SHASTA COUNTY, CA

MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

Prepared by BOLD planning

This page intentionally left blank.

Shasta County Multi-Jurisdictional Hazard Mitigation Plan

April 18, 2023

Encompassing the California Jurisdictions of: Shasta County, the City of Anderson, and the Igo Ono Community Services District

Prepared and submitted by:

James Woulfe, Manager of Global Solutions
Mitigation Planner
BOLDplanning Inc. (a division of Agility)
480 Duke Drive, Suite 130
Franklin, TN 37067
615.469.5558 / James.Woulfe@agilityrecovery.com

Rachelle Russell
Accountant Auditor III
Shasta County Public Works
1855 Placer Street
Redding, CA 96001
530.225.5665 / rrussell@co.shasta.ca.us

This page intentionally left blank.

Contents

Table of Contents

Executive Summary

The Shasta County Multi-Jurisdictional Hazard Mitigation Plan (HMP) was developed to update the hazard mitigation activities for two California jurisdictions: Shasta County and the City of Anderson, as well as identify those of the newest plan participant, the Igo Ono Community Services District. It was prepared in partnership with the Shasta County Department of Public Works, the Shasta County Hazard Mitigation Planning Team, or HMPT, and BOLDplanning Inc., a division of Agility (https://www.agilityrecovery.com). This plan, formally approved on April 18, 2023, which supersedes the Shasta County Hazard Mitigation Plan (November 16, 2017), outlines a mitigation strategy for five years.

Formal adoption and implementation of a federally approved hazard mitigation plan, or HMP, presents many benefits to Shasta County and the participating jurisdictions. Most notably, by identifying problems and possible solutions in advance of natural disasters, the planning area will be in a better position to obtain hazard mitigation funding from the Federal Emergency Management Agency (FEMA). This may include both pre- and post-disaster financial assistance.

The Shasta County Hazard Mitigation Plan Update aims to produce the following strategic outcomes:

- Reduce loss of life and decrease property losses due to the occurrence of natural disasters within the planning area; and
- Provide the framework and coordination to encourage government, and both public and private sector organizations at all levels, to undertake mitigation to minimize potential disasters and to employ mitigation strategies in the recovery following disasters.

Specifically, these strategic outcomes will be brought about through the following planning process:

1) Identify, describe, and characterize the hazards to which the planning area is susceptible; and
2) Assess the risk of each hazard, including probability, frequency, exposure, and vulnerability; and
3) Examine feasible mitigation opportunities appropriate for the identified hazards, and prioritize those opportunities; and
4) Implement mitigation actions to reduce loss of life and damage to property; and
5) Identify mitigation opportunities for long-term planning consideration.

Glossary

ACS – American Community Survey
ASCE – American Society of Civil Engineers
BFE – Base Flood Elevation
CAL FIRE – California Department of Forestry and Fire Protection
CalOES – California Office of Emergency Services
CDC – Centers for Disease Control and Prevention
CRS – Community Rating System
CUSEC – Central U.S. Earthquake Consortium
CWPP – Community Wildfire Protection Plan
DHS – Department of Homeland Security
DMA 2000 – Disaster Mitigation Act of 2000
EAP – Emergency Action Plan
EOC – Emergency Operations Center
EOP – Emergency Operations Plan
FEMA – Federal Emergency Management Agency
FIRM/DFIRM – Flood Insurance Rate Map/Digital Flood Insurance Rate Map
FMA – Flood Mitigation Assistance (Grant Program)
GIS – Geographic Information System
HAZUS – GIS System (FEMA)
HMGP – Hazard Mitigation Grant Program
HMP – Hazard Mitigation Plan
HMPT – Hazard Mitigation Planning Team
ICS – Incident Command System
LEPC – Local Emergency Planning Committee
LEOP – Local Emergency Operations Plan
MJHMP – Multijurisdictional Hazard Mitigation Plan
NCEI – National Centers for Environmental Information
NEIC –National Earthquake Information Center
NFHL – National Flood Hazard Layer
NFIP – National Flood Insurance Program
NFPA – National Fire Protection Association
NOAA – National Oceanic and Atmospheric Administration
NRCS – National Resources Conservation Service
NWS – National Weather Service
OES – Office of Emergency Services
PDM – Pre-Disaster Mitigation (Grant Program)
PDSI – Palmer Drought Severity Index
POC – Point of Contact
RL – Repetitive Loss
SFHA – Special Flood Hazard Area
SRL – Severe Repetitive Loss
SSURGO – Soil Survey Geographic Database
UAISI – Urban Area Security Initiative
UDC – Unified Development Code
USACE – U.S. Army Corps of Engineers
USDA – U.S. Department of Agriculture
USGS – U.S. Geological Survey
WID – Watershed Improvement District
WUI – Wildland Urban Interface

Introduction to Mitigation

The Emergency Management Cycle & Mitigation

Understanding the emergency management cycle is the first step in effectively planning and operating in relation to all disaster-related activities. The emergency management cycle is an open-ended and ongoing process. The four phases in the process are mitigation, preparedness, response, and recovery. Each phase of the cycle can last for years, months, or only moments in duration, while different paths can exist simultaneously.

Mitigation planning is the process of determining how to reduce or eliminate loss of life and damage to property resulting from natural disasters. It is carried out as any sustained action to reduce or eliminate long-term risk to life and property from a hazard event. Mitigation encourages long-term reduction of hazard vulnerability. As is the goal of emergency management, so is the goal of mitigation to save lives and reduce property damage.

The Disaster Mitigation Act of 2000 (DMA 2000)

In the past, federal legislation has provided funding for disaster relief, recovery, and some hazard mitigation planning. The Disaster Mitigation Act of 2000 (DMA 2000) became law on October 30, 2000, amending the Robert T. Stafford Disaster Relief and Emergency Assistance Act (the "Stafford Act") (Public Law 93-288, as amended). Regulations for this activity can be found in Title 44 of the Code of Federal Regulations Part 206, Subpart M.

This legislation reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur. This act establishes a pre-disaster hazard mitigation program and new requirements for the national post-disaster Hazard Mitigation Grant Program (HMGP).

Section 322 of the act specifically addresses mitigation planning at the state, local, and tribal levels. It identifies new requirements that allow HMGP funds to be used for mitigation planning activities and increases the amount of HMGP funds available to states that have developed a comprehensive, enhanced mitigation plan prior to a disaster. States and communities must have an approved mitigation plan in place prior to receiving post-disaster HMGP funds. Local and tribal mitigation plans must demonstrate that their proposed mitigation measures are based on a sound planning process that accounts for the risk to and the capabilities of the individual communities and identifiable gaps.

DMA 2000 is intended to facilitate cooperation between state and local authorities, prompting them to work together. It encourages and rewards local and state pre-disaster planning and promotes sustainability as a strategy for disaster resistance. This enhanced planning network will better enable local and state governments to articulate accurate needs for mitigation, resulting in faster allocation of funding and more effective risk reduction projects. To implement the new DMA 2000 requirements, the Federal Emergency Management Agency (FEMA) prepared an interim final rule, published in the Federal Register on February 26, 2002, at 44 CFR Parts 201 and 206, which establishes planning and funding criteria for states and local communities.

On October 31, 2007, FEMA subsequently published an Interim Rule in the Federal Register, which ensures the Flood Mitigation Assistance (FMA) program planning requirements are consistent with the mitigation planning regulations as cited in the Code of Federal Regulations (CFR) at Title 44, Chapter 1, Part 201 (44CFR Part 201).

This interim rule established that local communities must comply with mitigation planning requirements to be eligible to apply for FEMA mitigation project grant funding, including FMA and FEMA's Severe Repetitive Loss (SRL) Program. Meeting the requirements of the regulations cited above ensures participating jurisdictions within the planning area will be eligible to receive disaster assistance, including hazard mitigation grants available through the Robert T. Stafford Disaster Relief and Emergency Assistance Act, P.L. 93-288, as amended.

Shasta County has the responsibility to coordinate activities relating to hazard evaluation and mitigation, and to prepare and submit to FEMA a local hazard mitigation plan, following the criteria established in 44 CFR 201.6 and Section 322 of the DMA 2000 (Public Law 106- 390).

Section 1: Planning Process

1.1 – Plan Introduction

This update to the Shasta County and City of Anderson Multi-Jurisdictional Hazard Mitigation Plan (November 16, 2017), involves three jurisdictions: one (1) county, one (1) city, and one (1) community services district. These include the original plan participants, Shasta County, and the City of Anderson, as well as new plan participant, the Igo Ono Community Services District. Each jurisdiction was actively engaged in the planning process and provided at least one (1) representative to offer a locality-specific perspective toward the plan's development.

Members of the Shasta County Hazard Mitigation Planning Team, or HMPT, participated in meetings, solicited input from community members, and ensured that all jurisdictional information was reflected in the plan.

If a team member could not attend a meeting, they were contacted by phone or email and/or provided recorded web meetings. All documentation presented at the meeting(s) was emailed to HMPT members, and all were encouraged to offer their suggestions or comments throughout the planning process.

Plan stakeholders, including the public, were also encouraged to participate in an online Public Input questionnaire (shown below) through which they could rank local hazards and express concerns.

Image 1: Public Input Questionnaire, Shasta County

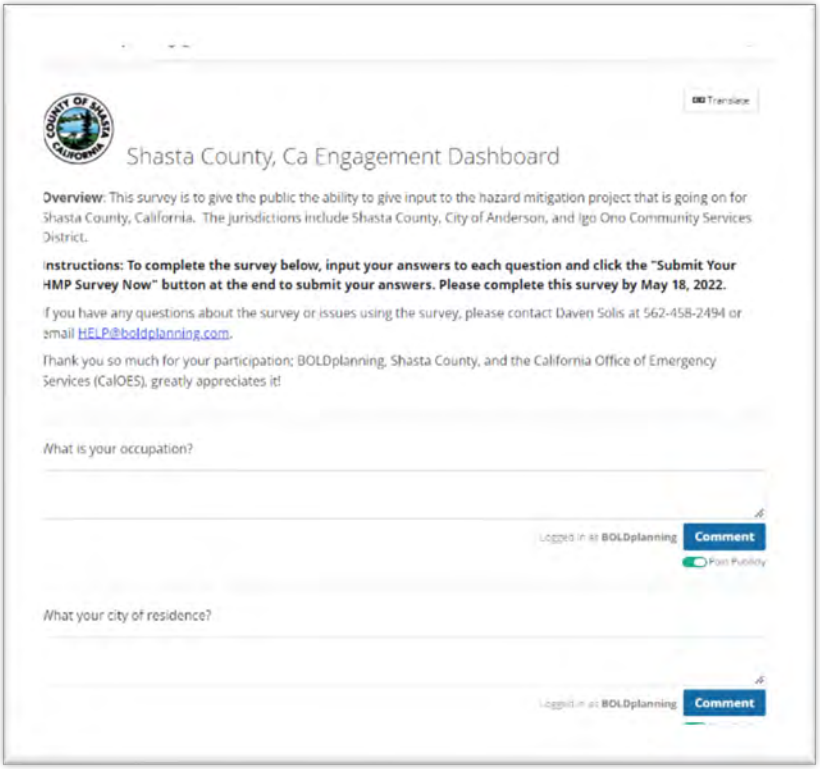


Image Source:

https://publicinput.com/B4137

Additionally, various plan stakeholders, including Shasta County government, had access to BOLD planning's online platform, dubbed ShastaCOOP.com, during the plan's development. The website (shown below) was, and continues to be, a repository of important hazard mitigation data for Shasta County and the participating jurisdictions.

Image 2: ShastaCOOP.com Online Planning Platform

Image Source: https://shasta.boldplanning.com

A detailed description of the planning process, including a list of contributions from each jurisdiction, is provided in Section 1.2.2 – Jurisdictions. Additional information pertaining to plan contributors can be found in Section 1.3 – Stakeholder Participation.

1.2 – Plan Development

1.2.1 – Plan Drafting Stage

Shasta County's plan revision process began in October 2021, when the Shasta County Department of Public Works contracted with BOLDplanning through a competitive bid process.

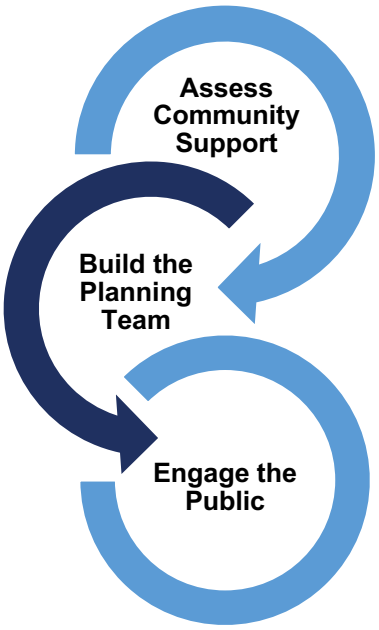
On February 16, 2022, BOLDplanning hosted a hazard mitigation plan (HMP) kick-off planning meeting for both the previous Hazard Mitigation Planning Team (HMPT), as well as the public. All participating jurisdictions, including Igo Ono Community Services District (CSD), were actively involved in the planning process through soliciting input and participating in meeting. The HMPT was established for the 2022 plan (update).

In total, five (5) planning events were held throughout the planning process. These included meetings with representation from each participating jurisdiction and conference calls with municipal and government agency officials who could not attend scheduled meetings. The final planning meeting was a public hearing held on May 30, 2023.

Throughout the planning process, the public was given opportunities to review drafts, ask questions, and provide input on hazards. They were also invited to provide feedback on mitigation project prioritization, hazard identification, and hazard ranking. Details and documentation of the public's participation can be found in Appendix C – Public Participation.

Planning Process Summary

Shasta County appointed a hazard mitigation planning team, or HMPT, consisting of local officials from the participating jurisdictions, including Shasta County (Department of Public Works), the City of Anderson, and the Igo Ono Community Services District, as well as BOLDplanning.



The Shasta County Department of Public Works engaged BOLDplanning to provide staff support in conducting the planning process and preparing the plan (update).

Meetings were held with HMPT members to understand and agree on planning processes and steps required, including organizing resources, assessing hazards, developing a mitigation plan, implementing the plan, and monitoring progress.

BOLDplanning held subsequent discussions about the planning process with staff from each participating jurisdiction.

An online Public Input questionnaire captured information from stakeholders in real time and tracked their concerns. Data gained from the questionnaire was used to develop mitigation actions and mitigate hazards in Shasta County.

Various plan stakeholders, including Shasta County government, were given access to ShastaCOOP.com, the online repository of information specific to hazard mitigation planning.

1.2.2 – Jurisdictions

The following table lists the participating jurisdictions of Shasta County, their appropriate contact during the plan's development, and their specific contributions by planning phase.

Table 1: Jurisdictional Contribution by Planning Phase

Jurisdictional Contribution by Planning Phase				
Jurisdiction and Representative	Planning Process	Risk Assessment	Mitigation Strategy	Plan Maintenance
Shasta County - Rachelle Russell, Shasta County Public Works	• Served as primary Point of Contact (POC) for Shasta County during the plan development process • Participated in HMPT • Provided information on critical facilities, hazards, etc.	• Completed hazard history documentation • Completed risk assessment questionnaire • Reviewed risk assessment	• Provided mitigation projects and actions history • Proposed mitigation projects	• Will participate in the Local Emergency Planning Committee (LEPC) as prescribed in Section 2 – Plan Maintenance
City of Anderson - Peter Wickenheiser, Public Works Department	• Served as primary POC for the City of Anderson during the plan development process • Participated in HMPT • Provided information on critical facilities, hazards, additional POCs, etc.	• Completed hazard history documentation • Completed risk assessment questionnaire • Reviewed risk assessment	• Provided mitigation projects and actions history • Proposed mitigation projects	• Will participate in the Local Emergency Planning Committee (LEPC) as prescribed in Section 2 – Plan Maintenance
Igo Ono Community Services District - Joshua Tucker, Board of Directors	• Served as primary POC for Igo Ono Community Services District • Participated in HMPT • Provided information on critical facilities, hazards, additional POCs, etc.	• Completed hazard history documentation • Completed risk assessment questionnaire • Reviewed risk assessment	• Provided mitigation projects and actions history • Proposed mitigation projects	• Will participate in the Local Emergency Planning Committee (LEPC) as prescribed in Section 2 – Plan Maintenance

1.2.3 – Major Mitigation Planning Meetings & Activities

The Shasta County HMPT held public meetings and facilitated a number of activities to discuss the mitigation planning process as well as gain public support and input for the plan. The following is a brief synopsis of those meetings. Proof of meetings, sign in sheets, and public notification documentation can be found in Appendix C – Public Participation.

Hazard Mitigation Plan (HMP) Kick-Off Meeting, February 16, 2022 – A public announcement ran for two (2) weeks on the Shasta County Public Work's website and posted in the Redding Record Searchlight, newspaper. The public was invited to voice any concerns, ask questions, and provide input toward the hazard mitigation plan's development. The virtual kick-off meeting was held for the newly developed Shasta County HMPT as well as the public. The mitigation planning process was reviewed, questions were answered, and roles were assigned. The HMPT ranked hazards and prioritized mitigation projects. BOLDplanning worked with the HMPT to collect contact information, hazard history, critical facility information, and other pertinent jurisdictional details. Documentation pertaining to this meeting is in Appendix C – Public Participation.

Hazard Mitigation Plan Survey Tool Initiation, February 17, 2022 – BOLDplanning launched a Public Input survey tool to get feedback from the public.

Shasta County HMP Meeting and Project Priority Workshop, May 5, 2022 – The in-person HMP and project priority meeting was held for Shasta County to develop plan priorities and review hazard mitigation actions. Additional data was collected from Shasta County to strengthen HMP sections. County stakeholders reviewed current drafts of the plan and provided feedback.

Monthly SitRep Meetings, January – July 2022 – Monthly SitRep meetings were held to go over plan progress and deliverables throughout the process. All Shasta County HMPT members were invited to attend each SitRep meeting via ZOOM. All copies of each final SitRep are stored in the ShastaCOOP platform for review or comment.

Hazard Mitigation Plan Final Review Meeting, August 1, 2022 – The Shasta County Hazard Mitigation Plan was reviewed by the HMPT and other stakeholders, as requested, prior to its submission to CalOES for review/approval.

Hazard Mitigation Plan Adoption Signing, March 14, 2023 (Igo Ono), May 2, 2023 (Anderson) & May 30, 2023 (County) – The Shasta County Hazard Mitigation Plan adoption letters were disseminated and signed by the participating jurisdictions. The signing of these resolutions codifies the adoption of the HMP by the participating jurisdictions.

1.3 - Stakeholder Participation

Effective hazard mitigation planning does not take place in a silo; it involves active participation by a variety of stakeholders, including representatives from government agencies, organizations, or other entities as well as the public. Following is a description of Shasta County's plan stakeholders and information specific to one of the methods used to solicit feedback from the community-at-large.

- **Hazard Mitigation Planning Team** – This group consists of individuals from Shasta County, the City of Anderson, and the Igo Ono Community Services District.
- **Other Stakeholders** – These include CalOES, supporting state/federal agencies, and BOLDplanning.
- **The Public at Large** – FEMA requires mitigation planning efforts to be open to constant input from interested citizens. Accordingly, Shasta County and the participating jurisdictions encourage citizens to attend plan-related meetings and follow the plan's progress over its five-year life cycle.

To facilitate community involvement, BOLDplanning utilized an online public survey tool. The link was distributed to planners and the local community. The survey can be found at: https://publicinput.com/B4137.

Another survey was created to obtain the status of previous hazard mitigation actions from stakeholders and seek comments for future mitigation actions. The survey can be found at: https://publicinput.com/I3046.

1.4 - Community Involvement

The Shasta County HMPT provided the opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process. As previously mentioned, the public was notified of open meetings via the internet and through their local newspapers.

Shasta County does not have any Memorandums of Understanding (MOUs) with its neighboring counties; therefore, response operations and equipment lending is handled informally. As such, Shasta County does not coordinate planning activities with its neighboring communities, but will, upon plan adoption notify its neighboring communities of its hazard mitigation plan's completion and inform them where and how they can obtain a copy for their use.

The following table details the plan stakeholders and HMPT members who participated in the hazard mitigation planning process. This list includes all relevant local and state agencies involved in hazard mitigation activities, agencies that have the authority to regulate/monitor plan development, any/all appropriate neighboring communities, among others.

Table 2: HMPT Members & Plan Stakeholders

HMPT Members & Plan Stakeholders			
Name	Organization	Position	Invitation/Collaboration
Principal Plan Developers			
Fulton Wold	BOLDplanning	Mitigation Planner	Organized planning schedule, meetings, and plan development process
Daven Solis	BOLDplanning	Mitigation Planner	Researched and developed plan content
Kiana Freeman	BOLDplanning	Mitigation Planner	Researched and developed plan content
Rachelle Russell	Shasta County Public Works	Account Auditor III	Facilitated local participation and provided data
Local Governments			
Rob Sandbloom	Shasta County Sheriff's Office	Lieutenant	Represented jurisdiction and provided information
Mike Lindsey	Shasta County Sheriff's Office	Chief Fiscal Officer	Provided local support and input
Tennille Doerschel	Shasta County Sheriff's Office	Account Auditor III	Provided local support and input
Dr. Richard Sealana	Shasta County Fire Safe Council	President	Represented jurisdiction and provided information
Tania Greenwood	Shasta County Fire Safe Council	Vice President	Provided local support and input
Ed Steward	Shasta County Fire Safe Council	Chief Fiscal Officer	Provided local support and input
Fran Belden	Shasta County Fire Safe Council	Secretary-Treasurer	Provided local support and input
Al Cathey	Shasta County Department of Public Works	Deputy Public Works Director	Provided local support and input
Paul Hellman	Shasta County Resource Management	Resource Management Director	Represented jurisdiction and provided information
Jim Whittle	Shasta County Resource Management	Environmental Health Director	Provided local support and input
Adam Fieseler	Shasta County Resource Management	Planning Division Manager	Provided local support and input
Lio Salazar	Shasta County Resource Management	Senior Planner	Provided local support and input
Amanda Smith	Shasta County Public Health	Community Education Specialist II	Represented jurisdiction and provided information
Peter Wickenheiser	City of Anderson	Deputy Public Works Director	Represented jurisdiction and provided information
Megan Poletski	City of Anderson	Engineering Technician	Provided local support and input

HMPT Members & Plan Stakeholders			
Name	Organization	Position	Invitation/Collaboration
Local Governments, Cont'd.			
John Moore	Igo Ono CSD	Board of Directors	Provided local support and input
Brenda Sandifer	Igo Ono CSD	Board of Directors	Provided local support and input
Joshua Tucker	Igo Ono CSD	Board of Directors	Provided local support and input
Regional Organizations			
Kelli England	Western Shasta Resource Conservation District	Chief of Field Operations	Provided regional support and input
Ross Perry	Western Shasta Resource Conservation District	Project Manager	Provided regional support and input
Maureen Taulbert	Western Shasta Resource Conservation District	District Manager	Provided regional support and input
State Agencies			
Hazard Mitigation Planners	CalOES Mitigation Planning	Various Positions	Provided state feedback and information
Scott Corn	Cal Fire	Assistant Chief	Provided wildfire data
Mike Haigh	Caltrans	Engineering Services Manager	Provided state feedback and information
Kurt Schneider	Caltrans	Transportation Engineer	Provided state feedback and information
Kevin Alexander	California Highway Patrol	Captain	Provided state feedback and information
Mike Berry	California Highway Patrol	Lieutenant	Provided state feedback and information
Greg Ross	California Highway Patrol	Sergeant	Provided state feedback and information
Federal Agencies			
Plan Reviewers	FEMA	Designated Plan Reviewers, FEMA Region 9	Reviewed and approved plan

Section 2: Local Procedures & Resources

Planning Process
Local Procedures & Resources
• Available Resources
• Continued Public Involvement
• Plan Maintenance Process
Planning Area
Hazard Risk Assessment
Mitigation Strategy

2.1 – Available Resources

2.1.1 – Documentation Resources

The Shasta County Hazard Mitigation Planning Team, or HMPT, conducted a comprehensive review of the planning area, i.e., Shasta County, the City of Anderson, and the Igo Ono Community Services District, to determine the availability of existing emergency management and preparedness information. The Plan addressed development changes and new emergency preparedness information released by state and federal agencies. Following is a synopsis of their findings.

Shasta County and City of Anderson Multi-Jurisdictional Hazard Mitigation Plan, November 16, 2017
Shasta County and the City of Anderson are currently covered by a FEMA-approved hazard mitigation plan. The current plan has been reviewed and incorporated into this plan update per FEMA requirements.

2018 California State Hazard Mitigation Plan (SHMP)
The 2018 California State Hazard Mitigation Plan (SHMP) represents the state's primary hazard mitigation guidance document and is composed of comprehensive actions designed to reduce losses from different hazards.

Shasta County Critical Facilities List
The Shasta County HMPT compiled a list of critical facilities and pertinent information on those facilities. The list was used to throughout this plan update and is the basis for the vulnerability assessments and loss estimates. The complete list is available in Appendix D – Critical Facilities & Infrastructure.

Shasta County Emergency Operations Plan (EOP)
The Shasta County OES has developed a countywide Emergency Operations Plan (EOP). Using a commercial template to follow best practices methodology, this plan is a "living document" that is continually reviewed, tested, and updated. Information from the EOP has been integrated into this hazard mitigation plan update.

Shasta County Planning Documents
To properly assess Shasta County and the participating jurisdictions' hazard risks, a thorough review of its development plans, policies, ordinances, zoning, and building codes was conducted. Following is the list of documents that were reviewed for mitigation planning purposes:

- Shasta County General Plan
- Shasta County Floodplain Municipal Code
- Shasta County Manufactured/Mobile Home Placement Permit Ordinance
- Shasta County Subdivision Ordinance

2.1.2 – Fiscal Resources

The Shasta County HMPT assessed all available funding options for hazard mitigation planning purposes. Following is a list of federal, state, and local funding sources that are either available or relevant to this plan (update).

Hazard Mitigation Grant Program (HMGP)

The Hazard Mitigation Grant Program (HMGP) is managed by FEMA and administered by CalOES. The development of this plan has been funded by a HMGP grant at a 75% match. California created PrepareCA Match that provides 25% of the required local cost funding for FEMA HMGP activities.

Local Revenues & Budgets

Recognizing the importance of hazard mitigation planning, Shasta County and the participating jurisdictions have self-funded the 25% match required by FEMA's HMGP grant. *Note: The State of California provides funding for presidential declared disasters.*

Pre-Disaster Mitigation Grant Program (PDM)

Shasta County received a Fire Management Assistance Grant from FEMA for the Fawn Fire on September 23, 2021. At the time of the request, the fire threatened approximately 1,900 residential structures in and around Shasta Lake. The fire also threatened 100 commercial structures, two churches, an elementary school, Shasta College, Interstate 5, Bella Vista Water System, and power transmission lines and cell towers that could impact 911 emergency communication systems.

- *Emergency Management Assistance Compact (EMAC).* Shasta County received funds.
- *Preparedness Grant Evaluations.* The Committee directs $7.5 million for FEMA to conduct independently verified and validated evaluations on the effectiveness of preparedness grants. In addition to issues of effectiveness, the study is to focus on current requirements and recommendations for appropriate privacy and civil liberty safeguards and reporting on deaths or injuries resulting from equipment purchased.
- *Dam Safety & Earthquake Hazards Program.* The National Dam Safety Program and National Earthquake Hazards Reduction Program are funded at $9.7 million and $8.5 million, respectively. This is consistent with current funding levels.

Federal Assistance Grants & Programs

- *Preparedness Grants.* The funding levels for all grant programs is below.
- *Management Costs for Non-Profit Grants.* With the increase in the Non-Profit Security Grant Program (NSGP) under the State Homeland Security Grant Program, a provision is included allowing states to utilize part of the NSGP funding for administration costs.
- *Continuing Training.* Of the $12 million provided, $3 million will be competitively awarded for FEMA-certified rural and tribal training; $2 million is for FEMA to partner with the Federal Aviation Administration to conduct a regional training program in using UAS for disaster response; and $4 million is for the National Cybersecurity Preparedness Consortium.
- *Funding Considerations.* When awarding grants, the Committee directs FEMA to consider: the needs of cybersecurity preparedness and planning; state court cybersecurity; 911 call capabilities; alert and warning capabilities; implementation of the REAL ID Act; and countering targeted violence and terrorism prevention programs.
- *Next Generation Warning System.* The Committee provides $40 million for the Next Generation Warning System as part of the Integrated Public Alert and Warning System (IPAWS). The Committee expects FEMA to work with the Corporation for Public Broadcasting to implement this program for public broadcasting entities.

- *Regional Catastrophic Preparedness Grant Program.* FEMA is directed to prioritize funding for efforts which formalize new or sustain existing working groups for continued effective coordination; ensure synchronization of plans and shared best practices; implement citizen and community preparedness campaigns; and pre-position needed commodities and equipment.

- *FEMA's Rehabilitation of High Hazard Potential Dams (HHPD).* Grant program provides technical, planning, design, and construction assistance for eligible rehabilitation activities that reduce dam risk and increase community preparedness.

Post-Disaster Mitigation Program

This program is managed by FEMA and is a nationally competitive grant program. Shasta County does have any PDM funds available for mitigation planning. FEMA provided Shasta County with funds for the Carr Fire (DR-4382) to provide wildfire hazard mitigation.

- *HMGP-4382-178-008:* The project is comprised of eleven (11) project activity areas (PAAs) within five wildland urban interface, or WUI, areas: Bear Mountain, O'Brien Mountain, Ridgeline Landscape, Shingletown, and West Redding South. The proposed action would mitigate impacts from wildfire hazards by reducing hazardous fuels along critical transportation corridors and ridgeline areas within the defined WUI area, thereby reducing high intensity wildfire behavior.

2.1.3 – Technical Resources

The Shasta County HMPT employed a variety of technical resources in this plan's development. These technical resources were instrumental in completing an accurate vulnerability and risk assessment.

BOLDplanning (now a division of Agility, https://www.agilityrecovery.com)

Over 17 years in business, and as the principal plan writer, BOLDplanning has helped state and local agencies across the country create more than 10,000 Hazard Mitigation Plans (HMPs), Continuity of Operations Plans (COOPs), Emergency Operations Plans (EOPs), and Local Emergency Operations Plans (LEOPs). The company offers clients a unique combination of expert consulting and a world-class online software solution, the BOLDplanning.com platform, that together make the planning process easier, more efficient, and more effective.

NOTE: The company has a 100% FEMA approval rate for well over 50 state, local and tribal mitigation plans since 2004, including numerous first-submission approvals.

ESRI ArcGIS v10

Each map developed for this plan, including the HAZUS models, were developed using ESRI's ArcGIS v10.

FEMA National Flood Hazard Layer (NFHL)

FEMA's NFHL data was instrumental in mapping floodplain locations and estimating potential flood impacts and loss estimates.

California Resource Geographic Information Systems Program (RGIS)

NM RGIS provided the critical facilities data for the risk assessment.

National Oceanic and Atmospheric Administration, National Centers for Environmental Information (NOAA/NCEI)

Weather data and historical events were primary provided by NOAA's NCDC.

University of Wisconsin – Madison SILVIS Labs

SILVIS Labs collects and distributes the raw WUI information used in calculating Shasta County and its participating jurisdictions' wildfire risk.

U.S. Army Corps of Engineers (USACE)

The USACE provided Shasta County and BOLDplanning with data from its national dam inventory containing their location and assessed hazard level.

U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS)

Expansive Soils risk was calculated using SSURGO data provided by the USDA NRCS.

U.S. Geological Survey (USGS)

The USGS's studies and reports on earthquakes provided the basis for Shasta County and the participating jurisdictions' earthquake risk assessments.

2.2 – Continued Public Involvement

Shasta County is dedicated to involving the public in the continual shaping of its mitigation plan and the development of its mitigation projects and activities.

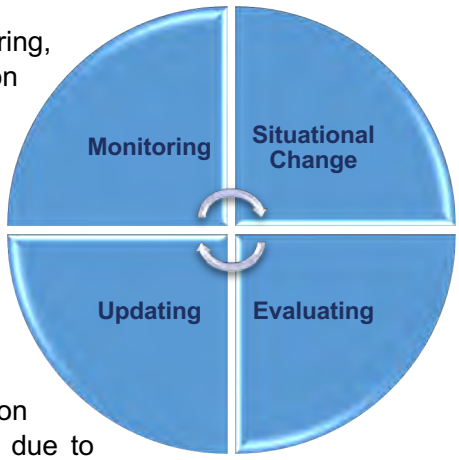
The Shasta County HMPT will continue to keep the public informed about its hazard mitigation projects and activities through its planning portal, https://www.shastacoop.com. Additionally, it will provide a "comments/suggestions" option for the public to submit input through the website.

The public will also be invited to participate in annual HMPT meetings to review and discuss the mitigation-related events of the past year.

Shasta County used a public input website to collect data from local plan stakeholders during the hazard mitigation planning process. All collected data was used to create a local hazard profile and provide insight on the public's concerns. The public input site will continue be used as needed to track the status of previous hazard mitigation actions and elicit feedback for future hazard mitigation actions.

Redacted copies of this plan (update) will be available online through the Shasta County website https://www.co.shasta.ca.us.

2.3 – Plan Maintenance Process



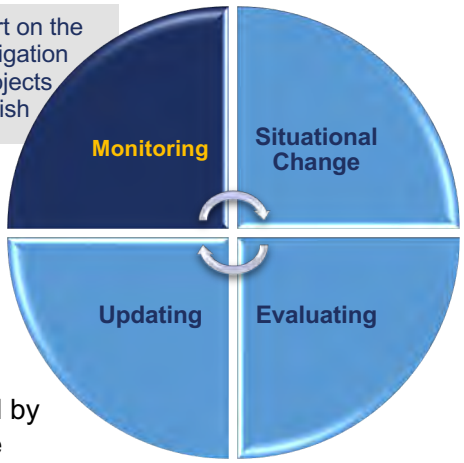
The Shasta County HMPT has developed a method to ensure monitoring, evaluation, and updating of its multijurisdictional hazard mitigation plan. Upon adoption of this plan (update), Shasta County will form a subcommittee, comprised of Shasta County's Public Works Director and jurisdictional representatives from the HMPT, to oversee mitigation projects. The chair of the subcommittee will be determined by a vote in the subcommittee. Additional members may be added based on necessity. The subcommittee will submit a report, which in turn, will submit an annual report to the Public Works Department. Refer to section 2.3.4 for an example of this report.

Shasta County Public Works may request a non-scheduled report on the monitoring, evaluation, or updating of any portion of this plan due to irregular progress on mitigation actions and or projects, in the aftermath of a hazard event, or for any reason deemed appropriate.

NOTE: Hazard mitigation plans are required to be updated every five (5) years per FEMA. Shasta County will meet this requirement by starting the planning process three (3) years after this plan is formally adopted.

2.3.1 – Plan Monitoring & Situational Change

Regularly report on the progress of mitigation actions and projects from start to finish



Plan monitoring can be defined as the ongoing process by which stakeholders obtain regular feedback on the progress being made towards achieving their goals and objectives. In the more limited approach, monitoring may focus on tracking projects and the use of the agency's resources. In the broader approach, monitoring also involves tracking strategies and actions being taken by partners and non-partners, and figuring out what new strategies and actions need to be taken to ensure progress towards the most important results.

A monitoring report will be written by Shasta County Public Works and submitted for review after the annual HMPT meeting, or when triggered by situational change. The monitoring report answers the questions on the following page.

- ✓ *Is the mitigation project under, over, or on budget?*
- ✓ *Is the mitigation project behind, ahead of, or on schedule?*
- ✓ *Are there any changes in Shasta County's capabilities which impact the hazard mitigation plan?*
- ✓ *Are there any changes in Shasta County's hazard risk?*
- ✓ *Has the mitigation action been initiated, or its initiation planned?*
- ✓ *If applicable, has participation in a mitigation action's collaboration been regular?*
- ✓ *If any, what plan updates occurred, why did they occur, and what is their impact?*

Plan change(s) due to training, drills, exercises, project completions, hazard events, etc.

The plan maintenance process is cyclical and maintenance items can operate simultaneously within the process.

2.3.2 – Plan Evaluating

A plan evaluation is a rigorous and independent assessment of either completed or ongoing activities to determine the extent to which they are achieving stated objectives and contributing to decision making.

A situation report will be written by Shasta County Public Works and submitted to Shasta County's HMPT when the situation dictates. The following situations are typical examples of when an evaluation will be necessary.

Answers to questions e.g., *"Is the current mitigation plan sufficient, helpful, and relevant?"* are imperative during an evaluation

- Post hazard event
- Post training exercise
- Post tabletop or drill exercise
- Significant change or completion of a mitigation project
- Significant change or completion of a mitigation action

An evaluation report will ask the following questions in response to the previously listed events.

- ✓ *Do the mitigation objectives and goals continue to address the current hazards?*
- ✓ *Are there new or previously unforeseen hazards?*
- ✓ *Are current resources appropriate for implementing a mitigation project?*
- ✓ *Was the outcome of a mitigation action/project expected?*
- ✓ *Are there implementation problems?*
- ✓ *Are there coordination problems?*

2.3.3 – Plan Updating

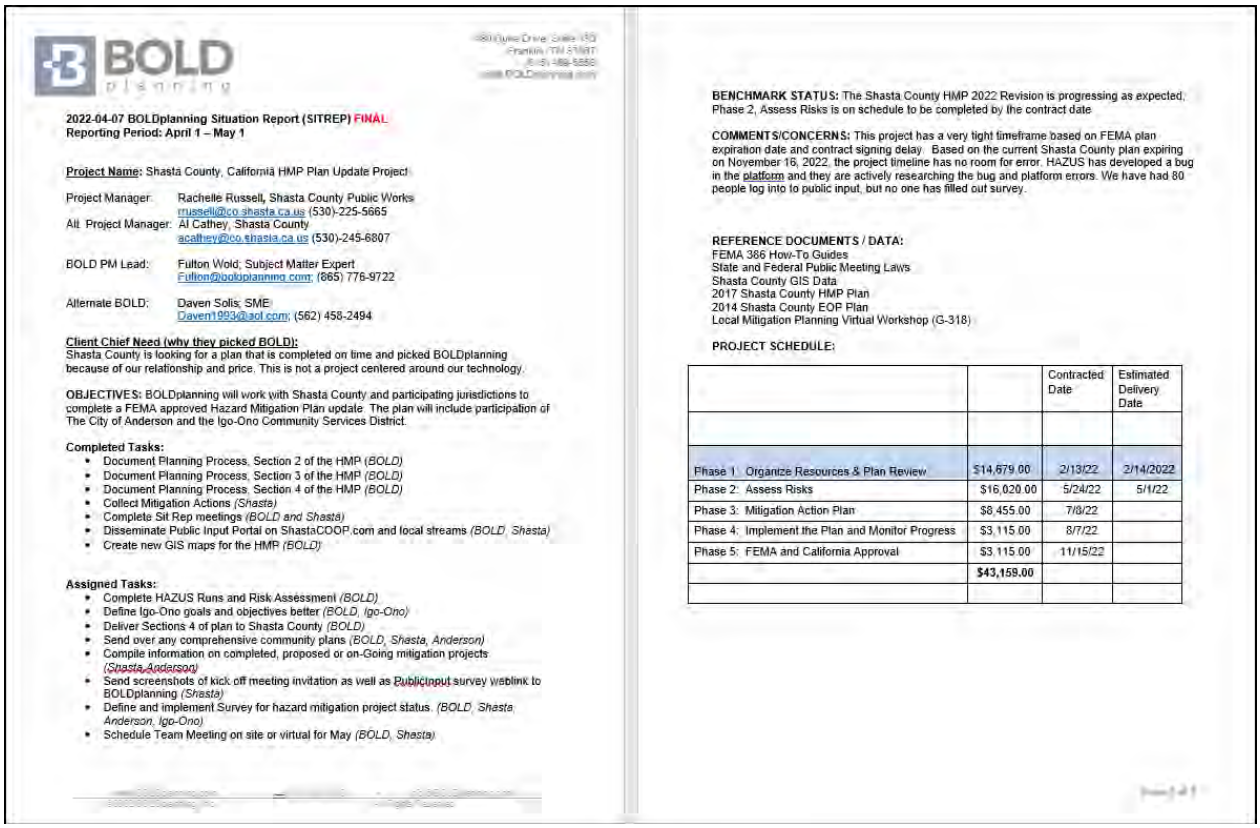
Typically, the updating of a hazard mitigation plan is initiated upon the completion of a plan evaluation and even then, only when the evaluation determines an update is appropriate. A plan update also occurs every five years per FEMA guidelines. Additionally, when new hazard data becomes available, it will be added to the plan. New data will be confirmed or denied at future HMPT meetings.

A HMP update can be written anytime it is deemed necessary by the Shasta County Department of Public Works. HMP updates will occur annually to review the progress of HMP actions and evaluate their effectiveness. Departments in charge of mitigation projects will conduct a review and provide their feedback to the Shasta County Department of Public Works.

To ease this process, Shasta County will continue to use the online platform, www.ShastaCOOP.com. The platform, as previously mentioned, serves as a repository for information specific to hazard mitigation and increases collaboration between plan stakeholders. Users can track the plan's progress in real time and document their concerns.

