ed7b90f9698d2>

Figure 64: Critical Facilities and Vertical Displacement in Glenn County

A significant phenomenon that is most responsible for the potential loss of life and property damage is ground failure (subsidence/liquefaction). The County and the Cities of Orland and Willows will monitor any potential subsidence events and include this information in future iterations of the MJHMP.

Magnitude/Extent

Earthquake

The most common method for gauging an earthquake is magnitude, which measures its strength. Although the Richter scale is familiar as the measurement for magnitude, many scientists currently use either the Mw Scale or the Modified Mercalli Intensity (MMI) Scale. The effects of an earthquake in a particular location are measured by intensity. Earthquake intensity declines as distance from the epicenter of the earthquake increases.

The magnitude of an earthquake is related to the total area of the fault that ruptures and the amount of offset (displacement) across the fault. Table 41 lists the seven earthquake magnitude classes, ranging from great to minor. An earthquake of great magnitude can cause tremendous damage to infrastructure, while a minor one might cause little or no such damage. The county's western portion has strong and very strong shaking potential, while most of its eastern area has moderate shaking potential. A map of shaking intensity specific to the Glenn County area is shown in Figure 57.

Table 41: Earthquake Magnitude Classes

Magnitude Class	Magnitude Range	Potential Damage
Great	8 or Larger	Significant
Major	7.0-7.9	Damage expected
Strong	6.0-6.9	Damage may occur
Moderate	5.0-5.9	Minor damage may occur
Light	4.0-4.9	Likely felt
Minor	3.0-3.9	May be Felt

Source: California Earthquake Authority, "Earthquake Measurements: Magnitude vs Intensity."
<https://www.earthquakeauthority.com/Blog/2020/Earthquake-Measurements-Magnitude-vs-Intensity>

The MMI Scale measures earthquake intensity, as shown in Table 42. The MMI Scale has 10 intensity levels. Each level is defined by a group of observable earthquake effects, such as ground shaking and/or damage to infrastructure. Levels I through VI describe what people see and feel during a small to moderate earthquake. Levels VII through X describe damage to infrastructure during a moderate to catastrophic earthquake.

Table 42: Modified Mercalli Scale

Intensity	Shaking	Description/Damage
I	Not Felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest, especially on the upper floors of buildings. Delicately suspended objects may swing.
III	Weak	Felt quite noticeably by persons indoors, especially on the upper floors of buildings. Many people do not recognize it as an earthquake. Standing motorcars may rock slightly. Vibration is like the passing of a truck. Duration estimated.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Intensity	Shaking	Description/Damage
IV	Light	Felt indoors by many and outdoors by few during the day. At night, some awakened. Dishes, windows, and doors are disturbed; walls make cracking sounds. Sensation like a heavy truck striking a building. Standing motorcars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes and windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved, a few instances of fallen plaster. Damage slight.
VII	Very Strong	Damage is negligible in buildings of good design and construction, slight to moderate in well-built ordinary structures, considerable damage in poorly built or badly designed structures, and some broken chimneys.
VIII	Severe	Damage is slight in specially designed structures, but there is considerable damage to ordinary substantial buildings, including partial collapse. Damage is great in poorly built structures. Chimneys, factory stacks, columns, monuments, and walls may fall. Heavy furniture is overturned.
IX	Violent	Damage is considerable in specially designed structures; well-designed frame structures are thrown out of plumb. Damage is great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures were destroyed; most masonry and frame structures were destroyed with foundations. Rails are bent.

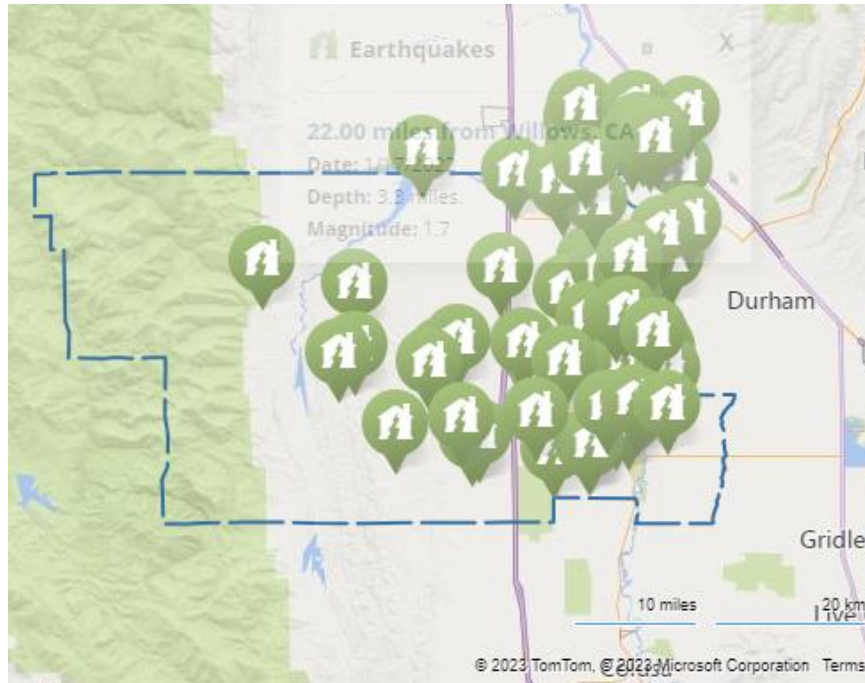
Source: California Earthquake Authority, "Earthquake Measurements: Magnitude vs Intensity."
<https://www.earthquakeauthority.com/Blog/2020/Earthquake-Measurements-Magnitude-vs-Intensity>

Table 43 and Figure 65 provide additional information on recent earthquakes in the Glenn County area.

Table 43: Earthquakes in or near Glenn County, 2023

Date	Magnitude	Depth in Miles	Location
12/20/2023	2.7	29.2	4 miles from Hamilton City
09/23/2023	2.9	4.9	13 miles from Willows
09/08/2023	2.9	4.4	11 miles from Willows
08/30/2023	2.8	4.9	6 miles from Willows
08/29/2023	2.5	3.1	9 miles from Willows
08/28/2023	2.6	29.5	12 miles from Willows
08/16/2023	2.5	3.2	5 miles from Willows
07/29/2023	3.0	15.5	7 miles from Willows
07/16/2023	2.6	0	10 miles from Willows
03/06/2023	1.5	0.5	13 miles from Willows
03/05/2023	2.8	4.5	14 miles from Willows
02/28/2023	2.8	4.6	13 miles from Willows
02/21/2023	2.0	0.0	4 miles from Willows

Source: Home Facts. "Earthquake Information for Glenn County, California."
<https://www.homefacts.com/earthquakes/California/Glenn-County.html>



Source: Home Facts. "Earthquake Information for Glenn County, California."
<https://www.homefacts.com/earthquakes/California/Glenn-County.html>

Figure 65: Earthquakes in and near Glenn County, 07/22/2018–12/20/2023

Expansive Soils

Expansive soils are able to undergo considerable changes in volume, either shrinking or swelling, with changes in moisture content. Shrink–swell capacity refers to the soil's potential contract when desiccated and expand when rehydrated. Shrinking and swelling can damage roads, dams, building foundations, and other structures, and it can harm plant roots (Soil Conservation Service 1986). Several factors influence the magnitude of shrinking or swelling in expansive soils:

- Amount of expansive silt or clay in the soil;
- Thickness of the expansive soil zone;
- Thickness of the active zone (depth at which the soils are not affected by dry or wet conditions); and
- Climate (variations in soil moisture content attributed to climatic or human-induced changes).

Soils composed primarily of sand and gravel are not considered expansive soils (the soil volume does not change with a change in moisture content). Soils containing silts and clays may possess expansive characteristics. The Natural Resource Conservation Service classifies soils as having low, moderate, or high potential for volume changes, as noted below.

- Low – This class includes sands and silts with relatively low amounts of clay minerals. Sandy clays may also have low expansion potential if the clay is kaolinite, a common clay mineral.
- Moderate – This class includes silty clay and clay-textured soils if the clay is kaolinite and includes heavy silts, light sandy clays, and silty clays with mixed clay minerals.
- High – This class includes clays and clay with mixed montmorillonite, a clay mineral that expands and contracts more than kaolinite.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

Data on expansive soils include lateral earth pressure (LEP), which is categorized as low, moderate, high, and very high hazard. LEP refers to the pressure exerted by soil against a retaining structure, such as a wall or a basement. This pressure comes from the weight of the soil and any external loads acting on it.⁶⁴

Subsidence

Subsidence occurs at great depths below the surface when the subsurface pressure is reduced by the withdrawal of fluids (i.e., groundwater and natural gas). This may create a void that gradually leads to the sinking of the ground. Between 2020 and 2022, Glenn County reported hundreds of dry wells in the area, which may have contributed to vertical land subsidence in 2022. In January 2023, due to groundwater recharge projects, the Orland–Artois Water District, the Glenn County Groundwater Authority, the City of Orland, and local landowners worked together to deliver over 650 million gallons of water to the area.⁶⁵ In the Winter of 2023–2024, no persons were affected by drought in Glenn County.

Past Occurrences

Earthquakes

Nearly all of California has a >95% chance of a damaging earthquake in the next century according to the United States Geological Survey National Seismic Hazard Model 2023.⁶⁶ However, past earthquake activity in Glenn County has been significantly lower than California's state average. No federally declared earthquake event has occurred in Glenn County since 1950. In 1975, an M5.7 earthquake occurred 48.4 miles from the county center, and in 1998, an M5.4 earthquake occurred 69.0 miles from the county center at a depth of 14.5 miles. The largest earthquake within 30 miles of Glenn County was an M4.6 in 1995 at a depth of 13 miles. On October 30, 2015, a minor earthquake (M3.5) struck approximately 10 miles south of Hamilton City.

Expansive Soils

Expansive soils have been known to cause problems for building foundations and roads, but no specific data on past occurrences and damage are available. Glenn County, Orland, and Willows will monitor any potential expansive soil events and include this information in future iterations of the MJHMP.

Subsidence

Extensive groundwater pumping of San Joaquin Valley aquifers is increasing the rate of land subsidence in the Northern Sacramento Valley. Between 1926 and 1970, groundwater pumping caused widespread aquifer compaction and land subsidence in the valley. Subsidence in some areas of Southern California exceeded 28 feet (USGS, 2013). Increased pumping has caused additional land subsidence and land shifting in areas most impacted by subsidence. Exact data on past occurrences and damage are not available. Figure 62 shows that subsidence has occurred in Glenn County from 2022 to 2023.

⁶⁴ Understanding Lateral Earth Pressure. <https://civilengpro.com/understanding-lateral-earth-pressure/>

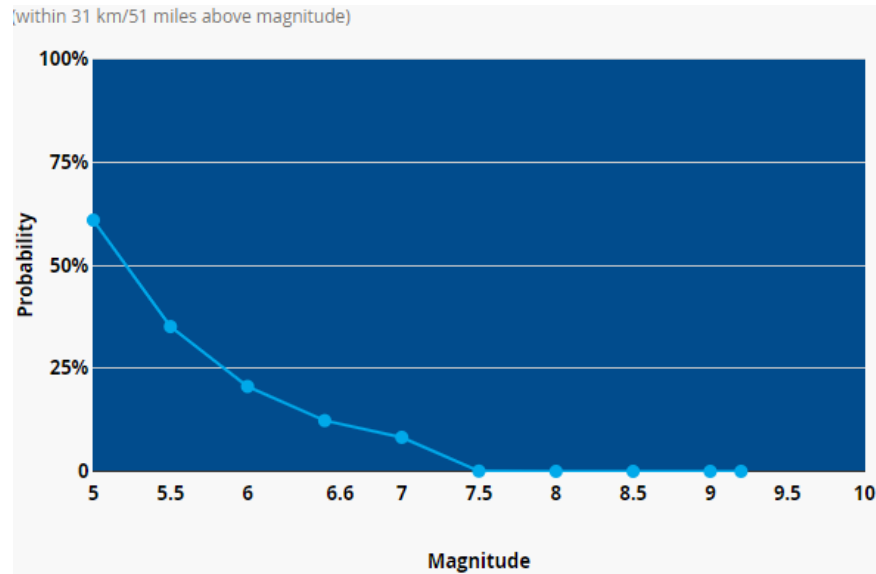
⁶⁵ KRCR, "Glenn County fights drought aftermath with over a dozen groundwater recharge projects." <https://krcrtv.com/news/local/glenn-county-groundwater-recharge-project>

⁶⁶ National Seismic Hazard Model 2023 – Chance of Damaging Earthquake Shaking. <https://www.usgs.gov/media/images/national-seismic-hazard-model-2023-chance-damaging-earthquake-shaking>

Frequency/Probability of Future Occurrences

Earthquake

Earthquakes occur less frequently than other natural hazards, but they have caused the greatest losses in terms of deaths, injuries, and damages in California since 1950. They also have the highest potential for catastrophic disasters. According to CalOES 2010, the likelihood of an M5.0–9.2 earthquake in Glenn County in the next 50 years is 60.91%, as shown in Figure 66. Probability of earthquake is Likely.



Source: Home Facts, "Earthquake Information for Glenn County, California."
<https://www.homefacts.com/earthquakes/California/Glenn-County.html>

Figure 66: Probability of a Magnitude 5.0–9.2 Earthquake in Glenn County in the Next 50 Years

It is important to recognize that earthquakes can devastate infrastructure, communities, and economies, resulting in costly and time-consuming repairs. Therefore, it is crucial to mitigate their impact through appropriate measures, such as creating earthquake-resistant building codes and improving emergency response capabilities. By understanding the likelihood of earthquakes, Glenn County can prepare and take the necessary measures to minimize losses and damages.

Expansive Soils

The potential for soil shrinkage and expansion depends on the amount and types of clay in the soil. The presence of certain clay types can lead to an expansion of the soil when wet and a disproportionate contraction when dry. Expansive soils respond to changes in precipitation and temperature conditions. This hazard is widespread across the county, but it is not expected to threaten life. Damage from expansive soils can be reduced by building practice standards, such as designing foundations to withstand the contraction and expansion of the soil. However, it is important to note that the impact of this hazard is expected to increase because of climate change and continued development in these areas. Therefore, it is key for builders and planners to take steps to minimize the risk of damage from expansive soils. Probability of future events is Occasional.

Subsidence

The depletion of groundwater reserves and its impact on subsidence has been a cause for concern in the Northern Sacramento Valley. A reduction in groundwater pumping since the 1970s has moderated the occurrence of subsidence events. However, the recent drought diminished the region's groundwater reserves drastically. Despite the current stabilization of water levels, subsidence persists because of past stresses on aquifer systems. This phenomenon is expected to continue in the long term but at a slower rate. Given projected population growth, increasing water demands, and the influence of climate change, it is anticipated that groundwater depletion and subsequent subsidence in and near the county will persist. Although there is not sufficient data to determine a recurrence interval, past and ongoing events indicate that the probability of subsidence in Glenn County is Likely.

Changes in Development

Glenn County

Subsidence has and will continue to fluctuate with changing conditions. Drought, extreme heat, and other effects of climate change may contribute to increased demand for ground water, which could exacerbate subsidence. Glenn County and the California Department of Water Resources are monitoring groundwater and subsidence conditions to understand how they change and identify potential actions. Based on current efforts vulnerability is expected to stay the same, but extended drought in the future would cause vulnerability to increase.

Soil conditions can also be impacted by extended drought and heat and other changes in precipitation. The presence of expansive soils can also limit or complicate future development, as additional considerations, such as special grading or more costly construction techniques, may be needed when building on expansive soils. It can also be more complicated to install utilities, such as sewers and water lines. This may limit development, particularly commercial use, in areas west of I-5.⁶⁷ There is no change in vulnerability to expansive soil.

Compared to many communities across California, the earthquake risk to Glenn County is relatively moderate. New development may increase the number of people or buildings exposed to earthquake hazards, but new construction must also adhere to modern building codes, which will help reduce risk. Older construction remains at higher risk of earthquakes. There is no change in the vulnerability to earthquake since the last plan update because there has not been much development.

Orland

Like the rest of the county, Orland has had no change in vulnerability to geologic hazards.

Willows

Similarly, Willows has had no change in vulnerability to geologic hazards.

⁶⁷ City of Orland, "General Plan November 2021 4.0 Safety Element" <https://www.cityoforland.com/wp-content/uploads/2022/04/GPA-2021-01-Safety-Element.pdf>

Vulnerability Assessment

Earthquake

Hazus 6.0 was used to produce two earthquake scenarios for Glenn County. One is based on an M6.8 earthquake on the Great Valley 1 fault. The second is a 100-year probabilistic model based on an M5.8 earthquake. The earthquake model in Hazus aggregates data by census tract. Although census tracts do not exactly line up with city boundaries, the tracts aligning most closely to the Orland and Willows city boundaries were used to determine the building loss results for the county and the cities in the following sections.

Hazus 100-year Probabilistic Scenario of an M5.8 Earthquake

Over \$200 million in building losses is projected in this scenario. Residences account for 26% of the loss, and 19% of losses were related to business interruptions in the region. A breakdown of direct economic losses for Glenn County, Orland, and Willows is provided in Table 44. The loss ratio is the percentage of total direct economic losses for each jurisdiction compared to the total building exposure in the county.

An estimated \$1.77 million in transportation losses is expected from damage to highway bridges, and railways. Roadway segments, and railroad tracks are assumed to be damaged by ground failure only. Ground failure maps were not included in this scenario, so damage estimates for these components were not computed. Although this model did not reveal significant impacts, it can be anticipated that there may be damage to these structures that could disrupt travel in the area. Economic losses from utility systems total \$9.16 million from wastewater systems, electric power facilities, and potable water systems and a minor amount from natural gas distribution lines and communications facilities.

45 shows the amount of damage estimated for different building occupancy types. Government, educational, and religious/nonprofit facilities make up a small percentage in all damage categories. Agricultural and commercial buildings make up a larger percentage of structures damaged in the extensive and complete damage states, but these categories have a lower count overall. Single-family residences make up a significant portion of buildings with slight or moderate damage. Multi-family residences are of particular concern because they represent a large percentage of damage in all categories, from slight to complete.

Hazus estimates that 60 households will be displaced by this scenario earthquake, with 37 persons seeking temporary public shelter. Hazus does not identify specific locations of persons displaced by an earthquake, so it is unknown which communities these persons may be displaced from. This number is based on a fraction of the amount of structural damage to dwelling units, and there are different weights for single-family homes and multi-family rental properties. Shelter needs are based on a function of displaced persons that also considers income, ethnicity, ownership, and age. Those seeking public shelter typically have lower incomes and have fewer options. They also tend to have young children or are over age 65.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Table 44: Loss Estimate Summary for a Hazus 100-Year Probabilistic Scenario of an M5.8 Earthquake

	Building Loss (Structural and Non-Structural)	Contents Loss	Inventory Loss	Relocation Loss	Income Loss	Rental Income Loss	Wage Loss	Total Loss	Loss Ratio
Orland	\$26,505,760	\$7,508,160	\$759,900	\$3,790,620	\$2,401,620	\$1,918,460	\$2,811,150	\$45,695,660	0.70%
Willow	\$24,018,060	\$6,662,430	\$464,310	\$3,643,800	\$2,245,570	\$1,901,670	\$3,096,060	\$42,031,900	0.65%
County	\$69,203,860	\$20,628,550	\$7,623,640	\$7,443,150	\$2,523,900	\$2,689,060	\$2,723,290	\$112,835,450	1.73%
Total	\$119,727,680	\$34,799,140	\$8,847,850	\$14,877,570	\$7,171,090	\$6,509,190	\$8,630,500	\$200,563,010	3.08%

Table 45: Expected Building Damage by Occupancy for a Hazus 100-Year Probabilistic Scenario of an M5.8 Earthquake

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	984.56	10.66	201.44	10.00	138.26	15.85	37.75	22.82	2.99	28.45
Commercial	562.67	6.09	164.12	8.15	123.17	14.12	32.51	19.65	2.52	23.98
Education	25.70	0.28	4.79	0.24	3.51	0.40	0.92	0.56	0.07	0.69
Government	63.93	0.69	17.30	0.86	14.16	1.62	3.31	2.00	0.30	2.82
Industrial	168.26	1.82	38.95	1.93	35.25	4.04	10.81	6.53	0.73	6.95
Other Residential	1408.85	15.26	410.49	20.37	274.69	31.48	54.50	32.94	3.48	33.11
Religion	60.54	0.66	14.88	0.74	10.88	1.25	2.49	1.51	0.21	2.01
Single Family	5958.15	64.53	1162.94	57.72	272.56	31.24	23.14	13.99	0.21	2.00
Total	9,233		2,015		872		165		10	

Hazus M6.8 Great Valley Earthquake Scenario

Of the almost \$520 million in general building losses expected in this scenario, 22% were from residences. Table 46 shows the estimates of losses by jurisdiction. This includes direct losses to buildings, contents, and inventory and indirect losses from business interruption.

An estimated \$5.35 million in transportation losses is expected from damage to highway bridges, railways, and port facilities. Roadway segments, railroad tracks, and light rail are assumed to be damaged by ground failure only. Ground failure maps were not included in this scenario, so damage estimates for these components were not computed. Economic losses from utility systems total \$32.5 million from wastewater systems, electric power facilities, potable water systems, and communications facilities.

Building damage for different building occupancy types is similar to that in the previous scenario (see 47). Single-family and multi-family residences show the highest percentages of damage, with single-family becoming a smaller percentage in the higher damage categories, and multi-family replacing it as the highest percentage in the extensive and complete damage categories. Agriculture and commercial buildings also make up a high percentage of the extensive and complete damage categories.

Hazus estimates that 170 households would be displaced by this scenario earthquake, with 106 persons seeking temporary public shelter. As mentioned in the previous scenario, this number is a function of the number and extent of damage to dwellings, and it also considers demographic factors, such as income, ethnicity, ownership, and age, in estimating how many people will seek public shelter.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Table 46: Loss Estimate Summary for a Hazus M6.8 Great Valley Earthquake Scenario

	Building Loss (Structural and Non-Structural)	Contents Loss	Inventory Loss	Relocation Loss	Income Loss	Rental Income Loss	Wage Loss	Total Loss	Loss Ratio
Orland	\$53,286,520	\$17,985,870	\$1,864,420	\$7,005,800	\$4,787,520	\$3,518,800	\$5,546,860	\$93,995,790	1.44%
Willow	\$74,604,790	\$22,513,480	\$1,686,410	\$10,510,910	\$6,895,230	\$5,392,680	\$9,479,900	\$131,083,400	2.01%
County	\$175,634,380	\$60,669,000	\$20,775,550	\$16,982,800	\$6,648,080	\$6,580,330	\$7,389,240	\$294,679,380	4.53%
Total	\$303,525,690	\$101,168,350	\$24,326,380	\$34,499,510	\$18,330,830	\$15,491,810	\$22,416,000	\$519,758,570	7.99%

Table 47: Expected Building Damage by Occupancy in a Hazus M6.8 Great Valley Earthquake Scenario

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	786.75	10.21	259.17	9.84	222.48	15.25	83.78	19.43	12.81	19.56
Commercial	370.86	4.81	190.19	7.22	215.19	14.75	91.17	21.14	17.59	26.84
Education	20.37	0.26	5.97	0.23	5.78	0.40	2.44	0.57	0.45	0.69
Government	38.83	0.50	19.69	0.75	25.98	1.78	11.91	2.76	2.59	3.95
Industrial	108.11	1.40	47.40	1.80	62.77	4.30	30.49	7.07	5.23	7.98
Other Residential	1092.94	14.18	480.41	18.24	408.30	27.98	147.03	34.10	23.33	35.60
Religion	43.88	0.57	17.53	0.67	18.52	1.27	7.65	1.77	1.43	2.18
Single Family	5244.48	68.06	1613.31	61.26	500.36	34.29	56.75	13.16	2.10	3.20
Total	7,706		2,634		1,459		431		66	

Subsidence

The area in Glenn County experiencing vertical displacement from subsidence varies from year to year and is related to drought, extreme heat, and groundwater use. When the region experiences prolonged periods of drought, reliance on groundwater for water supply and agriculture increases. Climate change is expected to lead to an increasing frequency and severity of drought, which could further increase subsidence.

In general, the trend appears to be that displacement is occurring between Orland and Willows on either side of I-5. The community of Artois is an area where displacement has been occurring. Roads, bridges, railroads, utility lines, and other structures have been damaged in other parts of California and could be impacted by continued displacement in Glenn County.

Continued ground subsidence may lead to increased flood risk in low-lying areas. Changes in topography can impact sewer lines, stormwater drainage, and other conveyance systems. Topography changes can also add strain to levee systems, requiring maintenance and strengthening. Compaction of aquifers can permanently decrease their capacity to store water.

Jurisdiction-Specific Vulnerabilities

Glenn County

Earthquake: The potential vulnerabilities discussed along with the Hazus scenarios in the previous section apply to all of Glenn County. The highest potential for ground shaking is in the central to eastern portion of the county, roughly following I-5 north to south. This is also where much of the population of Glenn County is concentrated, including the cities of Orland and Willows and several other small towns. According to Hazus, costly damage to residences and other structures should be expected, as well as economic losses from business interruption.

The impact of an earthquake can be widespread depending on its magnitude and intensity. While it cannot be determined where a future earthquake may occur and which areas may experience the greatest shaking, several concentrations of vulnerable populations in the county may experience more severe effects from an earthquake. The northeast portion of the county has a higher percentage of Hispanic or Latino populations, many who primarily speak Spanish. Orland, Willows, Hamilton City, and much of eastern Glenn County have a higher percentage of people with an income below the poverty level. These populations roughly overlap the area with a higher ground shaking potential. There is not a high concentration of individuals with disabilities in the area of highest shaking potential, but there are individuals with various disabilities or access and functional needs that may require additional assistance following an earthquake.

Subsidence: Based on the vertical displacement data shown in Figure 64, the Artois Fire District Station, the Artois Water District, and Artois Water Mains and Storm Drain systems are in areas recently affected by subsidence. Railroad lines, I-5, Natural Gas Pipelines, and numerous county roads also are in this area. Although it is uncertain at what rate subsidence may continue, monitoring these areas and efforts to moderate the use of groundwater supplies will be critical to avoiding damage.

Expansive Soils: Expansive soils can shrink and swell because of changes in the moisture content of clay-rich soils. Changes in climate, including extreme heat and drought and changes in precipitation patterns, could cause soils to shrink or expand. These changes can cause damage to the walls and foundations of structures as pressure from the surrounding soil changes. Expansive soils are found in many parts of Glenn County, including its central, south, and southeast areas, as shown in Figure 58. The

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

county has 55 critical facilities in areas of high risk of expansive soils affecting these community lifelines: 25 Water systems, 21 Safety and Security facilities, 4 Health and Medical facilities, 2 Transportation facilities, and 1 each for Communication, Food, Hydration and Water, and Hazardous Materials.

City of Orland

Earthquake: Orland has no record of damaging shaking events during the last century. However, the Corning Fault could impact Orland. The I-5 freeway overlays it for more than 30 miles. Orland is susceptible to strong shaking from periodic earthquakes in the region. The Hazus scenarios provide insight into the types of damage that can be anticipated if a large earthquake were to occur. Homes would be damaged, and some residents would be displaced. Damage to transportation and utility systems could disrupt services to the area. Businesses also would be damaged, leading to various economic losses from lost income and other business interruption costs.

Subsidence: Vertical displacement has occurred to the south of Orland, and changing conditions could cause displacement in the city. Subsidence could affect various transportation and infrastructure systems in or leading to Orland. As discussed in Section 3.1. Drought, dry wells have been reported in the area, which shows that water use may be contributing to displacement. Climate change may make drought and extreme heat events more common, which can lead to increased dependence on groundwater and further subsidence.

Expansive Soil: Orland has a low potential for expansive soils. A map of expansive soils in the General Plan shows that most of the expansive soils are west of I-5. Detailed geologic investigations may be necessary for areas with moderate to high shrink–swell potential. Development on expansive soils may require special grading and construction techniques. This type of soil also increases the cost of installing sewer and water lines and affects the design of storm drainage facilities, since percolation is slow. This may present challenges in developing commercial uses in areas west of I-5.

City of Willows

Earthquake: There is no record of damaging earthquakes in Willows in the last century, and no recent earthquake epicenters have occurred in the city. Fault lines and maps of ground shaking potential suggest the potential for damaging earthquakes in the area. The Hazus scenarios provide insight into the types of damage that can be anticipated if a large earthquake were to occur. Homes would be damaged, and some residents would be displaced. Damage to transportation and utility systems could disrupt services to the area. Businesses also would be damaged, leading to various economic losses from lost income and other business interruption costs.

Subsidence: Subsidence has not caused damage in Willows. However, vertical displacement has occurred just north of the city. If extended drought, heat, and dependence on groundwater continue, the area of subsidence may expand or show greater amounts of vertical shift. Subsidence north of Willows could affect important transportation routes to and from the city, including I-5, the railroad, and utility lines. Ongoing monitoring of their conditions should continue to assess changes in risk.

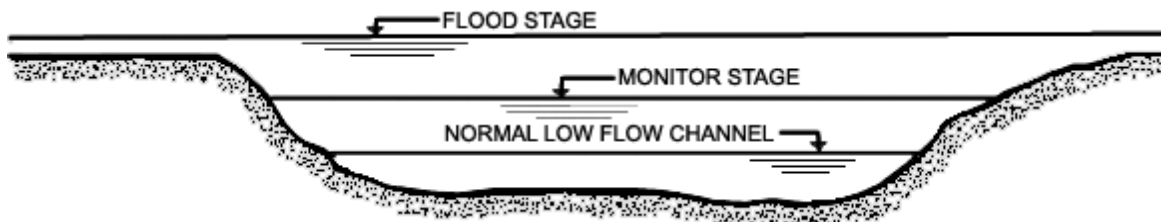
Expansive Soils: All of Willows has been mapped as having high potential for expansive soils. The soils in Willows are generally considered shallow. Clays expand and contract when they go through wet–dry cycles. Foundations on clay soils can be impacted by changes in soil volumes over time. This phenomenon can be most directly seen in roadway surfaces that fail and must be patched repeatedly. Clays also have significant shrink–swell potential. Sections of I-5 in Orland and Willows are built on fine silt and alluvium, which can cause subsidence along the roadway. In Willows, the following community lifeline facilities are in areas with high expansive soil hazards: 19 Safety and Security Facilities, 17 Water systems, 4 Health and Medical facilities, 2 Transportation facilities, 1 Hazardous Materials facility.

Section 3.5 Levee Failure

The National Flood Insurance Program (NFIP) defined a levee in Title 44, Chapter 1, 59.1 of the Code of Federal Regulations (44 CFR 59.1) as a human-made structure, typically an earthen embankment, which is created in accordance with sound engineering practices. Its purpose is to contain, control, or divert the flow of water to minimize the risks of temporary flooding.⁶⁸ NFIP regulations define a levee system as a flood-protection system that comprises one or more levees and associated structures, such as drainage and closure devices, which are constructed and operated according to sound engineering practices.

River Stage Definitions

These definitions are used by the California Department of Water Resources (DWR) Flood Center in Sacramento in correspondence and alerts provided to local governments and posted on the California Data Exchange Center (CDEC) and National Oceanic and Atmospheric Administration (NOAA) web pages. The following definitions apply streams that do not have levees (see Figure 67).



Source: 2018 Glenn County, CA, Multi-Jurisdiction Hazard Mitigation Plan.

Figure 67: Typical Stream without Levees

Monitor Stage: The stage at which initial action must be taken by concerned interests (livestock warning, removing equipment from the lowest overflow areas, or general surveillance of the situation). This level may produce overbank flows sufficient to cause minor flooding of low-lying lands and local roads.

Flood Stage: The stage at which overbank flows are of sufficient magnitude to cause considerable inundation of land and roads and/or threat of significant hazard to life and property.

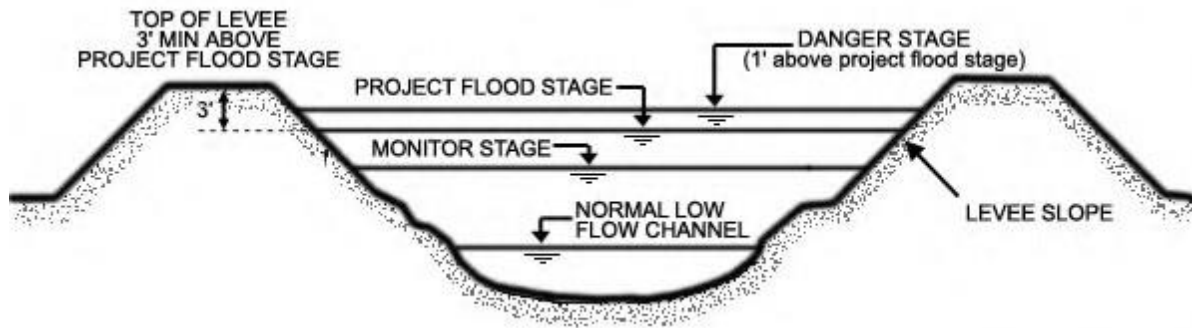
The following definitions apply streams with levees (see Figure 68).

Monitor Stage: The stage at which the responsible levee maintenance agency must patrol flood control project levees, or the stage at which flow occurs into bypass areas from project overflow weirs.

Project Flood Stage: The stage at which the flow in a flood control project is at maximum design capacity (US Army Corps of Engineers "Project Flood Plane"). At this level, there is a minimum freeboard of 3 feet to the tops of the levees.

Danger Stage: The stage at which the flow in a flood control project is greater than maximum design capacity and where there is extreme danger and a threat of significant hazard to life and property if the levee fails. This is 1 foot above the project flood stage.

⁶⁸ FEMA, "NFIP and Levees: An Overview." https://www.fema.gov/sites/default/files/documents/fema_nfip-levees.pdf



Source: 2018 Glenn County, CA, Multi-Jurisdiction Hazard Mitigation Plan.

Figure 68: Typical Stream with Levees

Every year, flooding results in the loss of life and causes millions of dollars of damage to property. Except for flash flooding, most floods occur slowly and have a buildup period of several days. This period provides an opportunity for emergency responders to reduce the damage that flooding will cause.

Regulatory Environment

The U.S. Department of Homeland Security (DHS) considers levees to be part of the nation's critical infrastructure and collaborates with its public and private partners to identify levees that present the greatest risk to the nation. DHS also coordinates protective programs that use an all-hazards approach to risks (considering human-made and natural incidents). This collaboration highlights the importance of protecting and ensuring the safety of the nation's levees, with contributions from all levels of government and the private sector.

Levee regulatory requirements at federal, state, and local levels are critical for the safeguarding of agriculture, economy, power supply, and quality of life in the unincorporated areas of Glenn County. One local policy pertaining to levees in Glenn County is listed in the 1993 General Plan. CDP-16 states:

Recognize that because of discrepancies arising from the original land surveys conducted in the state, which resulted in acreage shortages in sections of land, the existence of physical barriers, such as canals, roads, streams, levees, etc., and parcel configuration, exceptions to minimum parcel size for properties zoned to exclusive agricultural categories may be necessary and appropriate to promote the spirit and intent of the General Plan.

A slow-rise flood situation resulting from a levee breach could evolve through a series of four stages. Emergency actions will be based on the following four stages of response actions:

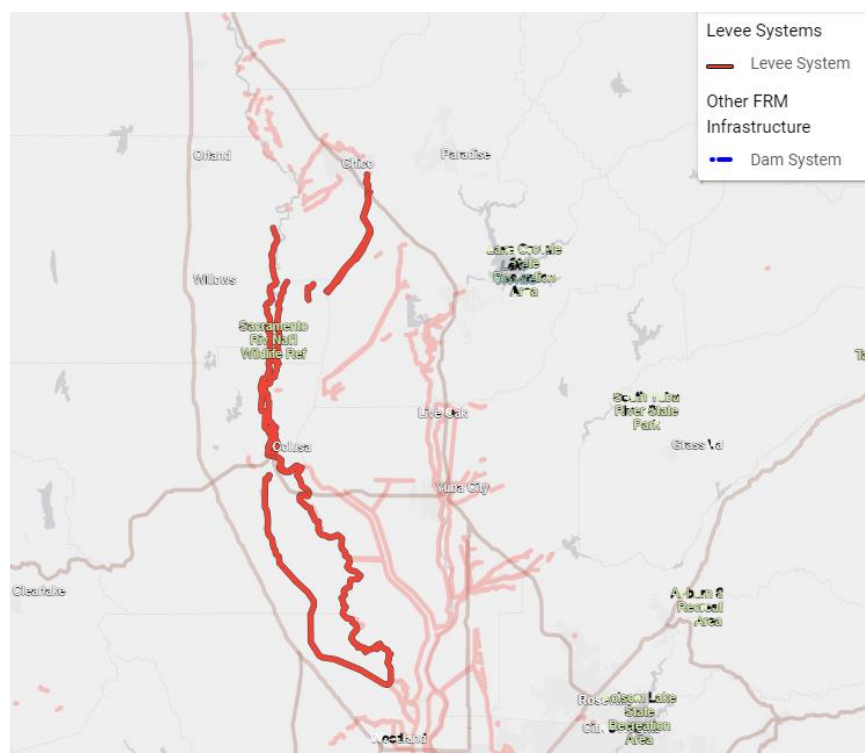
- Stage 1 – Planning & Preparation (incoming storms, flooding possible)
- Stage 2 – Monitor Stage (high water levels)
- Stage 3 – Emergency Stage (Flood Stage)
- Stage 4 – Danger Stage (extensive flooding is imminent)

Location/Geographic Extent

Glenn County has five levee systems: Glenn County Levee System 2205, MA05 Unit 1 – Butte Creek left bank, MA 05 Unit 2 – Butte Creek right bank, Sacramento River East Levee – LD 3 Glenn County, and LD 1 (Sacramento River northwest bank) and LD 2 (Sacramento River southwest bank, Sacramento River west bank). These systems are located along Butte Creek, Elk Creek, French Creek, Grindstone Creek, Hambright Creek, Logan Creek, Stony Creek, Walker Creek, Wilson Creek, and Willow Creek and

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

their tributaries. The Glenn-Colusa Canal and Tehama-Colusa Canal are other sites where levees could fail and impact surrounding communities. The maps in Figure 69 through Figure 74) provide more information on where levee failure might occur.



Source: National Levee Database. [https://levees.sec.usace.army.mil/#/levees/search/in=@county%20state:Glenn,%20California&sg=@AUTHORIZATION_CATEGORY_ID:\(1%7C2%7C3%7C4%7C5\)&viewType=map&resultsType=systems&advanced=true&hideList=false&eventSystem=false](https://levees.sec.usace.army.mil/#/levees/search/in=@county%20state:Glenn,%20California&sg=@AUTHORIZATION_CATEGORY_ID:(1%7C2%7C3%7C4%7C5)&viewType=map&resultsType=systems&advanced=true&hideList=false&eventSystem=false)

Figure 69: Levee Systems Glenn County

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents



Source: National Levee Database. [https://levees.sec.usace.army.mil/#/levees/search/in=@county%20state:Glenn,%20California&sg=@AUTHORIZATION_CATEGORY_ID:\(1%7C2%7C3%7C4%7C5\)&viewType=map&resultsType=systems&advanced=true&hideList=false&eventSystem=false](https://levees.sec.usace.army.mil/#/levees/search/in=@county%20state:Glenn,%20California&sg=@AUTHORIZATION_CATEGORY_ID:(1%7C2%7C3%7C4%7C5)&viewType=map&resultsType=systems&advanced=true&hideList=false&eventSystem=false)

Figure 70: Glenn County Levee System 2205



Source: National Levee Database. [https://levees.sec.usace.army.mil/#/levees/search/in=@county%20state:Glenn,%20California&sg=@AUTHORIZATION_CATEGORY_ID:\(1%7C2%7C3%7C4%7C5\)&viewType=map&resultsType=systems&advanced=true&hideList=false&eventSystem=false](https://levees.sec.usace.army.mil/#/levees/search/in=@county%20state:Glenn,%20California&sg=@AUTHORIZATION_CATEGORY_ID:(1%7C2%7C3%7C4%7C5)&viewType=map&resultsType=systems&advanced=true&hideList=false&eventSystem=false)

Figure 71: MA 05 Unit 1 – Butte Creek Left Bank

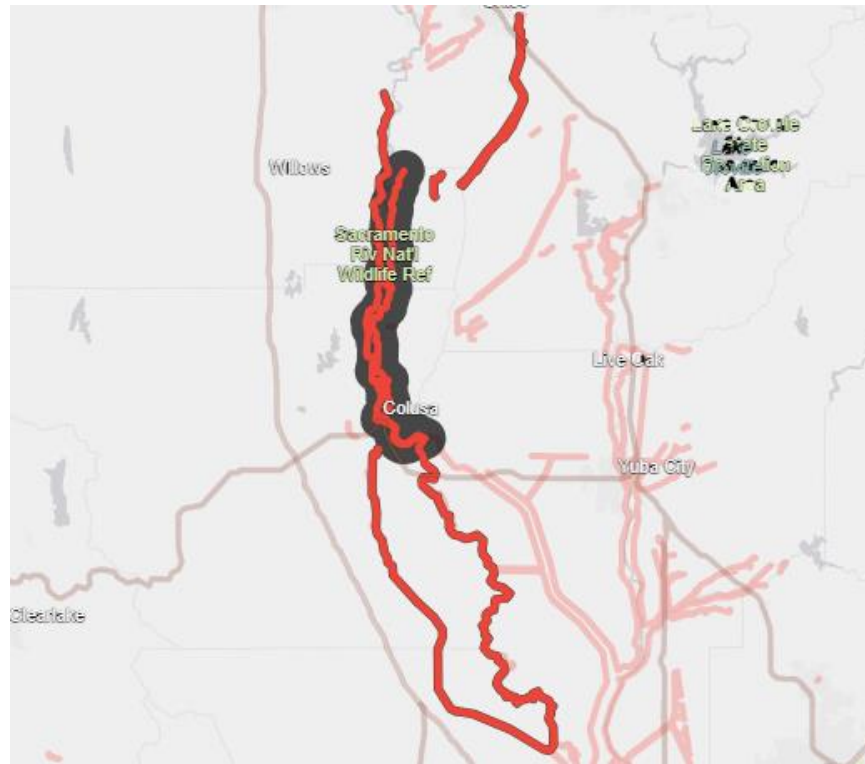
Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents



Source: National Levee Database. [https://levees.sec.usace.army.mil/#/levees/search/in=@county%20state:Glenn,%20California&sg=@AUTHORIZATION_CATEGORY_ID:\(1%7C2%7C3%7C4%7C5\)&viewType=map&resultsType=systems&advanced=true&hideList=false&eventSystem=false](https://levees.sec.usace.army.mil/#/levees/search/in=@county%20state:Glenn,%20California&sg=@AUTHORIZATION_CATEGORY_ID:(1%7C2%7C3%7C4%7C5)&viewType=map&resultsType=systems&advanced=true&hideList=false&eventSystem=false)

Figure 72: MA 05 Unit 2-Butte Creek Right Bank

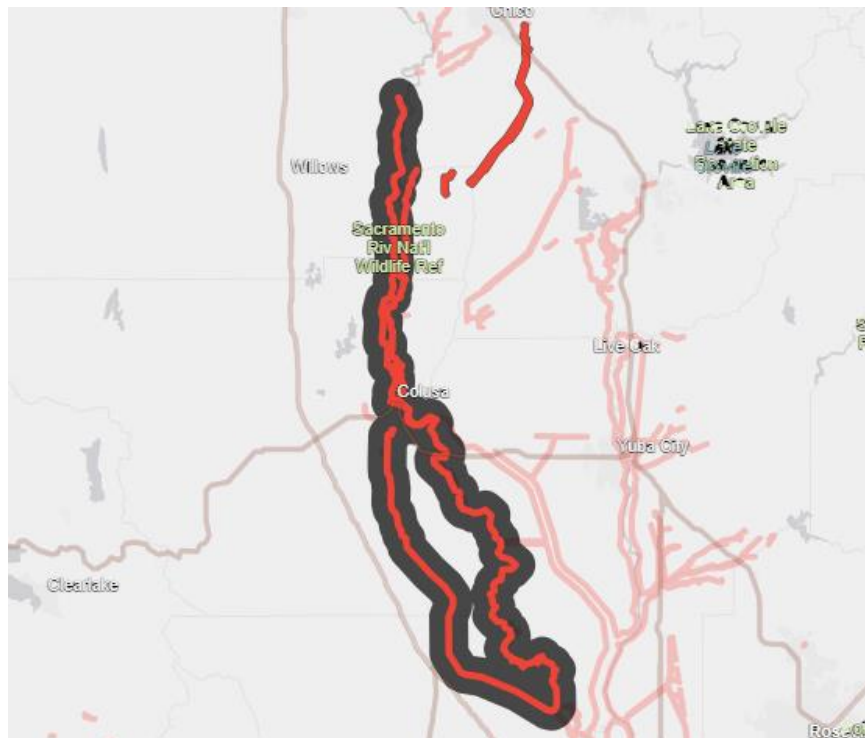
Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents



Source: National Levee Database. [https://levees.sec.usace.army.mil/#/levees/search/in=@county%20state:Glenn,%20California&sg=@AUTHORIZATION_CATEGORY_ID:\(1%7C2%7C3%7C4%7C5\)&viewType=map&resultsType=systems&advanced=true&hideList=false&eventSystem=false](https://levees.sec.usace.army.mil/#/levees/search/in=@county%20state:Glenn,%20California&sg=@AUTHORIZATION_CATEGORY_ID:(1%7C2%7C3%7C4%7C5)&viewType=map&resultsType=systems&advanced=true&hideList=false&eventSystem=false)

**Figure 73: Sacramento River East Levee – LD 3
Glenn County (Butte, Colusa, Sutter)**

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents



Source: National Levee Database. [https://levees.sec.usace.army.mil/#/levees/search/in=@county%20state:Glenn,%20California&sg=@AUTHORIZATION_CATEGORY_ID:\(1%7C2%7C3%7C4%7C5\)&viewType=map&resultsType=systems&advanced=true&hideList=false&eventSystem=false](https://levees.sec.usace.army.mil/#/levees/search/in=@county%20state:Glenn,%20California&sg=@AUTHORIZATION_CATEGORY_ID:(1%7C2%7C3%7C4%7C5)&viewType=map&resultsType=systems&advanced=true&hideList=false&eventSystem=false)

Figure 74: Sacramento River West Bank (Colusa, Glenn, Yolo)

Water levels in the Sacramento River are primarily controlled by the release of water from upstream dams. Heavy rainfall, accompanied by high releases from the Shasta and Keswick dams, can raise the river to flood levels. When water levels exceed the monitor stage of 142 ft at Hamilton City, the J Levee there is stressed. This can cause bank erosion in the northern section, which is managed by Reclamation District 2140. If the water reaches the flood stage, which is 147 ft, the erosion may impact the northern section. The midsection of the J Levee at Irvine Finch State Park also will be affected if the water rises above the first embankment. However, this section of the levee has been given wave wash protection to limit erosion.

When the water reaches the flood stage, it is also released to the east into Butte County. At this point, water pools in orchards and flows into Pine Creek, but it typically does not have an impact on State Road 32. The lower section of the J Levee system has recently been replaced and has a system of dikes to relieve pressure on the levee and allow for outflow into the flood management basin. Significant water enters the basin between the monitor stage and the flood stage. The park entrance on County Road 23 will likely flood and close.⁶⁹

Levee Flood Protection Zone (LFPZ) maps were developed by DWR to increase awareness of flood risks associated with state and federal Levees. These maps estimate the maximum area that may be flooded if

⁶⁹ County of Glenn, "Glenn County OA EOP 2019 Annex K: Hazard Specific Procedures." https://www.countyofglenn.net/sites/default/files/Office_of_Emergency_Services/Annex%20K%20-%20Hazard%20Public%20V%202019.pdf

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

a state or federal levee fails or is overtopped.⁷⁰ Lands not in an LFPZ also may be subject to flooding. Figure 75 and Figure 76 show the LFPZs in Glenn County.

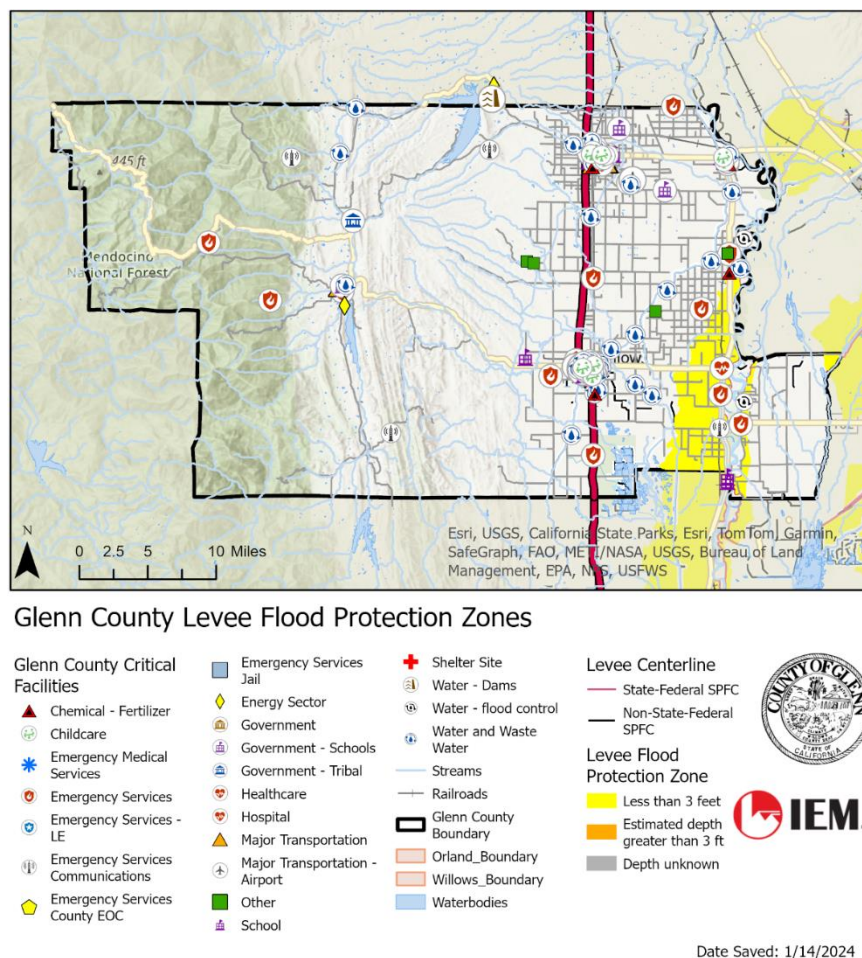


Figure 75: Levee Flood Protection Zones in Glenn County

⁷⁰ California Department of Water Resources. <https://gis.lfpz.water.ca.gov/lfpz/>

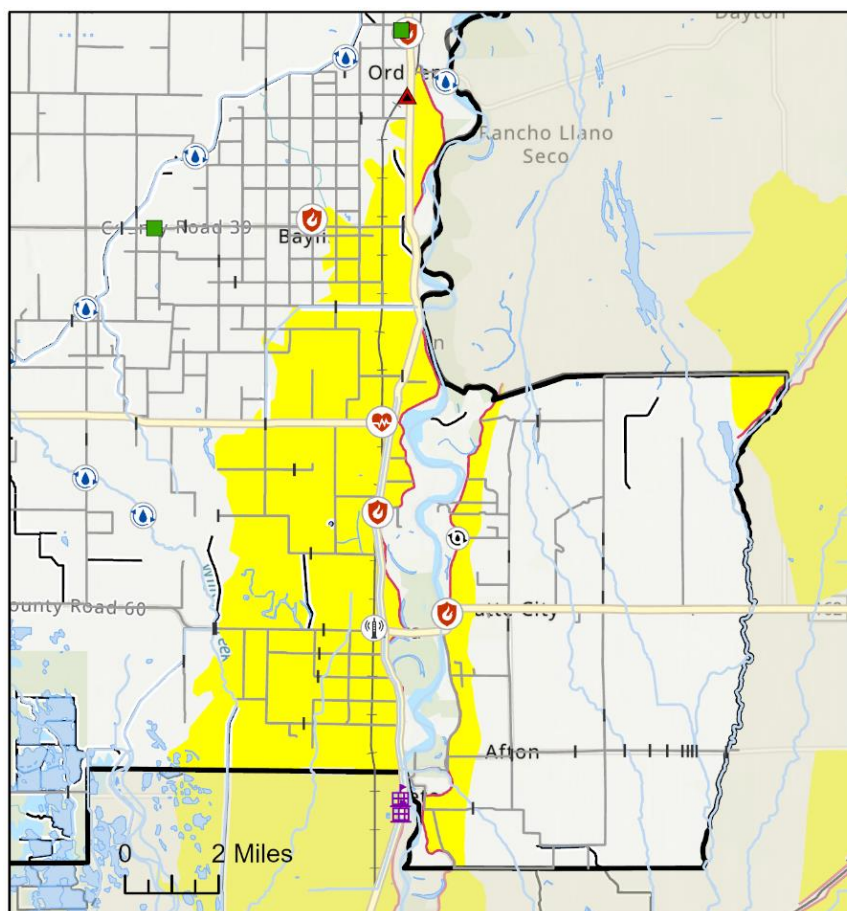


Figure 76: Levee Flood Protection Zones, Small Scale

Magnitude/Extent

Several factors can contribute to the extent of levee failure, which is usually measured according to the nature of the breach (overtopping the levee crown versus a failure along the slope), the affected area, flow volume and velocity, and depth of flooding. As shown in Figure 73 and Figure 74, flooding from a levee failure in Glenn County is anticipated to be less than 3 feet deep. The onset is typically slow as the river rises, but if a levee fails, the warning times are short for those in the inundation area. Flow volume and velocity are typically highest at the site of the failure. The water then slows and becomes less deep as it spreads over a larger area. Levee failures can last hours to weeks, depending on the river flows beyond the levee and the nature of the breach.