Shasta County will begin the plan update process three years from this plan's adoption according to FEMA DMA 2000 guidelines. This will take place under the direction of the Shasta County Department of Public Works.

2.3.4 – Shasta County Situation Report # 4 of 8



BOLD planning

2022-04-07 BOLDplanning Situation Report (SITREP) FINAL
Reporting Period: April 1 – May 1

Project Name: Shasta County, California HMP Plan Update Project

Project Manager: Rachelle Russell, Shasta County Public Works
rrussell@co.shasta.ca.us (530)-225-5665
Alt. Project Manager: Al Cathey, Shasta County
acathey@co.shasta.ca.us (530)-245-6807

BOLD PM Lead: Fulton Wold; Subject Matter Expert
Fulton@boldplanning.com; (865) 776-9722

Alternate BOLD: Daven Solis; SME
Daven1993@aol.com; (562) 458-2494

Client Chief Need (why they picked BOLD):
Shasta County is looking for a plan that is completed on time and picked BOLDplanning because of our relationship and price. This is not a project centered around our technology.

OBJECTIVES: BOLDplanning will work with Shasta County and participating jurisdictions to complete a FEMA approved Hazard Mitigation Plan update. The plan will include participation of The City of Anderson and the Igo-Ono Community Services District.

Completed Tasks:
- Document Planning Process, Section 2 of the HMP *(BOLD)*
- Document Planning Process, Section 3 of the HMP *(BOLD)*
- Document Planning Process, Section 4 of the HMP *(BOLD)*
- Collect Mitigation Actions *(Shasta)*
- Complete Sit Rep meetings *(BOLD and Shasta)*
- Disseminate Public Input Portal on ShastaCOOP.com and local streams *(BOLD, Shasta)*
- Create new GIS maps for the HMP *(BOLD)*

Assigned Tasks:
- Complete HAZUS Runs and Risk Assessment *(BOLD)*
- Define Igo-Ono goals and objectives better *(BOLD, Igo-Ono)*
- Deliver Sections 4 of plan to Shasta County *(BOLD)*
- Send over any comprehensive community plans *(BOLD, Shasta, Anderson)*
- Compile information on completed, proposed or on-Going mitigation projects *(Shasta,Anderson)*
- Send screenshots of kick off meeting invitation as well as Publicinput survey weblink to BOLDplanning *(Shasta)*
- Define and implement Survey for hazard mitigation project status. *(BOLD, Shasta Anderson, Igo-Ono)*
- Schedule Team Meeting on site or virtual for May *(BOLD, Shasta)*

BENCHMARK STATUS: The Shasta County HMP 2022 Revision is progressing as expected. Phase 2, Assess Risks is on schedule to be completed by the contract date

COMMENTS/CONCERNS: This project has a very tight timeframe based on FEMA plan expiration date and contract signing delay. Based on the current Shasta County plan expiring on November 16, 2022, the project timeline has no room for error. HAZUS has developed a bug in the platform and they are actively researching the bug and platform errors. We have had 80 people log into to public input, but no one has filled out survey.

REFERENCE DOCUMENTS / DATA:
FEMA 386 How-To Guides
State and Federal Public Meeting Laws
Shasta County GIS Data
2017 Shasta County HMP Plan
2014 Shasta County EOP Plan
Local Mitigation Planning Virtual Workshop (G-318)

PROJECT SCHEDULE:

		Contracted Date	Estimated Delivery Date
Phase 1: Organize Resources & Plan Review	$14,679.00	2/13/22	2/14/2022
Phase 2: Assess Risks	$16,020.00	5/24/22	5/1/22
Phase 3: Mitigation Action Plan	$8,455.00	7/8/22	
Phase 4: Implement the Plan and Monitor Progress	$3,115.00	8/7/22	
Phase 5: FEMA and California Approval	$3,115.00	11/15/22	
	$43,159.00		

Section 3: Planning Area

This section provides a brief history and broad perspective on Shasta County and the participating jurisdictions of the City of Anderson and the Igo Ono Community Services District, aka "the planning area."

It includes geographical, socioeconomic, and land use and development information, as well as a summary of all identified critical facilities and infrastructure.

Shasta County was founded in 1850 and was one of California's first counties. It was named after Mount Shasta, which is the English translation from the Native American language. Shasta County is bordered by present-day Siskiyou County (north), Modoc County (northeast), Lassen County (east), Plumas County (southeast), Tehama County (south), and Trinity County (west). The county seat is the City of Redding, which comprises most of the county's population.

According to the U.S. Census Bureau, Shasta County has a total area of 3,775.52 square miles (9,960 km2), of which 3,775 square miles (9,780 km2) is land and 72 square miles (190 km2) (1.9%) is water. Mountains line the north, south and eastern parts of the county. The Sacramento River flows from the northern parts of the county to the south through Shasta County's center. Extensive forests cover the county, fueling commercial development.

Shasta County has experienced marginal growth over the past decade. They boast excellent healthcare, an abundant water supply for agriculture and industry, inexpensive property, and multiple, high-capacity, transportation routes. The Economic Development Corporation of Shasta County (Shasta EDC) is a public-private non-profit that represents the cities of Redding Shasta Lake, Anderson, and Shasta County in their economic development activities. The Shasta EDC has grown, diversified, and maintained a balanced economy, leading to economic stability and sustainability for the region primarily through:

- Business Recruitment
- Business Retention and Expansion
- Air Service
- Scalable Startup Support

The City of Anderson is a Shasta County suburb that is located ten (10) miles south of Redding and 138 miles north of Sacramento. The city's roots are as a railroad town near the northern tip of the Central Valley of California. Today, it considered to be on the "up and up" with new and coming small businesses, parks, and community events.

The Igo Ono Community Services District (IOCSD) is a California Special District operated by a five seat Board of Directors. Its purpose is to deliver ag water to customers along a 17-mile, 100+-year-old irrigation ditch system running through the Igo Ono community within Shasta County.

The marginal changes in development did not change the vulnerability of Shasta County, the city of Anderson and Igo-Ono CSD.

The following table provides information specific to the structures (types/values) within the planning area:

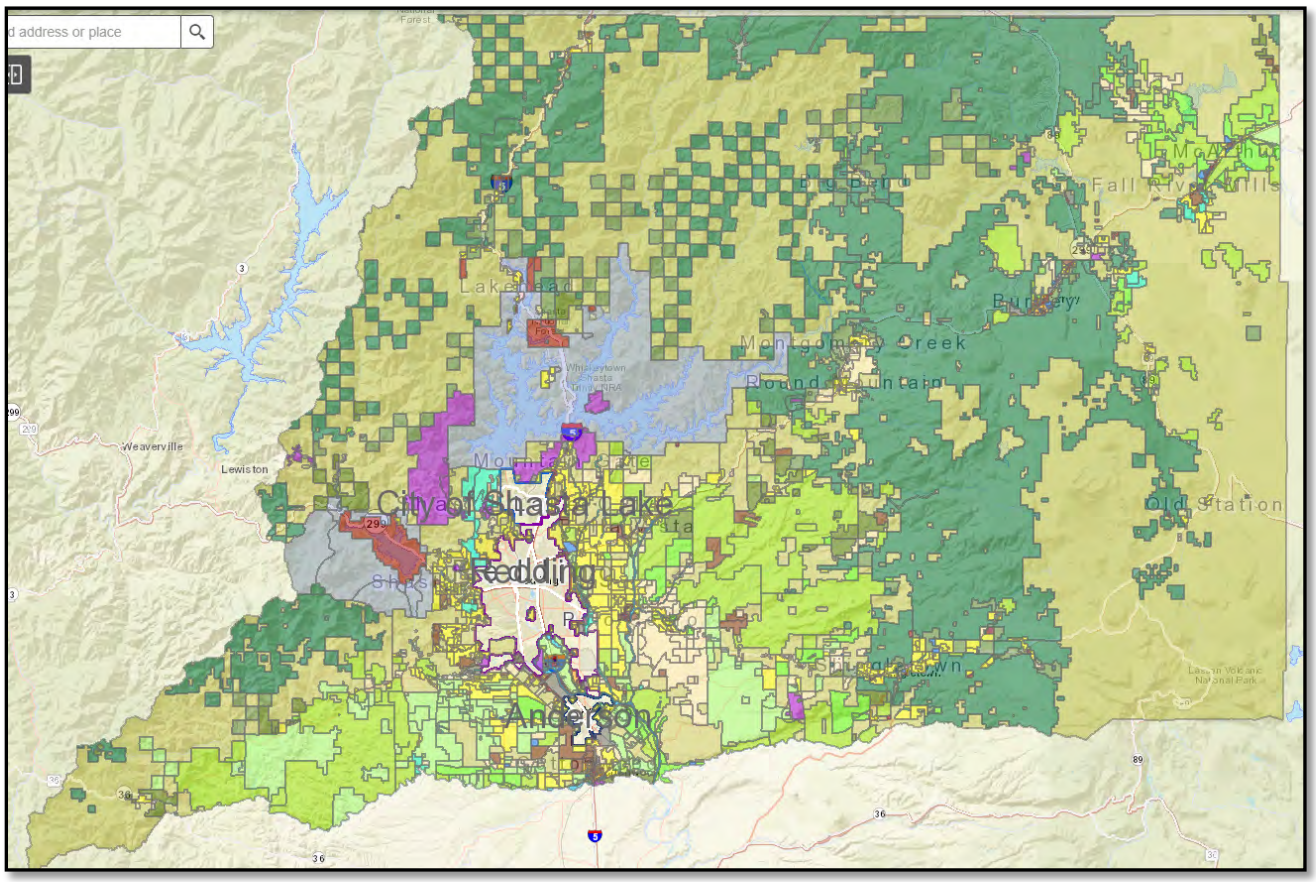
Table 3: Structural Summary

Structural Summary (Assessment Values)

Structure Type	Total Value
Commercial	$569,114,643
Residential	$5,303,367,944
Industrial	$95,123,126
Agriculture	$90,205,100

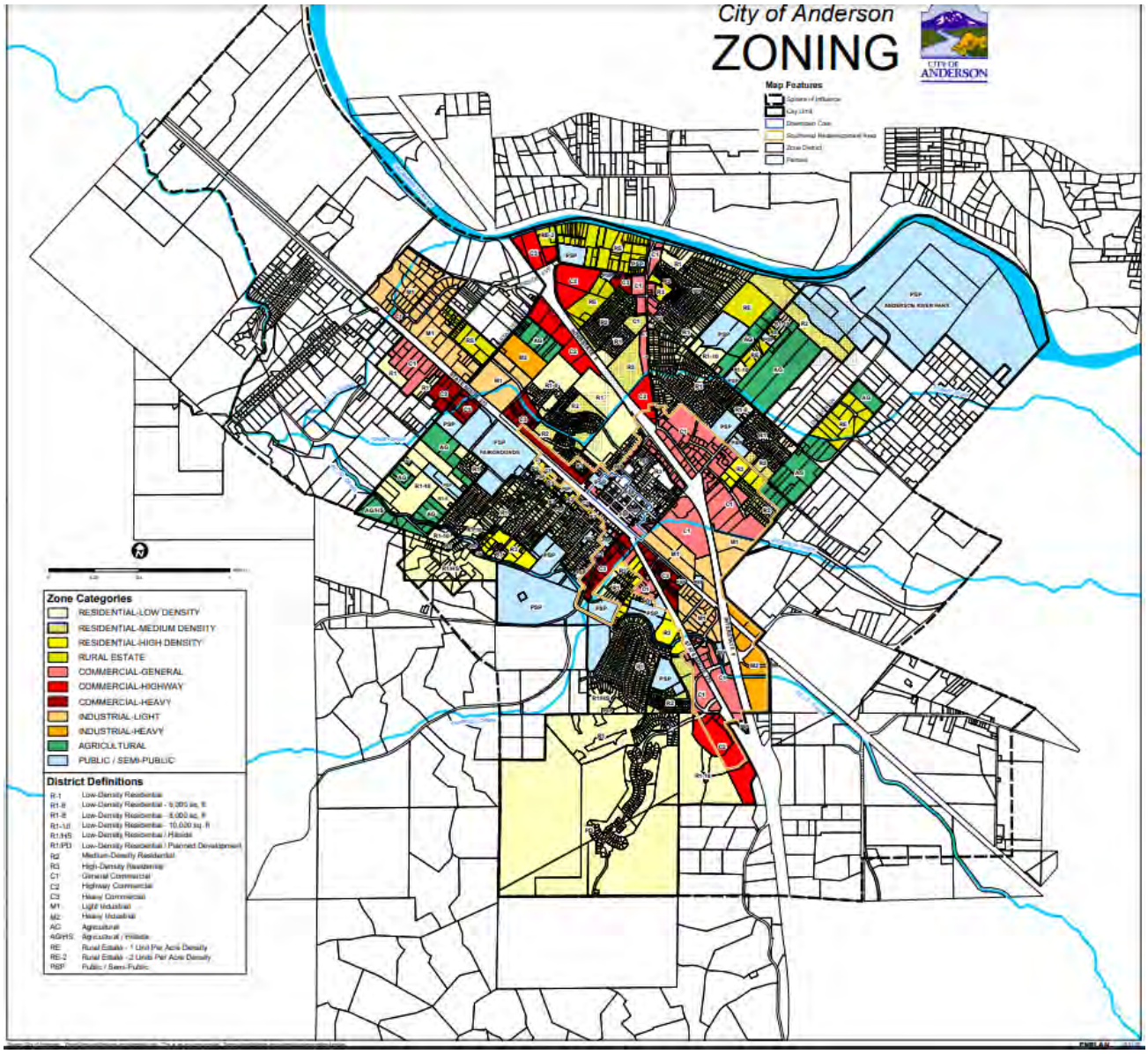
Data Source: County Assessor's Office

Map 1: Community Profile, Shasta County



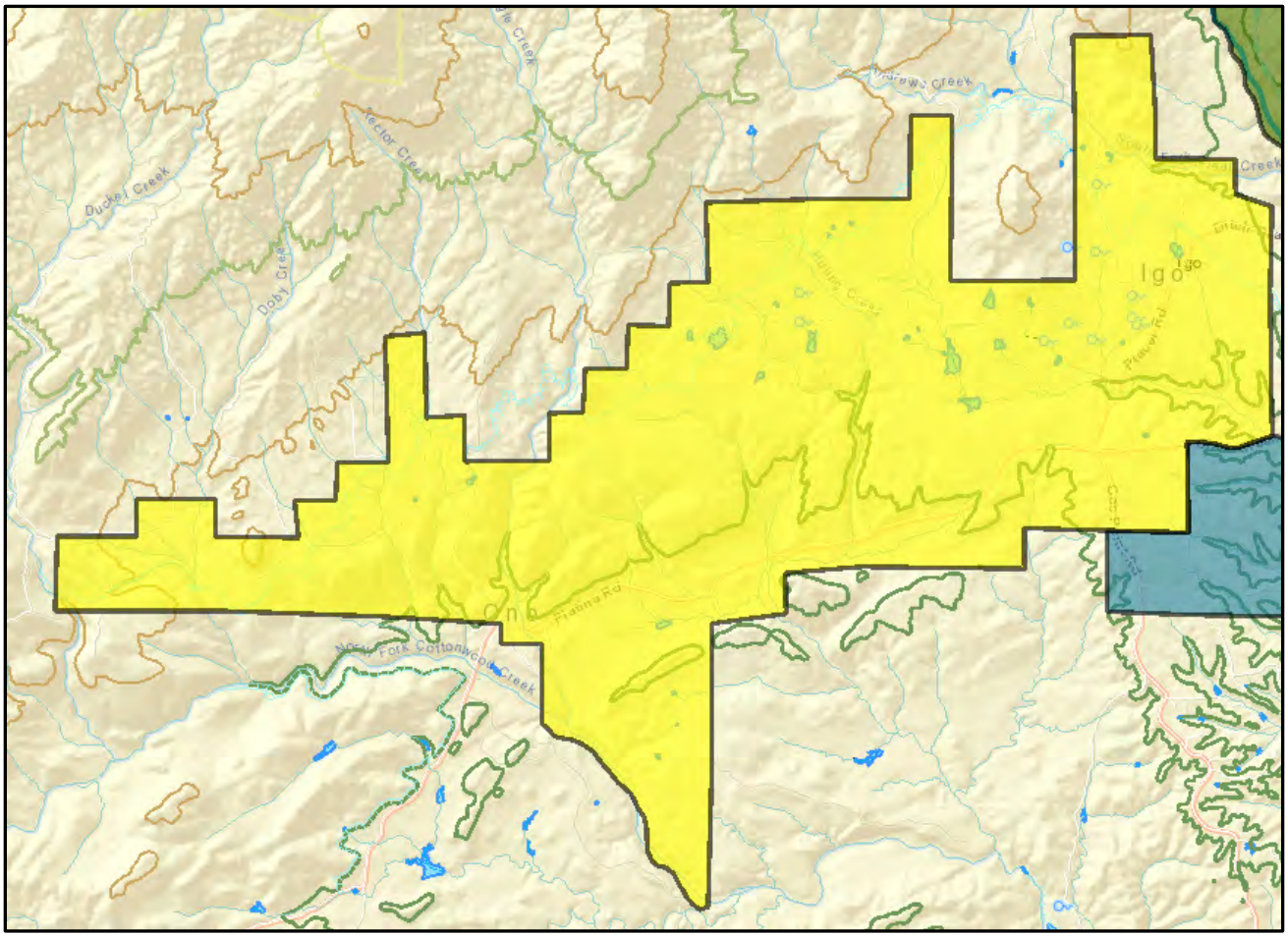
Map Source: Shasta County ArcGIS

Map 2: Community Profile, City of Anderson



Map Source: City of Anderson

Map 3: Community Profile, Igo Ono Community Services District



Map Source: Shasta County

3.1 – Demographics & Topography

Demographics

According to the U.S. Census Bureau (2020), Shasta County has a total of **182,115** people residing within its boundaries. This number is up from 2010, though marginally, at which time the population was 177,223. The table below provides information specific to the population change within Shasta County, as well as the participating jurisdictions since 2000.

Table 4: Population Change, Shasta County & Participating Jurisdictions

Population Change, Shasta County & Participating Jurisdiction							
Jurisdiction	Size (Acres)	Population			% Population Change		
		2000	2010	2020	2000-2010	2000-2020	2000-2020
Shasta County (Inclusive)	2,462,000	163,771	177,223	182,115	1.08%	1.03%	1.11%
City of Anderson	896	9,022	9,932	11,323	1.1%	1.14%	1.26%
Igo Ono Community Services District	101.3	-	-	103	-	-	-

Data Source: U.S. Census Bureau

Of the jurisdictions participating in this hazard mitigation plan (update), i.e., Shasta County, the City of Anderson, and the Igo Ono Community Services District, all have seen population growth over the years, but not of significant value. In fact, the 2020 Decennial Census indicates that Shasta County's population per square mile to be 48.2 versus 46.9 in 2010, which is a minimal difference.

Per the U.S. Census Bureau, there are 70,845 households (2016-2020) with an average size of two people, and 79,711 housing units (July 1, 2021). The median value of owner-occupied housing units (2016-2020) is $261,000. As for employment establishments, there are 4,407 (2020), and the median household income (2020) is $63,091.

Approximately 90% of Shasta County's economy is in the services sector, of which education, health care, and social services are the largest segments. The services sector consists of both high-skilled and high-paying occupations such as doctors and information technology (IT) developers, and low-wage, low-skilled jobs in the food service and tourism industries. Travel/tourism is a significant sector of Shasta County's economy, due to its multiple park and recreation areas on both public and private lands. These include:

Federal Lands

- Whiskeytown National Recreation Area (National Park Service)
- Lassen Volcanic National Park (National Park Service)
- Shasta-Trinity National Forest and National Recreation Area (including Shasta Lake) (U.S. Forest Service)

State Lands

- Shasta Lake State Historical Park (Department of Parks and Recreation)
- McArthur-Burney Falls Memorial State Park (Department of Parks and Recreation)
- Castle Crags State Park (Department of Parks and Recreation)
- Battle Creek Wildlife Area (Department of Fish and Wildlife)

Private and Private-Public Partnerships

- Turtle Bay Exploration Park and Sundial Bridge
- Sacramento River Trail System
- Hat Creek Radio Observatory (SRI International and SETI Institute)
- Lake Shasta Caverns (private)

Topography

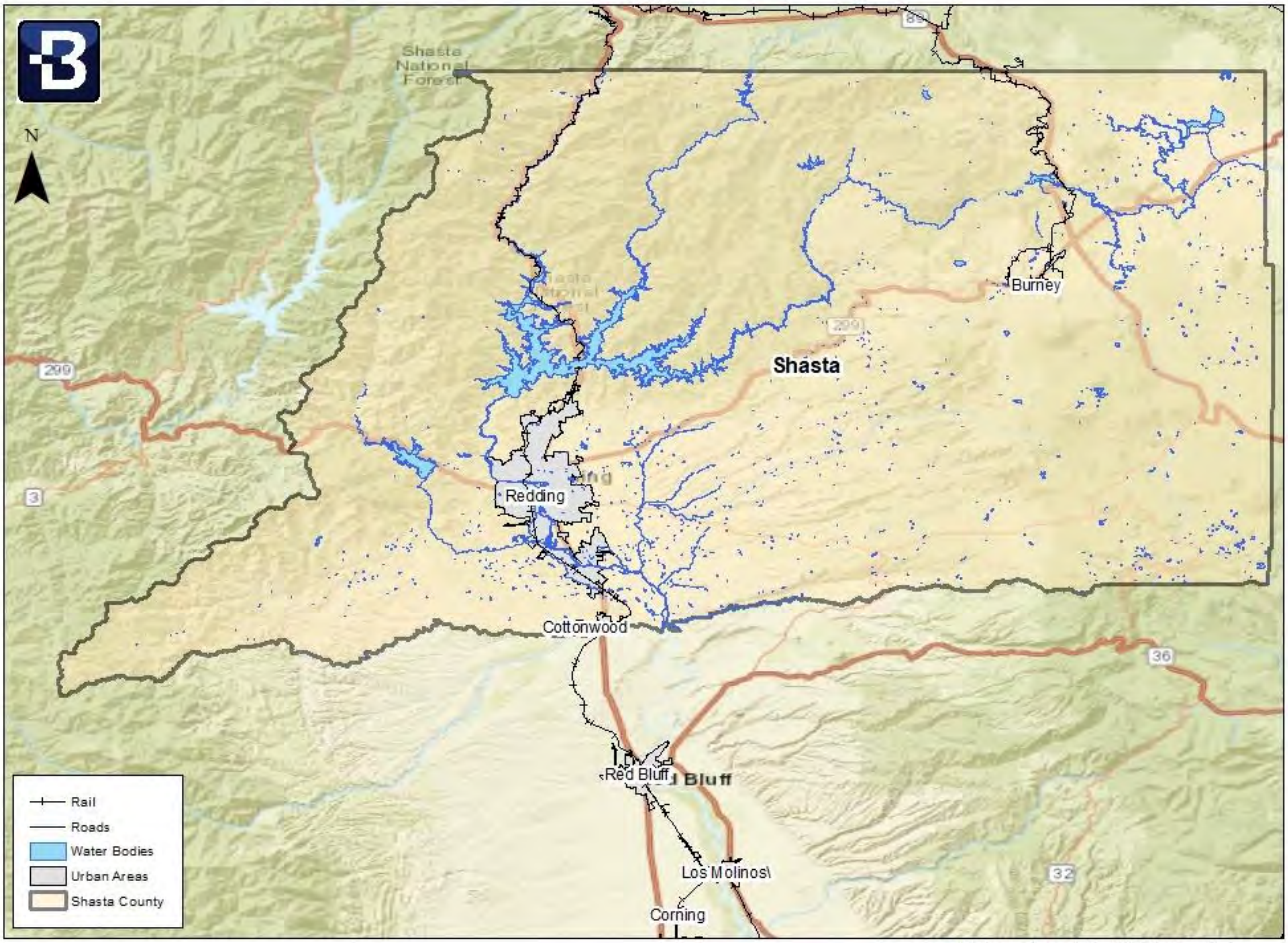
Shasta County is in northern California, at the northern end of the Sacramento Valley, which is part of the Great Central Valley of California. The Sacramento Valley is named after its main river, the Sacramento River. The Sacramento River is the principal river of northern and central California, draining from the Klamath Mountains south to San Francisco Bay. The Pit River joins the Upper Sacramento just north of the Shasta Dam, creating the Lake Shasta Reservoir. The McCloud River and Squaw Creek also flow into Lake Shasta. The Keswick Dam is located immediately downstream of the Shasta Dam on the Sacramento River. These dams are part of the Central Valley Projects, which regulate stream flow on the Sacramento and its tributaries. Whiskeytown Dam on Clear Creek is also located in Shasta County, impounding Whiskeytown Lake.

Mountains frame Shasta County on the north, east, and west. The Cascade Mountain Range dominates the geography of the northern and eastern portions of the planning area. Just east of Shasta County, the Cascades meet with the Sierra Nevada Mountain Range. East of Lake Shasta are the Trinity Mountains of the Coastal Mountain Range. The Cascade Mountains are part of the Pacific Ring of Fire. Two active volcanoes are located near or in Shasta County. Mt. Shasta is located north in Siskiyou County, 60 miles north of Redding, California. In the southeast corner of the Shasta County is the Lassen Volcanic Center, 55 miles east of Redding. The Lassen Volcanic Center is the most southerly active volcano of the Cascade Range.

Most residents live in the valley, in the southern and central part of Shasta County. The City of Redding, the county seat and commercial hub, is located on the Sacramento River and Interstate 5, the major north-south corridor for the Pacific states. The other incorporated cities in Shasta County are the City of Anderson, 10 miles south of Redding, and the City of Shasta Lake.

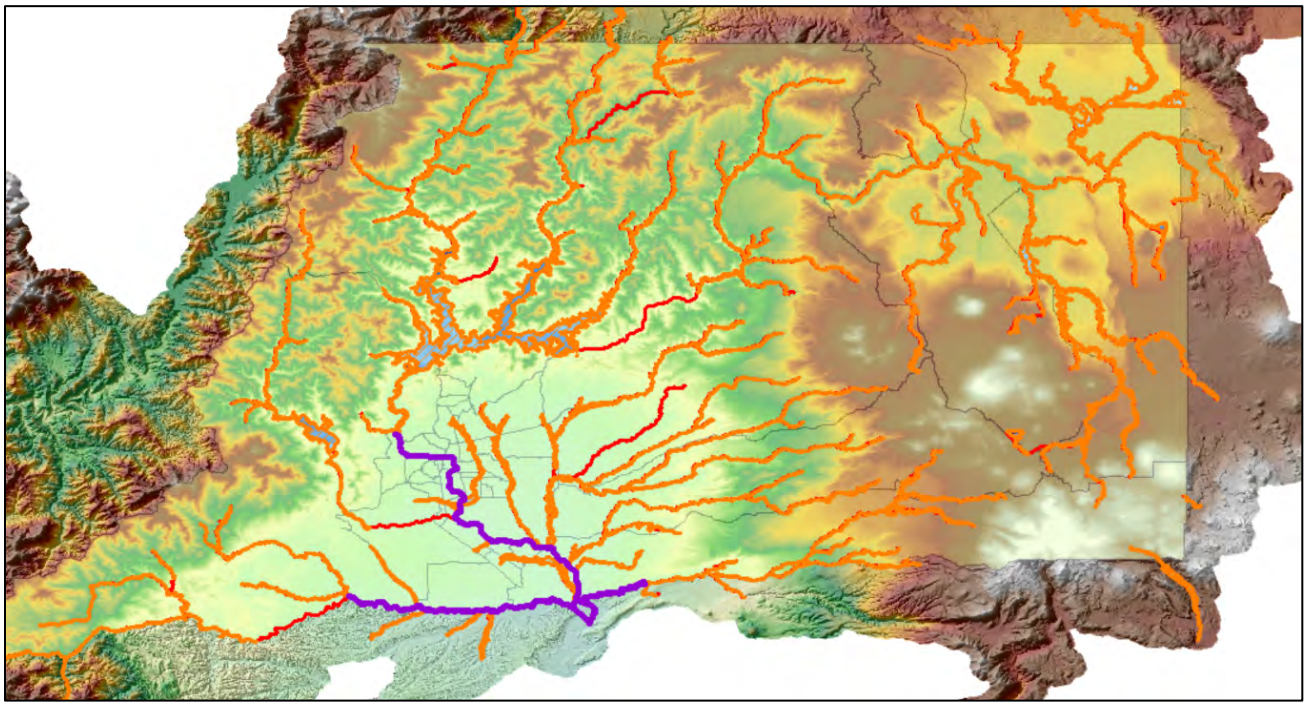
The following maps provide a visual representation of topographical features within the planning area.