Past Occurrences

Portions of Hamilton City and the surrounding area flooded in 1974. Extensive flood fighting was necessary in 1983, 1986, 1995, 1997, and 1998 to avoid the failure of the private 100-year-old J levee. Residents of the town were evacuated six times in the past 20 years: 1983, 1986, twice in 1995, 1997, and 1998 (Sacramento River Conservation Area Forum, 2003). A plan participant shared that floods in the 1940s were strong enough to carry homes away. In February 2019, a muscle wall and sandbag temporary structure were built to address a boil that developed during storms on the J Levee in Hamilton City. A new setback levee was built by USACE and put into service at this location in 2021–2022.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Various historical crests have occurred along the Sacramento River in Hamilton City:

1. 150.92 ft. on 01/02/1997
2. 150.80 ft. on 01/24/1970
3. 150.77 ft. on 03/01/1983
4. 150.65 ft. on 01/10/1995
5. 150.53 ft. on 02/18/1986
6. 149.3 ft. on 02/19/2017
7. 148.3 ft. on 02/27/2019

Additional historical crests have occurred along the Sacramento River at Butte City:

1. 96.87 ft. on 02/07/1942
2. 96.70 ft. on 02/20/1958
3. 95.89 ft. on 03/02/1983
4. 95.17 ft. on 02/12/1941
5. 95.15 ft. on 02/04/1998
6. 95.15 ft. on 02/28/2019
7. 92.47 ft. on 02/19/2017

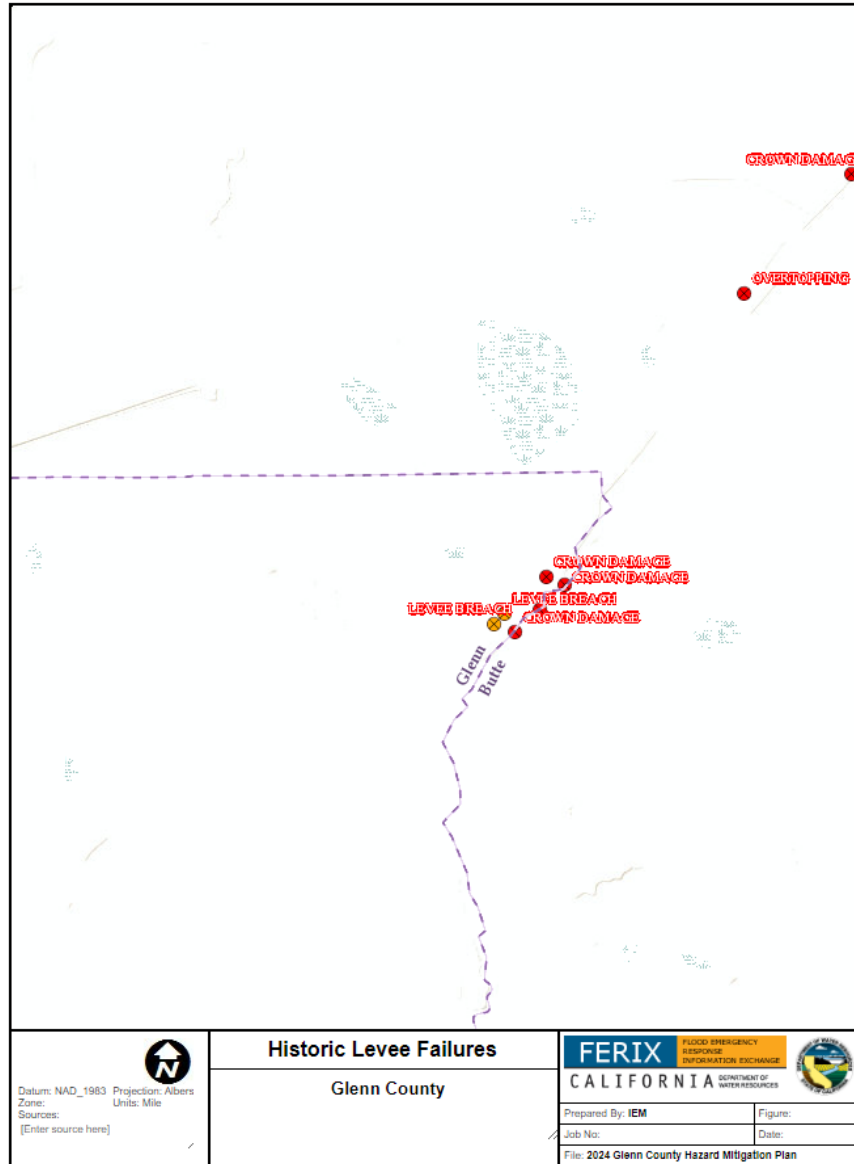
Historical crests along the Sacramento River at Ord Ferry include:

1. 121.70 ft. on 02/28/1940
2. 121.20 ft. on 02/06/1942
3. 121.10 ft. on 12/11/1937
4. 120.10 ft. on 02/25/1958
5. 119.79 ft. on 01/24/1970
6. 117.00 ft. on 02/19/2017
7. 116.00 ft. on 02/28/2019

The DWR Flood Emergency Response Information Exchange (FERIX)⁷¹ lists six incidents along the border of Glenn and Butte Counties. They are shown in Figure 77, and their details are listed in Table 48.

⁷¹ Flood Emergency Response Information Exchange (FERIX). California Department of Water Resources.
<https://ferix.water.ca.gov/webapp/fmo/?d=CZ1qoTSsw92ad21245f5a9a2cdf33a57d4b9ad8ce8>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents



Source: California Department of Water Resources Flood Emergency Response Information Exchange (FERIX) – FMO. <https://ferix.water.ca.gov/webapp/fmo/>

Figure 77: Levee Failures on and near the Border of Butte and Glenn Counties

Table 48: Levee Failures in Glenn County, according to FERIX

Date	Description	Type	Details
2/25/1997	Levee breach	Rotational slope failure	Levee break on agricultural land. 4321
2/25/1997	Crown damage	Overtopping	Levee was overtopped causing moderate to heavy erosion on the landside slope. 4320
2/25/1997	Crown damage	Overtopping	Levee topped in numerous locations causing moderate to heavy erosion on the landside slope. 4323

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Date	Description	Type	Details
2/25/1997	Crown damage	Overtopping	Levee was overtopped and completely eroded the landside slope. 4319
2/25/1997	Crown damage	Overtopping	Levee was overtopped causing heavy erosion on the landside slope. The entire landside slope was gone in spots and erosion cuts into the levee crown. 4318
4/1/1998	Levee breach	Rotational slope failure	Levee break repair site. 4322

A catastrophic failure of various levees along the Sacramento River in the region would significantly impact portions of Glenn County. Although relevant federal agencies coordinated and collaborated during the March 2023 winter storms, it was demonstrated that the possibility of breaching levees and subsequent flooding from intense atmospheric rivers and snowmelt still exists, despite elaborate protection and safety programs. During the week of March 20, 2023, Glenn County experienced extensive flooding and debris flows from severe storms. The natural bank of Hambright Creek, located to the west of Orland, was breached, which quickly widened the channel to about 100 feet. As a result, water flowed out of the channel and spread across property, roads, and into an irrigation canal, causing flooding around County Roads DD, E, and FF.⁷²



County of Glenn, "Hambright Creek Response." <https://www.countyofglenn.net/news/emergency-preparedness-public-information/20230320/hambright-creek-response>

Figure 78: Levee break 03/14/2023 Hambright Creek

Frequency/Probability of Future Occurrences

Levee failures do not occur in regular intervals but are often related to heavy rain and other flooding events. Factors, such as the levee's age and construction materials, and other signs that it is deteriorating, also may influence the probability of failure. Historic records indicate that seven events have occurred in the last 100 years in Glenn County, with an average of approximately every 14 years or

⁷² County of Glenn, "Hambright Creek Response." <https://www.countyofglenn.net/news/emergency-preparedness-public-information/20230320/hambright-creek-response>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan Appendix C: Plan Review Documents

a 7% chance annually. However, levee failures could happen more or less frequently than that. Ongoing maintenance is necessary to reduce the probability of failure. As a result, the levees are monitored and checked on a periodic basis. When a levee is recognized as having a potential failure, monitoring protocols and notification procedures for communicating levee status to emergency response personnel are carried out.

Changes in Development

Glenn County

In response to a known weakness in the J Levee in Hamilton City, a new setback was installed in 2021, which reduced the risk of possible failure. However, the overall risk to the county remains unchanged. The same overall hydrologic conditions, concerns from heavy precipitation, and possibilities of deterioration, failure, or breach of a levee and the impacts that would follow are still present.

No areas of significant new development or changes in land use in potential levee flood zones were identified. Much of the area in the LFPZs is intensive agricultural use, with a few small communities, such as Bayliss, Cordera, Glenn, Jacinto, and Ordbend. These communities are not currently experiencing significant growth. However, any future changes in land use or an increase in development could alter the assets potentially at risk of levee failure. Although levees can be useful for floodplain management, there is a concern that they can also reduce people's perceptions of flood risks. Future development projects should seek to objectively consider the risk of floods from levee failures.

The county's population is in a period of slight decline between 2022 and 2020, and no other significant changes in demographics are apparent. Levee failure is not expected to be directly impacted by climate change, but any future changes in precipitation patterns or the severity of weather events could indirectly contribute to levee failure if they lead to higher flows in rivers. Overall, there is no change in vulnerability to levee failure in the county.⁷³

City of Orland

Orland has not experienced changes in development that affect vulnerability to levee failure. Land use and population have remained predominantly the same.⁷⁴ Building in the floodplain is strongly discouraged, and no additional development has occurred since the last plan update. Climate change could indirectly affect the risk of levee failure because of changes in future precipitation patterns or the intensity of heavy rain events. The overall vulnerability to levee failure in Orland has remained the same.

City of Willows

Willows has not experienced changes in development that affect its vulnerability to levee failure. Land use has remained the same, and the population has had a slight decrease.⁷⁵ Climate change could indirectly affect the risk of levee failure because of changes in future precipitation patterns or the intensity of rain events. The overall vulnerability to levee failure in Willows has remained the same.

⁷³ United States Census, "Quick Facts Willows City, California; Orland City, California; Glenn County, California." <https://www.census.gov/quickfacts/fact/table/orlandcitycalifornia,glenncountycalifornia/BZA010221>

⁷⁴ Ibid.

⁷⁵ Ibid.

Vulnerability Assessment

The impacts of levee failure would be very similar to those from a flood event, but the areas likely to be flooded by a levee failure do not necessarily align with 1% and 0.2% annual chance flood hazard zones. Heavy precipitation events and high flows in rivers can contribute to the overtopping or failure of levees. Areas otherwise protected from flooding by levees could experience flooding if a levee fails or is breached. A levee failure could cause significant loss of life and property.

For structures that may be closer to the source of a levee failure, the force of fast-moving waters can damage foundations, walls, and siding. As the water spreads and slows down, it can still damage structures, building contents, utility systems, and vehicles exposed to standing water for a prolonged time.

Land use in areas of Glenn County that could be impacted by levee failure is primarily agricultural. General impacts could include scouring previously protected land as water rushes into an area. As the water spreads and slows down, it can deposit sediment or debris across a wide area that could include pollutants or other contaminants. Crops could be damaged or destroyed, and it may be necessary to restore the land by removing the deposited material, causing further loss of productivity.⁷⁶

Climate change could affect long-term precipitation and runoff patterns. If heavy rain events increase in frequency or intensity, the risk of levee failure also would increase because of the risk of overtopping during high runoff.

Jurisdiction-Specific Vulnerabilities

Glenn County

LFPZs in Glenn County cover 48 square miles (31,364 acres) and have an estimated depth of less than 3 feet. The zones are near the Sacramento River in the southeast portion of the county (Figure 75). To estimate the potential impacts of levee failure, census blocks and building stock values were exported from Hazus and overlaid with the LFPZs in GIS. Table 49 lists the values of exposed structure in the LFPZs. The National Structure Inventory indicates that 210 residential, 98 commercial, 8 industrial, and 6 public structures are in the LFPZ. If the 210 residential structures hold an average household of 2.8, approximately 588 people in this area could be affected by levee failure. Glenn County has significant agricultural interests. Business income loss, wage loss, and other economic impacts caused by agricultural losses from levee failure could be particularly difficult for lower-income households.

Eight critical facilities were identified in the hazard zone (see Table 50). Among these is the Riverside Assisted Living Facility. Its residents are likely to have access or functional needs that could make evacuating or closing the facility difficult. Two fire stations and Levee District 3 also are in the hazard area, which may inhibit their ability to respond if a levee breach or failure causes flooding or road closures nearby. State Routes 162 and 45 and multiple county roads are in the potential flood zone. Levee failure could inundate these roads, leading to closures that would limit access in the area. The Southern Pacific Railroad line also traverses the hazard area.

The 100-year-old J Levee upstream of Hamilton City is currently undergoing renovation to protect Hamilton City from flooding when the Sacramento River surges its banks. Portions of this area have flooded on several occasions since 1974 (Sacramento River Forum, 2015). The project area lies just north of the levees of the Sacramento River Flood Control Project and in the area of the Chico Landing to Red Bluff bank protection project. This project will construct a setback levee, degrade an existing levee,

⁷⁶ Agricultural Lands: Flooding and Levee Breaches. Encyclopedia of Soil Science. 2017
http://www.ngrrec.org/uploadedFiles/Pages/Research_Program/Levee%20breaches%20E-ESS3-120053228.pdf

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

and revegetate the setback area to restore 1,145 acres of riparian woodland, 261 acres of riparian shrub, and 70 acres of floodplain meadow. This project will reduce flood risk for Hamilton City and bordering agricultural lands (Hamilton City Justification Sheets, 2011). Figure 79 is a diagram, and Figure 80 is an aerial photograph of the J Levee along the Sacramento River near Hamilton City.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

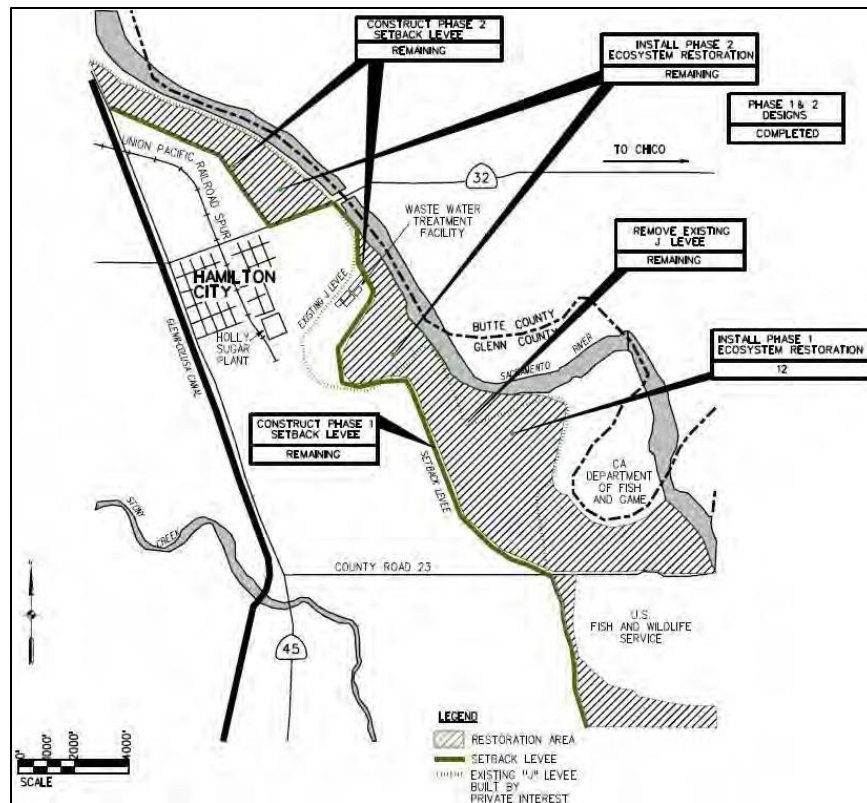
Table 49: Estimated Losses from State/Fed Levee Failure in Glenn County

	Residential	Commercial	Industrial	Agricultural	Religions/NP	Government	Education	Total
Orland	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Willow	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
County	\$149,663,000	\$71,366,000	\$70,205,000	\$168,882,000	\$13,594,000	\$396,000	\$6,824,000	\$480,930,000
Total	\$149,663,000	\$71,366,000	\$70,205,000	\$168,882,000	\$13,594,000	\$396,000	\$6,824,000	\$480,930,000

Table 50: Critical Facilities in Levee Flood Protection Zones

Facility Name	Jurisdiction	Description	FEMA Community Lifeline
Glenn Growers Radio Voter Site	Unincorporated	Emergency Services Communication	Safety and Security
Glenn–Colusa Fire District – Butte City	Unincorporated	Emergency Services	Safety and Security
Glenn–Cordera Fire Protection District	Unincorporated	Emergency Services	Safety and Security
Levee District 3 – Butte City	Unincorporated	Water – Flood Control	Water Systems
Princeton Elementary School	Unincorporated	School	Safety and Security
Princeton High School	Unincorporated	School	Safety and Security
Riverside Assisted Living Facility	Unincorporated	Healthcare	Health and Medical
Wilbur Ellis	Unincorporated	Chemical – Fertilizer	Hazardous Materials

Glenn County Multi-Jurisdiction Hazard Mitigation Plan



Source: www Orovillemr.com/news

Figure 79: Diagram of the J Levee along the Sacramento River



Figure 80: Aerial Photograph of the J Levee along the Sacramento River

City of Orland

Orland does not have any properties in the LFPZs, but residents could be affected by levee failures elsewhere in the county. Agricultural or economic losses could have impacts outside the immediately affected area, including Orland residents who are employed in that sector. Disruptions to roadways and other transportation routes could disrupt travel and affect people's ability to access a variety of services. State Route 32 is a primary transportation route between Orland and Chico, and it could be damaged or forced to close by a levee failure.

City of Willows

Willows does not have any properties in the LFPZs, but there are levees in or near Willows that are not state or federally owned and do not have an LFPZ. No other mapped inundation area was obtained. Potential flood areas are primarily along the Glenn–Colusa Canal, operated by the Glenn–Colusa Irrigation District. It enters Glenn County in the northeast corner and flows roughly south and southwest until it reaches the eastern border of Willows. It turns and passes through Willows south of Elm Street, and then continues south.

The Glenn–Colusa Canal was constructed through Willows in the late 1800s, and water began flowing in 1905 when construction was completed. The main canal is earth lined and 64 miles long. It begins north of Hamilton City, running south and ending south of the city limits of the City of Williams in Colusa County. Historical records show only minor seepage problems, which were repaired immediately with no impact on Willows. The canal is designed with many safety benefits, such as safety dams, yearly maintenance, and the Glenn–Colusa Irrigation District Emergency Response Plan. Safety dams are located at Walker Creek and Willow Creek and are manually controlled. Yearly maintenance procedures include rodent control, herbicide application to control weed growth, and bank inspections performed continually along

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

the main canal. There is no history of significant levee failure affecting Willows, but most of the city is in a floodplain, so damage could occur if a levee were to fail.

Similar to Orland, residents could experience impacts from levee failures that occur elsewhere in the county. Agricultural or economic losses could have impacts outside the immediately affected area, particularly for Willows residents who are employed in that sector. Disruptions to roadways and other transportation routes could disrupt travel in the county and affect people's ability to access a variety of services. State Routes 162 and 45 provide important transportation access to the city and are in potential levee flood zones.

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Section 3.6 Severe Weather

Severe weather is any destructive storm event that can damage property or cause the loss of life. Moreover, excessive localized precipitation over a short period may cause flash floods that threaten life and property. Severe weather usually occurs in Glenn County as localized storms that include heavy rain. Additionally, hazards associated with the term “severe weather” like hail, strong wind, and lightning have a Very Low probability of occurring according to the NRI. Given the very low risk to the planning area and limited opportunities for mitigation for such a low probability hazard, the plan participants requested only heavy rains will be profiled in this plan as “severe weather”.

Heavy rain is most common in Glenn County between December and February and may be associated with atmospheric rivers, long, concentrated regions in the atmosphere that transport moist air from the tropics to higher latitudes. They can produce heavy rain and snowfall in short periods. These extreme precipitation events can lead to flooding, mudslides, and damage to life and property. Some 30–50% of annual precipitation in the west coast states occurs in just a few atmospheric river events.⁷⁷

Atmospheric river

A long, narrow corridor of concentrated water vapor.

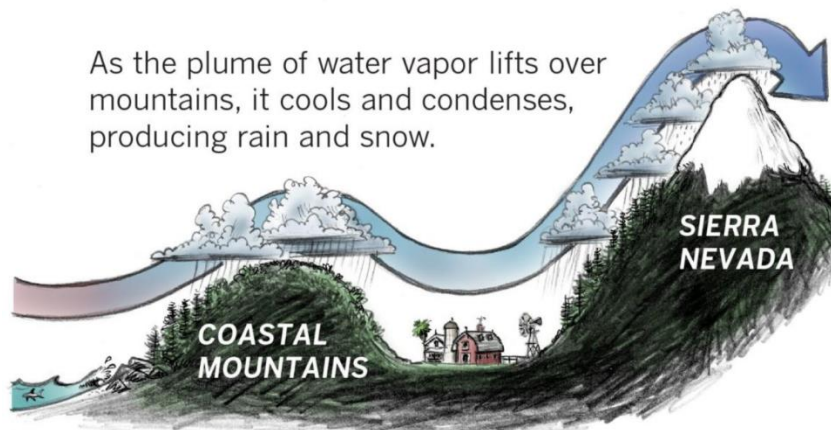
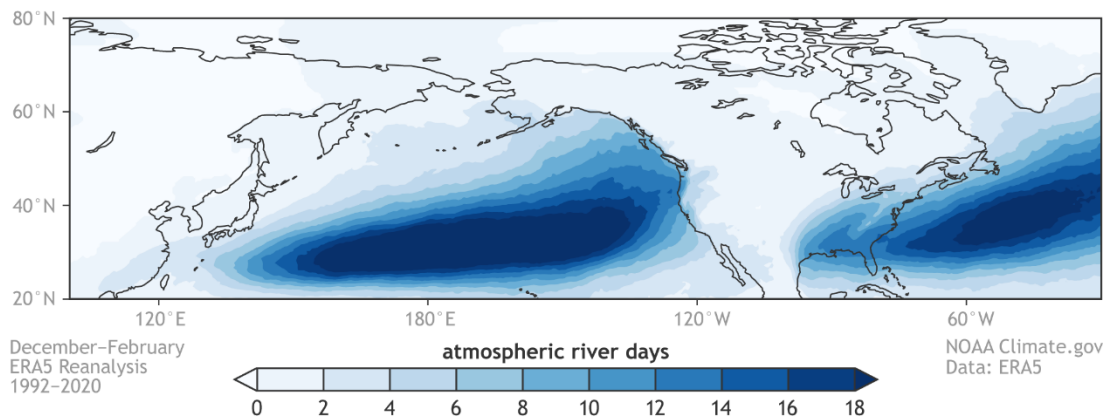


Figure 81: Visualizing Atmospheric Rivers⁷⁸

Figure 82 shows the numbers of days with atmospheric rivers.

⁷⁷ NOAA “Atmospheric Rivers: What are they and how does NOAA study them?” <https://www.climate.gov/news-features/feed/atmospheric-rivers-what-are-they-and-how-does-noaa-study-them>

⁷⁸ Yahoo News.com, Times Reporting, January 4, 2023, https://www.yahoo.com/news/atmospheric-river-hitting-california-seen-024342000.html?guce_referrer=aHR0cHM6Ly93d3cuYmluZy5jb20v&guce_referrer_sig=AQAAAGKg6TueeEpjIRnSZuolfN8sW96Ok1tBJ9R-JrR0N7laVCfvc0L1t3038CFYICxUrtkESc_KlggtceJJXM4CthXflSKUwaaBjT2rFMpeR1kn8-vnhR9CG7pNN4EYLXAnoxL_OGsw1nDFfsZ87dv4zAsqL5EPAdOfsESqfNxZBo



Source: Climate.gov. "When Rivers Reach the Sky," 2022.
<https://www.climate.gov/news-features/blogs/enso/when-rivers-reach-sky>

Figure 82: Average Number of Days with an Atmospheric River

Regulatory Environment

Very few formal regulations pertain to severe weather events in general.

Location/Geographic Extent

Heavy precipitation can occur anywhere in Glenn County, and the extent can vary greatly. It can impact large areas simultaneously because of the widespread nature. Historical records indicate that heavy precipitation events can occur in an isolated part of Glenn County or throughout the planning area. Geographical barriers do not restrict inclement weather events, which may affect all parts of Glenn County.

Magnitude/Extent

Glenn County's climate is classified as Mediterranean, with nearly 90% of the annual precipitation occurring in a relatively narrow window of about 16 weeks. The most severe storms occur from late fall to early spring. The climate pattern can generate severe and prolonged periods of heavy rain. Glenn County normally experiences heavy rains on an annual basis. Some severe winter storms may also contain thunderstorms. Thunderstorms are typically few and are more likely to occur in the spring or late fall.

A variety of metrics can be used to describe the magnitude and severity of severe weather in Glenn County. Typically, rainfall rate can be used to describe the amount of rain that could fall at any given time. According to the Manual of Surface Weather Observations (MANOBS), the following categories can describe rainfall intensity or extent:

Table 51: Rainfall Intensity Scale

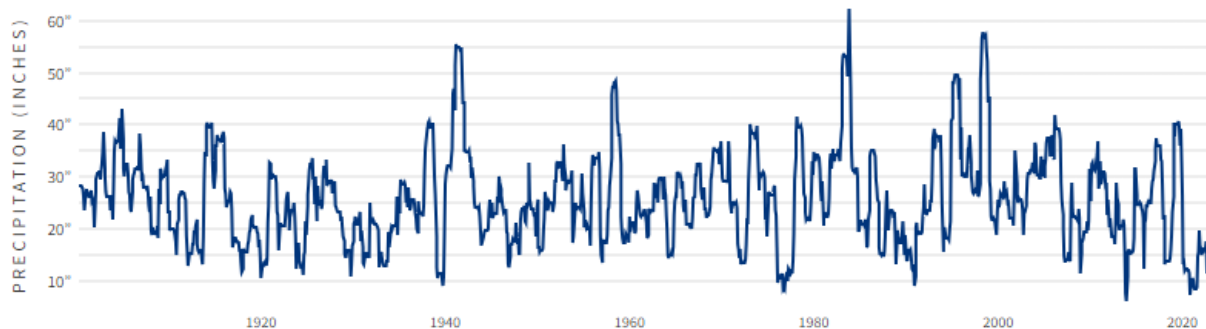
Description	Rate
Light Rain	Less than 0.1"/hour
Moderate Rain	0.1 to 0.3"/hour
Heavy Rain	0.3 to 2"/hour
Violent Rain	>2 in/hour

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Source: Rain rate intensity classification.

<https://www.baranidesign.com/faq-articles/2020/1/19/rain-rate-intensity-classification>

Data from NOAA, the National Weather Service, the Spatial Hazard Events and Losses Database for the United States (SHELDUS), and the National Centers for Environmental Information (NCEI) Storm Events Database can be used to develop the big picture about weather in Glenn County. Figure 83 shows annual precipitation rates for Glenn County. The wettest 12-month average was in 1983, with a total of 62.3 inches. The lowest was in 2013, with only 6.1 inches. Average rainfall varies in different regions of the county, but the equivalent of 2–3 inches of rain in the northern Central Valley and 4–11 inches in the mountainous areas have been reported in heavy rainstorms.

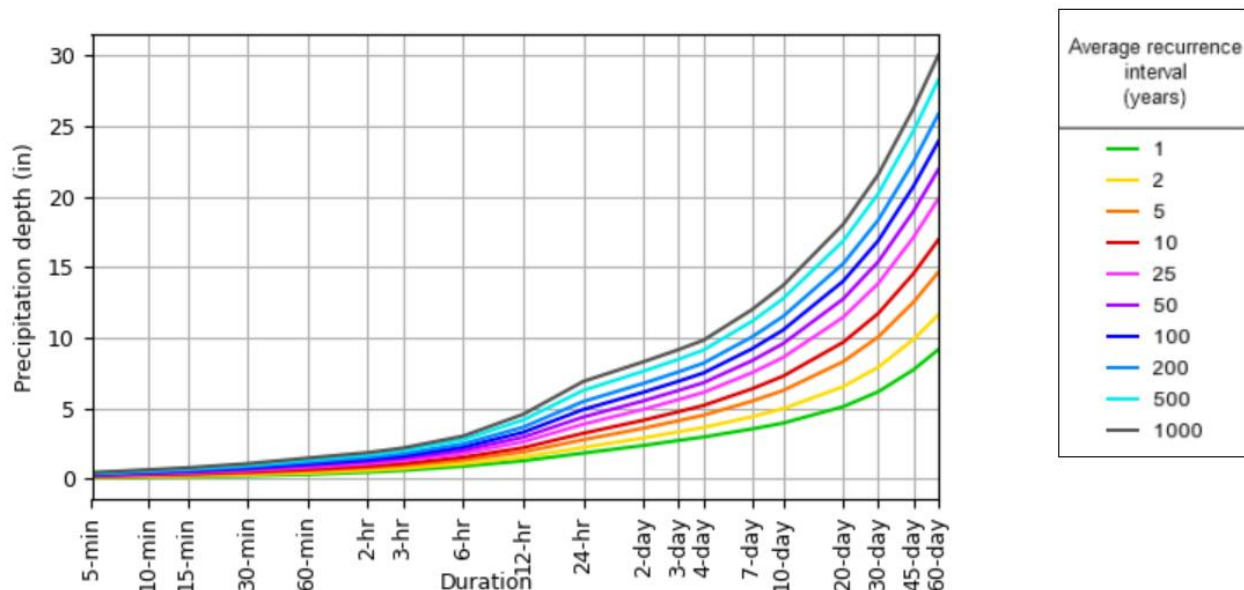


Source: USA Facts, Climate in Glenn County, California.

<https://usafacts.org/issues/climate/state/california/county/glenn-county/?endDate=2023-09-01&startDate=1900-02-01#precipitation>

Figure 83: 12-Month Precipitation Values in Glenn County

Figure 84 shows the precipitation frequency for Glenn County.



Source: NOAA Atlas 14 Point Precipitation Frequency Estimates: CA. Orland station.

https://hdsc.nws.noaa.gov/pfds/pfds_map_cont.html?bkmrk=ca

Figure 84: Precipitation Frequency for Glenn County, California

Past Occurrences

Since 1950, 7 federally declared major severe storm events have occurred in Glenn County, as shown in Table 52. According to Cal OES Disaster Proclamations, three executive orders have been issued for Glenn County for severe storms (see Table 53). Figure 85 shows damage from a storm in 2019.



Figure 85: CR 45 x CR D Damaged During DR4434

Table 52: Federal Disaster and Emergency Declarations by FEMA

Disaster #	Declaration Date	Incident Subcategory	Information
Federal Declarations			
4699	04/03/2023	Severe Storm	Winter storms, straight-line winds, flooding, landslides, and mudslides
4434	05/17/2019	Severe Storm	Winter storms, flooding, landslides, and mudslides
4308	05/17/2019	Severe Storm	Severe winter storms, flooding, mudslides
1203	02/09/1998	Severe Storm	Winter storms and flooding
1155	01/04/1997	Severe Storm	Flooding
1046	03/12/1995	Severe Storm	Winter storms, flooding, landslides, mud flows
1044	01/10/1995	Severe Storm	Winter storms, flooding, landslides, mud flows

Source: FEMA, "Disaster Declarations for States and Counties." <https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties>

Table 53: Cal OES Disaster Proclamations and Executive Orders, 2015–2024

Cal OES Disaster Proclamation/ Executive Order #	Date	Incident Subcategory	Information
Executive Order	June 21, 2024 (February 2024 storms)	Atmospheric river storms	Heavy rains, flooding, erosion, debris flows, roads, and infrastructure damage
Executive Order	03/23/22 (October 2021 storms)	Storms	Flooding, erosion, debris flows, roads, and infrastructure damage.
Executive Order (statewide)	03/17/2017	Atmospheric river storm	High winds, flooding, erosion, mud and debris flow, and damage to roads and highways.

Source: Cal OES Governor's Office of Emergency Services, "Open State of Emergency Proclamations." <https://www.caloes.ca.gov/office-of-the-director/policy-administration/legal-affairs/emergency-proclamations/>

Table 54: Governor-Proclaimed Disasters for Glenn County, October 20, 1991–Present

Date	Event
October 2021	Storms
January 2008	Extreme winds, heavy rains

Source: California State Board of Equalization, "Chronological List of Governor-Proclaimed Disasters for Property Tax Purposes." <https://www.boe.ca.gov/proptaxes/disaster-list.htm>

Table 55: 2018 Multi-Jurisdiction Hazard Mitigation Plan, "Other Disasters"

Date	Event	Description
10/26/1982	Severe Storms	Rains causing agricultural losses
03/05/1980	Severe Storms	Rain, Winds, Mudslides, & Flooding
02/1973	Storms/flooding	N/A
02/26/1958	Flood	Heavy rains and flooding
05/20/1957	Heavy rains	State of Emergency for producing areas of Northern California
11/21/1950	Flood	Statewide flooding

Storm Events Database

The Storm Events Database maintained by NOAA tracks 49 types of natural hazards in the United States at the county level. The database records events that caused property and crop losses, disruptions to commerce, injuries, and fatalities between 1950 and 2023. It also records rare or unusual weather phenomena that attract media attention. Other noteworthy meteorological events, such as record-breaking high or low temperatures or precipitation that occur in connection with another weather event also are included. Relevant heavy rain events for Glenn County include:

- January 12, 1998: Heavy rains caused widespread but minor flooding across the Sacramento and Northern San Joaquin Valleys.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

- January 18, 1998: In Sacramento, 0.75 inches of rain fell in 6 hours; 27,000 customers across the area lost power, and numerous traffic accidents occurred.
- December 17–22, 2005: A series of powerful winter storms brought heavy rainfall to Northern California. Reports of rainfall in the Sacramento and Northern San Joaquin Valleys ranged from 1 to 6 inches.
- January 14, 2023: A wet weather system caused heavy rainfall and flooding. Heavy rainfall caused mudslides, flash floods, and widespread flooding on roadways. Some areas were ordered to evacuate.⁷⁹

Table 56 lists the effects of storms in Glenn County from 1950 to 2023.

Table 56: Glenn County Storm Events, 1950–2023

Date	Location	Event	Fatalities	Injuries	Property Damage	Crop Damage
03/04/2023	Chrome	Flood	0	0	600,000	0
01/01/2023	Capay	Flood	0	0	5,000,000,000	0

Source: National Centers for Environmental Information, “Storm Events Database.”

https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=ALL&beginDate_mm=09&beginDate_dd=01&beginDate_yyyy=1950&endDate_mm=09&endDate_dd=30&endDate_yyyy=2023&county=GLENN%3A21&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=6%2CCALIFORNIA

Local Records of Disaster Impacts

The following summaries describe the types of impacts the most significant recent hazards have had on Glenn County.

2023:

- March Storms and Floods
 - March 10-23, 2023
 - ♦ Presidential Major Disaster Declaration
 - Approximately \$400,000 in County public works related response and recovery costs due to significant damage to infrastructure.
 - Response included public safety closure of approximately 30 roadways, rescue of stranded motorist in flooded roadways, Hambright Creek breach that required a temporary structure of sandbags and muscle wall, and damage to 6 roads.

2022:

- September 2022 Atmospheric River and Debris Flows
 - Severe storms impacted northern California region bringing excessive rainfall, flash flooding and debris flows, and rock and mud slides September 18-22, 2022. Significant impacts were sustained in the area of the August Complex burn scar on the west side of Glenn County.

⁷⁹ NOAA, “Storm Events Database.” <https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=1078459>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

The storms resulted in damage to county infrastructure and road systems, estimated at \$1 million

- This storm resulted in significant debris flows on CR 309 and FH7 which eroded the roadway and clogged more than 90 culverts.

2021:

- October 2021 Atmospheric River and Debris Flows
 - Atmospheric River impacted northern California region bringing high winds, excessive rainfall, flash flooding and debris flows, and rock and mud slides October 22-25, 2021. The storms resulted in damage to county infrastructure including CR 309, 313, 303, and the Glenn County Landfill, total cost \$300,000.



Figure 86: A Severe Storm in Willows in February 2024 Overwhelms the City's Drainage Systems

Frequency/Probability of Future Occurrences

Severe weather will continue to occur annually in Glenn County. The frequency and probability of future occurrences are highly likely (near 100% probability in the next year). Because of past weather patterns and global warming, increases in the probability of future occurrences of severe weather events in unincorporated areas of the county are anticipated.

Glenn County, located in the Sacramento Valley, is prone to flooding because of its numerous creeks and streams and the Sacramento River. During high water years, reservoir releases in the county and to the north lead to increased waterway flows. The 2022–2023 water season in California was marked by over 30 atmospheric rivers, leading to significant flooding and damage to public infrastructure in Glenn County.⁸⁰

⁸⁰ County of Glenn, "Winter Storms." <https://www.countyofglenn.net/dept/sheriff/office-emergency-services/winter-storms>

Changes in Development

Climate change is expected to increase the frequency and strength of storms across the US, causing severe flooding and damage to water infrastructure. The quality of source water may be at risk, and untreated sewage and stormwater can be discharged into nearby water bodies, threatening human health and water quality. Heavier storms can also damage drinking water and wastewater facilities, disrupting service. Moreover, as the climate warms, hurricane intensity may increase, leading to a higher risk of coastal flooding from storm surges.⁸¹ Glenn County has seen an increase in heavy rain events since the last plan update and while structures and populations may be similar, this increase in frequency and severity indicates the County's overall vulnerability to this hazard has increased.

Vulnerability Assessment

Because of the widespread nature of weather hazards, all populations, structures, critical facilities, infrastructure, natural environments, and economies in the planning area can be impacted by heavy rains. The specific areas impact, and the severity of damage can vary significantly between events. Critical infrastructure sites risk damage from heavy rain and the resulting flooding. The damage can cause secondary effects, such as delayed emergency response and sanitation threats. Business closures and lost work time caused by severe weather can also cause economic losses. Heavy rain could also contribute to crop damage and subsequent agricultural losses.

Rapid runoff of water can cause upstream rivers to overflow into low-lying areas.⁸² Heavy rain has caused localized flooding and subsequent water damage to nearby structures. Flooding from heavy rain can damage residential, commercial, industrial, and agricultural building types. Prolonged heavy rain can overwhelm storm drainage systems.

Flooding can require the closure of major transportation routes. Vehicles may lose traction or may be unable to safely traverse roadways. Impacts on roadways may cause delays for emergency responders.

Outdoor events such as sporting activities, farmers' markets, and community festivals can be disrupted by storms, and participants may have difficulty seeking shelter from a fast-moving storm. Outdoor workers may be particularly vulnerable to fast-moving storm events. Those working in rural agricultural areas may lack nearby places to seek shelter.

Jurisdiction-Specific Vulnerabilities

Glenn County

All of the nearly 29,000 residents of Glenn County are at risk of severe weather. Water, electric, fuel, transportation, and communication infrastructure could be damaged or services disrupted by heavy rain.

Hazus modeling cannot quantify potential damage to property, critical facilities, or infrastructure in the planning area. Physical damage and service disruptions depend on the size and severity of the weather event. Although the exact location and intensity of weather events make it difficult to identify the physical assets at risk, possible impacts can be inferred from historical records and similar events in the area.

⁸¹ United States Environmental Protection Agency, "Climate Adaption and Storms & Flooding."

<https://www.epa.gov/arc-x/climate-adaptation-and-storms-flooding>

⁸² Cybersecurity & Infrastructure Security Agency, "Severe Storms." <https://www.cisa.gov/topics/critical-infrastructure-security-and-resilience/extreme-weather-and-climate-change/severe-storms#:~:text=NASA's%20Earth%20Observatory%3A%20Severe%20Thunderstorms,of%20potential%20severe%20storm%20days>

The Cities of Orland and Willows

Like the unincorporated areas of Glenn County, Orland and Willows are subject to severe weather and hazards associated with heavy rain. Typical storms associated with the rainy season (late fall, winter, and early spring) cause different issues depending on elevations. Weather severe enough to cause damage can occur any time of the year, but it usually occurs during the rainy season (which generally runs from mid-fall through spring).

Due to the variability in severity and duration of heavy rain events, quantifying potential losses to Orland and Willows is difficult. Past events provide an indication of where localized flooding may occur in future heavy rain events, but impacts are possible in any part of each city. Similar to the rest of the Glenn County, all populations, structures, critical facilities, infrastructure, natural environments, and economies in the planning area can be impacted by heavy rain.

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Section 3.7 Wildfire

Wildfires are uncontrolled blazes that devastate wildland vegetation, often in rural settings. These fires are not confined to a particular region or environment and can occur in various ecosystems, such as forests, oak woodlands, and grasslands. Wildfire hazards are a significant and recurrent threat in Glenn County. They can destroy buildings, cause damage to vital infrastructure, injure people, and result in loss of life, agricultural land, and animals. The region of the county within the Mendocino National Forest is subject to the greatest threat from wildfires. California's wildfire season in the past occurred between early spring and late fall—the hotter and dryer months. Because of climate change, a key factor in the increasing risk and extent of wildfires in the Western United States during the last two decades, the lines have become indistinct on how long the fire season lasts. Traditionally, it peaked during the summer; however, more recently, it has peaked in September and early October, which follow the dry season but may be year-round.⁸³ The rise in temperature, extended drought, and a thirsty atmosphere are some of the contributing factors to this phenomenon. These factors have strong direct or indirect ties to climate variability. Other causes of wildfires include the following:

- Lightning (and possible volcanic and meteoric sources);
- Camping, including cooking, warming, and bonfires;
- Smoking cigarettes, cigars, and pipes and the matches/lighters used for lighting tobacco;
- Fire use, including burning debris and burning ditches, fields, or slash piles;
- Railroads, including exhaust, brakes, railroad work;
- Incendiary incidents, including arson and illegal or unauthorized burning;
- Equipment, including vehicle and aircraft exhaust, flat tires, dragging chains, and brakes;
- Juveniles including playing with matches and lighters; and
- Miscellaneous, including burning buildings, fireworks, power lines, shooting (ammunition or exploding targets), spontaneous combustion (hay baled while still wet, compost piles, oily rags), and blasting.⁸⁴

Figure 87 shows the effects of a recent fire.

⁸³ NBC news, "There's no more typical California wildfire season. It may be year-round, experts warn." <https://www.nbcnews.com/news/us-news/there-s-no-more-typical-wildfire-season-california-it-may-n934521>

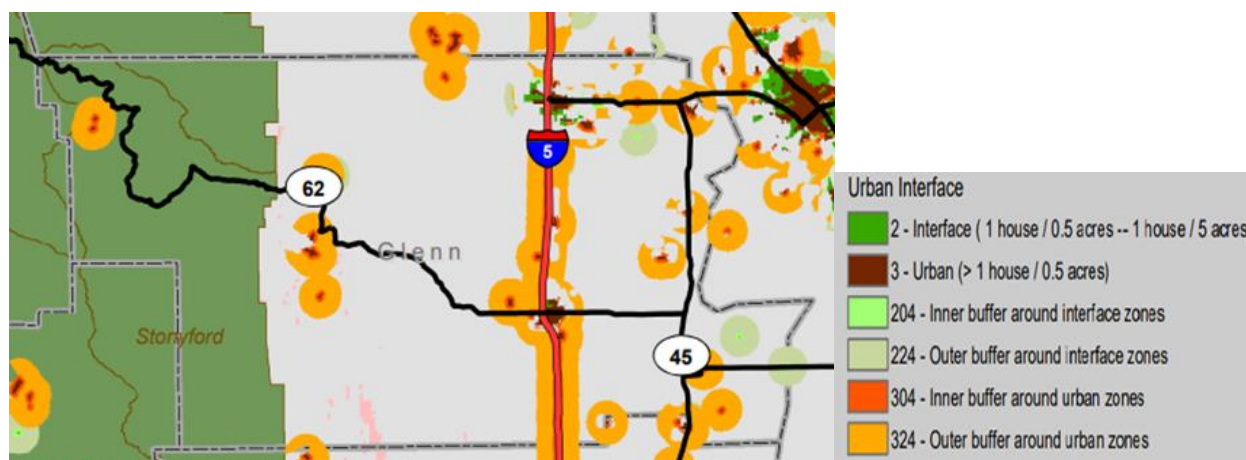
⁸⁴ U.S. Department of Indian Affairs, "Wildfire Investigations." <https://www.bia.gov/service/wildfire-prevention/wildfire-investigations>



Source: Glenn County

Figure 87: Red Mountain Fire Following the August Complex Fire

The topography, weather, and vegetation in areas of the county provide ideal conditions for wildfires to spread rapidly and pose a severe risk. Development overtime through the expansion of small communities in Glenn County has further intensified the risk by placing people in wildfire hazard areas. Long-term fire management practices, like the suppression of naturally occurring burns, has influenced the natural wildfire processes and allowed flammable brush and vegetation to accumulate. Moreover, such developmental undertakings have moved the urban–wildland interface, where human development meets undeveloped wildland, closer to higher-risk wildfire hazard areas. This move has increased the number of people and buildings at risk, as illustrated in Figure 88.



Source: Bureau of Land Management, "Map of Northern California Urban Wildland Interface Areas."
https://www.blm.gov/or/plans/surveyandmanage/files/mr-fire_amendment-va-li-br-fu-2002-08-att6.pdf

Figure 88: Glenn County Urban Interface

From 2020 to 2022, many western states experienced extraordinary wildfire seasons, with all three years far exceeding the average since 2016 of 1.2 million acres burned. Research shows that climate change creates warmer and drier conditions, leading to longer and more active fire seasons. Increases in temperatures and atmospheric aridity because of climate change have made forest fuels drier during the fire season. These factors have caused over half the decline in fuel moisture content in western U.S. forests from 1979 to 2015 and doubled the area burned by forest fires from 1984 to 2015.

Studies show that an annual increase of 1 degree Celsius would increase the median burned area per year by up to 600% in some types of forests in the U.S. West. Increased temperatures and extended droughts are two of the drivers that increase the risk and extent of wildfires in the western United States.⁸⁵

Wildfire releases carbon dioxide and other greenhouse gases (GHG) that can contribute to climate change. Determining how much wildfire alters GHG concentrations is a challenging task undertaken by the California Air Resources Board. Wildfire smoke contains a harmful mix of air pollutants, particulate matter, and toxic contaminants. Smoke can cause minor irritations such as burning eyes and lung irritation but can also increase the severity of asthma or other respiratory diseases.⁸⁶

Prescribed fires may lesson some of these effects of wildfire smoke. The Glenn County Community Wildfire Protection Plan (CWPP) notes that prescribed fires provide an opportunity to control the intensity and time of fire to reduce the impact of fire emissions. Prescribed fire allows for monitoring of weather conditions and utilization of smoke management practices that reduce the amount of GHG and other polluting emissions and the associated health impacts.⁸⁷

Regulatory Environment

The State of California and Glenn County have established wildfire regulatory requirements, which must be adhered to. Fire-safe regulations for the State Responsibility Areas (SRAs) for wildfires outline fundamental standards for wildland fire protection that local jurisdictions must follow. If enforced, these regulations could significantly decrease the risk of wildfire events at the wildland interface. However, it is important to note that the SRA fire safe regulations do not supersede local regulations that match or exceed the minimum state requirements. The Public Resources Code, Section 4290, is the state statute for wildfire protection. It includes specific requirements for the areas below that must be followed to mitigate the risk of wildfire events.⁸⁸

1. Road standards for fire equipment access.
2. Standards for signs identifying streets, roads, and buildings.
3. Minimum private water supply reserves for emergency fire use.
4. Fuel breaks and greenbelts.

Glenn County's building codes incorporate specific provisions of Public Code 4291, which governs individuals who own, lease, control, operate, or maintain any building or structure in, on, or adjacent to mountainous terrain, forested areas, shrub-covered zones, grassy plains, or other land susceptible to combustion.⁸⁹ Orland has established three fire protection policies as part of its 2021 4.0 Safety Plan. Policy 4.3.A. mandates that the city uphold current levels of fire protection by compelling new developments to provide and/or finance fire protection facilities, operations, and maintenance. Policy 4.3.B specifies that the city continue to support the needs of the Orland Volunteer Fire Department and aid it as needed to maintain a highly efficient and functional fire service operation. Lastly, Policy 4.3.C

⁸⁵ National Oceanic and Atmospheric Administration, "Wildfire Climate Connection." <https://www.noaa.gov/noaa-wildfire/wildfire-climate-connection>

⁸⁶ California Air Resources Board. FAQ: Wildfire Emissions.

<https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/Wildfire%20Emissions%20FAQ%202022.pdf>

⁸⁷ Glenn County Community Wildfire Protection Plan 2023.

https://www.glenncountyrca.org/files/9c6de6d21/GCRCD_CWPP_2023_Update_FINAL_10-16-2023.pdf

⁸⁸ U.S. Federal and State Cases, Codes, and Articles, "California Code, Public Resources Code-PRC 4290."

<https://codes.findlaw.com/ca/public-resources-code/prc-sect-4290/>

⁸⁹ California Legislative Information, "Code Section."

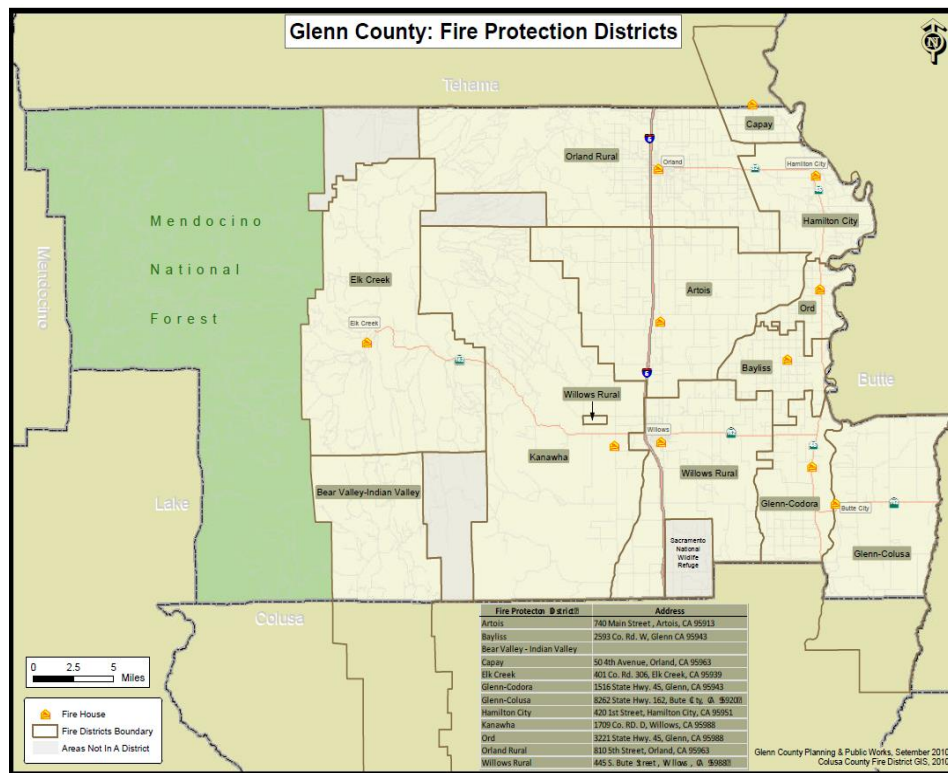
https://leginfo.ca.gov/faces/codes_displaySection.xhtml?sectionNum=4291.&lawCode=PRC

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

states that the city should strive to improve the current Insurance Service Office (ISO) rating of four for safety and associated economic benefits.⁹⁰

In Willows, Municipal Code 15.15 regulates fire codes for buildings and construction, including adopting California State Fire Codes.⁹¹

The unincorporated regions of Glenn County are subject to the authority of county fire protection districts: Artois, Bayliss, Bear Valley-Indian Valley, Capay, Elk Creek, Glenn-Codora, Glenn-Colusa, Hamilton City, Kanawha, Ord, Orland Rural, and Willows Rural (see Figure 89).⁹² County officials or officers can notify the relevant fire protection district of flammable materials or conditions on unoccupied or developed parcels. Fire protection districts are responsible for managing dangerous conditions on privately owned properties, among other public safety duties. They are authorized to clear or mandate land clearance, including removing dry grass, stubble, brush, rubbish, litter, or other flammable material as a preventive measure against wildfires.



Source: Granicus, "Glenn County: Fire Protection Districts."

https://glenncounty.granicus.com/MetaViewer.php?view_id=8&clip_id=999&meta_id=87165

Figure 89: Glenn County Fire Protection Districts

⁹⁰ City of Orland, "4.0 Safety Element." <https://www.cityoforland.com/wp-content/uploads/2022/04/GPA-2021-01-Safety-Element.pdf>

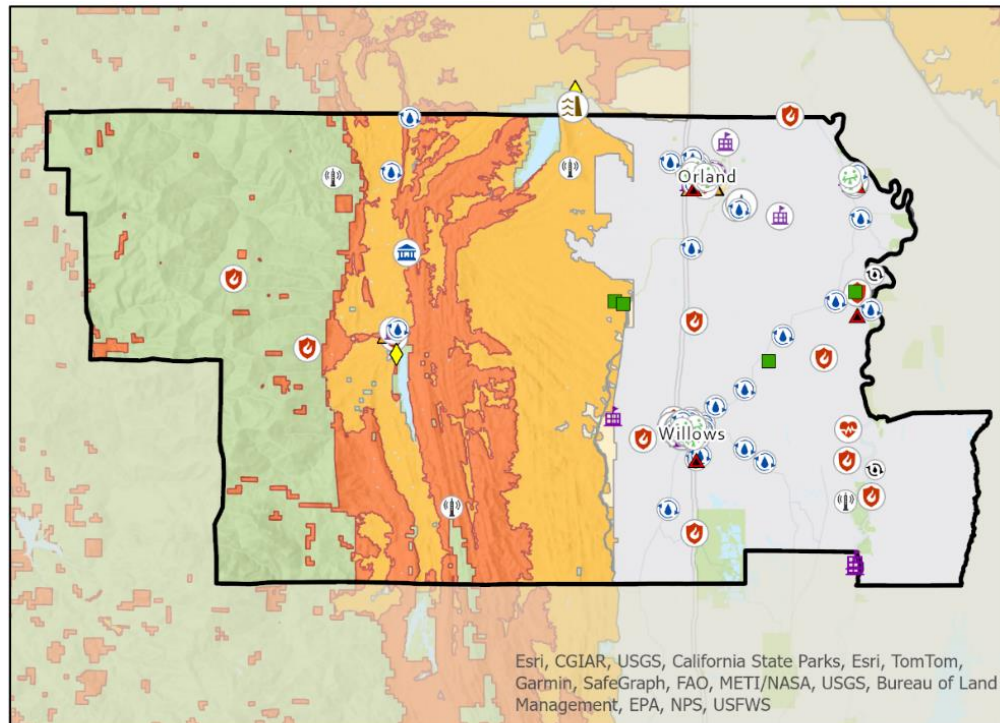
⁹¹ City of Willows California, "Willows Municipal Code Chapter 15.15 Fire Code." <https://www.codepublishing.com/CA/Willows/#!/Willows15/Willows1515.html#15.15>

⁹² Granicus, "Glenn County: Fire Protection Districts." https://glenncounty.granicus.com/MetaViewer.php?view_id=8&clip_id=999&meta_id=87165

Location/Geographic Extent

Figure 90 is a map of Fire Hazard Severity Zones (FHSZs), which delineate areas at risk of wildfire, based on data from the Office of the State Fire Marshal.⁹³ In Glenn County, the western regions exhibit the highest degrees of susceptibility to wildfire. Notably, they encompass an eastern section of the Mendocino National Forest, which includes Alder Springs, Copper City, Lee Logan Camp, Lone Star, Sky Hi, and Smith Camp. These areas are designated as very-high-risk fire zones. The Elk Creek area, situated in the west-central portion of the county, is home to Chrome, Fruto, Grindstone Rancheria, and Newville, which are primarily designated as high-risk areas. In contrast, the eastern valley section of the county, which is home to Hamilton City, Orland, Willows, and other small cities, is predominantly designated as non-fuel and represents the least vulnerable area to fire.

⁹³ Office of the State Marshal, "Fire Hazard Severity Zones Map 2022."
https://osfm.fire.ca.gov/media/aovewf2b/fhsz_county_sra_11x17_2022_glenn_ada.pdf



Glenn County Fire Hazard Severity Zones



Date Saved: 1/10/2024

Source: Office of the State Marshal, "Fire Hazard Severity Zones Map 2022."
https://osfm.fire.ca.gov/media/aovewf2b/fhsz_county_sra_11x17_2022_glenn_ada.pdf

Figure 90: Fire Hazard Severity Zones, 2022

Magnitude/Extent

In November 2007, CAL FIRE adopted FHSZ maps as a means of assessing SRA fire hazards. Fire hazard mapping is a critical tool for predicting the damage a fire may cause by measuring physical fire behavior. Assessing fire hazards includes evaluating vegetative fuels, the probability of wildfire spread, the amount of heat produced, and most notably, the burning firebrands (burning wood or debris) that a fire releases ahead of the flaming front. FHSZ maps provide a methodical analysis of fire hazards and are a vital tool for future planning and decision-making. They have been under revision since 2022. Figure 90 uses intermediary 2022 FHSZ data available in December 2023.

The severity of a fire is contingent on various factors, including topography and particularly the steepness of slopes. Fires tend to burn more rapidly as they move up slopes. Moreover, weather elements, such as temperature, humidity, and wind, significantly influence fire behavior. Consequently, the FHSZ map depicts vast areas in the unincorporated regions of the county, categorized as moderate, high, and very-

high fire hazards in Figure 90. “Hazard” is based on the physical conditions that create a likelihood and expected fire behavior over a 30- to 50-year period without considering mitigation measures, such as home hardening, recent wildfires, or fuel reduction efforts. Both Willows and Orland show very low probabilities of wildfire hazards in FHSZs.

Past Occurrences

Over the past few decades, Glenn County has witnessed 20 wildfire incidents, ranging from the small-scale Edward fire in 2022 to the massive Elk Fire/August Complex fire in 2020 that engulfed over 1,032,648 acres. Of these events, 11 eleven burned more than 200 acres of land. The first wildfire of such magnitude occurred in 1953 and is known as the Rattlesnake Fire. It originated in the Grindstone Canyon, 5 miles northwest of Elk Creek in the Mendocino National Forest. Although the main fire was contained that evening, the wind shifted direction while the 24 firefighter volunteers were having dinner, causing the fire to jump its line and head down the canyon. The fire lasted for two days, and 15 firefighters lost their lives when they were overrun by the rapidly moving fire. This tragedy prompted significant changes in wildfire safety standards, training, awareness of weather conditions, and fire behavior among firefighters.⁹⁴

On August 16–19, 2020, a rare weather pattern moved slowly through northern California, bringing moist unstable air from Tropical Storm Fausto that collided with a high-pressure ridge during a heat wave. The “Siege of ’20,” as it is known, caused over 2,500 lightning strikes and more than 600 fires. Unfortunately, many of these thunderstorms produced little or no rain, so dry fuels were ignited, causing the fires to spread rapidly. This overwhelmed the suppression capabilities of local, state, and federal fire organizations. Some fires were not staffed for days, and for weeks, most incidents struggled with fewer resources than they needed.

The August Complex fire is the largest fire in California’s history, covering over 1,032,648 acres. It is the result of 37 separate fires that started on August 17 and eventually burned together in the Mendocino National Forest. It spanned approximately 72 miles by 32 miles, which is larger than the state of Rhode Island (988,832 acres).⁹⁵ There were 4,075 personnel assigned to the fire, including 65 hand crews, as well as 353 fire engines and 31 helicopters. The August Complex fire lasted 86 days until November 11, 2020, and it destroyed approximately 100 residences and 104 other structures. 188,741 acres were lost. However, the destruction was limited because of the rural nature of the area. The cost of the fire has been estimated around \$166 million.⁹⁶ Figure 91 shows the Sherrif’s patrol monitoring the fire.

⁹⁴ United States Department of Forestry, “Rattlesnake Firefighter Trailhead.” <https://www.fs.usda.gov/recarea/mendocino/recarea/?recid=25300#:~:text=The%20brush%20fire%20burned%20over,fire%20weather%20and%20fire%20behavior>.

⁹⁵ Wildfire Today, “Since 2008 Wildfire News & Opinion.” <https://wildfiretoday.com/tag/august-complex/>

⁹⁶ CAL FIRE, “August Complex (Includes Doe Fire).” <https://www.fire.ca.gov/incidents/2020/8/16/august-complex-includes-doe-fire>



Source: Glenn County

Figure 91: Jeep near August Complex Fire

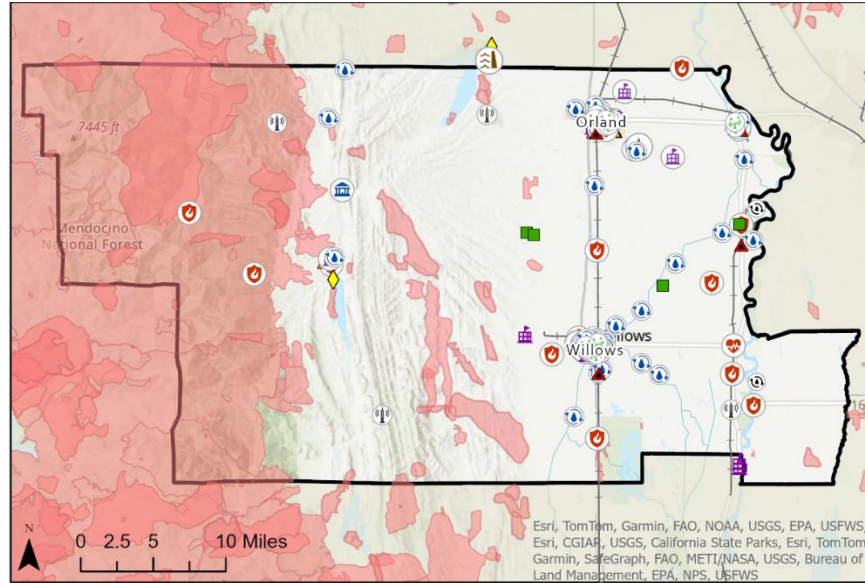
Figure 92 shows the areas impacted by past wildfire events. CAL FIRE's Fire and Resource Assessment Program (FRAP) has fire perimeter data from 1878 to 2022. To show areas that have burned multiple times, these data were grouped in fires from 1878 to 1950 (including events with no year recorded), 1950–1975, 1976–2000, and since 2001. A transparency was applied, and then the grouped perimeters were overlaid. Darker areas indicate fire perimeters that covered the same area more than once.

A recent example is the Thirty-Five Fire, a vegetation fire that occurred on August 17th, 2023, and consumed 109 acres near County Road 35, west of Road D, and west of Artois in Glenn County.⁹⁷ CAL FIRE has still not determined the cause of the fire, and it is still under investigation.⁹⁸

⁹⁷ Action news Now, "CAL Fire, Willows Fire Department Contain Thirty Five Fire." https://www.actionnewsnow.com/news/cal-fire-willows-fire-department-contain-thirty-five-fire/article_4240fb44-3d3d-11ee-97b2-d3f1ad5715e4.html

⁹⁸ CAL Fire, "Thirty Five Fire." <https://www.fire.ca.gov/incidents/2023/8/17/thirty-five-fire>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan



Glenn County Historic Fires



Date Saved: 1/29/2024

Source: Historic Fire Perimeters, 2022. CALFIRE, Fire Resource Assessment Program <https://www.fire.ca.gov/Home/What-We-Do/Fire-Resource-Assessment-Program/GIS-Mapping-and-Data-Analytics>

Figure 92: Historic Fires in Glenn County

Table 57 lists significant wildfires in Glenn County, with the numbers of acres burned by each one.

Table 57: Wildfires in Glenn County, 1953–2023

Incident	Date	Acres Affected
Rattlesnake Fire	July 9, 1953	1300
Thunder Fire	July 7, 2012	167
Elk Fire	August 29, 2012	125
306 Fire	May 1, 2013	217
Dave's Fire	June 12, 2013	226
Creek Fire	July 19, 2017	Unknown
Chrome Fire	May 28, 2018	75
Open Fire	June 1, 2018	127
Chrome Fire	June 9, 2018	2,290

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Incident	Date	Acres Affected
Ranch Fire (Mendocino Complex)	July 27, 2018	410,203
Elk Fire	October 4, 2019	63
Baseball Fire	February 25, 2020	211
Grizzly Fire	March 2, 2020	154
Elk Fire	August 16, 2020	727
Elk Fire/August Complex Fire	August 16, 2020	1,032,648
4-8 Fire	August 17, 2020	275
Butte/Tehama/ Glenn Lightning Complex Fire	August 17, 2020	19,609
Edward Fire	May 24, 2022	50
Burrows Fire	June 28, 2022	317
Stony Fire	July 18, 2023	89
Thirty-Five Fire	August 17, 2023	109

Source: California Department of Forestry and Fire Protection, "Glenn County."
<https://www.fire.ca.gov/Search-Results?search=Glenn%20county&programsCategoryFilters=&activeFilters=&page=&contenttype=&type=incidents>

Table 58 shows the acres affected by wildland fires in Glenn County by decade. Information for 2010 through the 2020's is taken from Table 57.

Table 58: Glenn County Fires by Decade

Decade	Number of Fires	Acres Affected	Decade	Number of Fires	Acres Affected
1900	1	948	1970	8	103,188
1920	7	59,518	1980	11	12,023
1930	12	61,254	1990	17	12,892
1940	32	59,914	2000	14	10,844
1950	18	13,234	2010	10	411,203
1960	12	5,758	2020	10	1,054,189

Source: County of Glenn, "Glenn County, CA Multi-Jurisdiction Hazard Mitigation Plan."
<https://www.countyofglenn.net/sites/default/files/Planning/Glenn%20County%20MJHMP%20100918.pdf>

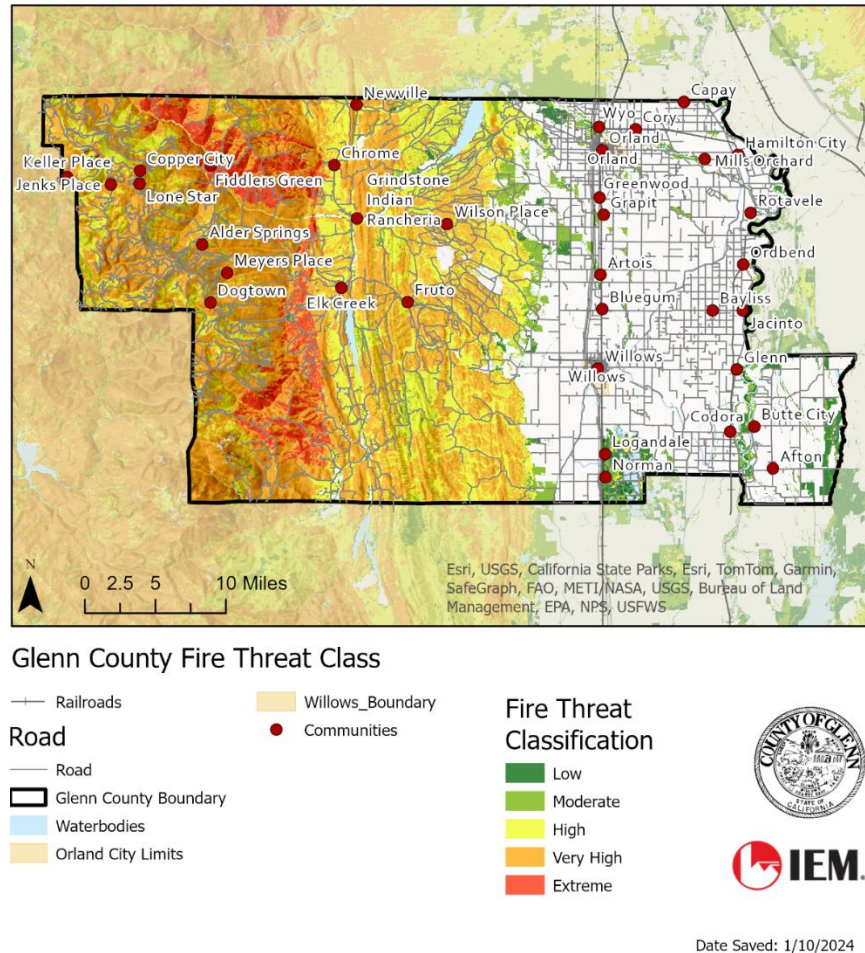
Frequency/Probability of Future Occurrences

The National Risk Index reports and annualized frequency of .42% chance per year. Twenty fires occurred in Glenn County between 2012 to 2023, an average of 2 per year. The probability of future occurrences of wildfire is Likely.

The risk of fire in Glenn County and its surrounding regions is increasing because of the expansion of development, wildland–urban interface areas, dense forests, and climate change. In recent decades, Glenn County has witnessed many notable wildfire occurrences, along with structure fires in Orland and Willows. More than half of the county is in moderate-, high-, and very-high-risk fire zones (see Figure 90).

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Fire threat is a measure of fuel conditions and fire potential, representing the likelihood of wildfires that are “damaging” or difficult to control. This classification can be useful for assessing potential impacts on various assets. Impacts are more likely to occur and/or increase in severity for higher threat classes. It is based on a combination of fire probability—the likelihood of a given area burning—and potential fire behavior or hazard. Figure 93 shows the 2019 update of the FRAP 2017 Forest and Rangeland Assessment for Glenn County.⁹⁹ Figure 94 and Figure 95 show the threats for Orland and Willows, respectively.

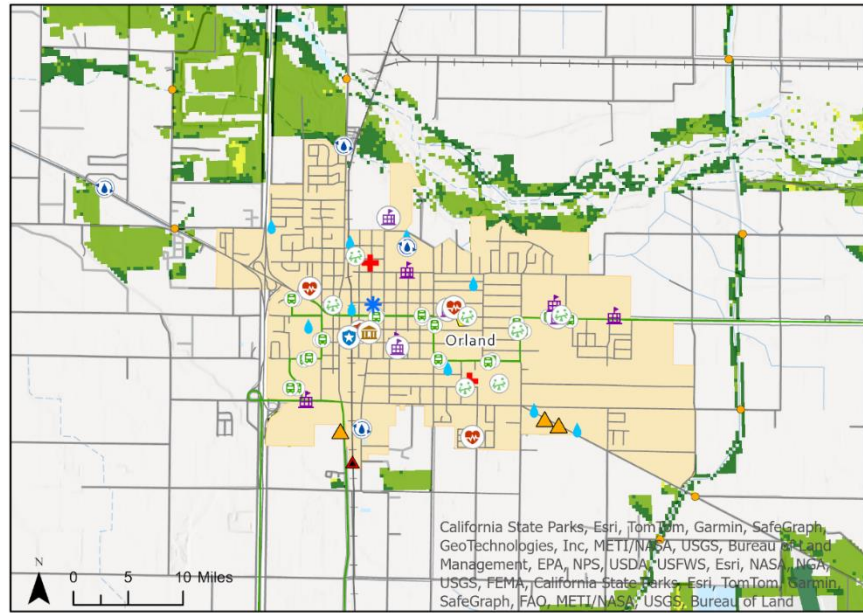


Source: FRAP GIS Mapping and Data Analytics. <https://www.fire.ca.gov/Home/What-We-Do/Fire-Resource-Assessment-Program/GIS-Mapping-and-Data-Analytics>

Figure 93: Glenn County Fire Threat

⁹⁹ California Department of Forestry and Fire Protection Fire and Resource Assessment Program, “California’s Forests and Rangelands 2017 Assessment.” <https://34c031f8-c9fd-4018-8c5a-4159cdf6b0d-cdn-endpoint.azureedge.net/-/media/calfire-website/what-we-do/fire-resource-assessment-program---frap/assessment/assessment2017.pdf>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan



Orland Wildfire Risk

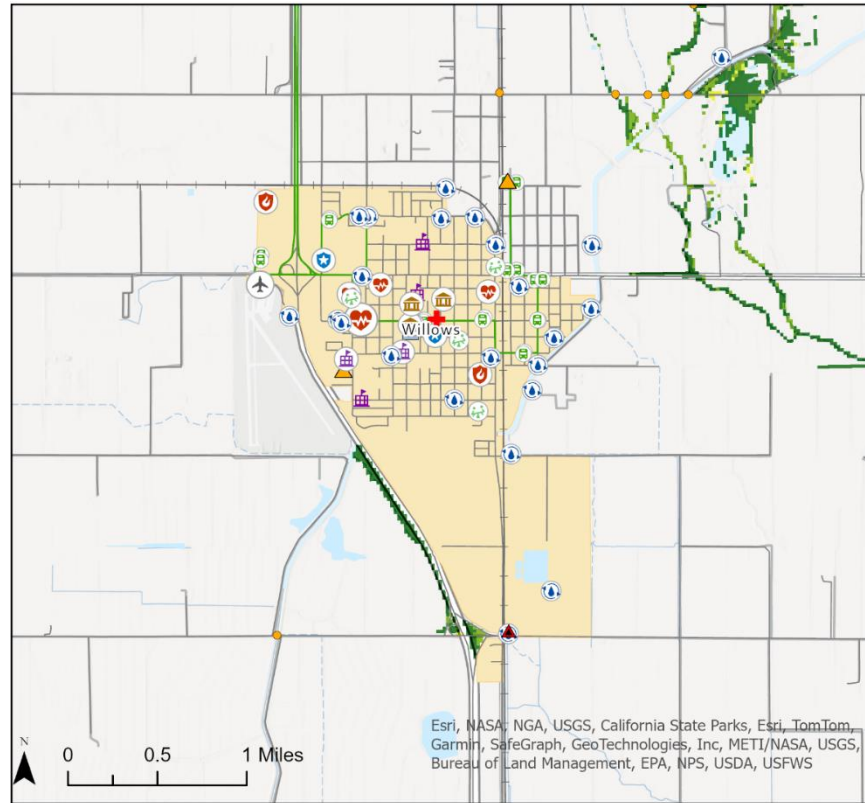


Date Saved: 1/10/2024

Source: Source: FRAP GIS Mapping and Data Analytics.
<https://www.fire.ca.gov/Home/What-We-Do/Fire-Resource-Assessment-Program/GIS-Mapping-and-Data-Analytics>

Figure 94: Threat of Wildfires in Orland

Glenn County Multi-Jurisdiction Hazard Mitigation Plan



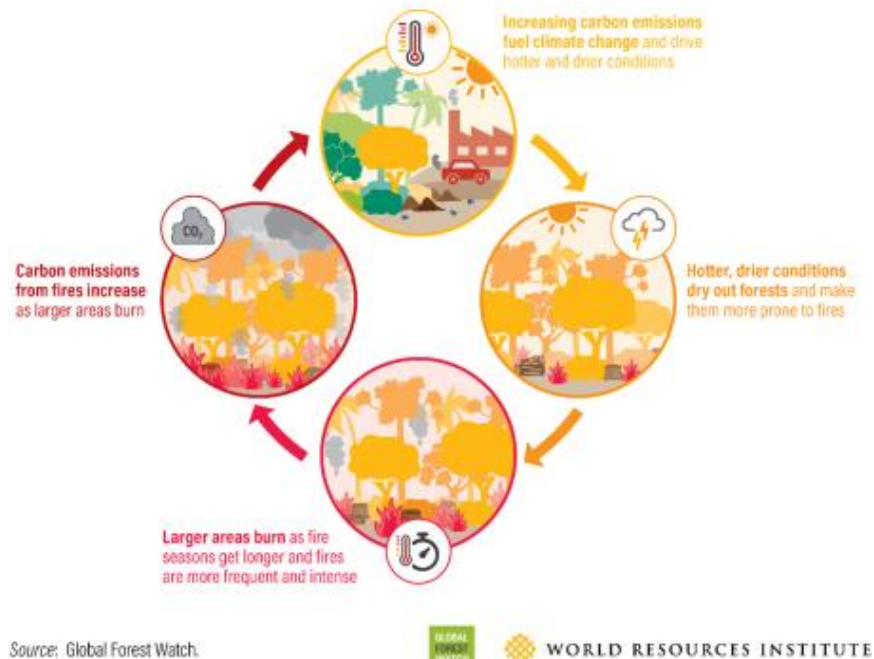
Willows Wildfire Risk



Date Saved: 1/10/2024

Source: Source: FRAP GIS Mapping and Data Analytics.
<https://www.fire.ca.gov/Home/What-We-Do/Fire-Resource-Assessment-Program/GIS-Mapping-and-Data-Analytics>

Figure 95: Risk of Wildfires in Willows



Source: World Resources Institute, "The Latest Data Confirms: Forest Fires Are Getting Worse." <https://www.wri.org/insights/global-trends-forest-fires#:~:text=Climate%20Change%20Is%20Making%20Fires,the%20planet%20continues%20to%20warm>

Figure 96: Feedback Loop of Fires and Climate

Climate change is a significant factor in the increasing number of fires. Today, extreme heat waves are five times as likely than they were 150 years ago, and they are expected to become even more frequent as the planet continues to warm. Higher temperatures cause the land to dry out, creating an ideal environment for larger and more frequent forest fires. This, in turn, leads to increased emissions from these fires, exacerbating climate change and contributing to a "fire–climate feedback loop" that leads to even more fires.

Over the last 40 years, there has been an increase in both the annual costs and the numbers of deaths from wildfires in the United States. As anthropological activities continue to contribute to global warming and alter the natural landscape, it is likely that such devastating and expensive disasters will become even more frequent.

Climate change is a significant factor in the occurrence of frequent and intense fires. Therefore, it is impossible to reduce the level of fire activity to what it used to be without significantly reducing greenhouse gas emissions and breaking the fire–climate feedback loop. Even though it is still feasible to mitigate the worst effects of climate change, achieving it will require rapid and substantial transformations across all systems.¹⁰⁰

Though already critical, the nature and impacts of wildfires are only expected to worsen. Wildfire frequency, size, and severity are projected to increase, along with the multitude of associated impacts, from smoke emissions to watershed function. Congress took bipartisan action to establish the Wildland

¹⁰⁰ World Resources Institute, "The Latest Data Confirms: Forest Fires are Getting Worse." <https://www.wri.org/insights/global-trends-forest-fires#:~:text=Climate%20Change%20Is%20Making%20Fires,the%20planet%20continues%20to%20warm>

Fire Mitigation and Management Commission, which has the ambitious task of creating policy recommendations to address nearly every facet of the wildfire crisis, including mitigation, management, and post-fire rehabilitation and recovery.

The report emphasized the critical need to shift the approach of addressing wildfire risk toward proactive actions intended to better prepare for wildfire impacts, reduce those impacts, and build resilience for the future.

*Only through significant investments in proactive planning, mitigation, risk reduction, and the workforce needed to accomplish these tasks can we break the current cycle of increasingly severe wildfire risk, damage, and loss. Importantly, these upfront actions must encompass both the built and natural environment. While significant funding has been put toward hazardous fuels reduction work in recent years, there have not been equivalent national-scale investments and efforts to reduce risk in the built environment and prepare communities before, during, and after a wildfire. Addressing this gap is essential to a comprehensive approach to wildfire.*¹⁰¹

Changes in Development

The Glenn County Community Wildfire Protection Plan (CWPP) noted the following concerns regarding changes in development: In Glenn County and California as a whole, communities in and near wildlands have experienced growth and increases in public access and use. Development in these areas has taken a number of forms. Remote residences and areas of development are often created without many of the infrastructure components and fire safety features that are integral to fire protection. Significant among these deficiencies are insufficient access on two-lane roads for ingress and egress of firefighting equipment, inadequate water supply systems, and the use of mobile homes as residences on small rural parcels. Considering that mobile homes are often installed with little or no vegetation removal, this type of residence is at an increased risk of flash fires.

The recent revision of the state's FHSZs included significant changes in Glenn County. Much of the area previously categorized as moderate hazard has been changed to high risk, and some areas previously identified as high hazard are now very-high risk. The changes in the mapping process incorporates new science in local climate data and improved fire assessment modeling in determining hazard ratings. Drought, extreme heat, and diseases affecting tree mortality have also increased risk of wildfire. The August Complex Fire also resulted in an increase in hazard trees. These factors indicate an increase in vulnerability to wildfire in Glenn County.

The City of Orland has experienced not experienced a wildfire since the last plan update. Currently, the city has close to 500 hydrants that can pass approximately 700 gallons per minute. However, volunteer fire protection services in the area could be strained as the city continues to expand. Overall, vulnerability to wildfire has not changed.

The City of Willows does not intersect with FHSZs, and therefore the development there would not increase the city's wildfire risk. If anything, the city has become a refuge for residents relocating after the 2018 Camp Fire. However, much of the city is at risk of flooding, and housing costs are comparatively high. Therefore, city officials have noted that annexing more land could provide opportunities to build additional housing. Current wildfire vulnerability is unchanged.

¹⁰¹ Report of the Wildland Fire Mitigation and Management Commission. 2023.
<https://www.usda.gov/sites/default/files/documents/wfmmc-final-report-09-2023.pdf>

Vulnerability Assessment

The danger posed by wildfires to both residents and property is a matter of significant concern in forested areas with high fuel loads. These factors, combined with natural weather conditions such as drought, low relative humidity, and strong winds, create the potential for both natural and human-caused fires that can result in property damage and the loss of life. It is noteworthy that any such fire has a high potential for becoming uncontrollable and catastrophic. Wildfires can create water repellant soils, which make landscapes vulnerable to post-fire erosion and debris flows. Smoke from wildfire can cause dangerous air quality conditions for areas far outside the communities closest to the fire.

Fire suppression can be costly, and the financial toll borne at the community level can overwhelm local resources. Much of the time, the impacts of wildfires and post-fire events impose the heaviest toll on people with lower incomes, people of color, the elderly, individuals with disabilities, those with limited English proficiency, and other social vulnerabilities.

To determine the distribution of critical facilities in each wildfire severity zone, community assets, and wildfire hazard severity zone data were overlaid and analyzed.

The data on critical facilities compiled by Glenn County were overlaid with the 2022 Intermediary FHSZs to determine which facilities are in areas at risk of wildfire. Table 59 groups these facilities according to FEMA Community Lifelines and identifies the number of facilities in each of the three hazard zones and the unzoned areas. 60 presents a summary of the critical facilities present in each wildfire severity zone.

The Fire Threat map in Figure 93 gives additional information on fire risk outside the State Responsibility Area FHSZs. One additional fire station, Elk Creek, and the Red Mountain Radio repeater site are in a very high fire threat class in the Federal Response Zone.

Local data on the locations and replacement values of individual structures were not available, so the National Structure Inventory (NSI) was used to estimate the potential structural losses in the FHSZs. The NSI uses a variety of data to estimate structure locations and characteristics nationwide. A summary of building counts, occupancy types, and loss estimates is provided in Table 64.

The size and shape of census geographies relative to the FHSZs pose a challenge in estimating the population exposed to wildfire risk. Using the number of residential structures identified in the NSI and the average household size of 2.8, an estimated 90 people are in the Moderate FHSZ, 442 in the High FHSZ, and 313 in the Very High FHSZ.

Table 59: Vulnerability of Critical Facilities to Wildfire

Community Lifeline	Number in Very High Fire Severity Zone	Number in High Fire Severity Zone	Number in Moderate Fire Severity Zone	Number in Unzoned Area	Total
Communications	1	1	0	1	3
Energy	1	0	0	2	3
Food, Hydration, Shelter	0	0	0	3	3
Hazardous Materials	0	0	0	4	4
Health and Medical	0	0	0	11	11
Safety and Security	1	4	1	64	70
Transportation	1	0	0	7	8

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Community Lifeline	Number in Very High Fire Severity Zone	Number in High Fire Severity Zone	Number in Moderate Fire Severity Zone	Number in Unzoned Area	Total
Water Systems	0	4	0	44	48
TOTAL	4	9	1	136	150

Table 60: Critical Facilities At Risk of Wildfire

Facility Name	Description	FEMA Community Lifeline	Fire Hazard Severity Zone
Black Butte Radio Repeater Site	Emergency Services Communication	Communication	High
CAL FIRE – Elk Creek Station	Emergency Services	Safety and Security	Very high
Division of Water Resources	Water and Waste Water	Water Systems	High
Elk Creek Community Service	Water and Waste Water	Water Systems	High
Elk Creek Fire District	Emergency Services	Safety and Security	Very High
Glenn County Landfill	Other	Safety and Security	High
Glenn County Public Works Agency Elk Creek Yard	Major Transportation	Transportation	Very High
Glenn County Transfer Station	Other	Safety and Security	High
Grindstone Rancheria	Government – Tribal	Safety and Security	High
Needham Radio Repeater Site	Emergency Services Communication	Communication	Very High
Red Mountain Repeater	Emergency Services Communication	Communication	Very High
Stony Creek Joint Unified School District	Government – Schools	Safety and Security	High
Stony Gorge Hydro Electric	Energy Sector	Energy	Very High
Tehama-Colusa Canal Authority	Water and Waste Water	Water Systems	High
USACE – Headquarters Black Butte	Water and Waste Water	Water Systems	High
Willow Creek Christian School	School	Safety and Security	High

Table 61 shows the overall area, in square miles and acres, at risk of wildfires, while Table 62, Table 63, and Table 64 show the values of buildings, their contents, and related vehicles that are in areas of moderate, high, and very high severity of fire hazards, respectively.

Table 61: Extent of Wildfire Hazard Areas in Glenn County

Hazard Severity	Square Miles	Acres
Moderate	7.33	4,692
High	290.33	185,811
Very High	167.05	106,911
Total at Risk	464.71	297,414

Table 62: Buildings in Areas of Moderate Fire Hazard Severity

Occupancy Type	Building Count	Structure Value	Contents Value	Vehicle Value	Total Value
Commercial	16	\$8,528,122	\$8,528,122	\$576,000	\$17,632,244
Industrial	0	0	0	0	0
Public	1	\$3,875,893	\$3,875,893	\$27,000	\$7,778,786
Residential	32	\$6,732,762	\$3,366,381	\$864,000	\$10,963,143

Table 63: Buildings in Areas of High Fire Hazard Severity

Occupancy Type	Building Count	Structure Value	Contents Value	Vehicle Value	Total Value
Commercial	109	\$65,355,607	\$65,355,607	\$3,852,000	\$134,563,214
Industrial	8	\$8,037,453	\$11,446,075	\$585,000	\$20,068,528
Public	5	\$6,683,892	\$6,683,892	\$252,000	\$13,619,784
Residential	158	\$36,019,792	\$18,009,896	\$4,644,000	\$58,673,688

Table 64: Buildings in Areas of Very High Fire Hazard Severity

Occupancy Type	Building Count	Structure Value	Contents Value	Vehicle Value	Total Value
Commercial	20	\$17,689,873	\$17,689,873	\$846,000	\$35,225,746
Industrial	2	\$2,998,127	\$4,497,191	\$126,000	\$7,621,318
Public	5	\$3,687,086	\$3,687,086	\$225,000	\$7,599,172
Residential	112	\$24,710,553	\$12,355,276	\$3,942,000	\$41,007,829

Table 65 lists the numbers and values of buildings at risk of fire by occupancy type.

Table 65: Total Building Exposure

Occupancy Type	Building Count	Total Value
Commercial	145	\$188,421,204
Industrial	10	\$27,689,846
Public	11	\$28,997,742

Occupancy Type	Building Count	Total Value
Residential	302	\$41,007,829

Jurisdiction-Specific Vulnerabilities

Glenn County

A significant land area in Glenn County is in moderate to very high FHSZs. This is mostly in the western, rural area of the county, where land use is primarily agricultural and forestry based. Several small, isolated pockets of development along Highway 162 and County Road 306 have high risk of wildfires, including Chrome, Elk Creek, Fruto, Newville, and the Grindstone Indian Reservation. These two-lane roads provide the primary transportation access to these communities and recreation sites, and alternative routes are limited. County roads, Forest Service routes, and other minor roads in the western area of the county are often unpaved and close to vegetation, isolated from response resources, and may be constrained by hilly terrain. Some roads are too narrow for firefighting equipment to pass, and they may become impassable if wildfires spread near or across them, which could block potential evacuation routes from more isolated structures.

Much of the western region of the county is steep and rocky, which has placed the development of residences on areas that are relatively flat. Because of these conditions, residences are widely scattered, and firefighting resources have had to disperse to protect isolated structures. Such distances can allow fires to spread and intensify more rapidly, and they make rescue and evacuation difficult. These scattered areas of development are often created without many of the infrastructure components and fire safety features that are integral to fire protection. Significant among these deficiencies are access to two-lane roads for evacuating residents and the ingress of firefighting equipment, water supply systems that can provide adequate fire protection, and parks and other large areas of cleared space between developed lots.

A total of 302 residences are currently in areas of wildfire hazard. Besides the risk of property damage or personal injury from wildfires, people who work or reside in these remote locations may have limited options for receiving communications about wildfire incidents. Distance from response facilities may create longer response times, which allows the fire to spread for a longer time before containment or suppression efforts begin, and they make rescue and evacuation difficult. Smoke from wildfires can affect air quality over a large region, which results in health consequences, particularly for those with underlying conditions, the very young, and the elderly.

Sixteen critical facilities are exposed to moderate to very high wildfire risk. Damage to these facilities may disrupt the services they provide, such as water, hydroelectric energy, and communications, which could impact a large number of people outside the immediate risk area.

The economy of rural Glenn County is largely agricultural, based on crop and livestock production. This area is also important for ranching, timber production, and watershed resources. The resources can be damaged or destroyed by wildfire, resulting in economic losses and restoration costs.

In addition to the forested west side of the county, high amounts of vegetative fuels are found along riparian areas of Lower Stony Creek, the Sacramento River, and in the Sacramento River National Wildlife Area. If left unmanaged, fuels in these areas can burn and threaten structures and communities in the eastern and southern portions of the county. Fire can damage sensitive habitats in these areas.

Prescribed fires are an opportunity to control the intensity and timing of fires, but they can be risky if they escape containment in areas of scattered development. Fuel breaks, fuel reduction projects, and other management efforts to reduce severity and spread of wildfire were identified as the top priority in the

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

CWPP. Costs for identifying, planning, developing, and conducting fuel management and other wildfire risk reduction projects strain local capabilities.

Some rural areas of the county have limited water supplies for firefighting. Water tank installations, water delivery infrastructure, and other improvements have been identified as priorities for addressing wildfire risk in the CWPP.

There is only one access point into the Grindstone Rancheria along County Road 306 via County Road 305. If County Road 305 became restricted or blocked during a wildfire event, it could prevent ingress by firefighting personnel and egress for residents evacuating the area. A second access route out of the property could address this issue.

Wood shake roofing is more susceptible to burning but is still often used in both new construction and roof replacement. Eliminating shake roofs increases the likelihood that a building will withstand a wildfire. Efforts to educate property owners about the importance of replacing shake roofs and changing building regulations and policies regarding roofing materials would reduce wildfire risk.

Public outreach, education, and engagement are low-cost ways to inform residents about wildfire risk, potential efforts at fire management, and fuel reduction and inform them of their roles in maintaining fire-safe landscapes.

Elderly, disabled, and low-income persons in rural communities may need assistance managing fuels and creating defensible space around their properties. Assistance programs, such as publicly sponsored chipping days, provide no- or low-cost assistance to eligible persons to develop defensible spaces, which could reduce risk to these individuals.

City of Orland

Orland does not intersect the FHSZs. However, fires do not understand boundaries on maps, and they still pose a threat to the city. Areas close to the city at risk of fire include riparian areas near Stony Creek, along the north of the city. The growth of Arundo and Tamarisk poses a risk of fire in this interface between the city and surrounding open space. The threat classifications are low to moderate, cover a relatively small area, and do not contain any critical facilities. A few residential streets are near these low-risk areas, including Gable Drive and Stony Creek Drive.

The threat of wildland fire is considered minimal in the city, based on land use. Fire protection services are provided by the Orland Volunteer Fire Department. This department has a mutual aid agreement with the Orland Rural Fire District, a separate special district that provides fire protection services to the unincorporated county areas that surround the city. Both fire protection services are staffed primarily by volunteers. Few properties have only one point of access, and multiple routes exist to evacuate if required, although these routes have not been standardized by the city.

Urban fires, including structural fires in a residence or small business or urban conflagration (multiple simultaneous structural fires), are possible in the city. Potential sources of urban fires include transportation incidents, such as an operational failure of rail service or traffic accidents on the interstate; fires or explosions at a processing plant; and hazardous materials incidents.

City of Willows

Willows has 1,815 acres in its planning area. Of these, 220 acres are undeveloped around the outskirts of the city and, therefore, susceptible to wildfire. However, the FHSZ and Fire Threat maps in Figure 93 and Figure 95 show that there is little threat to Willows. However, residents could be impacted if facilities or services in the unincorporated county are disrupted by wildfires, and they may be subject to poor air quality from wildfires that occur in the region.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

There have been four major fires in Willows. One changed the city entirely, and another led to the creation of the Willows Fire Department. On May 30, 1882, the most destructive fire in Willows' history occurred, and it nearly destroyed the entire downtown. Thirty-three buildings were lost, most of them thriving businesses, and the loss was estimated at \$200,000 (the equivalent of \$4.5 million today). In 1887, the Willows Fire Department was established with two hose companies. Each company had carts that held fire equipment, including axes, ladders, nozzles, and hoses. The Willows Fire Department has grown from the bucket brigade and hose companies to having nine apparatuses in the rural and city departments. There are five paid staff: the Chief, a Captain, and three Engineers.

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Section 4. Capabilities Assessment

In preparing the mitigation actions, the participating jurisdictions were asked to consider their overall capability to mitigate identified hazards. The capabilities assessment included evaluations of Glenn County's and the Cities of Orland and Willows' planning and regulatory, administrative and technical, financial, and education and community outreach abilities to complete the mitigation actions. In addition, it involved evaluating these capabilities to determine how they could be expanded upon or improved. By evaluating existing and potential capabilities, it is hoped that the participating jurisdictions will be able to select mitigation actions which are feasible for them to complete.

Planning and Regulatory

Planning and regulatory capabilities are the plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards. Glenn County and the Cities of Orland and Willows have several plans and programs in place that guide their mitigation of development in hazard-prone areas. Table 66 lists the planning and land management tools typically used by Glenn County to implement hazard mitigation activities. Table 67 indicates the planning capabilities of Orland, and Table 68 lists those for Willows.

Table 66: Glenn County Planning Capabilities

Plan	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	Last update? Next update?
General Plan	Yes	Implementing the actions identified in the Safety Element.	2023; no targeted timeframe
Capital Improvement Plan	Yes	There is a schedule of bridges that needs to be repaired and is currently included. Includes recovery projects from disasters that have a funding source.	Annually updated
Climate Change Adaptation Plan	N/A	The county does not have one but needs to develop one.	No timeline yet – still seeking funds from the Integrated Climate Adaptation and Resiliency Program (ICARP)
Community Wildfire Protection Plan	Yes	The Resource Conservation District uses this plan as a resource when applying for grants and completing mitigation projects.	2023; Probably not until at least 2028.
Economic Development Plan	Yes - briefly	Notes challenges and unknowns from wildfire impacts (Camp Fire).	Glenn County Economic Development Strategy 2019-2022
Land Use Plan	Yes – flooding	Yes, it is in the General Plan and can support floodplain management.	2023

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Plan	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	Last update? Next update?
Local Emergency Operations Then	Yes	The plan currently has no reference to mitigation but references the MJHMP.	It is updated on a five-year cycle; 2024
Stormwater Management Plan	Storm Drain Districts exist but no formal plans in place	Storm Drainage studies need to occur in multiple storm drain districts and the City of Willows sphere of influence.	Undetermined
Transportation Plan	Yes	Emergency preparedness guidelines and procedures. The most likely events in the County include forest fire, earthquakes, and flooding	2020
Substantial Damage Plan	N/A	N/A	N/A
Other? (please describe)	N/A		

Table 67: City of Orland Planning Capabilities

Plan	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	Last update? Next update?
General Plan	Y	In pursuit of grant funding and during discretionary actions	2023; Unknown
Capital Improvement Plan	N	Unknown	Unknown
Climate Change Adaptation Plan	N	Unknown	Unknown
Community Wildfire Protection Plan	Unknown	In pursuit of grant funding and during discretionary actions	Unknown
Economic Development Plan	Unknown	Unknown	Unknown
Land Use Plan	N	Unknown	2023 Unknown
Local Emergency Operations Plan	Unknown	Unknown	Unknown

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Plan	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	Last update? Next update?
Stormwater Management Plan	Unknown	Unknown	Unknown
Transportation Plan	Unknown	Unknown	2023 Unknown
Substantial Damage Plan	Unknown	Unknown	Unknown
Other? (please describe)			

Table 68: City of Willows Planning Capabilities

Plan	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it next be updated?
General Plan	Y	Ensures that development has examined potential hazards and that they are mitigated beforehand	November 2022; Updated periodically
Capital Improvement Plan	Y	Improvements of drainage, roads, wastewater and other infrastructure	Yearly
Climate Change Adaptation Plan	N/A		
Community Wildfire Protection Plan	Yes	Fuel reduction	As funding allows
Economic Development Plan	No		
Land Use Plan	N/A		
Local Emergency Operations Plan	Glenn County		
Stormwater Management Plan	N/A		
Transportation Plan	Glenn County		
Substantial Damage Plan	N/A		
Other? (Describe)			

Table 69 through Table 74 list the regulatory capabilities of Glenn County, Orland, and Willows, respectively.

Table 69: Glenn County Regulatory Capabilities

Plan	Does it reduce hazard impacts?	Is it adequately administered and enforced?	Last update? Next update?
Building Code	The 2022 California Building Code has been adopted and has added significantly to this capability, particularly when it comes to addressing flooding.	Yes – The building department is small and has to work to keep up with constantly changing requirements, but overall, it has been successful.	2022; Anticipate updating in 2025.
Flood Insurance Rate Maps	No – need additional information on areas that do not have base flood elevations	Yes – Planning and Building staff are proficient in reading flood maps and requiring appropriate permits, certifications, etc.	A broad, across the board update in 2010; A Letter of Map Revision (LOMR) would enable citizens to revise their property if concurred by FEMA, but no overall changes to the map are anticipated at this time.
Floodplain Ordinance	Yes – However, the FEMA Community Assistance Visit (CAV) noted that the ordinance should be updated with additional language.	Yes	2006; It is currently being updated.
Subdivision Ordinance	N/A	N/A	N/A
Zoning Ordinance	Yes – existing Zoning Code; Floodplain Management Title 15.54.030	Yes	2006
Natural Hazard-Specific Ordinance (Stormwater, Steep Slope, Wildfire)	Title 15 identifies limits on areas with steep slopes. Analysis from the California Environmental Quality Act is not in any ordinance, but it helps with this.	There is little development going on in areas with steep slopes.	2006
Acquisition of Land for Open Space and Public Recreation Use	N/A	N/A	N/A
Prohibition of Building in At-Risk Areas	N/A	N/A	N/A

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Plan	Does it reduce hazard impacts?	Is it adequately administered and enforced?	Last update? Next update?
Other? (please describe)	The Central Valley Flood Protection Board permits development in the Butte basin.		

Table 70: City of Orland Planning Capabilities

Plan	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	Last update? Next update?
General Plan	Yes	In pursuit of grant funding and during discretionary actions	2023; Unknown
Capital Improvement Plan	No	Unknown	Unknown
Climate Change Adaptation Plan	No	Unknown	Unknown
Community Wildfire Protection Plan	Unknown	In pursuit of grant funding and during discretionary actions	Unknown
Economic Development Plan	Unknown	Unknown	Unknown
Land Use Plan	No	Unknown	2023 Unknown
Local Emergency Operations Plan	Unknown	Unknown	Unknown
Stormwater Management Plan	Unknown	Unknown	Unknown
Transportation Plan	Unknown	Unknown	2023 Unknown
Substantial Damage Plan	Unknown	Unknown	Unknown
Other? (please describe)			

Table 71: City of Willows Planning Capabilities

Plan	Does the plan address hazards? (Y/N)	How can the plan be used to implement mitigation actions?	When was it last updated? When will it next be updated?
General Plan	Yes	Ensures that development has examined potential hazards and that they are mitigated beforehand	November 2022; Updated periodically
Capital Improvement Plan	Yes	Improvements of drainage, roads, wastewater and other infrastructure	Yearly
Climate Change Adaptation Plan	N/A		
Community Wildfire Protection Plan	Yes	Fuel reduction	As funding allows
Economic Development Plan	No		
Land Use Plan	N/A		
Local Emergency Operations Plan	Glenn County		
Stormwater Management Plan	N/A		
Transportation Plan	Glenn County		
Substantial Damage Plan	N/A		

Table 69 through Table 74 list the regulatory capabilities of Glenn County, Orland, and Willows, respectively.