Map 4: Bodies of Water, Shasta County



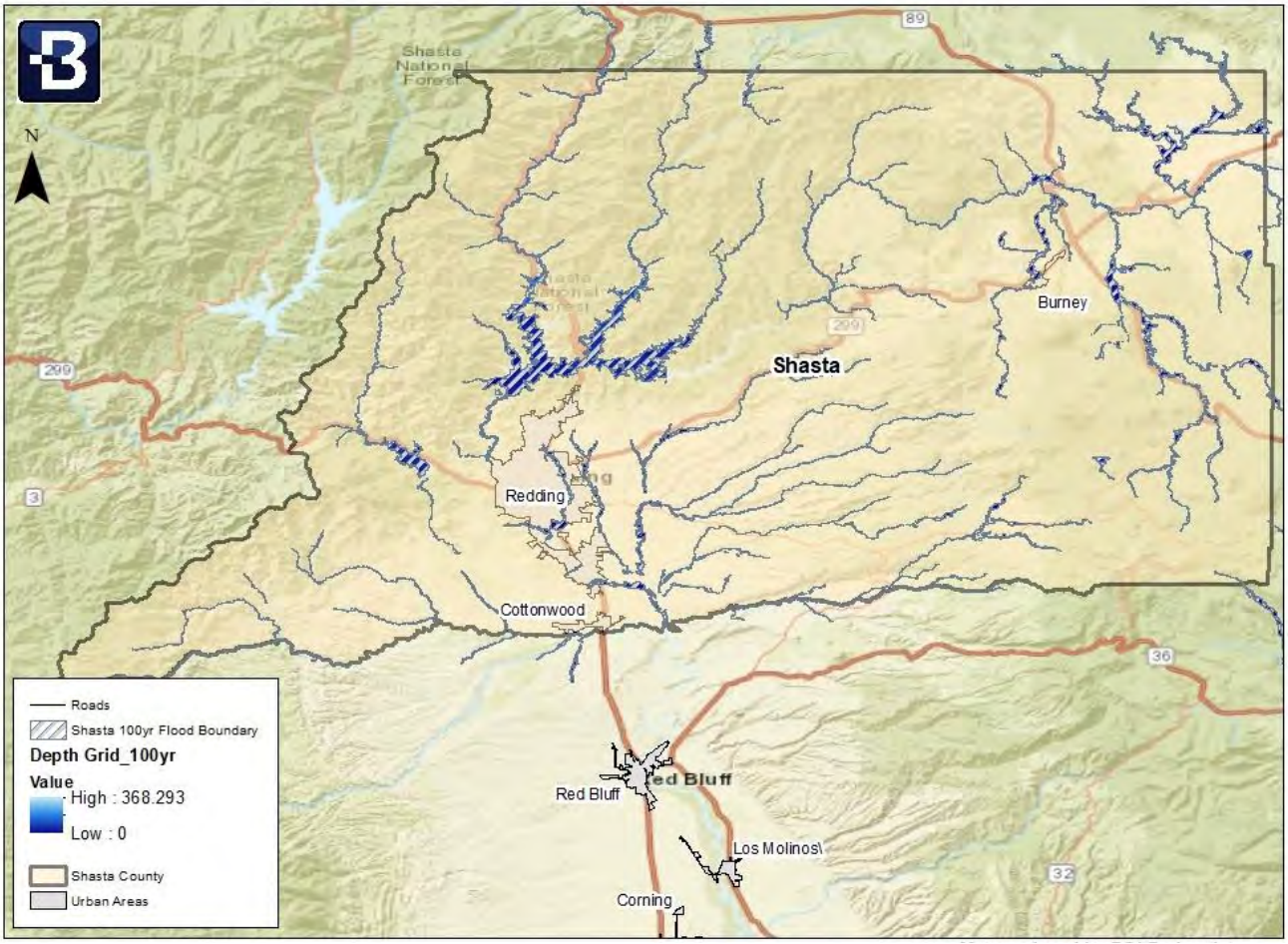
Map Source: BOLDplanning

Map 5: Rivers, Shasta County



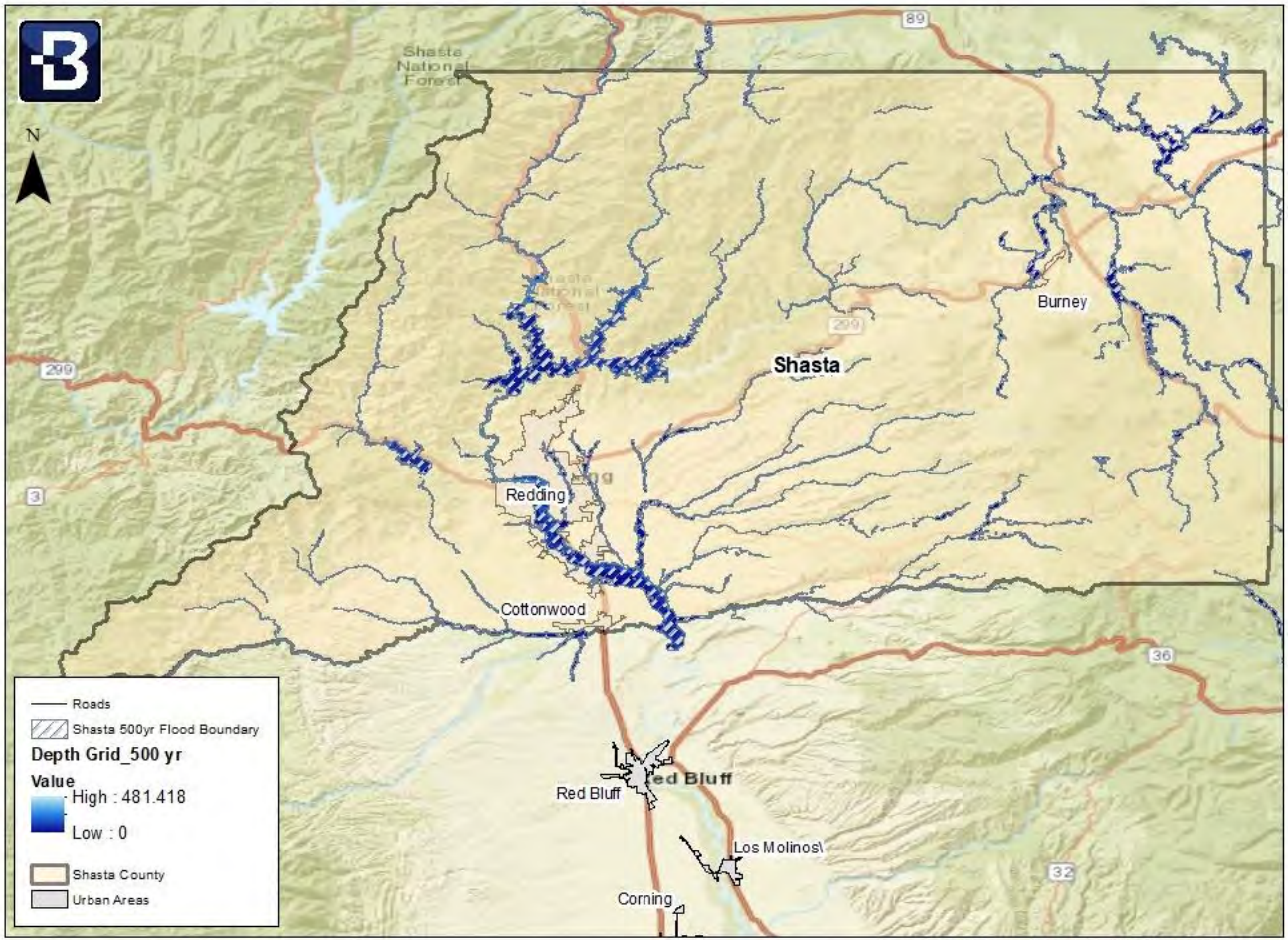
Map Source: BOLDplanning

Map 6: 100-year Floodplain, Shasta County



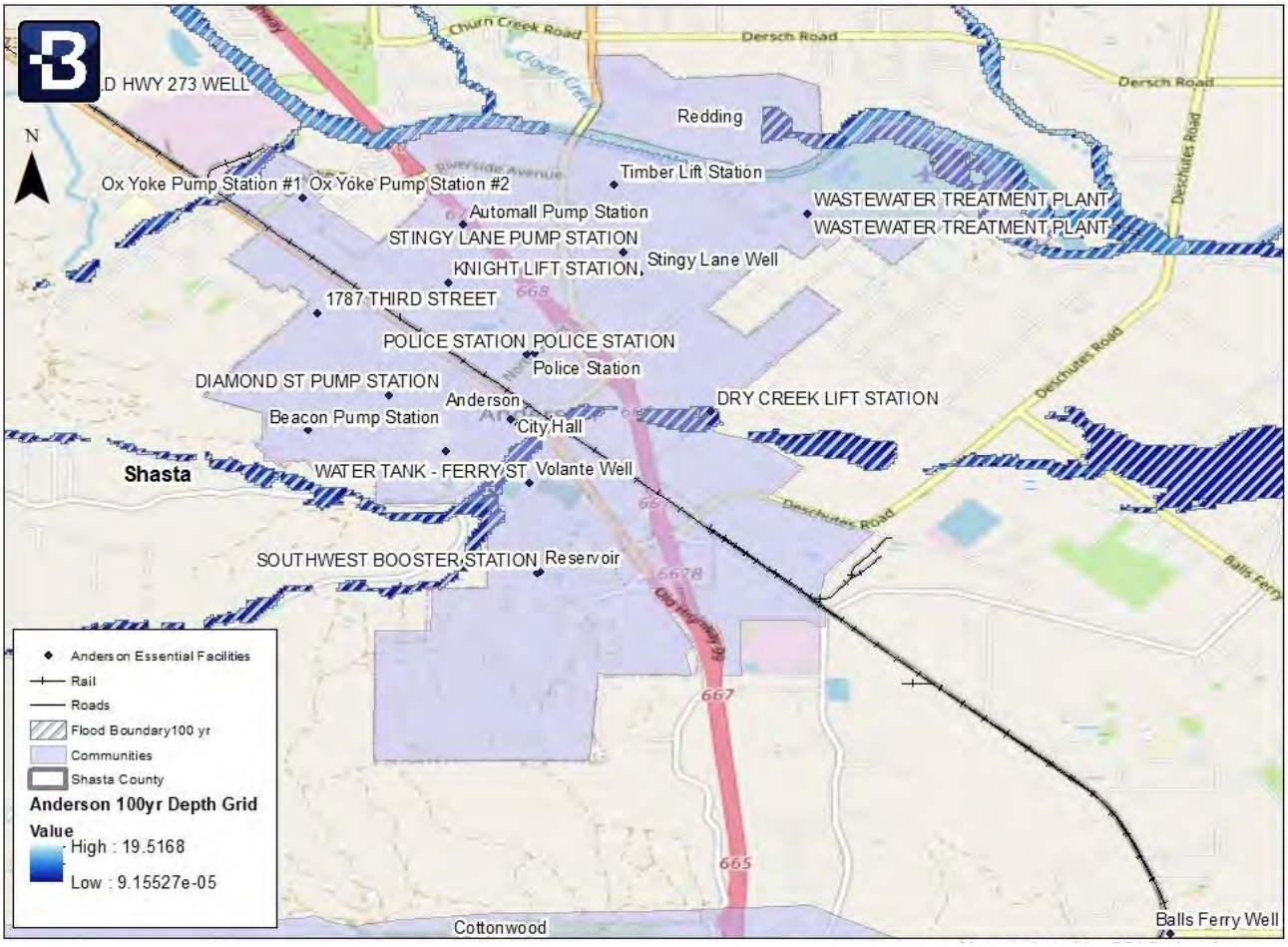
Map Source: BOLDplanning

Map 7: 500-year Floodplain, Shasta County



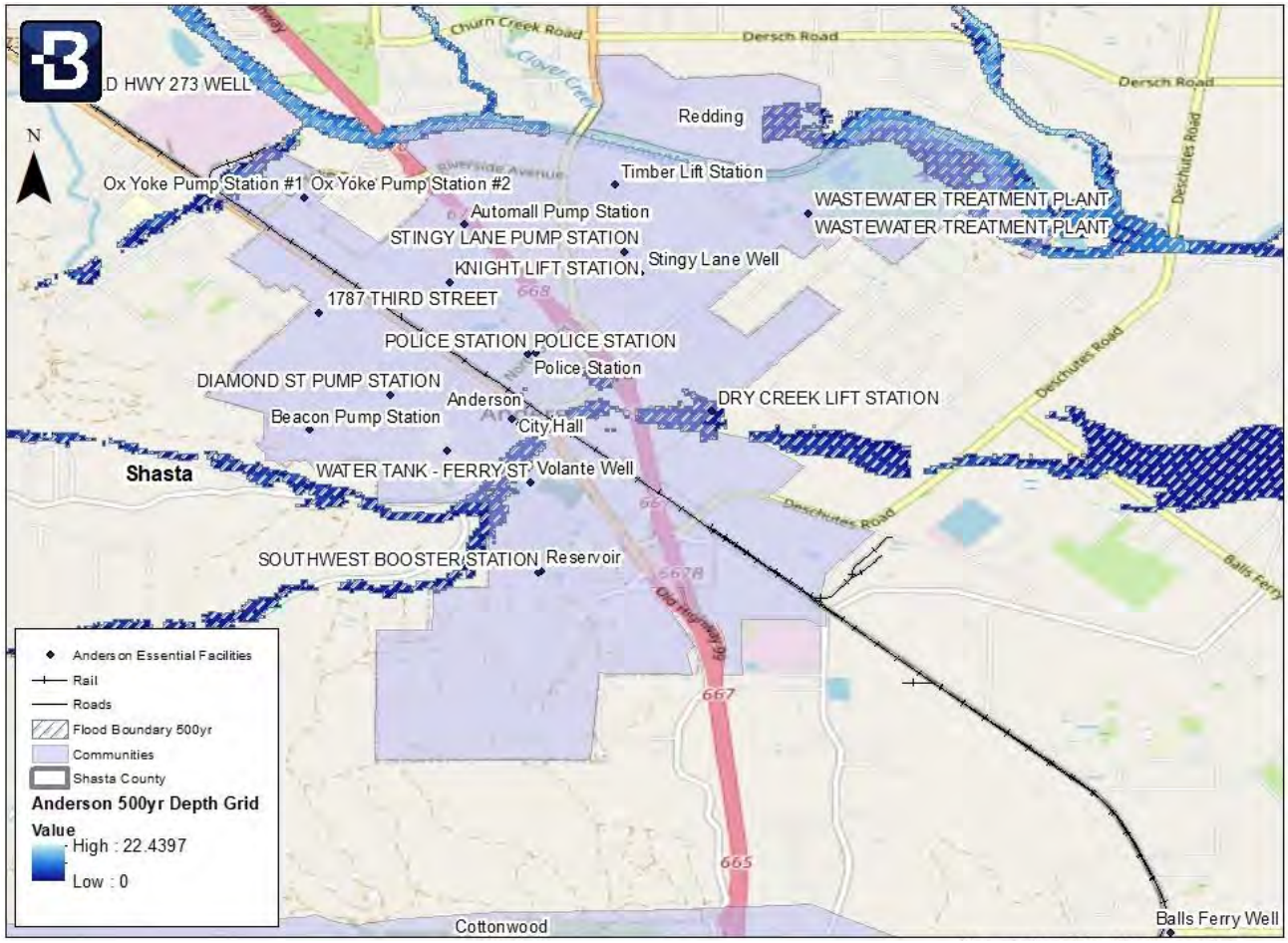
Map Source: BOLDplanning

Map 8: 100-year Floodplain, City of Anderson



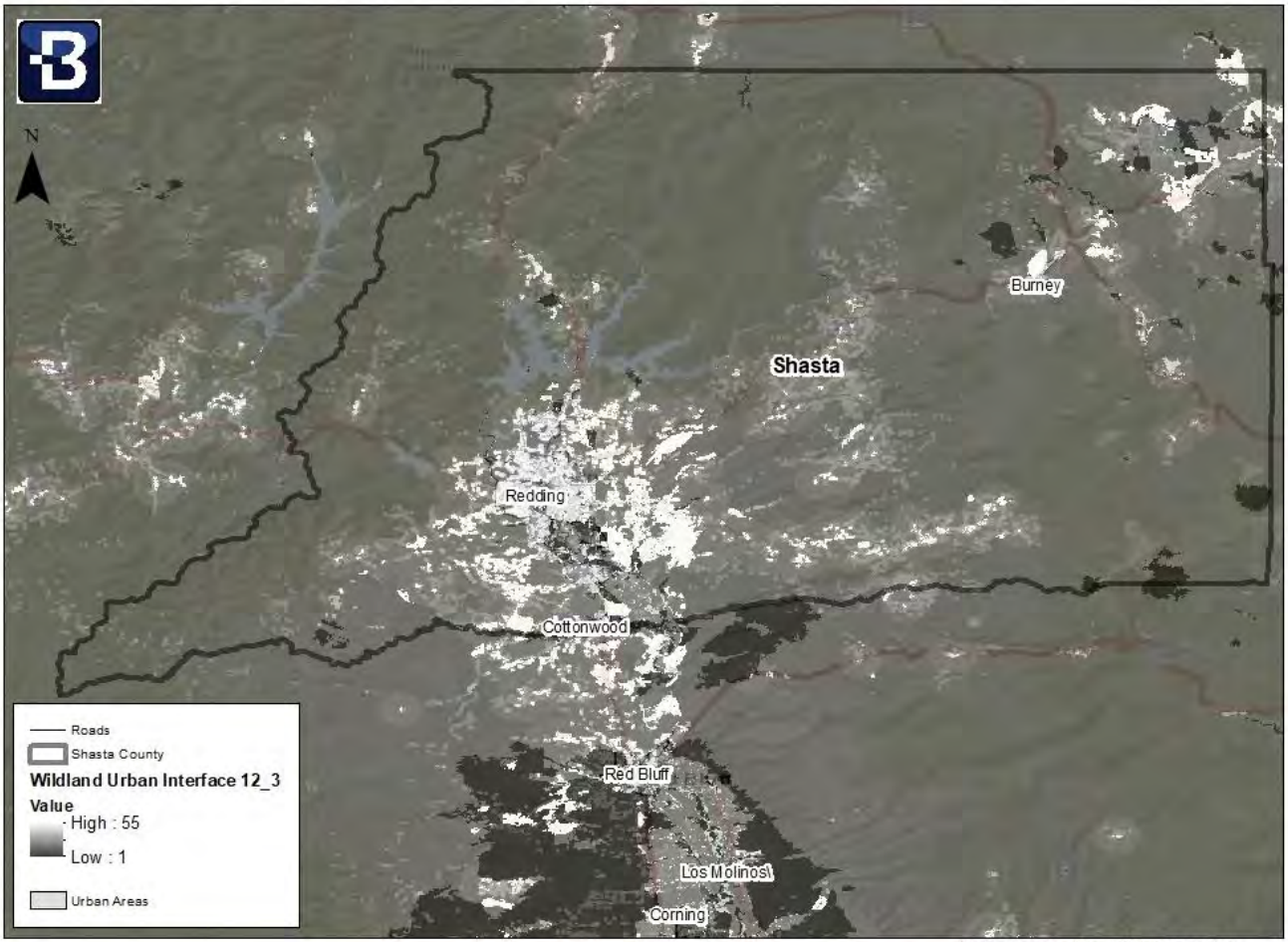
Map Source: BOLDplanning

Map 9: 500-year Floodplain, City of Anderson



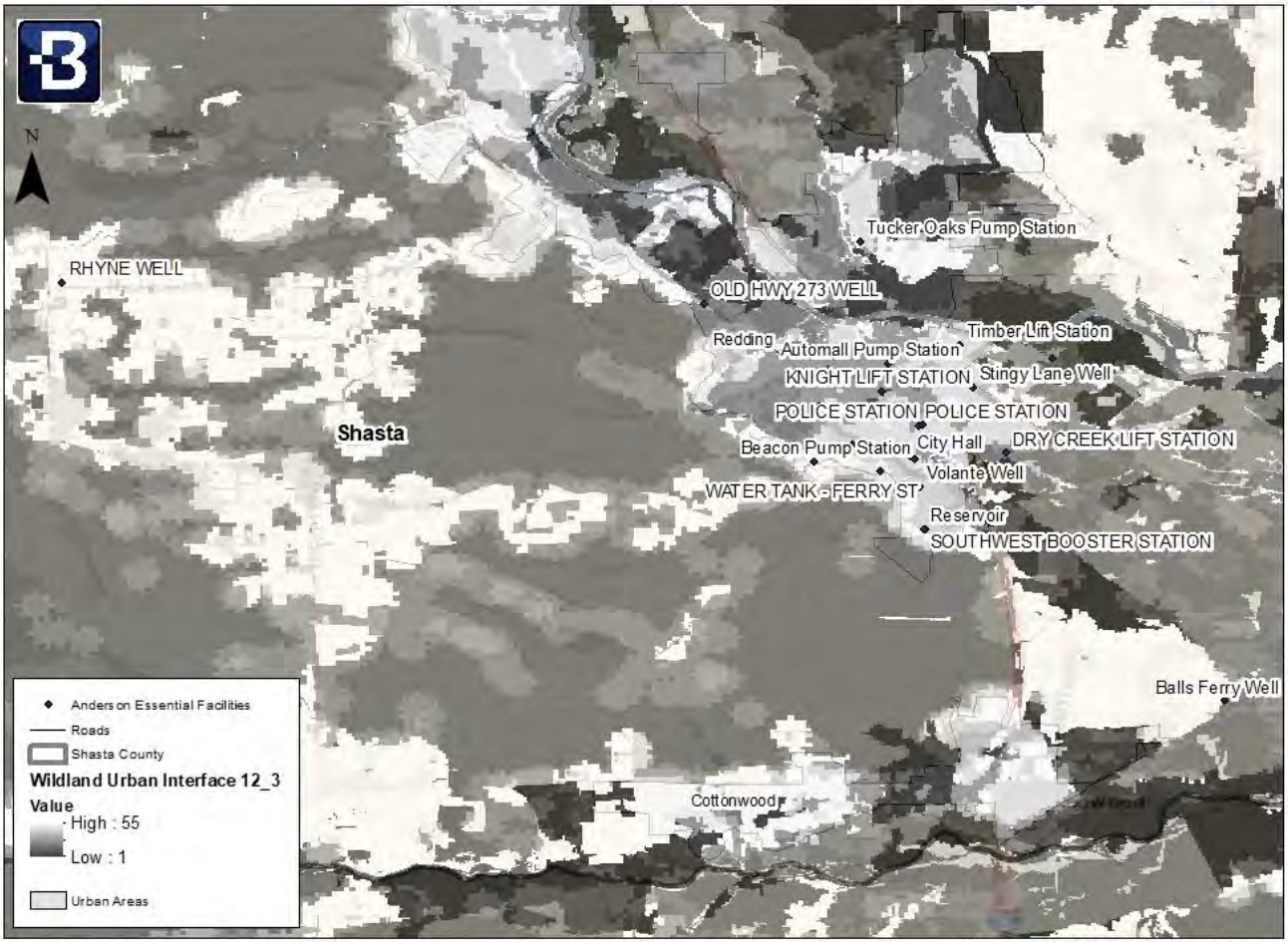
Map Source: BOLDplanning

Map 10: Wildland Urban Interface, Shasta County



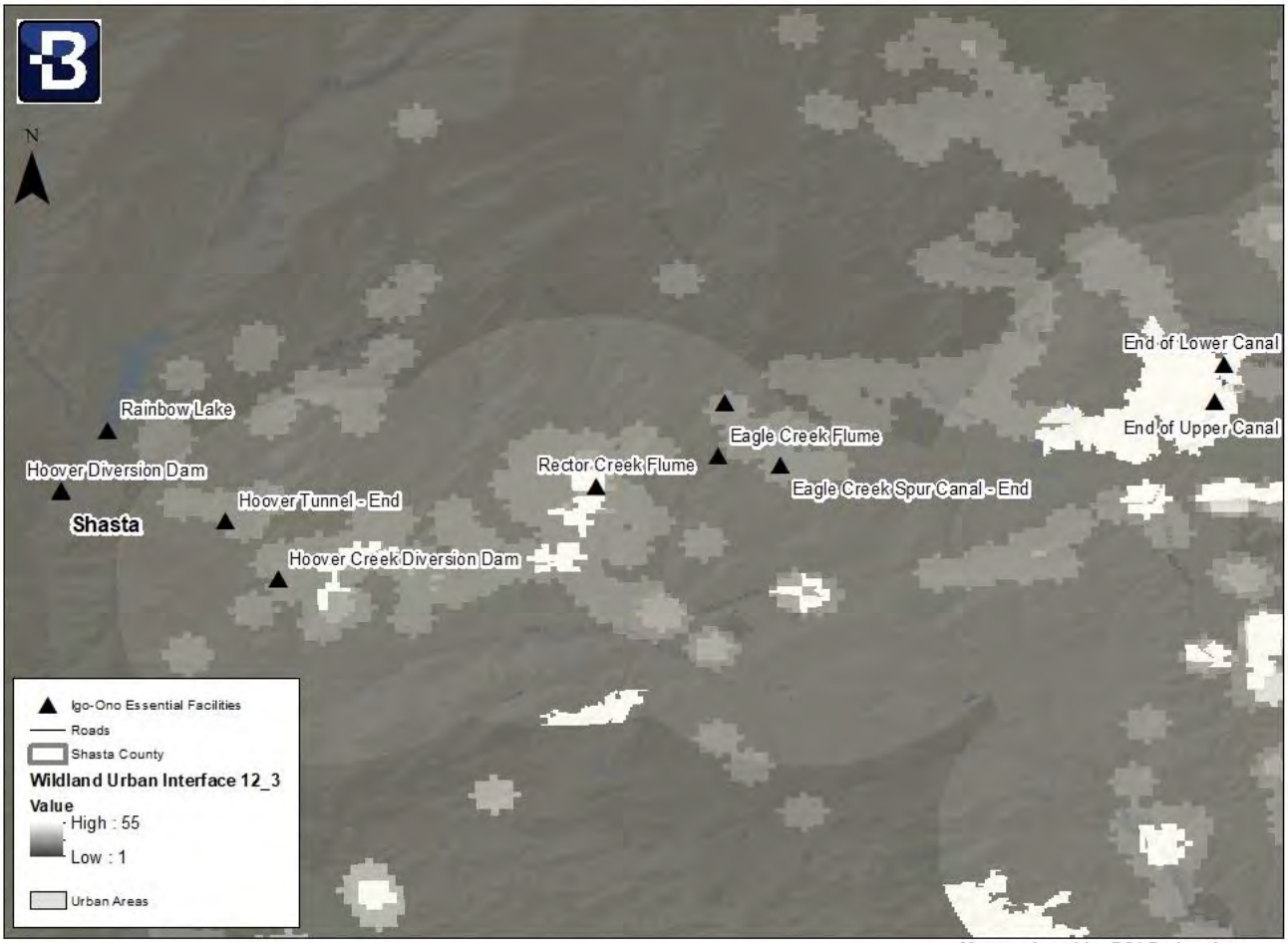
Map Source: BOLDplanning

Map 11: Wildland Urban Interface, City of Anderson



Map Source: BOLDplanning

Map 12: Wildland Urban Interface, Igo Ono Community Services District



Map Source: BOLDplanning

Climate

Shasta County typically receives 44 inches of rain per year; the U.S. average is 38 inches. Annual snowfall typically measures around 18 inches; the U.S. average is 28 inches. The number of days per year with any measurable precipitation is 88. On average, there are 249 sunny days per year in Shasta County. The July high is 93 degrees, and the January low is 32. The comfort index, which is based on humidity during the hot months, is a 7.5 out of 10, where higher is more comfortable. The U.S. average on the comfort index is 7. Shasta County's most comfortable months are June, July, and October.

NOTE: All weather-related data used within this plan will be in reference to Shasta County or the location of specific events.

3.2 – Land Use & Development Trends

Photo Source: Unknown

Passively, the population of Shasta County and the participating jurisdictions is increasing. Between 2000 and 2010, the total population of Shasta County (182,115) and its jurisdictions grew by 1.11%. Of its population, 71% of people live in urban areas and 21% live in rural areas. Building permits averaged 393 in 2020.

At the present time, Shasta Lake's dam is under consideration for enlargement. The dam is one of the largest in the state and Shasta Lake is the largest reservoir in California. Shasta Lake is the third largest body of water in the state. Water from Shasta Lake is used to irrigate crops, provide power, and support municipal purposes.

The combination of a growing population and developing communities have the potential to increase the planning area's hazard risk. Presuming these trends continue, the best way to curtail future development from increasing hazard risk is to enforce already-in-place zoning, ordinances, and building codes, and conform to National Flood Insurance Program (NFIP) standards. A hazard specific analysis, as it pertains to land use and development trends, is covered under each hazard in Section 4 – Hazard Risk Assessment.

For hazards that affect the entire planning area, increased population growth increases a jurisdiction's overall vulnerability, while decreased population growth decreases it. It is difficult to quantify the exact change in vulnerability in either direction but can be depicted as generally directly proportional to the population change itself. For more information on hazards effecting the entire planning area, see Section 4 – Hazard Risk Assessment.

For hazards which have easily measured extents, changes in vulnerability are more difficult to calculate. Over the past three (3) years, dramatic improvements in available geographic data and risk assessment methodologies make this plan update's risk assessment far superior to Shasta County's previous hazard mitigation plan (November 16, 2017). However, the downside of utilizing improved data and methodologies is that they are incapable of being directly compared to the previous plan's data and methodologies. For instance, the previous plan does not geographically and accurately depict the locations of the wildland urban interface (WUI) or the WUI intermix. Without knowing where they existed in 2016, there can be no true comparison of vulnerability.

For the sake of having a comparison, although not as accurate as desired, this plan considers any jurisdiction with a positive population growth rate, in this case all participating jurisdictions, to have increased vulnerability; while any with a decreasing population, none of the participating jurisdictions, have a decreased vulnerability.

Shasta County does not allow construction within its FEMA-designated floodplains without prior approval. Approval requires any structure to be raised to a Base Flood Elevation, or BFE. More information on Shasta County's floodplain construction practices can be found in Section 5.5 – Planning Integration. Increased growth will not increase Shasta County or its participating jurisdiction's vulnerability to flooding due to the enforcement of the building codes.

A hazard specific analysis, as it pertains to land use and development trends, is covered under each hazard in Section 4 – Hazard Risk Assessment.

3.3 – Floodplain Management & National Flood Insurance (NFIP) Participation

The Floodplain Management Program through is identified in Shasta County's General Plan under the Flood Protection Element. Activities associated with the Floodplain Management Program include reviewing new development permit applications for elevation above the 100-year flood level, proper setback from watercourses, and adequate drainage plans. The Floodplain Management Program exceeds the minimum requirements for participation in the National Flood Insurance Program (NFIP).

For purposes of the NFIP, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The precise boundaries of those two areas are delineated on maps and described in reports produced by the FEMA for various creeks in Shasta County which have experienced or are expected to experience significant development.

The floodway is the channel of a stream, plus any adjacent floodplain areas, which must be kept free of development so that the 100-year flood can be carried away without increasing the flood height more than one foot.

The area between the floodway and the boundary of the 100-year floodplain is termed the floodway fringe and encompasses the portion of the floodplain that could be used for development without increasing the surface elevation of the 100-year flood more than one foot at any point.

Once the floodway and the floodway fringe have been distinguished within the 100-year floodplain, different development standards must be formulated for each area. These standards have two functions. First, they are designed to minimize loss of life and property damage by: (1) controlling the types of land uses which are permitted, and (2) prescribing certain construction methods. Second, they are intended to preserve the ability of the floodway to discharge the 100-year flood.

NFIP information should serve as the basis for land use and zoning designations in floodplain regions during the implementation phase of the planning process.

Two jurisdictions participating in this plan are currently active members of the NFIP. The table below contains a list of each community and their NFIP status. The Igo Ono Community Services District does not participate in the NFIP.

Table 5: Participating Communities, NFIP

Participating Communities, NFIP					
FEMA Community Status Book Report, California – Communities Participating in the National Flood Program (7/02/2022)					
Shasta County	060035	12/13/77	09/27/88	12/12/21	N/A
Anderson	060359	06/14/74	09/01/77	03/17/11	N/A
Igo Ono	Not in NFIP	Not in NFIP	Not in NFIP	Not in NFIP	Not in NFIP

Data Source: FEMA Community Status Book, NFIP

Each jurisdiction participating in the NFIP has their own NFIP Coordinator/Floodplain Administrator (FPA) to 1) ensure base flood elevation (BFE) certificates are completed for all new construction in the planning area, 2) ensure any development in a flood plain is accompanied by a Flood Hazard Development Certificate, and 3) further develop the NFIP program in the planning area to mitigate flood risk to its population. Both certificates are required prior to construction and to be completed by a licensed surveyor. None of the jurisdiction's NFIP compliance has any codified requirements or ordinance adoption beyond the minimum required by the NFIP.

3.4 – Critical Facilities & Infrastructure

The table below provides a summary of the critical facilities and infrastructure identified by Shasta County, the City of Anderson, and the Igo Ono Community Services District for mitigation planning purposes. Details pertaining to these critical facilities can be found in Appendix D – Critical Facilities & Infrastructure.

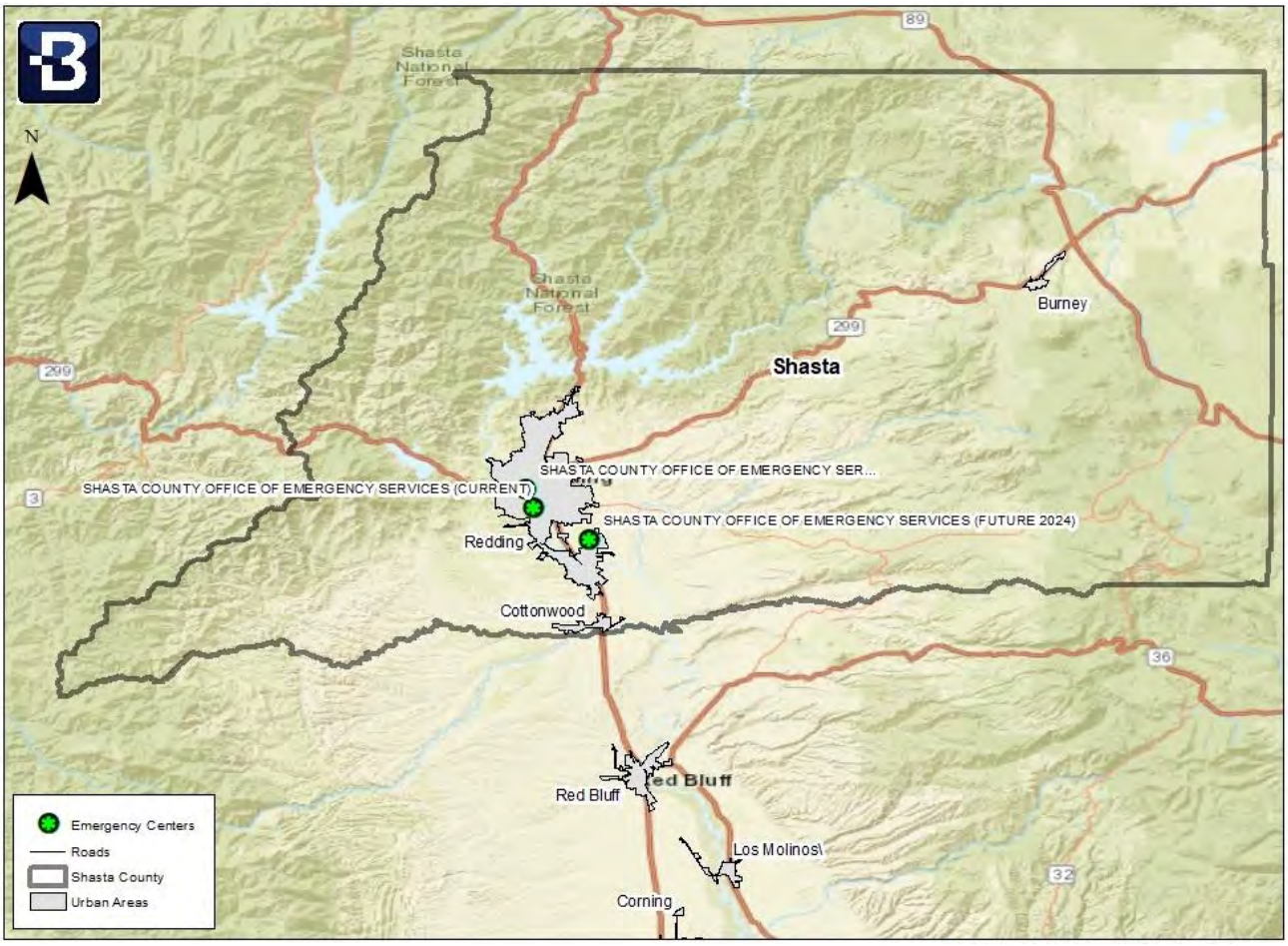
Table 6: Critical Facilities & Infrastructure Summary

Critical Facilities & Infrastructure Summary									
Jurisdiction	Communi-cation Tower	Education	Emergency Operations Center	Fire Station	Hospital	Oilfield	Mine	Police Station	TOTAL
Shasta County	0	120	2	38	7	0	1	9	177
City of Anderson	0	12	0	1	1	0	0	1	15
Igo Ono Community Services District	0	0	0	0	0	0	0	0	0

Data Source: Shasta County OES and the City of Anderson Public Works

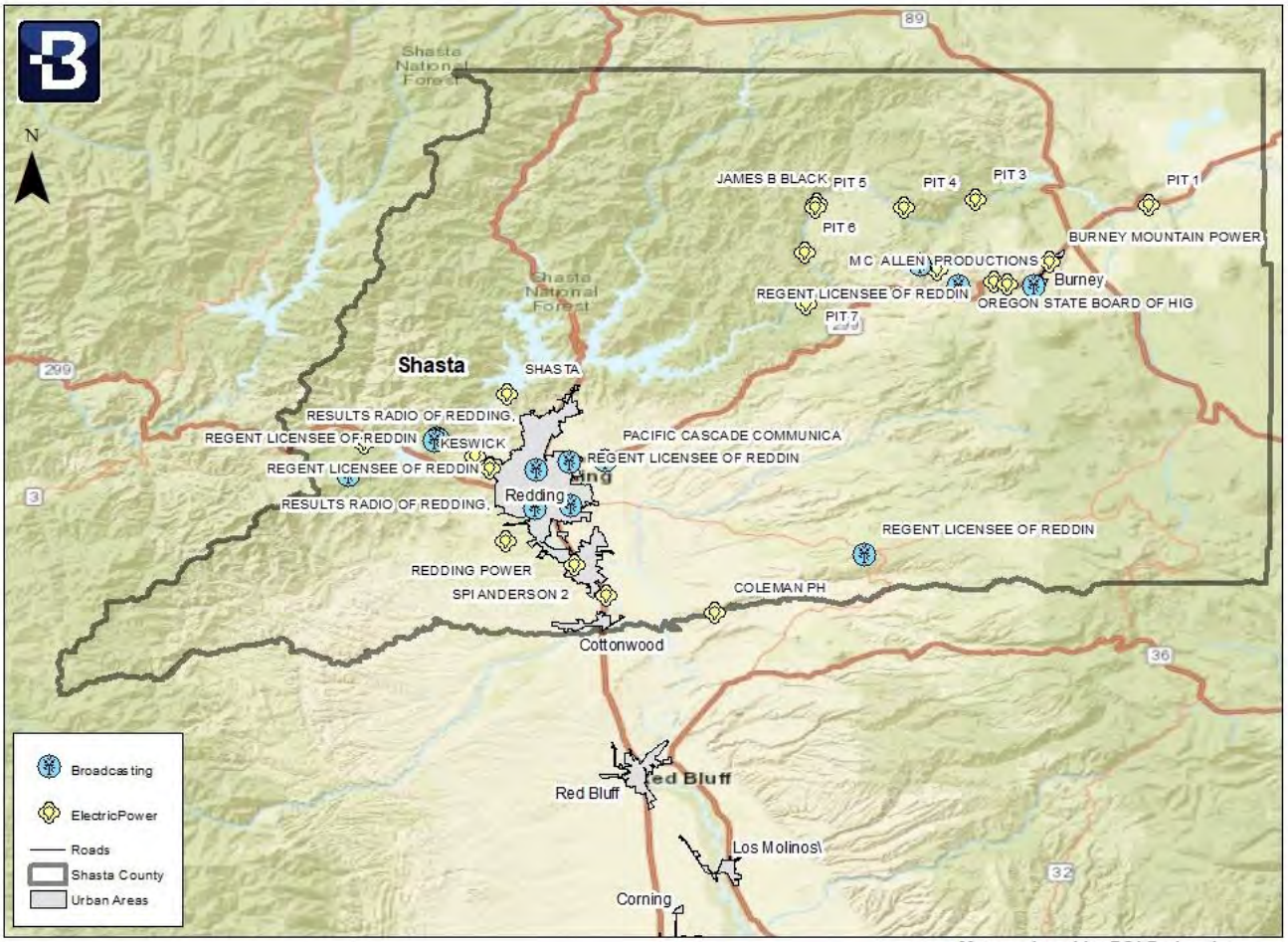
The following maps provide visual representation of critical facilities and infrastructure within the planning area.

Map 13: Emergency Operations Centers, Shasta County



Map Source: BOLDplanning

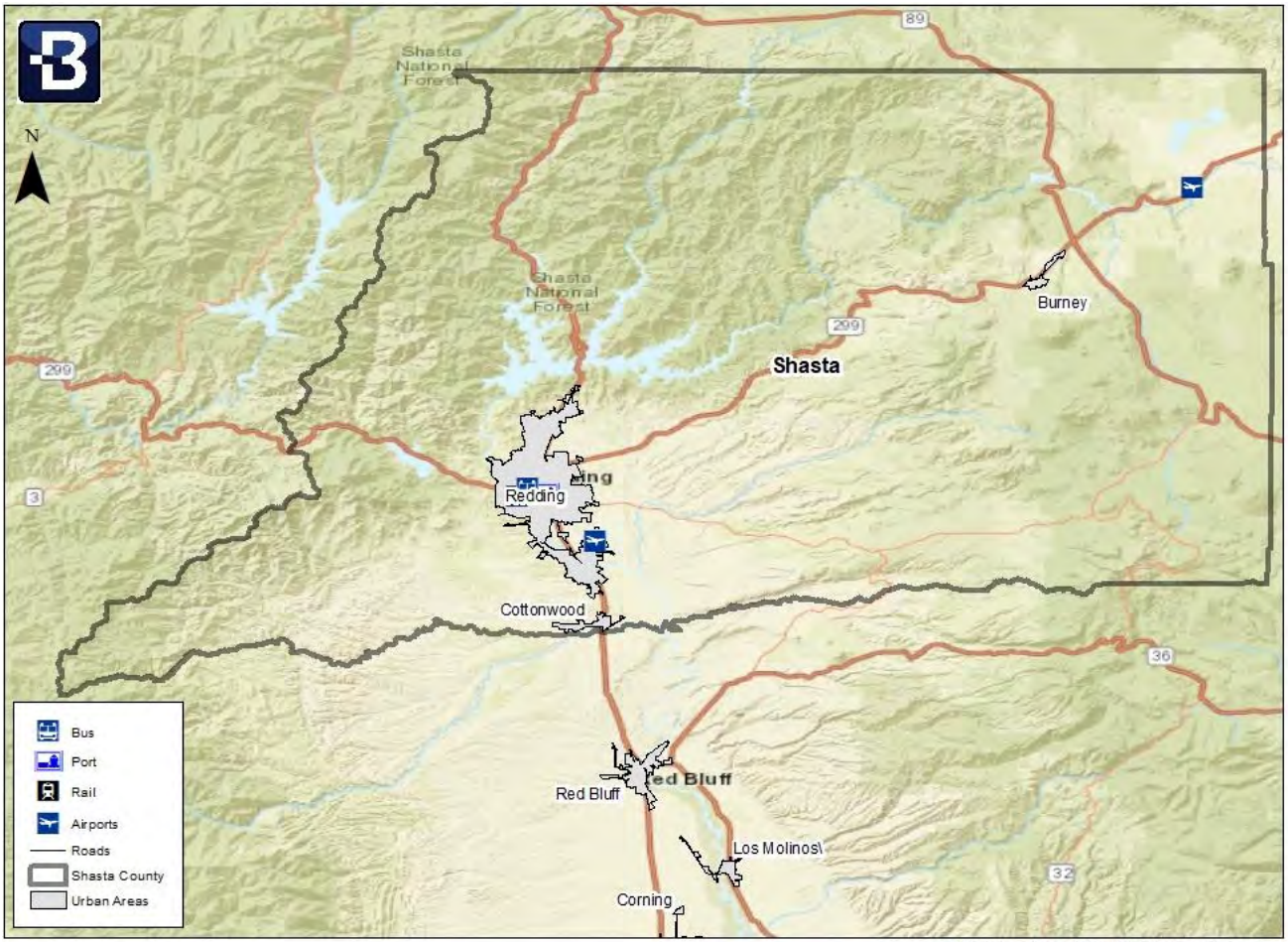
Map 14: Electric Grid, Shasta County



Map Source: BOLDplanning

NOTE: Shasta County has a high number of electric lines and natural gas lines that run through it. All are considered invaluable to the planning area and the entire region as they provide power to homes, business, schools, etc. within Shasta County and neighboring jurisdictions.

Map 15: Transportation Corridors, Shasta County



Map Source: BOLDplanning

Map 16: Critical Facilities, City of Anderson

Map Source: BOLDplanning

Map 17: Critical Facilities, Igo Ono Community Services District

Map Source: BOLDplanning

Section 4: Hazard Risk Assessment

The goal of mitigation is to reduce the future impacts of natural hazards, including property damage, disruption to local and regional economies, and the amount of public and private funds spent to assist recovery. To be done correctly, mitigation decision-making should be based on risk assessment.

A risk assessment consists of three components: hazard profiling, exposure, and a vulnerability assessment. The process entails researching past hazard events, calculating probability of future events, creating asset lists, determining loss estimation, and other actions, as needed.

Planning Process
Local Procedures & Resources
Planning Area
Hazard Risk Assessment
- Identifying Hazards
- Profiling Hazards (including Location & Extent, Previous Occurrences, Vulnerability & Impact, and HAZUS Models)
- Hazard Risk Summary
- Excluded Hazards
- Energy Infrastructure Vulnerability Assessment
- Special Consideration, Climate Change

Mitigation Strategy

A history of declared disasters helps capture an overview of the hazards facing the planning area, i.e., Shasta County, the City of Anderson, and the Igo Ono Community Services District. Since the last HMP update (November 16, 2017), Shasta County has suffered from seven (7) declared disasters. These disaster declarations were due to a flooding, wildfires, severe storms, and winter storms. A list of the declared disasters occurring in Shasta County since 2016 is presented in the table below.

NOTE: Smaller disasters are more frequent and are not reflected in the tables.

Table 7: Disaster Declarations, Shasta County

Disaster Declarations (2016 - 2021), Shasta County		
Designation	Date Declared	Incident Type
78	December 2016	December Winter Storms
103	July 2018	Wildfire
109	January and February 2019	Atmospheric River Storms
115	August and September 2020	Wildfire and Extreme Weather
116	September 2020	Wildfire
122	July and August 2021	Dixie, McFarland & Monument Fires
125	September 2021	Fawn Fire

Data Source: FEMA

4.1 – Identifying Hazards

The first step in developing a hazard assessment is identifying the hazards with reasonable potential to strike the planning area. Such identification allows for appropriate and well-planned action to mitigate the extent and impact of a hazard event. It also helps facilitate emergency response and recovery operations. Not all disaster contingencies can be planned for; however, by using an all-hazards approach to the planning, the mitigation process yields increased preparedness for unforeseen events.

The following table lists the hazards profiled in the 2018 California State Hazard Mitigation Plan (SHMP). Based on the research described above, nine (9) of these hazards pose a risk to at least one of the participating jurisdictions in Shasta County. These are dam failure, drought, earthquake, extreme heat, flood, severe storms, volcano, wildfire, and severe winter weather. Hail, high winds, and lightning are included under the severe storms profile. Heavy snow, ice storm, winter storm and extreme cold are included under the severe winter weather profile.

Details for each hazard and their potential impact on Shasta County are in Section 4.2. The following table compares the identified and profiled hazards as they relate to Shasta County's previous HMP and to the state's plan. Any hazards which affect the State of California or were profiled in the previous plan, but do not affect any of Shasta County's jurisdictions are listed as 'excluded.' An analysis of why a hazard has been excluded can be found in Section 4.5 – Excluded Hazards.

Table 8: State of California Identified Hazards

State of California Identified Hazards		
Hazard	Identification Process	Risk Identified
Avalanche	Local input	Limited risk
Climate Change	Excluded	Moderate risk
Dam Failure	Local input, dam location, and topography	Potential risk of dam failure
Drought	Local input, past hazard events	Recurring droughts
Earthquake	Local input, past hazard events	Moderate risk
Erosion	Excluded	Limited risk
Extreme Heat	Included	Moderate risk
Flood	Local input, past hazard events, FEMA NFHL	Extensive 100- and 500-year flood plains throughout the county
Levee Failure	Excluded	Moderate risk
Landslide	Excluded	Moderate risk
Severe Storms (Hail, Coastal Storm, Windstorm, Ice storm, Winter Storm, and Thunderstorm)	Local input, past hazard events	History of region-wide storm damage
Terrorism	Local input	Limited risk
Tsunami	Excluded	No reasonable or predicted risk
Volcano	Local input	Limited risk
Wildfire	Local input, WUI analysis	Extensive vegetation and historical wildfire activity
Winter Storm	Local input, past hazard events	Moderate risk

Data Source: 2018 California State Hazard Mitigation Plan

Table 9: Prior Hazards, Shasta County

Prior Hazards, Shasta County		
Hazard	Identification Process	Risk Identified
Chemical, Biological, Radiological, and Nuclear (CBRN)	Excluded	Low risk
Dam Failure	History of events, presence of dams	Moderate risk
Earthquake	Several fault zones are present within Shasta County, history of events	Moderate risk
Extreme Weather (including Extreme Heat, Drought, Severe Storms); Severe Storms include Heavy Rain, Hail, Wind; Severe Winter include Extreme Cold, Winter Storm, Ice storm and Heavy Snow)	History of events	Moderate risk
Flood	Areas are located within the 100-year floodplain; history of events	Extensive 100- and 500-year floodplains throughout Shasta County
Hazardous Materials (HazMat)	Excluded	Low risk
Mass Casualty Incident (MCI)	Excluded	Low risk
Pandemic/Epidemic	Excluded	Low risk
Volcano	Local input, past hazard events	Limited risk
Wildfire	Local input, terrain and Mediterranean climate, seasonal wind, past hazard events	High risk

Data Source: Shasta County and City of Anderson Multi-Jurisdictional Hazard Mitigation Plan (November 16, 2017)

4.2 – Profiling Hazards

4.2.1 – Hazard Description

This section contains a description of the hazard that can adversely affect one or more jurisdictions within the planning area.

4.2.2 – Location & Extent

This section contains information about the location, i.e., the geographic area(s) within the planning area, which may be affected by the profiled hazard, along with the extent, i.e., the potential strength and magnitude of the profiled hazard.

4.2.3 – Previous Occurrences

This section contains a history of previous events for the profiled hazard.

Methodology: *Most of the historical data used in the risk assessment originates from the National Oceanic and Atmospheric Administration/National Centers for Environmental Information (NOAA/NCEI). In most instances, the hazard affects a large geographic area, and thus, the hazard data is reported at a county level. This is the best available data for these hazards. The calculations for Previous Occurrences and the Probability of Future Events are based on county-level data as well.*

4.2.3A – Probability of Future Occurrences

This section of the plan describes, in general descriptions, the likelihood, or probability, of the profiled hazard occurring within the planning area.

Illustration 1: Probability Categories for Each Year

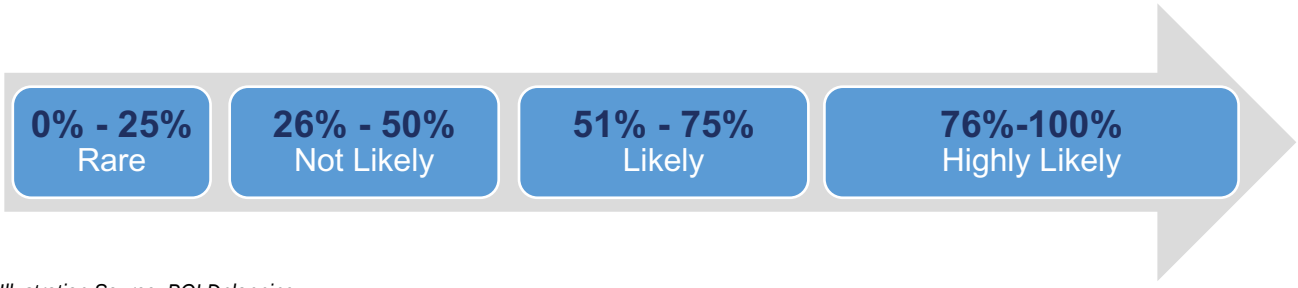


Illustration Source: BOLDplanning

4.2.4 – Vulnerability & Impact

This section describes the potential impacts of the profiled hazard for each participating jurisdiction and provides an overall summary of their vulnerability through damage/loss of structures, systems, populations, and community assets.