Table 72: Glenn County Regulatory Capabilities

Plan	Does it reduce hazard impacts?	Is it adequately administered and enforced?	Last update? Next update?
Building Code	The 2022 California Building Code has been adopted and has added significantly to this capability, particularly when it comes to addressing flooding.	Yes – The building department is small and has to work to keep up with constantly changing requirements, but overall, it has been successful.	2022; Anticipate updating in 2025.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Plan	Does it reduce hazard impacts?	Is it adequately administered and enforced?	Last update? Next update?
Flood Insurance Rate Maps	No – need additional information on areas that do not have base flood elevations	Yes – Planning and Building staff are proficient in reading flood maps and requiring appropriate permits, certifications, etc.	A broad, across the board update in 2010; A Letter of Map Revision (LOMR) would enable citizens to revise their property if concurred by FEMA, but no overall changes to the map are anticipated at this time.
Floodplain Ordinance	Yes – However, the FEMA Community Assistance Visit (CAV) noted that the ordinance should be updated with additional language.	Yes	2006; also, in March 2024, the County Flood Zone Code was updated to reflect DWR audit.
Subdivision Ordinance	Yes	New maps must show flood zones and drainage	2006, and to do
Zoning Ordinance	Yes – existing Zoning Code; Floodplain Management Title 15.54.030	Yes	2006, Title 15 will also be updated in 2025 to reflect the Adopted General Plan and Safety Element.
Natural Hazard-Specific Ordinance (Stormwater, Steep Slope, Wildfire)	Title 15 identifies limits on areas with steep slopes. Analysis from the California Environmental Quality Act is not in any ordinance, but it helps with this.	There is little development going on in areas with steep slopes.	2006; update to occur in 2025
Acquisition of Land for Open Space and Public Recreation Use	N/A	N/A	N/A
Prohibition of Building in At-Risk Areas	N/A	N/A	N/A
Other? (please describe)	The Central Valley Flood Protection Board permits development in the Butte basin.		

Table 73: City of Orland Regulatory Capabilities

Plan	Does it effectively reduce hazard impacts?	Is it adequately administered and enforced?	Last update? Next update?
Building Code	Yes	Yes	Every 3 years in California
Flood Insurance Rate Maps	Unknown	Unknown	Unknown
Floodplain Ordinance	Unknown	Unknown	Unknown
Subdivision Ordinance	Yes	Yes	Unknown
Zoning Ordinance	Yes	Yes	2023; Unknown
Natural Hazard Specific Ordinance (Stormwater, Steep Slope, Wildfire)	Unknown	Unknown	Unknown
Acquisition of Land for Open Space and Public Recreation Use	Potentially	N/A	N/A
Prohibition of Building in At-Risk Areas	Potentially	Unknown	Unknown
Other? (Describe)			

Table 74: City of Willows Regulatory Capabilities

Plan	Does it effectively reduce hazard impacts?	Is it adequately administered and enforced?	Last update? Next update?
Building Code	Yes	Yes	2022 When new state code is released
Flood Insurance Rate Maps	Yes	Yes	When FEMA updates maps
Floodplain Ordinance	Yes	Yes	2009, updated in 2024
Subdivision Ordinance	Yes	Yes	Will be updated in 2025
Zoning Ordinance	Yes	Yes	Will be updated in 2025
Natural Hazard Specific Ordinance (Stormwater, Steep Slope, Wildfire)	Yes	Yes	Will be updated in 2025
Acquisition of Land for Open Space and Public Recreation Use	Yes	Yes	Will be updated in 2025
Prohibition of Building in At-Risk Areas	N/A		
Other? (Describe)			

Administrative and Technical

Administrative and technical capabilities include staff and their skills, as well as tools that can help carry out mitigation actions. Where local staffing levels may be low, state and regional partners might be able to contribute. Table 75 through Table 77 identify the personnel responsible for activities related to mitigation in Glenn County, Orland, and Willows, respectively.

Table 75: Glenn County Administrative Capabilities

Administrative Capability	In place? (Y/N)	Is staffing adequate?	Are staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
Chief Building Official	Yes	No – could always use more	Yes – but more training is always good, especially on mitigation	Yes
Civil Engineer	Yes	Additional on-call engineering consultant contracts	Yes	Yes
Community Planner	Yes	Yes – New hires were also recently added.	Minimally	Yes
Emergency Manager	Yes	No – Need more staff to address ongoing hazards. The position was created in 2017.	No – could always use more	Yes
Floodplain Administrator	Yes – Chief Building Official	No – could always use more	Yes – but more training is always good, especially on mitigation	Yes
Geographic Information System (GIS) Coordinator	Yes	No – the GIS Department is a team of one which is challenging for an area that is so large.	No – Additional training on GIS for emergency management is needed.	Yes
Planning Commission	Yes	Yes – meets once a month	Minimally – only through the hazard mitigation planning process	Yes
Fire Safe Council	Yes	Yes	Yes	Yes
Community Emergency Response Team (CERT)	No			

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Administrative Capability	In place? (Y/N)	Is staffing adequate?	Are staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
Active VOADs (Voluntary Agencies Active in Disasters)	Yes – Butte-Glenn VOAD	No – all volunteer and newly formed	No	Yes – It has been tested in Butte County but not in Glenn County.
Other? (please describe)				

Table 76: City of Orland Administrative Capabilities

Administrative Capability	In place? (Y/N)	Is staffing adequate?	Are staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
Chief Building Official	Yes	No	Yes	Yes
Civil Engineer	Yes	No	Yes	Yes
Community Planner	Yes	No	Yes	Yes
Emergency Manager	N	No	N/A	N/A
Floodplain Administrator	Yes	No	Yes	Yes
Geographic Information System (GIS) Coordinator	No	No	N/A	N/A
Planning Commission	Yes	No	Unknown	Yes
Fire Safe Council	Unknown	Unknown	Unknown	Unknown
CERT (Community Emergency Response Team)	Unknown	Unknown	Unknown	Unknown
Active VOADs (Voluntary Agencies Active in Disasters)	Unknown	Unknown	Unknown	Unknown
Other? (please describe)				

Table 77: City of Willows Administrative Capabilities

Administrative Capability	In Place? (Y/N)	Is staffing adequate?	Are staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
Chief Building Official	No	N/A	N/A	N/A
Civil Engineer	Yes	Yes	Yes	Yes
Community Planner	Yes	Yes	Yes	Yes
Emergency Manager	No	N/A	N/A	N/A
Floodplain Administrator	Yes	Yes	Yes	Yes

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Administrative Capability	In Place? (Y/N)	Is staffing adequate?	Are staff trained on hazards and mitigation?	Is coordination between agencies and staff effective?
Geographic Information System (GIS) Coordinator	No	N/A	N/A	N/A
Planning Commission	Yes	Yes	No	Yes
Fire Safe Council	No	N/A	N/A	N/A
CERT (Community Emergency Response Team)	No	N/A	N/A	N/A
Active VOADs (Voluntary Agencies Active in Disasters)	No	N/A	N/A	N/A
Other? (please describe)				

Table 78 through Table 80 identify the technical capabilities of Glenn County, Orland, and Willows respectively.

Table 78: Glenn County Technical Capabilities

Technical Capability	In place? (Y/N)	How has it been used to assess/mitigate risk?	How can it be used to assess/mitigate risk in the future?
Mitigation Grant Writing	Not yet – The Fire Department got a grant to get a coordinator to help with this. The Resource Conservation District also applies for mitigation grants. Community Development Block Grants usually go through the Health and Human Services Agency.	It has been used by the Resource Conservation District (RCD) in the past and to apply for the Cal FIRE grant to update this mitigation plan.	Additional staff would be helpful to help apply for and implement mitigation grants.
Hazard Data and Information	Yes – The Emergency Manager & GIS Coordinator collect data as disasters occur.	It has been used to assess risk and is being incorporated into this hazard mitigation plan.	Hazards tend to repeat – These data will be used to continue to assess risk and ensure continuity of staffing.
GIS	Yes – However, new datasets are needed, including some base datasets like building footprints and inundation flood layers to enable true data analysis.	Datasets were used in the hazard mitigation plan update, but it is hard to implement response, recovery, and mitigation without certain base datasets.	If the datasets were expanded, they could be used as a communication tool by the Office of Emergency Services or the Building Department.
Mutual Aid Agreements	N/A	N/A	N/A
Other? (please describe)			

Table 79: City of Orland Technical Capabilities

Technical Capability	In place? (Y/N)	How has it been used to assess/mitigate risk?	How can it be used to assess/mitigate risk in the future?
Mitigation Grant Writing	No	Unknown	Unknown
Hazard Data and Information	It is unclear what this is about	Unknown	Unknown
GIS	Yes	Provision of maps	Mapping Risks
Mutual Aid Agreements	Yes	They call; we go. We call; they come.	Unknown
Other? (please describe)			

Table 80: City of Willows Technical Capabilities

Technical Capability	In Place? (Y/N)	How has it been used to assess/mitigate risk?	How can it be used to assess/mitigate risk in the future?
Mitigation Grant Writing	Yes	Identifies hazard risks so that general funds can be directed at the most likely and severe events	Can also be used to acquire grant funds to mitigate most likely and severe events
Hazard Data and Information	No	N/A	
GIS	N/A	N/A	
Mutual Aid Agreements	N/A	N/A	
Other? (please describe)			

Besides the departments and agencies described above, other departments and agencies that play a role in hazard mitigation in the planning area include the following:

- Glenn County Agricultural Commissioner
- Glenn County Community Wildfire Protection District
- Glenn County Resource Conservation District
- Glenn County Water Advisory Committee
- Glenn Economic Development Commission
- Glenn–Colusa Irrigation District
- Reclamation District

A number of state and federal agencies and programs also provide technical and financial assistance to local communities for hazard mitigation. They are listed in Table 81.

Table 81: State and Federal Agencies That Provide Administrative/Technical Support

State Agencies	Federal Agencies
California Department of Forestry and Fire Protection	Bureau of Land Management
California Department of Water Resources	Bureau of Reclamation
California Department of Food and Agriculture	FEMA (Region 9)
California Environmental Protection Agency	National Park Service
California Emergency Management Agency	US Army Corps of Engineers
California State Lands Commission	US Environmental Protection Agency (Region 9)
California Department of Fish and Game	US Fish and Wildlife Service
California Department of Transportation	US Geological Survey
California State Parks and Recreation Department	USDA Natural Resources Conservation Service
UC Davis	

Financial

This section identifies the financial tools and resources that the county and the Cities of Orland and Willows might use to help fund mitigation activities. These include county- or city-specific capabilities and state and federal resources. It is also important to note that funding can also be sourced from participating agencies and organizations that collaborate with the county to implement mitigation actions. Evaluating funding and financial capabilities is important to determine what kinds of projects are feasible given their costs. Mitigation actions like outreach programs cost less and often use staff time and existing budgets. Other actions, such as earthquake retrofits, could require substantial funding from local, state, and federal partners. Table 82 through Table 84 list the financial capabilities of Glenn County, Orland, and Willows, respectively.

Table 82: Glenn County Financial Capabilities

Funding Resource	In Place? (Y/N)	Has it been used in the past and for what types of activities?	Could it be used to fund future mitigation actions?	Can it be used as the local cost match for a federal grant?
Capital improvement project funding	Yes	Yes. HUTA and RMRA funds reserved for road maintenance have been used to mitigate storm damage	These funding sources can be used for match amounts, but are not sufficient to fund projects.	Yes
General funds	No	Flood Control	Maybe, if projects are budgeted and approved	Maybe, if projects are budgeted and approved

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Funding Resource	In Place? (Y/N)	Has it been used in the past and for what types of activities?	Could it be used to fund future mitigation actions?	Can it be used as the local cost match for a federal grant?
Hazard Mitigation Grant Program (HMGP/404)	Yes	No	Yes, but not this round of funding	No
Building Resilient Infrastructure & Communities (BRIC)	Annual	No	Yes	No
Flood Mitigation Assistance (FMA)	Annual	No	Yes	No
Public Assistance Mitigation (PA Mitigation/406)	Yes	Yes – typically for upsizing culverts	Yes	No
Community Development Block Grant (CDBG)	Yes	It has been used to cover the costs of COVID and other infectious diseases.	Yes – the Health and Human Services Agency (HHSA)	Yes
Natural Resources Conservation Services (NRCS) programs	Yes	It has been used to support the Hamilton City levee project.	Yes	Yes
U.S. Army Corps of Engineers (USACE) programs	Yes	Yes – It is working on the Hamilton City levee project.	Yes	Yes
Property, sales, income, or special purpose taxes	No – Service districts may have some.			
Stormwater utility fee	Storm Drain District Parcel Fees	Yes, Storm Drain maintenance	No, funding is not sufficient	Maybe, if funding is sufficient
Fees for water, sewer, gas, or electric services	No – Service districts may have some.			
Impact fees from new development and redevelopment	Yes	No	No – sheriff and probation only	No
General obligation or special purpose bonds	No			
Federally funded programs (please describe)	No			
Cal FIRE Mitigation Grants	Yes	Safety Element & Hazard Mitigation Plan update; RCD has also used it for vegetation removal.	Yes	Yes

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Funding Resource	In Place? (Y/N)	Has it been used in the past and for what types of activities?	Could it be used to fund future mitigation actions?	Can it be used as the local cost match for a federal grant?
Integrated Climate Adaptation and Resiliency Program (ICARP) grants	Yes	No	Yes	Yes – possibly for the Climate Adaptation Plan
Other state-funded programs (please describe)	Small Communities Flood Risk Reduction DWR grant	Yes – Butte City flood study	Yes	Undetermined
Private sector or nonprofit programs	North Valley Community Foundation	Yes – They have supported response and recovery, including during the recent droughts.	Yes	Yes
Other? (please describe)				

Table 83: City of Orland Financial Capabilities

Funding Resource	In Place? (Y/N)	Has it been used in the past and for what types of activities?	Could it be used to fund future mitigation actions?	Can it be used as the local cost match for a federal grant?
Capital improvement project funding	Yes	Capital Improvements	Yes	Depends on the funding entity
General funds	Yes	Operation of Organization	Yes	Depends on the funding entity
Hazard Mitigation Grant Program (HMGP/404)	Unknown	Unknown	Unknown	Unknown
Building Resilient Infrastructure & Communities (BRIC)	Unknown	Unknown	Unknown	Unknown
Flood Mitigation Assistance (FMA)	Unknown	Unknown	Unknown	Unknown
Public Assistance Mitigation (PA Mitigation/406)	Unknown	Unknown	Unknown	Unknown
Community Development Block Grant (CDBG)	Y	Unknown	Y	Depends on funding entity

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Funding Resource	In Place? (Y/N)	Has it been used in the past and for what types of activities?	Could it be used to fund future mitigation actions?	Can it be used as the local cost match for a federal grant?
Natural Resources Conservation Services (NRCS) programs	Y	Unknown	Y	Depends on funding entity “
U.S. Army Corps of Engineers (USACE) programs	Y	Unknown	Y	‘Depends on funding entity
Property, sales, income, or special purpose taxes	Y	Y	Public Safety Purchases	Depends on funding entity
Stormwater utility fee	N	N/A	Y	Depends on funding entity
Fees for water, sewer, gas, or electric services	Y	Public Safety Purchases	Y	Depends on funding entity
Impact fees from new development and redevelopment	Y	Capital Improvements	Possibly	Depends on the funding entity
General obligation or special purpose bonds	Y	Capital Improvements	Possibly	Depends on funding entity
Federally funded programs (please describe)	Unknown	Unknown	Unknown	Unknown
Cal FIRE Mitigation Grants	Y	Public Safety Purchases	Y	Depends on funding entity
Integrated Climate Adaptation and Resiliency Program (ICARP) grants	N/A	N	Unknown	Depends on funding entity
Other state-funded programs (please describe)	Unknown	Unknown	Unknown	Unknown
Private sector or nonprofit programs	Unknown	Unknown	Unknown	Unknown

Table 84: City of Willows Financial Capabilities

Funding Resource	In Place? (Y/N)	Has it been used in the past and for what types of activities?	Could it be used to fund future mitigation actions?	Can it be used as the local cost match for a federal grant?
Capital improvement project funding	Yes	Various improvements to roads, drainage, sewer and sidewalk infrastructure	Yes	No
General funds	Yes	Various improvements to roads, drainage, sewer and side walk infrastructure	Yes	Yes
Hazard Mitigation Grant Program (HMGP/404)	No	No	Yes	N/A
Building Resilient Infrastructure & Communities (BRIC)	No	No	Yes	N/A
Flood Mitigation Assistance (FMA)	No	No	Yes	N/A
Public Assistance Mitigation (PA Mitigation/406)	No	No	Yes	N/A
Community Development Block Grant (CDBG)	No	Yes- Private business infrastructure for Job Retention	Yes	N/A
Natural Resources Conservation Services (NRCS) programs	No	No	Yes	N/A
U.S. Army Corps of Engineers (USACE) programs	No	No	Yes	N/A
Property, sales, income, or special purpose taxes	Yes	Yes – General Fund for various divisions	Yes	Yes
Stormwater utility fee	No	N/A	N/A	N/A
Fees for water, sewer, gas, or electric services	Yes	Sewer Fees – Fund projects for upgrading sewer infrastructure.		
Impact fees from new development and redevelopment	Yes	Specific uses, such as fire, library, police	No	No

Funding Resource	In Place? (Y/N)	Has it been used in the past and for what types of activities?	Could it be used to fund future mitigation actions?	Can it be used as the local cost match for a federal grant?
General obligation or special purpose bonds	Yes	Yes– Sewer upgrades	Yes	N
Federally funded programs (please describe)	No	No	Yes	No
Cal Fire Mitigation Grants	No	No	Yes	No
Integrated Climate Adaptation and Resiliency Program (ICARP) Grants	No	No	Yes	No
Other state-funded programs (please describe)				
Private sector or nonprofit programs				
Other?				

State and Federal Funding Resources

Table 85 provides a list of potential funding programs and resources provided by state and federal agencies/programs which the county and the cities can use for hazard mitigation activities. Please note that the information provided below is not exhaustive.

Table 85: Potential State and Federal Funding Resources

Lead Agency	Timeframe	Potential Programs/ Grants	Types of Projects Funded
California Air Resources Board	Awards completed – ongoing implementation	Proposition 1B Grant	Funding to reduce emissions from transporting goods, thereby reducing health risks in communities near large distribution locations
California Department of Forestry and Fire Protection (Cal FIRE)	Annual	Wildfire Prevention Grants	Projects in and near fire-threatened communities to improve public health and safety while reducing greenhouse gas emissions

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Lead Agency	Timeframe	Potential Programs/ Grants	Types of Projects Funded
Cal FIRE in partnership with the California Wildfire & Forest Resilience Task Force	Annual	Wildfire Resilience Block Grants	Projects that build local capacity while providing financial and technical forestry assistance to nonindustrial forest landowners <ul style="list-style-type: none"> Several state forestry assistance programs in Cal FIRE share the goal of improving the health and productivity of private forest lands and reducing threats from wildland fires.
Cal FIRE in partnership with the Council of Western State Foresters	Annual – application through the state	Western States Wildland–Urban Interface (WUI) Fire Assistance Grant	Funding to mitigate wildfire risks in the WUI, with emphasis on hazardous fuels reduction, community outreach, wildfire risk assessment, planning, and monitoring
California Department of Housing and Community Development	Post-disaster	Disaster Recovery Initiative	Funds to help communities recover after disasters (such as droughts, fires, and floods) by administering special federal funds for both recovery and mitigation purposes
California Governor’s Office of Planning and Research	Ongoing	Integrated Climate Adaptation and Resiliency Program (ICARP) – Adaptation Planning Grant Program	Multiple rounds of funding for local, regional, and tribal governments to support climate adaptation and resilience planning activities
California Governor’s Office of Planning and Research	Ongoing	ICARP – Extreme Heat and Community Resilience Grant Program	Support for local, regional, and tribal efforts to reduce the impacts of extreme heat
California Governor’s Office of Planning and Research	Ongoing	ICARP – Regional Resilience Planning and Implementation Grant Program	Funding for public entities, California Native American tribes, Community-Based Organizations, and academic institutions that form regional partnerships to plan and implement projects that advance climate resilience and respond to the greatest climate risks in their regions.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Lead Agency	Timeframe	Potential Programs/ Grants	Types of Projects Funded
U.S. Department of Agriculture	Ongoing	Natural Resources Conservation Service (NRCS)	<p>Promoting leadership in a partnership effort to help people conserve, maintain, and improve natural resources and the environment.</p> <ul style="list-style-type: none"> The Emergency Watershed Protection Program is an emergency recovery program that responds to emergencies created by natural disasters. Eligibility for assistance does not depend on a national emergency declaration. The program is designed to help people and conserve natural resources by relieving imminent hazards to life and property caused by floods, fires, windstorms, and other natural occurrences.
Department of Health and Human Services (HHS)/ California Department of Health Services	Congressionally appropriated	Grants for Public Health Emergency Preparedness: Public Health Emergency Fund	Reserve funding to help HHS agencies, such as the Administration for Strategic Preparedness and Response and the Centers for Disease Control and Prevention (CDC) rapidly respond to any kind of public health emergency or threat
Department of Homeland Security (DHS)	Annual	Citizens Corps Program	Training for volunteer citizens to assist in recovery after a disaster or a terrorist attack
DHS	Annual	State Homeland Security Program (SHSP) Awarded through State Administrative Agencies (SAAs)	<p>Preparedness: comprehensive measures to help strengthen communities against potential terrorist attacks</p> <ul style="list-style-type: none"> Awards are based on risk.
DHS	Annual	Urban Area Security Initiative (UASI) Awarded through SAAs	Assistance for high-threat, high-density urban areas to build and sustain the capabilities necessary to prevent, protect against, mitigate, respond to, and recover from acts of terrorism.
DHS – Federal Emergency Management Agency (FEMA)	Annual	Assistance to Fire Fighter Grants (AFG) Staffing for Adequate Fire and Emergency Response (SAFER)	Funding for critically needed resources to equip and train emergency personnel, enhance efficiencies, and support community resilience

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Lead Agency	Timeframe	Potential Programs/ Grants	Types of Projects Funded
DHS – FEMA	Annual	Building Resilient Infrastructure and Communities (BRIC) Grant Program for state, local, and tribal territorial governments	Funding to address risks brought on by natural disasters, including wildfires, drought, hurricanes, earthquakes, extreme heat, and flooding <ul style="list-style-type: none"> Focus: Enhance climate resilience and adaptation/ nature-based solutions
DHS – FEMA	Annual	Emergency Management Performance Grants Program (EMPG) 2023 Budget: \$355.1 million [2023: \$27,342,079 allocated to California]	All-hazards emergency preparedness with 3 priorities: Equity; Climate Resilience; Readiness <ul style="list-style-type: none"> Build and sustain core capabilities across the prevention, protection, mitigation, response, and recovery mission areas Applicants must designate at least one project in their FY 2023 EMPG Program Work Plan and provide a budget narrative that specifically addresses equity considerations.
DHS – FEMA	Annual	Flood Mitigation Assistance Program (FMA)	Projects that reduce or eliminate the risk of repetitive flood damage to buildings insured by the National Flood Insurance Program
DHS – FEMA	Ongoing	Hazard Mitigation Grant Program (HMGP) for state, local, and tribal territorial governments	Funding to develop hazard mitigation plans and rebuild in a way that reduces, or mitigates disaster losses (after a presidentially declared disaster) <ul style="list-style-type: none"> Applicants must submit an application within 12 months of a major disaster declaration (some extensions are granted).
DHS – FEMA	Congressionally appropriated	Metropolitan Medical Response System Program	Strengthening homeland security preparedness by funding local or sub-state regional jurisdictions to support and enhance the integration of local emergency management, health, and medical systems
DHS – FEMA	Post-disaster (federally declared)	Public Assistance (PA)/406 Mitigation	Mitigation measures performed on damaged portion(s) of permanent facilities—Categories C–G are eligible for PA.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Lead Agency	Timeframe	Potential Programs/ Grants	Types of Projects Funded
DHS – FEMA	Annual	Transit Security Grant Program (TSGP)	Creation of sustainable, risk-based measures to protect critical surface transportation infrastructure and the traveling public from acts of terrorism, major disasters, and other emergencies
DHS Office of Emergency Communications (OEC) – FEMA	Annual – administered through the state	Interoperable Emergency Communications Center Grant Program (IECGP)	Funding to improve tribal, regional, statewide, and national interoperable emergency communications
FEMA grant administered through the California Governor’s Office of Emergency Services	Annual – competitively awarded	Regional Catastrophic Preparedness Grant Program (RCPGP)	Funding to build regional capacity to manage catastrophic incidents by improving and expanding collaboration for catastrophic incident preparedness <ul style="list-style-type: none"> • Focus is on housing, equity, climate resilience, and readiness
Department of Housing and Urban Development (HUD)	Annual	Community Development Block Grants	Funding on a formula basis to states, cities, and counties to develop viable urban communities with decent housing and a suitable living environment, expanding opportunities for low and moderate-income people
HUD	Congressionally appropriated	CDBG Mitigation (CDBG-MIT)	Support for a range of mitigation activities to reduce or eliminate long-term impacts of future disasters
National Weather Service	Annual	National Tsunami Hazard Mitigation Program National Earthquake Hazards Reduction Program	Funding to mitigate the impacts of tsunamis through public education, community response planning, and hazard assessment Support for hazard reduction by enforcing seismic codes, land-use zoning, and structural engineering
US Geological Survey (USGS)	Annual	US Geological and Geophysical Data Preservation Program Grant (NGGDPP)	Assistance to state geological surveys and bureaus in the Department of the Interior that maintain and preserve geophysical data

Education and Outreach

Education and outreach capabilities are programs and methods that promote awareness through a whole-community approach to encourage and facilitate risk reduction and promote resilience. Community-based partners, including those who are working with underserved populations, can contribute to efforts to coordinate education and outreach. Table 86 through Table 88 describe the education and outreach capabilities of Glenn County, Orland, and Willows, respectively.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Table 86: Glenn County Education and Outreach Capabilities

Education and Outreach Capability	In Place? (Y/N)	Does it currently incorporate hazard mitigation?	Notes
Community newsletter(s)			
Hazard awareness campaigns (such as Firewise, Storm Ready, Severe Weather Awareness Week, school programs)	Yes	Yes, encourages residents to complete fire and flood mitigation	National Preparedness Month Flood Awareness Week
Public meetings/events (please describe)			
Emergency management listserv	Yes	No, mainly response and recovery focused	Office of Emergency Services (OES) partner email distribution list
Local news	Yes	Yes	OES provides frequent updates and interviews for fire, flood, heat, local HMPs, etc.
Distributing hard copies of notices (e.g., public libraries, door-to-door outreach)			
Insurance disclosures/outreach			
Organizations that represent, advocate for, or interact with underserved and vulnerable communities (please describe)			
Social media (please describe)	Yes	Yes – Encourages residents to complete fire and flood mitigation. Provides tips for extreme heat and locations of cooling zones.	Glenn County Sheriff Facebook Glenn County OES Twitter Glenn County HHSA Facebook
Other? (please describe)			

Table 87: City of Orland Education and Outreach Capabilities

Education and Outreach Capability	In Place? (Y/N)	Does it currently incorporate hazard mitigation?	Notes
Community newsletter(s)	Yes	When necessary	Facebook, Internet
Hazard awareness campaigns (such as Firewise, Storm Ready, Severe Weather Awareness Week, school programs)	Yes	When necessary	Facebook, Internet
Public meetings/events (please describe)	Yes	When necessary	City Council, Planning Commission City Boards and Commissions Special meetings
Emergency management listserv	No	N/A	N/A
Local news	Yes	When necessary	TV, radio, Internet, Facebook
Distributing hard copies of notices (e.g., public libraries, door-to-door outreach)	Formally – No As Necessary – Yes	When necessary	N/A
Insurance disclosures/outreach	Unknown	Unknown	
Organizations that represent, advocate for, or interact with underserved and vulnerable communities (please describe)	Yes	Unknown	
Social media (please describe)	Internet page, Facebook	When necessary	
Other? (please describe)			

Table 88: City of Willows Education and Outreach Capabilities

Education and Outreach Capability	In Place? (Y/N)	Does it currently incorporate hazard mitigation?	Notes
Community newsletter(s)	Yes	Yes	
Hazard awareness campaigns (such as Firewise, Storm Ready, Severe Weather Awareness Week, school programs)	No	N/A	
Public meetings/events (please describe)	Yes – City Council, Planning Commission		

Education and Outreach Capability	In Place? (Y/N)	Does it currently incorporate hazard mitigation?	Notes
Emergency management listserv	No		
Local news	No		
Distributing hard copies of notices (e.g., public libraries, door-to-door outreach)	No		
Insurance disclosures/ outreach	No		
Organizations that represent, advocate for, or interact with underserved and vulnerable communities (please describe)	No		
Social media (please describe)	Yes	Notification of severe weather	
Other? (please describe)			

National Flood Insurance Program

The National Flood Insurance Program (NFIP) is a FEMA program that provides flood insurance to millions of policyholders across the country. The capabilities necessary to administer this program range across all four types of mitigation capabilities. All three participating jurisdictions participate in the NFIP. As part of the capability assessment, the jurisdictions evaluated the following series of questions on their NFIP capabilities.

Table 89 through Table 91 list the NFIP capabilities of Glenn County, Orland, and Willows, respectively.

Table 89: Glenn County National Flood Insurance Program Capabilities

Floodplain Management	
Who is the floodplain manager? Is this their primary or secondary role?	Chief Building Official; it is one of the primary roles of this position.
Does the floodplain manager have adequate training and capacity for their role? If not, what else is needed?	Additional support would always be good. Any classes on the NFIP would be good.
How does the community enforce its floodplain rules? Does enforcement include monitoring compliance and acting to correct violations?	The community enforces the floodplain management ordinance through the permitting process by requiring floodplain permits during construction and verifying elevations. Still addressing the findings from the last Community Assistance Visit.
When was the community's most recent Community Assistance Visit (CAV)?	2020

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Floodplain Management	
Were any violations noted on the community's most recent Assistance Visit (CAV)?	Yes – FEMA recommended changes to the floodplain management ordinance and California building code which requires 1 ft of freeboard. A few require Letters of Map Amendment and elevation information.
Is there an upcoming CAV? If no, is one needed?	No – currently working on one
When was the most recent floodplain management ordinance adopted?	February 2006
Does your community participate in the Community Rating System (CRS)? If so, describe the steps the community has taken to achieve the CRS goals.	No
Does the community's floodplain management ordinance include any higher standards? If so, please list.	No
Who is responsible for permitting?	Chief Building Official
How does the community issue development permits in the special flood hazard area?	Chief Building Official reviews flood elevations from a survey or other document or in plans that show adjacent Base Flood Elevations (BFEs) and the heights of final structures. They must demonstrate how they expect to elevate the base structure above the BFE. The Chief Building Official is responsible for issuing the permit and monitoring construction before the development goes vertical and verifying at final inspection.
Does the community maintain elevation certificates?	Yes – Each file in the floodplain includes the elevation certificate electronically. This system could be upgraded.
Does the community track the number of buildings in the special flood hazard area? If yes, are there any trends?	Not specifically – This could be documented more. Most development will occur near Hanbright Creek, Stony Creek, Butte City, and Hamilton City. Most of the building takes place near Orland.
How many repetitive loss (RL) structures does the community have? (List number and type of structure)	See Section 3.3. Flood.
How many severe repetitive loss (SRL) structures does the community have? (List number and type of structure)	See Section 3.3. Flood.
Have any RL/SRL properties been mitigated since the last plan update?	Yes
Who is responsible for making substantial damage/substantial improvement determinations?	Chief Building Official

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Floodplain Management	
How does the substantial damage/substantial improvement process work in your community?	The Chief Building Official reviews all permit requests and identifies structures in the Special Flood Hazard Area (SFHA) with an appraised value of 50% or more in damages based on pre-FIRM/post-FIRM and other structural considerations.
Is there sufficient staff and training to make substantial damage/substantial improvement determinations?	Mutual aid would probably be needed if there were a big event.
How are substantial damage/substantial improvement requirements messaged to the public before and after an event?	No event has warranted such messaging so far. Glenn County OES has messaging available, should it be needed. The Glenn County website also shares information on when a permit is required.
Have any substantially damaged/substantially improved structures been mitigated since the last plan update?	No, not applicable.
How will the community remain in compliance with the NFIP moving forward? (Simply stating “the community will continue to comply with the NFIP” will not meet FEMA’s planning requirements.)	The county is currently addressing deficiencies in the code identified in the CAV. The new code will also require 1 ft above BFE (minimally).
Floodplain Mapping	
How does the community support map change requests? This could be requests during the Risk MAP process or through Letters of Map Amendment or Revision.	The county provides information on FEMA’s process, including FEMA contact information, and the landowner is responsible for hiring a surveyor to submit these.
When did the latest Flood Insurance Rate Map (FIRM) become effective?	8/5/2010
When was the latest FIRM adopted?	Unknown
Is the FIRM and Flood Insurance Study (FIS) report in an accessible location? How would the public get access to their flood map information?	The Planning Department shares a link online when people ask. It’s also part of the building permit application.
Does the community use any Risk MAP products? If so, describe.	Not yet – FEMA recently completed one for Colusa County and now Glenn County is trying to get support in determining BFEs.
Does the community collect updated floodplain data or modeling? Is this shared with partners and FEMA?	No
Other comments?	It is challenging without BFEs.
Flood Insurance and Outreach	
How does the community educate the public on floodplain management and the availability of flood insurance, in and out of the floodplain?	No – previously shared social media posts on insurance and preparedness during National Preparedness Month

Flood Insurance and Outreach	
How does the community engage with insurance agents on flood insurance?	No
Does the community (or state) have flood hazard disclosure laws?	Yes
How familiar is the public with their flood insurance options?	People who are required to get flood insurance for a mortgage are, but others are not.
How many properties have flood insurance in the community?	Unsure.
Are there any areas where flood insurance is lacking?	Unsure. South of Ord Bend might lack flood insurance because it was developed relatively recently in 2010, and the flood maps changed so they were just recently included in the flood zone.
Other comments?	

Table 90: City of Orland National Flood Insurance Program Capabilities

Floodplain Management	
Who is the floodplain manager? Is this their primary or secondary role?	The City Engineer, the Public Works Director, Fire Chief, and Planning collaborate to accomplish the tasks of a floodplain manager.
How does the community enforce its floodplain rules? Does enforcement include monitoring compliance and acting to correct violations?	Building and Planning are responsible for permitting. Before approving a building permit, the Building Official looks at flood maps to see if the structure is in a Special Flood Hazard Area (SFHA).
Does the community track the number of buildings in the special flood hazard area? If yes, are there any trends?	No
How many repetitive loss (RL) structures does the community have? (List number and type of structure)	See Section 3.3. Flood.
How many severe repetitive loss (SRL) structures does the community have? (List number and type of structure)	See Section 3.3. Flood.
How does the substantial damage/ substantial improvement process work in your community?	No flood event has ever happened; the community does not have a written policy on file. Most likely, it would be a collaborative effort between departments to assess damaged structures.
How will the community remain in compliance with the NFIP moving forward? (Simply stating “the community will continue to comply with the NFIP” will not meet FEMA’s planning requirements.)	The community is considering an updated floodplain ordinance.
When did the latest Flood Insurance Rate Map (FIRM) become effective?	8/5/2010

Floodplain Management	
How does the community educate the public on floodplain management and the availability of flood insurance, in and out of the floodplain?	No outreach currently

Table 91: City of Willows National Flood Insurance Program Capabilities

Floodplain Management	
Who is the floodplain manager? Is this their primary or secondary role?	John Wanger (City Engineer)- Primary
Does the floodplain manager have adequate training and capacity for their role? If not, what else is needed?	Yes
How does the community enforce its floodplain rules? Does enforcement include monitoring compliance and acting to correct violations?	The enforcement comes during review of developments (with conditions) and in reviewing building permits, elevation certify., etc.
When was the community's most recent Community Assistance Visit (CAV)?	Unknown
Were any violations noted on the community's most recent CAV?	Unknown
Is there an upcoming CAV? If no, is one needed?	Yes – 2/13/24
When was the most recent floodplain management ordinance adopted?	2009 New ordinance proposed to be adopted in the municipal code update in the next few months
Does your community participate in the Community Rating System (CRS)? If so, describe the steps the community has taken to achieve the CRS goals.	No
Does the community's floodplain management ordinance include any higher standards? If so, please list.	No. The proposed ordinance is based off of the DWR model ordinance and matches the building code.
Who is responsible for permitting?	John Wanger and Sal Lucido for Willows
How does the community issue development permits in the special flood hazard area?	Places compliance conditions on the project that must be met before any plans are approved
Does the community maintain elevation certificates?	Yes
Does the community track the number of buildings in the special flood hazard area? If yes, are there any trends?	No
How many repetitive loss (RL) structures does the community have? (List number and type of structure)	None reported by the FPA
How many severe repetitive loss (SRL) structures does the community have? (List number and type of structure)	None reported by the FPA

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Floodplain Management	
Have any RL/SRL properties been mitigated since the last plan update?	N/A
Who is responsible for making substantial damage/substantial improvement determinations?	Sal Lucido, the Building Official, and Nate Monk, the Fire Chief
How does the substantial damage/substantial improvement process work in your community?	An evaluation is made during permit review to determine if the permit involves substantial improvements. For substantial damage – if it were to occur, the Building Inspector, the Building Official and the Fire Chief would be involved in the review
Is there sufficient staff and training to make substantial damage/substantial improvement determinations?	Yes
How are substantial damage/substantial improvement requirements messaged to the public before and after an event?	As far as the plan participants are aware, the city has not had to message the public before or after an event
Have any substantially damaged/substantially improved structures been mitigated since the last plan update?	None the FPA reported.
How will the community remain in compliance with the NFIP moving forward? (Simply stating “the community will continue to comply with the NFIP” will not meet FEMA’s planning requirements)	All developments and all building permits are reviewed by first checking to see if the proposed improvements are within a SFHA. If so, either the City will ask for modifications to not develop in the SFHA, or conditions will be placed on the development/permit requiring that the applicant comply with the City’s flood ordinance and implement any required floodproofing.
Floodplain Mapping	
How does the community support map change requests? This could be requests during the Risk MAP process or through Letters of Map Amendment or Revision.	If a project were to arise that required a CLOMR or LOMR, the applicant would be required to prepare the appropriate studies and calculations and submit them to the city for review and passing on to FEMA for review.
When did the latest Flood Insurance Rate Map (FIRM) become effective?	Amendment 3 became effective 1/7/2014
When was the latest FIRM adopted?	1/7/2014
Is the FIRM and Flood Insurance Study (FIS) report in an accessible location? How would the public get access to their flood map information?	Yes. We refer interested parties to https://msc.fema.gov/portal/home . The public would download the FIS from FEMA’s website
Does the community use any Risk MAP products? If so, describe.	No
Does the community collect updated floodplain data or modeling? Is this shared with partners and with FEMA?	Yes, but there hasn’t been any in the past 15 years.
Other comments?	

Opportunities to Expand and Improve Capabilities

Besides identifying what mitigation capabilities exist, the plan must describe the ability of each participant to expand on and improve those capabilities. This is an opportunity to evaluate whether the capabilities described so far have been effectively used to reduce risk. For example, a community may wish to adopt more restrictive building codes but is prevented from doing so by law. Each jurisdiction reviewed its capabilities and identified the opportunities in Table 92 to expand and improve them.

Table 92: Opportunities to Expand or Improve Capabilities

Capability Type	Opportunity to Expand and/or Improve
Planning and Regulations	<p>Glenn County: FEMA directed the county to update the Floodplain Management Ordinance. In addition, the county would like to pursue funding to develop a Climate Action Plan.</p> <p>City of Orland: The city seeks continual improvement and growth in all aspects of its operations. One of its mitigation actions is developing a Climate Action Plan.</p> <p>City of Willows: The city could expand on the floodplain management ordinance. Ideally, a new ordinance would be adopted soon.</p>
Administrative and Technical	<p>Glenn County: Multiple notable data deficiencies were discussed during this plan update, including the need for updated parcel data, such as building footprints with high accuracy addressing points. Addressing these data gaps would enhance the GIS and data analysis mitigation capabilities of the county, supporting both pre- and post-disaster initiatives. Moreover, staff are always open to additional training, including on administering the NFIP.</p> <p>City of Orland: New and/or additional staffing is always welcomed.</p> <p>City of Willows: The city has sufficient staffing at this time. The city could partner with other organizations, such as Glenn County, to expand its technical resources, including obtaining additional GIS data.</p>
Financial	<p>Glenn County: The county has not pursued multiple new federal and state grant funding programs, including BRIC and ICARP. Obtaining additional funding through programs like these would help expand the county's financial capabilities.</p> <p>City of Orland: The city can pursue additional grant funding opportunities, such as new FEMA grant programs.</p> <p>City of Willows: More grant funding would help the city accomplish mitigation actions, and it could pursue new grant programs like BRIC and ICARP.</p>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Capability Type	Opportunity to Expand and/or Improve
Education and Outreach	<p>Glenn County: The county has multiple avenues for educating and conducting public outreach in regard to mitigation, but these capabilities could be expanded to discuss the importance of obtaining flood insurance and share additional mitigation information through the county's Emergency Management listserv.</p> <p>City of Orland: The city selected an action to support additional public education in accessible areas, such as the library.</p> <p>City of Willows: The city can share information through a community newsletter and social media. Hazard mitigation could be included in future posts to help increase public awareness of mitigation measures residents can implement.</p>

Section 5. Mitigation Strategy

The intent of the mitigation strategy is to give Glenn County, Orland, and Willows tools that will serve as guiding principles for future hazard mitigation policy and project administration. The development of the mitigation strategy includes creating a Mitigation Action Plan, which includes a process for prioritizing selected mitigation actions. This plan is the key outcomes of the MJHMP planning process.

Hazard Mitigation Goals and Objectives

Goals are broad policy statements representing Glenn County and the Cities' desire for long-term hazard mitigation results. The participating jurisdictions and stakeholders reviewed the prior plan's mitigation goals and the goals of the 2023 California State Hazard Mitigation Plan during the meeting on February 1, 2024. It was determined that the prior plan's goals generally still applied and accurately reflected the participating jurisdiction's overarching approach to mitigation. Stakeholders did suggest expanding Goal #3 to include additional partners, such as tribes, so it was amended to include tribal, state, and federal partners. Goal #4 also identified "asset data" as a new priority.

After the discussion, the participating jurisdictions agreed on the following four goals:

1. Reduce or eliminate hazard-related loss of life and injuries.
2. Reduce or eliminate hazard-related damage to critical/essential facilities and public services, infrastructure, and property.
3. Promote collaboration/coordination among jurisdictions, agencies, tribes, and state and federal partners in Glenn County to reduce or eliminate the impacts of natural hazards.
4. Improve and maintain Glenn County capabilities (i.e., planning/regulatory personnel capacity, funding accessibility, asset data, etc.) to implement mitigation activities.

The participating jurisdictions and stakeholders discussed whether to add objectives to clarify these goals. Previously, no objectives were added. For this plan update, the plan participants identified one objective that should be added to clarify Goal #4.

Mitigation Actions

After the results of the hazard risk assessment were finalized, capabilities assessed, and mitigation goals established, the county and the cities set out to identify mitigation actions that would reduce the impacts of the hazards they face. Information from the public and stakeholders on what types of actions the jurisdictions should consider also was evaluated. Brief descriptions of the mitigation action categories are provided below, followed by a discussion of the process used to identify and prioritize mitigation actions.

Mitigation actions are measures, projects, plans, or activities that would reduce or eliminate the vulnerabilities described in the risk assessment. According to FEMA, there are four types of mitigation actions:

1. **Local Plans and Regulations:** These include government authorities, policies, or codes that influence the way land and buildings are developed and built.
Examples: comprehensive plans, land use ordinances, subdivision regulations, building codes and enforcement, stormwater management plans, community wildfire protection plans.
2. **Structure and Infrastructure Projects:** These involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures and critical facilities and infrastructure.
Examples: acquisitions and elevations of structures in flood-prone areas, utility undergrounding, structural retrofits, floodwalls, detention and retention structures, culverts, and safe rooms.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

3. **Natural System Protection:** This type of action can include green infrastructure and low-impact development, nature-based solutions, engineering with nature, and bioengineering to incorporate natural features or processes into the built environment. Additional funding opportunities are available for projects that incorporate this kind of action.
Examples: forest management, land conservation, wetland restoration and preservation, sediment and erosion control, stream corridor restoration, rain gardens, greenways, land conservation, and living shorelines.
4. **Education and Awareness Programs:** These keep residents informed about potential natural disasters. Many of these actions are eligible for funding through FEMA's HMA program.
Examples: social media outreach, websites with maps and information, presentations to school groups and neighborhood organizations, radio or television spots, mailings to residents in hazard-prone areas, targeted outreach to underserved communities and socially vulnerable populations, and outreach materials in languages other than English.

As part of the plan update process, the participating jurisdictions considered actions identified in other jurisdictional plans, including the General Plans and the Glenn County Community Wildfire Protection Plan, as well as actions discussed at stakeholder meetings or suggested by the public or stakeholders. The public responses can be found in Appendix B: Public Outreach. Additional considered actions are listed in Table 93.

Table 93: Additional Mitigation Actions Considered

Mitigation Action	Type of Action	Selected? (by Whom)	If not selected, why not?
Develop a countywide Climate Action Plan.	Local Plans and Regulations	Yes, however it will require finding and applying for a grant. (Glenn County)	
Develop a countywide Master Drainage Plan.	Local Plans and Regulations	Yes, however it will require finding and applying for a grant. (Glenn County)	
Update the floodplain ordinance in accordance with FEMA suggestions from the last Community Assistance Visit (CAV).	Local Plans and Regulations	Yes, this is in process; however, it will require federal/state guidance and funding sources. (Glenn County)	
Review the Sewer/Stormwater Subdivision Regulations and update them to reduce the risk of impacts from hazards like flooding.	Local Plans and Regulations	Yes; however, it may require federal/state guidance and funding sources. (Glenn County)	
Develop a Drought Resiliency Plan.	Local Plans and Regulations	Yes, Grant Application in process (Glenn County)	

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Mitigation Action	Type of Action	Selected? (by Whom)	If not selected, why not?
Support levee upgrades as needed, such as around the Butte City area.	Structure and Infrastructure Projects	Yes, support; however, the costs are beyond county feasibility; therefore, this will require federal/state actions. (Glenn County)	
Work with the Glenn County Resource Conservation District (RCD) on wildfire risk reduction projects, such as fuel reduction near Elk Creek.	Natural Systems Protection	Yes, support; however, RCD is the primary agency implementing the wildfire reduction projects. (Glenn County)	
Work with the Glenn County RCD on education and outreach projects, including educating the public on defensible space, home hardening, and creating fire breaks.	Education and Awareness Programs	Yes, support; however, RCD is the primary agency implementing the wildfire reduction projects. (Glenn County)	
Support the development of a countywide Climate Action Plan.	Local Plans and Regulations	Yes (Orland) No (Willows)	
Support the development of a countywide Master Drainage Plan.	Local Plans and Regulations	No (Orland) No (Willows)	Orland currently has a drainage plan, but it must be updated.
Amend plans and building codes in accordance with state requirements to reduce the risk of hazards like floods and wildfire.	Local Plans and Regulations	No (Orland)	Amended another action to include building codes.
Support the hardening of infrastructure, such as waterlines, sewer lines, and bridges, particularly around Hambright Creek and Stony Creek.	Structure and Infrastructure Projects	Yes (Orland)	
Eradicate Arundo and replace it with native vegetation around Stony Creek.	Natural Systems Protection	No (Orland)	Amended action to focus on removing invasive species (Arundo).
Review and rank stormwater infrastructure and upgrade the most vulnerable infrastructure to reduce risk of flooding including adding new lift systems.	Structure and Infrastructure Projects	Yes (Willows)	

Status of Previous Mitigation Actions

Besides identifying a comprehensive range of mitigation actions, the plan update should describe the status of all mitigation actions identified in the previous plan. Table 94 presents the status of those actions.

Table 94: Mitigation Actions by Glenn County in 2018

Mitigation ID	Mitigation Project Title	Status for Plan Update
GC-1	New Slip Liner in 42" Pipe Trunk Line that Runs from Glenwood Pump Station to Cemetery Pump Station	No action yet taken. Include in updated plan.
GC-2	Stream Cleaning/Debris Removal throughout the County	Public Works removed debris via CA DFW permitting near bridges. This requires seasonal action; include in update.
GC-3	Replace Box Culvert with A Bridge or Larger Culvert at Hunter Creek on County Road D, south of County Road 68	No action yet taken. Include in updated plan.
GC-4	Fill in the Road Dip on County Road Y, South of County Road 50	No action yet taken. Include in updated plan.
GC-5	Increase Natural Hazard Education and Risk Awareness	Glenn County RCD has done significant fire risk mitigation education and outreach in Elk Creek.
GC-6	Improve Household Disaster Preparedness	There has been education and outreach on preparedness including by OES.
GC-7	Monitor Drought Conditions	This is completed on an ongoing basis by OES.
GC-8	Develop and enforce water conservation measures during drought conditions	It was determined that the County does not have the legal authority to develop and enforce these kinds of measures. The Building Code Department does enforce all applicable state monitoring requirements including MWELO for new development.
GC-9	Implement and Maintain Fuels Management Program	GCRCD has done this consistently throughout the five-year planning cycle.
GC-10	Work with Dam Owners to develop Dam Failure Study to improve upon flood inundation data in Glenn County and develop/update emergency action plans, as appropriate	Possibly delete, no known progress at this time
GC-11	Hamilton City Flood Control and Ecosystem Restoration Project	The levee has been completed but the ecosystem restoration part is still under work. The levee also needs some patch work to be complete due to recent storms. Project is almost complete, and the levee has performed well when the river is at flood stage.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Mitigation ID	Mitigation Project Title	Status for Plan Update
GC-12	Small Communities Flood Risk Reduction	Completed and approved. This study took est. \$500,000 and 2 years to complete. There were alternatives developed for repairing the levee area north of Butte City, but are expensive.

Table 95 provides a status update for Willows' mitigation actions.

Table 95: Previous Mitigation Actions by Willows

Mitigation ID	Mitigation Project Title	Status for Plan Update
WI-1	Increase Natural Hazard Education and Risk Awareness	Newsletters and Facebook are the most frequent outreach methods. The city issues a monthly newsletter which provides updates on projects and events that occurred in the prior month and advice on what to do in the event of a disaster. Someone recently drove their car through flood water, indicating additional outreach is needed.
WI-2	Improve Household Disaster Preparedness	The city does not actively publicize this but adhering to the building codes adopted since the last plan update can increase preparedness for events.
WI-3	Drought Awareness – Educate City Residents on Water Saving Techniques/ Water Conservation Measures	CalWater has done outreach on this, especially during the recent droughts, including the “imagine a day without water” campaign. Local newspapers and radio commercials have been used to share this information.
WI-4	Slip Liner in 42” Storm Drainpipe Glenwood to GCID Canal (Cemetery Pump Station) 8500 Linear Feet	The City has not pursued this action. Grant funding is needed to pursue this project.
WI-5	Siphon under GCID canal at Sacramento Street (CO Rd 51) Storm Pump Station	The City has not pursued this action. Grant funding is needed to pursue this project.

Table 96 provides a status update for Orland's mitigation actions.

Table 96: Previous Mitigation Actions by Orland

Mitigation ID	Mitigation Project Title	Status for Plan Update
OR-1	Eradicate Arundo in Stony Creek	Glenn County RCD has begun work on this. However, Arundo is very aggressive and keeps coming back. Additional work is needed to reduce or eliminate this risk.

Mitigation ID	Mitigation Project Title	Status for Plan Update
OR-2	Flood Potential Reduction along Stony Creek	This has been implemented and considered ongoing. There has been no new recent construction.
OR-3	Black Butte Dam Failure Inundation	No progress due to limited staffing. This should be accomplished by the Bureau of Reclamation.
OR-4	Improve and Maintain Stormwater Drainage System Capacity	The city has been actively upsizing pipes and completing vegetation management after every event. It is ongoing and additional work is needed.
OR-5	Drought Awareness	The city adopted drought water conservation guidelines by stage. There are four tiers to these measures. Since the last plan update, it has been implemented, and limitations were placed on water use because of drought.
OR-6	Increase Natural Hazard Education and Risk Awareness	This has not been accomplished yet.
OR-7	Improve Household Disaster Preparedness	This has not been accomplished yet.

Mitigation Success Stories

Hamilton City Flood Damage Reduction and Ecosystem Restoration Project

The recently completed Flood Damage Reduction and Ecosystem Restoration project in Hamilton City is a remarkable achievement that has helped the community in many ways.¹⁰² One of the most significant benefits of the new levee system is its ability to protect the locality from atmospheric rivers, which are large-scale weather systems that can bring intense rainfall and cause severe flooding. The new levee system also protects against flooding during severe storms or water-related emergencies, protecting the populace and commercial establishments from potential damage (see Figure 97 and Figure 98).

The upgraded levee system is much more extensive than the previous one, making it more effective. It helps divert excess water from the community, preventing potential damage to residential and commercial properties. The new levee system also helps curtail erosion and sediment buildup in the river, which helps preserve the local environment. This is a significant improvement from the previous system, which was not equipped to handle such intense weather events.

This project is a testament to the community's resilience and commitment to ensuring its members' safety and well-being. It is poised to make a remarkable impact on the area and provide the necessary protection to the community for years to come. It is an excellent example of the importance of investing in infrastructure projects to safeguard communities and the environment, especially in areas prone to severe weather events.

¹⁰² US Army Corps of Engineers Sacramento District Website, "Hamilton City Flood Damage Reduction and Ecosystems Restoration." <https://www.spk.usace.army.mil/Missions/Civil-Works/Hamilton-City/>



Figure 97: Photograph from the Hamilton City Flood Damage Reduction and Ecosystem Restoration Project



Figure 98: Levee as part of the Hamilton City Flood Damage Reduction and Ecosystem Restoration Project

Walker Street Well Project

Orland has been facing water shortage issues because of drought conditions in the region. To address this problem, the city launched a water project for dry wells called the Walker Street Well Project (see Figure 99). The project involved drilling new wells connected to the existing municipal water system. This will help provide a reliable water source to the residents of Orland, even during drought conditions. In

addition, constructing a 1-million-gallon water storage tank will ensure that enough water is available for the entire city, even during prolonged dry spells.¹⁰³

The residents of Orland have praised the project, as it will ensure that they have access to clean and safe drinking water throughout the year. The city officials have also assured the residents that the project will be completed on time and within budget and that it will be maintained properly to ensure its longevity.

Overall, the Orland water project for dry wells is a significant step toward ensuring the sustainability of the city's water supply. It is a great example of how communities can proactively address water shortage issues and provide residents with a reliable water source, even during droughts. The project is scheduled to be finished by the summer of 2024.



Figure 99: Photograph from the Walker Street Well Project

The Upper Stony Creek Arundo Project

The Upper Stony Creek Arundo Project is an initiative to control the spread of invasive *Arundo donax*, commonly known as Giant Reed, in the Upper Stony Creek watershed.¹⁰⁴ The project is a collaborative effort between the Upper Stony Creek Watershed Coalition and other stakeholders, including landowners, farmers, and conservation groups.

Giant Reed is a fast-growing plant that can grow over 20 feet tall, forming dense stands that displace native vegetation, reduce biodiversity, and increase the risk of wildfires (see Figure 100). The Upper Stony Creek watershed is particularly vulnerable to *Arundo* infestation, as the plant thrives in the area's warm and dry climate. The project aims to eradicate *Arundo* from the watershed by employing mechanical, chemical, and biological control methods. These methods include hand cutting, root plowing, herbicide application, and the introduction of a natural enemy of *Arundo*, the *Arundo* wasp.

¹⁰³ Action News, "New well in Orland could help 185 households with or at-risk of dry wells." https://www.actionnewsnow.com/news/local/new-well-in-orland-could-help-185-households-with-or-at-risk-of-dry-wells/article_b2a3cc70-d98a-11ed-85a3-538cd24e599a.html

¹⁰⁴ Glenn County Resource Conservation District, "Upper Stony Creek Arundo Project." <https://www.glenncountyrccd.org/upper-stony-creek-arundo-project>



Figure 100: Giant Reeds at Upper Stony Creek

The Upper Stony Creek Arundo Project has already made significant progress in controlling the spread of Arundo in the watershed. Through the collaborative efforts of the stakeholders, over 2,000 acres of Arundo-infested land have been treated, and the plant's spread has been reduced by over 90% in that area.

The project's success has benefited the ecological health of the Upper Stony Creek watershed and improved the community's safety and well-being. By reducing the risk of wildfires and restoring the watershed's biodiversity, the project has enhanced the quality of life of those who live and work there.

Overall, the Upper Stony Creek Arundo Project is an excellent example of how collaborative efforts can effectively tackle ecological challenges and improve the health of our natural environment.

Prioritizing Mitigation Actions

Not all identified mitigation actions can be implemented in the five-year plan cycle because of technical feasibility, political acceptance, lack of funding, or other constraints. Once the mitigation actions for each participating jurisdiction were identified, they were evaluated and prioritized (high, medium, low) to identify the most suitable mitigation actions for each participating jurisdiction to implement. The STAPLEE method was used to evaluate and prioritize the mitigation actions. The criteria and considerations in this evaluation/prioritization process are identified in Table 97.

Table 97: STAPLEE Method for Evaluating and Prioritizing Mitigation Actions

Evaluation Category	Description	Considerations
<u>S</u>ocial	The public support for the overall mitigation strategy and specific mitigation actions.	<ul style="list-style-type: none"> Community acceptance Adversely affects the population
<u>T</u>echnical	If the mitigation action is technically feasible and if it is the whole or partial solution, it will have minimal secondary impacts.	<ul style="list-style-type: none"> Technical feasibility Long-term solutions Secondary impacts
<u>A</u>ministrative	If the community has the personnel and administrative capabilities necessary to implement the action or whether outside help will be necessary.	<ul style="list-style-type: none"> Staffing Funding allocation Maintenance/operations

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Evaluation Category	Description	Considerations
<u>P</u>olitical	The level of political support for the mitigation action.	<ul style="list-style-type: none"> Political support Local champion Public support
<u>L</u>egal	Whether the community has the legal authority to implement the action or whether the community must pass new regulations.	<ul style="list-style-type: none"> Local, state, and federal authority Potential legal challenges
<u>E</u>conomic	If the action can be funded with current or future internal and external sources, it is cost-effective (benefits outweigh the costs).	<ul style="list-style-type: none"> Benefit/cost of action Contributes to other economic goals Outside funding required
<u>E</u>nvironmental	The impact on the environment because of public desire for a sustainable and environmentally healthy community.	<ul style="list-style-type: none"> Effect on local flora and fauna Consistent with community environmental goals Consistent with local, state, and federal laws

The jurisdictions were asked to use these criteria and the following categories to rate their selected actions.

- 1: Many questions or concerns. Further research, outreach, or engagement is needed to determine if this action would be acceptable.
- 2: Some questions or concerns. This action sounds good, but more information or support is still needed.
- 3: Neutral. There may be questions or concerns, but they are unknown at this time.
- 4: No questions or concerns. The STAPLEE criteria have been considered, and this action addresses them effectively.

The jurisdictions were also asked to prioritize each natural hazard action being retained or created as low, medium, or high, based on the following definitions:

- **High:** Based on five or more STAPLEE criteria, the action is feasible and important for the jurisdiction, with minimal to no concerns. It is very important for the jurisdiction to implement and may be prioritized in the short term.
- **Medium:** Based on three or four STAPLEE criteria, the action is feasible and important for the jurisdiction, with some potential challenges. Its implementation is less urgent than a high-priority action item and can be implemented over time.
- **Low:** Based on one or two STAPLEE criteria, the action is feasible and important for the jurisdiction, with multiple potential challenges. The action should be implemented as funding becomes available.

Mitigation Action Plan

With support from the public, stakeholders, and the IEM planning team, the participating jurisdictions worked with their internal staffs to develop and refine mitigation actions into a Mitigation Action Plan. The plan includes information on each mitigation action and how it was prioritized. At a minimum, per FEMA requirements, the following elements are described for each mitigation action:

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

- **Responsible Agency** – The department or agency is most appropriate to lead each mitigation action.
- **Potential Funding Resources** – Funding mechanisms and other available resources that will be pursued to implement each mitigation action. Local funding sources may include the general operating budget, capital improvement budgets, staff time, impact fees, and special assessment districts.
- **Timeframe** – Identifies when each mitigation action will be started and fully implemented.

The more information that can be provided for the implementation strategy for each mitigation, the easier it will be to develop project scopes of work, schedules, and budgets for FEMA mitigation grant applications. Each mitigation action includes the following additional action implementation elements:

- Hazard addressed
- Vulnerability addressed
- Potential partners
- Existing planning mechanisms
- Cost estimate
- Benefits (losses avoided)
- Useful life of the project

Including this additional information, which is beyond FEMA requirements, provides the start-up information the county and the cities need to begin preparing project applications for potential grant funding and implementation as soon as possible.

The mitigation action plans for Glenn County, the City of Orland, and the City of Willows are in Table 98, 99, and Table 100, respectively.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Table 98: Glenn County Mitigation Action Plan

#	Project Title	Hazard Addressed	Vulnerability Addressed (Including Vulnerable Populations)	Responsible Agency	Potential Partners	Planning Mechanism(s) through Which the Action Will Be Implemented	Potential Funding	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Time-frame	Priority
1	Culvert Replacement on County Road D	Flood, Severe Weather	Flooding on transportation routes	GC Public Works Agency (PWA)	GC Transportation Commission	Public Works Improvements, Hazard Mitigation Plan	Caltrans, transportation funds	TBD	Flood Damage	30 years	1 year	M
Description: Replace box culvert with a bridge or larger culvert at Hunter Creek on County Road D, south of County Road 68												
2	Arundo Reduction in Stony Creek	Wildfire	Homes and potential homeless	County, City, CA Dept. Fish and Wildlife	RCD CalFire	Hazard Mitigation Plan	CalFire, CA DFW, DOI Fuels Management Program	TBD	Fire and Flood Damage, Environmental improvements	Seasonal maintenance	3 years	M
Description: Address arundo in Stony Creek and implement hazardous fuels-reduction programs.												
3	Mobile Home Park Flood Risk Reduction	Flood	Repeated flooding in transient non-permanent housing	Private property in Glenn County	Caltrans	Hazard Mitigation	FMA Grant and/or potential parcel fee Plan	TBD	Flood Damage	Seasonal maintenance	3 years	M
Description: Address flooding to the Willows Mobile Home & RV Park that has experienced frequent flooding.												
4	West Willows Flood Study	Flood	Repeated flooding affecting transportation and shopping	Glenn County, Private property	Caltrans, Caltrans Aeronautics	Hazard Mitigation Plan	FMA or BRIC Grant	TBD	Flood Damage	TBD	3 years	L
Description: Conduct a flood study to identify the source of flooding near west Willows by the Walmart and the airport. This flooding is frequent but tends to resolve itself within 6 hours.												
5	West Orland/ Hambright Creek Bank Repairs	Flood	Residents along Hambright Creek, roadways and bridges	Glenn County PWA	Property Owners, CA DFW, RCD	Hazard Mitigation Plan	FMA or BRIC Grant and/or potential parcel fee	TBD	Flood Damage	Seasonal maintenance	TBD	M
Description: Fix blowout on Hambright Creek where the river overtopped the bank. Anticipating this would reduce the likelihood of repetitive losses in the area.												

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

#	Project Title	Hazard Addressed	Vulnerability Addressed (Including Vulnerable Populations)	Responsible Agency	Potential Partners	Planning Mechanism(s) through Which the Action Will Be Implemented	Potential Funding	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Time-frame	Priority
6	Climate Action Plan	Climate related hazards, Extreme Heat, Drought	Infrastructure, citizens affected by heat related illness, agricultural water supply	County, City, Private	CA OPR, CalFire	Hazard Mitigation Plan	ICARP grant, Adaptation Planning Grant, Community Assistance for Climate Equity	\$150,000	Climate Damage	30 years	1 year	M
Description: Develop a countywide Climate Action Plan.												
7	Master Drainage Plan	Flood	Infrastructure, critical facilities, residences and other structures, citizens, agriculture	County, City	Private Outside agencies	Hazard Mitigation Plan	FMA Grant, General Budget	TBD	Flood Damage	30 years	TBD	M
Description: Develop a countywide Master Drainage Plan.												
8	Floodplain Ordinance Update	Flood	Infrastructure, residences and other structures, citizens, agriculture	County, City	Private Outside agencies	Zoning	PCDSA/PW, General budget	TBD	Flood Damage, Enforced building codes reduce damage to structures.	Annual Review	1 year	M
Description: Update the floodplain ordinance in accordance with FEMA suggestions from the last Assistance Visit (CAV).												
9	Sewer/ Stormwater Subdivision Regulations Upgrade	Flood	Infrastructure, citizens, agriculture, Homes, Businesses, critical facilities, other structures	County, City	RWQCB	Zoning	FMA Grant, General budget	TBD	Flood Damage	30 years	2 years	L
Description: Review the sewer/stormwater subdivision regulations and update them to reduce the risk of impacts from hazards like flooding.												
10	Fuel Reduction Projects	Fire	Multiple critical structures are in proximity to high wildfire risk zones, Infrastructure, citizens, agriculture	RCD, CalFire	RCD, CalFire	Wildfire Plan	FMA Grant, CalFire Wildfire Prevention Grant	TBD	Fire Damage	Seasonal maintenance	Annual	M

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

#	Project Title	Hazard Addressed	Vulnerability Addressed (Including Vulnerable Populations)	Responsible Agency	Potential Partners	Planning Mechanism(s) through Which the Action Will Be Implemented	Potential Funding	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Time-frame	Priority
Description: Work with the Glenn County RCD on wildfire risk reduction projects, such as fuel reduction near Elk Creek.												
11	Wildfire Outreach and Education	Fire	Infrastructure, citizens, agriculture, Prevent loss of life, reduce structural damage	RCD, CalFire	RCD, CalFire	Wildfire Plan	USFS Community Wildfire Defense Grant, CalFire Wildfire Prevention Grant, General budget	TBD	Fire Damage, Increase resident's ability to take appropriate action to reduce their personal wildfire risk.	Seasonal maintenance	Annual	M
Description: Work with the Glenn County RCD on education and outreach projects including educating the public on defensible space, home hardening, and creating fire breaks.												
12	Cooling Center Upgrades	Extreme Heat	Vulnerable populations, outdoor workers, over 65, homeless, those without air conditioning	County, City	Non-Profits	OES	ICARP Grant, General budget	TBD	Prevent or reduce heat related illness or loss of life from heat	10 years	1 year	M
Description: Improve Cooling Centers												
13	Fairgrounds Evacuation Center Upgrade	Most hazards, Extreme Heat, Flood, Geologic Hazards, Wildfire	Vulnerable populations	County, City	Nonprofits	OES	ICARP Grant, General budget	TBD	Prevent or reduce heat-related illness or loss of life from heat	10 years	1 year	M
Description: Work with Fairgrounds to identify and implement improvements to make it suitable as an evacuation center and cooling center. It is currently an evacuation center but lacks showers. which would pose a challenge during hazards like drought if wells were to go dry. If it could become a cooling center, it would also help reduce the risk of extreme heat.												
14	Expand Cooling Center Capacity	Extreme Heat	Vulnerable populations, outdoor workers, over 65, homeless, those without air conditioning	County, City	Non-Profits	OES	ICARP Grant	TBD	Prevent or reduce heat related illness or loss of life from heat	10 years	1 year	M
Description: Increase the capacity of cooling centers and the number of places to use as 24/7 cooling centers. Currently, cooling centers are open 9–5 on weekdays. Transportation also is lacking.												

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

#	Project Title	Hazard Addressed	Vulnerability Addressed (Including Vulnerable Populations)	Responsible Agency	Potential Partners	Planning Mechanism(s) through Which the Action Will Be Implemented	Potential Funding	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Time-frame	Priority
15	Support Flood Mapping	Flood	Multiple Agencies, Prevent damage to infrastructure from flooding.	County, City	PW, OES	FEMA, CVFPP	FMA Grant	Variable	Flood Damage	Requires updating	3 years	M
Description: Support the development of new flood maps and/or a flood zone, especially for Orland south of I-62. In 2016, the flood maps changed as the levee was decertified putting a large segment of the population into flood zone A. Understanding the risk by developing flood maps with flood depths would help.												
16	Conduct Mitigation Education and Awareness Programs	Flood	Multiple Agencies, public survey identified a need to further understand how to reduce risk from hazards on the county.	County, City	RCD, OES	FEMA, CVFPP	Grant, General budget	\$20,000	All hazards, increase resident's ability to take appropriate action to reduce their personal risk.	Undetermined	3 years	L
Description: Conduct education and outreach on hazards, including flood zones and soil types, and why it is important. The public could use additional education on soil types and how they matter, including while building.												
17	County Parcel Project: Automated Megabyte Integration & Parcel Fabric Migration/Update	Flood, Severe Weather, Fire, Drought	Multiple Agencies, lack of data to use for response and recovery activities, including applying for mitigation funding for cost-effective projects	County	OES, Assessor	FEMA, CVFPP	Community/Economic development Grant, CA IBANK or APGP, HMGP 5% initiative, General budget	\$89,000	Foundational datasets used by all county departments. Basis for land management.	Ongoing benefits if data is maintained in house	Short-term	L
Description: Improved land ownership data improves ability to identify potential hazard exposure and impacts.												

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

#	Project Title	Hazard Addressed	Vulnerability Addressed (Including Vulnerable Populations)	Responsible Agency	Potential Partners	Planning Mechanism(s) through Which the Action Will Be Implemented	Potential Funding	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Time-frame	Priority
18	Derived Dataset Acquisition: Building footprints, high accuracy address points, bare earth DEM.	Flood, Severe Weather, Fire, Drought	County, lack of data to use for response and recovery activities, including applying for mitigation funding for cost-effective projects	County Building Division	OES, Assessor	FEMA, CVFPP	Community/Economic development Grant, CA IBANK or APGP, HMGP 5% initiative, General budget	\$30,000	Particular datasets will benefit the county when planning for and analyzing vulnerabilities related to hazards	Ongoing benefits if data is maintained in house	Short-term	L
Description: Improved land ownership data improves ability to identify potential hazard exposure and impacts.												

Table 99: Orland Mitigation Action Plan

#	Project Title	Hazard Addressed	Vulnerability Addressed (Including Vulnerable Populations)	Responsible Agency	Potential Partners	Existing Planning Mechanism(s) through Which the Action Will Be Implemented	Potential Funding	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
1	Eradicate Invasive Species in Stony Creek	Wildfire	Homes, potential homeless populations	County, City, Dept of Fish and Wildlife, Upper Stony Creek Watershed Coalition	Glenn County, CalFire, RCD	CWPP, General Plan	City Fire, CalFire, CA Fish and Wildlife	TBD	Fire, Environmental Improvement)	Seasonal Maintenance	3 years	H
Description: Eradicate invasive species like Arundo near Stony Creek.												
2	Upgrade Undersized Water Systems	Wildfire	Homes, Businesses, critical facilities, other structures	Public Works	Glenn County,	Stormwater Management Plan	Capital Improvement funding, Fees	TBD	Improved fire suppression, reduction in structural loss	30 Years	5 years	M
Description: The current pipes have a reduced capacity to carry the quantity of water necessary for full fire prevention operations. Upgrading these systems will help reduce the loss of life and property from a fire.												

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

#	Project Title	Hazard Addressed	Vulnerability Addressed (Including Vulnerable Populations)	Responsible Agency	Potential Partners	Existing Planning Mechanism(s) through Which the Action Will Be Implemented	Potential Funding	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
3	Increase Natural Hazard Education, Risk Awareness, and Mitigation Knowledge	All Hazards, Wildfire, Flood, Drought, Extreme Heat, Geologic Hazards, Severe Weather	Prevent loss of life, reduce structural damage	City Admin, Planning Department	Glenn County,	General Plan	General Fund	TBD	Increase resident's ability to take appropriate action to reduce their personal risk.	3 years	1 year	M
Description: Provide public workshops and informational brochures at City Hall and Library												
4	Enforce and Update Building Codes	Severe Weather, Geologic Hazards	Reduce structural losses and potential injury or loss of life.	Building Department, Planning Department		General Plan	General Fund	TBD	Enforced building codes reduce damage to structures.	5 years	1 year	M
Description: Enforce current codes protecting homes from hazards like severe weather including promoting underground of power lines in new developments. Update building codes as required by law.												
5	Support the development of a countywide Climate Action Plan	Extreme Heat, Drought	Heat related illness, energy demands, water supply impacts, dry wells	Glenn County	Glenn County, City, RCD, state agencies	General Plan, Safety Element	Grant funding such as ICARP	TBD	Prevent or reduce heat related illness or loss of life from heat, conserve water supply for residential and agricultural use.	10 Years	3 years	M
Description: Work with the County to develop a countywide Climate Action Plan.												
6	Update Storm Drain Master Plan	Flood	Localized flooding	Planning,	Public Works, County	General Plan	General fund, FMA grant	TBD	Reduction in flooding from inadequate stormwater draining	10 years	1 year	M
Description: Update the city's current storm drain master plan.												

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

#	Project Title	Hazard Addressed	Vulnerability Addressed (Including Vulnerable Populations)	Responsible Agency	Potential Partners	Existing Planning Mechanism(s) through Which the Action Will Be Implemented	Potential Funding	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
7	Adopt New Floodplain Ordinance	Flood	Floodplain management	Planning, City Council	Glenn County	General Plan	General Fund	TBD	Ensure policies for reducing flood risk are in place and enforced to reduce potential flood impacts	30 years	1 year	M
Description: Adopt new floodplain ordinance clearly identifying the roles and responsibilities of the floodplain manager in accordance with current floodplain ordinance requirements and language. Continue to encourage minimal development in the SFHA.												
8	Infrastructure Hardening	Flood	Prevent damage to infrastructure from flooding.	Public Works	County, Watershed Management agencies, CA DWR	General Plan	Capital Improvement Funds, FMA grant, BRIC	TBD	Protect critical infrastructure from flood damage, bank erosion, etc.	20 years	5 years	L
Description: Support the hardening of infrastructure such as waterlines, sewer lines, and bridges particularly around Hambright Creek and Stony Creek.												
9	Increase Storage Capacity of City Reservoirs	Drought, Wildfire	Recent drought and dry wells have demonstrated the need to expand city water infrastructure. Water discharge rates need to be slowed down to be used.	City Admin, Planning, Public Works	CA DWR	General Plan	Capital Improvement Funds,	TBD	Maintain adequate residential and agricultural water supply.	30 years	5 years	M
Description: Extend the city's current waterlines as well as implement storage capacity enhancing initiative such as build an aboveground storage tank or drill an additional well to expand the city's municipal water infrastructure. Study the opportunity to slow down water drainage and capture rainwater. Implement groundwater recharge projects as possible.												
10	Assess Cooling Center Needs	Extreme Heat	Increasing number of extreme heat days contributes to heat related illness.	City Admin, Planning	Glenn County, Community volunteer groups, faith-based organizations	General Plan	General funds	TBD	Prevent heat related illness for those without adequate cooling.	10 years	1 year	M

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

#	Project Title	Hazard Addressed	Vulnerability Addressed (Including Vulnerable Populations)	Responsible Agency	Potential Partners	Existing Planning Mechanism(s) through Which the Action Will Be Implemented	Potential Funding	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
Description: Evaluate opportunities for city cooling centers.												

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Table 100: Willows Mitigation Action Plan

#	Project Title	Hazard Addressed	Vulnerability Addressed (Including Vulnerable Populations)	Responsible Agency	Potential Partners	Planning Mechanism(s) through Which the Action Will Be Implemented	Potential Funding	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Time-frame	Priority
1	Increase Natural Hazard Education and Risk Awareness	Flood, Extreme Heat, Drought, Geologic Hazards. Levee Failure, Severe Weather, Wildfire	All citizens, elderly, disabled, non-English speaking. Address gaps in residents' knowledge of how to mitigate risk as described in the public survey.	City of Willows Planning	Glenn County		ICARP, BRIC	Depends on outreach type (flyers, television, radio)	Citizen safety and reduction in loss of property	Yearly	Current/Ongoing	High
Description: Additional outreach and education are needed on safety procedures, evacuation routes and route closures, water conservation measures, and long-term mitigation solutions like how to retrofit a home to reduce the risk of flooding. Updating notification systems also is important. The city's website is being updated and could be expanded to provide additional preparedness and mitigation information.												
2	Acquire Vacuum Truck to Implement Flood Mitigation	Flood, Severe Weather	All citizens, elderly, disabled, non-English speaking. Address high probability of future flood events (near 100%)	City of Willows Public Works	City of Orland		Sewer Fund	\$650,000	Citizen safety, reduction in property loss	10 years	1-2 years	High
Description: Acquire a new vacuum truck to drain the drainage system, including sewer lines, to ensure it is clean and able to withstand a flood without causing a sewer sanitary overflow.												
3	Upgrade Sewer Infrastructure	Flood, Levee Failure, Severe Weather	All citizens, elderly, disabled, non-English speaking. Address high probability of future flood events (~100%)	City of Willows Public Works			BRIC, HMGP, PA Mitigation (406)	\$16 million	Citizen Safety	50-100 years	1-2 Years	High

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

#	Project Title	Hazard Addressed	Vulnerability Addressed (Including Vulnerable Populations)	Responsible Agency	Potential Partners	Planning Mechanism(s) through Which the Action Will Be Implemented	Potential Funding	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Time-frame	Priority
Description: Review and rank sewer infrastructure and upgrade the most vulnerable infrastructure to reduce risk of flooding including adding new lift systems. These pipes are at risk of being infiltrated during a flood event. This project would include more project scoping and construction. All of the lift systems should be upgraded as well as to avoid sewer overflow.												
4	Increase Fuels Reduction	Drought, Wildfire	All citizens, elderly, disabled, non-English speaking. Address potential for wildfire risk, including disruption in services and undeveloped land around the city.	Fire Department	Other Fire Districts in Glenn County		General Fund		Citizen safety, reduction in property loss	Ongoing	Current and ongoing	High
Description: Increase fuel reduction projects through the Fire Department and Public Works crews. Expand the Fire Department's weed abatement program. Recent drought has increased this risk.												
5	Upgrade Cooling Center	Extreme Heat	All citizens, elderly, disabled, non-English speaking. Address Willows' increased risk of extreme heat because of the higher density of housing and concrete than in other parts of the county by providing safe sites for citizens.	City of Willows	Glenn County and City of Orland		General Fund, ICARP (Extreme Heat and Community Resilience Program)		Reduce heat stroke and other heat related illness	\$70,000	February 2023	High
Description: Pursue funding to upgrade the duct system in the city's cooling center as debris comes out of them when the AC is on. Ensure any cooling center is upgraded, including proper HVAC as needed. Consider opportunities to identify and modify new cooling centers as necessary.												

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

#	Project Title	Hazard Addressed	Vulnerability Addressed (Including Vulnerable Populations)	Responsible Agency	Potential Partners	Planning Mechanism(s) through Which the Action Will Be Implemented	Potential Funding	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Time-frame	Priority
6	Ditch Cleaning	Flood	All citizens, elderly, disabled, non-English speaking. Address high probability of future flood events (~100%)	City of Willows Public Works, Glenn County, GCID	Glenn County, GCID		General Fund		Citizen safety, reduction in property loss		Ongoing	High
Description: Clean ditches were needed.												
7	Siphon Under GCID Canal at Sacramento Street (Co Rd 51) Storm Pump Station	Flood	All citizens, elderly, disabled, non-English speaking. Address high probability of future flood events (~100%)	City of Willows Public Works, GCID			HMGP, BRIC		Citizen safety, reduction in property loss	unknown	5+ years dependent on flooding	Medium
Description: Reduce flooding by adding a siphon under GCID Canal at Sacramento Street (CR 51) Storm Pump Station.												

Section 6. Plan Maintenance

As this document is a living document, it is important that it become a tool in the county's and cities' resources to ensure minimal damage in the event of a natural disaster. This section discusses the adoption and implementation of the plan and the processes for monitoring, evaluating, and updating the MJHMP, to ensure that it remains relevant and continues to address the changing environment in the county and cities. In addition, this section describes how the MJHMP will be incorporated into the planning mechanisms of Glenn County and the Cities of Orland and Willows and how they will continue to engage the public.

Plan Adoption

To comply with DMA 2000, Glenn County, Orland, and Willows will officially adopt the 2025 Glenn County, California, MJHMP within one year of receiving FEMA Approval Pending Adoption status. The adoption of the MJHMP recognizes the county's and cities' commitment to reducing the impacts of natural hazards in Glenn County.

Continued Public Participation

As they did during the development of the MJHMP, the jurisdiction participants will involve the public during the monitoring, evaluating, and updating of the MJHMP through various public workshops and meetings. Information on upcoming public events related to the MJHMP or solicitation for comments will be announced through newsletters, newspapers, mailings, and on the County website (<http://www.countyofglenn.net>). An electronic copy of the current MJHMP will be accessible through the Glenn County website, with a hard copy available for review at the Glenn County Department of Planning and Public Works' office. All relevant comments will be incorporated when appropriate, including in the next plan update.

During the development of this MJHMP, there was very little public involvement, despite the efforts to engage the public. In the future, additional efforts can be targeted toward community groups and other community events or meetings. Further outreach could be completed with AFN communities specifically. Starting the update sooner will provide opportunities for increased outreach and public engagement.

Plan Integration

Another important implementation mechanism is to incorporate the recommendations and underlying principles of the MJHMP into other community planning mechanisms, such as local land use development and community decision-making, including budgets, comprehensive plans, capital improvement plans, or other long-range plans, codes, and ordinances. Mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. This collaborative effort is also important for monitoring funding opportunities that can be leveraged to implement the mitigation actions.

Integration of Previous Plans

As part of the plan update process, the jurisdictions evaluated how the prior plan was integrated into other planning mechanisms. This discussion included any type of plan integration, such as the following:

- The integration of the hazards to which the community is vulnerable;

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

- The data and analysis presented in the risk assessment;
- The goals of the mitigation plan; and
- Potential projects or actions to carry out.

Table 101 lists the documents into which the prior plan was integrated.

Table 101: Previous Plan Integration

Jurisdiction	Plan Name	Description
Glenn County	Glenn County Operational Area Emergency Operations Plan	Incorporated the LHMP into the OA EOP under Annex M – Mitigation. The Annex then refers all mitigations to the LHMP.
City of Orland	General Plan – Safety Element	Text was added to the General Plan Safety Element recognizing the MJHMP and expressing the city's support of the plan and its contents
City of Willows	None	The prior plan was referenced as part of the Safety Element and added on the homepage for reference. The intent of the plan, including efforts to reduce flood risk through preventative measures, was incorporated into the daily routine of staff members.

Future Plan Integration

Table 102 lists the plans into which the 2025 MJHMP will be integrated.

Table 102: Future Plan Integration Opportunities

Jurisdiction	Plan Name	Description
Glenn County	Climate Action Plan	The county is pursuing funding to support the development of a Climate Action Plan. If this plan is funded, it would be developed by the PCDSA, which also led the MJHMP update. The staff who participated in the MJHMP will be responsible for sharing relevant information with the Climate Action Plan planning team.
City of Orland	None	No plans were identified for Orland. Because it is a small jurisdiction, plans are not updated on a frequent basis. If future plans such as the Climate Action Plan, are implemented, there could be opportunities for plan integration.
City of Willows	Capital Improvement Plan	This plan is updated annually and may include references to actions in the MJHMP, including stormwater infrastructure improvements. The City Engineer is responsible for updating this plan and participated in the MJHMP update. Therefore, he will be familiar with the contents of the MJHMP and be able to integrate it as necessary during the Capital Improvement Plan update.

Monitoring, Evaluating and Updating the Plan

This section describes the schedule and process for monitoring, evaluating, and updating the MJHMP.

Schedule

Monitoring the progress of the mitigation actions will continue until the next update of the MJHMP. The participating jurisdictions will meet annually to monitor the status of the mitigation actions. This review will take place on or near the anniversary of the adoption of the plan. Any updates can be shared with the Glenn County Board of Supervisors and the City Councils.

The MJHMP will be updated every five years, as required by DMA 2000. The update process will begin at least two years before approval of the 2025 MJHMP expires. Additional time may be allocated to acquiring a grant to support the next plan update. The PCDSA will help facilitate these discussions and identify the best available grant funding mechanisms at the time of the next plan update.

Should a significant disaster occur in the county before the next plan update, the participating jurisdictions will reconvene within 30 days of the disaster to review and update the MJHMP, as appropriate. The Glenn County Board of Supervisors and the City Councils of Orland and Willows will adopt written updates to the MJHMP. The next update will be adopted before this plan expires, ensuring that the communities remain eligible for mitigation grants.

Process

The Glenn County Planning & Community Development Services Agency (PCDSA) will coordinate with responsible departments/agencies/organizations identified for each mitigation action. These responsible agencies/organizations will monitor and evaluate the progress made in implementing mitigation actions and report to the participating jurisdiction on an annual basis. Working together, the participating jurisdictions will assess the effectiveness of the mitigation actions and modify the mitigation actions as appropriate. A MJHMP Mitigation Action Progress Report worksheet, provided in Appendix A has been developed as part of this MJHMP to assist the jurisdictions in reporting on the status and assessing the effectiveness of the mitigation actions.

Information culled from the annual meeting to monitor mitigation actions can be used for the annual evaluation of the MJHMP. The following questions will be considered as criteria for evaluating the effectiveness of the MJHMP and its actions:

- Has the mitigation action been completed?
- Has the nature or magnitude of hazards affecting the county changed?
- Are there new hazards that can impact the county?
- Do the goals and actions address current and expected conditions?
- Have mitigation actions been implemented or completed?
- Have the mitigation actions led to the expected outcomes?
- Are current resources adequate to implement the MJHMP?
- Should additional local resources be committed to addressing identified hazards?

An Annual MJHMP Review Questionnaire worksheet, also provided in Appendix A was developed as part of this MJHMP to provide guidance on what should be included in the evaluation.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Future updates to the MJHMP will account for any new hazard vulnerabilities, special circumstances, or new information that becomes available. Possible opportunities to expand the planning process include addressing human-made and technological hazards, such as hazardous materials and transportation incidents, and using events and festivals sponsored by others to engage the public. Issues that arise during monitoring and evaluating the MJHMP, which require changes to the risk assessment, mitigation strategy, and other components of the MJHMP, also will be incorporated into the next update of the Glenn County MJHMP in 2029.

Appendix A: Plan Maintenance Resources

Glenn County MJHMP Annual MJHMP Review Questionnaire

Plan Section	Question	Yes	No	Comments
Planning Process	Have there been local staffing changes that would warrant inviting different members to the planning team?			
	Are there procedures (e.g., meeting announcements, plan updates) that can be done more efficiently?			
	Are there any representatives of essential organizations who have not fully participated in the planning and implementation of actions? If so, can someone else from this organization commit to the implementation team?			
	Has the Steering Committee undertaken any public outreach activities regarding the MJHMP or implementation of mitigation actions?			
Hazard Profiles	Has a natural and/or human-caused disaster occurred in this reporting period?			
	Are there natural and/or human-caused hazards that have not been addressed in this MJHMP and should be?			

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix A: Plan Maintenance Resources

Plan Section	Question	Yes	No	Comments
	Are additional maps/data or new hazards studies available? If so, what have they revealed?			
Vulnerability Analysis	Are there new critical facilities or infrastructure that should be added to the asset lists?			
	How will the vulnerability analysis be affected by additional maps/data or new hazard studies?			
	Have there been changes in development patterns that could influence the effects of hazards or create additional risks?			
	Has the vulnerability analysis changed as a result of implementing mitigation actions?			
	Are there different or additional resources (financial, technical, and human) that are now available for mitigation planning?			
	Is the goal still applicable?			
	Should new mitigation actions be added to the Mitigation Action Plan?			

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix A: Plan Maintenance Resources

Plan Section	Question	Yes	No	Comments
Mitigation Strategy	What mitigation actions have proven effective?			
	What has proven not effective?			
	Should the mitigation actions in the Mitigation Action Plan be reprioritized, deleted, or revised?			
	Are the mitigation actions in the Mitigation Action Plan appropriate for available resources?			
Planning Mechanisms	Has the Mitigation Action plan been incorporated into existing planning mechanisms? If yes, please list the planning mechanisms and say how the plan has been incorporated.			
	Has the Mitigation Action plan incorporated existing planning mechanisms? If yes, please list these existing planning mechanisms and indicate the elements that were incorporated and how.			

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix A: Plan Maintenance Resources

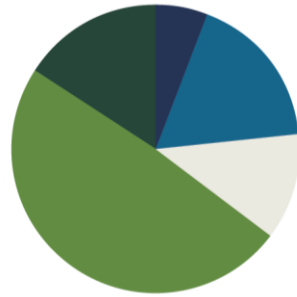
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Appendix B: Public Outreach

The following graphics summarize the results of the Risk Assessment public survey.

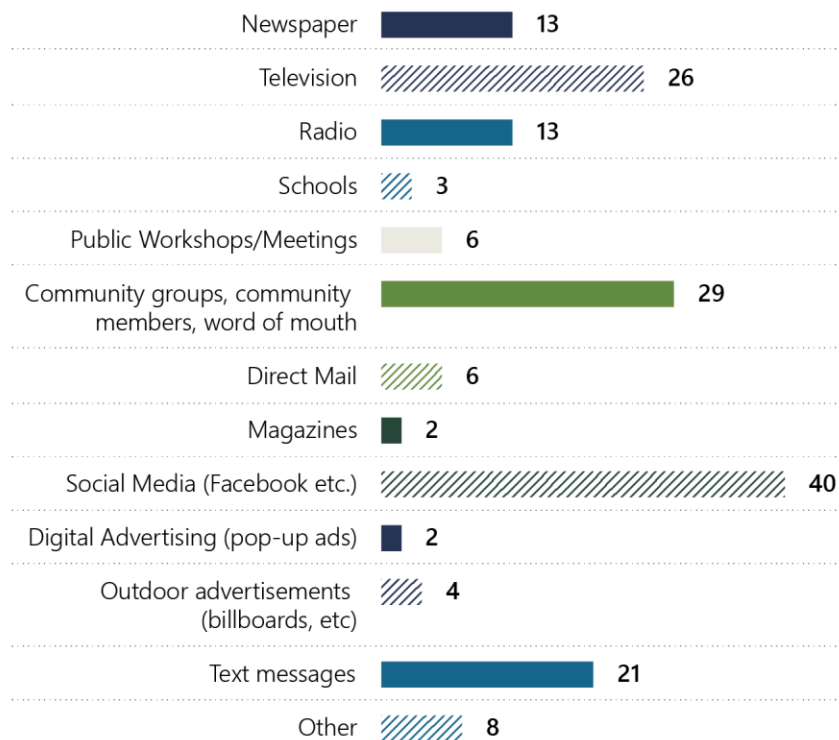
2 How familiar are you with hazard mitigation?

Not at all familiar	3
Not very familiar	9
Not sure	6
Somewhat familiar	25
Very familiar	8



Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix B: Public Outreach

3 How do you get information about the hazards that could impact your community and steps to reduce your risk? Check any that apply.



4

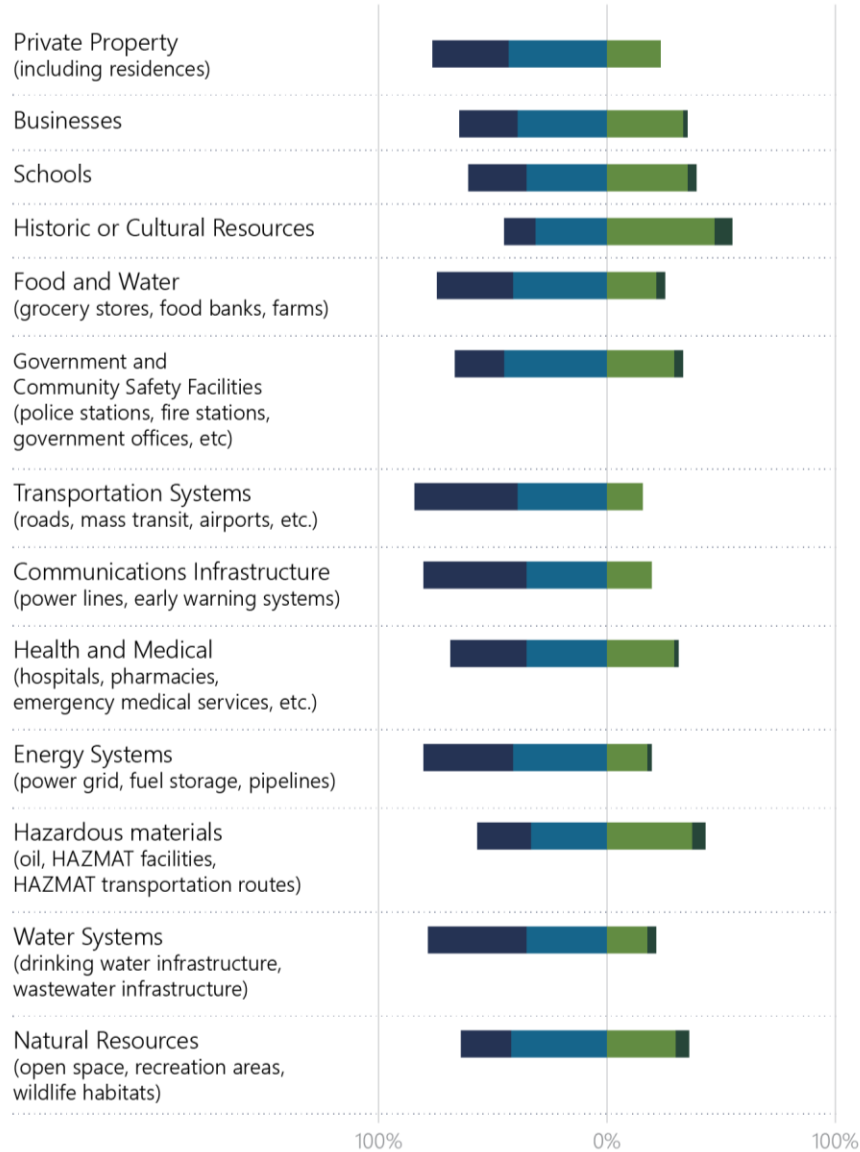
I receive enough information on the hazards that threaten my community and understand how to reduce my risk from future disasters.

- I **receive enough information** on the hazards that threaten my community and **understand** how to reduce my risk from future disasters. 20
- I **receive enough information** on the hazards that threaten my community but **don't understand** how I can reduce my risk from future disasters. 5
- I **do not receive enough information** on my local hazards, but I **understand** how I can reduce my risk from future disasters. 15
- I **do not receive enough information** on my local hazards, and I **do not understand** how I can reduce my risk from future disasters. 11



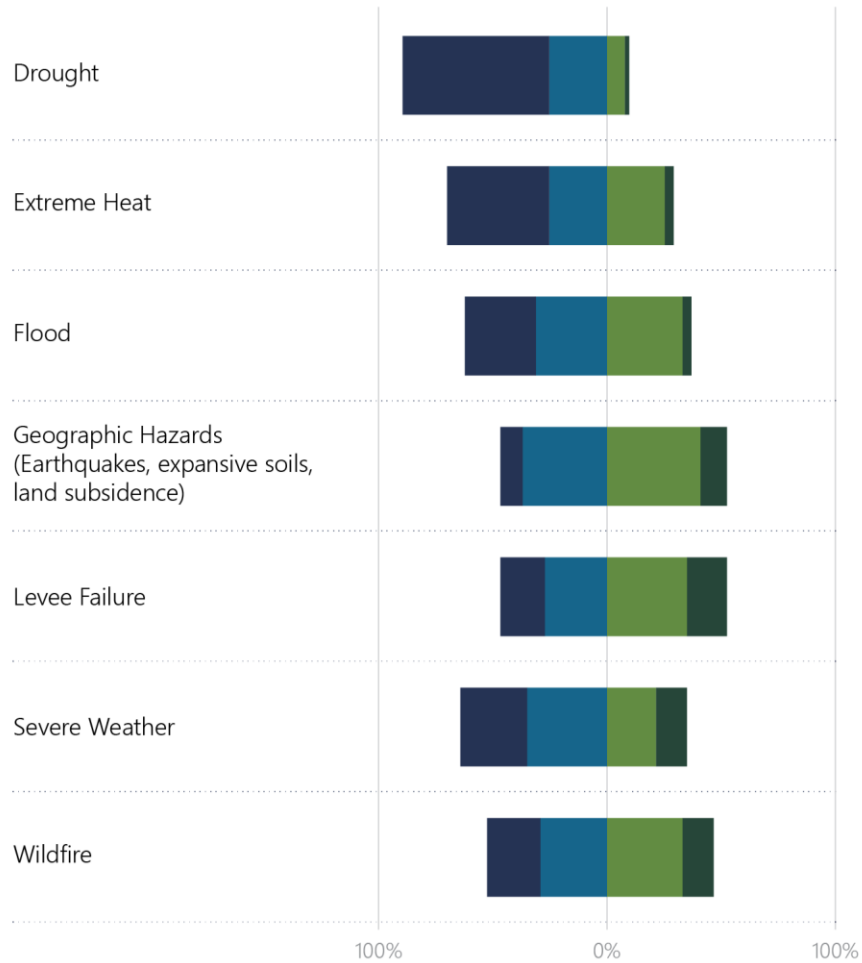
5 What types of assets are most at risk from these kinds of hazards in your community?

● High Risk ● Medium Risk ● Low Risk ● Not at risk



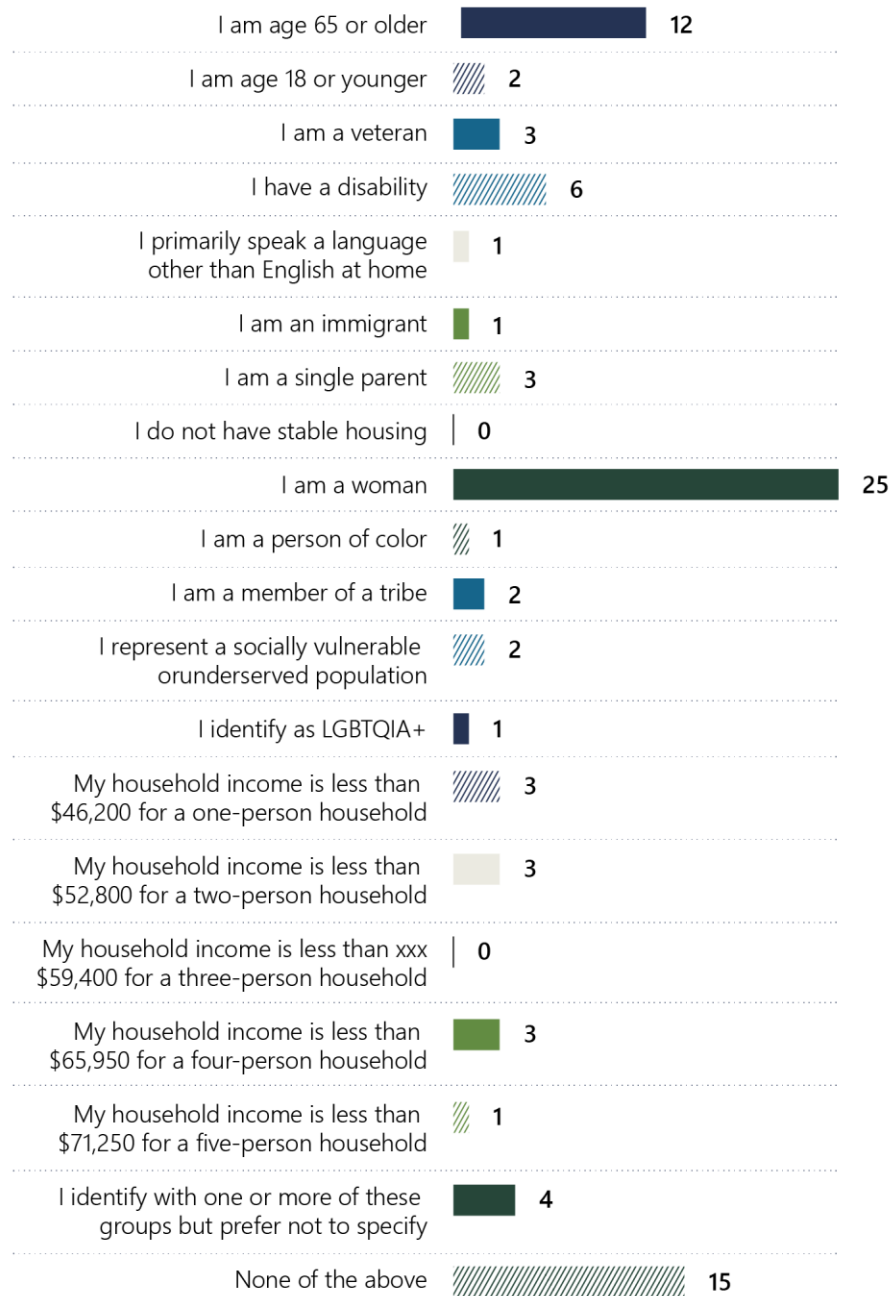
6 How concerned are you about the following hazards impacting your community?

Very Concerned Somewhat concerned Neutral I don't think this will impact my community



Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix B: Public Outreach

**9 Which of the following statements applies to you?
Check all that apply.**



The survey form follows.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix B: Public Outreach

WE NEED YOUR HELP:



Glenn County Multi-Jurisdiction Hazard Mitigation Plan 2024 Update

Glenn County, the City of Willows, and the City of Orland are currently updating their Multi-Jurisdiction Hazard Mitigation Plan and we need your help understanding what areas at risk from natural hazards that could impact your community.

Q1. Where do you live or work? Circle all that apply.

- ☒ Glenn County (unincorporated)
- ☒ City of Willows
- ☐ City of Orland
- ☐ Other (please list)

Q2. How familiar are you with hazard mitigation? Circle the answer.

1. Not at all familiar
2. Not very familiar
3. Not sure
- ☒ 4. Somewhat familiar
5. Very familiar

Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards.

Q3. How do you get information about the hazards that could impact your community and steps to reduce your risk? Circle all that apply.

- ☒ Newspaper
- ☒ Television
- ☐ Radio
- ☐ Schools
- ☐ Public Workshops/Meetings
- ☒ Community Groups, Community Members, Word of Mouth
- ☒ Direct Mail
- ☐ Magazines
- ☒ Social Media (Facebook, etc.)
- ☐ Digital Advertising (pop-up ads)
- ☐ Outdoor advertisements (billboards, etc.)
- ☒ Text messages
- ☐ Other (please specify)

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Appendix B: Public Outreach

Glenn County Multi-Jurisdiction Hazard Mitigation Plan 2024 Update Risk Assessment and Capabilities Meeting 1/18/2024

Q4. How would you rate the effectiveness of disaster-related public education and awareness activities in your community? Circle the answer.

- ☐ I receive enough information on the hazards that threaten my community and understand how to reduce my risk from future disasters.
- ☐ I receive enough information on the hazards that threaten my community but don't understand how I can reduce my risk from future disasters.
- ☒ I do not receive enough information on my local hazards, but I understand how I can reduce my risk from future disasters.
- ☐ I do not receive enough information on my local hazards, and I do not understand how I can reduce my risk from future disasters.