4.2.4A – Critical Facilities & Infrastructure

When appropriate, this section details the critical facilities and infrastructure pertinent to the profiled hazard.

4.2.4B – Land Use & Development Trends

This section provides a general description of land use and development trends within the planning area as it relates to the profiled hazard.

4.2.4C – Unique or Varied Risk

Each jurisdiction's risk, where it varies from the risks facing the entire planning area, is discussed in this section of the plan.

4.2.4D – Repetitive Loss Properties

If applicable to the profiled hazard, a description of the location types, along with estimates for the number of Repetitive Loss (RL) properties, will be provided in this section.

4.2.5 – HAZUS Models

When applicable, this section provides the results of various HAZUS simulation models.

Photo Source: Wikipedia

4.2(DF) – Dam Failure

4.2.1 – Hazard Description

A dam is a barrier across flowing water that obstructs, directs, or slows down the flow, often creating a reservoir, lake, or impoundment. Most dams have a section called a spillway or weir, over or through, which water flows, either intermittently or continuously. Dams commonly come in two types, embankment (the most common) and concrete (gravity, buttress, and arch), as well as sizes. They also serve several purposes and provide essential benefits, including drinking water, irrigation, hydropower, flood control, and recreation.

Large or small, dams have a powerful presence that is frequently overlooked until a failure occurs. Dams fail in two ways: 1) a controlled spillway release done to prevent full failure, or 2) the partial or complete collapse of the dam itself. In each instance, an overwhelming amount of water, and potentially debris, is released. Dam failures are rare, but when they do occur, they can cause loss of life and immense damage to property, critical infrastructure, and the environment.

Common reasons for dam failure include but are not limited to:

- Sub-standard construction materials/techniques
- Spillway design error
- Geological instability caused by changes to water levels during filling or poor surveying
- Sliding of a mountain into the reservoir
- Poor maintenance, especially of outlet pipes
- Human, computer, or design error
- Internal erosion, especially in earthen dams
- Earthquakes

There are three classifications of dam failure: 1) hydraulic, 2) seepage, and 3) structural. Following is an explanation of each these failure classifications:

1. **Hydraulic:** This failure is a result of an uncontrolled flow of water over and around the dam structure as well as the erosive action on the dam and its foundation. The uncontrolled flow causing the failure is often classified as wave action, toe erosion, or gullying. Earthen dams are particularly

susceptible to hydraulic failure because earthen materials erode more quickly than other materials, such as concrete and steel. This type of failure constitutes approximately 40% of all dam failures.

2. **Seepage:** Seepage is the velocity of an amount of water controlled to prevent failure. This occurs when the seepage occurs through the structure to its foundation, where it begins to erode within. This type of failure accounts for approximately 4% of all dam failures.

3. **Structural:** A failure that involves the rupture of the dam or the foundation by water movement, earthquake, or sabotage. When weak materials construct dams (large, earthen dams) are the primary cause of this failure. Structural failure occurs with approximately 30% of dam failures.

Today, there are over 92,000 dams nationwide with an average age of 61 years. A high number of these dams have received less than favorable Dam Safety Action Classification (DSAC) ratings from the U.S. Army Corps of Engineers (USACE). In fact, 75% of all U.S. dams are now classified as having high-hazard potential (HHP), meaning that their failure could result in loss of life.

4.2.2 – Location & Extent

Shasta Dam, on the Sacramento River north of Redding, is the second largest dam in mass in the U.S. (behind Grand Coulee Dam on the Columbia River in Washington State). The dam is 602 ft. high, with a crest length of 3,460 ft. It is 883 ft. thick at the bottom and 30 ft. thick at the top. Shasta Dam is a curved concrete gravity-type dam with 6.5 million cubic yards of concrete weighing 15 million tons.

Among the dam's many purposes, it controls floodwaters and stores winter runoff for irrigation in the Sacramento and San Joaquin Valleys; maintains navigable flows; and provides flows for the conservation fisheries in the Sacramento River and its downstream tributaries. It also provides water for municipal and water district use; protects the Sacramento-San Joaquin Delta from saltwater intrusion; and generates hydroelectric power.

Shasta Lake, behind Shasta Dam, provides boating and recreation opportunities that bring millions of dollars to the Redding area annually.

Construction of Shasta dam started in 1938 and was completed in 1945. The spillway is 487 ft. long— the largest man-made waterfall in the world. The spillway is 375 ft. wide with three drum-gates, each 110 ft. wide and 28 ft. tall, and weighing 500 tons each. There are 18 outlets on the face of the dam, each 8.5 ft. in diameter with a maximum overall capacity of 186,000 cubic ft. per second. Prior to the construction of Shasta Dam, floods frequently ravaged the Sacramento Valley, including the State Capital. It is estimated that Shasta Dam has prevented over five billion dollars in flood damages. The U.S. Bureau of Reclamation (USBR) uses flood control procedures and regulations prescribed by the Corps of Engineers for operations per agreements between the two entities. The city of Redding is the first incorporated city downstream of Shasta Dam through which the Sacramento River flows. As such, it would be affected by a dam overflow or failure. Although these are two different types of events, the results are the same – uncontrolled releases from Shasta Dam.

A dam overflow is more likely to occur than a dam failure. However, it is unlikely that a true overtopping of the dam would take place. The design of the structure includes three spillway gates to minimize the possibility of a true overtopping of the dam. During an intense and prolonged storm period that might bring water levels near the top of the dam, these spillway gates would be lowered allowing water to be discharged down the spillway. Controlling, or funneling, the discharge down the spillway directly prevents structural erosion along the base and sides of the dam, protects the turbine power generation plant at the base of the dam, and allows a controlled release.

A dam failure is highly unlikely. A dam failure would be characterized by a structural breach of the dam. Flooding and overtopping, earthquakes, release blockages, landslides, lack of maintenance, improper

operation, poor construction, vandalism, or terrorism are typical causes of dam failure. California has had approximately 45 failures of non-federal dams. These failures occurred for a variety of reasons, the most common being overtopping of earthen dams. Other reasons include specific shortcomings in the dams themselves or inadequate assessment of the surrounding geomorphologic characteristics. Of the concrete dams that failed, all were of the thin-arch design. Shasta Dam is a federally controlled and inspected dam and is considered a thick-arch design. Seismic activity is monitored and tunnels throughout the dam allow inspectors to monitor for cracks and seepage. The dam is built on bedrock and is geomorphologically sound.

Uncontrolled releases from the dam, although very unlikely, would devastate the entire northern Central Valley. The Sacramento River and its tributaries would overtop banks and levees. Massive flooding in the lowlands along the river would occur and I-5, the main west coast transportation artery, would be affected by closure and other structural damage. Other effects of large-scale flooding downstream include, but are not limited to loss of life; limited potable water supplies; the potential for the spread of disease from the release of untreated sewage; structural damage to buildings; probably loss of electricity and landline communications; crop damage and loss agricultural lands; loss of livestock; hampered emergency response efforts caused by flooded transportation corridors; and the inevitable clean-up of silt, mud flows, erosion, and debris.

In the event of a dam failure, large-scale flooding could occur repeatedly until the replacement of the dam is complete. As stated before, prior to the completion of Shasta Dam, devastating floods were a regular occurrence in the Sacramento River Valley. The cities of Redding, Shasta, Anderson and Igo-Ono CSD are in the inundation zone for Shasta Dam and would face severe flooding.

Shasta Dam has never overflowed in its 60-year history. In 1977 and again in 1998, prolonged warm spring rainfalls in the watershed above Shasta Dam raised the lake levels as much as 10 feet per day for more than a week. This early snowmelt was followed by intense storms over several days that dropped record precipitation bringing lake levels to within 10 feet of the top. In 1998, the flows were increased to 80,000 cubic feet per second, or cfs, out of the dam, but inflow to the lake was steady at more than 225,000 cfs. The storms subsided as the lake neared four feet from the top and the USBR assured everyone that the dam was never in danger of overtopping. The next day officials at the dam announced that for only the second time in the dams' history, the massive drum gates would all be lowered, and water would come over the entire spillway to draw the lake back down to comfortable levels. The spillway gates remained open for several days, releasing 78,000 cfs.

The Misselbeck Dam is owned by the Igo Ono Community Services District. It is located on the south end of Rainbow Lake, 9250 Rainbow Lake Rd. Ono, California. The dam is located five (5) miles northwest of the town of Ono.

Misselbeck Dam is a hydraulic-fill dam, constructed in 1920 from a mixture of decomposed granite, sandy clay, and silt that was sluiced into place. Gunite covers the upstream face of the dam. The dam crest has a minimum elevation of 2,026.6 feet. The auxiliary dam has a crest elevation of 2027.1 feet and the spillway has a crest elevation of 2,013.4 feet. The main dam's upstream toe is 100 feet below the dam crest elevation while the downstream toe is 110 feet below the dam crest elevation. The dam is 470 feet in length. The total designed freeboard of the dam is 14 feet, and the operating freeboard is 50 feet.

The spillway was cut from the original ground surface, which was composed of diorite, by sluicing away decomposed materials. It has one uncontrolled spillway with a maximum capacity of 13,000 cfs when the water surface elevation reaches the dam crest. The spillway is 100 feet wide at the crest, then decreases in width asymmetrically approaching the chute. Concrete blocks near the crest of the spillway prevent the flow from being deflected towards the left wall of the chute during low flows but are ineffective at moderate to high flows. At the downstream end of the chute, flow discharges into a plunge pool. The spillway vertical sidewalls have been overtopped in the past during high flows due to improper hydraulic design. The

spillway is in poor condition, badly spalled and undercut with exposed rebar. Erosion of the diorite under the spillway has occurred. Per the Division of Safety Dams (DSOD), there are no critical appurtenant structures connected to the dam.

The DSOD has determined the dam is not capable of withstanding the maximum creditable earthquake, estimated to be 9.0 on the Richter Scale. DSOD computer modeling indicates an earthquake of this magnitude will liquefy the dam, allowing the lake to overtop the dam. For this reason, DSOD has restricted the lake level to a maximum 1976.6 feet. The Misselbeck Dam outlet works consist of one outlet tower on the upstream side of the dam that serves as the inlet to the outlet works. The height of the outlet tower is 23 feet, and it is connected to a horizontal tunnel, 550 feet in length that carries the outlet water to the downstream toe of the dam. Two 30-inch pipes with manually operated gate valves control the flow through the outlet works tunnel. The maximum capacity of the outlet works is 260 cfs. The lake capacity has been impacted by heavy sedimentation, which is estimated to be approaching an elevation of 1966 feet and is currently 10 feet above the top of the outlet works inlet tower. The primary cause of the sedimentation is wildfire and logging activities in the watershed above the lake. The recent Carr Fire has caused historic sediment and debris flows into the reservoir, depositing a large amount at the head of the reservoir which is visible above the high-water level. It is currently not known how far the sediment and debris extends into the lake under the water surface. The Igo Ono Community Services District is actively seeking funding assistance to dredge the outlet works to restore function and lower the lake level to the restricted level. After this occurs, the district will be able to determine the extent of the Carr Fire debris flow impact to the storage capacity of the reservoir. Currently, and until the outlet works is dredged and functioning, all the water entering the lake is flowing over the spillway. DSOD has ordered the spillway not to be used because of its deteriorated condition and hydraulic design.

The capacity of the channel at the site of the structures located closest to the dam site, Sunny Hill Rd., is 1,500 cfs. These structures would be the first to be impacted by high flows or a dam breach. The only downstream jurisdictions affected by a Misselbeck Dam incident are the unincorporated lands of Shasta County and Tehama County. No cities, towns or other incorporated areas lie within the impact boundary of the Misselbeck inundation map. No public safety, medical facilities or schools are inside the inundation boundary. The main stem of Cottonwood Creek lies on the County line separating Shasta and Tehama Counties. The town of Cottonwood lies on the County line beyond the downstream extent of the dam breach inundation boundary which occurs downstream of the confluence of the South Fork of Cottonwood Creek and the main stem of Cottonwood Creek.

Below this confluence, the maximum discharge due to the dam breach is approximately 7,000 cfs, which is smaller than the two-year peak flood at this location of 30,200 cfs. The town of Cottonwood is the community that is closest to the inundation boundary. The Shasta and Tehama County Sheriff's Offices provide public safety services to Cottonwood. There is a volunteer fire station located in Cottonwood, but primary fire protection services are provided by CAL FIRE. If a dam incident occurs, the Shasta and Tehama County Sherriff's Offices will be the primary points of contact. The two sheriff's offices have mutual aid agreements between themselves and all other public safety agencies in the area.

There are no other dams located upstream or downstream of Misselbeck Dam. There are no cities, towns or communities located within the Misselbeck dam breach flood inundation. The dam breach flood inundation boundary lies entirely within the unincorporated areas of Shasta and Tehama Counties, and as such, are the only impacted jurisdictions.

In the event of a dam breach flood, depths in the reach of the North Fork of Cottonwood Creek closest to Misselbeck Dam would exceed 50 feet. Several structures adjacent to the North Fork of Cottonwood Creek on Sunny Hill Road near Ono, California would be inundated to depths greater than 20 feet less than 15 minutes after a dam breach. Farther downstream, the dam breach flow would inundate several structures on Lower Gas Point Road near its intersection with Thomas Road near Igo. Inundation depths up to 10 feet would occur at these structures between one to two hours after the dam breach. The dam breach flow

would also overtop or come close to overtopping multiple bridges crossing the North Fork of Cottonwood Creek: the bridges for Platina Road, Lower Gas Point Road, and Foster Road. A few structures near the main stem of Cottonwood Creek, including a structure on Ponder Way and a structure on an unpaved road off Denise Way, both near Cottonwood, California, would be inundated to depths less than five feet. The downstream extent of the dam breach inundation boundary occurs downstream of the confluence of the South Fork of Cottonwood Creek and Cottonwood Creek. Below this confluence, the maximum discharge due to the dam breach is approximately 7,000 cfs, which is smaller than the two-year peak flood at this location of 30,200 cfs (USGS, 2012). It is possible a dam breach failure could release up to 1,200,000 cubic yards of sediment and debris into the watershed below Misselbeck dam. This sediment would migrate to the Sacramento River, having a negative impact on endangered fisheries.

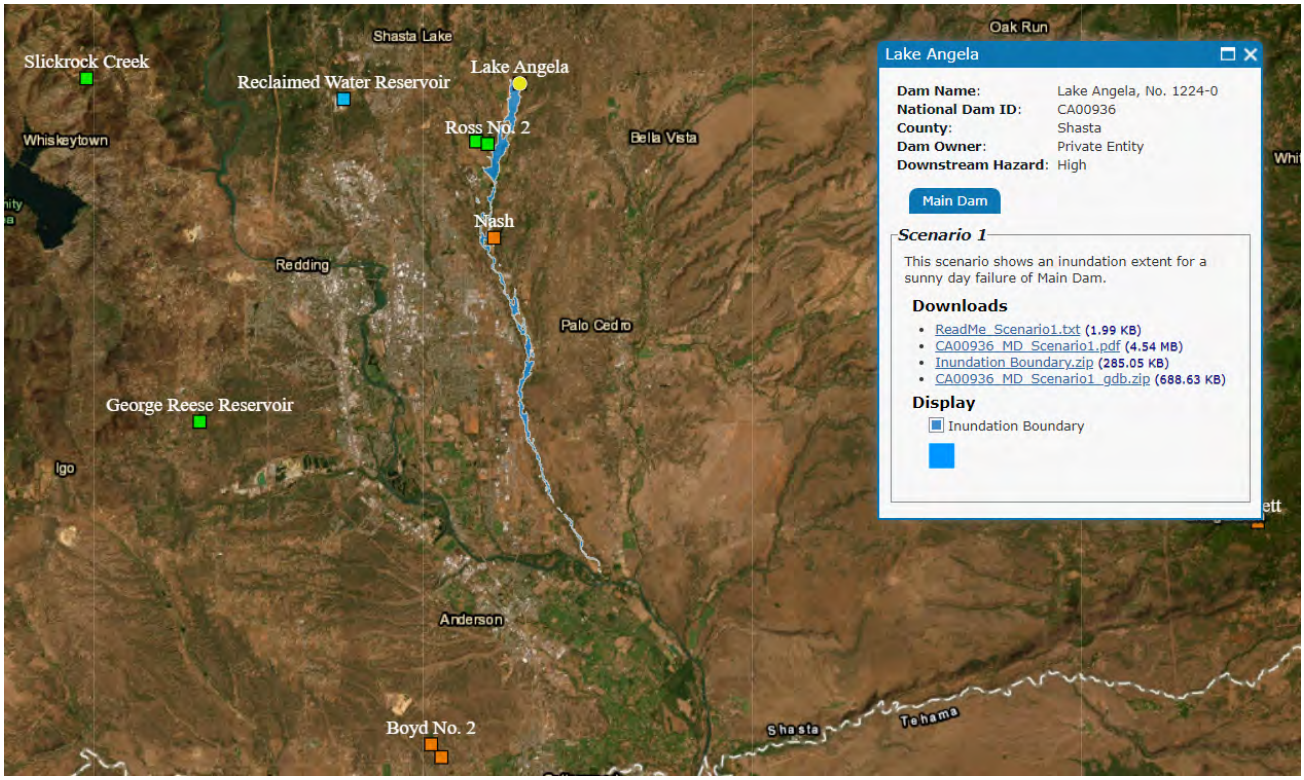
The Boyd 1 dam failing will cause a flooding south of the dam and place several residential structures at risk. USACE does not have an inundation study; however, limited inundation modeling exists from California studies. A complete failure would send water south of the dam with a velocity of 8 cps and a depth of 5 feet. Residential structures at risk will have a 25-minute warning to evacuate. After 30 minutes water from the dam failure will reach the Anderson-Cottonwood canal and continue to travel south. Once flood water reaches the Cottonwood Creek it will have a depth of 5 feet and a velocity of 3.7 feet.

The Boyd 2 dam failing will cause a sequential failure of the Boyd 1 dam. USACE does not have an inundation study; however, limited inundation modeling exists from California studies. A complete failure would send water south of the dam with a velocity of 11.2 cps and a depth of 6 feet. Few structures are at risk of flooding and the water would continue to head south to the Cottonwood River. Residential structures at risk will have a 25-minute warning to evacuate. After 30 minutes water from the dam failure will reach the Anderson-Cottonwood canal and continue to travel south. This water would eventually reach Cottonwood creek with a depth of 11 feet and a velocity of 6 cps.

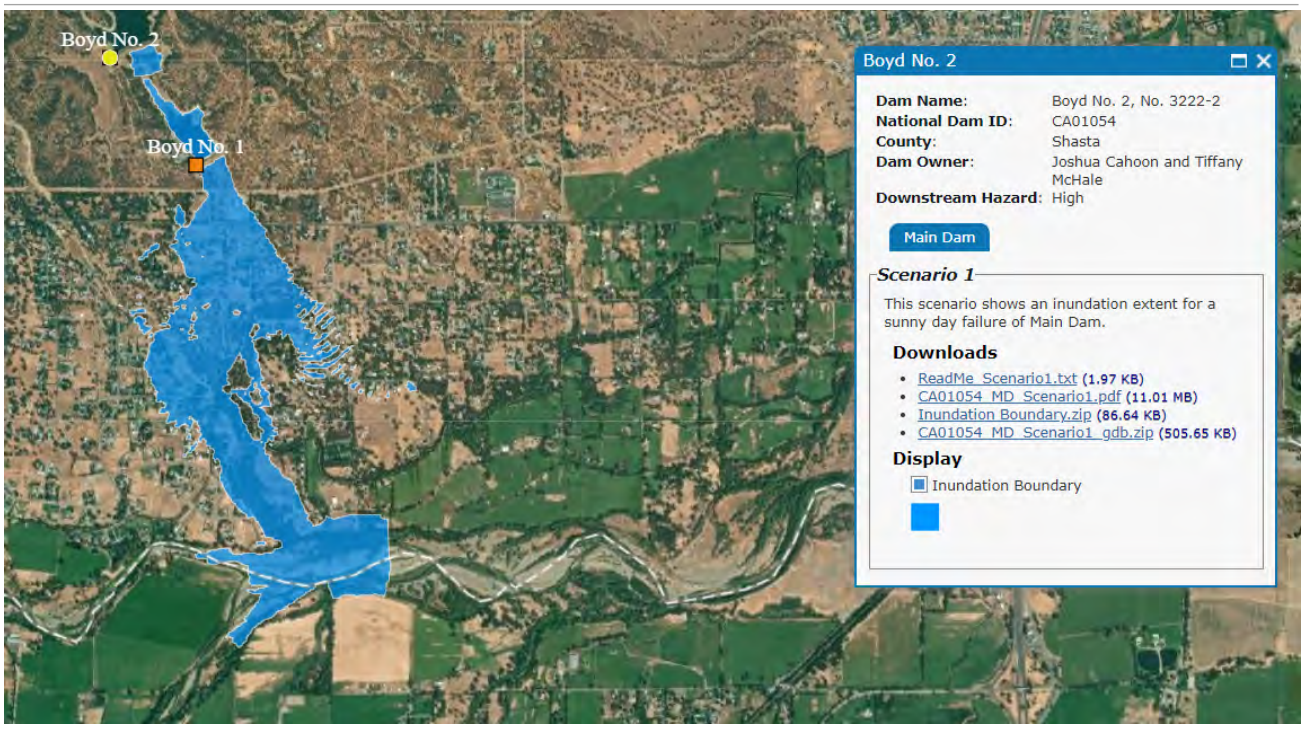
The last high-risk dam is the Nash Dam. Complete dam failure would not threaten residential structures according to inundation studies done by the state of California. No inundation studies were done by the USACE. Initial floodwaters would have a depth of 12 feet and spread to a maximum width of 560 feet. The water will go down the Stillwater and Salmon creeks. A trailer park is near Stillwater Creek but current mapping does not place it at risk.

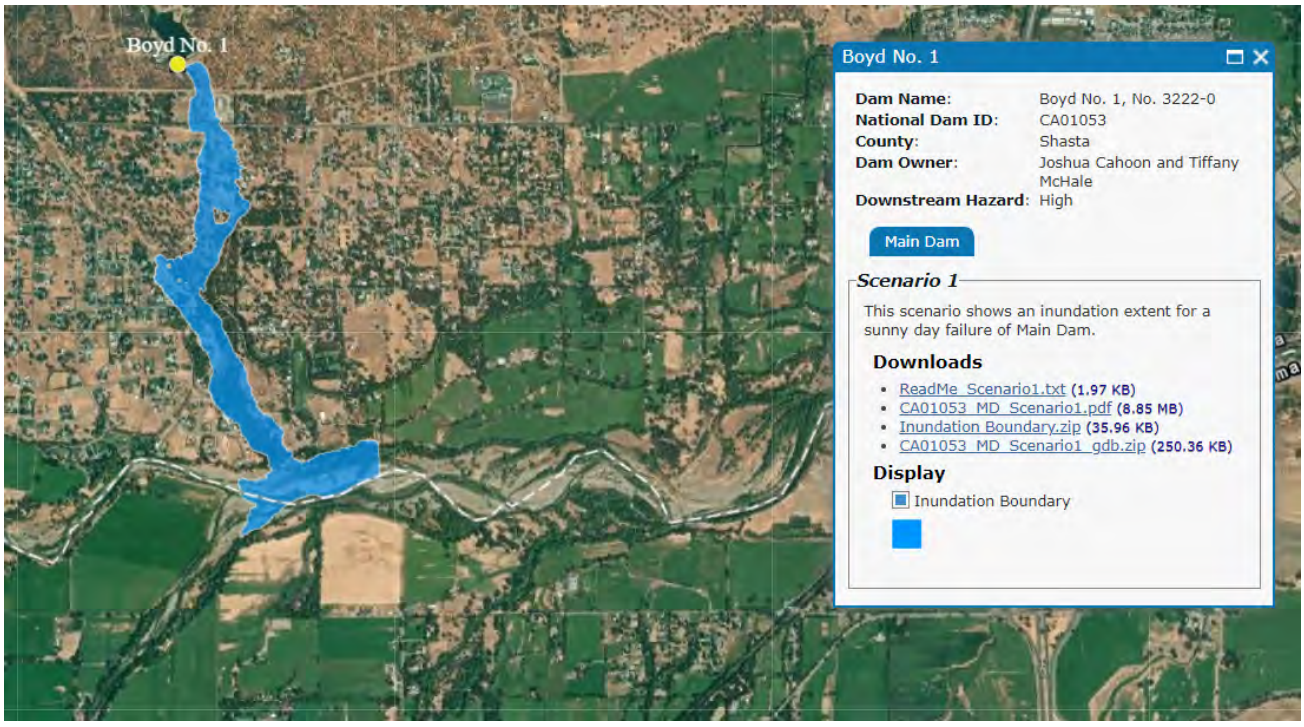
Shasta County Dam Inundation Maps

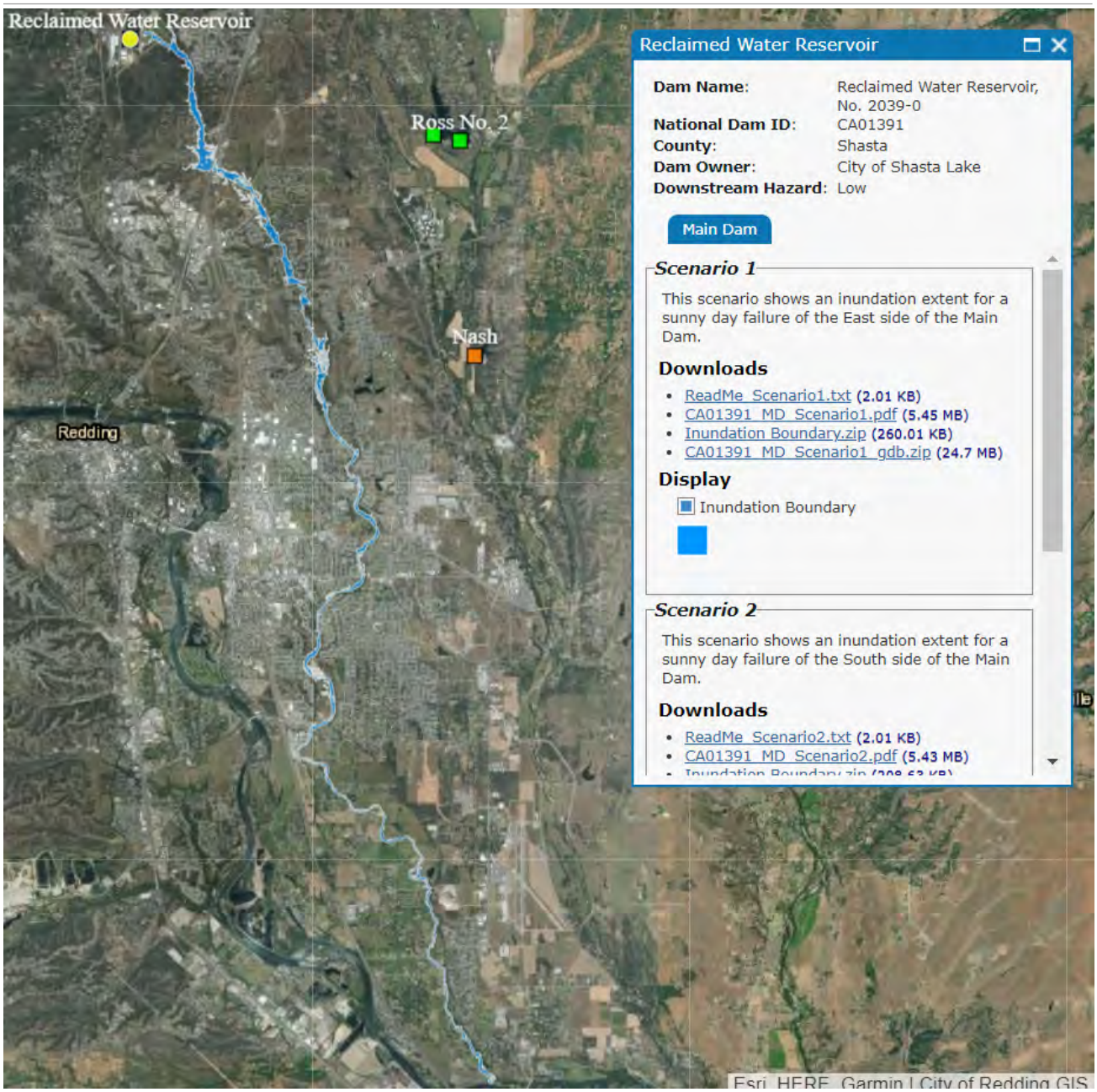
- Blue dots are damns with minimal risk.
- Green dots are damns with significant risk.
- Orange dots are damns with high risk.
- Red dots are damns with extremely high risk.


Shasta Lake
Slickrock Creek
Reclaimed Water Reservoir
Lake Angela
Ross No. 2
Whiskeytown
Bella Vista
Nash
Redding
Palo Cedro
George Reese Reservoir
Igo
Anderson
Boyd No. 2
Shasta
Tehama
Oak Run
Lake Angela
Dam Name: Lake Angela, No. 1224-0
National Dam ID: CA00936
County: Shasta
Dam Owner: Private Entity
Downstream Hazard: High
Main Dam
Scenario 1
This scenario shows an inundation extent for a sunny day failure of Main Dam.
Downloads
ReadMe_Scenario1.txt (1.99 KB)
CA00936_MD_Scenario1.pdf (4.54 MB)
Inundation Boundary.zip (285.05 KB)
CA00936_MD_Scenario1_gdb.zip (688.63 KB)
Display
Inundation Boundary


George Reese Reservoir
Misselbeck
Igo
Anderson
Boyd No. 2
Shasta
Tehama
Cottonwood
Misselbeck
Dam Name: Misselbeck, No. 2220-2
National Dam ID: CA01027
County: Shasta
Dam Owner: Igo-Ono Community Services District
Downstream Hazard: High
Main Dam
Scenario 1
This scenario shows an inundation extent for a sunny day failure of Main Dam.
Downloads
ReadMe_Scenario1.txt (1.97 KB)
CA01027_MD_Scenario1.pdf (6.56 MB)
Inundation Boundary.zip (133.78 KB)
CA01027_MD_Scenario1_gdb.zip (5.16 MB)
Display
Inundation Boundary


Boyd No. 2
Boyd No. 1
Boyd No. 2
Dam Name: Boyd No. 2, No. 3222-2
National Dam ID: CA01054
County: Shasta
Dam Owner: Joshua Cahoon and Tiffany McHale
Downstream Hazard: High
Main Dam
Scenario 1
This scenario shows an inundation extent for a sunny day failure of Main Dam.
Downloads
ReadMe_Scenario1.txt (1.97 KB)
CA01054_MD_Scenario1.pdf (11.01 MB)
Inundation Boundary.zip (86.64 KB)
CA01054_MD_Scenario1_gdb.zip (505.65 KB)
Display
Inundation Boundary


Boyd No. 1
Boyd No. 1
Dam Name: Boyd No. 1, No. 3222-0
National Dam ID: CA01053
County: Shasta
Dam Owner: Joshua Cahoon and Tiffany McHale
Downstream Hazard: High
Main Dam
Scenario 1
This scenario shows an inundation extent for a sunny day failure of Main Dam.
Downloads
ReadMe_Scenario1.txt (1.97 KB)
CA01053_MD_Scenario1.pdf (8.85 MB)
Inundation Boundary.zip (35.96 KB)
CA01053_MD_Scenario1_gdb.zip (250.36 KB)
Display
Inundation Boundary



4.2.3 – Previous Occurrences

As previously stated, there are more than 92,000 dams in the United States (USACE, National Inventory of Dams). Approximately 75% of these pose a 'high' or 'significant' hazard to life and property if failure occurs.

On June 3, 2019, very high inflows into the lake caused Carr Fire debris to plug the outlet works. The lake filled and water began to flow in the spillway. A dive team inspected the outlet works inlet tower and determined it was covered by 10 feet of sediment and wood debris. A comprehensive search for funding assistance to dredge the outlet works and restore functionality was not successful. On Feb. 1, 2020, the sediment and debris began to flush through the outlet works and exit into the plunge pool. The sediment and debris are still 10 feet above the top of the inlet tower; however, a cone has formed immediately above the tower allowing partial flows which is enough to keep the reservoir below the spillway elevation at this time. The flow capacity of the outlet works is uncertain at this time.

4.2.3A – Probability of Future Occurrences

There can be advanced warning to no warning at all for a dam failure event. At present, there is no history of a dam failure of any size in Shasta County or its participating jurisdictions. In lieu of any historical events, the next best prediction tool would be based on the structural state of the dam. However, maintenance and structural information on the USACE's dams in Shasta County and its participating jurisdictions is confidential information and not for public use.

Although it is highly unlikely, the most probable scenario would be a dam overflow, not a dam failure. In the event that prolonged periods of high-intensity rain (typical in mid to late spring) in the watersheds above Shasta Dam, the inflows to the lake could exceed 225,000 cfs for extended periods of time. If the lake levels were near capacity and discharges from the dam at 80,000 cfs were unable to draw the lake down enough to prevent an overtopping, the USBR would likely be forced to open the spillway gates and allow higher flows. There is no precedence for this, but it is likely that the bureau would give 12 or more hours' notice of the impending rise in river flows. The City of Redding has run an Emergency Operations Center (EOC) drill simulating an uncontrolled release at 100,000 cfs with 12 hours' notice for evacuation of people and livestock from the inundation area. The affected area covers 3,000 acres and would displace some 1,987 people. Damages estimates are $131.2 million.

Record rainfall events drew lake levels near the top twice in the last two decades, but both events were sidestepped using modern weather forecasting and safe release levels from the dam. Following the terrorist events of 9/11, Shasta Dam was closed to traffic across the dam for security reasons, thus minimizing a terrorist threat. The dam has since reopened to through traffic by permit but maintains a policy of no parking or stopping on the dam.

NOTE: The structural states of dams are confidential information held by the USACE. This deficiency is addressed in this plan's mitigation strategy located in Section 5.

Given the absence of any historical precedence of dam failure in Shasta County and its participating jurisdictions, information on the dams being poorly maintained, or having reoccurring structural flaws, the probability of experiencing a dam failure event is categorized as **'rare.'** The Shasta Dam and Misselbeck dams are rated as a high under the Dam Breach Web Inundation Publisher.

4.2.4 – Vulnerability & Impact

Without an official USACE dam failure inundation study, it is nearly impossible to measure the potential impacts of arrival time, inundation, elevation, and peak elevation of a dam failure. Based on the best available data, one can identify large areas of potential risk and potential impacts. This deficiency is addressed in this plan's mitigation strategy located in Section 5.

Given the deficiency, Shasta County's OES has reported that the likely impact of Shasta Dam's failing would result in a fast moving, large volume of water running through the southernmost portion of the planning area. Failure of Shasta Dam would result in the inundation of most of Redding within less than an hour of failure. Within two hours, all of Anderson and much of the Sacramento River Valley downstream of Redding would be inundated.

Vulnerability of Facilities

Facilities within a dam failure inundation area are at extreme risk. The water level of a dam failure can range from inches, causing damage like small floods, to completely engulfing a structure in water. Additionally, the speed of the flow can cause variations in the impact. A slow flow will cause damage similar to a riverine flood, however, a fast-moving, high-level flow has the potential to completely destroy a structure.

Vulnerability of Population

Populations within a dam failure inundation area are at extreme risk. Depending on the speed of the water's arrival, a community's population may not have time to evacuate. Additionally, evacuation routes can be blocked by the dam waters. If flood waters arrive quickly, many people can unfortunately die. Depending on the elevation of the water, a community's population may not have any available shelter to avoid the waters.

Vulnerability of Systems

Community systems with a dam failure inundation area are at extreme risk. Depending on the water level and arrival speed, a community's entire energy infrastructure, transportation network, and economic system(s) could be completely destroyed.

4.2.4A – Critical Facilities & Infrastructure

A dam failure has the potential to impact critical facilities and infrastructure within the planning area, particularly those closest to the structure. A complete list of critical facilities and infrastructure can be found in Appendix D.

4.2.4B - Land Use & Development Trends

Shasta County and its participating jurisdictions' predominant growth area is residential housing, as detailed in Section 3.2 – Land Use & Development Trends.

Increased development near dams increases a community's risk. For a jurisdiction to engage in development, free of dam failure risk, the USACE would need to map each dam's inundation zones. If a jurisdiction has mapped these zones, it could steer development into safer areas.

Any buildings or infrastructure built in the future will have the same risk as other buildings or infrastructure built within or outside of unknown inundation area.

4.2.4C – Unique or Varied Risk

The type of dam breach impacts the severity of flooding to the region. Overflows can inundate parts of Shasta County; however, a catastrophic breach can cause the entire dam to collapse, resulting in dire consequences throughout the entire planning area. Different scenarios are planned for in Emergency Action Plans, or EAPs, for key dams in Shasta County.

4.2.4D – Repetitive Loss Properties

Not applicable to the hazard.

4.2.5 – HAZUS Models

Not applicable to the hazard.

Photo Source: iStock by Getty Images

4.2(D) – Drought

4.2.1 – Hazard Description

Drought is defined as an abnormally dry period lasting months or years when an area has a deficiency of water and precipitation in its surface and or underground water supply. It is, however, a normal, seasonal, and recurrent feature of climate that occurs in virtually all climate zones—typically in late spring through early fall. The hydrological imbalance can be grouped into the following non-exclusive categories:

Agricultural: When the amount of moisture in the soil no longer meets the needs of previously grown crops,

Hydrological: When surface and subsurface water levels are significantly below their normal levels,

Meteorological: When there is a significant departure from the normal levels of precipitation, and

Socio-Economic: When the water deficiency begins to significantly affect the population.

When little or no rainfall, soil can dry out and plants can die. If unusually dry weather persists and water supply problems develop, the period is defined as a drought. Human activity such as over-farming, excessive irrigation, deforestation, and poor erosion controls can exacerbate the effects of drought. It can take weeks or months before the effects of below average precipitation on bodies of water are observed. Depending upon the region, droughts can happen more quickly, be noticed sooner, or have their effects naturally mitigated. The more humid and wet an area is, the faster the effects will be realized. A naturally dry region, which typically relies more on subsurface water will take more time to actualize its effects.

Droughts are regularly monitored by multiple federal agencies using several different indices. Among them are the U.S. Drought Monitor, the Standardized Precipitation Index (SPI), and the Palmer Drought Severity Index (PDSI). Drought monitoring focuses on both precipitation and temperature. When precipitation is less than normal, and natural water supplies begin to decrease, a drought is occurring.

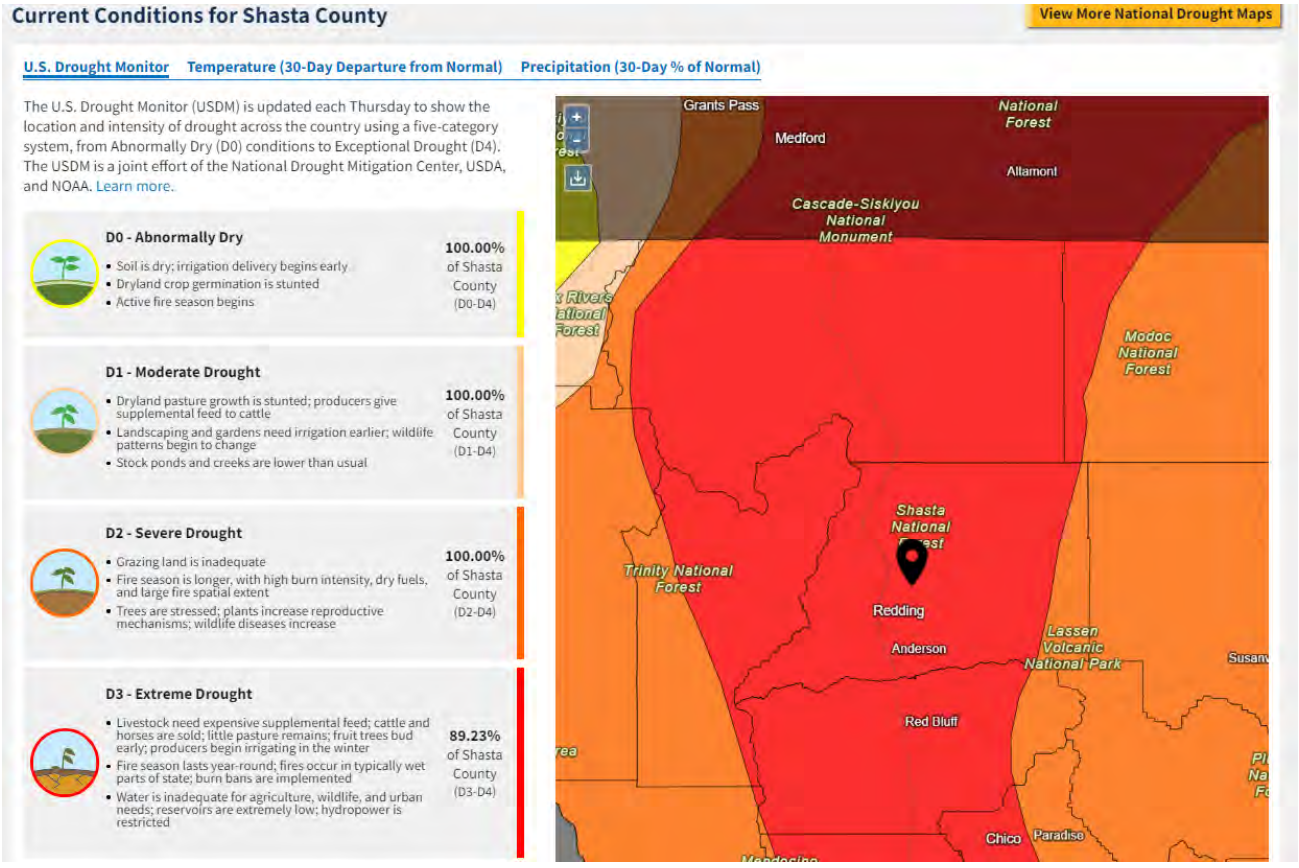
Periods of drought can have significant environmental, agricultural, health, economic, and social consequences. The effects vary depending upon vulnerability and regional characteristics. Droughts can also reduce water quality through a decreased ability for natural rivers and streams to dilute pollutants and decrease contamination. The most common effects are diminished crop yield, increased erosion, dust storms, ecosystem damage, reduced electricity production due to reduced flow through hydroelectric dams, shortage of water for industrial production, and increased risk of wildland fires.