Q5. How concerned are you about the following hazards impacting your community? Circle the answer.

Drought

- ☒ Very concerned
- ☐ Somewhat concerned
- ☐ Neutral
- ☐ I don't think this will impact my community.

Extreme Heat

- ☒ Very concerned
- ☐ Somewhat concerned
- ☐ Neutral
- ☐ I don't think this will impact my community.

Flood

- ☒ Very concerned
- ☐ Somewhat concerned
- ☐ Neutral
- ☐ I don't think this will impact my community.

Geologic Hazards (Earthquakes/Expansive Soils/Land Subsidence)

- ☐ Very concerned
- ☒ Somewhat concerned
- ☐ Neutral
- ☐ I don't think this will impact my community.

Levee Failure

- ☐ Very concerned
- ☒ Somewhat concerned
- ☐ Neutral
- ☐ I don't think this will impact my community.

Severe Weather

- ☐ Very concerned
- ☒ Somewhat concerned
- ☐ Neutral
- ☐ I don't think this will impact my community.

Wildfire

- ☐ Very concerned
- ☒ Somewhat concerned

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

Appendix B: Public Outreach

Glenn County Multi-Jurisdiction Hazard Mitigation Plan 2024 Update Risk Assessment and Capabilities Meeting 1/18/2024

- Neutral
- I don't think this will impact my community.

Q6. What types of assets are most at risk from these kinds of hazards in your community? Circle the answer.

- ☒ Private property (including residents)
 - High Risk, Medium Risk, Low Risk, Not at Risk
- ☒ Businesses
 - High Risk, Medium Risk, Low Risk, Not at Risk
- ☒ Schools
 - High Risk, Medium Risk, Low Risk, Not at Risk
- Historic/Cultural resources
 - High Risk, Medium Risk, Low Risk, Not at Risk
- ☒ Food and water (grocery stores, food banks, farms)
 - High Risk, Medium Risk, Low Risk, Not at Risk
- ☒ Government and Community Safety Facilities (police stations, fire stations, government offices, etc.)
 - High Risk, Medium Risk, Low Risk, Not at Risk
- ☒ Transportation systems (roads, mass transit, airports, etc.)
 - High Risk, Medium Risk, Low Risk, Not at Risk
- ☒ Communications infrastructure (power lines, early warning systems, etc.)
 - High Risk, Medium Risk, Low Risk, Not at Risk
- ☒ Health and medical (hospitals, pharmacies, emergency medical services, etc.)
 - High Risk, Medium Risk, Low Risk, Not at Risk
- ☒ Energy systems (power grid, fuel storage, pipelines)
 - High Risk, Medium Risk, Low Risk, Not at Risk
- ☒ Hazardous materials (oil, HAZMAT facilities, HAZMAT transportation routes)
 - High Risk, Medium Risk, Low Risk, Not at Risk
- ☒ Water systems (drinking water infrastructure, wastewater infrastructure)
 - High Risk, Medium Risk, Low Risk, Not at Risk
- ☒ Natural resources (open space, recreation areas, wildlife habitats)
 - High Risk, Medium Risk, Low Risk, Not at Risk

Q7. What parts of your community (including buildings, people, economic activities and events, and natural areas) are most at risk to these hazards? Please be specific, if known.

see Q6 (above)

Q8. Which of the following statements applies to your work? Circle all that apply.

- I work for the County, City of Willows, or City of Orland.
- I work for a special district within Glenn County.
- I work for a state or federal agency that operates in Glenn County.
- I work for a neighboring jurisdiction.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix B: Public Outreach

Glenn County Multi-Jurisdiction Hazard Mitigation Plan 2024 Update
Risk Assessment and Capabilities Meeting 1/18/2024

- ☒ I work for a non-profit or community-based organization in Glenn County.
- ☐ I work for a business in Glenn County.
- ☐ I work for a school or university in Glenn County.
- ☐ I'm a Glenn County resident
- ☐ None of the above.

Q9. Which of the following statements applies to you? Circle all that apply.

- ☒ I am age 65 or older.
- ☐ I am age 18 or younger.
- ☐ I am a veteran.
- ☒ I have a disability.
- ☐ I primarily speak a language other than English at home.
- ☐ I am an immigrant.
- ☐ I am a single parent.
- ☐ I do not have stable housing.
- ☒ I am a woman.
- ☐ I am a person of color.
- ☐ I am a member of a tribe.
- ☐ I represent a socially vulnerable or underserved population.
- ☐ I identify as LGBTQIA+.
- ☐ My family income is less than \$46,200 for a one-person family.
- ☐ My family income is less than \$52,800 for a two-person family.
- ☐ My family income is less than \$59,400 for a three-person family.
- ☐ My family income is less than \$65,950 for a four-person family.
- ☐ My family income is less than \$71,250 for a five-person family.
- ☐ I identify with one or more of these groups but prefer not to specify.
- ☐ None of the above.

Q10. Are you interested in learning more about hazard mitigation or participating in future projects? If so, please provide your contact information.

No

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix B: Public Outreach

Table 103 includes further details about specific suggestions received from the public. For consistency, comments on hazardous materials and transportation incidents are not included in this summary. While the jurisdictions are concerned about these issues, they elected to focus on natural hazards for the MJHMP update. Moreover, feedback like “unsure” or “unknown” was excluded from this summary, as no response was required.

Table 103: Summary of Public Comments Received

Public Comment	How Was This Feedback Incorporated into the Plan?
What parts of your community (including buildings, people, economic activities and events, and natural areas) are most at risk of these hazards? Please list specific examples or locations, if known.	
Dry wells	This was also brought up as a concern by the plan participants and is discussed in detail in the Drought hazard profile. Mitigation measures that have been taken are also addressed in the Capability Assessment and Mitigation Strategy sections.
Black Butte dam	The risk from this dam is discussed in the Flood hazard profile.
Flooding	Flooding was also identified as a hazard of concern by the plan participants and is discussed further in the Flood hazard profile as well as the
People and residences	People and residences are addressed in each hazard profile. In addition, the jurisdictions have selected actions to reduce the risk to people and residences, including actions to protect people like expanding cooling centers.
The access and functional needs population is very vulnerable in our community. Elk Creek is often very impacted by both floods and PSPS [Public Safety Power Shutdowns]. Capay Rancho is highly impacted by drought. Hamilton City could be heavily impacted should our levees be damaged. Glenn County has a very compromised medical health system. Our hospital is always struggling, and as a community, we struggle to have access to primary care providers.	These risks are discussed throughout the hazard profiles. In addition, representatives of the health and medical community, including stakeholders who work with access and functional needs population, participated in the plan update.
County roads – KK and many others	County roads at risk are identified and the county has identified an action to reduce the risk of flooding on a county road of concern.
Flooding being my main concern: Road & utility infrastructure; property adjacent to flood plains and waterways. FEMA maps should point you to the trouble areas.	Flooding was also a concern of the plan participants which is reflected in the Flood hazard profile and in the actions selected. FEMA maps and the challenges associated with not having a base flood elevation (BFE) established in certain areas were also discussed as a part of the Capability Assessment.
Flooding of Hambright Creek and those citizens that live near the creek when it floods.	Flooding was also a concern of the plan participants which is reflected in the Flood hazard profile and in the actions selected.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix B: Public Outreach

Public Comment	How Was This Feedback Incorporated into the Plan?
Our water system is at risk. People with wells have already had problems, and the hazardous waste from Orland Cleaners has put our water at great risk.	Steps the City of Orland has taken to address water challenges is included in the Capability Assessment.
People and property.	People and property are addressed in each hazard profile. In addition, the jurisdictions have selected actions to reduce the risk to people and property, including actions to protect people, such as expanding cooling centers.
Perimeter of town near agricultural areas, flooding can occur, the homeless have started fires near our neighborhood at their encampment.	The risk from wildfire in Stony Creek including from the unhoused population there was discussed as a part of this update. Reducing fuel in this area was selected as a mitigation action by some jurisdictions.
Anybody with a well located near an orchard is at risk of not having water. The hospital is old, and there is only 1, leaving emergency health needs at risk. The heat is damaging and leaving residents with little water when orchards are sucking up the resource.	Dry wells were a concern of the plan participants as well and were addressed in the Drought profile. Efforts to reduce this risk were addressed throughout the plan. Health and medical stakeholders were invited to participate in the plan update.
Levee break on the canal, street flooding, and hazardous chemicals from a fertilizer plant south of Willows	Levees are addressed in the Levee Failure section; hazardous material releases were not profiled as part of this plan update.
Water supply, particularly groundwater.	Water supply is addressed in the Drought profile, including steps that have been taken to address this issue.
Stony Creek	Stony Creek was identified as an area of concern for Wildfire and Flood. Actions were identified to address this risk.
people	Vulnerable populations were also addressed as part of this update. Specific actions, including steps to reduce the risk to people from hazards like Extreme Heat, were identified by each jurisdiction.
Earthquakes in any part of the town, canals, PG&E lines, telephone towers.	Earthquakes
People, drought, lack of water.	Specifics actions were identified by each jurisdiction to reduce the risk to people, including from hazards like
Above-ground utility lines	This was discussed as a potential action by the jurisdictions. Some work is already being done by the City of Willows, including tree trimming, which was discussed in the Capability Assessment section.
Open farmland flooding (without crops); neighboring property eucalyptus trees within 40 feet of homes and outdoor residence propane tanks.	This was shared with the participants, but no further integration opportunity was identified. Additional information on this concern may be needed.
The towns of Hamilton City and Willows due to flooding.	Flooding was noted as a concern for both these communities and is addressed in the Flood hazard profile as well as the actions selected by the county and Willows.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix B: Public Outreach

Public Comment	How Was This Feedback Incorporated into the Plan?
Private residences near Road P and HWY32 areas.	This information was noted and shared with the plan participants. No actions were selected at this time.
Flooding	Flooding was a concern of the plan participants as well. It was addressed in the Flood profile and in multiple mitigation actions for each jurisdiction.
Fire due to not maintaining defensible space.	This was discussed by the plan participants and additional actions, including education and outreach on defensible space and/or supporting fuel reduction, was selected by each jurisdiction.
Food retailers	More information is needed on this feedback. The plan participants did discuss this as a vulnerability, and Glenn County did identify an action on planning to address stormwater management around the community, including areas which would benefit food retailers.
Willows Springs Senior Housing 1340 W Sycamore. The property has a space next to the freeway that gets overgrown every year and becomes a fire danger. The fire dept tries to abate it by using it as a training area, but they never give us warning at the office. The heat and risk are way too close for some of us, who cannot move very fast and have breathing problems. It also has homeless people starting to hide in there. The canal that is back there has so many weeds and garbage in it.	This was discussed at the stakeholder meeting. No actions were selected at this time.
Low lying areas during high rain accumulations.	Flooding was also a concern of the plan participants and was addressed
Walmart All subdivisions on outskirts of town.	This comment was discussed and the county identified an action to address flooding through the development of a Master Drainage Plan.
Most at risk are those that cannot obtain normal social determinate of health and in disaster do not have resources or plans.	This plan update included a discussion of vulnerable populations. Future updates may include additional targeted outreach.
Buildings	The risk to buildings was addressed in each hazard profile.
Foothills	The risk to the foothills was discussed where applicable, particularly in the Wildfire section.
Power Grid Potable Water	This was discussed by the plan participants. Water shortages are addressed in the Drought profile and associated actions.
Older buildings. Government	Older infrastructure was discussed where that would pose a concern, such as in the Extreme Heat section. Government infrastructure was also assessed, and this vulnerability was described in the Risk Assessment.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix B: Public Outreach

Public Comment	How Was This Feedback Incorporated into the Plan?
People due to heat or cold	This was also a concern of the plan participants. Multiple jurisdictions identified actions to reduce the risk of Extreme Heat on people by having operational cooling centers.
Infrastructure	Structure and infrastructure projects were considered by the plan participants.
Riverside properties. National Forest	Riverside properties were mapped and discussed in the Flood profile, including community lifelines. The National Forest was discussed in the Wildfire section. Ultimately, the jurisdictions do not have the legal authority to implement mitigation actions in the National Forest.
Drought – all area farmers and ag-related industry; Fires – western part of the county, foothills, forest; Flooding – eastern Glenn County near the river.	These hazards were addressed in the associated hazard profiles.
Sacramento valley milling buildings in Ord Bend Wilbur Ellis yard in Ord Bend Road 29 levee River flooding	This was discussed at the stakeholder meeting. This has been noted. Further follow-up may be needed to determine how to mitigate these sites effectively. Some actions were selected for riverine flooding.
Transportation routes from flooding. County Road 99w and Highway 162	This was discussed at the stakeholder meeting. This has been noted. Further follow-up may be needed to determine how to mitigate these sites effectively. The county selected an action on stormwater management planning, which may support this in the future.
What at-risk areas (including structures, infrastructures, and natural areas) or people in your community would you like to see protected from future disasters? Be specific, if known.	
Generic Elementary School needs to be rebuilt outside of floodplain.	Unsure what this is referencing.
SR 162 east of Willows floods	Flood risk is noted in the Flood profile. Furthermore, the county and Willows selected actions to reduce flood risk.
99 between Orland and Willows flooding	Flood risk is noted in the Flood profile. The county also
Flood Mitigation for the Count and Cities, cleaning of creeks and streams. Fire mitigation in the foothills and National Forest, control burns, logging, grazing. Infrastructure maintenance and repair: county and city power supplies primary and backup, water lines, bridges, roads, etc.	Flood mitigation concerns were noted, and the county chose to develop a Master Drainage Plan to address these concerns. Additional flood mitigation measures were selected by the cities.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix B: Public Outreach

Public Comment	How Was This Feedback Incorporated into the Plan?
Hambright creek from county road 200 to county road H was cleaned as needed. The county had a blanket policy in place that would allow the road department to clean areas of flooding concern. What happened, I have no clue, but last year we had many creek banks fail along the creek, causing major damage to home owners. I am sure Glenn County has a pretty tight budget, so I think making Hambright Creek a storm district and people pay their fair share within the district to help from flooding. Right now, there is so much overgrown bamboo and other vegetation clogging the creek as well as blown out banks or very weak spots along the creek that a good run of water is bound to repeat what happened last year. Thank You.	This has been noted, and Hambright Creek was identified as a potential flood concern.
Highway 99 between road 48 and road 45 constantly floods and has to be closed making it difficult to get town and slows down emergency personnel. It also takes months for county personnel to get it cleared up.	Flood mitigation concerns were noted, and the county chose to develop a Master Drainage Plan to address these kinds of concerns.
1. The dips on Broadway and 2nd Street in Hamilton City are prone to flooding, consistently impeded, and foot traffic blocked. 2. There is also flooding on Los Robles and 1st Avenue in Hamilton City due to the lack of in-ground drainage.	Flood mitigation concerns were noted, and the county chose to develop a Master Drainage Plan to address these kinds of concerns.
County Road T has massive potholes that fill with water and they are so hard to see when it rains. The "S" turn on Road 39 floods often. Walmart in Willows has always been a huge flood zone.	This concern was discussed, including the ongoing flooding during the plan update process. The county selected to develop a Master Drainage Plan to address these kinds of concerns.
Modoc Street in Orland flood due to not enough drainage.	This is noted.
Roads	Roads are evaluated throughout the plan update.
Everyone should be protected from hazards that is the right thing to do.	The participating jurisdictions support mitigation measures to protect everyone from hazards.
Hwy 162 and Airport Rd. The flooding that often occurs near and at Walmart.	This concern was discussed, including the ongoing flooding during the plan update process. The county selected to develop a Master Drainage Plan to address these kinds of concerns.
Highway 99W heading north from Willows. It floods nearly every year, and people always try to drive through it, resulting in stuck vehicles.	Flood mitigation concerns were noted and the county chose to develop a Master Drainage Plan to address these kinds of concerns.
First is the Arundo and Stony Creek that has threatened the community of Orland over a dozen times.	This hazard was discussed by the plan participants and Orland selected a mitigation action to address this.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix B: Public Outreach

Public Comment	How Was This Feedback Incorporated into the Plan?
Co Rd 25 at the dip, Co Rd 48/47, Co Rd 45 from Co Rd 99- Co Rd J, Co Rd 99 from Co Rd 48 to Co Rd 39	Assuming this relates to flooding – the county selected to develop a Master Drainage Plan to address these kinds of concerns.
Stony Creek preservation would benefit most of Orland. Parts of it flood and threaten evacuation routes and homes. The parts that don't flood over get overgrown fire fuels. Many of the culverts in the county need to be improved to prevent flooding when heavy rain happens.	This hazard was discussed by the plan participants and Orland selected a mitigation action to address this. The county also selected a mitigation action to address flooding through a Master Drainage Plan.
County Road 200 (Newville Rd) outside of the City Limits of Orland had major flooding. The trailer park at 6155 Hwy 162 in Willows had major flooding as well in 2023.	Flood mitigation concerns were noted and the county selected to develop a Master Drainage Plan to address these kinds of concerns.
Co Rd 25 at the dip, Co Rd 48/47, Co Rd 45 from Co Rd 99- Co Rd J, Co Rd 99 from Co Rd 48 to Co Rd 39	Assuming this comment is about flooding – the county identified a mitigation action to address flooding through a Master Drainage Plan.
The structural stability of Glenn Medical Center, it has water damage and mold.	No mitigation action was selected to address this at this time however, this concern is noted.
Storm events; power outages	These are discussed in the hazard profiles, including Severe Weather and Wildfire.
Hambright Creek constantly flooding, and no progress has been made on a permanent solution. Stony Creek eroding away land near Stoney Creek Drive and Woodhaven Court. Fire danger in Stony Creek due to unlawful activities by the homeless population.	These concerns were discussed and multiple organizations including the county, City of Orland, and Glenn County RCD are looking to mitigate the fire risk in Stony Creek.
We have consistent flooding in our community. Main and 2nd street in front of post office, store. Corner of 2nd Ave. and Sacramento Ave. Our mobile home park on Sacramento Ave. The house on Esparaza St. flood due to the drainage system from the Mobile Home Park off Sacramento Ave.	Flood mitigation concerns were noted including the risk to the mobile home park, and the county chose to develop a Master Drainage Plan to address these kinds of concerns.
Hambright Creek west of Orland	The risk from Hambright Creek is noted in this plan update.
Clean out Walker Creek, Wilson Creek, etc. to reduce flooding in & around Artois Area, Grove/ Blue Gum area.	This is noted, no action selected at this time.
Emergency services.	Noted, no further mitigation action selected at this time.
Drought, dry wells.	This was also brought up as a concern by the plan participants and is discussed in detail in the Drought hazard profile. Mitigation measures that have been taken are also addressed in the Capability Assessment and Mitigation Strategy sections.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix B: Public Outreach

Public Comment	How Was This Feedback Incorporated into the Plan?
<p>Lack of long-term visioning and leadership resulting in poor growth in economic base and opportunity needed to fund mitigations for current and future at risk situations.</p> <p>Overemphasis on staffing and pay for governmental employees who say we need to compete with successful areas where the economic structure actually increases needs for everything a viable community needs to have, build, plan for 25 years from now. The rivers, the lakes, the highways, and the drainage systems needed to deal with flooding small and major, all seem to be fine here.</p> <p>Long time since I-5 north and south of the county had to close due to flooding. Same for highway 162. I have never seen the Sacramento River cause significant issues. 45 is OK. Levees seem to be OK as far as I can tell. highways and city streets, especially street lighting in Willows, is in need of attention, but there is no \$\$\$ to address these local issues as far as I can tell. Recreation suffers, which means our investment in well-rounded adults will be a deferred loss to all.</p>	<p>No further follow-up needed.</p>
<p>Homes that flood along Hambright in Orland, Hwy 99 flooding outside of willows. Road 306 past Newville desperately needs repaired, huge potholes, and if residents need to evacuate and trailer animals in the event of a fire or even damage emergency vehicles, fire trucks, and patrol cars. Glenn Medical is an older bldg. and needs to be evaluated for risk.</p>	<p>Noted, no further actions selected at this time.</p>
<p>Senior Citizens, especially those housed in SNF, affordable housing, etc.</p>	<p>This concern was brought up by the stakeholders as well. Outreach was done to engage the senior population, but additional outreach and implementation of mitigation actions that support senior citizens could be completed in the future.</p>
<p>County Rd 28. Flooding at the drain by the TC canal. It has gotten significantly worse since all of the orchards have been planted both east and west of the canal, and most of the natural drains have been leveled with the drainage being dumped into the one drain that is left. It is not big enough to handle that much water, and the bridge over Rd 28 doesn't seem to be big enough to let the water flow through fast enough.</p>	<p>Flood mitigation concerns were noted, and the county chose to develop a Master Drainage Plan to address these kinds of concerns.</p>
<p>A program to burn or remove flammable debris from rural properties would be useful.</p>	<p>Noted, no mitigation action selected at this time.</p>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix B: Public Outreach

Public Comment	How Was This Feedback Incorporated into the Plan?
protection from flooding west of I-5	Flood mitigation concerns were noted, and the county chose to develop a Master Drainage Plan to address these kinds of concerns.
RR track drains need to be cleaned	This concern was discussed, no mitigation action selected at this time.
The Sacramento River is always a concern. Glad to see the J Levee repaired in Hamilton City. Ord Bend area and the bridge could use some work.	The Flood and Levee Failure profile addresses these concerns.
Wood Street in front of Walmart consistently floods Making it nearly impossible to get to Willows from Elk Creek sometimes during the winter. The bridge at County Road 306 and Newville Rd is not functioning. County Rd. 99w floods, County Rd. 48 floods near Manville and east of County Road 99, Hwy 162 floods east of Willows. Eureka Street is eroding from years of neglect and water. This does not seem to be a priority.	Flood mitigation concerns were noted, and the county chose to develop a Master Drainage Plan to address these kinds of concerns.
Highway 162 floods during heavy rain	
Yes, need to do a study	Further information required to respond to this comment.
Oroville residents	Unsure what this comment refers to. Actions were selected to protect residents of all participating jurisdictions from hazards.
Making sure all Schools, businesses, hospital, government buildings have the proper water drainage,(Ex. Willows Track and Field flooding)	Noted, no action selected at this time.
The properties of two homes on the west side of road 49&1/2 nearest road 48 and the 2 nd house from this corner on 48 going west flood during substantial rains, not only as a result of water from the ditch on the south side of 48 but from a stream that developed from the north. This isn't reflected in FEMA's flood zone maps and ought to be evaluated.	The county selected an action to support FEMA flood mapping.
The freeway	Unsure what hazard this comment refers to.
County roads in rural areas of Elk Creek and Newville road and county road 200. Like to see more prevention efforts for flooding on county road 306 .	Flood mitigation concerns were noted, and the county chose to develop a Master Drainage Plan to address these kinds of concerns.
/orchards being put in have changed the drainage of many areas, leaving homeowners with the deluge. Also, groundwater use for ag purposes is a disaster on the horizon.	This comment is noted, but not incorporated into the mitigation actions at this time.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix B: Public Outreach

Public Comment	How Was This Feedback Incorporated into the Plan?
<p>There are many pot holes in the residential area past the railroad tracks that get worse with each storm because of the flooding. The roads should be fixed.</p> <p>The field next to the Walmart always floods out the area. It would be nice to have a system in place there so that it doesn't happen every time it storms.</p>	<p>This concern was discussed, including the ongoing flooding during the plan update process. The county selected to develop a Master Drainage Plan to address these kinds of concerns.</p>
<p>Flooding at CA 162 (E of Willows), County Road 48 (NE of Willows), County Road 39 (E of 99w).</p>	<p>Flood mitigation concerns were noted, and the county chose to develop a Master Drainage Plan to address these kinds of concerns.</p>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix B: Public Outreach

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Appendix C: Plan Review Documents

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

U.S. Department of Homeland Security
FEMA Region 9
1111 Broadway, Suite 1200



FEMA

Oakland, CA 94607-4052

January 16, 2025

Andy Popper
Principal Planner
Glenn County Planning & Community Development Services Agency
225 North Tehama Street
Willows, CA 95988

Dear Andy Popper:

The Federal Emergency Management Agency (FEMA) has completed its review of the *2024 Glenn County Multi-Jurisdiction Hazard Mitigation Plan* and has determined that this plan is eligible for final approval pending its adoption by Glenn County and all participating jurisdictions. Please see the enclosed list of approvable pending adoption jurisdictions.

Formal adoption documentation must be submitted to FEMA Region 9 by at least one participating jurisdiction within one calendar year of the date of this letter, or the entire plan must be updated and resubmitted for review. FEMA will approve the plan upon receipt of the documentation of formal adoption.

Once the plan is approved, each participating jurisdiction must adopt the plan within five calendar years of the date of the approval. The adoption of the plan by each jurisdiction ensures that jurisdiction's continued eligibility for funding under FEMA's Hazard Mitigation Assistance (HMA) programs. All requests for funding, however, will be evaluated individually according to the specific eligibility, and other requirements of the particular program under which applications are submitted.

If you have any questions regarding the planning or review processes, please contact the FEMA Region 9 Hazard Mitigation Planning Team at fema-r9-mitigation-planning@fema.dhs.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Alison Kearns".

Alison Kearns
Planning and Implementation Branch Chief
Mitigation Division
FEMA Region 9

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Glenn County Hazard Mitigation Plan Approvable Pending Adoption Notice January 16, 2025

Page 2 of 3

Enclosures (2)

Glenn County Plan Review Tool, dated January 16, 2025

Status of Participating Jurisdictions, dated January 16, 2025

cc: Robyn Fennig, State Hazard Mitigation Officer, California Governor's Office of
Emergency Services
Victoria LaMar-Haas, Hazard Mitigation Planning Chief, California Governor's Office of
Emergency Services

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Glenn County Hazard Mitigation Plan Approvable Pending Adoption Notice January 16, 2025
Page 3 of 3

Status of Participating Jurisdictions as of January 16, 2025

Jurisdictions – Adopted and Approved

#	Jurisdiction	Adoption Receipt Date
1		
2		
3		

Jurisdictions – Approvable Pending Adoption

#	Jurisdiction
1	Glenn County
2	The City of Orland
3	The City of Willows

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Local Mitigation Plan Review Tool

Cover Page

The Local Mitigation Plan Review Tool (PRT) demonstrates how the local mitigation plan meets the regulation in 44 CFR § 201.6 and offers states and FEMA Mitigation Planners an opportunity to provide feedback to the local governments, including special districts.

3. The Multi-Jurisdictional Summary Sheet is a worksheet that is used to document how each jurisdiction met the requirements of the plan elements (Planning Process; Risk Assessment; Mitigation Strategy; Plan Maintenance; Plan Update; and Plan Adoption).
4. The Plan Review Checklist summarizes FEMA's evaluation of whether the plan has addressed all requirements.

For greater clarification of the elements in the Plan Review Checklist, please see Section 4 of this guide. Definitions of the terms and phrases used in the PRT can be found in Appendix E of this guide.

Plan Information	
Jurisdiction(s)	Glenn County, City of Orland, City of Willows
Title of Plan	Glenn County Multi-Jurisdiction Hazard Mitigation Plan
New Plan or Update	Update
Single- or Multi-Jurisdiction	Multi-Jurisdiction
Date of Plan	March, 2024
Local Point of Contact	
Title	Andy Popper
Agency	Glenn County Planning & Community Development Services Agency
Address	225 North Tehama Street Willows, CA 95988
Phone Number	530-934-6540
Email	APopper@countyofglenn.net

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Additional Point of Contact	
Title	Click or tap here to enter text.
Agency	Click or tap here to enter text.
Address	Click or tap here to enter text.
Phone Number	Click or tap here to enter text.
Email	Click or tap here to enter text.

3. Review Information	
4. State Review	
State Reviewer(s) and Title	Jody Newton, Plan Reviewer
State Review Date	3/15/2024, 11/25/2024
FEMA Review	
FEMA Reviewer(s) and Title	Avery M. Frank, Community Planner Kiana Wong, Community Planner
Date Received in FEMA Region	12/11/2024
Plan Not Approved	
Plan Approvable Pending Adoption	1/16/2025
Plan Approved	

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Multi-Jurisdictional Summary Sheet

In the boxes for each element, mark if the element is met (Y) or not met (N).

#	Jurisdiction Name	A. Planning Process	B. Risk Assessment	C. Mitigation Strategy	D. Plan Maintenance	E. Plan Update	F. Plan Adoption	G. HHPD Requirements	H. State Requirements
1	Glenn County	Y	Y	Y	Y	Y			
2	City of Orland	Y	Y	Y	Y	Y			
3	City of Willows	Y	Y	Y	Y	Y			
4									
5									
6									
7									
8									
9									
10									

Plan Review Checklist

The Plan Review Checklist is completed by FEMA. States and local governments are encouraged, but not required, to use the PRT as a checklist to ensure all requirements have been met prior to submitting the plan for review and approval. The purpose of the checklist is to identify the location of relevant or applicable content in the plan by element/sub-element and to determine if each requirement has been “met” or “not met.” FEMA completes the “required revisions” summary at the bottom of each element to clearly explain the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is “not met.” Sub-elements in each summary should be referenced using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each element and sub-element are described in detail in Section 4: Local Plan Requirements of this guide.

Plan updates must include information from the current planning process.

If some elements of the plan do not require an update, due to minimal or no changes between updates, the plan must document the reasons for that.

Multi-jurisdictional elements must cover information unique to all participating jurisdictions.

Element A: Planning Process

Element A Requirements	Location in Plan (section and/or page number)	Met / Not Met
A1. Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement 44 CFR § 201.6(c)(1))		
A1-a. Does the plan document how the plan was prepared, including the schedule or time frame and activities that made up the plan’s development, as well as who was involved?	Schedule: - Pg. 5 - Table 9 Activities: - Pg. 29 Table 9 Who: - Table 10	Met
A1-b. Does the plan list the jurisdiction(s) participating in the plan that seek approval, and describe how they participated in the planning process?	Participants: - Table 10 - Pg. 53 - Pg. 301 - Pg. 325 How: - Table 10	Met

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Element A Requirements	Location in Plan (section and/or page number)	Met / Not Met
A2. Does the plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development as well as businesses, academia, and other private and non-profit interests to be involved in the planning process? (Requirement 44 CFR § 201.6(b)(2))		
A2-a. Does the plan identify all stakeholders involved or given an opportunity to be involved in the planning process, and how each stakeholder was presented with this opportunity?	Stakeholders: - Table 5 How: - Pg. 30	Met
A3. Does the plan document how the public was involved in the planning process during the drafting stage and prior to plan approval? (Requirement 44 CFR § 201.6(b)(1))		
A3-a. Does the plan document how the public was given the opportunity to be involved in the planning process and how their feedback was included in the plan?	Public participation: - Pg. 45-52 Vulnerable populations: - Pg. 48-52 Included how: - Pg. 52	Met
A4. Does the plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement 44 CFR § 201.6(b)(3))		
A4-a. Does the plan document what existing plans, studies, reports and technical information were reviewed for the development of the plan, as well as how they were incorporated into the document?	Existing information: - Pg. 54 NFIP Products: - Pg. 118 - Figure 48-50	Met
ELEMENT A REQUIRED REVISIONS		
Required Revision: Click or tap here to enter text.		

Element B: Risk Assessment

Element B Requirements	Location in Plan (section and/or page number)	Met / Not Met
B1. Does the plan include a description of the type, location, and extent of all natural hazards that can affect the jurisdiction? Does the plan also include information on previous occurrences of hazard events and on the probability of future hazard events? (Requirement 44 CFR § 201.6(c)(2)(i))		
B1-a. Does the plan describe all natural hazards that can affect the jurisdiction(s) in the planning area, and does it provide the rationale if omitting any natural hazards that are commonly recognized to affect the jurisdiction(s) in the planning area?	<p>Natural hazards:</p> <ul style="list-style-type: none"> - Section 3 Risk Assessment <p>Omission:</p> <ul style="list-style-type: none"> - Section 3 Risk Assessment 	Met
B1-b. Does the plan include information on the location of each identified hazard?	<p>Drought:</p> <ul style="list-style-type: none"> - Pg. 81 <p>Extreme Heat:</p> <ul style="list-style-type: none"> - Pg. 103 <p>Flood:</p> <ul style="list-style-type: none"> - Pg. 121 - Figure 48 <p>Geological Hazards:</p> <ul style="list-style-type: none"> - Pg. 148 - Figure 57 - Figure 58 - Figure 64 <p>Severe Weather:</p> <ul style="list-style-type: none"> - Pg. 190 <p>Wildfire:</p> <ul style="list-style-type: none"> - Pg. 203 - Figure 90 	Met
B1-c. Does the plan describe the extent for each identified hazard?	<p>Drought:</p> <ul style="list-style-type: none"> - Pg. 81-86 <p>Extreme Heat:</p> <ul style="list-style-type: none"> - Figure 34 - Figure 38 -39 - Pg. 103- <p>Flood:</p> <ul style="list-style-type: none"> - Pg. 121-124 - Pg. 127 	Met

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Element B Requirements	Location in Plan (section and/or page number)	Met / Not Met
	Geological Hazards: - Pg. 157-160 Severe Weather: - Pg. 190-191 Wildfire: - Pg. 204	
B1-d. Does the plan include the history of previous hazard events for each identified hazard?	Table 12-13 Drought: - Pg. 86 - Figure 28 Extreme Heat: - Pg. 105-106 Flood: - Pg. 129-130 Geological Hazards: - Pg. 160 Severe Weather: - Pg. 192-193 Wildfire: - Pg. 205-208	Met
B1-e. Does the plan include the probability of future events for each identified hazard? Does the plan describe the effects of future conditions, including climate change (e.g., long-term weather patterns, average temperature and sea levels), on the type, location and range of anticipated intensities of identified hazards?	Drought: - Table 18 - Pg. 91 Extreme Heat: - Table 18 - Pg. 106-109 Flood: - Table 18 - Pg. 130-131 Geological Hazards: - Table 18 - Pg. 161-162 Severe Weather: - Table 18 - Pg. 195 Wildfire: - Table 18 - Pg. 208-213	Met
B1-f. For participating jurisdictions in a multi-jurisdictional plan, does the plan describe any hazards that are unique to and/or vary from those affecting the overall planning area?	See annex review tool	Met
B2. Does the plan include a summary of the jurisdiction's vulnerability and the impacts on the community from the identified hazards? Does this summary also address NFIP-		

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Element B Requirements	Location in Plan (section and/or page number)	Met / Not Met
insured structures that have been repetitively damaged by floods? (Requirement 44 CFR § 201.6(c)(2)(ii))		
<p>B2-a. Does the plan provide an overall summary of each jurisdiction's vulnerability to the identified hazards?</p> <ul style="list-style-type: none"> - People - Structures - Systems - Resources - Activities 	<p>Social vulnerability: - Pg. 24-28</p> <p>Drought: - Pg. 93-95</p> <p>Extreme Heat: - Pg. 112-113</p> <p>Flood: - Pg. 131-142</p> <p>Geological Hazards: - Figure 58 - Pg. 163-168</p> <p>Severe Weather: - Pg. 196</p> <p>Wildfire: - Figure 90 - Pg. 214-218</p>	Met
<p>B2-b. For each participating jurisdiction, does the plan describe the potential impacts of each of the identified hazards on each participating jurisdiction?</p> <ul style="list-style-type: none"> - Climate change - Changes in population patterns - Changes in land use and development 	<p>Climate change: - Pg. 18-19</p> <p>Population patterns: - Pg. 19</p> <p>Land use trends: - Pg. 21-24</p> <p>Drought: - Pg. 92-95</p> <p>Extreme Heat: - Pg. 112-113</p> <p>Flood: - Pg. 131-142</p> <p>Geological Hazards: - Pg. 162-168</p> <p>Severe Weather: - Pg. 196</p> <p>Wildfire: - Pg. 213-218</p>	Met
<p>B2-c. Does the plan address NFIP-insured structures within each jurisdiction that have been repetitively damaged by floods?</p>	<p>NFIP repetitively damaged: - Pg. 126</p>	Met
ELEMENT B REQUIRED REVISIONS		
<p>Required Revision:</p> <p>Click or tap here to enter text.</p>		

Element C: Mitigation Strategy

Element C Requirements	Location in Plan (section and/or page number)	Met / Not Met
C1. Does the plan document each participant's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement 44 CFR § 201.6(c)(3))		
C1-a. Does the plan describe how the existing capabilities of each participant are available to support the mitigation strategy? Does this include a discussion of the existing building codes and land use and development ordinances or regulations?	Capabilities: - Section 4 Building codes: - Section 4	Met
C1-b. Does the plan describe each participant's ability to expand and improve the identified capabilities to achieve mitigation?	Expand/improve: - Table 92	Met
C2. Does the plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement 44 CFR § 201.6(c)(3)(ii))		
C2-a. Does the plan contain a narrative description or a table/list of their participation activities? - Adoption of NFIP - Adoption of FIRM - Implementation and enforcement - Designee - Substantial improvement/damage	NFIP: - Pg. 118 - Table 89	Met
C3. Does the plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement 44 CFR § 201.6(c)(3)(i))		
C3-a. Does the plan include goals to reduce the risk from the hazards identified in the plan?	Goals: - Pg. 253	Met

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Element C Requirements	Location in Plan (section and/or page number)	Met / Not Met
C4. Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement 44 CFR § 201.6(c)(3)(ii))		
C4-a. Does the plan include an analysis of a comprehensive range of actions/projects that each jurisdiction considered to reduce the impacts of hazards identified in the risk assessment?	Comprehensive range of actions: - Table 93 - Table 98	Met
C4-b. Does the plan include one or more action(s) per jurisdiction for each of the hazards as identified within the plan's risk assessment?	See annex review tool	Met
C5. Does the plan contain an action plan that describes how the actions identified will be prioritized (including a cost-benefit review), implemented, and administered by each jurisdiction? (Requirement 44 CFR § 201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))		
C5-a. Does the plan describe the criteria used for prioritizing actions?	Prioritization: - Pg. 261-262	Met
C5-b. Does the plan provide the position, office, department or agency responsible for implementing/administrating the identified mitigation actions, as well as potential funding sources and expected time frame?	Funding: - Table 98 Responsible party: - Table 98	Met
ELEMENT C REQUIRED REVISIONS		
Required Revision: Click or tap here to enter text.		

Element D: Plan Maintenance

Element D Requirements	Location in Plan (section and/or page number)	Met / Not Met
D1. Is there discussion of how each community will continue public participation in the plan maintenance process? (Requirement 44 CFR § 201.6(c)(4)(iii))		
D1-a. Does the plan describe how communities will continue to seek future public participation after the plan has been approved?	Continued public involvement: - Pg. 275	Met
D2. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a five-year cycle)? (Requirement 44 CFR § 201.6(c)(4)(i))		
D2-a. Does the plan describe the process that will be followed to track the progress/status of the mitigation actions identified within the Mitigation Strategy, along with when this process will occur and who will be responsible for the process?	Progress: - Section 6	Met
D2-b. Does the plan describe the process that will be followed to evaluate the plan for effectiveness? This process must identify the criteria that will be used to evaluate the information in the plan, along with when this process will occur and who will be responsible.	Effectiveness: - Section 6	Met
D2-c. Does the plan describe the process that will be followed to update the plan, along with when this process will occur and who will be responsible for the process?	Update: - Section 6	Met
D3. Does the plan describe a process by which each community will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement 44 CFR § 201.6(c)(4)(ii))		
D3-a. Does the plan describe the process the community will follow to integrate the ideas, information and strategy of the mitigation plan into other planning mechanisms?	Integration: - Table 102	Met
D3-b. Does the plan identify the planning mechanisms for each plan participant into which the ideas, information and strategy from the mitigation plan may be integrated?	Mechanisms: - Table 102	Met
D3-c. For multi-jurisdictional plans, does the plan describe each participant's individual process for integrating information from the mitigation strategy into their identified planning mechanisms?	See annex review tool	Met

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

ELEMENT D REQUIRED REVISIONS

Required Revision:

Click or tap here to enter text.

Element E: Plan Update

Element E Requirements	Location in Plan (section and/or page number)	Met / Not Met
E1. Was the plan revised to reflect changes in development? (Requirement 44 CFR § 201.6(d)(3))		
E1-a. Does the plan describe the changes in development that have occurred in hazard-prone areas that have increased or decreased each community's vulnerability since the previous plan was approved?	Changes in development: - Pg. 92, 112, 131, 162, 196, and 213	Met
E2. Was the plan revised to reflect changes in priorities and progress in local mitigation efforts? (Requirement 44 CFR § 201.6(d)(3))		
E2-a. Does the plan describe how it was revised due to changes in community priorities?	Changes in priorities: - Pg. 30	Met
E2-b. Does the plan include a status update for all mitigation actions identified in the previous mitigation plan?	Status update: - Table 94	Met
E2-c. Does the plan describe how jurisdictions integrated the mitigation plan, when appropriate, into other planning mechanisms?	Previous integration: - Table 101	Met
ELEMENT E REQUIRED REVISIONS		
Required Revision:		
Click or tap here to enter text.		

Element F: Plan Adoption

Element F Requirements	Location in Plan (section and/or page number)	Met / Not Met
F1. For single-jurisdictional plans, has the governing body of the jurisdiction formally adopted the plan to be eligible for certain FEMA assistance? (Requirement 44 CFR § 201.6(c)(5))		
F1-a. Does the participant include documentation of adoption?	Click or tap here to enter text.	Choose an item.
F2. For multi-jurisdictional plans, has the governing body of each jurisdiction officially adopted the plan to be eligible for certain FEMA assistance? (Requirement 44 CFR § 201.6(c)(5))		
F2-a. Did each participant adopt the plan and provide documentation of that adoption?	Click or tap here to enter text.	Not Met
ELEMENT F REQUIRED REVISIONS		
Required Revision: F2-a: After receiving official approvable pending adoption correspondence from the FEMA Region 9 Office please send a signed adoption resolution to FEMA-R9-MITIGATION-PLANNING fema-r9-mitigation-planning@fema.dhs.gov		

Element G: High Hazard Potential Dams (Optional)

HHPD Requirements	Location in Plan (section and/or page number)	Met / Not Met
HHPD1. Did the plan describe the incorporation of existing plans, studies, reports and technical information for HHPDs?		
HHPD1-a. Does the plan describe how the local government worked with local dam owners and/or the state dam safety agency?	Click or tap here to enter text.	Choose an item.
HHPD1-b. Does the plan incorporate information shared by the state and/or local dam owners?	Click or tap here to enter text.	Choose an item.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

HHPD Requirements	Location in Plan (section and/or page number)	Met / Not Met
HHPD2. Did the plan address HHPDs in the risk assessment?		
HHPD2-a. Does the plan describe the risks and vulnerabilities to and from HHPDs?	Click or tap here to enter text.	Choose an item.
HHPD2-b. Does the plan document the limitations and describe how to address deficiencies?	Click or tap here to enter text.	Choose an item.
HHPD3. Did the plan include mitigation goals to reduce long-term vulnerabilities from HHPDs?		
HHPD3-a. Does the plan address how to reduce vulnerabilities to and from HHPDs as part of its own goals or with other long-term strategies?	Click or tap here to enter text.	Choose an item.
HHPD3-b. Does the plan link proposed actions to reducing long-term vulnerabilities that are consistent with its goals?	Click or tap here to enter text.	Choose an item.
HHPD4-a. Did the plan include actions that address HHPDs and prioritize mitigation actions to reduce vulnerabilities from HHPDs?		
HHPD4-a. Does the plan describe specific actions to address HHPDs?	Click or tap here to enter text.	Choose an item.
HHPD4-b. Does the plan describe the criteria used to prioritize actions related to HHPDs?	Click or tap here to enter text.	Choose an item.
HHPD4-c. Does the plan identify the position, office, department or agency responsible for implementing and administering the action to mitigate hazards to or from HHPDs?	Click or tap here to enter text.	Choose an item.
HHPD Required Revisions		
Required Revision: Click or tap here to enter text.		

Element H: Additional State Requirements (Optional)

Element H Requirements	Location in Plan (section and/or page number)	Met / Not Met
This space is for the State to include additional requirements.		
Click or tap here to enter text.	Click or tap here to enter text.	Choose an item.

Plan Assessment

These comments can be used to help guide your annual/regularly scheduled updates and the next plan update.

Element A. Planning Process

Strengths

- The plan team selected its stakeholder types based on the five stakeholder types found in the [FEMA Local Planning Policy Guide](#). Additionally, the plan used a table format with a column included for stakeholder type to clearly document these stakeholder groups. This helps to strengthen the plan by demonstrating not only alignment with 44 CFR 201.6(b)(2) but also ensures a holistic plan development process that elevates the voices of numerous stakeholders involved in hazard mitigation.
- The planning team used multiple methods of stakeholder engagement including meetings, a dedicated stakeholder digital survey, phone calls, and reviewing the draft plan. This ensures each stakeholder has the opportunity to participate in the plan's development in numerous ways.
- The planning team is commended for increasing public participation in the plan's development along with targeted outreach efforts to vulnerable populations. The plan documented that the 2018 update did not garner any public participation although efforts were made. The current plan update includes not only documentation that the public participated but also how this feedback was incorporated into the plan's development.
- The plan effectively builds upon FEMA Flood Insurance Rate Maps by including the flood zones and critical assets on the same map. This helps to strengthen the plan by not only showing potential hazard areas but the vulnerability of assets in and around those areas.

Opportunities for Improvement

- In future plan updates to build upon the successful practice of documenting jurisdictional participation in the planning process consider adding in either narrative format or table format the agency and title of the consultants that represented the participating jurisdictions throughout the planning process. Additionally consider adding more detail about how the consultants representing the jurisdictions relayed information to city officials. This will help to strengthen the plan by including more details as to how each participating jurisdiction was involved and made decisions in the planning process regardless of consultant representation.
- In future plan updates to build upon the successful practice of reviewing a variety of technical resources to inform the plans development consider including the NFIP regulatory flood mapping products that were used throughout the plan's development in the list of resources documented in the plan.

Element B. Risk Assessment

Strengths

- The plan documented several different types of scales that could be used to assess the anticipated range of intensities for a drought event. These scales include the Vegetation Drought Response Index, Surface Water Supply Index, Palmer Drought Severity Index, and U.S. Drought Monitor. This enhances the plan by examining potential intensities from various perspectives.
- The plan effectively used statewide climate change predictions to apply them on a county level. This demonstrates the planning team's ability to use the data that is accessible to the county to make meaningful predictions about future conditions and the probability of hazard events occurring.
- The planning team used both low and high emissions scenarios where appropriate to evaluate the correlation between climate change and the probability of a given hazard event. This is a helpful analysis method as it provides the jurisdiction with options and the ability to make mitigation actions based on the different scenarios.
- The plan includes impactful real-life photos from previous hazard events. These images help to demonstrate the threat that exists from these hazard events as well as serve as a reminder for why the hazard mitigation plan is so important.

Opportunities for Improvement

- In future plan updates consider using the [National Risk Index](#) to analyze and map a potential hazard. For example, the plan can be enhanced by including the National Risk Index map for drought which will complement the narrative section that states drought can be affect the entire county. Additionally, the National Risk Index has valuable information that can add to the risk assessment for each hazard type.
- In future plan updates consider building upon the vulnerabilities assessment by including additional information to support and enhance the overall assessment. For example, the drought vulnerability analysis discusses farm workers but does not provide the total number of farm workers in the county. This information can be obtained through [Census Bureau Data](#) and would help to provide additional context to the analysis.
- In future plan updates consider building upon the impact analysis by including additional information on changes in population patterns and land use and development trends. The plan documents valuable information in the Community Profile section discussing a decline in the population for all participating jurisdictions but it does not connect this decline to the impact analysis. Additionally, the plan documents in the same section the land use and development trends for the County but it does not tie this information back to the impact analysis. The impact analysis for each hazard does touch on these topics but it will help to strengthen the plan if this information is incorporated directly into the impact analysis.

Element C. Mitigation Strategy

Strengths

- The State and Federal Funding Resource Table (table 85) is a valuable tool for documenting the available funding mechanisms outside of the jurisdictions budget. This tool should be used and maintained each plan update cycle and old funding mechanisms that are no longer relevant should be removed.
- The plan included in Table 89 a robust NFIP compliance/capabilities assessment. This table helps to strengthen the plan by not only documenting the county's compliance and current NFIP procedures but also helps to analyze the county's ability to leverage this capability or improve upon it if needed.
- The plan included in Table 93 additional mitigation actions that were considered but not selected for this plan update. This additional information is a useful practice as it provides context for the next plan update cycle and potential mitigation actions that might be more appropriate for the specific update. Additionally, the plan included a comprehensive range of actions including physical projects as well as studies and community outreach programs.
- The plan included a Mitigation Success Story section that highlights effective projects and success stories that have occurred since the last plan updated. This is a beneficial practice for not only documenting what works well but it provides additional context for creating mitigation actions in the future.

Opportunities for Improvement

- In future plan updates consider building upon the successful practice of selecting and prioritizing mitigation actions by reviewing the FEMA [Mitigation Ideas](#) Handbook. This resource has valuable information on mitigation strategies for various natural hazards. The handbook can be particularly helpful in creating potential mitigation activities for hazards that are challenging to plan for such as drought.

Element D. Plan Maintenance

Strengths

- The planning team is commended for creating a plan update schedule that starts 2 years prior to the plan's expiration date. This ensures the planning team has adequate time to collect the necessary information, engage with the public, conduct a risk assessment, and submit the plan for formal review.

Opportunities for Improvement

- [insert comments]

Element E. Plan Update

Strengths

- [insert comments]

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Opportunities for Improvement

- The planning team may consider in future plan updates expanding upon any changes in priorities or available resources/data that influenced the changes in the plan's contents. The plan effectively documents that it was a priority to update the plan in accordance with the most recent FEMA policy guidance, but this section can be enhanced by including additional information on any other changes that have occurred in priorities for the community.