4.2.2 – Location & Extent

Shasta County and the participating jurisdictions of the City of Anderson and the Igo Ono Community Services District are comprised largely of forests and hills; however, there are significant pockets of development in urban areas necessitating increased water usage. Farms exist in throughout the planning area and require additional water as well. Both areas are vulnerable to prolonged or severe drought.

Following is a snapshot of the drought conditions for Shasta County as of June 22, 2022, per the U.S. Drought Monitor.

Image 3: U.S. Drought Monitor, Shasta County (June 22, 2022)



When a drought begins, and ends is difficult to determine. Rainfall data alone will not tell if an area is in a drought, how severe the drought may be, or how long the area has been in drought. However, one can identify various indicators of drought, such as rainfall, snowpack, stream flow, and more, and track these

indicators to monitor drought. Researchers, as previously mentioned, have developed several tools to help define the onset, severity, and end of droughts.

Drought indices take thousands of bits of data on rainfall, snowpack, stream flow, etc., analyze the data over various time frames, and turn the data into a comprehensible 'big picture.' A drought index value is typically a single number, which is interpreted on a scale of abnormally wet, average, and abnormally dry. There are three primary drought indices that are all used to determine the onset and the severity of a drought, the Standard Precipitation Index, the Palmer Drought Severity Index, and the Crop Moisture Index.

Standard Precipitation Index (SPI)

The SPI shows the actual precipitation compared to the probability of precipitation for various time frames. It is an index based on precipitation only. It can be used on a variety of time scales, which allows it to be useful for both short-term agricultural and long-term hydrological applications. A drought event occurs any time the SPI is continuously negative and reaches an intensity of -1.0 or less. The event ends when the SPI becomes positive. Each drought event, therefore, has a duration defined by its beginning and end, and intensity for each month the event continues. The positive sum of the SPI for all the months within a drought event can be termed the drought's "magnitude."

Table 10: Standard Precipitation Index

Standard Precipitation Index	
Extremely Wet	2.0+
Very Wet	1.5 to 1.99
Moderately Wet	1.0 to 1.49
Near Normal	-.99 to .99
Moderately Dry	-1.0 to -1.49
Severely Dry	-1.5 to -1.99
Extremely Dry	-2.0 and less

Palmer Drought Severity Index (PDSI)

Devised in 1965, the PDSI has been used the longest for monitoring drought conditions. The PDSI allows for a categorization of various levels of wetness and dryness that are prominent over an area. The PDSI is calculated based on precipitation and temperature data, as well as the local Available Water Content (AWC) of the soil. PDSI values may lag emerging droughts for several months, are less well-suited for mountainous land or areas of frequent climatic extremes, and present unspecified, built-in time scales that can be misleading.

Table 11: Palmer Drought Severity Index

Palmer Drought Severity Index	
Extremely Wet	4.0 or more
Very Wet	3.0 to 3.99
Moderately Wet	2.0 to 2.99
Slightly Wet	1.0 to 1.99
Incipient Wet Spell	0.5 to 0.99
Near Normal	0.49 to -0.49
Incipient Dry Spell	-0.5 to -0.99
Mild Drought	-1.0 to -1.99
Moderate Drought	-2.0 to -2.99
Severe Drought	-3.0 to -3.99
Extreme Drought	-4.0 or less

During a drought event, Shasta County and the participating jurisdictions can expect to see a range anywhere from -1.0 to -2 on the Standard Precipitation Index or from 0.0 to – 4.0 on the Palmer Drought Severity Index.

Crop Moisture Index (CMI)

A derivative of the Palmer Drought Severity Index, or PDSI, is the Crop Moisture Index (CMI). The CMI looks at moisture supply in the short term for crop producing-regions in its own redefined context. It monitors week-to-week crop conditions, whereas the PDSI monitors long-term meteorological wet and dry spells. The CMI was designed to evaluate short-term moisture conditions across major crop-producing regions. Because it is designed to monitor short-term moisture conditions affecting a developing crop, the CMI is not a good long-term drought monitoring tool. Therefore, the CMI's rapid response to changing short-term conditions may provide misleading information about long-term conditions.

4.2.3 – Previous Occurrences

Extended periods without sufficient rainfall can and do occur across Shasta County, causing damage to lawns, gardens, flora, and fauna. Unfortunately, comprehensive data on droughts, drought impacts, and drought forecasting is extremely limited and often inaccurate. Due to the complexity of drought monitoring, the complexity of agricultural and livestock market pricing, and the large areas droughts impact, the USDA and USGS have difficulty quantifying and standardizing drought data. Each of these contributing drought factors has confounding variables within them.

The U.S. Geological Survey (USGS) partners with the U.S. Department of Agriculture (USDA) for drought monitoring by means of ground water and aquifer measurement. Since ground water and aquifer levels are highly variable from year to year, this indicator is useful for reporting whether there is a current shortage or surplus but is unhelpful in forecasting future events. Additionally, ground water and aquifer levels are correlates only in a lagged model to climactic conditions further compounding their usefulness in predicting future droughts.

A drought's primary impact is on agriculture and livestock. However, there are many factors it can affect: most notably livestock count, crop prices, crop losses, livestock size, and livestock by products such as milk. Absent a drought, these factors vary highly from season to season. Prices vary with international market factors influenced by conditions across the globe. Crop yields vary with other climate conditions

such as too much rain during planting season or insect abundance, and even marketing campaigns developed to sell more meat from one type of livestock. Drought is only one factor in an equation of many variables.

The USDA monitors these conditions and aggregates the data to create its drought monitor. However, due to the reasons discussed, it is limited in its ability to quantify how severe a drought was over specified period of time and a specific jurisdiction.

Since 1996, the National Oceanic and Atmospheric Administration (NOAA) and its National Centers for Environmental Information (NCEI) recorded three (3) drought events in Shasta County. No injuries, deaths, or property/crop damage was reported. For information pertaining to these NOAA-recorded drought events, see Appendix E. The current drought started in September 2020 and continues to this day. A drought occurred during June-December 2015 and from March to October 2016.

4.2.3A – Probability of Future Occurrences, Drought

Based upon previous occurrences, Shasta County and the participating jurisdictions of the City of Anderson and the Igo Ono Community Services District can expect a drought with a 27.77% probability per year, or .2777 events per year. Thus, the likelihood of a drought occurring within the planning area is considered **'likely.'**

Table 12: Probability of Future Occurrences, Drought

Probability of Future Occurrences, Drought	
Event Year	Event Count
2000	0
2001	0
2002	0
2003	0
2004	0
2005	0
2006	0
2007	0
2008	0
2009	0
2010	0
2011	0
2012	0
2013	0
2014	0
2015	1
2016	1
2017	0
2018	0
2019	0
2020	1
2021	1
Total Recorded Events =	5
Total Years =	18
Yearly Probability =	27.77%

Data Source: NOAA/NCEI Storm Events Database

4.2.4 – Vulnerability & Impact

Shasta County and its participating jurisdictions have recorded four (4) drought events since 1996, of which the first two did not have a record for magnitude. The last two droughts were severe with parts of Shasta County reaching 'exceptional.' Based on the future probability in the previous table, the planning area can expect .2777 droughts per year which can range anywhere below 0 and -4 on the Palmer Drought Severity Index.

Vulnerability of Facilities

Continuous use of water usage during a drought can cause groundwater reserves to be depleted. Once groundwater reaches critical levels ground levels can decrease damaging key facilities.

Vulnerability of Population

Drought poses no direct risk of injury or death to Shasta County or its participating jurisdictions' population. However, all of Shasta County's population will be impacted by drought.

Vulnerability of Systems

Drought can have a significant effect on a jurisdiction's agriculture and tourism economies. If the precipitation level is below normal, farmers and ranchers will struggle to grow their crops and feed their livestock. If rivers, streams, and lakes dry up, tourists will be less likely to enjoy a jurisdiction's amenity resources. Shasta County relies on lakes for tourism and will suffer economic setbacks if water levels decline. Map 1 depicts land use throughout Shasta County and its participating jurisdictions. This geographical representation indicates that every jurisdiction in the planning area has vulnerable systems. Drought is a major determinant of wildfire hazard, in terms of greater propensity for fire starts and larger, more prolonged conflagrations fueled by excessively dry vegetation and reduced water supply for firefighting purposes.

4.2.4A – Critical Facilities & Infrastructure

Critical facilities above depleted groundwater reservoirs can sink damaging structures. A complete list of infrastructure and critical facilities can be found in Appendix D.

4.2.4B – Land Use & Development Trends

Shasta County and its participating jurisdictions' predominant growth area is residential housing, as detailed in Section 3.2 – Land Use & Development Trends.

If the fresh water supply system is strained by consumption and then further contrained by a drought, the residents of Shasta County will likely be forced to limit their water usuage. This strain will then trickle into the surrounding areas of agriculture, futher compounding the problem. An increase of dry vegetation increases the Shasta County's overall fire risk.

4.2.4C – Unique or Varied Risk

Based upon the best available resources and lack of predictable differences in vulnerability, coupled with the fact drought can affect the entire planning area, there is no unique or varied risk to the hazard.

4.2.4D – Repetitive Loss Properties

Not applicable to the hazard.

4.2.5 – HAZUS Models

Not applicable to the hazard.

Photo Source: iStock by Getty Images

4.2(E) – Earthquake

4.2.1 – Hazard Description

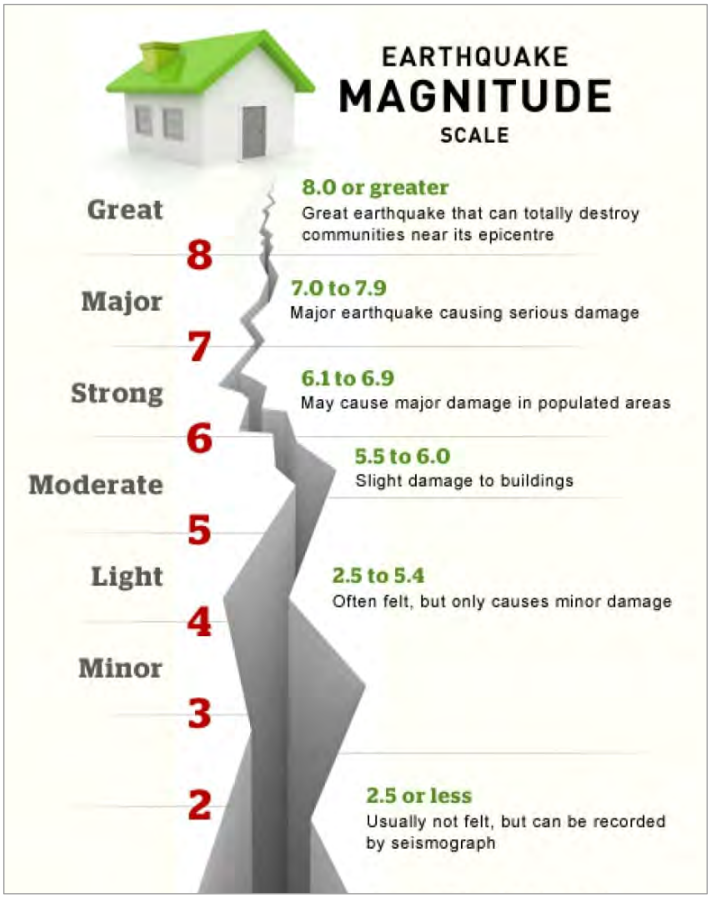
An earthquake is the vibration of the earth's surface following a release of energy in the earth's crust. This energy can be generated by a sudden dislocation of the crust or by a volcanic eruption. An earthquake's point of initial rupture is called its focus or hypocenter; and the point of ground directly above the hypocenter is called the epicenter.

Earthquakes tend to reoccur along faults, which are zones of weakness in the crust. Faults are more likely to have earthquakes on them if they have more rapid rates of movement, have had recent earthquakes along them, experience greater total displacements, and are aligned so that movement can relieve accumulating tectonic stresses.

There are numerous characteristics measured when observing earthquake activity; however, four of them—force, depth, peak ground acceleration and the distance to the epicenter—are most influential in determining damage. Two scales are used when referring to earthquake activity: the Richter Scale, which estimates the total force of the earthquake; and the Modified Mercalli Intensity Scale, which categorizes the observed damage from the earthquake.

The Richter Scale is a scientific measurement based on the magnitude of the earthquake. It provides seismic experts greater accuracy in comparing the strength of earthquakes across time and at different locations in all areas of the world. The measurements of the Richter Scale are further explained in the following illustration.

Illustration 2: Earthquake Magnitude Scale (Richter)



Data Source: UPSeis / Michigan Tech

The Modified Mercalli Intensity value assigned to a specific site after an earthquake has a more meaningful measure of severity to the nonscientist than the magnitude because intensity refers to the effects experienced at that place. The lower numbers of the intensity scale generally deal with the way the earthquake is felt by people. The higher numbers of the scale are based on observed structural damage. Structural engineers usually contribute information for assigning intensity values of VIII or above. The table below is an abbreviated description of the levels of Modified Mercalli intensity.

Table 13: Modified Mercalli Intensity Scale

Modified Mercalli Intensity 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 upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations like the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum in clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plates. Damage slight.
VII	Very Strong	Damage 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; some chimneys broken.
VIII	Severe	Damage slight in specially designated structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage greater in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundation. Rails bent.

Data Source: The Severity of an Earthquake (abridged), USGS General Interest Publication 1989-288-913

According to the U.S. Geological Survey (USGS), it is estimated that there are 500,000 detectable earthquakes in the world each year; 100,000 of those can be felt, and 100 of them cause damage. Earthquakes are much less common in the eastern United States than in California, with most events imperceptible by the public. This leads to a dangerous complacency that may be unwarranted.

4.2.2 – Location & Extent

Earthquakes represent the most destructive source of hazard, risk, and, and vulnerability, both in terms of recent California history and the probability of future destruction of greater magnitudes than previously

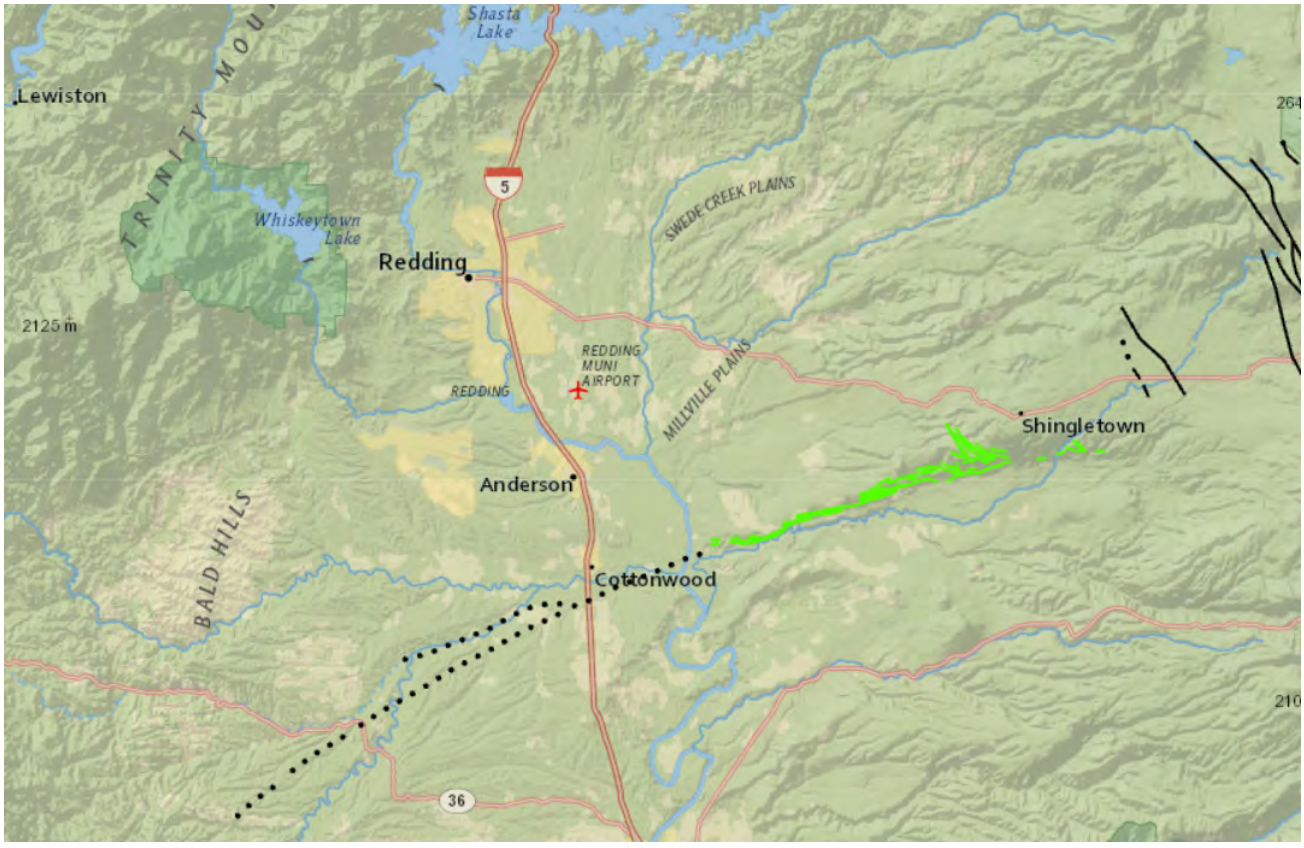
recorded. The state has thousands of recognized faults but only some are known to be active and pose significant risk.

The motion between the Pacific and North American plates occurs primarily on the faults of the San Andreas system and the eastern California shear zone. Faults are more likely to have future earthquakes on them if they have more rapid rates of movement, have had recent earthquakes along them, experience greater total displacements, and are aligned so that movement can relieve the accumulating tectonic stresses.

Geologists classify faults by their relative hazards. Active faults represent the highest hazards which have ruptured to the ground surface during the Holocene period (about the last 11,000 years). Potentially active faults are those that displaced layers of rock from the Quaternary period (the last 1,800,000 years). Nearly all movement between the two plates is on active faults.

There are fault lines located in southern and eastern Shasta County that could produce low to moderate ground shaking. Ground shaking is the principal cause of damage in a seismic event and could catalyze dam failures, landslides, and fires. According to the U.S. Geological Survey (USGS), factors that affect the potential damage of structures and systems because of severe ground shaking include epicenter location and depth, the proximity to a fault, the direction of the rupture, the magnitude, the existing soil and geologic conditions, and the structure-type. Newer structures are more resistant to ground shaking than older structures because of improved building codes. Manufactured housing is very susceptible to damage because the foundation systems are rarely braced for seismic activity. Lifeline systems such as highways, bridges, water and gas pipelines, railroads, and utility services, can experience substantial damage from ground shaking. Structure damage is considered likely when ground motion average peak acceleration reaches 10% and 15% of gravity.

Shasta County Fault Lines Illustration 3



Green fault lines are late quaternary fault displacement lines.

Black fault lines are pre-quaternary fault displacement lines.

According to the California Geological Survey's (CGS) Probabilistic Seismic Hazards Assessment (PSHA), the area is subject to low and moderate ground shaking and lies within the 10% to 30% gravity zone (CGS 2003). The region within the boundaries of Shasta County has not sustained damages attributed to earthquakes, dam failures, or landslides as far as records have been maintained and Shasta County has not proclaimed a state of emergency due to earthquakes events.

4.2.3 – Previous Occurrences

Shasta County has a low level of historic seismic activity. In the past 120 years, there has been no significant property damage or loss of life due to earthquakes occurring within or near the planning area. Maximum recorded intensities have reached Modified Mercalli (MM) VII, with possibly one instance of MM VIII. Most of the stronger intensity seismic activity in Shasta County has occurred in the eastern half near Lassen Peak. The City of Redding is located in the less seismically active western half of Shasta County, referred to as an area of moderate seismicity. Earthquake activity has not been a serious hazard in the City of Redding's history, nor is it probable that it will become a serious hazard in the future. Research of historical earthquakes indicates that Redding has experienced several moderate-sized earthquakes, magnitude 4.0 to 4.5 (estimated) in 1904, 1915, 1919, 1920 and 1930.

On November 26 (Thanksgiving Day), 1998, the City of Redding experienced a local magnitude 5.2 earthquake that was centered three miles north-northwest of Redding near Keswick Dam. This was the largest recorded earthquake since USGS began monitoring Shasta County in 1981 and believed to be the largest earthquake in the Redding area since 1878. No structural damage was reported in the City of Redding. Nonstructural damage that was reported consisted of broken merchandise, loss of power due to a damaged electrical panel, ire sprinkler breaks in a mechanical room and two operating rooms at Mercy Medical Center, and non-structural cracks at expansion joints in a highway overpass. Outside the city limits, four-million-gallon water tank in Bella Vista lifted about an inch off its foundation, resulting in bent anchor bolt washers; and a Pacific Gas & Electric (PG & E) transformer caught fire resulting in temporary power outage for 7500 customers. The only reported earthquake injury occurred in the City of Shasta Lake when a woman slipped and fell.

4.2.3A – Probability of Future Occurrences, Earthquake

There can be advanced warning or no warning at all in the event of an earthquake. Earthquakes have occurred in Shasta County before, and they will again. Notable faults in the planning area are the Cleveland Hills and Sierra Nevada fault lines. According to the California Earthquake Authority, there is a 76% chance of an earthquake with a magnitude greater than 7.0 striking northern California over the next 30 years.

Given this estimate and the history of previous occurrences, the likelihood of an earthquake within the planning area is considered **'not likely.**

4.2.4 – Vulnerability & Impact

The planning area, i.e., Shasta County, the City of Anderson, and the Igo Ono Community Services District, has recorded one (1) moderate earthquake since 1990. Information specific to that occurrence is provided in the table below:

Table 14: Historical Impacts, Earthquake

Historical Impacts, Earthquake	
Summary Statistics	
Count of Events	0
Average Magnitude	-
Average Range	-
Average Cost	$0
Magnitude of Cost	$0
Total Recorded Cost	$0
Average Fatalities	0
Total Fatalities	0
Average Injuries	0
Total Injuries	0

Data Source: NOAA/NCEI

Vulnerability of Facilities

Structural vulnerability to earthquakes is the same throughout the planning area. Shaking accumulation can cause roofing to collapse on old or poorly constructed facilities. Liquefaction can destroy structures and ensuing landslides destroy everything in their path. Cascading disasters from ruptured gas lines can start fires increasing damage.

The City of Redding recently ran an earthquake scenario based on an expected peak ground acceleration (PGA) of 18% over Shasta County. Building Damage Ratios, or BDRs, were estimated at 6% for older structures located in the immediate downtown area of the city, and 3% for all other areas within the city. The BDR represents an estimate of the ratio, as a percentage, of the repair cost divided by the replacement cost. The higher damage ratio in the downtown area was chosen since these structures are typically older and less likely to have been constructed with any seismic code design provisions (i.e., pre-seismic code buildings). The total damage is estimated at $198 million for the city as a whole, which is less than 1% of the damage estimates from the 1994 Northridge earthquake.

Vulnerability of Population

The entire population of Shasta County is equally vulnerable to the effects of an earthquake. These may include power failures, which can leave citizens, particularly the young and old, at risk from extreme temperatures, or restricted travel. Debris blocking roadways can leave people stranded on roadways and at the mercy of their vehicle's fuel supply, increasing their vulnerability to the hazard.

Vulnerability of Systems

Shasta County and the participating jurisdictions' assets and systems vulnerability to earthquakes is the same throughout the planning area. Critical systems can be damaged and rendered inoperable reducing available resources. Neighboring counties might face severe damage reducing available mutual aid.

4.2.4A – Critical Facilities & Infrastructure

All critical facilities and infrastructure are equally at risk since earthquakes can indiscriminately affect the entire planning area. A complete list of critical facilities and infrastructure can be found in Appendix D.

4.2.4B – Land Use & Development Trends

Shasta County and its participating jurisdictions' predominant growth area is residential housing, as detailed in Section 3.2 – Land Use & Development Trends.

Increased residential growth will not increase Shasta County or its participating jurisdictions' vulnerability and risk to earthquakes as long as the residential structures continue to be built under currently adopted international and state building codes, and an appropriately accommodating power grid. Thus, all buildings or infrastructure built in the future will have the same risk as other buildings or infrastructure constructed within the planning area.

It is important to note, however, that an earthquake's effect(s) can be compounded by the soil type underlying a community's buildings and infrastructure. If the soil is not composed of bedrock and consists of clays, silts, and other types of sand, the pressure generated by an earthquake can force brittle soil and water up toward the surface. These upward forced materials will then destabilize buildings and infrastructure, causing damage that can range from minor cracks to complete destruction. Smaller upward forced materials can destabilize slopes and building foundation further compounding the potential damage to a community.

The National Earthquake Hazards Reduction Program (NEHRP) rates soils from hard to soft and give the soils ratings from Type A through Type E, with the hardest soils being Type A, and the softest soils rated at Type E. Liquefaction risk is considered high if there are soft soils (Types D or E) present within an active fault zone. Most of the soils in Shasta County are Types A-C, with some areas having Type D. No Type E soils were identified, nor was consistent mapping of soil types. For these reasons, combined with a lack of liquefaction history, liquefaction was not addressed in a manner separate from earthquake. It should be considered in subsequent updates to the Shasta County HMP as better data becomes available.

4.2.4C – Unique or Varied Risk

To predict any unique or varied risk for the planning area, one would need a comprehensive earthquake study with accurate modeling. Such a study is beyond the resources of most communities, including Shasta County. Based on historical data, evacuation routes are put a risk from earthquakes along with the threat of cascading disasters. Fires are common after earthquakes and multiple hazards can overwhelm disaster response operations.

4.2.4D – Repetitive Loss Properties

Not applicable to the hazard.

4.2.5 – HAZUS Models

Not applicable to the hazard.

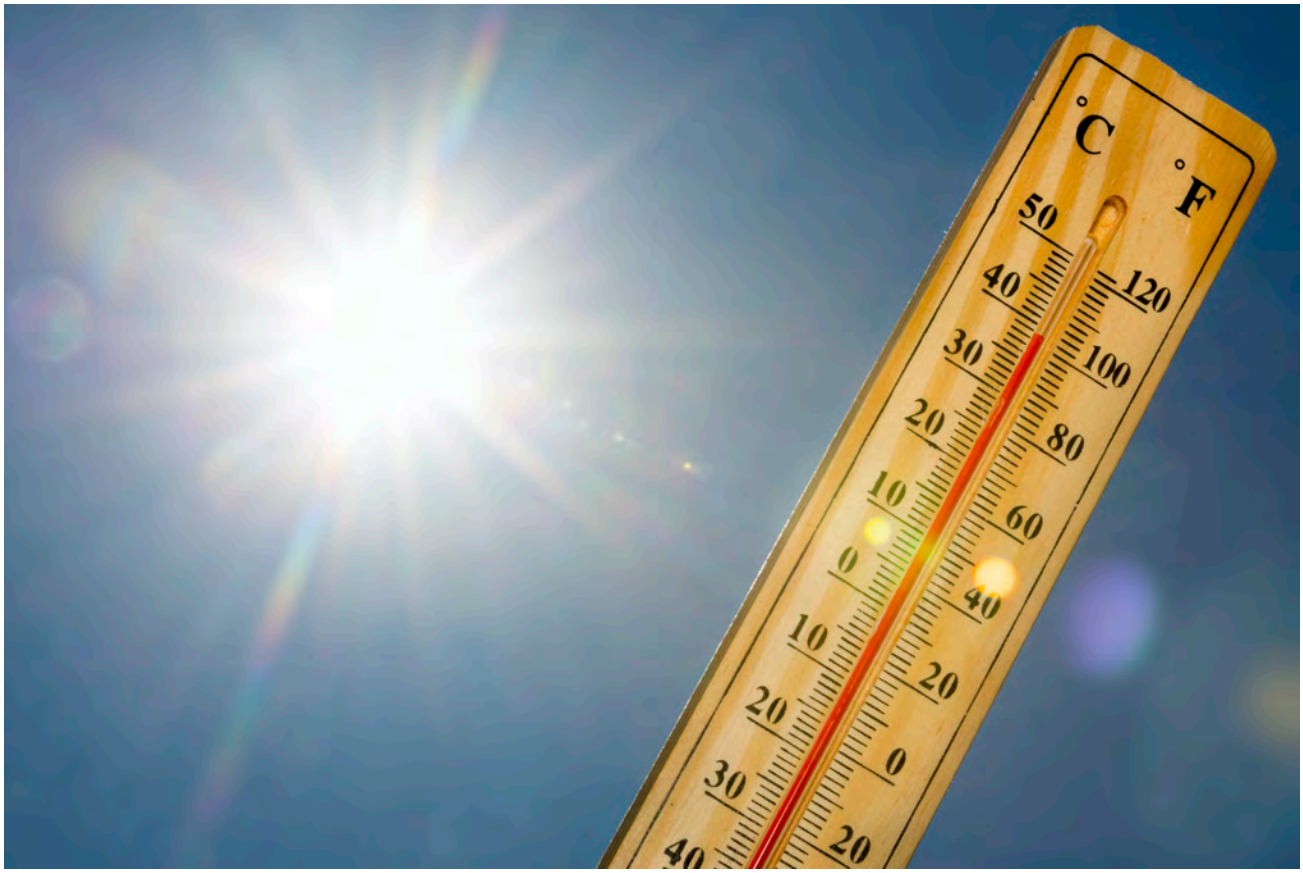


Photo Source: iStock by Getty Images

4.2(EH) – Extreme Heat

4.2.1 – Hazard Description

According to the National Weather Service (NWS), extreme heat, also known as a heat wave, is a period of abnormally hot weather generally lasting more than two days. It is the number one weather-related killer in the United States, resulting in hundreds of fatalities each year. In fact, on average, extreme heat claims more lives each year than floods, lightning, tornadoes, and hurricanes – *combined*.

Extreme heat events occur when the heat index is more than 105 degrees during the day with a nighttime low index of 80 degrees or higher forecast to occur for two (2) consecutive days.

North American summers are hot; most of the United States sees heat waves on a regular basis. East of the Rockies, they tend to combine both high temperature and high humidity, although some of the worst heat waves have been catastrophically dry.

4.2.2 – Location & Extent

Extreme heat occurs often throughout Shasta County and the participating jurisdictions. These events, when they do occur, take place on a massive geographic scale, often affecting multiple counties, regions, and states designating the entire planning area as at risk. Extreme heat events kill more people in California than all other disaster-declared events combined.

Waves of extreme heat can be predicted days in advance and occur seasonally during or around the summer. The National Oceanic and Atmospheric Administration (NOAA) and the National Weather

Service (NWS) may employ an extreme heat watch, warning, and or advisories to assist in alerting a community. The alerts and the events themselves can last for a few days or for a period of weeks.

Extreme heat is measured using the NOAA/NWS heat index. The heat index measures how it feels in regard to the actual temperature and the relative humidity.

NOAA does not have specific extreme heat monitoring stations in Shasta County or the participating jurisdictions. Daily activities throughout Shasta County and its participating jurisdictions will remain unchanged under the "caution" level. Under "extreme caution," schools will begin monitoring its students, Emergency Medical Services (EMS) will heighten preparedness to heat-related injuries, community festivals and organized gatherings will distribute water and monitor attendees, and health care facilities will monitor their vulnerable populations. If the index level reaches "danger" or "extreme danger," schools will cancel outdoor activities, community festivals and organized gatherings will be cancelled, health care facilities will restrict outdoor activities for vulnerable populations, and the Shasta County OES and EMS will work to minimize prolonged exposure of the population in every way possible.

Based on climate data from the NWS, Shasta County and its participating jurisdictions can expect extreme heat events up to 110 degrees Fahrenheit. This temperature, depending on the humidity, will put the planning area in the "Danger" and potentially the "Extreme Danger" category of NOAA's heat index (as shown below).

Table 15: NOAA's National Weather Service Heat Index

NOAA's National Weather Service

Heat Index

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution | Extreme Caution | Danger | Extreme Danger

Data Source: NOAA/NWS

4.2.3 – Previous Occurrences

Although extreme heat regularly occurs throughout Shasta County, NOAA has published any records on the events. In the past five years there have been 12 extreme heat events in Shasta County with no loss of life or injuries.

The following table details the climate norms for Shasta County and its participating jurisdictions as they relate to extreme heat. The record high for the hottest months; June, July, August, and September are

117-, 118-, 118- and 106-degrees Fahrenheit, respectively. The average high for the hottest months are 84-, 93-, 92- and 86-degrees Fahrenheit, respectively.

Table 16: High Temperatures, Shasta County

High Temperatures, Shasta County												
	Temperature in Fahrenheit											
Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Record High	87	87	93	98	109	117	118	118	116	106	99	82
Average High	54	56	58	65	73	84	93	92	86	73	60	52

Data Source: NWS

4.2.3A – Probability of Future Occurrences

For mitigation planning purposes, it is considered **'likely'** that the planning area will experience multiple extreme heat events per year.

NOTE: Climate change is having an impact on the frequency of extreme heat. According to the Climate Science Special Report, the annual average temperature over the contiguous United States has increased by 1.2°F for the period 1986–2016 relative to 1901–1960 and by 1.8°F based on a linear regression for the period 1895–2016. Annual average temperature over the contiguous United States is projected to rise. Increases of about 2.5°F are projected for the period 2021–2050 relative to 1976–2005, implying recent record-setting years may be "common" in the next few decades. Much larger rises are projected by the late century (Vose, R.S., D.R. Easterling, K.E. Kunkel, A.N. LeGrande, and M.F. Wehner, 2017: Temperature changes in the United States. In: Climate Science Special Report: Fourth National Climate Assessment, Volume I [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 185-206, doi: 10.7930/J0N29V45).

4.2.4 – Vulnerability & Impact

NOAA and its National Centers for Environmental Information (NCEI) have not recorded extreme heat impacts for Shasta County and the participating jurisdictions. However, the recorded climate data indicates that the planning area will experience at least one extreme heat impact per year as previously stated. Given the lack of NOAA/NCEI-recorded events and past experiences, it can only be assumed that extreme heat events are not likely to cause any injuries or deaths.

Vulnerability of Facilities

Extreme heat does not pose a risk to Shasta County or the participating jurisdictions' facilities.

Vulnerability of Population

Extreme heat can be a grave threat to the citizens of any exposed community. At certain levels, the human body cannot maintain proper internal temperatures. Exposure to heat and dehydration can injure and even kill people through heat stroke, dehydration, and by also compounding existing medical conditions. The Centers for Disease Control and Prevention (CDC) identifies the following six groups as being especially vulnerable to extreme heat (https://www.cdc.gov/disasters/extremeheat/specificgroups.html):

1. Older Adults (Age 65+)
2. Infants and Children
3. Individuals with Chronic Conditions
4. Low-income Individuals

5. Athletes
6. Outdoor Workers

The citizens of Shasta County and the participating jurisdictions must take great care to remain cool and well hydrated during bouts of extreme heat. Any causal or typical behavior may become dangerous if exposure to extreme heat is prolonged. This includes outdoor activities, daily activities, and even indoor activities within an improperly cooled structure.

Vulnerability of Systems

Extreme heat may cause a community to overuse their air conditioners and cooling units, causing an excessive power draw on its energy infrastructure. If the drain is great enough, it could bring down portions of the power grid and cause a power loss throughout the planning area. Without power, the citizens of Shasta County and the participating jurisdictions would have difficulty keeping cool and thus, put them at risk of bodily harm. Since this hazard typically affects the entire planning area, there is no reasonable way to predict when or where the power grid would fail due to cooling unit overuse.

4.2.4A – Critical Facilities & Infrastructure

Extreme heat does not pose a risk to Shasta County or its participating jurisdictions' facilities. A complete list of infrastructure and critical facilities can be found in Appendix D.

4.2.4B – Land Use & Development Trends

Shasta County and its participating jurisdictions' predominant growth area is residential housing, as detailed in Section 3.2 – Land Use & Development Trends.

As long as new residential developments are built to contemporary cooling standards and the communities maintain an appropriately accommodating power grid, their vulnerability and risk to extreme heat is not impacted.

4.2.4C – Unique or Varied Risk

To predict such risk for Shasta County and the participating jurisdictions, one would need to complete a comprehensive study of its power grid given the drain by cooling units during an extreme heat event. Such a study is beyond the resources of most communities within the planning area. Based on the best available resources, the lack of predictable differences in vulnerabilities, and the fact that the hazard can affect the entire planning area, Shasta County and the participating jurisdictions do not have any unique or varied risk to the extreme heat hazard.

4.2.4D – Repetitive Loss Properties

Not applicable to the hazard.

4.2.5 – HAZUS Models

Not applicable to the hazard.

Photo Source: iStock by Getty Images

4.2(F) – Flood

4.2.1 – Hazard Description

Flooding is the most prevalent and costly disaster in the United States. It occurs when water, due to rain, melting snows, or dam failures, exceeds the absorptive capacity of the soil and the flow capacity of rivers, streams, or coastal areas. At this point, the water concentration hyperextends the capacity of the floodway, and the water enters the floodplain. Flooding can happen at any time throughout the year but is most common in the spring due to the likelihood of rain and thunderstorms. Flooding is also frequently associated with tropical activity, such as tropical storms and hurricanes.

According to the U.S. Geological Survey (USGS), there are two basic types of floods: flash floods and the more widespread river floods. Flash floods generally cause greater loss of life and river floods generally cause greater loss of property.

A **flash flood** occurs when runoff from excessive rainfall causes a rapid rise in the water height (stage) of a stream or normally dry channel. Flash floods are more common in areas with a dry climate and rocky terrain because lack of soil or vegetation allows torrential rains to flow overland rather than infiltrate into the ground.

River flooding is generally more common for larger rivers in areas with a wetter climate, when excessive runoff from longer-lasting rainstorms and sometimes from melting snow causes a slower water-level rise over a larger area. Floods also can be caused by ice jams on a river or high tides, but most floods can be linked to a storm of some kind.

The spatial extent of a flooding event depends on the amount of water overflow but can usually be mapped because of existing floodplains. A floodplain, as depicted below, is an area of low-lying ground adjacent to a river, formed mainly of river sediments and subject to flooding.

Illustration 3: Characteristics of a Floodplain

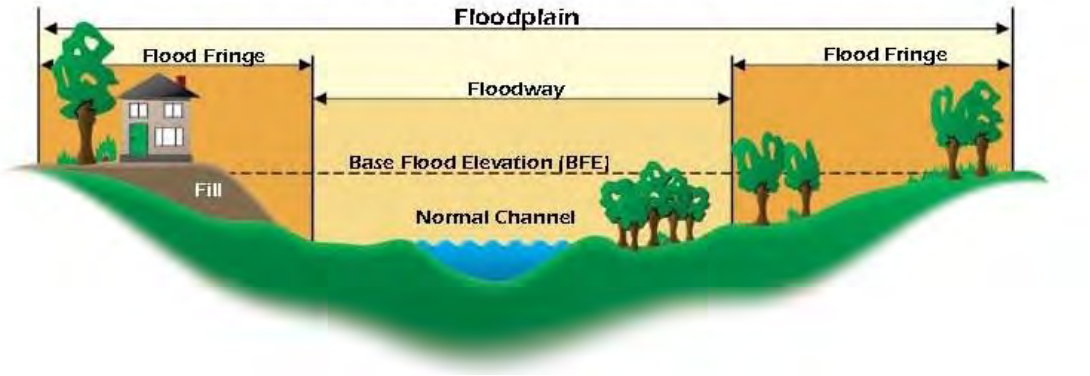


Illustration Source: www.co.mille-lacs.mn.u

In its common usage, floodplains refer to areas inundated by the 100-year flood, i.e., the flood that has a 1% chance of being equaled or exceeded in any given year and the 500-year flood, i.e., the flood that has a 0.2% chance of being equaled or exceeded in any given year. The 100-year flood is the national minimum standard to which communities regulate their floodplains through the National Flood Insurance Program (NFIP). The NFIP aims to reduce the impact of flooding on private and public structures.