Element G. HHPD Requirements (Optional)

Strengths

- [insert comments]

Opportunities for Improvement

- [insert comments]

Element H. Additional State Requirements (Optional)

Strengths

- [insert comments]

Opportunities for Improvement

- [insert comments]

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Participating Jurisdiction	A1.b. Describe jurisdictional participation in planning process		A2.a. Documentation of Local Stakeholder Groups		A3.a. Documentation of Public Engagement (including underserved and vulnerable populations)		B1.a. Identified Jurisdictional Hazards	
	Met?	Location in Plan	Met?	Location in Plan	Met?	Location in Plan	Met?	Location in Plan
City of Orland	Y	Pg. 301	Y	Table 5 Table 104	Y	Pg. 45-52 and 304-305	Y	Table 106
City of Willows	Y	Pg. 325	Y	Table 5 Table 111 Table 112	Y	Pg. 45-52 and 329-330	Y	Table 114

Participating Jurisdiction	B1.f. Identified Jurisdictional Risk Differences			B2.a. Addressed Specific Vulnerabilities People Structures Systems Resources Activities		B2.b. Addressed Specific Impacts Climate change Changes in pop patterns Changes in land use	
	Met?	Location in Plan	Comments (required)	Met?	Location in Plan	Met?	Location in Plan
City of Orland	Y	Table 106 Figure 49	Strength: The table provided is a useful tool to analyze the unique jurisdictional risks for each hazard type.	Y	Drought: Pg 95, Figure 30, Table 106 Extreme Heat: Pg. 114, Table 106 Flood: Figure 49, Table 37, Table 39, Table 40, Pg 143, Table 106 Geological Hazards: Figure 49, Table 46, Pg. 168, Table 106 Severe Weather: Pg. 197, Table 106 Wildfire: Figure 94, Pg 218, Table 106	Y	Drought: Pg. 92, Table 106 Extreme Heat: Table 106, Pg. 114 Flood: Table 106, pg 131 Geological Hazards: Pg 162 Table 106 Severe Weather: Table 106, pg 196 Wildfire: Table 106, pg 213
City of Willows	Y	Table 114 Figure 50	Strength: The table provided is a useful tool to analyze the unique jurisdictional risks for each hazard type.	Y	Drought: Pg. 95, Table 114 Extreme Heat: Pg. 114, Table 114 Flood: Figure 50, Table 38, Table 39, Table 40, Pg. 143, Table 114 Geological Hazards: Figure 50, Table 46, Pg. 168, Table 114 Severe Weather: Pg. 197, Table 114 Wildfire: Figure 50, Pg. 218-219, Table 114	Y	Drought: Pg. 93, Table 114 Extreme Heat: Table 114, Pg 114 Flood: Table 114, Pg 131 Geological Hazards: Pg 162, Table 114 Severe Weather: Table 114, pg 196 Wildfire: Table 114, pg 213

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Participating Jurisdiction	B2.c. Repetitive Loss Information		C1.a. Mitigation Capabilities Identified		C1b. Expand and Improve Upon Mitigation Capabilities		C2.a. NFIP Program Information Adoption FIRM Implementation Designee Substantial improvement/damage	
	Met?	Location in Plan	Met?	Location in Plan	Met?	Location in Plan	Met?	Location in Plan
City of Orland	Y	Table 106	Y	Section 4	Y	Table 92, Table 107, Pg.315-316	Y	Table 90
City of Willows	Y	Table 114	Y	Section 4	Y	Table 92, Table 115, Pg 340-341	Y	Table 91

Participating Jurisdiction	C4.b. Mitigation actions for each hazard		C5.b. Action Information (Agency, Funding, Timeframe)		D3.c. Process for Integrating with Jurisdictionally Identified Planning Mechanisms (check on jurisdiction's D3.a. & D3.b)		E1.a. Changes in Development	
	Met?	Location in Plan	Met?	Location in Plan	Met?	Location in Plan	Met?	Location in Plan
City of Orland	Y	Table 110	Y	Table 110	Y	Pg. 322	Y	Drought: Pg. 92, Table 106 Extreme Heat: Table 106, Pg. 114 Flood: Table 106, pg 131 Geological Hazards: Pg 162 Table 106 Severe Weather: Table 106, pg 196 Wildfire: Table 106, pg 213
City of Willows	Y	Table 118	Y	Table 118	Y	Pg 347-348	Y	Drought: Pg. 93, Table 114 Extreme Heat: Table 114, Pg 114 Flood: Table 114, Pg 131 Geological Hazards: Pg 162, Table 114 Severe Weather: Table 114, pg 196 Wildfire: Table 114, pg 213

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

Participating Jurisdiction	E2.a. Changes in Priorities		E2.b. Status of Previous Actions		E2.c. Past Integration Efforts	
	Met?	Location in Plan	Met?	Location in Plan	Met?	Location in Plan
City of Orland	Y	Pg 323-324	Y	Table 108	Y	Pg 322
City of Willows	Y	Pg 348	Y	Table 116	Y	Pg 347-348

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
Appendix C: Plan Review Documents

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City of Orland Annex

The City of Orland reaffirms its commitment to addressing the community's safety concerns and meeting the hazard mitigation planning requirements outlined in the Disaster Mitigation Act (DMA 2000) by participating in the Glenn County Multi-Jurisdiction Hazard Mitigation Plan (MJHMP) update. Since the initial MJHMP, there have been no significant priority changes. The wildfire hazard from invasive vegetation in Stony Creek remains a significant concern. The potential impacts of drought are also more noticeable following recent drought events. County EMS, including timely service, is a concern as well. Through this plan update, the city has sought to address drought, wildfire, and other hazards of concern. This annex has been designed to be adopted by the City of Orland following Cal OES and FEMA mitigation planning expectations to ensure that the city is eligible for pre- and post-disaster mitigation grant programs, including FEMA's Hazard Mitigation Grant Program (HMGP) and the Building Resilient Infrastructure and Communities (BRIC) grant program.

The Planning Process

The planning consultant, IEM, developed the plan with input from the participating jurisdictions, including Orland, the stakeholders, and the public. A key part of hazard mitigation planning is engaging the whole community. The city was represented during the planning process by the following individuals:

Name	Title	Org.
Scott Friend	City Planner	City of Orland
Ed Vonasek	Public Works Director	City of Orland
Jennifer Schmitke	City Clerk	City of Orland
Peter Carr	City Manager	City of Orland

Stakeholders, including local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development, neighboring communities, representatives of businesses, academia, and other private organizations, nonprofit organizations, and community-based organizations that work directly with and/or provide support for underserved communities and socially vulnerable populations also were invited to be involved in the planning process. Stakeholders were invited to three stakeholder meetings, encouraged to complete stakeholder surveys, and provided the opportunity to review the draft plan. A list of the stakeholders given the opportunity to participate can be found in Section 2. The Planning Process.

According to the FEMA Local Mitigation Planning Policy Guide, stakeholders are categorized in the following ways:

1. Local and regional agencies involved in hazard mitigation activities.
Examples include public works, emergency management, local floodplain administration, and Geographic Information Systems (GIS) departments.
2. Agencies that have the authority to regulate development.
Examples include zoning, planning, community, and economic development departments, building officials, planning commissions, and other elected officials.
3. Neighboring communities.
Examples include adjacent local governments, including special districts, such as those affected by similar hazard events, or may share a mitigation action or project that crosses boundaries.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Orland Annex

Neighboring communities may be partners in hazard mitigation and response activities or where critical assets, such as dams, are located.

4. Representatives of businesses, academia, and other private organizations.
Examples include private utilities or major employers that sustain community lifelines.
5. Representatives of nonprofit organizations, including community-based organizations, which work directly with and/or support underserved communities and socially vulnerable populations, among others.
Examples include housing, healthcare, and social service agencies.¹⁰⁵

Table 104 shows the stakeholders who participated in Orland’s planning process.

Table 104: Stakeholders Who Participated in Planning for Orland

Name	Type of Stakeholder	Description
Community Action Administrative Services under Glenn Co. Health & Human Services Agency (HHSA)	Local/regional agency	Manages a variety of grant-funded programs including emergency services, housing services, income, and employment. Offers community services and development for low-income seniors, youth, and families. Lead agency for the Colusa–Glenn–Trinity Community Action Partnership.
Department of Social Services	Community Based Organization (CBO)	Oversees a wide range of social services and support for families and individuals in the community.
First Care Medical (Colusa Medical Center)	CBO	Offers a wide range of services, including adult medical and surgical care, emergency medicine, long-term skilled nursing care, laboratory services, imaging and radiographic services, physical rehabilitation, home health, and palliative care.
Glenn County Fire Chief Association	Local/regional agency	Advocates for unity and collaboration in Glenn County Fire Service.
Glenn County HHSA	Local/regional agency	Provides services in the four major divisions of healthcare: social, behavioral health, public health, and community action.
Grindstone Indian Rancheria	Neighboring community	Reservation/tribal headquarters of the Wintun–Wailaki Indians of California.
Orland Area Chamber of Commerce	Business organization	Voluntary organization of the business community, uniting the efforts of business and professional individuals to improve the economy and build a better community. Serves as Orland’s business voice.

¹⁰⁵ FEMA, “Local Mitigation Planning Policy Guide.” https://www.fema.gov/sites/default/files/documents/fema_local-mitigation-planning-policy-guide_042022.pdf

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Orland Annex

Name	Type of Stakeholder	Description
Orland Fire Department	Local/regional agency	Works in partnership with the Orland Rural Fire Protection District to provide emergency fire services.
Orland Police Department	Local/regional agency	Enforces the law and provides emergency response.
Orland Rural Fire Protection District	Local/regional agency	Provides fire protection and emergency response services.
Orland Unit Water Users' Association (OUWUA)	Local/regional agency	Assumed responsibility for the care, operation, and maintenance of the Orland Project in 1954.
Orland–Artois Water District	Neighboring community	Water district serving the Artois community, south of Orland.
University of California Cooperative Extension – Glenn County	Academic organization	Provides education, outreach, and research activities to the county.

The public, including underserved communities and vulnerable populations in Orland, was invited to participate in the plan update process (see Figure 101). The city solicited public input through a digital survey in English and Spanish shared on the City of Orland Facebook (4,600) and at the Orland Volunteer Fire Department 69th Annual Spaghetti Feed. The survey results were publicized in public places, such as Orland City Hall (Figure 102) and the Orland Library (Figure 103). Additionally, hard copies of the surveys were distributed at the Glenn County Senior Nutrition site in Orland, a location which provides nutritious meals to seniors aged 60 years or older.



Figure 101: Screenshot of the City of Orland Social Media Post

Glenn County Multi-Jurisdiction Hazard Mitigation Plan City of Orland Annex

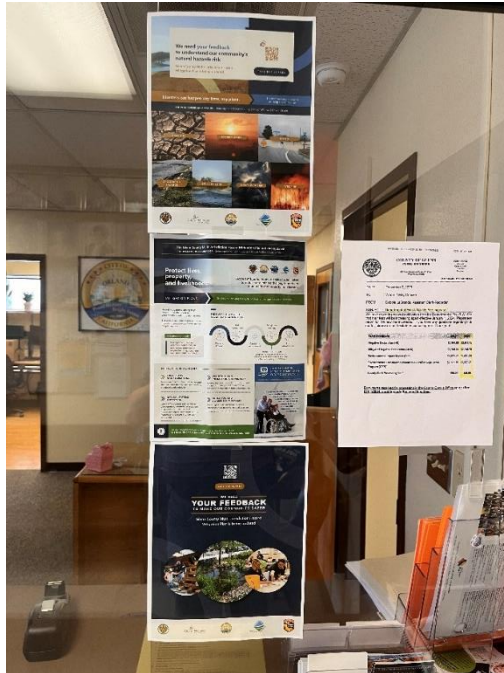


Figure 102: Public Surveys at Orland City Hall



Figure 103: Survey Information at the Orland Free Library

The plan update was also discussed at the Planning Commission meeting on January 18, 2024. This meeting was open to the public, but no citizenry attended. Since the initial MJHMP received minimal public input at in-person events, this plan update survey was shared in person at locations that included the following:

- Orland Free Library – A free public library in the heart of Orland offering access to Wi-Fi and other resources.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan City of Orland Annex

- Orland Arbor Apartments – Local apartment complex offering USDA RD Affordable Housing.
- Grocery Outlet – Local discount grocery store near I-5.
- Blue and White Laundromat – Laundromat in Orland near I-5.
- Mill Street Apartments – Apartment complex in Orland.
- La Perla de Occidente Market – Local Mexican-owned grocery store serving Mexican food.
- Los Tres Potrillos – Local market.

This outreach was designed to reach vulnerable populations, including Spanish-speaking community members and the elderly, by soliciting input at places of congregation. Public outreach was discussed at every meeting, and whether there were any other events at which the plan could be presented was evaluated. However, it was determined—in part because it was winter—that no current events fit the timeline of this plan update. In addition, an Access and Functional Needs (AFN) representative suggested that the AFN population could be engaged throughout the plan update process at the last stakeholder meeting. However, the volunteer was not further available for the plan update. In the future, the new Butte–Glenn AFN Committee can be incorporated to enhance this public outreach.

A total of 51 responses were received, including 8 from Orland. This public feedback was incorporated into the plan, including in the risk assessment sections as described in the Planning Process section. The engagement with the public may have been limited by severe weather during the plan update, including an atmospheric river. Starting the next plan update in advance may allow for additional ongoing public outreach.

Risk Assessment

Risk assessment identifies and analyzes the hazards that could impact the participating jurisdictions. The participating jurisdictions and stakeholders identified the following hazards at the Kickoff Meeting:

- Drought
- Extreme Heat
- Flood (including dam failure)
- Geologic Hazards
- Levee Failure
- Severe Weather
- Wildfire

After the Risk Assessment meeting, Orland evaluated its unique risks compared to the overall planning area using the Calculated Priority Risk Index (CPRI). The results are shown in Table 105.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Orland Annex

Table 105: Calculated Priority Risk Index for Orland

Hazard Type	Probability of Future Occurrence	Spatial Extent	Magnitude/severity of Life/Property Impact	Warning time	Duration	Total
Drought	Likely (3)	Significant (3)	Negligible (1)	>24 hours (1)	Prolonged (4)	11
Extreme Heat	Highly Likely (4)	Extensive (4)	Negligible (1)	>24 hours (1)	Extended (3)	12
Flood	Occasional (2)	Extensive (4)	Critical (3)	>24 hours (1)	Prolonged (4)	14
Geologic Hazards	Unlikely (1)	Small (2)	Limited (2)	<6 hours (4)	Brief (1)	10
Levee Failure	Occasional (2)	Small (2)	Critical (3)	>24 hours (1)	Prolonged (4)	12
Severe Weather	Likely (3)	Significant (3)	Negligible (1)	>24 hours (1)	Prolonged (4)	12
Wildfire	Occasional (2) (	Small (2)	Limited (2)	<6 hours (4)	Extended (3) (	13

Table 106 shows the hazard profile for Orland.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Orland Annex

Table 106: Hazard Profile for Orland

Hazard Type	Description	Spatial Extent	Magnitude	Previous Occurrences	Frequency/ Probability of Future Occurrences	Impacts and Vulnerabilities	Changes in Development
Drought	<p>Drought is an intrinsic cyclic feature of the climate that prevails across most geographical regions. Four types of drought are common:</p> <ol style="list-style-type: none"> 1. Agricultural drought occurs naturally when moisture in the soil falls below the water requirements of plant life, typically arid crops. 2. Hydrological drought comes from insufficient precipitation for stream flows and water levels in reservoirs, lakes, and groundwater. 3. Meteorological drought occurs when precipitation is less than normal in monthly, seasonal, or annual time frames. 4. Socioeconomic drought occurs when the supply 	All of Orland is subject to drought.	<p>There is no commonly accepted return period or non-exceedance probability for drought (such as the 100-year or one percent annual chance of flood). The magnitude of drought is typically based on the time of its occurrence and the severity of the hydrologic deficit. The primary indicator for the western United States is the Palmer Drought Severity Index:</p> <p>https://www.drought.gov/data-maps-tools/us-gridded-palmer-drought-severity-index-pdsi-gridmet#:~:text=The%20PDSI%20is%20a%20standardized,4%20represents%20an%20extreme%20drought.</p>	Thirteen instances of drought have impacted Glenn County since 1977, including one federal disaster declaration in 1977 (DR-3023).	<p>The severity of droughts and the number of dry years is anticipated to rise, even if precipitation remains stable or increases. Several climate models predict that a warming climate will increase precipitation variability, leading to more frequent periods of extreme precipitation and drought. This means that there will be a greater need for expanded water storage to prepare for drought years.</p> <p>Drought has an annualized frequency of 27% in the county, according to the National Risk Index (NRI), so future droughts in Orland are likely.</p>	<p>Long-term impacts include ground water shortage, tree mortality, mental and physical stress, reduced farm-labor days, less income for those in the agricultural sector. Alternating extremely wet and dry years can promote the spread of vector-borne diseases. Drought can also increase the risk of wildfires. Decreased soil moisture stresses vegetation and increases plant mortality, which provides fuel for wildfires. When combined with extreme heat, more extreme wildfires are possible. Drought conditions in Orland are on par with the rest of the county. Less land is used for agriculture in cities. However, employment in the farming industry could still be reduced, impacting local jurisdictions. Recent drought has also shown that private wells may be impacted, and the city</p>	<p>Changes in development have not significantly increased or decreased Orland's vulnerability. The city obtains a large portion of its water from deep wells in and around Orland. New wells are often drilled in the region during intense droughts. The Orland Public Works Department maintains the city water system from well production. Orland is undertaking a Municipal Water Extension Project to connect the owners of dry wells outside the city to the municipal water system. However, some owners cannot be</p>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Orland Annex

Hazard Type	Description	Spatial Extent	Magnitude	Previous Occurrences	Frequency/ Probability of Future Occurrences	Impacts and Vulnerabilities	Changes in Development
	and demand of economic goods or services become imbalanced because of droughts.					has had issues with numerous dry wells.	connected at this time because their properties are too far from the project, and funding limitations make these connections cost prohibitive.
Extreme Heat	Extreme heat occurs when conditions are substantially hotter and/or more humid than average. In California, in the area around Orland, extreme heat is defined as three successive days over 105°F .	The danger of extreme heat has no geographical limits and could impact the entire planning area.	The impacts of extreme heat can be measured using the National Weather Service (NWS) Heat Risk Prototype, which helps identify risk over 24 hours. It can be found at https://www.wrh.noaa.gov/wrh/heatrisk/	Eight heat or excessive heat events have been recorded in the NOAA NCEI Storm Events Database for regions that include Orland. Record-breaking temperatures occurred on July 1–2, 2023, with daytime highs of 100°F –110°F , and overnight lows from the mid-70s to low 80s. Similar conditions occurred in the region on July 15–16, 2023, July 21–22, 2023, and August 8–17, 2023.	The NRI has recorded 49 heat wave events for Glenn County, or three events per year. The area is likely to experience extreme heat every year. Orland will have an increased risk of extreme heat because of the higher density of housing and concrete than in other parts of the county. Because of increasing “feel-like” temperatures in Orland, they are projected to increase steadily. Orland’s average annual maximum temperature, based on data from 1961 to 1990, was 74.9°F (Cal-Adapt, 2017). Increased average temperatures are	Extreme heat can harm human health, particularly among the elderly and those with chronic conditions, such as respiratory or cardiovascular diseases. Heat-related illnesses arise when the body cannot regulate temperature. They range from mild dehydration to hospitalization and death from heat stroke. Outdoor workers, older persons, infants and children, pregnant women, and individuals with low incomes are among those most vulnerable to prolonged heat. Older adults are less able to regulate body temperature and are more likely to have underlying medical conditions. Outdoor workers may lack a location to get relief from	California’s Fourth Climate Change Assessment, Sacramento Valley Region, indicates an increased risk of extreme heat events from climate change. While broader changes to the climate may increase extreme heat, there have not been significant changes in development that would impact Orland’s vulnerability to extreme heat since the last plan update.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Orland Annex

Hazard Type	Description	Spatial Extent	Magnitude	Previous Occurrences	Frequency/ Probability of Future Occurrences	Impacts and Vulnerabilities	Changes in Development
					expected to lead to secondary climate change impacts, including increases in the frequency, intensity, and duration of extreme heat days and multi-day heat waves in California.	high temperatures. Avoiding work in the heat of the day may reduce heat-related illnesses but can lead to overall loss of productivity.	
Flood	Flood refers to a general and temporary condition of partial or complete inundation of normally dry land. Riverine or fluvial flooding occurs when streams or rivers exceed their capacity because of heavy seasonal rainfall, which typically occurs from December through February. Pluvial flooding is localized flooding that occurs during heavy seasonal rainfall, independent of an overflowing water body. Flooding can also occur when dams fail or levees are breached.	Two major watershed basins of the Sacramento River Watershed extend across the county: Glenn-Colusa and Shasta-Tehama. They pose significant flood risks from natural and human-made factors in their respective floodways. Areas adjacent to Hambright Creek and Stony Creek near Orland also are at risk of flooding. According to the FIRMs, some of the northwest portion of the city and areas along its northern edge	Floods are described in terms of the area affected, the depth of floodwaters, and the probability of occurrence. Flood studies often use historical records, such as streamflow gauges, to determine the probability of the occurrence of floods of different magnitudes. This probability is expressed in percentages as the chance of a flood of a specific extent occurring in a given year. The probability of flooding is measured as the average recurrence interval of a flood of a given size and place. It is defined as the percent chance that a flood of a certain magnitude or greater will occur at a particular	The county, including Orland, has been included in 8 flooding federal disaster declarations since 1964 including DR 3592, 4683, 4308, 758, 412, 283, 183. Furthermore, many areas of the county have a history of seasonal flooding, frequently causing safety concerns and transportation delays, including during the plan update.	According to the NRI, 0.5 events of riverine flooding is expected in the county each year, based on 13 events over 24 years. However, these past flood events have not directly impacted the City of Orland. The entire City of Orland is within the potential inundation area for the Black Butte dam. The probability of occurrence in the next year is estimated to be between 1-10%, or Occasional.	The vulnerabilities and impacts of flooding depend on the size, extent, and magnitude of the event. Injury or death can occur if people are caught in floodwaters, and floodwaters can create other public health concerns by spreading infectious diseases and exposure to chemicals and hazardous materials, including pollutants stored in sediment. Flooding can cause extensive damage to structures, depending on its depth and velocity, the construction types of buildings, and other factors. Increased development can accelerate the risk of flooding in urban areas like Orland. Hazus estimated \$8,372,0000 (0.36% of assets) in	No significant changes to the population or land use which would impact the City of Orland's vulnerability to flood have occurred since the last plan update. More frequent severe storms and floods are expected because of climate change, which could increase vulnerability in the future.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Orland Annex

Hazard Type	Description	Spatial Extent	Magnitude	Previous Occurrences	Frequency/ Probability of Future Occurrences	Impacts and Vulnerabilities	Changes in Development
		are in either Flood Zone A or Flood Zone X (shaded), which means the area may be subject to flooding.	location in a given year. ¹⁰⁶ <ul style="list-style-type: none"> A 10-year flood has a 10% chance of occurring in a given year, while a 50-year flood has a 2% chance and a 100-year flood has a 1% chance. The 100-year flood is the standard for floodplain management in the US and is referred to as a base flood. A 500-year flood has a 0.2% chance of occurring in a given year. 			losses at the 1% annual chance of flood and an additional \$3,303,000 (0.14% of assets) at the 0.2% annual chance. The city also has structures related to flooding due to dam failure, with over \$2,357,950,000 in community assets at risk. The main community lifeline at risk is Safety and Security. Orland has no repetitive loss or severe repetitive loss properties, as defined by the National Flood Insurance Program (NFIP).	
Geologic Hazard	These include earthquakes, expansive soils, and subsidence. An earthquake occurs when two blocks of the earth suddenly slip past one another. Seismic shaking is the greatest cause of damage from an earthquake in the county, followed by liquefaction.	The entire city is at risk of earthquakes. Six earthquake fault systems exist in and around the county, including the Great Valley Fault, which traverses the county in a north-westerly direction, just west of I-5. This system has	The magnitude of an earthquake is related to the area of the fault that ruptured and the offset (displacement) across the fault. There are seven earthquake magnitude classes according to the California Earthquake Authority, ranging from great (8 or larger with significant potential damage) to minor (3.0-3.9 which may be felt).	There have been no damaging earthquakes in Orland in the last century and no recent earthquake epicenters have occurred in the city. Since 1931, an estimated 662 earthquakes have occurred within 30 miles of Orland. Seismic activity has been	Earthquakes are likely in Orland. According to Cal OES 2010, the probability of a 5.0M earthquake there is 44.62%, slightly less than the 60.91% chance for the county. Future events for expansive soils are likely to be occasional, as they depend on the	The potential losses from a 5.8M earthquake in Orland is \$45,695,660. Across the county, single-family residences make up a significant portion of damaged buildings. Multi-family residences also would be a concern in Orland. Land subsidence can lead to changes in the elevation and slope of streams, canals, and drains and damage	There has been no change in vulnerability to geologic hazards since the last plan update.

¹⁰⁶ The 100-Year Flood. USGS, 29018. <https://www.usgs.gov/special-topics/water-science-school/science/100-year-flood>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Orland Annex

Hazard Type	Description	Spatial Extent	Magnitude	Previous Occurrences	Frequency/ Probability of Future Occurrences	Impacts and Vulnerabilities	Changes in Development
	Expansive soils have a high clay content, which swells with increased moisture content and contracts during dry periods. This change in volume can damage building foundations, roads, and concrete pavement. Land subsidence refers to the gradual or sudden sinking of the Earth's surface caused when subsurface materials are displaced or removed. The primary causes of land subsidence include aquifer system compaction from groundwater withdrawals, drainage of organic soils, underground mining, and natural compaction or collapse, such as sinkholes or thawing permafrost.	several small fracture faults, including the Stony Creek Fault, which is parallel to the reservoir and tributary of the same name and terminates in Stonyford. The Corning Fault branches off from the Willows Fault, where the two pass under the Colusa Canal. The Corning Fault continues through the central part of the county, following I-5. Almost all of the city has soil which has medium or high shrink-swell potential and is at risk of expansive soils. The entire city could be at risk of land subsidence.	The Modified Mercalli Intensity Scale is also used to measure magnitude and can be found at https://www.earthquakeauthority.com/blog/2020/earthquake-measurements-magnitude-vs-intensity	consistent since the last plan update, with earthquakes ranging from 0.9M to 4.6M. There has been no occurrence or damage from expansive soil in Orland, and the area is mapped as having a "low" risk to expansive soils. Subsidence has not caused damage in Orland, but vertical displacement has occurred just north of the city.	amount and types of clay in the soil. Although data are not sufficient to determine a recurrence interval, past and ongoing events indicate that the probability of subsidence in Orland is likely.	bridges, roads, railroads, storm drains, sanitary sewers, canals, and levees. Private and public buildings also may be damaged by subsidence. The compaction of fine-grained materials in aquifer systems can cause well casings to fail. Roads, bridges, utility lines, and other structures on either side of I-5 would be most vulnerable. Near Orland, the greatest risks are outside of the city proper, including to the southwest where the possibility of expansive soils is rated as moderate.	
Levee Failure	According to the National Flood Insurance Program,	The county has five levee systems, which	Levee failure is usually measured according to the nature of the breach	No levee failures have impacted Orland since the	Levee failures do not occur in regular intervals but are	The impacts of levee failure would be very similar to those from	Since the last plan update, Orland has not

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Orland Annex

Hazard Type	Description	Spatial Extent	Magnitude	Previous Occurrences	Frequency/ Probability of Future Occurrences	Impacts and Vulnerabilities	Changes in Development
	a levee is a human-made structure, typically an earthen embankment, created in accordance with sound engineering practices, to contain, control, or divert the flow of water to minimize the risks of temporary flooding.	are located along Butte Creek, Elk Creek, French Creek, Grindstone Creek, Hambright Creek, Logan Creek, Stony Creek, Walker Creek, Wilson Creek, and Willow Creek and their tributaries. The Glenn-Colusa Canal and Tehama-Colusa Canal are other sites where levees could fail and impact surrounding communities. The City of Orland does not have any levees in its vicinity but is aware of potential impacts in neighboring communities.	(overtopping the levee crown versus a failure along the slope), the affected area, flow volume and velocity, and depth of flooding. Flooding from levee failure in the county is expected to be less than 3 feet deep. The onset is typically slow as the river rises, but if a levee fails, the warning times are short for those in the inundation area. Flow volume and velocity are typically highest at the site of the failure. The water then slows and becomes less deep as it spreads over a larger area. Levee failures can last hours to weeks, depending on the river flows beyond the levee and the nature of the breach. The City of Orland does not have any properties or populations within a Levee Flood Protection Zone.	last plan update. However, the county has experienced levee failures in the past, including rotational slope failure and overtopping.	often related to heavy rain and other flooding events. Factors, such as the levee's age, construction materials, and signs that it is deteriorating, also may influence the probability of failure. Seven events have occurred in the last 100 years in the county—approximately every 14 years, or a 7% chance annually. However, levee failures could happen more or less frequently than that. Orland is not currently protected by levees, future events are unlikely.	flooding, but the areas likely to be flooded by a levee failure do not necessarily align with 1% and 0.2% annual chance flood hazard zones. Heavy precipitation and high flows in rivers can contribute to the overtopping or failure of levees. Areas otherwise protected from flooding by levees could experience flooding if a levee fails or is breached. A levee failure could cause significant loss of life and property. The City or Orland is not expected to experience losses from levee failure but could be indirectly affected by failures elsewhere in the county that could disrupt transportation routes in the region.	experienced changes in development that affect vulnerability to levee failure. Land use has remained the same, and the population has experienced a slight decrease. Climate change could indirectly affect the risk of levee failure because of changes in future precipitation patterns or the intensity of rain events. The overall vulnerability to levee failure in Orland has remained the same.
Severe Weather	Severe weather is any destructive heavy rain event that can damage property or cause the loss of life. Moreover,	Severe weather can occur anywhere in Orland.	A variety of metrics can be used to describe the magnitude and severity of severe weather in the county, including Orland. Data from	A total of 7 FEMA disaster declarations and 3 Cal OES declarations have included Glenn	Severe weather will continue to occur annually in Orland. The frequency and probability of future occurrences are	Because of the widespread nature of weather hazards, all populations, structures, critical facilities, infrastructure, natural	No significant change in population and land use has occurred since the last plan

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Orland Annex

Hazard Type	Description	Spatial Extent	Magnitude	Previous Occurrences	Frequency/ Probability of Future Occurrences	Impacts and Vulnerabilities	Changes in Development
	excessive localized precipitation over a short period may cause flash floods that threaten life and property. Severe weather usually occurs in the county as localized storms that bring heavy rain.		NOAA, the NWS, the Spatial Hazard Events and Losses Database for the United States (SHELDUS), and the National Climatic Data Center (NCDC) Storm Events Database. Damaging winds typically exceed 50–60 mph. Gusts that strong have been reported in heavy rainstorms, and some have reached 75–85 mph in the region. Average rainfall varies across the county, but the equivalent of 2–3 inches of rain in the northern Central Valley and 4–11 inches in the mountainous areas have been reported in heavy rainstorms.	County, including Orland. In speaking with the City's Public Works Director, he indicated that his definition of "severe weather" in Orland is "greater than 1/2" of rain in a 5-hour period". The City has had multiple instances of flooding in the past few years (intersection of 5th Street and SR32; Intersection of 3rd Street and Yolo; E. South Street (aka Road 200) by Lely Park).	highly likely (near 100% probability in the next year). Because of past weather patterns and changing future conditions, increases in the probability of future occurrences of severe weather events in Orland are anticipated.	environments, and economies in the planning area can be impacted by heavy rains. People may be unaware of risks from severe weather and the proper actions to take to ensure their personal safety.	update. However, because of climate change, the frequency and strength of storms across the US are expected to increase, which could increase Orland's vulnerability to this hazard.
Wildfire	Wildfires are uncontrolled blazes that ravage wildland vegetation, often in rural settings. They are not confined to a particular region or environment and can occur in various ecosystems. The topography, weather, and vegetation of the county provide ideal conditions for wildfires to spread	The western parts of the county, including the Mendocino National Forest, are more susceptible to wildfire than Orland which is predominantly non-fuel according to the Office of the State Fire Marshal. Despite	The severity of a fire depends on various factors, particularly the steepness of slopes. Fires tend to burn more rapidly as they move up slopes. Moreover, temperature, humidity, and wind significantly influence fire behavior. As mapped, Orland would not expect to experience an extreme wildfire, as indicated on a map of Fire Hazard	Over the past few decades, the county has witnessed 20 wildfire incidents, ranging from the small-scale Edward fire in 2022 to the massive Elk Fire/ August Complex fire in 2020 that engulfed over 1,032,648 acres. Orland has not	Orland does not intersect the FHSZs. However, fires do not understand the boundaries on maps, and they still pose a threat to the city. Areas close to the city at risk of fire include riparian areas near Stony Creek, north of the city. The growth of Arundo and Tamarisk poses a risk of fire in this	The threat of wildland fire is considered minimal in the city, based on land use. Areas around Stony Creek would be the most vulnerable. Urban fires, including structural fires in a residence or small business and urban conflagration (multiple simultaneous structural fires), are possible in the city. Potential sources of urban fires include	Overall, vulnerability to wildfire has not changed. The city has close to 500 hydrants, which can provide approximately 700 gallons per minute. However, volunteer fire protection services in the area could be strained as the

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Orland Annex

Hazard Type	Description	Spatial Extent	Magnitude	Previous Occurrences	Frequency/ Probability of Future Occurrences	Impacts and Vulnerabilities	Changes in Development
	rapidly and pose a severe risk.	this designation, Orland could still be at risk of a major wildfire and wildfire smoke. The community emphasized that wildfires don't always respect zones on a map. Areas like vegetation around Stony Creek still present a real threat to the city.	Severity Zones (FHSZs). People and residents around Stony Creek may still be impacted.	experienced a wildfire since the last plan update.	interface between the city and the surrounding open space. The threat classifications are low to moderate, cover a relatively small area, and do not contain any critical facilities. A few residential streets are near these low-risk areas, including Gable Drive and Stony Creek Drive. Furthermore, climate change is a significant factor in the increasing number of fires. Higher temperatures, drought, and other impacts of climate change could increase the probability of a wildfire impacting Orland.	transportation incidents, such as an operational failure of rail service or traffic accidents on the interstate; fires or explosions at an agricultural processing plant; and hazardous materials incidents.	city continues to expand. Additional development to support the water infrastructure used in firefighting could help reduce the city's vulnerability to this hazard.

Capability Assessment

As part of the plan update, Orland identified current mitigation capabilities and opportunities to improve or expand these existing policies and programs (see Table 107). Identifying these capabilities or resources helps communities select feasible mitigation actions.

Table 107: Mitigation Capabilities and Opportunities for Orland

Type	Analysis
Planning and Regulatory	Existing: General Plan, Building Codes, Subdivision Ordinance, Zoning Ordinance
	Opportunity to Improve or Expand Capability: The city seeks continual improvement and growth in all aspects of its operations. One mitigation action is developing a Climate Action Plan.
Administrative and Technical	Existing: Building Official, Civil Engineer, Community Planner, Floodplain Administrator, Planning Commission, GIS, Mutual Aid Agreements
	Opportunity to Improve or Expand Capability: New and/or additional staffing is always welcomed. Emergency management is one area in which the city could expand its current staffing. In particular, an emergency event coordinator would be beneficial.
Financial	Existing: Capital Improvement Project funding, general funds, Community Development Block Grants, Natural Resources Conservation Services programs, U.S. Army Corps of Engineers programs, property, sales, income, or special purpose taxes, fees for water, sewer, gas, or electric services, impact fees from new development and redevelopment, general obligation or special purpose bonds, Cal FIRE mitigation grants
	Opportunity to Improve or Expand Capability: The city can pursue additional grant funding, such as new FEMA grant programs like the Building Resilient Infrastructure and Communities (BRIC) grant program.
Education and Outreach	Existing: Community newsletter, hazard awareness campaigns, public meetings/events, local news, distributing hard copies of notices as necessary, organizations that represent, advocate for, or interact with underserved and vulnerable communities, social media
	Opportunity to Improve or Expand Capability: Expand public outreach efforts including in accessible areas, such as the library, to ensure the whole community has access to information on natural hazards and how to mitigate them

FEMA also requires that communities address their participation in the National Flood Insurance Program (NFIP). The program allows property owners and renters to purchase flood insurance to protect against future flooding damage in exchange for implementing additional community floodplain management measures.

Orland has participated in the NFIP since August 5, 2010. Further information on community participation includes the following:

1. **Adoption of Minimum Floodplain Management Criteria:** The community adopted Ordinance No. 2011-03 on 09/06/2011. The community is considering an updated floodplain ordinance.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Orland Annex

2. **Adoption of the Latest Effective Flood Insurance Rate Map (FIRM):** The current effective FIRM is dated 09/16/11.
3. **Implementation of Local Floodplain Management Regulations:** Building and Planning are responsible for permitting. Before approving a building permit, the Building Official looks at flood maps to see if the structure is in a Special Flood Hazard Area (SFHA).
4. **Designated Floodplain Manager:** The City Engineer, the Public Works Director, Fire Chief, and Planning collaborate to accomplish the tasks of a floodplain manager. The Public Works Director is automatically designated as the floodplain manager.
5. **Implementation of Substantial Improvement/Substantial Damage Provisions:** No flood event has ever happened; the community does not have a written policy on file. Most likely, it would be a collaborative effort between departments to assess damaged structures.

Mitigation Strategy

The mitigation strategy is the community's blueprint for disaster risk reduction. It comprises mitigation goals, objectives, actions, and the mitigation action plan. This strategy is designed to address the vulnerabilities identified in the risk assessment by using the capabilities addressed in the capability assessment. The first step in updating the mitigation strategy involved reviewing the status of prior mitigation actions. After that, the city considered a comprehensive range and identified a list of actions to be included in the current plan update. Then, the jurisdiction compiled a final list of mitigation actions and prioritized each action.

Status of Prior Mitigation Actions

Table 108 contains previous mitigation actions that require status updates.

Table 108: Previous Mitigation Actions in Orland

Mitigation ID	Mitigation Project Title	Status for Plan Update
OR-1	Eradicate Arundo in Stony Creek	Glenn County RCD has begun work on this. However, Arundo is very aggressive and keeps coming back. Additional work is needed to reduce or eliminate this risk. This action has been retained, with edits to account for additional invasive species which are present in the area (Action #1)
OR-2	Flood Potential Reduction along Stony Creek	This has been implemented and considered ongoing. There has been no new recent construction. The remaining tasks have been consolidated into another relevant action therefore this action is retained with edits (Action #8).
OR-3	Black Butte Dam Failure Inundation	No progress due to limited staffing. This should be accomplished by the Bureau of Reclamation. Therefore, this action is not retained as it is no longer relevant to this plan update.
OR-4	Improve and Maintain Stormwater Drainage System Capacity	The city has been actively upsizing pipes and completing vegetation management after every event. It is ongoing, and additional work is needed. (Action #8)

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Orland Annex

Mitigation ID	Mitigation Project Title	Status for Plan Update
OR-5	Drought Awareness	The city adopted drought water conservation guidelines by stage. There are four tiers to these measures. Since the last plan update, it has been implemented, and limitations were placed on water use because of drought. Complete, does not need to be retained.
OR-6	Increase Natural Hazard Education and Risk Awareness	This has not been accomplished yet. This action has been retained with edits (Action #3).
OR-7	Improve Household Disaster Preparedness	This has not been accomplished yet. It was discussed during the planning process that preparedness focused actions are not the main focus of the mitigation plan. Therefore, this action is considered no longer relevant and will not be retained. Preparedness will be addressed outside of the mitigation plan.

The city developed the actions in Table 109 at the Mitigation Strategy meeting with stakeholders and other participating jurisdictions. Hazard mitigation actions are detailed in Table 110.

Table 109: Considered Mitigation Actions

Mitigation Action	Type of Action	Selected? (Y/N)	If not selected, why not?
Support the development of a countywide Climate Action Plan	Local Plans and Regulations	Yes	
Support the development of a countywide Master Drainage Plan	Local Plans and Regulations	No	Orland currently has a drainage plan, but it must be updated.
Amend plans and building codes in accordance with state requirements to reduce the risk of hazards like floods and wildfires.	Local Plans and Regulations	No	Amended another action to include building codes.
Support the hardening of infrastructure such as waterlines, sewer lines, and bridges around Hambright Creek and Stony Creek.	Structure and Infrastructure Projects	Yes	
Eradicate Arundo and replace it with native vegetation around Stony Creek.	Natural Systems Protection	No	Amended action to focus on removing invasive species (Arundo).

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Orland Annex

Table 110: 2025 Hazard Mitigation Actions for Orland

#	Project Title	Hazard Addressed	Vulnerability Addressed (Including Vulnerable Populations)	Responsible Agency	Potential Partners	Existing Planning Mechanism(s) through Which the Action Will Be Implemented	Potential Funding	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
1	Eradicate Invasive Species in Stony Creek	Wildfire	Homes, potential homeless populations	County, City, Dept of Fish and Wildlife, Upper Stony Creek Watershed Coalition	Glenn County, CalFire, RCD	CWPP, General Plan	City Fire, CalFire, CA Fish and Wildlife	TBD	Fire, Environmental Improvement)	Seasonal Maintenance	3 years	H
Description: Eradicate invasive species like Arundo near Stony Creek.												
2	Upgrade Undersized Water Systems	Wildfire	Homes, Businesses, critical facilities, other structures	Public Works	Glenn County,	Stormwater Management Plan	Capital Improvement funding, Fees	TBD	Improved fire suppression, reduction in structural loss	30 Years	5 years	M
Description: The current pipes have a reduced capacity to carry the quantity of water necessary for full fire prevention operations. Upgrading these systems will help reduce the loss of life and property from a fire.												
3	Increase Natural Hazard Education, Risk Awareness, and Mitigation Knowledge	All Hazards, Wildfire, Flood, Drought, Extreme Heat, Geologic Hazards, Severe Weather	Prevent loss of life, reduce structural damage	City Admin, Planning Department	Glenn County,	General Plan	General Fund	TBD	Increase resident's ability to take appropriate action to reduce their personal risk.	3 years	1 year	M
Description: Provide public workshops and informational brochures at City Hall and Library												
4	Enforce and Update Building Codes	Severe Weather, Geologic Hazards	Reduce structural losses and potential injury or loss of life.	Building Department, Planning Department		General Plan	General Fund	TBD	Enforced building codes reduce damage to structures.	5 years	1 year	M
Description: Enforce current codes protecting homes from hazards like severe weather including promoting underground of power lines in new developments. Update building codes as required by law.												

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Orland Annex

#	Project Title	Hazard Addressed	Vulnerability Addressed (Including Vulnerable Populations)	Responsible Agency	Potential Partners	Existing Planning Mechanism(s) through Which the Action Will Be Implemented	Potential Funding	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
5	Support the development of a countywide Climate Action Plan	Extreme Heat, Drought	Heat related illness, energy demands, water supply impacts, dry wells	Glenn County	Glenn County, City, RCD, state agencies	General Plan, Safety Element	Grant funding such as ICARP	TBD	Prevent or reduce heat related illness or loss of life from heat, conserve water supply for residential and agricultural use.	10 Years	3 years	M
Description: Work with the County to develop a countywide Climate Action Plan.												
6	Update Storm Drain Master Plan	Flood	Localized flooding	Planning,	Public Works, County	General Plan	General fund, FMA grant	TBD	Reduction in flooding from inadequate stormwater draining	10 years	1 year	M
Description: Update the city's current storm drain master plan.												
7	Adopt New Floodplain Ordinance	Flood	Floodplain management	Planning, City Council	Glenn County	General Plan	General Fund	TBD	Ensure policies for reducing flood risk are in place and enforced to reduce potential flood impacts	30 years	1 year	M
Description: Adopt new floodplain ordinance clearly identifying the roles and responsibilities of the floodplain manager in accordance with current floodplain ordinance requirements and language. Continue to encourage minimal development in the SFHA.												
8	Infrastructure Hardening	Flood	Prevent damage to infrastructure from flooding.	Public Works	County, Watershed Management agencies, CA DWR	General Plan	Capital Improvement Funds, FMA grant, BRIC	TBD	Protect critical infrastructure from flood damage, bank erosion, etc.	20 years	5 years	L
Description: Support the hardening of infrastructure such as waterlines, sewer lines, and bridges particularly around Hambright Creek and Stony Creek.												

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Orland Annex

#	Project Title	Hazard Addressed	Vulnerability Addressed (Including Vulnerable Populations)	Responsible Agency	Potential Partners	Existing Planning Mechanism(s) through Which the Action Will Be Implemented	Potential Funding	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Timeframe	Priority
9	Increase Storage Capacity of City Reservoirs	Drought, Wildfire	Recent drought and dry wells have demonstrated the need to expand city water infrastructure. Water discharge rates need to be slowed down to be used.	City Admin, Planning, Public Works	CA DWR	General Plan	Capital Improvement Funds,	TBD	Maintain adequate residential and agricultural water supply.	30 years	5 years	M
Description: Extend the city's current waterlines as well as implement storage capacity enhancing initiative such as build an aboveground storage tank or drill an additional well to expand the city's municipal water infrastructure. Study the opportunity to slow down water drainage and capture rainwater. Implement groundwater recharge projects as possible.												
10	Assess Cooling Center Needs	Extreme Heat	Increasing number of extreme heat days contributes to heat related illness.	City Admin, Planning	Glenn County, Community volunteer groups, faith-based organizations	General Plan	General funds	TBD	Prevent heat related illness for those without adequate cooling.	10 years	1 year	M
Description: Evaluate opportunities for city cooling centers.												

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Orland Annex

In order to prioritize the implementation of actions, the City of Orland were asked to consider the benefits and costs of each including the following “STAPLEE” criteria:

- **S – Social:** The public must support the overall mitigation implementation strategy and specific mitigation actions. Consider: Will the action disrupt housing or cause the relocation of people? Will the proposed action adversely affect one segment of the population? Is the action compatible with present and future community/agency values?
- **T – Technical:** It is important to determine if the proposed action is technically feasible, will help to reduce losses in the long term, and will have minimal secondary impacts. How effective is the action in avoiding or reducing future losses? Does the action solve the problem or only a symptom? Will the action create more problems than it solves? Consider the root cause of the issue at hand to determine whether the action is a whole or partial solution, or not a solution at all.
- **A – Administrative:** This category examines the anticipated staffing, funding, time, and maintenance requirements for the mitigation action to determine if the jurisdiction/special district has the personnel and administrative capabilities to implement the action or whether outside help will be necessary. Consider, a) Staffing (enough staff and training): Does the jurisdiction/special district have the capability (staff, technical experts) to implement the action? b) Funding allocated: does the jurisdiction/special district have the funding to implement the action or can it readily be obtained? c) Time: can it be accomplished in a timely manner? d) Maintenance/Operations: can the jurisdiction/special district provide the necessary maintenance? It is important to remember that most federal grants will not provide funding for maintenance.
- **P – Political:** This considers the level of political support for the mitigation action. Is there political support to implement and maintain this action? Have political leaders participated in the planning process so far? Is there a local champion willing to help see the action to completion? Is there enough public support to ensure the success of the action? Have all stakeholders been offered an opportunity to participate in the planning process?
- **L – Legal:** The jurisdiction/special district must have the legal authority to implement the action or consider what new laws or regulations would be needed to carry out the mitigation action. Evaluate, are the proper laws, ordinances, and resolutions in place to implement the action? Are there any potential legal consequences? Is the action likely to be challenged by stakeholders who may be negatively affected?
- **E – Economic:** Economic considerations must include an evaluation of the present economic base and projected growth. Cost-effective mitigation actions that can be funded in current or upcoming budget cycles are more likely to be implemented than actions requiring general obligation bonds or other instruments that would incur long-term debt in a jurisdiction/special district. Consider benefits and costs at the planning level. A detailed benefit–cost analysis will be performed as project-specific funding becomes available. What financial benefits will the action provide? Does the cost seem reasonable for the size of the problem and the likely benefits? What burden will be placed on the tax base or local economy to implement this action? Does the action contribute to community economic goals, such as capital improvements or economic development? Are there currently sources of funding that can be used to implement the action?
- **E – Environmental:** The impact on the environment is an important consideration because of public desire for sustainable and environmentally healthy communities. Also, statutory considerations, such as the National Environmental Policy Act (NEPA), need to be kept in mind when using federal funds. How will this action impact land/water? Impact on endangered species: How will this action impact endangered species? How will this action impact hazardous materials and waste sites? Is this action consistent with community environmental goals? Is the action consistent with federal laws, such as the National Environmental Policy Act (NEPA)?

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Orland Annex

Plan Integration

Plan integration helps ensure progress in local mitigation efforts. The plan update is also required to identify where the prior plan was incorporated into other planning mechanisms and where the plan update may be incorporated in the future. In this case, planning mechanisms refer to the governance structures used to manage local land use development and community decision-making, such as budgets, comprehensive plans, capital improvement plans, or other long-range plans, codes, and ordinances.

Orland is committed to ensuring its residents' and businesses' safety and well-being in the face of potential hazards. To this end, it is integrating its hazard mitigation plan into its overall emergency management framework and incorporating it into various aspects of its budgeting, planning, and development processes.

For example, the city's comprehensive plan includes provisions for hazard mitigation and outlines strategies for reducing risks from potential hazards. The city's land development regulations consider the potential risks associated with different types of development and require appropriate measures to mitigate those risks. Similarly, the city's capital improvement plan allocates resources to projects that address potential hazards and improve the community's ability to respond to disasters and emergencies.

The city's codes and ordinances also play an important role in integrating the hazard mitigation plan. For example, building codes and standards ensure that new construction meets appropriate safety standards and is built to withstand potential hazards. Zoning codes may prohibit development in particularly vulnerable areas or require specific mitigation measures.

Through such efforts, Orland is working to ensure that its hazard mitigation plan is fully integrated into its planning, development, and emergency management processes and that the community is well prepared to respond to potential hazards.

Previous Plan Integration

Plan Name	Description
General Plan – Safety Elements	The text was added to the General Plan Safety Element, recognizing the MJHMP and expressing the city's support of the plan and its contents. (Pages: 4.0-2, 4.0-3, 4.0-7, 4.0-11–4.0-15, 4.0-18, 4.0-22, 4.0-25–4.0-30, 4.0-35 & 36.

Future Plan Integration

Because of its size and limited capacity, Orland may face challenges updating and integrating its hazard mitigation and emergency management plans within the next five years. The city may face resource constraints, limited staffing, or other factors impacting its ability to prioritize and invest in these areas. Despite these challenges, Orland remains committed to ensuring its residents' and businesses' safety and well-being. The city continues to explore innovative solutions and partnerships to enhance its emergency management capabilities and mitigate the risks associated with potential hazards. While there may be limitations to the scope and timing of plan integration in the next five years, Orland is dedicated to making the most of its available resources to protect its community.

Mitigation Success Story

Walker Street Well Project

Orland has been facing water shortage issues because of drought conditions in the region. To address this problem, the city launched a water project for dry wells called the Walker Street Well Project. It aims to connect municipal water to the properties with at-risk or dry wells and to add a one-million-gallon water storage tank to ensure water availability during the dry season.

The project involved drilling new wells connected to the existing municipal water system. This will help provide a reliable water source to the residents of Orland, even during drought conditions. In addition, constructing the one-million-gallon water storage tank will ensure enough water is available for the city, even during prolonged dry spells.

The residents of Orland have praised the project, as it will ensure that they have access to clean and safe drinking water throughout the year. The city officials have also assured the residents that the project will be completed on time and within budget and that it will be maintained properly to ensure its longevity.

Overall, the Orland water project for dry wells is a significant step toward ensuring the sustainability of the city's water supply. It is a great example of how cities can proactively address water shortage issues and provide residents with a reliable water source, even during droughts. The project is planned to be finished by the summer of 2024.



Figure 104: Photograph from the Walker Street Well Project

Conclusion

The City of Orland has made notable progress in enhancing its emergency management framework by updating its Hazard Mitigation Plan. This has enabled the city to identify potential hazards in the area, assess the risks and vulnerabilities associated with each hazard, and outline strategies for reducing or mitigating the impact of these hazards.

One of the key accomplishments of this update is the city's ability to address changes in priorities based on new data and emerging risks. The updated plan considers the latest information on potential hazards, such as natural and technological hazards, and identifies the community's most critical risks. This has

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Orland Annex

allowed the city to prioritize its resources and focus on pressing issues regarding emergency management.

Besides addressing priority changes, the updated plan has helped the city identify strategies and next steps for improving emergency management in the community. For example, the plan recommends increasing public awareness and education regarding emergency preparedness, developing partnerships with neighboring communities and agencies, and investing in new technologies and infrastructure to better respond to disasters and emergencies. By implementing these recommendations, the city hopes to further reduce the risk of harm to its residents and businesses and improve its ability to respond to disasters and emergencies.

City of Willows Annex

The City of Willows reaffirms its interest in protecting residents, businesses, visitors, and land uses from hazards by participating in the Glenn County Multi-Jurisdiction Hazard Mitigation Plan (MJHMP) update. Hazard mitigation planning is the platform through which communities evaluate their risks and vulnerabilities and identify opportunities to reduce them by establishing mitigation goals and actions. Adopting a hazard mitigation plan is also a requirement for many pre- and post-disaster mitigation grant programs, including FEMA's Hazard Mitigation Grant Program (HMGP) and the Building Resilient Infrastructure and Communities (BRIC) grant program. This annex is designed to be adopted by the city to remain eligible for these and other grant programs.