Unfortunately, the risks from future floods are significant, given expanded development in coastal areas and floodplains, unabated urbanization, land-use changes, and climate change. Because of this, flooding may intensify in many regions across the country, even in areas where total precipitation is projected to decline. According to FEMA, water, and flooding account for about 40% of the Presidential declared disasters in the United States.

4.2.2 – Location & Extent

A variety of factors, including topography, urban development and infrastructure, and geology, affect the type and severity of flooding within Shasta County and the participating jurisdictions. Intense rainfall, accompanying large thunderstorms in the planning area, can result in water flowing rapidly from higher elevations into valleys, collecting in, and sometimes overtopping the low-lying streams. However, serious flooding in the mountainous or elevated areas is unusual because streams tend to be faster flowing and flood waters drain quickly.

The predicative magnitude of floods is indeterminate and can vary from minimal manage to wreaking havoc in all or portions of the planning area. The effects of flooding can come in the form of a nuisance, i.e., just inches of water to homes and businesses or as a full-blown disaster with critical facilities being completely submerged in feet of water. People may become trapped in their homes and entire communities left without basic goods or services for an extended period of time. Further, any amount of damage can render a structure unusable for as long as recovery operations would take.

Because flooding can indiscriminately affect the entire planning area, some locations have established a Base Flood Elevation (BFE) to use as a determinate for construction and mitigation activities.

The following table provides information specific to the flood zone classifications identified within the planning area.

Table 17: Flood Zone Classifications

Flood Zone Classifications	
Zone	Description
A	An area inundated by 1% annual chance flooding, for which no BFEs have been determined. (100-Year Floodplain)
AE	An area inundated by 1% annual chance flooding, for which BFEs have been determined. 100-Year Floodplain)
B	Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood; an area inundated by 0.2% annual chance flooding

Data Source: FEMA Flood Zone Designations, https://snmapmod.snco.us/fmm/document/fema-flood-zone-definitions.pdf

4.2.3 – Previous Occurrences

Since 1950, the National Oceanic and Atmospheric Administration (NOAA) and its National Centers for Environmental Information (NCEI) recorded 36 riverine flood impact in Shasta County and the participating jurisdictions. Shasta County and the participating jurisdictions have recorded 0 deaths and 0 injuries relating to riverine flooding. These events have cost the planning area $21,080,000 in property damage and $6,500,000 in crop damage.

From 1950 to December 2021, NOAA/NCEI has recorded 10 flash flood impacts in Shasta County and the participating jurisdictions. There were three deaths and no injuries associated with these events. However, they cost the planning area $117,000 in property damage and $0 in crop damage.

For information pertaining to all NOAA/NCEI-recorded events, refer to Appendix E.

4.2.3A – Probability of Future Occurrences, Flood (Riverine)

The definition of each flood zone's classification is used for the purpose of calculating the yearly probability of riverine flooding.

As indicated in the previous table, jurisdictions with property in a 100-year floodplain can expect a 1% annual chance of flooding within the designated area(s). Jurisdictions with property in a 500-year floodplain can expect a 0.2% annual chance of flooding within the designated area(s).

Table 18: Probability of Future Occurrences, Riverine Flood

Probability of Future Occurrences, Riverine Flood		
Jurisdiction	Floodplain Exposure	
	100-year (1% Annual)	500-year (0.2% Annual)
Shasta County	10.5%	30%
The City of Anderson	-	-
Igo Ono Community Services District	40%	45%

Data Source: FEMA, NFHL

Shasta County and its participating jurisdictions can each expect a flash flood event with 45% probability per year, or.45 events per year.

Thus, the probability of a both a riverine and flash flood event occurring in the planning area is considered **'not likely."**

Table 19: Probability of Future Occurrences, Flash Flood

Probability of Future Occurrences, Flash Flood	
Event Year	Event Count
2000	0
2001	0
2002	0
2003	0
2004	0
2005	0
2006	0
2007	0
2008	1
2009	1
2010	0
2011	0
2012	0
2013	0
2014	1
2015	0
2016	0
2017	0
2018	0
2019	6
2020	0
2021	0
Total Recorded Events =	9
Total Years =	20
Yearly Probability =	45%

Data Source: NOAA/NCEI Storm Events Database

4.2.4 – Vulnerability & Impact

Based on historical flood data, and the future probability in Section 4.2.3A, the planning area can expect eight (8) riverine flood events per year and 4.5 flash floods per year. Each jurisdiction's probability of incurring a flash flood is equal.

Since floodplains are measurable, past riverine and flash flood events are the best predictor of future events. Therefore, the following table is provided as a best available estimate of what a typical riverine or flash flood event in the region may cause in terms of damage, injuries, and death.

Table 20: Historical Impacts, Flood

Historical Impacts, Flood		
Summary Statistics	Riverine Flood	Flash Flood
Count of Events	36	10
Average Magnitude	-	-
Magnitude Range	-	-
Average Cost	$585,555.56	$11,700
Magnitude of Cost	$0 - $20,080,000	$0 - $50,000
Total Recorded Cost	$21,080,000	$117,000
Average Fatalities	0	0
Total Fatalities	0	.3
Average Injuries	0	0
Total Injuries	0	0

Data Source: NOAA/NCEI Storm Events Database

Vulnerability of Facilities

Shasta County and the participating jurisdictions have a fire station, mine, police station, school, and commercial and residential structures in floodplains. Flooding can cause minimal or complete damage to any of these types of facilities taking them offline for days to years depending on the resources available after an event.

The average flash flood event in Shasta County and its participating jurisdictions costs $11,700, while the existing range of a single incident has been from $0 to $50,000. Shasta County has incurred a total of $117,000 in property damage from flash flood events since 1950.

The average riverine flood event in Shasta County and its participating jurisdictions costs $585,555.56, while the existing range of a single incident has been from $0 to $20,080,000. Shasta County and its participating jurisdictions have incurred a total of $21,080,000 in property damage from riverine flood events since 1950.

Vulnerability of Population

If evacuations are not heeded, or flood waters rise quickly enough, residents within the planning area can be swept away by floodwater currents, become trapped on rooftops or other points of high elevations, and even sustain injury or death. Depending upon the conditions, this will expose them to the elements and deprive them of basic needs and services.

Long-term care facilities housing vulnerable populations can take longer to evacuate. Additionally, the potential presence of mold after a flood requires extra care to be taken before residents can re-inhabit such facilities.

Vulnerability of Systems

City halls and fire stations can be rendered unusable or permanently destroyed having a significant impact on the jurisdictions ability to conduct its day to day or current flood event operations. Significant damage to residential and or commercial structures can irrevocably damage a community and its economy, creating refugees and economic hardship. If a facility housing hazardous materials is significantly impacted, it is possible the chemicals can wash away with the flood waters and have detrimental effects on the local environment.

4.2.4A – Critical Facilities & Infrastructure

Depending on the location and severity of a flood event, certain critical facilities and infrastructure within the planning area may be impacted. These impacts can include extensive water damage, loss of service/functionality, structural failure, etc. The following table identifies the number of critical facilities and infrastructure locations identified by Shasta County, the City of Anderson, and the Igo Ono Community Services District in respect to riverine flood risk. A complete list of critical facilities and infrastructure is available in Appendix D.

Table: 21: Critical Facilities & Infrastructure, Riverine Flood Risk

Critical Facilities & Infrastructure, Riverine Flood Risk		
Jurisdiction	100-Year Floodplain	500-Year Floodplain
Shasta County	190	190
City of Anderson	20	20
Igo Ono Community Services District	-	-

Data Source: Shasta County Public Works and the City of Anderson Public Works

4.2.4B – Land Use & Development Trends

Shasta County and its participating jurisdictions' predominant growth area is residential housing, as detailed in Section 3.2 – Land Use & Development Trends.

Increased residential growth can increase or not increase a jurisdiction's risk to flooding. With the proper flood control policies, codes, zoning, and laws in place there is no reason why new residential construction should occur within designated floodplains. If a community does undergo growth in a floodplain, the local government will need to ensure the structures are properly protected through insurance or other structural mitigation measures.

Any buildings or infrastructure built in the future will have the same risk as other buildings or infrastructure built within or outside of the designated floodplains.

4.2.4C – Unique or Varied Risk

Due to the nature of flooding (riverine and flash), each jurisdiction within the planning area is equally at risk to the hazard. The variable risk associated with riverine flooding is indicated in the following table.

Table 22: Unique or Varied Risk, Riverine Flood

Unique or Varied Risk, Riverine Flood	
Jurisdiction	Risk Characteristics
Shasta County	Parts of the jurisdiction are located in 100- and 500-year floodplains. Most of the critical infrastructure is located in the 100- and 500- year floodplain. Atmospheric rivers in 2019 sent severe weather systems causing extensive damage to residential and commercial properties.
City of Anderson	Parts of the jurisdiction are located in a 100-year floodplain. Most of the critical infrastructure is located in the 100- and 500- year floodplain. Atmospheric rivers in 2019 sent severe weather systems causing extensive damage.
Igo Ono Community Services District	Parts of the jurisdiction are located in 100- and 500-year floodplains. Some residential properties are in the 500- year floodplain.

4.2.4D – Repetitive Loss Properties

Shasta County (Unincorporated Areas): Under the National Flood Insurance Program (NFIP), the unincorporated areas of Shasta County have had residential repetitive loss properties for a combined total of approximately $307,000 and commercial repetitive loss properties for a combined total of approximately $27,000. There have also been residential severe repetitive loss (SRL) properties for a combined total of approximately $146,000.

Shasta County does not presently have any properties in a special hazard floodplain area. Properties that fall in Special Hazard Floodplain Areas, or SFHAs, in the future will be included in this plan.

The City of Anderson: Under the National Flood Insurance Program (NFIP), the City of Anderson has had residential repetitive loss (RL) properties for a combined total of approximately $67,000. There have been no costs associated with severe repetitive loss properties.

4.2.5 – HAZUS Models

Included in the risk assessment are comprehensive simulations conducted in FEMA's GIS-based natural analysis tool, HAZUS-MH v2.1. To properly display Shasta County and the participating jurisdictions' risk to riverine floods, two (2) models have been developed for this HMP (update).

Table 23: HAZUS Models for Riverine Flood, Shasta County

HAZUS Models for Riverine Flood, Shasta County			
Model #	Occurrence	River System	Location
Model 1	100-Year	Sacramento River	Countywide
Model 2	500-Year	Sacramento River	Countywide

The simulation models utilize the USGS's National Elevation Database (at 1 arc second) as the baseline for determining stream basins, hydrology, and drainage. A 10-square mile stream drainage setting was used to calculate each model's hydrology functions. One simulation models a 500-year flood, while the other models a 100-year flood. The information depicts the simulation models' estimates for debris generation, economic losses, shelter requirements, transportation infrastructure damage, and utility infrastructure damage.

Table 24: HAZUS Model 1, 100-year Riverine Flood, Shasta County

Model 1, 100-year Riverine Flood, Shasta County								
Economic Loss	**Capital Stock Losses**			**Building Loss Ratio**	**Income Losses**			**Total**
	Building	**Contents**	**Inventory**		**Relocation**	**Capital**	**Wages & Rental**	
	$1,230,890,000	$942,260,000	$7,370,000	10.56	$227,050,000	$177,310,000	$475,660,000	$1,952,739,000
Shelter	**Displaced People**				**People Needing Short Term Shelter**			
	23,961				1,696			
Debris	**Finishes (Tons)**		**Structures (Tons)**		**Foundations (Tons)**		**Total (Tons)**	
	6,647		3,860		4,424		14,931	
Utilities	**Potable Water**	**Wastewater**	**Oil Systems**	**Natural Gas**	**Electric Power**	**Communication**	**Total**	
Facilities	$0	$0	$0	$0	$0	$0	$0	
Pipelines	$0	$0	$0	$0	$0	$0	$0	
Total =	$0	$0	$0	$0	$0	$0	$0	
Transportation	**Highways**	**Railways**	**Light Rail**	**Bus Facilities**	**Ports**	**Ferries**	**Airports**	**Total**
Segments	$0	$0	$0	$0	$0	$0	$0	$0
Bridges	$0	$0	$0	$0	$0	$0	$0	$0
Tunnels	$0	$0	$0	$0	$0	$0	$0	$0
Facilities	$0	$0	$0	$0	$0	$0	$0	$0
Total =	$0	$0	$0	$0	$0	$0	$0	$0

Data Source: FEMA, HAZUS

Table 25: HAZUS Model2 for 500-year Riverine Flood, Shasta County

HAZUS Model 2 – 500-year Flood								
Economic Loss	**Capital Stock Losses**			**Building Loss Ratio**	**Income Losses**			**Total**
	Building	**Contents**	**Inventory**		**Relocation**	**Capital**	**Wages & Rental**	
	$1,230,890,000	$942,260,000	$7,370,000	30%	$227,050,000	$177,310,000	$475,660,000	$1,952,739,000
Shelter	**Displaced People**				**People Needing Short Term Shelter**			
	23,961				1,696			
Debris	**Finishes (Tons)**		**Structures (Tons)**		**Foundations (Tons)**		**Total (Tons)**	
	47,717		69,013		69,770		185,500	
Utilities	**Potable Water**	**Wastewater**	**Oil Systems**	**Natural Gas**	**Electric Power**	**Communication**	**Total**	
Facilities	$0	$0	$0	$0	$0	$0	$0	
Pipelines	$0	$0	$0	$0	$0	$0	$0	
Total =	$0	$0	$0	$0	$0	$0	$0	
Transportation	**Highways**	**Railways**	**Light Rail**	**Bus Facilities**	**Ports**	**Ferries**	**Airports**	**Total**
Segments	$0	$0	$0	$0	$0	$0	$0	$0
Bridges	$0	$0	$0	$0	$0	$0	$0	$0
Tunnels	$0	$0	$0	$0	$0	$0	$0	$0
Facilities	$0	$0	$0	$0	$0	$0	$0	$0
Total =	$0	$0	$0	$0	$0	$0	$0	$0

Data Source: FEMA, HAZUS

Photo Source: iStock by Getty Images

4.2(SS) – Severe Storms

4.2.1 – Hazard Description

Meteorologists generally define severe weather as any aspect of the weather that poses risk to life and/or property and requires the intervention of authorities. Severe weather can happen at any time, and in any part of the country, and may present itself in a variety of ways. For mitigation planning purposes, this plan addresses severe storms as a combination of the following severe weather effects as defined by the National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service (NWS).

Hail: Showery precipitation in the form of irregular pellets or balls of ice more than 5 mm in diameter, falling from a cumulonimbus cloud.

High/Strong Wind: Sustained wind speeds of 40 miles per hour or greater lasting for one (1) hour or longer, or winds of 58 miles per hour or greater for any duration. Often referred to as straight-line wind to differentiate from rotating or tornado-related wind.

Thunderstorm Wind: The same classification as high/strong wind but accompanies a thunderstorm. Also often referred to as straight-line wind to differentiate from rotating or tornado-related wind. Strong, i.e., up to more than 120 mph, straight-line winds associated with thunderstorms can knock down trees and power lines and overturn mobile homes.

Lightning: A visible electrical discharge produced by a thunderstorm. The discharge may occur within or between clouds, between the cloud and air, between a cloud and the ground or between the ground and a cloud.

Severe storms have been so consistent throughout modern history that much of the vulnerability associated with them is mitigated. However, this section is not concerned with everyday wind, lightning in the sky, or mild precipitation. It addresses these common storm elements when they behave such that they pose a threat to property and life; this is what is classified as 'severe.'

4.2.2 – Location & Extent

Severe storms occur throughout the year in Shasta County. High/strong or thunderstorm wind can affect any size area, from an isolated pocket, i.e., city or neighborhood, to the entire county or region. Hail will occur in small pockets of an accompanying storm, and lightning will strike a single point. It is not often multiple strikes will hit and damage persons and property in one severe storm event.

The likelihood of storms, severe or not, is often predicted in advance (within a day or multiple days). However, the severity of storms is not as easily predicted, and when it is, the window of notification is up to a few hours to under an hour. When a severe storm is imminent, it is unknown whether damaging winds, hail, or lightning will occur, even though the potential exists and/or an incident has been reported.

High/strong and thunderstorm winds are classified as winds that occur between 40 and 70 miles per hour lasting for 1 hour or greater or of 58 miles per hour for any duration. The Beaufort Scale, shown below, displays the ranges of wind speed and correlates them with their typical effects. At a level 7 and 8, citizens should remain indoors and anywhere above a level 8 will cause damage to structures. Damage to any amount of structures can cause serious disruption to Shasta County and the participating jurisdictions. The scope of damage can range from one residential house up to widespread destruction of homes and reinforced buildings throughout the planning area.

Illustration 4: Beaufort Scale

Beaufort number	Wind Speed (mph)	Seaman's term		Effects on Land
0	Under 1	Calm		Calm; smoke rises vertically.
1	1-3	Light Air		Smoke drift indicates wind direction; vanes do not move.
2	4-7	Light Breeze		Wind felt on face; leaves rustle; vanes begin to move.
3	8-12	Gentle Breeze		Leaves, small twigs in constant motion; light flags extended.
4	13-18	Moderate Breeze		Dust, leaves and loose paper raised up; small branches move.
5	19-24	Fresh Breeze		Small trees begin to sway.
6	25-31	Strong Breeze		Large branches of trees in motion; whistling heard in wires.
7	32-38	Moderate Gale		Whole trees in motion; resistance felt in walking against the wind.
8	39-46	Fresh Gale		Twigs and small branches broken off trees.
9	47-54	Strong Gale		Slight structural damage occurs; slate blown from roofs.
10	55-63	Whole Gale		Seldom experienced on land; trees broken; structural damage occurs.
11	64-72	Storm		Very rarely experienced on land; usually with widespread damage.
12	73 or higher	Hurricane Force		Violence and destruction.

Illustration Source: Unknown

Hail typically falls in sizes anywhere from half an inch to upwards of three (3) inches and at speeds of up to 120 mph. A complete hail index with size and typical damages, the Modified NOAA/TORR Hailstorm Intensity Scale, is presented below. Any incident(s) of hail can cause injury to Shasta County residents and animals, including livestock. Hailstones that are one (1) inch or more in diameter could cause damage to structures within the planning area. If windows are broken, some facilities would be rendered unusable until repaired.

Table 26: Modified NOAA/TORRO Hailstorm Intensity Scale

Modified NOAA/TORRO Hailstorm Intensity Scale				
Code	Intensity Category	Diameter (Inches)	Approximate Size	Typical Damage Impacts
H0	Hard Hail	0 - 0.33	Pea	No damage
H1	Potentially Damaging	0.33 - 0.60	Marble/Mothball	Slight damage to crops
H2	Potentially Damaging	0.60 - 0.80	Dime/Grape	Significant damage to crops
H3	Severe	0.80 - 1.20	Nickel to Quarter	Severe damage to crops, damage to glass and plastic, paint and wood scored
H4	Severe	1.20 - 1.60	Half Dollar	Widespread glass damage, vehicle bodywork damage
H5	Destructive	1.60 - 2.00	Silver Dollar to Golf Ball	Damage to tiled roofs, significant risk of personal injury
H6	Destructive	2.00 - 2.40	Egg	Aircraft bodywork dented; brick walls pitted
H7	Very Destructive	2.40 - 3.00	Tennis Ball	Severe roof damage, risk of serious injuries to persons not protected
H8	Very Destructive	3.00 - 3.50	Baseball to Orange	Severe damage to aircraft bodywork
H9	Super Hailstorms	3.50 - 4.00	Grapefruit	Extensive structural damage, risk of severe injury or fatal injuries to persons not protected
H10	Super Hailstorms	4.00+	Softball and up	Extensive structural damage, risk of severe injury or fatal injuries to persons not protected

Data Source: NOAA

A lightning strike is not categorized by any measure of intensity; just that it has occurred. A strike could damage structure throughout the county and render it unusable for a period of time or cause it to catch fire and damage it beyond repair. Most lightning strikes do not hit structures or people and therefore go unreported.

Table 27: Lightning Activity Intensity Levels

Lightning Activity Intensity Levels	
LAL Level	Description
LAL 1	No thunderstorms
LAL 2	Isolated thunderstorms: Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud-to-ground strikes in a 5-minute period.
LAL 3	Widely scattered thunderstorms: Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud-to-ground strikes in a 5-minute period.
LAL 4	Scattered thunderstorms: Moderate rain is commonly produced Lightning is frequent, 11 to 15 cloud-to-ground strikes in a 5-minute period.
LAL 5	Numerous thunderstorms: Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud-to-ground strikes in a 5-minute period.

Data Source: Vaisala U.S. National Lightning Detection Network

4.2.3 – Previous Occurrences

Shasta County and its participating jurisdictions have eight (8) recorded deaths and 11 recorded injuries due to Severe Storms.

Since 1950, NOAA and its National Centers for Environmental Information (NCEI), formerly the National Climatic Data Center, or NCDC, has recorded 27 hail events in Shasta County. These hail events caused $67,500 in recorded property damage and $300,000 in crop damage.

Since 1950, NOAA has recorded 92 high/strong wind events in Shasta County. These resulted in seven (7) deaths and 11 injuries. They also caused $7,215,000 in recorded property damage and $50,000 in crop damage.

Since 1950, NOAA/NCEI recorded one (1) lightning event in Shasta County. These lightning strikes caused $10,000 in recorded property damage.

Since 1950, NOAA has recorded 12 thunderstorm wind events in Shasta County. These resulted in one (1) death and caused $65,000 in recorded property damage.

For a complete list of NOAA/NCEI-recorded severe storm events, please reference Appendix E.

4.2.3A – Probability of Future Occurrences, Severe Storms

Based on its history of previous occurrences, Shasta County and the participating jurisdictions of the City of Anderson and the Igo Ono Community Services District can expect a hail event with 100% probability per year, or one (1) event per year. The planning area also can expect high/strong or thunderstorm wind events with a 223.80% probability per year, or 2.23 events per year, as well as a lightning event with 4.7% probability, or .047 lightning events per year. Thus, the probability of future occurrences of severe weather is considered **'highly likely'** for hail, **'highly likely'** for high/strong and thunderstorm wind, and **'rare'** for lightning (strikes).

Table 28: Probability of Future Occurrences, Severe Storms

Probability of Future Occurrences, Severe Storms			
Event Year	Event Type/Count		
	Hail	High/Strong and Thunderstorm Wind	Lightning
2000-2010	5	21	0
2011	0	0	0
2012	0	1	0
2013	2	1	0
2014	4	5	0
2015	1	4	0
2016	0	0	0
2017	2	0	0
2018	0	1	0
2019	7	1	1
2020	0	4	0
2021	0	9	0
Total Years =	21	21	21
Total Recorded Events =	21	47	1
Yearly Probability =	100%	223.80%	4.7%

Data Source: NOAA/NCEI Storm Events Database

NOTE: Climate change may intensify severe weather in many regions across the country, even in areas where severe weather is rare.

4.2.4 – Vulnerability & Impact

Hail Impacts – There have been 27 recorded hail events in Shasta County since 1950, of which the range of magnitude was between 0.75 and three (3) inches in diameter with an average of 1.33 inches. Based on the Modified NOAA/TORRO Hailstorm Intensity Scale and future probability calculations in the previous table, the planning area can expect 3.4074 hail events per year ranging from 'severe' to 'destructive.' Hail can damage property, infrastructure, and people causing disruptions in the local community.

High/Strong and Thunderstorm Wind Impacts – NOAA/NCEI recorded 92 wind events in Shasta County since 1996, of which the range of magnitude was between 36 knots (41.42 mph) and 134 knots (154.2 mph) with an average of 53.81 knots (61.92 mph). Based on the Beaufort Scale and future probability calculations in the previous table, the planning area can expect 2.19 wind events per year ranging from Beaufort Scale 8 – "Twigs and small branches broken off trees" to Beaufort Scale 12 – "Violence and destruction." High wind can destroy critical infrastructure including power lines and buildings. Power outages impede emergency services and continuity of government.

Lightning Impacts – There has only been one (1) lightning event recorded in Shasta County since 1993, costing $10,000 in damage. Based on future probability calculations in the previous table, the planning area can expect .0435 lightning events per year with an unknown range of impact.

Table 29: Historical Impacts, Severe Storms

Historical Impacts, Severe Storms			
Summary Statistics	Hail	High/Strong and Thunderstorm Wind	Lightning
Count of Events	27	44	1
Average Magnitude	1.33	53.81 knots	-
Magnitude Range	0.75 - 3 inches	36 - 134 knots	-
Average Cost	$2,500	$121,420.45	$0
Magnitude of Cost	$0 - $500,000	$0-$3,183,000	$10,000
Total Recorded Cost	$367,500	$5,342,500.00	$0
Average Fatalities	0.00	0.15	0
Total Fatalities	0	7	0
Average Injuries	0	.25	0
Total Injuries	0	11	0

Data Source: NOAA/NCEI Storm Events Database

Vulnerability of Facilities

Structural vulnerability to severe storms is the same throughout the planning area. Hail can be costly by damaging rooftops, outdoor equipment, and windows. Lightning can strike anything and has the potential to significantly damage electrical infrastructure or ignite a fire. High/strong and thunderstorm wind can damage buildings and infrastructure and create flying debris, which can exacerbate things. Strong enough wind can cause structural damage to older, less well-constructed buildings; even toppling or leveling them.

The average hail event in the Shasta County costs $2,500 while the existing range of a single incident has been from $0 to $50,000.

The average wind event in Shasta County costs $121,420.45, while the existing range of a single incident has been from $0 to $3,183,000.

The average lightning event in Shasta County costs $10,000. Since there is only one (1) recorded event, a range cannot be calculated.

Vulnerability of Population

Shasta County and the participating jurisdictions' vulnerability to severe storms is the same throughout the planning area. In the absence of proper shelter, hail can cause serious injury or even death to an unprotected person. If Shasta County and its participating jurisdictions' citizens stay indoors and away from windows, they will be protected against the hazard. Similarly, they can avoid being struck by lightning by staying indoors. Although lightning may strike a structure sheltering people, it is extremely unlikely that the strike itself will directly injure or kill a sheltered person.

As long as a structure is able to maintain its integrity during high-speed winds, it will protect people from injury or death. However, old, or poorly constructed facilities are not good shelter, as flying debris (or the wind itself) can break windows or cause structural damage.

Historically, there have been 8 deaths and 11 injuries recorded from severe storms in the planning area.

Vulnerability of Systems

Shasta County and participating jurisdictions' assets and systems are equally vulnerable to severe storms.

Hail damage is typically superficial and does not hamper a community's assets, systems, or activities. High/strong and thunderstorm wind events, on the other hand, can damage or destroy multiple structures and points of infrastructure, including a community's power grid. Lightning can damage or destroy a community asset, but since strikes are typically isolated, it is unlikely to impact a larger system.

4.2.4A – Critical Facilities & Infrastructure

All critical facilities and infrastructure are equally at risk since severe storms indiscriminately affect the entire planning area. A complete list of infrastructure and critical facilities can be found in Appendix D.

4.2.4B – Land Use & Development Trends

Shasta County and the participating jurisdictions' predominant growth area is residential housing, as detailed in Section 3.2 – Land Use & Development Trends.

Increased residential growth will not increase Shasta County or the participating jurisdictions' vulnerability and risk to severe storms as long as the residential structures continue to be built under currently adopted international and state building codes.

Any buildings or infrastructure built in the future will have the same risk as other buildings or infrastructure built within the planning area.

4.2.4C – Unique or Varied Risk

To predict such risks for the planning area, one would need a comprehensive catalog of wind resilience ratings, hail impact ratings, and grounding capacity for every piece of infrastructure and structure. Such a study is beyond the resources of most communities including Shasta County and the participating jurisdictions. Based on the best available resources, lack of predictable differences in vulnerabilities, and that the hazard affects the entire planning area, Shasta County and its participating jurisdictions do not have any unique or varied risk to the severe storms hazard.

4.2.4D – Repetitive Loss Properties

Not applicable to the hazard.

4.2.5 – HAZUS Models

Not applicable to the hazard.

Photo Source: iStock by Getty Images

4.2(V) – Volcano

4.2.1 – Hazard Description

The U.S. Geological Survey (USGS) describes volcanoes as openings or vents, where lava, tephra (small rocks), and steam erupt to the Earth's surface. Accordingly, volcanoes can produce a wide variety of hazards that can destroy property and kill people. Volcanic eruptions result in fires, toxic gas emissions, air pollution, and extensive ash deposits. Ash deposits can create public health emergencies, affect telecommunications, and lead to structural damage or collapse. Volcanic eruptions can also catalyze earthquakes, landslides, and floods. Landslides are known to occur even when there is no active disruption.

Large, explosive eruptions can endanger people and property hundreds of miles away from the actual volcano and even affect global climate.

4.2.2 – Location & Extent

According to *The World Atlas*, California contains a total of 20 volcanoes. These are generally well removed from urban areas. Regions at greater risk of experiencing volcanic activity such as lava flows, ash fall, lahars (volcanic mudflows), and debris avalanches are limited to sparsely populated resort areas (e.g., Shasta and Mammoth Lakes regions).

Mount Shasta, which is the highest volcano in the state, was originally within Shasta County, but it is now part of Siskiyou County. The original Shasta County included a major portion of Northern California,

including Mt. Shasta and all the territory that later became Modoc, Lassen, and Siskiyou counties as well as parts of present-day Plumas and Tehama counties.

Given the proximity of Mount Shasta, as well as the Medicine Lake Volcano and the Lassen Volcanic Field, the planning area is at risk of various volcano-related hazards. These include lava flows, pyroclastic flows and mudflows, and tephra eruptions, as described by the following:

Lava Flows: Potential hazard zones for future lava flows erupted at and in the vicinity of Mount Shasta are based on the vent locations of past lava flows, the areal extents of those lava flows, and their behavior. It is likely that most future eruptions of lava will occur at the central vents rather than on the flanks of the volcano. However, some future lava flow could erupt at flank vents located five miles downslope from the present summit and individual flows may travel five miles downslope from their sources. The outer limit of potential hazard from lava flows is placed at a distance of eleven miles from the summit, excluding areas within eleven miles of the summit that are more than 350 feet above the surrounding fan surface or any adjacent low areas. The eleven-mile extent of this zone is based on the assumption that future lava flows will be of andesite or basaltic andesite and of similar viscosity and volume to those erupted in Holocene time.

The area of potential hazard from lava flows is divided into three concentric zones. In general, within the 22-mile diameter area, the risk is greatest near the present summit, where eruptions of lava have been most frequent in the past and decreases with distance outward. Zone A extends from the summit outward 3.7 miles in all directions and includes the main vents that were active during Holocene time and their associated cones. Most future lava flows are likely to erupt within Zone A, thereby constituting it to have the greatest potential threat from lava flows.

Zone B consists of a ring-shaped area that extends from 3.7 to 7.4 miles from the summit. It is a zone into which lava flows from the Hotlum and Shastina central vents have flowed. In the northwest and west sectors, it is also a zone in which lava flows have been erupted from flank vents during Holocene time.

Zone C is a ring extending from 7.4 to 11.1 miles from the summit. No known lava flows have been erupted form vents in Zone C during Holocene time; however, this zone has been affected by flows that were erupted from vents in Zone B and flowed into Zone C.

Pyroclastic Flows and Mudflows: Potential hazard zones for future pyroclastic flows and mudflows at and in the vicinity of Mount Shasta are based on the locations of past flows, the areal extents of those flows, and their behavior. Zones 1, 2, 3 and 4 were created to measure risk of pyroclastic flows and mudflows. Parts of Zone 1, centered on the volcano, have frequently been affected by pyroclastic flows and mudflows during the last 10,000 years. Future eruptions like those of the past will affect this zone more frequently than any other area around Mount Shasta. In general, the degree of hazard within this zone decreases outward in all direction from the summit. The greatest hazard from mudflows is in deep canyons. Mudflows tend to follow valleys and may not spread out until they reach fan surfaces.

Zone 2 is a zone or irregular shape between 6.2 and 12.4 miles from the summit of Mount Shasta that has been affected less frequently by pyroclastic flows and mudflows than Zone 1. The outer boundary is based on the maximum distance at which pyroclastic flow deposits younger than 10,000 years have been found.

Zone 3 includes areas between 12.4 and 18.6 miles from Mount Shasta that are known to have been affected only by mudflows, but that could be affected by very large and infrequent pyroclastic flows. No known pyroclastic flows have reached distances of more than 12.4 miles from Mount Shasta. Mudflows are likely to cover broad areas in Zone 3 as often as several times per century. The risk from mudflows is greatest on smooth fans and topographic depressions near major valleys which head on Mount Shasta.

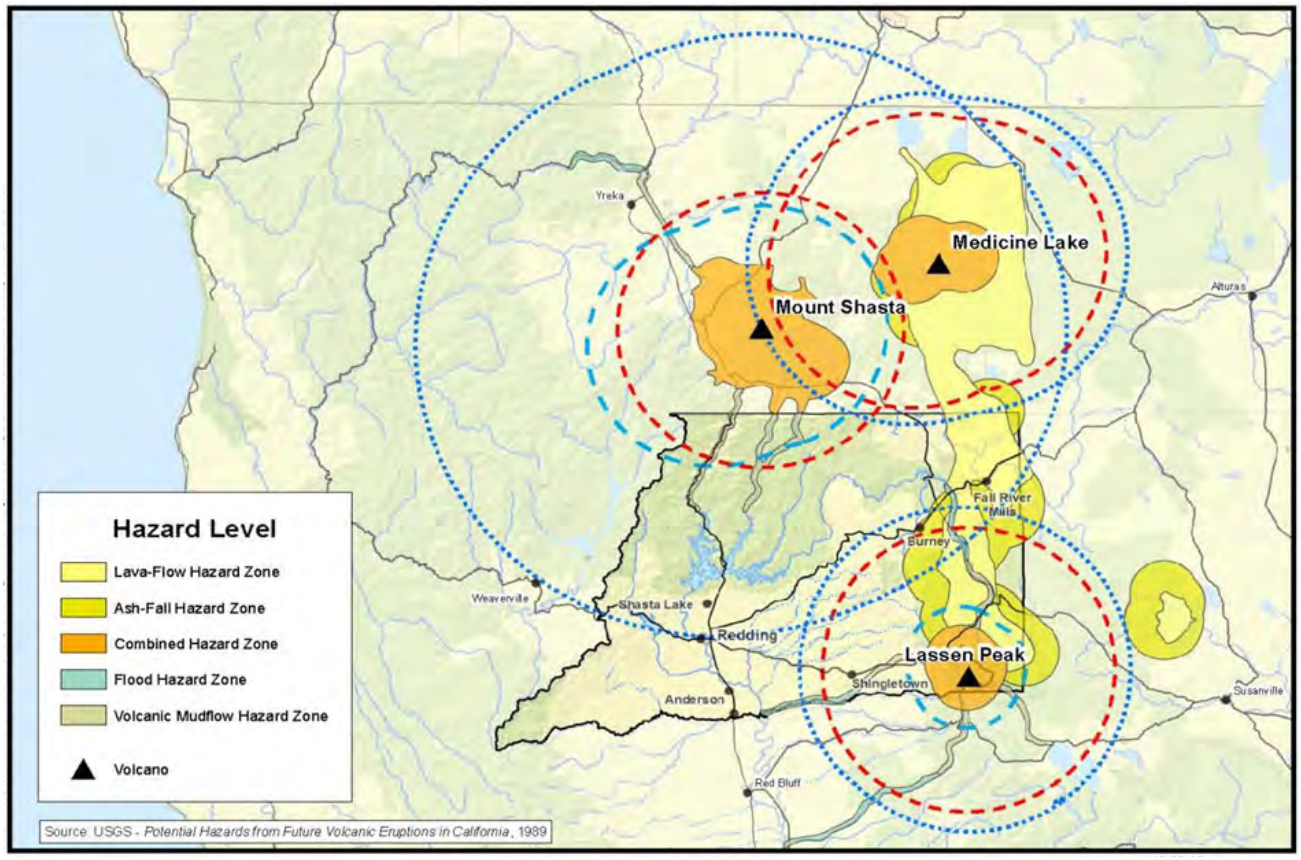
Zone 4 consists of areas that have been affected only by mudflows and are beyond the limit of the largest predictable pyroclastic flows. This zone reaches from 18.6 to 43.4 miles south from Mount Shasta. Future

mudflows may extend many tens of kilometers south along major drainages and may reach Shasta Lake. Future mudflows may also spread out in Shasta Valley northwest of Mount Shasta and could cover wide areas of the valley floor. Broad areas within and beyond the limits of Zones 1-3 could be affected by clouds of hot ash and air blasts associated with pyroclastic flows. Ash clouds and associated air blasts would not be restricted to topographic depressions as pyroclastic flows and mudflows would be but could affect all areas within several kilometers of pyroclastic flows.

Tephra: Eruptions of pumiceous tephra form Mount Shasta have been rare and of small volume in the past 10,000 years. Significant ash-fall thicknesses from a single eruption are likely to cover only a narrow band downwind from the vent if winds are strong and unidirectional during the eruption. A review of wind records indicates that high-altitude winds in this region blow much more frequently and at higher speeds toward the east-northeast and east than toward the west. This data suggests that risk from tephra could be considerably less west of Mount Shasta than toward the east and that ash from about 90 percent of the future tephra eruptions could be expected to fall east of the mountain. It is possible that an eruption of ash could be deposited on the communities that lie generally west, southwest, and south of Mount Shasta. This ultimately means that a future eruption at Mount Shasta could deposit ash on communities like Weed and Mount Shasta.

Volcano-related hazards with the potential to impact the planning areas stem from three locations: Mount Shasta, Medicine Lake Volcano, and the Lassen Volcanic Field.

Map 18: Northern California Volcanic Hazards



Map Source: USGS

Mount Shasta – Mount Shasta has been the most active volcano in California during the past 4,000 years. During that time, it has erupted on average about once every 300 years, producing many pyroclastic flows and lahars. Mount Shasta last erupted in 1786.

Medicine Lake Volcano – Medicine Lake Volcano is a broad shield volcano capped by a 4- by 7-mile-wide caldera that erupted at least seven times in the past 4,000 years; most recently about 950 years ago. With a volume of more than 130 cubic miles, it is the largest volcano in the Cascade Mountain Range.

Lassen Volcanic Field – The Lassen Volcanic Field includes Lassen Peak and is the southernmost volcanic center in the Cascade Mountain Range. The most recent volcanic eruptions in California occurred at Lassen Peak from 1914 to 1917. An explosive eruption on May 22, 1915, produced a large pyroclastic flow, lahars and ash that fell as far away as Elko, Nevada, 300 miles to the east.

After the eruption of Mount St. Helens in in Washington State in 1980, the USGS intensified its monitoring of active and potentially active volcanoes in the Cascade Mountain Range. Monitoring of the Lassen area includes periodic measurements of ground deformation and volcanic gas emissions and continuous transmission of data from a local network of nine seismometers to USGS offices in Menlo Park, California. Should indications of a significant increase in volcanic activity be detected, the USGS will immediately deploy scientists and specially designed portable monitoring instruments to evaluate the threat. In addition, the National Park Service has developed an emergency response plan that would be activated to protect the public in the event of an impending eruption.

4.2.3 – Previous Occurrences

According to an April 2005 report published by the USGS, Mount Shasta and Lassen Peak are considered to be very high threat volcanoes with limited monitoring. Mount Shasta erupted with pyroclastic flows in 1786, and Lassen Peak experienced a series of small explosions in 1914 that was followed by destructive lava flows in 1915 (USGS, 2004). Although Shasta County has experienced some volcanic activity, the South-Central Urban Region has not sustained damages attributed to volcanic activity as far as records have been maintained. In their April 2005 report, the USGS proposed the highest level of monitoring, Level 4, for Mount Shasta and Lassen Peak, both of which are currently at the Level 2 monitoring stage. Monitoring includes tracking detailed changes in real-time of on-going activities such as seismic, land deformation and gas emissions.

4.2.3A – Probability of Future Occurrences

Specific volcanic threats are complex but may be simplified to include lava flows, mudflows, and ash-fall. Prevailing winds are to the east-northeast. Medicine Lake poses only a nominal threat due to its distance from populated areas of Shasta County Mount Shasta is beyond the eleven-mile horizon for lava flows, but mudflows may impact the Upper Sacramento and McCloud Rivers. The Upper Sacramento River Canyon contains several communities (Lakehead, Sweetbriar, Castella, Cragview), Interstate 5 and the Union Pacific Railroad which could be impacted by mudflows in the river. The river is steep and channelized with few obstructions. Community water systems draw from tributaries and springs instead of the river itself so they would not be impacted by mudflows. Water quality degradation may impact fisheries and recreation.

Lassen Peak is located within Lassen National Park in the sparsely inhabited southeast corner of the Shasta County. Park roads, lands and facilities would potentially be subject to lava flows and mudflows. State Route 44 traverses the northerly Park boundary and would potentially be impacted by lava flows. The Park is surrounded by National Forest lands and private timber holdings. There is little permanent habitation within the eleven-mile horizon for lava flows. Hat Creek extends northerly from the park and may be subject to lava flows and mudflows. The community of Hat Creek is within this area. The U.S. Geological Survey and the State of California monitor Lassen Peak and Mount Shasta. With this system established, there would be sufficient warning of renewed volcanic activity to evacuate the immediate vicinity. State Routes 44 and 89 may be impacted and could become impassable for extended periods.

All three volcanic locations (Mount Shasta, Medicine Lake, Lassen Volcanic Field) may generate ash-fall over large areas of Shasta County. Prevailing winds are to the east-northeast, away from the City of

Anderson and most other densely populated areas of Shasta County. Ash-fall is most likely to occur in the Intermountain communities of Burney, Hat Creek, Fall River Mills and MacArthur.

Shasta County and the participating jurisdictions have recorded 0 volcanic eruptions since 1990; however, the risk is ever-present, and the range of magnitude will always be considered severe. So, while the probability of future events is presently 0%, or '**rare,**' the hazard remains a concern for the entire planning area.

4.2.4 – Vulnerability & Impact

There are no recorded historical impacts to the planning area from the volcano hazard. Regardless, volcanic activity in the form of lava flow, pyroclastic flows and mudflows, and tephra eruptions could have a significant impact on Shasta County's population. Homes and businesses could damage or destroyed, critical facilities and infrastructure damaged, or lives lost.

Table 30: Historical Impacts, Volcanoes

Historical Impacts, Volcanoes	
Summary Statistics	
Count of Events	0
Average Magnitude	-
Average Range	-
Average Cost	0
Magnitude of Cost	$0
Total Recorded Cost	$0
Average Fatalities	0
Total Fatalities	0
Average Injuries	0
Total Injuries	0

Data Source: NOAA/NCEI Storm Events Database

Vulnerability of Facilities

Structural vulnerability to volcanoes is the same throughout Shasta County and its participating jurisdictions. Ash accumulation can cause roofing to collapse on old or poorly constructed facilities. Lava can destroy structures and pyroclastic flows destroy everything in their path. Lahars can cause damage comparable to flooding.

The existing range of a single incident has been $0; however, a volcanic eruption in the region will invariably cause long-term economic damage.

Vulnerability of Population

Shasta County and the participating jurisdictions' populations are equally vulnerable throughout the planning area. All citizens are at risk from prolonged mass evacuations from longer lasting eruptions. Additionally, if a volcanic eruption restricts travel, people may become immobile on roadways and be at the mercy of their vehicle's gas supply. They may also be forced to remain indoors with reduced ventilation or sufficient heating/cooling sources due to ash accumulation.

Historically, there have been 0 recorded deaths and 0 injuries relating to volcanic eruptions across in Shasta County.

Vulnerability of Systems

Shasta County and the participating jurisdictions' assets and systems' vulnerability to volcanoes is the same throughout the planning area. Volcanoes create havoc on roads by impacting travel from mass evacuations. Additionally, ash accumulation can directly bring down power lines or bring down vegetation onto power lines. From these scenarios, Shasta County and the participating jurisdictions can suffer power outages, making it difficult to heat or cool structures depending on the time of year the volcanic eruption.

4.2.4A – Critical Facilities & Infrastructure

All infrastructure and critical facilities are equally at risk since volcanoes impact the entire planning area. complete list of infrastructure and critical facilities can be found in Appendix D.

4.2.4B – Land Use & Development Trends

Shasta County and its participating jurisdictions' predominant growth area is residential housing, as detailed in Section 3.1.1 – Land Use & Development Trends.

Increased residential growth will not increase Shasta County or the participating jurisdictions' vulnerability and risk to volcanoes as long as the residential structures continue to be built under currently adopted international and state building codes.

Any buildings or infrastructure built in the future will have the same risk as other buildings or infrastructure built within the planning area.

4.2.4C – Unique or Varied Risk

To predict such risks for Shasta County and the participating jurisdictions, one would need a comprehensive catalog of local capabilities. Such a study is beyond the resources of most communities, including Shasta County and the participating jurisdictions. Based on the best available resources, lack of predictable differences in vulnerabilities, and the fact that the hazard has the potential to affect the entire planning area, Shasta County and the participating jurisdictions do not have any multi-jurisdictional, unique, or varied risk to volcanoes.

4.2.4D – Repetitive Loss Properties

Not applicable to the hazard.

4.2.5 – HAZUS Models

Not applicable to the hazard.

Photo Source: iStock by Getty Images

4.2(WF) – Wildfire

4.2.1 – Hazard Description

The National Weather Service (NWS) defines a wildfire as any free-burning, uncontainable wildland fire not prescribed for the area which consumes the natural fuels and spreads in response to its environment. They can occur natural, by human accident, and on occasion, by human action. Typically, their origin is far from human development except for roads, powerlines, and similar infrastructure. There is constant threat to hikers, campers, and other people engaging in outdoor activities. Significant danger to life and property occurs when human development meets and becomes intertwined with wildland vegetation. This threat increases exponentially in areas prone to intermittent drought or that are generally arid or dry.

Population de-concentration in the U.S. has resulted in rapid development in the outlying fringe of metropolitan areas and in rural areas with attractive recreational and aesthetic amenities, especially forests. This demographic change is increasing the size of the wildland urban interface (WUI), which is defined as the area where structures and other human development meet or intermingle with undeveloped wildland. Its expansion has increased the likelihood that wildfires will threaten life and property.

Rampant destruction can be mitigated by fire services regularly engaging in preventative burns and land use measures to minimize the spread of wildfire events. Both of these practices are routinely used in areas prone to wildfire, including the State of California. Homeowners and business owners can also do their part by taking precautionary efforts, such as following local fire-related ordinances; removing leaves, limbs, and other debris from property; and creating a defensible space around structures. Among those emphasizing the need for such preemptive actions is Firewise USA™, a national recognition program that provides instructional resources to inform people how to adapt to living with the risk of wildfire.

4.2.2 – Location & Extent

The expansion of the WUI in recent decades has significant implications for wildfire management and its proactive and emergency response capabilities. The WUI creates an environment in which fire can move readily between structural and vegetation fuels. Two types of WUI are mapped: intermixed and interface. Intermix WUI are areas where housing and vegetation intermingle; interface WUI are areas with housing in the vicinity of dense, contiguous wildland vegetation.

The duration of a wildfire depends on the weather conditions, how dry it is, the availability of fuel to spread, and the ability of responders to contain and extinguish the fire. Historically, some wildfires have lasted only hours, while other fires have continued to spread and grow for an entire season. They spread quickly and often begin unnoticed until they have grown large enough to signal by dense smoke. If fuel is available, and the high wind speeds hit, a wildfire can spread over a large area in a very short amount of time. These factors make the difference between small upstart fires easily controlled by local fire services to fires destroying thousands of acres requiring multiple state and federal assets for containment and suppression.

Given the WUI and Intermix depictions in section 3, every jurisdiction within the planning area is exposed to wildfire.

The following table details the range of wildfire damages as identified by the Burn Severity Index. The severity of the wildfire depends on many quickly changing environmental factors. It is impossible to strategically estimate the severity of a wildfire as the quickly changing factors, drought conditions and wind speed, have such a great influence on the wildfire conditions. If exposed to the WUI or Intermix, Shasta County or its participating jurisdictions could experience a wildfire ranging from 0 to 4.

Table 31: Burn Severity Index

Burn Severity Index			
Ranking	Burn Severity	Description	Characteristics
0	Unburned	Fire extinguished before reaching microsite	• Leaf litter from previous years intact and uncharred • No evidence of char around base of trees and shrubs • Pre-burn seedlings and herbaceous vegetation present
1	Low Severity Burn	Surface fire which consumes litter yet has little effect on trees and understory vegetation	• Burned with partially consumed litter present • Evidence of low-flame heights around base of trees and shrubs (<0.5 m) • No significant decreases in overstory and understory basal area, diversity, or species richness from pre-burn assessments • Usually burning below 80 degrees Celsius
2	Medium-Low Severity Burn	No significant differences in overstory density and basal area, and no significant differences in species richness; however, understory density, basal area, and species richness declined	• No litter present and 100% of the area covered by duff • Flame lengths <2 m • Understory mortality present, little or no overstory mortality
3	Medium-High Severity Burn	Flames that were slightly taller than those of Medium-Low Severity intensity fires, but these fires had occasional hot spots that killed large trees with significant reduction in the understory	• Soil exposure on 1-50% of the area • Flame lengths <6 m • High understory mortality with some overstory trees affected
4	High Severity Burn	Crown fires, usually a stand-replacing burn with relatively high overstory mortality	• Soil exposure >50% of the area • Flame lengths >6 m • Higher overstory mortality >20% • Usually burning above 800 degrees Celsius

Data Source: Southern Appalachian Forest Coalition

4.2.3 – Previous Occurrences

Shasta County and the participating jurisdictions regularly experience wildfire events. The State of California reports the planning area has recorded 55 wildfires between 1950 and 2021. The Storm Events Database developed by the National Oceanic and Atmospheric Administration and its National Centers for Environmental Information (NOAA/NCEI) indicates 55 of these wildfires occurred between 2000 and 2021, resulting in 111 recorded deaths and 58 injuries. Over $18.5 billion in damages occurred since 2000 with over $17 billion in damages from the Camp Fire alone. The Camp Fire was the deadliest and most destructive wildfire in California's history, and the most expensive natural disaster in the world in 2018 in terms of insured losses. Many residents from Butte County evacuated or stayed in Shasta County straining local resources. Shasta County provided mutual aid to Butte County and activated their EOC.

The below fires occurred in the County over the past five years and incurred significant losses:

- Carr Fire, 7/23/18-8/30/18: 229,651 acres burned, 7 fatalities, 1,614 structures destroyed, and 279 structures damaged.
- Creek Fire, 6/24/18-1/4/19: 1,678 acres burned, 11 structure destroyed and 1 injury.
- Zogg Fire, 9/27/20-10/13/20: 56,338 acres burned, 4 fatalities, 1 injury, 204 structure destroyed and 27 structures damaged.
- Fawn Fire, 9/22/21-10/2/21: 8,578 acres burned, 3 injuries, 185 structures destroyed, and 26 structures damaged.

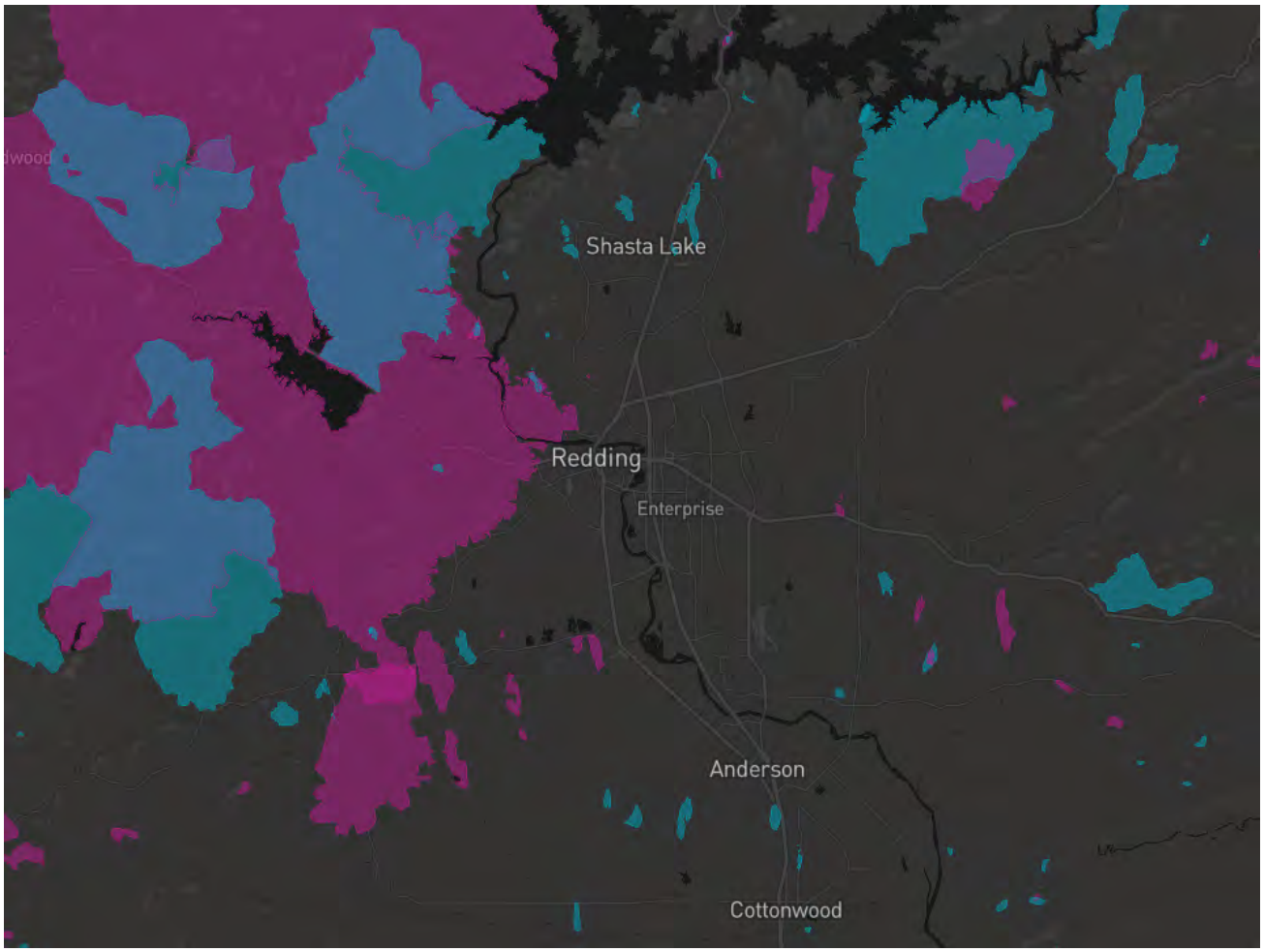
The following table identifies previous occurrences of wildfire in the planning area between 2000 and 2021.

Table 32: Previous Occurrences, Wildfire

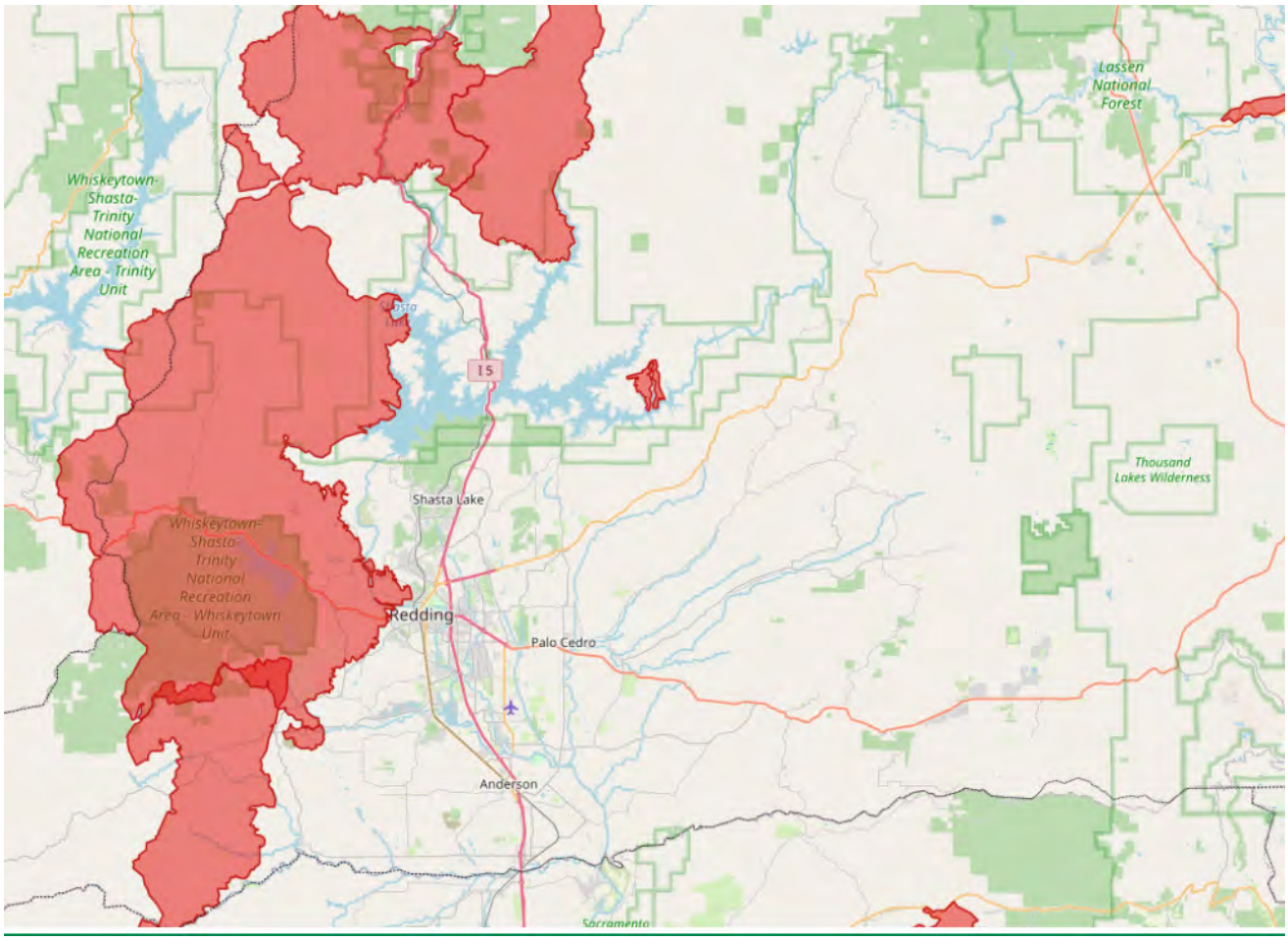
Previous Occurrences, Wildfire	
Event Year	Event Count
2000-2010	20
2011	0
2012	0
2013	1
2014	2
2015	0
2016	1
2017	0
2018	6
2019	4
2020	12
2021	9
Total =	55

Data Source: NOAA/NCEI Storm Events Database

Shasta County Wildfires from 2000-2020



Burn Severity Index



4.2.3A – Probability of Future Occurrences

The data collected by NOAA/NCEI is based upon the county level only. Utilizing this information, Shasta County can expect a wildfire event with at 261.90% probability per year, or 2.9 wildfire events per year. Thus, the probability of future occurrences is considered **'highly likely.'**

Table 33: Probability of Future Occurrences, Wildfire

Probability of Future Occurrences, Wildfire	
Event Year	Event Count
2000-2010	20
2011	0
2012	0
2013	1
2014	2
2015	0
2016	1
2017	0
2018	6
2019	4
2020	12
2021	9
Total Years =	21
Total Recorded Events =	55
Yearly Probability =	261.90%

Data Source: NOAA/NCEI Storm Events Database

4.2.4 – Vulnerability & Impact

Shasta County has recorded 65 wildfires since 1950, 55 of which occurred between 2000 and 2021 (per the NOAA/NCEI Storm Events Database. While previous occurrences prove useful in determining future probability, the potential impact of future wildfire events is near impossible to quantify. This is because more specific predictions on potential impacts are dependent upon highly variable and continually changing conditions. Such conditions are not appropriate at this level of planning. Wildfires can destroy property can render survivors homeless. Communities in remote areas face a higher risk from wildfires. Burn scars leave areas vulnerable to flooding and erosion due to the lack of vegetation.

Vulnerability of Facilities

A wildfire burning near a jurisdiction may cover it in soot, cause secondary fires from traveling coals, or directly engulf facilities, burning them to the ground. Facilities can be protected by creating defensible spaces or buffer zones, maintaining a fuel-free environment, and/or modifying structures to prevent the growth of a wildfire.

Vulnerability of Population

The greatest vulnerability of a jurisdiction's population is the inability to properly evacuate in an emergency. In particular, the population can be caught off guard due to slow or improper warning systems, erratic weather conditions, or apathy. The population of Shasta County, as determined by the U.S. Decennial Census (2020) is 182,115.

Vulnerability of Systems

A variety of critical systems, including utilities, communications, and transportation can be severely impacted, if not rendered inoperable, in the event of a wildfire. For example, in the event a wildfire begins to burn and grow, evacuation routes may become blocked by the fire or by other people attempting to evacuate. The impingement of the local transportation system makes appropriate warning and information paramount in mitigating Shasta County and the participating jurisdictions systems' vulnerability to wildfire.

4.2.4A – Critical Facilities & Infrastructure

Wildfires have the potential to affect the entire planning area. A complete list of critical facilities and infrastructure can be found in Appendix E.

Table 34: Critical Facilities & Infrastructure, Wildfire Risk

Critical Facilities & Infrastructure, Wildfire Risk	
Jurisdiction	Level of Risk (Low, Medium, High)
Shasta County	Every facility in Shasta County is in the WUI or a vegetated area. Some critical facilities reside in high-risk areas with only one way out next to ample vegetation. Evacuation routes remain dangerous.
City of Anderson	Every facility in Shasta County is in the WUI or a vegetated area. Some critical facilities reside in high-risk areas with only one way out next to ample vegetation. Evacuation routes remain dangerous.
Igo Ono Community Services District	Some critical facilities reside in high-risk areas with only one way out next to ample vegetation. Residential communities reside in high-risk areas with limited escape options.

Data Source: Shasta County OES

4.2.4B – Land Use & Development Trends

Shasta County and the participating jurisdictions' predominant growth area is residential housing, as detailed in Section 3.2 – Land Use & Development Trends.

Increased residential growth can significantly increase a jurisdiction's risk to wildfires. If the growth occurs in the WUI or Intermix, the total risk increases. Shasta County and the participating jurisdictions can mitigate the risk of this growth by introducing structural standards which help prevent the spread of wildfire, creating defensible spaces and buffer zones, or not allowing growth in WUI and Intermix area.

Any buildings or infrastructure built in the future will have the same risk as other buildings or infrastructure built within the planning area.

4.2.4C – Unique or Varied Risk

To predict such risks for Shasta County and the participating jurisdictions, one would need a comprehensive catalog of local capabilities. Such a study is beyond the resources of most communities, including Shasta County and the participating jurisdictions. Based on the best available resources, lack of predictable differences in vulnerabilities, and the fact that the hazard has the potential to affect the entire planning area, Shasta County and the participating jurisdictions do not have any multi-jurisdictional, unique, or varied risk to wildfires.

Table 35: Unique or Varied Risk, Wildfires

Unique or Varied Risk, Wildfire	
Jurisdiction	Risk Characteristics
Shasta County	Some critical facilities are in low-risk areas in lower elevation. Medium risk areas are around the hills and include power lines and roads. Some critical facilities reside in medium risk areas. High-risk areas feature remote structures and isolated roads. Some of these include evacuation routes.
City of Anderson	Some critical facilities are in low-risk areas in lower elevation. Medium risk areas are around the hills and include power lines and roads. Some critical facilities reside in medium risk areas. High-risk areas feature remote structures and isolated roads. Some of these include evacuation routes.
Igo Ono Community Services District	Some critical facilities are in low-risk areas in lower elevation. Medium risk areas are around the hills and include power lines and roads. Some critical facilities reside in medium risk areas. High-risk areas feature remote structures and isolated roads. Some of these include evacuation routes.

Data Source: Shasta County Public Works and the City of Anderson Public Works

4.2.4D – Repetitive Loss Properties

Not applicable to the hazard.

4.2.5 – HAZUS Models

Not applicable to the hazard.

Photo Source: iStock by Getty Images

4.2(WW) – Winter Weather

4.2.1 – Hazard Description

Winter weather encompasses multiple weather conditions. Included are strong winds, ice storms, heavy or prolonged snow, sleet, and extreme temperatures. Winter weather can be increasingly hazardous in areas and regions that only see such conditions intermittently.

This hazard mitigation plan defines winter weather (of a potentially severe nature) as a combination of the following winter weather conditions as defined by the National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service (NWS).

Ice Storm: An ice storm is used to describe occasions when damaging accumulations of ice are expected during freezing rain situations. Significant accumulations of ice pull down trees and utility lines resulting in loss of power and communication. These accumulations of ice make walking and driving extremely dangerous. Significant ice accumulations are usually accumulations of ¼" or greater.

Heavy Snow: This generally means snowfall accumulating to four (4) inches or more in depth in 12 hours or less; or snowfall accumulating to six (6) inches or more in depth in 24 hours or less. In forecasts, snowfall amounts are expressed as a range of values, e.g., "8 to 12 inches." However, in heavy snow situations where there is considerable uncertainty concerning the range of values, more appropriate phrases are used, such as "...up to 12 inches..." or alternatively "...8 inches or more."

Winter Storm: A winter storm comes in the form of heavy snow, heavy freezing rain, or heavy sleet. Such hazardous storms may also include extremely low temperatures and increased wind.

For this plan update winter weather includes a storm lasting more than 24 hours or snowfall greater than six inches.

4.2.2 – Location & Extent

Winter weather occurs throughout Shasta County and thus, the entire planning area. These events, when they do occur, do so on a massive geographic scale, often affecting multiple counties, regions, or states.

Winter weather typically forms with warning and is often anticipated. However, unlike other large storm fronts, the severity of a storm is not as easily predicted and when it is, the window of notification is up to few hours to under an hour. Although meteorologists estimate the amount of precipitation that will drop, it is not known exactly how much snow will fall, whether the precipitation be come in the form of sleet or freezing rain, or how powerful the winds will be until the storm is already affecting a community.

Winter weather can involve moderate snowfall over a few hours, inches of freezing rain or sleet, or blizzard conditions and extremely cold temperatures that lasts for extended periods of time.

4.2.3 – Previous Occurrences

Since 1990, NOAA and its National Centers for Environmental Information (NCEI) recorded no ice storm events in Shasta County.

Since 1990, NOAA has recorded 56 heavy snow events in Shasta County. These resulted in one (1) death and $0 in property damage.

Since 1990, NOAA/NCEI recorded 350 winter storms in Shasta County. These resulted one (1) death and $450,000 in property damage.

Information specific to these severe winter weather events can be found in Appendix E.

4.2.3A – Probability of Future Occurrences, Winter Weather

Based on historical data, the likelihood of a winter weather, i.e., heavy snow and winter storms, occurring in Shasta County is 95.71% per year, and therefore considered **'highly likely.'** The likelihood of an ice storm occurring within the planning area is 0% and is therefore considered **'rare.'** The table below reviews data from 1990 to present day.

Table 36: Probability, Severe Winter Weather

Probability, Winter Weather		
Event Year	Event Count	Event Types
1990 - 1999	95	Winter Storm, Heavy Snow
2000 - 2010	181	Winter Storm, Heavy Snow
2011	24	Winter Storm
2012	13	Winter Storm
2013	6	Winter Storm
2014	6	Winter Storm, Heavy Snow
2015	3	Heavy Snow
2016	4	Winter Storm, Heavy Snow
2017	6	Winter Storm, Heavy Snow
2018	7	Winter Storm, Heavy Snow
2019	13	Winter Storm, Heavy Snow
2020	12	Winter Storm, Heavy Snow
2021	36	Winter Storm, Heavy Snow

Total Years =	31
Total Recorded Events =	406
Yearly Probability =	130.71%

Data Source: NOAA/NCEI Storm Events Database

4.2.4 – Vulnerability & Impact

Shasta County has recorded 406 winter weather events since 1990, of which the range of magnitude can be any combination of winter conditions but will always be considered severe. Based on these previous occurrences and future probability calculations, the planning area can expect 13.09 severe winter weather-related events per year. These could impact Shasta County, the City of Anderson, and the Igo Ono Community Services District in the form of an ice storm, heavy snow, or winter storm, or any combination of the three.

Table 37: Historical Impacts, Severe Winter Weather

Historical Impacts, Winter Weather			
Summary Statistics	Ice Storm	Heavy Snow	Winter Storm
Count of Events	-	56	350
Average Magnitude	-	-	-
Magnitude Range	-	-	-
Average Cost	$0	$0	$1,285.71
Magnitude of Cost	$0	$0	$0 - $300,000
Total Recorded Cost	$0	$0	$450,000
Average Fatalities	-	.017	0.002
Total Fatalities	-	1	1
Average Injuries	-	0	0
Total Injuries	-	0	0

Data Source: NOAA/NCEI Storm Events Database

Vulnerability of Facilities

Structural vulnerability to severe winter weather is the same throughout the planning area. Ice storms will coat a facility's exterior but is unlikely to cause anything more than superficial damage. Heavy snow accumulation can cause roofing to collapse on old or poorly constructed facilities. Prolonged, extremely cold temperatures can cause significant damage to poorly insulated or heated facilities. The cold temperatures can cause a facility's water pipes and plumbing systems to freeze. As the water in these systems turns to ice, it expands and eventually may cause pipes to burst.

The average winter storm in Shasta County and its participating jurisdictions costs roughly $1,285.71, while the existing range of a single incident has been from $0 to $300,000.

Vulnerability of Population

Shasta County and the participating jurisdictions' population are equally vulnerable throughout the planning area. Citizens are at risk from prolonged, cold temperatures if they fail to be sheltered in an adequately heated structure or are unable to reach shelter. Exposure to the cold can lead to frostbite and hypothermia; both conditions, if untreated, can lead to death. Some structures are dependent upon electricity for their heating, making them vulnerable if a winter weather event causes a power outage. Additionally, if severe winter weather restricts travel, people may become immobile on roadways and be at the mercy of their vehicle's gas supply.

Historically, there have been two (2) recorded deaths and no (0) injuries related to severe winter weather in Shasta County.

Vulnerability of Systems

Shasta County and the participating jurisdictions' assets and systems' vulnerability to severe winter weather is the same throughout the planning area. Winter storms have the potential to create havoc on roads, impacting travel from decreased speeds and resulting in traffic jams. Accumulating snow and ice, as well as blowing snow drifts, can make travel extremely dangerous or even, impossible. Additionally, accumulating snow and ice can directly bring down power lines or bring down vegetation onto power lines. From these scenarios, the planning area can suffer power outages, making it difficult to heat structures and exposing critical systems, including IT infrastructure, to extremely cold temperatures.

4.2.4A – Critical Facilities & Infrastructure

Since severe winter weather indiscriminately affects the entire planning area, all critical facilities and infrastructure within Shasta County, the City of Anderson, and the Igo-One Community Services District are at equal risk to the hazard. A complete list of critical facilities and infrastructure can be found in Appendix D.

4.2.4B – Land Use & Development Trends

Shasta County and the participating jurisdictions' predominant growth area is residential housing, as detailed in Section 3.2 – Land Use & Development Trends.

Increased residential growth will not increase Shasta County or the participating jurisdictions' vulnerability and risk to severe winter weather as long as the residential structures continue to be built under currently adopted international and state building codes, contemporary heating standards, and an appropriately accommodating power grid.

Any buildings or infrastructure built in the future will have the same risk as other buildings or infrastructure built within the planning area.

4.2.4C – Unique or Varied Risk

To predict such risks for Shasta County and the participating jurisdictions, one would need a comprehensive catalog of snow removal capacity, electrical systems resiliency and capacity, and number of individual power generators per structure. Such a study is beyond the resources of most communities, including Shasta County and the participating jurisdictions. Based on the best available resources, lack of predictable differences in vulnerabilities, and the fact that the hazard has the potential to affect the entire planning area, Shasta County and the participating jurisdictions do not have any unique or varied risk to the severe winter weather hazard.

4.2.4D – Repetitive Loss Properties

Not applicable to the hazard.

4.2.5 – HAZUS Models

Not applicable to the hazard.

4.3 – Hazard Risk Summary

The table below outlines each participating jurisdictions' general risk to this plan's profiled hazards. The rankings are based on a composite evaluation of this plan's risk assessment, namely, a hazard's probability of occurring in the future, the vulnerability of a jurisdiction to a specific hazard, the intensity of past hazard impacts, and a joint evaluation of local experts and stakeholders.

Category	Range (Per Year)
Rare	0% - 25%
Not Likely	26% - 50%
Likely	51% - 75%
Highly Likely	76%- 100%

Table 38: Hazard Risk Summary

Hazard Risk Summary by Jurisdiction									
Jurisdiction	Hazard								
	Dam Failure	Drought	Earthquake	Extreme Heat	Flood	Severe Storms	Volcano	Wildfire	Winter Weather
Shasta County	Rare	Not Likely	Not Likely	Likely	Likely	Likely*	Rare	Highly Likely	Likely*
City of Anderson	Rare	Not Likely	Not Likely	Likely	Likely	Likely*	Rare	Highly Likely	Likely*
Igo Ono Community Services District	Rare	Not Likely	Not Likely	Likely	Likely	Likely*	Rare	Highly Likely	Likely*

**The hazard of Severe Storms includes hail, high/strong and thunderstorm wind, and lightning. The probability of both hail and high/strong and thunderstorm wind occurring is considered 'highly likely,' while the likelihood of lightning, namely lightning strikes, occurring is considered 'rare.'*

**The hazard of Severe Winter Storms includes ice storm, heavy snow, and winter storms. The probability of an ice storm occurring within the planning area is considered 'rare.' However, the probability of a heavy snow and winter storms occurring within the planning area is considered 'highly likely.'*

4.4 – Excluded Hazards

Avalanche

Avalanches can occur on mountains during the winter months in the region. Shasta County does not have many residents or businesses in the mountainous parts of the area. Therefore, the hazard is excluded.

Climate Change

Climate change impacts California and Shasta County addressed the hazard in dam failures, wildfires, winter weather, drought, and severe weather sections. Therefore, the hazard is excluded. Refer to Section 4.5 – Special Consideration, Climate Change for more information.

Erosion

Limited erosion takes place in the planning area from flooding and severe weather events. The risk to Shasta County is low and therefore the hazard is excluded.

Health Hazards

Shasta County's prior HMP contained a health hazards section. This has been excluded from this plan (update). Although health hazards continue to exist, this hazard does not yield actionable information by which to better protect this plan's participating jurisdictions. The level of detail and specificity to do so is outside the required scope of this hazard mitigation plan.

Land Subsidence

There are no recorded incidents of land subsidence or sinkholes in Shasta County or the participating jurisdictions and is therefore, excluded from this plan.

Landslides

There are no recorded incidents of landslides in Shasta County or the participating jurisdictions and is therefore, excluded from this plan.

Levee Failure

One of the worrying flood hazards arises from dam failure. The risk of a levee breach in Shasta County is low and therefore, the hazard is excluded.

Terrorism

Hazard mitigation plans focus on natural hazards and not human-caused hazards. Terrorism is addressed in Shasta's Emergency Operations Plan (EOP) and therefore, not profiled in this plan.

Tsunami

The State of California has a history of tsunamis. These tsunamis are located far outside of Shasta County and the participating jurisdictions. Due to the geologic consensus that none are active, this hazard is not being profiled in this hazard mitigation plan (update).

4.5 – Energy Infrastructure Vulnerability Assessment

People rely on energy sources, including electricity, petroleum, and natural gas, every day. Many of the hazards identified within this plan have the potential to disrupt service/availability for days, hours, or even weeks. The following assessment addresses the vulnerabilities associated with each hazard and how it may impact the planning area, i.e., Shasta County, the City of Anderson, and the Igo Ono Community Services

Vulnerability to Dam Failure – The Shasta Dam, nor the Misselbeck Dam, pose risk to Shasta County's energy infrastructure as it located too far away. It also has too small of a reservoir to have a significant enough impact on pipelines.

Vulnerability to Drought – Drought does not pose reasonable risk to Shasta County's energy infrastructure.

Vulnerability to Earthquake – Earthquake poses moderate risk to Shasta County's energy infrastructure. Violent shaking destroys power lines and damages power plants. Natural gas lines can rupture causing fires. Damaged structures can block roadways slowing down emergency response operations.

Vulnerability to Extreme Heat – Extreme heat poses limited risk to Shasta County's energy infrastructure. Increased usage of air conditioning can strain the power system/grid, leading to power loss. People needing treatment from heat related emergencies can strain the healthcare system.

Vulnerability to Flood – Shasta County does not have a high-incident, high-impact history of flooding to reasonably consider a risk to its oil and natural gas pipelines Throughout the planning area, oil and natural gas pipelines cross through floodplains, but well-constructed and built-to-code ones will not fail from riverine or flash floods.

Vulnerability to Severe Storms – Severe storms pose no reasonable risk to Shasta County's energy infrastructure. All pipelines are grounded and constructed to handle any reasonable amount of wind.

Vulnerability to Volcano – Volcanic eruptions pose limited risk to Shasta County's energy infrastructure. Different types of eruptions can generate pyroclastic flows capable of destroying wide areas. Ashfall weighs down on buildings and energy infrastructure leading to potential collapses.

Vulnerability to Wildfire – Given the increased expansion of the Wildland Urban Interface (WUI) within Shasta County, there is potential risk to its energy infrastructure. However, historical evidence contradicts any reasonable, predictable vulnerability.

Vulnerability to Winter Weather – Winter weather, chiefly severe winter storms, pose limited risk to Shasta County's energy infrastructure. During cold weather, power consumption increases as heat is needed for warmth. Too much consumption can overburden the power system/grid, resulting in power loss.

4.6 – Special Consideration, Climate Change

Photo Source: Google

Climate change, as described by the National Aeronautics and Space Administration (NASA), is "a long-term change in the average weather patterns that have come to define Earth's local, regional and global climates."

Further, NASA states, "Changes observed in Earth's climate since the early 20th century are primarily driven by human activities, particularly fossil fuel burning, which increases heat-trapping greenhouse gas levels in Earth's atmosphere, raising Earth's average surface temperature. These human-produced temperature increases are commonly referred to as global warming. According to the U.S. Geological Survey (USGS), temperatures are rising at a faster pace than at any time in history.

Scientific observations, coupled with climate data records, provide evidence of climate change "key indicators." Among them are global land and ocean temperature increases; rising sea levels; ice loss at Earth's poles and in mountain glaciers; frequency and severity changes in extreme weather such as hurricanes, heatwaves, wildfires, droughts, floods, and precipitation; and cloud and vegetation cover changes, to name a few.

Many of the hazards identified within this update to Shasta County's Multi-Jurisdictional Hazard Mitigation Plan are, in one way or another, potentially affected by climate change.

Health Risks

Certain people are more vulnerable to emerging climate change impacts. Climate change raises health risks for people with existing physical or mental illness, children, and older adults, those who work outdoors, and those living in areas prone to flooding. Climate change can lead to weather events and conditions that are associated with health hazards such as 1) heat waves, which can cause heat-related illnesses, heat stroke, and other serious health problems, 2) extreme drought and flooding, 3) disruptions to agriculture, i.e., altered growing and storage conditions requiring changes in crop and livestock species or food production practices.

Given the potential for climate change to increase the frequency and magnitude of natural hazards, FEMA encourages states, regions, counties, and municipalities to consider climate change when mitigating hazards.

Opportunities for Enhancement

Based on the capability assessment, the County, city of Anderson and Igo-Ono CSD has existing regulatory, administrative/technical, fiscal mechanisms in place that help to mitigate hazards. In addition to these existing capabilities, there are opportunities for the County to expand or improve on these policies and programs to further protect the community. These are organized below by regulatory, administrative/technical, fiscal, and outreach opportunities.

Regulatory Opportunities

Future opportunities for regulatory enhancement should focus on compliance with Assembly Bill 2140, including amending the County General Plan Safety Element to incorporate the 2022-2027 County MJHMP.

Administrative/Technical Opportunities

Other future enhancements may include providing hazard training for staff or hazard mitigation grant funding in partnership with the County, city of Anderson, Igo-Ono CSD and Cal OES. Existing County staff are aware of the benefits of participating in training and webinars offered by Cal OES Hazard Mitigation Assistance (HMA) Team related to HMGP opportunities, HMGP Sub application Development support, and other funding programs, such as Prepare California Jumpstart. Other opportunities may be related to coordinating and educating key stakeholders in the County, city of Anderson and Igo-Ono CSD. Other stakeholders may be interested in aligning efforts related to hazard mitigation and also supporting HMGP Sub applications and other hazard mitigation trainings.

Fiscal Opportunities

The County, city of Anderson and Igo-Ono CSD can update other plans, such as their EOP to incorporate hazard information and include hazard mitigation actions and climate adaptation strategies that relate to infrastructure systems resiliency associated with the water and wastewater systems. The County, city of Anderson and Igo-Ono CSD should also apply for HMGP grants to fund implementation costs associated with key CIP projects, and related projects in the City's mitigation strategy. The County, city of Anderson and Igo-Ono CSD could look to expand its fiscal capabilities by raising taxes or issuing bonds. These fiscal capabilities may be supported by County, city of Anderson and Igo-Ono CSD staff or augmented with consultant staff.

Outreach Opportunities

The County, city of Anderson and Igo-Ono CSD can expand their outreach capabilities related to the implementation of the 2022-2027 County MJHMP and annexes. Specific enhancements may include continued public involvement through social media posts and advertisements focused on projects successes related to the Annex Mitigation Strategy as well as focused outreach to under-represented and special-interest groups in the County city of Anderson and Igo-Ono CSD. The County, city of Anderson and Igo-Ono CSD can also develop outreach kits for partner organizations by expanding on the information include in the MJHMP Outreach Strategy.