This plan update also provides the opportunity to reevaluate existing conditions and the unique vulnerabilities of the city. Since Willows participated in the first Glenn County MJHMP in 2018, there have been some changes in its priorities, including an increased emphasis on assessing and mitigating hazards, including flood, fire, and severe weather. Glenn County has received at least one federal disaster declaration for all of these hazards in recent years, indicating an ongoing risk. The city has conducted multiple efforts to maintain flood infrastructure, keeping ditches and canals used for storage runoff clean and trimming trees to reduce the risk from them during severe weather. The city also recognizes hazardous fuel reduction as an important deterrent to wildfire risk and that the risk of fire in the surrounding area has become more apparent, particularly after the August Complex fire. The city places a high priority on capitalizing on available grants and mitigation money to reduce the risks of hazards.

The Planning Process

The MJHMP was developed by the planning consultant IEM with input from the participating jurisdictions, including Willows, the stakeholders, and the public. A key part of hazard mitigation planning is engaging the whole community. The city was represented during the planning process by the following individuals:

Name	Title	Organization
Joe Betterncourt	Community Development and Services Director	City of Willows
Nate Monck	Fire Chief	City of Willows Fire
Natasa Pfyl	Public Works Superintendent	City of Willows Public Works
John Wanger	City Engineer/ Floodplain Manager	City of Willows Parks & Public Works

Stakeholders, including local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development, neighboring communities, representatives of businesses, academia, and other private organizations, nonprofit organizations, and community-based organizations that work directly with and/or provide support for underserved communities and socially vulnerable populations also were invited to be involved in the planning process. Stakeholders were invited to three stakeholders' meetings, encouraged to complete a stakeholder survey, and provided the opportunity to review the draft plan. The Glenn County MJHMP Base Plan includes a full list of stakeholders in Section 2. The Planning Process.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Willows Annex

Per FEMA's [Local Mitigation Planning Policy Guide](#), stakeholders are categorized in the following ways:

1. Local and regional agencies involved in hazard mitigation activities.
Examples include public works, emergency management, local floodplain administration, and Geographic Information Systems (GIS) departments.
2. Agencies that have the authority to regulate development.
Examples include zoning, planning, community, and economic development departments, building officials, planning commissions, or other elected officials.
3. Neighboring communities.
Examples include adjacent local governments, including special districts, such as those affected by similar hazard events or may share a mitigation action or project that crosses boundaries. Neighboring communities may be partners in hazard mitigation and response activities or where critical assets, such as dams, are located.
4. Representatives of businesses, academia, and other private organizations.
Examples include private utilities or major employers that sustain community lifelines.
5. Representatives of nonprofit organizations, including community-based organizations, which work directly with and/or support underserved communities and socially vulnerable populations, among others.
Examples include housing, healthcare, and social service agencies.¹⁰⁷

Table 111 shows the stakeholders given an opportunity to participate in planning, and Table 112 shows those who did participate in Willows' planning process.

Table 111: Stakeholders Invited to Participate

Organization	Description
CHP Willows – California Highway Patrol	Assists the community in managing natural resources and manages fire safety procedures
USDA Natural Resources Conservation Services (Willows, CA)	Focus on soil health and water efficiency
Glenn County Mosquito and Vector Control District (Willows)	Main function is to control the threat of mosquito/vector-borne diseases in Glenn County
Cal Water – Willows	Provides water utility/customer care services
NE Willows CSD	Oversees municipal services in the community
Willows Rural Fire District	Provides a vast range of emergency services, strong public relations, and fire safety education
Willows Chamber of Commerce	Serves the community to create a viable resource for businesses and citizens
Willows Post-Acute	A licensed long-term care and skilled nursing facility providing rehabilitation services after a stay in an acute care hospital
Willows Care Center	A rural nursing facility offering short-stay rehabilitation, long-term care, and subacute care

¹⁰⁷ FEMA, "Local Mitigation Planning Policy Guide." https://www.fema.gov/sites/default/files/documents/fema_local-mitigation-planning-policy-guide_042022.pdf

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Willows Annex

Organization	Description
Willows Library	Libraries are places where people can borrow books and other resources for free
Willows Ink Well	Office Supply Store in Willows

Table 112: Stakeholders Who Participated in Planning for Willows

Organization	Description
Cal Water-Willows	Provides water utility/customer care services
CHP Willows	Various educational projects and programs engage farmers, ranchers, and the community in protecting resources. We continue to address natural resource concerns and pursue opportunities that benefit Glenn County
GCOE (Glenn County Office of Education)	Located in Willows, GCOE has various educational & community programs at all ages & levels, including adult education, senior nutrition programs, and substance abuse prevention.
Glenn County Business Association	Focus on helping create economic & business development and retention for Glenn County
Glenn County District 3	One of 5 districts in Glenn County
Glenn County District Attorney's Office	Focus on prosecuting criminal violations of law with integrity and to support and protect the rights of victims of crime in Glenn County.
Glenn County HHSA	Provides services in the four major divisions of healthcare: social, behavioral health, public health, and community action
Glenn County Mosquito and Vector Control District (Willows)	Main function is to control the threat of mosquito/vector-borne diseases in Glenn County
Glenn County Personnel Department	Glenn County Human Resources
Glenn County Resource Conservation District	Various educational projects and programs engage farmers, ranchers, and the community in protecting resources. We continue to address natural resource concerns and pursue opportunities that benefit Glenn County
Glenn County Resource Conservation District/Tehama-Glenn Fire Safe Council	Assists the community in managing natural resources and manages fire safety procedures
Glenn County Sheriff's Department	Responsible for law enforcement services and emergency response in the unincorporated areas of the county and in the City of Willows
Glenn Medical Center	Serves the Communities of Willows, Elk Creek, Maxwell, Orland, Princeton, and Stonyford with 24/7 emergency care and other medical services
Glenn-Colusa Irrigation District	Committed to maintaining sustainable practices for managing water supply and preserving and protecting the environment
Kanawha Fire Protection District	Provides fire protection services

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Willows Annex

Organization	Description
LAFCO (Local Agency Formation Commission)	A state-mandated local agency that oversees boundary changes to cities and special districts, the formation of new agencies, including the incorporation of new cities, and the consolidation of existing agencies
Levee District #1 – Glenn County	Land reclamation and levee maintenance
Levee District #2 – Glenn County	Land reclamation and levee maintenance
Mendocino National Forest	Provides fire management, emergency response, public information, and fire education
Mendocino National Forest/ Grindstone Ranger District (USDA – Forest Service)	Responsible for fire and resource management in this area
NE Willows CSD	Oversees municipal services in the community
Northern Valley Indian Health	Provides healthcare services to Native Americans and all community members
PG&E (Pacific Gas and Electric)	An investor-owned utility company that provides natural gas and electricity to 5.2 million households in the northern two-thirds of California
Provident Irrigation District	Serves 120 landowners of predominantly rice-crop agriculture to oversee irrigation water supply
Sacramento National Wildfire Refuge	Part of the Sacramento NWR Complex offering recreation, hiking opportunities, and wildlife viewing
Tehama Colusa Canal Authority	A Joint Powers Authority comprised of 17 Central Valley Project water contractors. The service area spans four counties (Tehama, Glenn, Colusa, and Yolo) along the west side of the Sacramento Valley
US Bureau of Reclamation	Its mission is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.
USDA Natural Resources Conservation Services (Willows, CA)	Services to help conserve natural resources to maintain healthy ecosystems, some of which include air, soil, water, plants, land, wildlife habitat
Willows Care Center	A rural nursing facility offering short-stay rehabilitation, long-term care, and subacute care
Willows Chamber of Commerce	Serves the community to create a viable resource for businesses and citizens
Willows Post-Acute	A licensed long-term care and skilled nursing facility providing rehabilitation services after a stay in an acute care hospital
Willows Rural Fire District	Provides a vast range of emergency services, strong public relations, and fire safety education

The public, including underserved communities and vulnerable populations in Willows, were invited to participate in the plan update process through such efforts as Facebook posts (Figure 105). In the last plan update, a public workshop was held, but no participants attended. This time, the plan participants suggested using social media (particularly Facebook) and local gathering places where people would likely be, such as local businesses. Willows solicited public input through a digital survey posted on the

Glenn County Multi-Jurisdiction Hazard Mitigation Plan City of Willows Annex

city website and shared on Facebook (1,800 followers) (see Figure 106). Moreover, the survey was shared with the What's Going on in Willows Facebook group, which has over 8,300 members and reaches across Glenn County. Multiple attempts were made to identify events that would be appropriate through the Willows Chamber of Commerce or library. However, because it was winter and the atmospheric rivers during the critical outreach periods of this extremely expedited planning process, that was not considered feasible. The planning process could begin earlier in future updates, allowing the planners to use preexisting events to promote the hazard mitigation plan update. The public reported that television is a common way to receive information on hazard mitigation, and the survey was shared on Action 12 News, which is seen by nearly 175,000 Northern Californians. In addition, hard copies of the surveys were distributed at the Glenn County Senior Nutrition site in Willows, a location which provides nutritious meals to seniors aged 60 years or older, but no completed surveys were received.

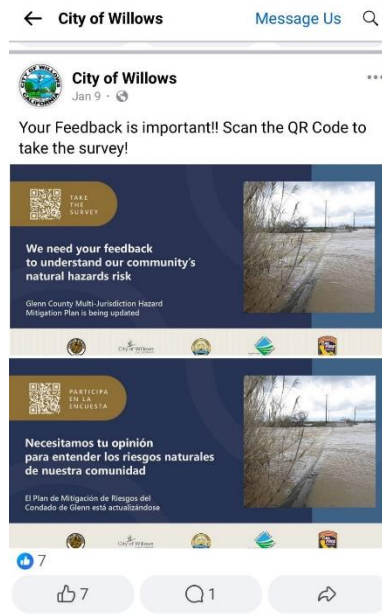


Figure 105: Screenshot of the City of Willows Facebook Post



Figure 106: Survey Posted at Willows Pharmacy

Glenn County Multi-Jurisdiction Hazard Mitigation Plan City of Willows Annex

Outreach to vulnerable populations also was conducted. Reaching the Spanish-speaking community was one of the goals of this plan update. According to the U.S. Census QuickFacts, almost 30% of Willows speaks a language other than English at home, so all public surveys were translated into Spanish to help reach that population. The same survey indicated that most of the community—over 86%—had a broadband Internet subscription. FEMA has acknowledged that while people may not have access to home Wi-Fi, they still may have access to a cell phone. Besides the survey link, the QR code on the survey documents can be easily accessed by cell phone. The stakeholder survey also indicated that the elderly (aged 65 or older) were a significant population of concern. Individuals with low incomes also are a consideration in Willows, where the same site estimated over 25% of residents are considered persons in poverty. One way to reach these populations is to go where they are already going—including grocery stores, pharmacies, hospitals, housing, and other sites that they would naturally visit as part of their routines. Based on these considerations, the survey was posted in person at the following locations:

1. Cedar Hills Manor – a low-income apartment complex and the largest residential apartment complex in Willows.
2. Glenn Medical Center – a “Critical Access Hospital” (a hospital more than 35 miles from any other hospital) in Willows, which offers inpatient, outpatient, and rural health clinic services to residents of Glenn County and surrounding areas.
3. Eskaton Manor – a low-rent apartment which offers support for older adults and people with disabilities.
4. Mar-Val Food Stores – the largest local grocery store.
5. Sycamore Ridge – an affordable housing apartment complex located near bus stops, schools, Walmart, and the Glenn Medical Center.
6. Walmart Pharmacy – one of two local pharmacies in Willows.
7. Willows Acute Care – a nursing home in Willows.
8. Willows Food Bank – a food bank providing food to low-income Glenn County residents.
9. Willows Pharmacy – one of two local pharmacies in Willows.
10. Willows Public Library – a public library with free public computers and Wi-Fi which serves the communities of Willows and the surrounding Glenn County area.
11. Willow Springs Senior Apartments – a senior apartment complex offering housing support to senior English- and Spanish-speaking residents.

Members of the access and functional needs (AFN) community suggested including representatives of that community in the plan update. The newly established Butte–Glenn AFN Committee could become a great resource for these outreach efforts.

A total of 51 public survey responses were received including 16 responses from Willows, and that feedback was incorporated into the plan.

Risk Assessment

Risk assessment identifies and analyzes the hazards that could impact the participating jurisdictions. The participating jurisdictions and stakeholders identified the following hazards at the Kickoff Meeting:

- Drought
- Extreme Heat
- Flood
- Geographic Hazards
- Levee Failure

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Willows Annex

- Severe Weather
- Wildfire

After the Risk Assessment meeting, each participating jurisdiction evaluated its unique risks compared to the overall planning area using the Calculated Priority Risk Index (CPRI). 20 shows the risks for Willows. According to the rankings, it seems that Glenn County and Willows differ in their levels of risk for certain natural hazards. While both areas face a moderate risk of drought and high risks for extreme heat, floods, and wildfires, Willows is also at high risk of severe weather, geologic hazards, and levee failure. On the other hand, Glenn County has a low risk of geologic hazards and a moderate risk of levee failure and severe weather. It is important for residents to stay informed and take necessary precautions to stay safe amid these challenging conditions.

However, the city is not at risk of flooding from dam failure, as flood waters from Stony Gorge Dam are naturally designed to avoid the city and go into Stony Creek.

Table 113: Calculated Priority Risk Index for Willows

Type of Hazard Event	Probability of Future Events	Spatial Extent	Severity of Life/Property Impact	Warning Time	Duration	Response Capacity	Risk Factor Value
Drought	Likely (3)	Limited (1)	Negligible (1)	>24 hours (1)	Prolonged (4)	Medium – very dependent on Glenn County OES (2)	Moderate (2)
Extreme Heat	Highly Likely (4)	Extensive (4)	Negligible (1)	>24 hours (1)	Prolonged (4)	Medium (2)	High (2.6)
Flood	Likely (3)	Extensive (4)	Catastrophic (4)	6 to 12 hours (3)	Extended (3)	Low – very dependent on Glenn County OES (3)	High (3.4)
Geologic Hazards (Earthquake/ Expansive Soils/Land Subsidence)	Likely (3)	Significant (3)	Critical (3)	<6 hours (4)	Prolonged (4)	Low – very dependent on Glenn County OES (3)	High (3.2)
Levee Failure	Unlikely (1)	Extensive (4)	Catastrophic (4)	<6 hours (4)	Prolonged (4)	Low (3)	High (3)
Severe Weather	Likely (3)	Extensive (4)	Limited (2)	>24 hours (1)	Prolonged (4)	Low – very dependent on Glenn County OES (3)	High (2.7)
Wildfire	Likely (3)	Small (2)	Limited (2)	<6 hours (4)	Extended (3)	Low – very dependent on other organizations (3)	High (2.7)

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Willows Annex

Table 114 shows the hazard profiles for Willows.

Table 114: Jurisdiction-Specific Hazard Profiles

Hazard Type	Description	Spatial Extent	Magnitude	Previous Occurrences	Frequency/ Probability of Future Occurrences	Impacts and Vulnerabilities	Changes in Development
Drought	<p>Drought is an intrinsic cyclic feature of the climate that prevails across most geographical regions. Four types of droughts are common:</p> <ol style="list-style-type: none"> 5. Agricultural drought occurs naturally when moisture in the soil falls below the water requirements of plant life, typically arid crops. 6. Hydrological drought comes from insufficient precipitation for stream flows and water levels in reservoirs, lakes, and groundwater. 7. Meteorological drought occurs when precipitation is less than normal in monthly, seasonal, or annual time frames. 	All of Willows is subject to drought.	<p>There is no commonly accepted return period or non-exceedance probability for drought (such as the 100-year or one percent annual chance of flood). The magnitude of drought is typically based on the time of its occurrence and the severity of the hydrologic deficit. The primary indicator for the western United States is the Palmer Drought Severity Index:</p> <p>https://www.drought.gov/data-maps-tools/us-gridded-palmer-drought-severity-index-pdsi-gridmet#:~:text=The%20PDSI%20is%20a%20standardized,4%20represents%20an%20extreme%20drought.</p>	Thirteen instances of drought have impacted Glenn County since 1977, including one federal disaster declaration in 1977 (DR-3023).	<p>The severity of droughts and the number of dry years is anticipated to rise, even if precipitation remains stable or increases. Several climate models predict that a warming climate will increase precipitation variability, leading to more frequent periods of extreme precipitation and drought. This means that there will be a greater need for expanded water storage to prepare for drought years.</p> <p>Drought has an annualized frequency of 27% in the county, according to the National Risk Index (NRI), so Willows will likely experience droughts relatively frequently.</p>	<p>Long-term impacts include ground water shortage, tree mortality, mental and physical stress, reduced farm-labor days, less income for those in the agricultural sector. Alternating extremely wet and dry years can promote the spread of vector-borne diseases. Drought also can increase the risk of wildfires. Decreased soil moisture stresses vegetation and increases plant mortality, which provides fuel for wildfires. When combined with extreme heat, more extreme wildfires are possible. Willows will likely experience drought as often as the rest of the county. As an urban community with little agricultural land and without the same dependency on wells as the county and Orland, Willows is not as vulnerable to this hazard.</p>	<p>No significant changes in development have occurred which would influence Willows' vulnerability to drought. It is a slow-growing community with little development. Cal Water reported that new services to the area have increased by only 0.3% per year. New residential structures comprise most of this increase. The district has been able to meet the needs of its service area despite recent droughts, and it anticipates having a sufficient supply under normal, single dry, and multiple dry-year conditions.</p>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Willows Annex

Hazard Type	Description	Spatial Extent	Magnitude	Previous Occurrences	Frequency/ Probability of Future Occurrences	Impacts and Vulnerabilities	Changes in Development
	8. Socioeconomic drought occurs when the supply and demand of economic goods or services become imbalanced because of droughts.						
Extreme Heat	Extreme heat occurs when conditions are substantially hotter and/or more humid than average. In California, in the area around Willows, extreme heat is defined as three successive days over 100°F .	The danger of extreme heat has no geographical limits and could impact the entire planning area.	The impacts of extreme heat can be measured using the National Weather Service (NWS) Heat Risk Prototype, which helps identify risk over 24 hours. It can be found at https://www.wrh.noaa.gov/wrh/heatrisk/	Eight heat or excessive heat events have been recorded in the Storm Events Database for regions that include Willows. Record-breaking temperatures occurred on July 1–2, 2023, with daytime highs of 100°F –110°F , and overnight lows from the mid-70s to low 80s. Similar conditions occurred in the region on July 15–16, 2023, July 21–22, 2023, and August 8–17, 2023.	The NRI has recorded 49 heat wave events for Glenn County, or three events per year. The area is likely to experience extreme heat every year. Willows will have an increased risk of extreme heat because of the higher density of housing and concrete than in other parts of the county. Because of increasing “feel-like” temperatures, all the homes in Willows have severe heat factors, and the probability of dangerously hot days and heatwaves with temperatures above 100°F pose a serious health threat to everyone. Willows is projected to have 7	Extreme heat can harm human health, particularly among the elderly and those with chronic conditions, such as respiratory or cardiovascular diseases. Heat-related illnesses arise when the body cannot regulate temperature. They range from mild dehydration to hospitalization and death from heat stroke. Outdoor workers, older persons, infants and children, pregnant women, and individuals with low incomes are among those most vulnerable to prolonged heat. Older adults are less able to regulate body temperature and are more likely to have underlying medical conditions. Outdoor workers may lack a location to get relief from	California’s Fourth Climate Change Assessment, Sacramento Valley Region, indicates an increased risk of extreme heat events from climate change. While broader changes to the climate may increase extreme heat, there have not been significant changes in development that would impact Willows’ vulnerability to extreme heat since the last plan update.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Willows Annex

Hazard Type	Description	Spatial Extent	Magnitude	Previous Occurrences	Frequency/ Probability of Future Occurrences	Impacts and Vulnerabilities	Changes in Development
					hot days with a “feels like” temperature of 106°F in 2024, and with climate change, it is expected to have 16 such hot days in 30 years.	high temperatures. Avoiding work in the heat of the day may reduce heat-related illnesses but can lead to overall loss of productivity.	
Flood	Flood refers to a general and temporary condition of partial or complete inundation of normally dry land. Pluvial flooding is localized flooding that occurs during heavy seasonal rainfall, independent of an overflowing water body. Flooding can also occur when dams fail or levees are breached.	Between the zones with 1% and .02% annual chance of flooding, a large portion of Willows, particularly its west side, could be affected by flooding. A few streets on the northwest side are at risk of inundation from dam failure. Further, anywhere it rains, it could flood.	Floods are described in terms of the area affected, the depth of floodwaters, and the probability of occurrence. Flood studies often use historical records, such as streamflow gauges, to determine the probability of the occurrence of floods of different magnitudes. This probability is expressed in percentages as the chance of a flood of a specific extent occurring in a given year. The probability of flooding is measured as the average recurrence interval of a flood of a given size and place. It is defined as the percent chance that a flood of a certain magnitude or greater will occur at a particular	The county, including Willows, has been included in eight flooding federal disaster declarations since 1964 including DR 3592, 4683, 4308, 758, 412, 283, 183. In addition, Road 48 to 162 consistently backs up. When the roads close off, Willows is trapped on a little island. I-5 is the only way out, and it closes at times. The uncontrolled creeks on the west side of the county converge right outside the city limits, where they sometimes flood. Walmart to the west of I-5 on SR 162 floods when rain is heavy,	According to the NRI, 0.5 events of riverine flooding is expected in the county each year, based on 13 events over 24 years. There is a high probability (nearing 100%) of flooding occurring in Willows in the coming years.	The vulnerabilities and impacts of flooding depend on the size, extent, and magnitude of the event. Injury or death can occur if people are caught in floodwaters, and floodwaters can create other public health concerns by spreading infectious diseases and exposure to chemicals and hazardous materials, including pollutants stored in sediment. Flooding can cause extensive damage to structures, depending on its depth and velocity, the construction types of buildings, and other factors. Increased development can accelerate the risk of flooding in urban areas like Willows. Hazus estimated \$4,218,000 in total losses at the 1% annual chance of flood and \$4,894,000 for the 0.2% annual chance.	Since the last plan update, Willows has not experienced changes in development that affect its vulnerability to flood. More frequent severe storms and floods are expected because of climate change, which could increase vulnerability in the future.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Willows Annex

Hazard Type	Description	Spatial Extent	Magnitude	Previous Occurrences	Frequency/ Probability of Future Occurrences	Impacts and Vulnerabilities	Changes in Development
			location in a given year. ¹⁰⁸ A 10-year flood has a 10% chance of occurring in a given year, while a 50-year flood has a 2% chance and a 100-year flood has a 1% chance. The 100-year flood is the standard for floodplain management in the US and is referred to as a base flood. A 500-year flood has a 0.2% chance of occurring in a given year.	including during the plan update.		The city also has structures related to community lifelines, including Health and Medical, Safety and Security, Transportation, and Water Systems. Repetitive Loss Structures: 9 single-family residential structures; Severe Repetitive Loss Structures: 0	
Geologic Hazard	These include earthquakes, expansive soils, and subsidence. An earthquake occurs when two blocks of the earth suddenly slip past one another. Seismic shaking is the greatest cause of damage from an earthquake in the county, followed by liquefaction. Expansive soils have a high clay content,	All of Willows is at risk of earthquakes. Six earthquake fault systems exist in and around the county, including the Great Valley Fault, which traverses the county in a north-westerly direction, just west of I-5. This system has several small fracture faults,	The magnitude of an earthquake is related to the area of the fault that ruptured and the offset (displacement) across the fault. There are seven earthquake magnitude classes according to the California Earthquake Authority, ranging from great (8 or larger with significant potential damage) to minor (3.0-3.9 which may be felt). The Modified Mercalli Intensity Scale also is	There have been no damaging earthquakes in Willows in the last century and no recent earthquake epicenters have occurred in the city. Since 1931, an estimated 678 earthquakes have occurred near Willows, and seismic activity has been consistent since the last plan	Earthquakes are likely in Willows. According to Cal OES 2010, the probability of a 5.0M earthquake there is 55.75%, slightly less than the 60.91% chance for the county. Future events for expansive soils are likely to be occasional, as they depend on the amount and types of clay in the soil.	The potential losses from a 5.8M earthquake in Willows, according to Hazus, is \$24,018,060. Across the county, single-family residences make up a significant portion of the damaged buildings. Multi-family residence also would be a concern in Willows. Land subsidence can lead to changes in the elevation and slope of streams, canals, and drains and damage bridges, roads, railroads,	There has been no change in vulnerability to geologic hazards since the last plan update.

¹⁰⁸ The 100-Year Flood. USGS, 29018. <https://www.usgs.gov/special-topics/water-science-school/science/100-year-flood>

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Willows Annex

Hazard Type	Description	Spatial Extent	Magnitude	Previous Occurrences	Frequency/ Probability of Future Occurrences	Impacts and Vulnerabilities	Changes in Development
	<p>which swells with increased moisture content and contracts during dry periods. This change in volume can damage building foundations, roads, and concrete pavement.</p> <p>Land subsidence refers to the gradual or sudden sinking of the Earth's surface caused when subsurface materials are displaced or removed. The primary causes of land subsidence include aquifer system compaction from groundwater withdrawals, drainage of organic soils, underground mining, and natural compaction or collapse, such as sinkholes or thawing permafrost.</p>	<p>including Stony Creek Fault, which is parallel to the reservoir and tributary of the same name and terminates in Stonyford. The Corning Fault branches off from the Willows Fault, where the two pass under the Colusa Canal. The Corning Fault continues through the central part of the county, following I-5. Almost all of the city has soil which has medium or high shrink-swell potential and is at risk of expansive soils. The entire city could be at risk of land subsidence.</p>	<p>used to measure magnitude and can be found at https://www.earthquakeauthority.com/Blog/2020/Earthquake-Measurements-Magnitude-vs-Intensity</p>	<p>update with earthquakes from 0.9M to 3.9M. There has been no occurrence or damage from expansive soil in Willows. However, all of Willows has high potential for expansive soils. Subsidence has not caused damage in Willows, but vertical displacement has occurred just north of the city.</p>	<p>Although data are not sufficient to determine a recurrence interval, past and ongoing events indicate that the probability of subsidence in Willows is likely.</p>	<p>storm drains, sanitary sewers, canals, and levees. Private and public buildings also may be damaged by subsidence.</p> <p>I compaction of fine-grained materials in aquifer systems can cause well casings to fail. Roads, bridges, utility lines, and other structures on either side of I-5 would be most vulnerable. Willows has the following community lifeline facilities in areas with high expansive soil hazards: 19 Safety and Security Facilities, 17 Water systems, 4 Health and Medical facilities, 2 Transportation facilities, and 1 Hazardous Materials facility.</p>	

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Willows Annex

Hazard Type	Description	Spatial Extent	Magnitude	Previous Occurrences	Frequency/ Probability of Future Occurrences	Impacts and Vulnerabilities	Changes in Development
Levee Failure	According to the National Flood Insurance Program, a levee is a human-made structure, typically an earthen embankment, created in accordance with sound engineering practices, to contain, control, or divert the flow of water to minimize the risks of temporary flooding.	The county has five levee systems, which are located along Butte Creek, Elk Creek, French Creek, Grindstone Creek, Hambright Creek, Logan Creek, Stony Creek, Walker Creek, Wilson Creek, and Willow Creek and their tributaries. The Glenn-Colusa Canal and Tehama-Colusa Canal are other sites where levees could fail and impact surrounding communities.	Levee failure is usually measured according to the nature of the breach (overtopping the levee crown versus a failure along the slope), the affected area, flow volume and velocity, and depth of flooding. Flooding from levee failure in the county is expected to be less than 3 feet deep. The onset is typically slow as the river rises, but if a levee fails, the warning times are short for those in the inundation area. Flow volume and velocity are typically highest at the site of the failure. The water then slows and becomes less deep as it spreads over a larger area. Levee failures can last hours to weeks, depending on the river flows beyond the levee and the nature of the breach.	No levee failures have impacted Willows since the last plan update. However, the county has experienced levee failures in the past, including from rotational slope failure and overtopping.	Levee failures do not occur in regular intervals but are often related to heavy rain and other flooding events. Factors, such as the levee's age, construction materials, and signs that it is deteriorating, also may influence the probability of failure. Seven events have occurred in the last 100 years in the county—approximately every 14 years or a 7% chance annually. However, levee failures could happen more or less frequently than that, which could impact Willows.	The impacts of levee failure would be very similar to those from flooding, but the areas likely to be flooded by a levee failure do not necessarily align with 1% and 0.2% annual chance flood hazard zones. Heavy precipitation and high flows in rivers can contribute to the overtopping or failure of levees. Areas otherwise protected from flooding by levees could experience flooding if a levee fails or is breached. A levee failure could cause significant loss of life and property.	Since the last plan update, Willows has not experienced changes in development that affect its vulnerability to levee failure. Land use has remained the same, and the population has experienced a slight decrease. Climate change could indirectly affect the risk of levee failure because of changes in future precipitation patterns or the intensity of rain events. The overall vulnerability to levee failure in Willows has remained the same.
Severe Weather	Severe weather is any destructive heavy rain event that can damage property or cause the loss of life. Moreover, excessive localized	Severe weather can occur anywhere in Willows.	A variety of metrics can be used to describe the magnitude and severity of severe weather in the county, including Willows: data from NOAA, the NWS, the	7 FEMA disaster declarations and 3 Cal OES declarations have included Glenn County, including Willows. One	Severe weather will continue to occur annually in Willows. The frequency and probability of future occurrences are highly likely (near	Because of the widespread nature of weather hazards, all populations, structures, critical facilities, infrastructure, natural environments, and	No significant change in population and land use has occurred since the last plan update. However,

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Willows Annex

Hazard Type	Description	Spatial Extent	Magnitude	Previous Occurrences	Frequency/ Probability of Future Occurrences	Impacts and Vulnerabilities	Changes in Development
	precipitation over a short period may cause flash floods that threaten life and property. Severe weather usually occurs in the county as localized storms that bring heavy rain.		Spatial Hazard Events and Losses Database for the United States (SHELDUS), and the National Climatic Data Center (NCDC) Storm Events Database. Damaging winds typically exceed 50–60 mph. Gusts that strong have been reported in heavy rainstorms, and some have reached 75–85 mph in the region. Average rainfall varies across the county, but the equivalent of 2–3 inches of rain in the northern Central Valley and 4–11 inches in the mountainous areas have been reported in heavy rainstorms.	recent storm of note occurred on February 19, 2024. Heavy rains from this storm overwhelmed the City's drainage system causing flooding throughout the City	100% probability in the next year). Because of past weather patterns and changing future conditions, increases in the probability of future occurrences of severe weather events in Willows are anticipated.	economies in the planning area can be impacted by heavy rain. People may be unaware of risks from severe weather and the proper actions to take to ensure their personal safety.	because of climate change, the frequency and strength of storms across the US are expected to increase, which could increase Willows' vulnerability to this hazard.
Wildfire	Wildfires are uncontrolled blazes that ravage wildland vegetation, often in rural settings. They are not confined to a particular region or environment and can occur in various ecosystems. The topography, weather, and vegetation of the county provide ideal conditions for wildfires to spread	The western parts of the county, including the Mendocino National Forest, are more susceptible to wildfire than Willows, which is predominantly non-fuel according to the Office of the State Fire Marshal. Despite this designation,	The severity of a fire depends on various factors, particularly the steepness of slopes. Fires tend to burn more rapidly as they move up slopes. Moreover, temperature, humidity, and wind significantly influence fire behavior. As mapped, Willows would not expect to experience an extreme wildfire, as indicated on a map of Fire Hazard	Of the four major fires in Willows, one changed the city entirely, and another led to the creation of the Willows Fire Department. On May 30, 1882, the most destructive fire in Willows' history nearly destroyed the entire downtown. Thirty-three buildings were	Fire threat is a measure of fuel conditions and fire potential, representing the likelihood of wildfires that are "damaging" or difficult to control. This classification can be used to assess the potential impacts on various assets. Impacts are more likely to occur and/or be of increased severity for	The Willows planning area has 1,815 acres, including 220 acres of undeveloped land around its outskirts, which is more susceptible to wildfire. The FHSZs show that there is little threat to Willows. However, residents could be impacted if facilities or services in the unincorporated county are disrupted by wildfires, and they may	Willows does not intersect with FHSZs, so the little development there would not increase the city's wildfire risk. If anything, the city has become a refuge for Chico residents relocating after the 2018 Camp Fire. However, housing costs are high in Willows,

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Willows Annex

Hazard Type	Description	Spatial Extent	Magnitude	Previous Occurrences	Frequency/ Probability of Future Occurrences	Impacts and Vulnerabilities	Changes in Development
	rapidly and pose a severe risk.	Willows could still be at risk of a major wildfire and wildfire smoke.	Severity Zones (FHSZs).	lost, most of them thriving businesses, and the loss was estimated at \$200,000 (the equivalent of \$4.5 million today). No wildfires have occurred in Willows since the last plan update, but residents have been exposed to nearby events, including the August Complex fire, the largest fire in California's history which largely burned in rural areas of the county, including Mendocino National Forest.	higher threat classes. It is based on a combination of fire probability—the likelihood of a given area burning—and potential fire behavior or hazard. Willows is classified as non-fuel and unlikely to experience a wildfire. Furthermore, climate change is a significant factor in the increasing number of fires. Higher temperatures, drought, and other impacts of climate change could increase the probability of a wildfire impacting Willows.	be subject to poor air quality from wildfires in the region.	and city officials have noted that annexing more land could provide opportunities to build additional housing. If the city were to annex more land, it might increase its vulnerability to wildfire. Current wildfire vulnerability remains unchanged.

The Capability Assessment

As part of the plan update, Willows identified current mitigation capabilities and opportunities to improve or expand these existing policies and programs (see Table 115). Identifying these capabilities or resources helps communities select feasible mitigation actions.

Table 115: Mitigation Capabilities and Opportunities for Willows

Type	Analysis
Planning and Regulatory	Existing: General Plan, Capital Improvement Plan, Community Wildfire Protection Plan, Local Emergency Operations Plan (Glenn County), Transportation Plan (Glenn County), Building Code (2022), Flood Insurance Rate Maps, Floodplain Ordinance, Subdivision Ordinance, Zoning Ordinance, Natural Hazard Specific Ordinance (Stormwater, Steep Slope, Wildfire), Acquisition of Land for Open Space and Public Recreation Use
	Opportunity to Improve or Expand Capability: The city could expand on the floodplain management ordinance. Ideally, a new ordinance would be adopted soon.
Administrative and Technical	Existing: Civil engineer, Community Planner, Floodplain Administrator, Planning Commission
	Opportunity to Improve or Expand Capability: The city currently has minimal staffing and additional in-house staffing is needed to take proactive measures to implement maximum mitigation efforts. The city does not have funds to hire staff or consultants. However, the City Council could receive additional information on hazards and mitigation, such as through annual review update presentations on the status of this hazard mitigation plan.
Financial	Existing: Capital Improvement Project Funds, General Funds, Property, Sales, Income, or Special Purpose Taxes, Fees for Water, Sewer, Gas, or Electric Services, Impact fees from New Development and Redevelopment, General Obligation or Special Purpose Bonds
	Opportunity to Improve or Expand Capability: More grant funding would help the city accomplish mitigation actions, and it could pursue new grant programs like BRIC and ICARP.
Education and Outreach	Existing: Community Newsletter, Public Meetings/Events
	Opportunity to Improve or Expand Capability: The city can share information through a community newsletter and social media. Hazard mitigation could be included in future posts to help increase public awareness of the mitigation measures residents can implement.

FEMA also requires that communities address their participation in the National Flood Insurance Program (NFIP). The program allows property owners and renters to purchase flood insurance to protect against future flooding damage in exchange for implementing additional community floodplain management measures.

Willows has participated in the NFIP since June 4, 1980. Further information on community participation is included below.

1. **Adoption of Minimum Floodplain Management Criteria:** The community adopted Chapter 15.65 of the Willows Municipal Code as the community's Floodplain Management Ordinance, following NFIP requirements.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Willows Annex

2. **Adoption of the Latest Effective Flood Insurance Rate Map (FIRM):** The current effective FIRM was adopted on 1/7/2014.
3. **Implementation of Local Floodplain Management Regulations:** The designated Floodplain Manager is responsible for implementing the community's floodplain management requirements, including working with the Building Official to issue permits.
4. **Designed Floodplain Manager:** John Wanger – City Engineer
5. **Implementation of Substantial Improvement/Substantial Damage Provisions:** The Building Official and Fire Chief are responsible for making determinations of substantial damage and improvement. If damage were to occur, the building inspector, building official, and fire chief would all be involved in the review. Permits are monitored and used to identify whether the permit involves substantial improvements.

Mitigation Strategy

The mitigation strategy is the community's blueprint for disaster risk reduction. It comprises mitigation goals, objectives, actions, and the mitigation action plan. This strategy is designed to address the vulnerabilities identified in the risk assessment by using the capabilities addressed in the capability assessment. The first step in updating the mitigation strategy involved reviewing the status of the prior mitigation actions. After that, the city considered a comprehensive range and identified a list of actions to be included in the current plan update. Then, the jurisdiction compiled a final list of mitigation actions and prioritized each action.

Status of Prior Mitigation Actions

Table 95 contains previous mitigation actions that require status updates.

Table 116: Previous Mitigation Actions

Mitigation ID	Mitigation Project Title	Status for Plan Update
WI-1	Increase Natural Hazard Education and Risk Awareness	Newsletters and Facebook are the most frequent outreach methods. The city issues a monthly newsletter which provides updates on projects and events that occurred in the prior month and advice on what to do in the event of a disaster. Someone recently drove their car through flood water, indicating additional outreach is needed. Included this action in updated list of mitigation actions (Action #1).
WI-2	Improve Household Disaster Preparedness	The city does not actively publicize this but adhering to the building codes adopted since the last plan update can increase preparedness for events. Completed, does not need to be retained in this plan.
WI-3	Drought Awareness – Educate City Residents on Water Saving Techniques/ Water Conservation Measures	CalWater has done outreach on this, especially during the recent droughts, including the “imagine a day without water” campaign. Local newspapers and radio commercials have been used to share this information. Completed, does not need to be retained in this plan.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Willows Annex

Mitigation ID	Mitigation Project Title	Status for Plan Update
WI-4	Slip Liner in 42" Storm Drainpipe Glenwood to GCID Canal (Cemetery Pump Station) 8500 Linear Feet	The City has not pursued this action. Grant funding is needed to pursue this project. Included in the list of updated mitigation actions for this plan (Action #3).
WI-5	Siphon under GCID canal at Sacramento Street (CO Rd 51) Storm Pump Station	The City has not pursued this action. Grant funding is needed to pursue this project. Included in the list of updated mitigation actions for this plan (Action #7).

At the Mitigation Strategy meeting with stakeholders and other participating jurisdictions, the city identified the actions shown in Table 109, and Table 118 lists the 2025 Hazard Mitigation Actions for the City of Willows.

Table 117: Considered Mitigation Actions

Mitigation Action	Type of Action	Selected? (Y/N)	If not selected, why not?
Support the development of a countywide Climate Action Plan.	Local Plans and Regulations	N	Not selected at this time.
Support the development of a countywide Master Drainage Plan	Local Plans and Regulations	N	Not selected at this time.
Review and rank stormwater infrastructure and upgrade the most vulnerable infrastructure to reduce risk of flooding including adding new lift systems	Structure and Infrastructure Projects	Y	

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Willows Annex

Table 118: Willows 2025 Hazard Mitigation Actions

#	Project Title	Hazard Addressed	Vulnerability Addressed (Including Vulnerable Populations)	Responsible Agency	Potential Partners	Planning Mechanism(s) through Which the Action Will Be Implemented	Potential Funding	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Time-frame	Priority
1	Increase Natural Hazard Education and Risk Awareness	Flood, Extreme Heat, Drought, Geologic Hazards. Levee Failure, Severe Weather, Wildfire	All citizens, elderly, disabled, non-English speaking. Address gaps in residents' knowledge of how to mitigate risk as described in the public survey.	City of Willows Planning	Glenn County		ICARP, BRIC	Depends on outreach type (flyers, television, radio)	Citizen safety and reduction in loss of property	Yearly	Current/Ongoing	High
Description: Additional outreach and education are needed on safety procedures, evacuation routes and route closures, water conservation measures, and long-term mitigation solutions like how to retrofit a home to reduce the risk of flooding. Updating notification systems also is important. The city's website is being updated and could be expanded to provide additional preparedness and mitigation information.												
2	Acquire Vacuum Truck to Implement Flood Mitigation	Flood, Severe Weather	All citizens, elderly, disabled, non-English speaking. Address high probability of future flood events (near 100%)	City of Willows Public Works	City of Orland		Sewer Fund	\$650,000	Citizen safety, reduction in property loss	10 years	1-2 years	High
Description: Acquire a new vacuum truck to drain the drainage system, including sewer lines, to ensure it is clean and able to withstand a flood without causing a sewer sanitary overflow.												
3	Upgrade Sewer Infrastructure	Flood, Levee Failure, Severe Weather	All citizens, elderly, disabled, non-English speaking. Address high probability of future flood events (~100%)	City of Willows Public Works			BRIC, HMGP, PA Mitigation (406)	\$16 million	Citizen Safety	50-100 years	1-2 Years	High

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Willows Annex

#	Project Title	Hazard Addressed	Vulnerability Addressed (Including Vulnerable Populations)	Responsible Agency	Potential Partners	Planning Mechanism(s) through Which the Action Will Be Implemented	Potential Funding	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Time-frame	Priority
Description: Review and rank sewer infrastructure and upgrade the most vulnerable infrastructure to reduce risk of flooding including adding new lift systems. These pipes are at risk of being infiltrated during a flood event. This project would include more project scoping and construction. All of the lift systems should be upgraded as well as to avoid sewer overflow. Another example of an upgrade includes the Slip Liner in 42" Storm Drainpipe Glenwood to GCID Canal (Cemetery Pump Station) 8500 Linear Feet project.												
4	Increase Fuels Reduction	Drought, Wildfire	All citizens, elderly, disabled, non-English speaking. Address potential for wildfire risk, including disruption in services and undeveloped land around the city.	Fire Department	Other Fire Districts in Glenn County		General Fund		Citizen safety, reduction in property loss	Ongoing	Current and ongoing	High
Description: Increase fuel reduction projects through the Fire Department and Public Works crews. Expand the Fire Department's weed abatement program. Recent draught has increased this risk.												
5	Upgrade Cooling Center	Extreme Heat	All citizens, elderly, disabled, non-English speaking Address Willows' increased risk of extreme heat because of the higher density of housing and concrete than in other parts of the county by providing safe sites for citizens.	City of Willows	Glenn County and City of Orland		General Fund, ICARP (Extreme Heat and Community Resilience Program)		Reduce heat stroke and other heat related illness	\$70,000	February 2023	High
Description: Pursue funding to upgrade the duct system in the city's cooling center as debris comes out of them when the AC is on. Ensure any cooling center is upgraded, including proper HVAC as needed. Consider opportunities to identify and modify new cooling centers as necessary.												

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Willows Annex

#	Project Title	Hazard Addressed	Vulnerability Addressed (Including Vulnerable Populations)	Responsible Agency	Potential Partners	Planning Mechanism(s) through Which the Action Will Be Implemented	Potential Funding	Cost Estimate	Benefits (Losses Avoided)	Project Useful Life	Time-frame	Priority
6	Ditch Cleaning	Flood	All citizens, elderly, disabled, non-English speaking. Address high probability of future flood events (~100%)	City of Willows Public Works, Glenn County, GCID	Glenn County, GCID		General Fund		Citizen safety, reduction in property loss		Ongoing	High
Description: Clean ditches were needed.												
7	Siphon Under GCID Canal at Sacramento Street (Co Rd 51) Storm Pump Station	Flood	All citizens, elderly, disabled, non-English speaking. Address high probability of future flood events (~100%)	City of Willows Public Works, GCID			HMGP, BRIC		Citizen safety, reduction in property loss	unknown	5+ years dependent on flooding	Medium
Description: Reduce flooding by adding a siphon under GCID Canal at Sacramento Street (CR 51) Storm Pump Station.												

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Willows Annex

To prioritize the implementation of actions, the City of Willows considered the benefits and costs of each action including the following “STAPLEE” criteria:

- S - Social: The public must support the overall mitigation implementation strategy and specific mitigation actions. Consider, will the action disrupt housing or cause the relocation of people? Will the proposed action adversely affect one segment of the population? Is the action compatible with present and future community/agency values?
- T – Technical: It is important to determine if the proposed action is technically feasible, will help to reduce losses in the long term, and has minimal secondary impacts. How effective is the action in avoiding or reducing future losses? Does the action solve the problem or only a symptom? Will the action create more problems than it solves? Consider the root cause of the issue at hand to determine whether the action is a whole or partial solution, or not a solution at all.
- A – Administrative: This category examines the anticipated staffing, funding, time, and maintenance requirements for the mitigation action to determine if the jurisdiction/special district has the personnel and administrative capabilities to implement the action or whether outside help will be necessary. Consider, a) Staffing (enough staff and training): does the jurisdiction/special district have the capability (staff, technical experts) to implement the action? b) Funding allocated: does the jurisdiction/special district have the funding to implement the action or can it readily be obtained? c) Time: can it be accomplished in a timely manner? d) Maintenance/Operations: can the jurisdiction/special district provide the necessary maintenance? It is important to remember that most federal grants will not provide funding for maintenance.
- P – Political: This considers the level of political support for the mitigation action. Is there political support to implement and maintain this action? Have political leaders participated in the planning process so far? Is there a local champion willing to help see the action to completion? Is there enough public support to ensure the success of the action? Have all stakeholders been offered an opportunity to participate in the planning process?
- L – Legal: The jurisdiction/special district must have the legal authority to implement the action or consider what new laws or regulations would be needed in order to carry out the mitigation action. Evaluate, are the proper laws, ordinances, and resolutions in place to implement the action? Are there any potential legal consequences? Is the action likely to be challenged by stakeholders who may be negatively affected?
- E – Economic: Economic considerations must include evaluation of the present economic base and projected growth. Cost-effective mitigation actions that can be funded in current or upcoming budget cycles are more likely to be implemented than actions requiring general obligation bonds or other instruments that would incur long-term debt in a jurisdiction/special district. Consider benefits and costs at a planning level. A detailed benefit-cost analysis will be performed as project-specific funding becomes available. What financial benefits will the action provide? Does the cost seem reasonable for the size of the problem and the likely benefits? What burden will be placed on the tax base or local economy to implement this action? Does the action contribute to community economic goals, such as capital improvements or economic development? Are there currently sources of funding that can be used to implement the action?
- E – Environmental: The impact on the environment is an important consideration because of public desire for sustainable and environmentally healthy communities. Also, statutory considerations, such as the National Environmental Policy Act (NEPA), need to be kept in mind when using federal funds. How will this action impact land/water? Impact on endangered species: how will this action impact endangered species? How will this action impact hazardous materials and waste sites? Is this action consistent with community environmental goals? Is the action consistent with federal laws, such as the National Environmental Policy Act (NEPA)?

Glenn County Multi-Jurisdiction Hazard Mitigation Plan
City of Willows Annex

Table 119 summarizes the findings for each action.

Table 119: 2025 Mitigation Action Prioritization

Action #	Considerations
1	The action will not disrupt housing or adversely affect any segments of the population disproportionately. The action is compatible with present and future Agency values. Providing additional outreach will inform communities on how to prepare and mitigate hazards as they arise. Staff can implement the task. Providing information in the newsletter, website, and on social media has no cost. This will take staff time but can be implemented immediately. The city has support for this action from Stakeholders and it will work with other organizations to partner in disseminating information related to hazard mitigation. Local stakeholders have had input at various meetings. There are no legal issues in implementing this action. Some options will be no to low cost. Other options, such as print materials and television/radio campaigns, will require additional funding, which would most likely be obtained through grant funds. There is no impact to the environment.
2	The action will not disrupt housing or adversely affect any segments of the population disproportionately. The action is compatible with present and future Agency values.
3	The action will not disrupt housing or adversely affect any segments of the population disproportionately. The action is compatible with present and future Agency values.
4	The action will not disrupt housing. Weed abatement may be more difficult for low-income individuals, elderly, and disabled. The action is compatible with present and future Agency values.
5	The action will not disrupt housing or adversely affect any segments of the population disproportionately. The action is compatible with present and future Agency values.
6	The action will not disrupt housing or adversely affect any segments of the population disproportionately. The action is compatible with present and future Agency values.
7	The action will not disrupt housing or adversely affect any segments of population disproportionately. The action is compatible with present and future Agency values.

Plan Integration

Plan integration helps ensure progress in local mitigation efforts. The plan update is also required to identify where the prior plan was incorporated into other planning mechanisms and where the plan update may be incorporated in the future. In this case, planning mechanisms refer to the governance structures used to manage local land use development and community decision-making, such as budgets, comprehensive plans, capital improvement plans, or other long-range plans, codes, and ordinances.

Previous Plan Integration

Willows is a vibrant and growing city committed to sustainability and community development. To ensure progress in mitigation efforts, the city has implemented several plan integrations to create a comprehensive strategy for managing growth and development while minimizing environmental impact.

The city's General Plan is a key component of this strategy, providing a long-term vision for land use, transportation, housing, and other critical aspects of community planning. The General Plan includes policies and goals to reduce greenhouse gas emissions, conserve natural resources, and promote sustainable development practices.

Glenn County Multi-Jurisdiction Hazard Mitigation Plan City of Willows Annex

Besides its General Plan, Willows has developed a Capital Improvement Plan (CIP) that lays out specific projects and investments to improve infrastructure and facilities throughout the city. The CIP includes several sustainable and environmentally friendly initiatives, such as constructing new bike paths and retrofitting city buildings to be more energy efficient.

Finally, the city's Building Development Plan provides guidelines and standards for new construction and development projects, ensuring that all new buildings and infrastructure meet high sustainability and environmental responsibility standards. This includes requirements for green building materials, energy-efficient design, and water conservation measures.

Taken together, these plan integrations provide a comprehensive framework for managing growth and development in Willows, while minimizing environmental impact. By focusing on sustainability and community development, the city is well positioned to continue thriving for years.

Future Plan Integration

Willows will strive to incorporate the MJHMP into its Capital Improvement Plan. This plan is updated annually and may include references to actions in the MJHMP, including stormwater infrastructure improvements. The City Engineer is responsible for updating this plan and participated in the MJHMP update. Therefore, he will be familiar with the contents of the MJHMP and be able to integrate it as necessary during the Capital Improvement Plan update.

Mitigation Success Stories

A new water main has been installed to extend Cal Water's service to the city's residents. Cal Water has also installed individual service lines to connect its new customers to the new main. The project and acquisition will improve future development in the area and relieve the city of the liabilities and costs of operating a small municipal system. Cal Water thus becomes the sole purveyor of water in the city, providing safe and reliable water to all the residents and visitors of Willows.

Conclusion

The City of Willows has made significant progress in enhancing its emergency management framework by updating its Hazard Mitigation Plan. This has enabled the city to take a proactive approach to emergency management, identify potential hazards and risks, and implement strategies for reducing the impact of disasters and emergencies. The city is committed to enhancing its emergency management framework and ensuring its residents' and businesses' safety and well-being.

One significant achievement of this update is the city's ability to adjust its priorities based on new data and emerging risks. The updated plan considers the latest information on potential natural and technological hazards, and it pinpoints the community's most critical risks. This has allowed the city to allocate its resources and concentrate on the most pressing issues in emergency management.

Besides addressing priority changes, the updated plan has helped the city identify new strategies and next steps for improving emergency management in the community. For instance, the plan suggests increasing public awareness and education regarding emergency preparedness, developing partnerships with neighboring communities and agencies, and investing in new technologies and infrastructure to better respond to disasters and emergencies. By implementing these recommendations, the city hopes to further reduce the risk of harm to its residents and businesses and improve its ability to respond to disasters and emergencies.