Section 5: Mitigation Strategy

Planning Process

Local Procedures & Resources

Planning Area

Hazard Risk Assessment

Mitigation Strategy

- Mitigation Capabilities
- Mitigation Strategy Development
- Mitigation Goals
- Mitigation Actions & Prioritization
- Planning Integration

5.1 – Mitigation Capabilities

Local initiatives, programs, and policies are often facilitated by Shasta County Public Works, as it is the primary department responsible for mitigation planning. It does so in coordination with local governments, including the City of Anderson and the Igo Ono Community Services District, thereby fostering local partnerships and relationships, and assisting local governments with funding and training initiatives.

All future-implemented mitigation projects will be overseen by Shasta County, the City of Anderson, and/or the Igo Ono Community Services District, and will coordinate with the corresponding local municipal government. The corresponding local government involvement will vary by jurisdiction and be decided by that jurisdictional government as they see it fit to best plan, design, and implement mitigation projects.

Each jurisdiction can levee their own taxes through law, or in the case of school districts, through referendum. Each jurisdiction has their own budget to appropriate towards hazard mitigation as they deem appropriate or necessary. Additionally, Shasta County, the City of Anderson, and the Igo Ono Community Services District will seek out grant opportunities through the State of California and the Federal Emergency Management Agency (FEMA) to help decrease the financial burden on local government.

The development and implementation of this plan comes with the full authority of Shasta County, the City of Anderson, and the Igo Ono Community Services District, and all resources deemed appropriate and necessary.

The following table outlines each jurisdiction's authorities, resources, policies, and programs as it relates to hazard mitigation. Personnel resources are measured on a scale according to the U.S. Small Business Administration's size categories: (1 – 6) Micro, (7 – 250) Small, (251 – 500) Medium, (501 – 1000) Large, and (> 1000) Enterprise. It is assumed any labor needed will be contracted for jurisdictions with no personnel resources pertaining to mitigation.

Table 39: Local Mitigation Capabilities

Local Mitigation Capabilities			
Jurisdiction	Leading Authority	Policies & Programs	Personnel Resources
Shasta County	Board of Supervisors, Joint OES	Building Codes, Shasta County Comprehensive Plan, CRS, NFIP, Planning Department, Zoning Ordinances	EMS (Micro), Fire (Small), Police (Small), Public Works (Small)
City of Anderson	Town Council	Building Codes, Shasta County Comprehensive Plan, Planning Department NFIP	Fire (Small), Police (Small), Public Works (Micro)
Igo Ono Community Services District	Town Council	Building Codes, Shasta County Comprehensive Plan	Fire (Micro)

Data Source: Shasta County

5.1.1 - Mitigation Capabilities Assessment

The participating jurisdictions identified current capabilities, i.e., administrative, technical, legal, and fiscal, available for implementing hazard mitigation activities. This included a listing of departments and their responsibilities associated with hazard mitigation planning as well as codes, ordinances, and plans already in place associated with hazard mitigation planning.

Following is a summary of existing departments in Shasta County, along with brief descriptions of their various roles, responsibilities, and documents in relationship to hazard mitigation planning and implementation. Certain resources reviewed include those involving technical personnel, e.g., planners/engineers with knowledge of land development and land management practices, engineers trained in construction practices related to building and infrastructure, planners, and engineers with an understanding of natural or manmade hazards, floodplain managers, surveyors, personnel with GIS (mapping) skills and scientists familiar with hazards in the community.

Resource Management (RM) – The Department of Resource Management was created in 1992 as a result of the merger of four separate and previously independent departments or divisions. This move was prompted by the Board of Supervisors as both a cost saving measure as well as an effort to add greater efficiencies to the operations of these four units.

RM's reports, plans, and fees play a specific role in this plan by helping to mitigate multiple hazards. Some examples of these are:

- When building in a flood plain, there are certain foundation height requirements that have to be met. These are in place to help minimize the probability of the structure flooding.
- When building at an elevation where snow is a factor, there are roof weight requirements that help mitigate extreme weather hazards.
- With any new structure, there are particular items that have to be strapped down to be help mitigate hazards that come with an earthquake.
- Exposure to hazardous wastes is reduced and/or prevented by the imposed steps one must take to remove and/or destroy them.

Air Quality Management District (AQMD) – AQMD endeavors to manage and enhance the air quality resources of Shasta County through a balanced program of environmental oversight and protection of public health. The AQMD functions as professional staff to the Air Pollution Control Board regarding rule development and potential industrial and commercial development. It also proposes mitigation strategies working cooperatively with affected emission sources, evaluates potential health risks and adopts air pollution control measures and regulations that seek to attain federal and state ambient air quality standards.

Building Division (BD) – BD has the primary function to safeguard the life, health, and property of Shasta County residents through the application of uniform building standards. These standards involve design, materials, construction, use, occupancy and location of all buildings and structures within the unincorporated area of Shasta County.

Community Education Section (CES) – CES provides a multitude of educational activities both in the schools and as part of community events. Programs are designed to impart lifestyle changes and prevent the imposition of regulatory control.

Environmental Health Division (EHD) – The EHD is charged with the responsibility of enforcement of pertinent California health laws, rules, regulations, and Shasta County ordinances. This responsibility covers Shasta County as well as the three incorporated cities within Shasta County. While the traditional

objectives of the EHD have focused on the control of microbiological hazards, new areas of potential public health concern have arisen.

Planning Division (PD) – The PD serves as the land use information center for Shasta County. It functions as a professional staff to the Board of Supervisors, the Planning Commission, and the Airport Land Use Commission. The division disseminates information to the public regarding potential development areas for residential, commercial, industrial, and resource development and management. *NOTE: The Planning Commission makes decisions on land use matters scheduled for public hearing regarding land divisions, use permits and variances.*

Health and Human Services Agency (HHSA) – HHSA offers an array of services, from food assistance and employment training to counseling and immunizations. Its vision is for every person living within Shasta County to enjoy a safe, healthy, and productive life.

HHSA's Public Health (PH) branch focuses on community-wide prevention of communicable disease, chronic disease, injury, substance abuse, suicide prevention, and the prevention of Adverse Childhood Experiences (ACE). PH helps the community develop systems, and policies that support healthy behaviors. It promotes nutrition and physical activity, healthy aging, worksite wellness, and educational attainment. PH also maintains an active emergency response unit, and its laboratory provides testing services for Shasta and numerous other Northern California counties.

The county health officer (HO), a physician appointed by the Shasta County Board of Supervisors, shall take measures as may be necessary to prevent the spread of disease (California Health and Safety Code 120175). Such measures include, but are not limited to, isolation, quarantine, examination, vaccination, evacuation, decontamination, restriction of public gatherings, and declaration of health emergency among others (Public Health Law Work Group, Health Officer Practice Guide for Communicable Disease Control in California, January 1, 2007, p. 5).

Public Works (PW) – The mission of Shasta County PW is to provide safe, reliable, and cost- effective facilities and services to the residents of Shasta County. Throughout the hazard mitigation planning process, PW served as the lead liaison agency.

PW's Bridge Design and Administration Division designs and administers the construction of bridge projects, which include bridge replacement, bridge rehabilitation, seismic retrofit, and bridge railing upgrades.

PW's Development Services Division is responsible for the administration of permanent road divisions (PRDs); assessment districts; County Surveyor functions; CSA Community Advisory Boards; CSA formations, annexations, and engineering; subdivision and encroachment field inspections; land use projects review, approval, and inspection; transportation permits; and flood plain administration.

Shasta County Fire Department (SCFD) – The mission of the SCFD is to serve and safeguard the community from the impacts of fires, medical emergencies, environmental emergencies, and natural disasters. This will be accomplished through education, code enforcement, planning and prevention, emergency response, and disaster recovery. SCFD is responsible for managing the following activities related to wildfire hazard reduction:

- The Weed Abatement Program (hazard reduction program), enforcing of defensible space through the clearing of entire parcels or lots, maintaining a 100-foot perimeter break around buildings, removal of all flammable vegetation around and adjacent to any structure for a distance of 30 feet or to the property line, etc.
- Enforcing Development Standards

- Writing and Implementing the Wildfire Management Plan for the County (meeting National Fire Plan Standards)
- Assisting the Planning Division (and other Departments) with Development Standards for High Fire Hazard Areas
- Enforcing fuel breaks along highway corridors and public roadways
- Conducting outreach and education
- Implementing fire suppression
- Conducting prescribed burns
- Participating in the Healthy Forest Initiative
- Monitoring fire weather and completing annual action plans based on data from fire service agencies

SCFD also provides numerous other programs/services within Shasta County, including but not limited to:

Fire Hazard Severity Zoning: The State of California is required to determine and map fire hazard severity zones. SCFD and the County hold the maps for the local responsibility area. The County is in the process of reevaluating the zones while meeting both the intent of the State law and county ordinances.

Vegetative Management Plan Requirements: Prior to the erection of combustible materials, a vegetation management plan must be submitted and approved by the department. The vegetation management plan shall describe all actions that will be taken to prevent fire from being carried toward or away from structures.

Stored Water Fire Protection Systems for One- and Two-Family Dwellings: As the name implies, this development standard prescribes standards for stored water at one- and two-family dwellings in high fire hazard areas.

Fire Hydrant Spacing and Flow Rates: This development standard addresses the placement and standard for fire hydrants in new developments.

Private Road and Driveway Standards for One- and Two-Family Dwellings: This development standard addresses easements, vegetative clearing, access (width, turnaround, etc.), paving and surface standards for private roads and driveways serving residential structures.

Fire Hazard Abatement Notices: Every year SCFD sends notices to abate fire hazards to the owners of all properties in county fire's jurisdiction that potentially pose a fire hazard, in conjunction with public education efforts through media outlets such as local television stations and newspapers. These notices indicate the start of yearly weed abatement requirements.

As for SCFD's specific role in relationship to this plan, the department's programs, ordinances, and fees play a key role in mitigating multiple hazards, especially wildfire.

Shasta Cascade Hazardous Materials Response Team (SCHMRT) – Based in Northern California, the SCHMRT is a multi-agency and multi-jurisdictional emergency response team which serves six counties in Region III. The Shasta County Fire Department serves as the lead agency for SCHMRT. The SCHMRT is a Type 2 Haz Mat Team, as determined by CalOES; thus, it is qualified to make entries into unknown chemical environments.

SCHMRT is comprised of 50 skilled hazardous materials technicians and specialists from various agencies and departments, including law enforcement, fire service, environmental and public health.

Shasta County Sheriff's Department (SCSO) – The members of the SCSO are committed to improving the quality of life, in partnership with the community it serves, through fair and ethical law enforcement services. The department is currently operating under the direction of Sheriff Michael L. Johnson.

Shasta County Office of Emergency Services (OES) – OES is a division of the Shasta County Sheriff's Department and is responsible for emergency planning and coordination for the Shasta Operational Area. On a day-to-day basis, OES is responsible for emergency planning and coordination among the Shasta Operational Area entities which include:

- Cities: Anderson, Redding, and Shasta Lake
- Special Districts: Air Pollution Control District, Fire Districts, Sanitary Districts, School Districts, Vector Control Districts, Water Districts
- Volunteer Organizations: American Red Cross, Amateur Radio Emergency Services (ARES), Equine Evacuation
- Industry Groups: CAER-Community Awareness and Emergency Response, Petroleum Industry Mutual Aid Group, Shasta Industrial Association (SBIA)

OES also coordinates with adjoining offices of emergency services. The tri-county coordinators meet to discuss regional preparedness several times throughout the year. OES responsibilities include, but are not limited to:

- Maintain the Shasta County Operational Area Multi-Hazard Functional Plan.
- Maintain Shasta County's Emergency Operations Center (EOC) in a state of operational readiness
- Maintain a trained cadre of EOC team members.
- Provide ongoing leadership and coordinate disaster plans and exercises with the three cities throughout Shasta County.
- Assist county departments in developing department emergency plans which address how they will perform during disasters.
- Assist county departments with development of facility emergency plans for every occupied County facility.
- Provide ongoing training for county department emergency coordinators.
- Participate in an ever-expanding public education campaign for all hazards through the Earthquake Survival Program (ESP), public venues and various media presentations.

Shasta County OES' role in this plan's development and implementation is significant. Its plans and procedures are, by far, the most involved when it comes to hazard mitigation. They do continual training to prepare for any hazards that might arise. They also work side by side with all other county departments, as well as state/local agencies to prepare for, mitigate and deal with potential hazards.

5.2 – Mitigation Strategy Development

5.2.1 – Developing Mitigation Goals & Objectives

Shasta County, the City of Anderson, and the Igo Ono Community Services District reviewed the hazard profile and loss estimation information presented in Section 4 of this plan and used it as a basis for developing mitigation goals and objectives. Mitigation goals are general explanations of what hazards, and losses due to hazards, each jurisdiction would like to prevent. They are typically long-range visions

and are oriented towards jurisdictional policy. The objectives define strategies to attain those goals. Both are based on consistent and complementary goals contained within existing local plans, policy documents, regulations, and public input. The hazard priorities remain the same from the last update causing the hazard mitigation action priorities to stay the same from the last plan. Lack of development and changes in climate did not result in additional hazards and did not alter their ranking.

5.2.2 – Defining Mitigation Actions & Priorities

Mitigation actions, aka projects, are a means of carrying out plan goals and objectives. They must be compatible with the plans, policies, and regulations of the participating jurisdiction(s). The jurisdiction(s) must also have the legal, administrative, fiscal, and technical capacities to perform each action. The process of analyzing the capacity of the participating jurisdiction(s) is called the capabilities assessment and it results in a list of acceptable and realistic mitigation actions. This list can then incorporate the social, technical, administrative, political, legal, economic, and environmental opportunities and constraints of each action, and it can be trimmed accordingly. This methodology is known as STAPLEE, which is further explained in the following table. Once funding for the hazard mitigation projects is secured, Shasta County will conduct a STAPLEE assessment to prioritize their hazard mitigation actions.

Table 40: STAPLEE Criteria

STAPLEE Criteria	
Evaluation Category	Sources of Information
Social	Mitigation actions are acceptable to the community if they do not adversely affect a particular segment of the population, do not cause relocation of lower income people, and if they are compatible with the communities' social and cultural values.
Technical	Mitigation actions are technically most effective if they provide long-term reduction of losses and have minimal secondary adverse impacts.
Administrative	Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.
Political	Mitigation actions can truly be successful if all stakeholders have been offered an opportunity to participate in the planning process and if there is public support for the action.
Legal	It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.
Economic	Budget constraints can significantly deter the implementation of mitigation actions. Hence, it is important to evaluate whether an action is cost-effective, as determined by a cost-benefit review, and possible to fund.
Environmental	Sustainable mitigation actions that do not have an adverse effect on the environment, which comply with Federal, State, and local environmental regulations, and that are consistent with the community's environmental goals, have mitigation benefits while being environmentally sound.

Data Source: FEMA

After completing the capabilities assessment, the participating jurisdiction(s) further evaluated the proposed mitigation actions and prioritized them based upon the highest, short-to-medium-term priorities.

An implementation schedule was identified, along with the coordinating individual(s) or agency(ies) for each prioritized mitigation action.

It was (and continues to be) understood that each approach to reducing the impacts of natural disasters must be tailored to intertwine with the competing needs and objectives of the participating jurisdiction(s). Accordingly, the following categories of mitigation measures were chosen to work towards achieving the goals and objectives identified with this plan.

A) Prevention Measures

- Keep a hazard risk from getting worse.
- Ensure that future development does not increase hazard losses.
- Guide future development away from hazards, while maintaining other community goals such as economic development and quality of life and environment.

Communities can achieve significant progress toward hazard resistance through prevention measures, particularly in areas that have not been developed or where capital investment has not been substantial.

B) Property Protection Measures

- Modify existing buildings subject to hazard risk, or their surroundings.
- Directly protect people and property at risk.
- Inexpensive measures often are implemented or cost-shared with property owners.

Protecting a building does not have to affect the building's appearance and is therefore a popular measure for historic and cultural sites.)

C) Public Education and Awareness Measures

- Inform and remind people about the hazardous area(s) and the measures they can take to avoid potential damage and injury.

Education and awareness measures can be tailored to different audiences, including but not limited to property owners, potential property owners, business owners, children, and visitors.

D) Natural Resource Protection Measures

- Reduce the intensity of hazard effects and improve the quality of the environment and wildlife habitats.

Parks, recreation or environmental agencies or organizations usually implement these activities.

E) Emergency Services Measures

- Inform Emergency services protect people before and after a hazard event.

Actions taken to ensure the continuity of emergency services are considered to be mitigation.

F) Structural Measures

- Direct protect people and property at risk.

These measures are termed structural mitigation because they involve construction of man-made structures to control hazards.

5.2.3 – Evaluating Alternatives & Prioritizing Projects

As previously mentioned, the STAPLEE methodology will be used to ensure the most equitable and feasible mitigation actions will be undertaken, based on funding, capabilities, etc. within the planning area.

5.2.4 – Implementing the Plan

The participating jurisdictions prepared a strategy for implementing the mitigation actions/projects. The strategy identifies who is responsible for which action/project, what kind of funding mechanisms and other resources are available or will be pursued, and when the strategies will be completed. The goals, objectives, actions, and implementation strategies form the body of this plan.

5.2.5 – Documenting the Mitigation Planning Process

Agencies and organizations with plans in place were used in developing a list of actions for implementation by the participating jurisdictions. These reports and lists of actions were reviewed by the Hazard Mitigation Planning Team, or HMPT, which added additional actions to the planning process. The HMPT prioritized the action items and the involved consultant(s), i.e., BOLDplanning, and held public meetings.

5.2.6 – Regional Considerations

The DMA 2000, as described in this plan's introduction, requires that regions develop and maintain a document outlining measures that can be taken *before* a hazard event occurs; thus, minimizing damage to life and property. This plan meets this requirement by including specific goals, objectives, and mitigation action items that Shasta County, the City of Anderson, and the Igo Ono Community Services District developed. Some of the overall goals and objectives shared some commonalities (including promoting disaster-resistant future development; increasing public understanding, support, and demand for effective hazard mitigation; building and supporting local capacity and commitment to continuously becoming less vulnerable to hazards; and improving coordination and communication with federal, state, local and tribal governments). However, the specific hazards and degree of risk vary greatly with the mix of other goals and objectives, and most action items are unique to each hazard.

5.3 – Mitigation Goals

The mitigation goals for Shasta County, the City of Anderson, and the Igo Ono Community Services District were established based upon results from the local and state risk assessments, stakeholder meetings, and input from non-planning team local jurisdiction and state officials. These goals represent the planning area's long-term vision for the continued reduction of hazard risks and the enhancement of mitigation capabilities.

Goal 1: Promote disaster-resistant future development.

Goal 2: Increase public understanding and support for effective hazard mitigation.

Goal 3: Build and support capacity and commitment to become less vulnerable to hazards.

Goal 4: Enhance hazard mitigation coordination and communication with federal, state, local, and tribal governments.

Goal 5: Reduce the possibility of damage and losses to existing assets, particularly people, critical facilities and infrastructure, and county-owned facilities due to the identified hazards.

5.4 – Mitigation Actions Summary & Prioritization

To support its hazard mitigation goals, the Shasta County Mitigation Planning Team (HMPT) first reviewed the actions identified in the previous plan (November 16, 2017) and determined the following project statuses for this plan update. Several mitigation actions from the previous HMP were completed altering future mitigation actions.

Table 41: Mitigation Actions Update from Previous Plan (November 16, 2017)

Mitigation Actions Update from Previous Plan (November 16, 2017)				
Shasta County				
Action (aka Project)	Hazard(s) Addressed	Lead Department(s)	Status	Emphasis
Maintain Updated Multi-Jurisdictional Hazard Mitigation Plan	All Hazards	Shasta County Public Works (PW)	Ongoing	New & Existing
Increase Participation in Floodplain Re-mapping Initiative	Flood	Shasta County Public Works (PW), Shasta County Resource Management (RM)	Ongoing	New & Existing
Cottonwood Sewer Improvements	Flood	Shasta County Public Works (PW)	Completed	New & Existing
Prevent Unplanned Bridge Closures	Flood	Caltrans, Shasta County Public Works (PW)	Ongoing	New & Existing
Replace Platina Road Culvert	Flood	Shasta County Public Works (PW)	Completed	Existing
Modify or Replace Culverts and Bridges to Improve Water and Traffic Flow	Flood	Caltrans, Shasta County Public Works (PW), Western Shasta Resource Conservation District (WSRCD)	Ongoing	Existing
Vegetation Management in Creeks	Flood	Western Shasta Resource Conservation District (WSRCD)	Ongoing	Existing
Burney Flood Wall	Flood	FEMA, California Office of Emergency Services (CalOES)	Ongoing	Existing
Improve Cottonwood Fourth Street Drainage	Flood	FEMA	Ongoing	Existing
Construct Retention Ponds to Reduce Flooding	Flood	Western Shasta Resource Conservation District (WSRCD), Shasta County Public Works (PW)	Ongoing	Existing
Conduct Flow Monitoring and Hydrological Modeling of Waterways	Flood	State Department of Water Resources (DWR), Western Shasta Resource Conservation District (WSRCD), Shasta County Public Works (PW)	Ongoing	New & Existing

Maintain an Updated Shasta County Community Wildfire Protection Plan (CWPP)	Wildfire	Western Shasta Resource Conservation District (WSRCD), Shasta County Fire (SCF)	Ongoing	Existing
Implement Fuel Reduction Management Plans as Identified in the CWPP	Wildfire	Western Shasta Resource Conservation District (WSRCD), Shasta County Fire (SCF), CAL FIRE, Shasta County Fire Safe Councils (FSC)	Ongoing	Existing
Re-establish Fire Councils (FSC)	Wildfire	Western Shasta Resource Conservation District (WSRCD), Shasta County Fire (SCF), CAL FIRE	Completed	Existing
CAL FIRE, Shasta-Trinity Unit Fire Management Plan	Wildfire	Shasta County Fire (SCF), CAL FIRE	Ongoing	Existing
Burney Community Fuel Break	Wildfire	CAL FIRE	Completed	Existing
Burney Basin Community Wildfire Protection Plan (CWPP)	Wildfire	CAL FIRE, Burney Fire Protection District	Ongoing	Existing
Reduce Potable Water Losses	Extreme Weather	Shasta County Public Works (PW)	Ongoing	Existing
Prevent Unplanned Bridge Closures	Earthquake	Caltrans	Deferred, Not Applicable	New & Existing
Maintain and Update the Shasta County Hazardous Materials Area Plan	Hazardous Materials	Shasta County Resource Management (RM)	Deferred, Not Applicable	New & Existing
Maintain Integrated Evacuation Plan	Volcano	Shasta County Office of Emergency Services (OES)	Ongoing	New & Existing
Maintain and Update the Shasta County General Plan and Zoning Plan	Volcano	Shasta County Resource Management (RM)	Ongoing	New & Existing
Educate Citizens for Protection/Prevention	Chemical, Biological, Radiological, and Nuclear (CBRN)	Shasta County Fire (SCF), Shasta County Health & Human Services/Public Health (HHS/PH)	Completed	Existing
Update Pandemic Flu Annex to Emergency Response Plan (ERP)	Pandemic/Epidemic	Shasta County Public Health (PH)	Ongoing	Existing
Shasta County and Sierra-Sacramento Valley Emergency Medical Services (EMS) Meetings	Multi-Casualty Incident	Shasta County Fire (SCF), Shasta County Public Health (PH)	Ongoing	Existing
Aircraft Fire Disaster Drill	Multi-Casualty Incident	Shasta County Fire (SCF), CAL FIRE, City of Redding (COR), Fire Districts	Completed	Existing
Effective Community Outreach & Education About Emergency Services and Plans for Communications for Dam Failure	Dam Failure	Shasta County Office of Emergency Services (OES)	Ongoing	Existing

City of Anderson				
Maintain Updated Multi-Jurisdictional Hazard Mitigation Plan	All Hazards	Anderson Public Works (PW)	Ongoing	Existing
Increase Participation in Floodplain Re-mapping Initiative	Flood	Anderson Public Works (PW)	Ongoing	New & Existing
Floodplain Management and Flood Mitigation Education and Outreach	Flood	Anderson Public Works (PW)	Ongoing	New & Existing
Enhance Floodplain Management Ordinance	Flood	Flood Control and Water District	Ongoing	New & Existing
Add Community Volunteers to Creek Cleanup Committees	Flood	Anderson Public Works (PW), Flood Control, Western Shasta Resource Conservation District (WSRCD)	Ongoing	New & Existing
Tormey Drain	Flood	Anderson Public Works (PW)	Ongoing	New & Existing
Build a New Police Station	Flood	City of Anderson	Ongoing	New & Existing
ACID Aqueduct at South Street	Flood	City of Anderson	Ongoing	New & Existing
Vegetation Management in Creeks	Flood	Western Shasta Resource Conservation District (WSRCD)	Ongoing	New & Existing
Construct Retention Ponds to Reduce Flooding	Flood	Western Shasta Resource Conservation District (WSRCD), Anderson Public Works (PW)	Ongoing	New & Existing
Conduct Flow Monitoring and Hydrological Modeling of Waterways	Flood	State Department of Water Resources (DWR), Anderson Public Works (PW)	Ongoing	New & Existing
Biohazard Detection System Drills	Hazardous Materials	Anderson Public Works (PW)	Ongoing	Existing
Extreme Heat Cooling Centers	Extreme Heat	-	Ongoing	Existing
Prevent Unplanned Bridge Closures	Earthquake	Caltrans	Ongoing	Existing
Anderson Community Wildfire Protection Plan (CWPP)	Wildfire	Anderson Fire Protection District	Ongoing	Existing

The Shasta County HMPT next developed a comprehensive list of possible, new mitigation actions for this plan update, as shown in the following table.

Table 42: Proposed Mitigation Actions, 2022 Plan (Update)

Proposed Mitigation Actions, 2022 Plan Update							
Action (aka Project)	Hazard(s) Addressed	Jurisdiction(s)	Lead Department	Status	Funding	Emphasis	Priority
Increase Fuel Breaks	Wildfire	All Jurisdictions	Shasta County Fire (SCF), CAL FIRE, Fire Districts	Proposed	Cal Fire Grant	New	High
Protect Wildfire-Prone Homes and Neighborhoods	Wildfire	All Jurisdictions	Shasta County Fire (SCF), CAL FIRE, Fire Districts	Proposed	Cal Fire Grant, Grant Funding as Available	New	High
Create Fire-Safe Roadways	Wildfire	All Jurisdictions	Shasta County Fire (SCF), CAL FIRE, Fire Districts	Proposed	Cal Fire Grant, Grant Funding as Available	New	Medium
Cottonwood Sewer Improvements	Flood	All Jurisdictions	Shasta County Public Works (PW)	Proposed	HMGP	New	Medium
Update the Safety Community Development Groups/Elements of the General Plan	All Hazards	All Jurisdictions	Shasta County Resource Management (RM)	Proposed	HMGP, Grant Funding as Available	New	Medium
Map Essential/Safety-Related Infrastructure and Services	All Hazards	All Jurisdictions	Shasta County Resource Management (RM)	Proposed	HMGP, Grant Funding as Available	New	Medium
Boyd Dam 1 Seismic Retrofitting	Dam Failure	All Jurisdictions	Shasta County Public Works, USACE	Proposed	HMGP, Grant Funding as Available	New	Medium
Boyd 1 Dam Clear Vegetation off Spillway	Dam Failure	All Jurisdictions	Shasta County Public Works, USACE	Proposed	HMGP, Grant Funding as Available	New	Medium
Boyd Dam 2 Seismic Retrofitting	Dam Failure	All Jurisdictions	Shasta County Public Works, USACE	Proposed	HMGP, Grant Funding as Available	New	Medium

Boyd 2 Dam Clear Vegetation off Spillway	Dam Failure	All Jurisdictions	Shasta County Public Works, USACE	Proposed	HMGP, Grant Funding as Available	New	Medium
Misselbeck Dam Seismic Retrofitting	Dam Failure, Drought, Earthquake, Flood	Igo Ono Community Services District	Igo Ono Community Services District	Proposed	HMGP, Grant Funding as Available	New	Medium
Misselbeck Dam Spillway Capacity Upgrade	Dam Failure, Drought, Earthquake, Flood	Igo Ono Community Services District	Igo Ono Community Services District	Proposed	HMGP, Grant Funding as Available	New	Medium
Misselbeck Dam Outlet Works	Dam Failure, Drought, Earthquake, Flood	Igo Ono Community Services District	Igo Ono Community Services District	Proposed	HMGP, Grant Funding as Available	New	Medium
Upgrade Eagle Creek Flume	Drought, Earthquake, Flood	Igo Ono Community Services District	Igo Ono Community Services District	Proposed	HMGP, Grant Funding as Available	New	Low

The final selected set of 42 mitigation actions (both new and carried over from the previous plan) are presented in the table below. Each carefully takes an all-hazards approach to mitigation while simultaneously addressing the nine (9) hazards specific to Shasta County, the City of Anderson, and the Igo Ono Community Services District.

Table 43: Mitigation Actions Summary, 2022 Plan (Update)

Mitigation Actions Summary, 2022 Plan (Update)					
Mitigation Action (aka Project)	Hazard(s) Addressed	Jurisdiction(s)	Funding	Timeframe	Priority
Community Wildfire Risk Reduction and Adaptation Planning	Wildfire	All participating jurisdictions	Cal Fire Grant, Grant Funding as Available	1-5 Years	High
Increase Fuel Breaks	Wildfire	All participating jurisdictions	Cal Fire Grant	Continuous	High
Protect Wildfire-Prone Homes and Neighborhoods	Wildfire	All participating jurisdictions	Cal Fire Grant, Grant Funding as Available	Continuous	High
Create Fire-Safe Roadways	Wildfire	All participating jurisdictions	Cal Fire Grant, Grant Funding as Available	1-2 Years	Medium
Cottonwood Sewer Improvements	Flood	Shasta County	Grant Funding as Available	1-2 Years	Medium
Update the Safety Community Development Groups/Elements of the General Plan	All Hazards	All participating jurisdictions	HMGP, Grant Funding as Available	Continuous	Medium
Map Essential/Safety-Related Infrastructure and Services	All Hazards	All participating jurisdictions	HMGP, Grant Funding as Available	1-5 Years	Medium
Misselbeck Dam Seismic Stability Improvement	Dam Failure, Drought, Earthquake, Flood	Igo Ono CSD	HMGP, Grant Funding as Available, USACE	1-5 Years	Medium
Misselbeck Dam Spillway Capacity Upgrade	Dam Failure, Drought, Earthquake, Flood	Igo Ono CSD	HMGP, Grant Funding as Available, USACE	1-5 Years	Medium
Misselbeck Dam Outlet Works	Dam Failure, Drought, Earthquake, Flood	Igo Ono CSD	HMGP, Grant Funding as Available	1-5 Years	Medium
Upgrade Eagle Creek Flume	Drought, Earthquake, Flood	Igo Ono CSD	HMGP, Grant Funding as Available	1-5 Years	Low
Boyd Dam 1 Seismic Retrofitting	Drought, Earthquake, Flood	All participating jurisdictions	HMGP, Grant Funding as Available, USACE	1-5 Years	Medium
Boyd 1 Dam Clear Vegetation off Spillway	Drought, Earthquake, Flood	All participating jurisdictions	HMGP, Grant Funding as Available, USACE	1-5 Years	Medium

Boyd Dam 2 Seismic Retrofitting	Drought, Earthquake, Flood	All participating jurisdictions	HMGP, Grant Funding as Available, USACE	1-5 Years	Medium
Boyd 2 Dam Clear Vegetation off Spillway	Drought, Earthquake, Flood	All participating jurisdictions	HMGP, Grant Funding as Available, USACE	1-5 Years	Medium
Flood Map Update	Flood	All participating jurisdictions	Grant Funding as Available	1-3 Years	Medium
Maintain Updated Multi-Jurisdictional Hazard Mitigation Plan	All Hazards	All participating jurisdictions	Grant Funding as Available	Continuous	High
Increase Participation in Floodplain Re-mapping Initiative	All Hazards	All participating jurisdictions	HMGP, Grant Funding as Available	Continuous	Medium
Prevent Unplanned Bridge Closures	Flood	All participating jurisdictions	HMGP, Grant Funding as Available	1-2 Years	Medium
Modify or Replace Culverts and Bridges to Improve Water and Traffic Flow	Flood	Shasta County	HMGP, Grant Funding as Available	Continuous	Low
Vegetation Management in Creeks	Flood	Shasta County	HMGP, Grant Funding as Available	Continuous	Medium
Burney Flood Wall	Flood	Shasta County	HMGP, Grant Funding as Available	1-3 Years	Low
Improve Cottonwood Fourth Street Drainage	Flood	Shasta County	HMGP, Grant Funding as Available	1-3 Years	Low
Construct Retention Ponds to Reduce Flooding	Flood	Shasta County	HMGP, Grant Funding as Available	1-5 Years	Low
Conduct Flow Monitoring and Hydrological Modeling of Waterways	Flood	All participating jurisdictions	HMGP, Grant Funding as Available	1-5 Years	Medium
Maintain an Updated Community Wildfire Protection Plan (CWPP)	Wildfire	Shasta County	Cal Fire Grant, Grant Funding as Available	1-5 Years	Medium
Implement Fuel Reduction Management Plans as Identified in the CWPP	Wildfire	Shasta County	Cal Fire Grant, Grant Funding as Available	1-3 Years	Medium
CAL FIRE, Shasta-Trinity Unit Fire Management Plan	Wildfire	Shasta County	Cal Fire Grant, Grant Funding as Available	1-5 Years	Medium
Burney Basin Community Wildfire Protection Plan (CWPP)	Wildfire	Shasta County	Cal Fire Grant, Grant Funding as Available	1-5 Years	Medium

Reduce Potable Water Losses	Drought, Wildfire	Shasta County	Grant Funding as Available	1-3 Years	Low
Prevent Unplanned Bridge Closures	Earthquake	Shasta County	HMGP, Grant Funding as Available	1-3 Years	Low
Maintain Integrated Evacuation Plan	Volcano	All participating jurisdictions	HMGP, Grant Funding as Available	Continuous	Medium
Limit Land Use Near Mount Lassen	Volcano	Shasta County	HMGP, Grant Funding as Available	Continuous	Low
Create a Dam Safety Outreach and Education Program	Dam Failure	All participating jurisdictions	HMGP, Grant Funding as Available	Continuous	Medium
Floodplain Management and Flood Mitigation Education and Outreach	Dam Failure	City of Anderson	HMGP, City Funds, Grant Funding as Available	Continuous	Medium
Enhance Floodplain Management Ordinance	Flood	City of Anderson	HMGP, City Funds, Grant Funding as Available	1-5 Years	Medium
Add Community Volunteers to Creek Cleanup Committee	Flood	City of Anderson	HMGP, City Funds, Grant Funding as Available	1-5 Years	Low
Tormey Drain [Remove Excess Organic Materials]	Flood	City of Anderson	HMGP, City Funds, Grant Funding as Available	1-3 Years	Medium
Build a New Police Station	All Hazards	City of Anderson	City Funds	1-5 Years	Medium
ACID Aqueduct at South Street [Develop Mitigation Plan]	Flood	City of Anderson	HMGP, City Funds, Grant Funding as Available	1-3 Years	Low
Extreme Heat Cooling Centers	Extreme Heat	City of Anderson	HMGP, City Funds, Grant Funding as Available	1-3 Years	Medium
Anderson Community Wildfire Protection Plan (CWPP)	Wildfire	City of Anderson	HMGP, City Funds, Grant Funding as Available	1-5 Years	Medium

NOTE: The Igo Ono Community Services District did not participate in the previous hazard mitigation plan. All projects/actions identified by the district for this plan (update) will be considered 'new' with no previous status provided.

All mitigation actions, aka projects, were selected based upon their potential to reduce the risk to life and property with an emphasis on new and existing infrastructure, ease of implementation, community and agency support, consistency with local jurisdictions' plans and capabilities, available funding, vulnerability, and total risk. Projects that save the most lives, property, and the environment will be prioritized first. Annual HMP meetings will determine if new projects become prioritized.

STAPLEE

Shasta County's primary hazard risks and thus, priorities, are the hazards of dam failure, drought, earthquake, extreme heat, flood, severe storms, volcano, wildfire, and severe winter weather.

A composite evaluation matrix will be used to prioritize the planning area's mitigation projects and activities. The evaluation will be conducted for each mitigation project and activity for each participating jurisdiction. All priorities will be re-assessed using STAPLEE for this plan update to ensure that the projects reflect current priorities. The composite evaluation matrix will be comprised of the three factors detailed below.

The first factor is the STAPLEE evaluation which is best for measuring feasibility and ease of implementation.

The second factor is the effectiveness of the mitigation project. How well does it mitigate the impact of a particular hazard? This is determined by its ability to protect citizens, property, and systems. For instance, wires installed to pin down trees and other objects will reduce their ability to become uprooted or take flight during hazards of high wind but are not as effective at reducing impacts from tornadoes or strong winds as are properly constructed and reinforced buildings. This factor is rated as: Low = 0.5, Medium = 1, and High = 1.5.

The third factor is a hazard risk-based evaluation. It draws on the hazard risk summary found in Section 4.3 of this plan. Each risk rating is assigned a value based on the assessment (None = 0, Low = 5, Medium = 10, and High = 15).

(HRT) = (HR1 + HR2 + HRn)

The total evaluation score is based on the hazard risk total multiplied by the effectiveness factor, added to the STAPLEE score.

Hazard Risk Total (HRT): The sum of values (low through high) of each hazard the project is designed to mitigate.

Mitigation Project Effectiveness (MPE): A multiplier based on the project's effectiveness to mitigate against a chosen hazard.

STAPLEE Evaluation: A raw score comprised of positive and negative feasibility.

(Priority) = (STAPLEE) + (MPE * HRT)

Upon completing the evaluations, a composite score is calculated and prioritized based on their total score (Low = 0 – 25, Medium = 26 – 50, High = > 50).

5.5 – Planning Integration

Mitigation does not end at plan approval. Plan approval is only the beginning. The successful implementation of any number of mitigation activities and projects requires the coordination and collaboration of local agencies, departments, and organizations, among others. Each group has

varying decision-making processes and authorities governing their actions. This plan, once approved, must be integrated into their decision-making processes as a tool for improving their respective resiliencies.

The Shasta County Multi-Jurisdictional Hazard Mitigation Plan will be incorporated into existing planning mechanisms in varying processes. These processes will be tailored to the unique characteristics of the planning mechanism and the governing structure of each participating jurisdiction.

Emergency Management Planning – The Igo Ono Community Services District have deferred their emergency management authority to the Shasta County Office of Emergency Services. The City of Anderson appoints a disaster council. Shasta County OES serves as the lead agency for emergency management planning and incorporates the Emergency Operations Plan and LHMPs into preparedness planning.

Emergency Operations Plan (EOP) – The Shasta County EOP will be reviewed and updated to reflect the most probable and dangerous hazard event scenarios from this plan's risk assessment. Additionally, the Shasta County Multi-Jurisdictional Hazard Mitigation Plan will be added in its entirety as an Appendix to the EOP. This revision is the responsibility of the Shasta County OES for all of the jurisdictions participating in this plan. Upon revision completion, all participating jurisdictions and appropriate emergency services will be notified of the revisions and sent out new copies of the EOP. Under the last LHMP Shasta County pulled hazard data and incorporated it into the EOP.

State of California Hazard Mitigation Plan – The state's hazard mitigation plan is required by FEMA regulation to include all local HMPs. The process of integrating the Shasta County Multi-Jurisdictional Hazard Mitigation Plan update into this plan is already an established process and is managed by the California Office of Emergency Services (CalOES). The last HMP incorporated hazards listed on the state HMP and the updated plan detailed why some state hazards were not given profiles.

Building Codes – All jurisdictions participating in this plan (update) are obligated by law to abide by the State of California Building Codes under Title 24 – Housing and Construction, Part 2 enacted in 2022. The Shasta County Multi-Jurisdictional Hazard Mitigation Plan does not change any of the state's requirements and therefore, does not interfere with any jurisdiction's current building code enforcement or land use planning.

Land Use & Zoning – None of the participating jurisdictions currently use any method of hazard mitigation land use planning other than NFIP compliance and the Shasta County Flood Damage Prevention Ordinance. However, there are a number of non-mitigation designated zoning ordinances which could be used to assist in mitigation activities including the Shasta County: Zoning Ordinance, Subdivision Ordinance, and the Manufactured/Mobile Home Placement Ordinance. Current land use and zoning laws prohibit development in certain floodplains and near volcanoes. The last plan was used to determine if the laws needed updating.

Shasta County General Plan – Shasta County's general plan states that "Shasta County will promote and facilitate a comprehensive plan that has the flexibility to react to the future growth of the county and surrounding region." This plan includes a number of zoning ordinances and plans including, but not limited to agricultural land use, industrial land use, commercial land use, and residential land use. Findings from the last LHMP were used to update future Shasta County General Plans.

National Flood Insurance Program (NFIP) Construction Compliance – All of the jurisdictions participating in this hazard mitigation plan (update), and more specifically, the National Flood Insurance Program (NFIP), are required to meet the minimum standards set forth by participating in the NFIP through the local

NFIP Coordinator. Shasta County's NFIP Coordinator/Floodplain Administrator currently ensures all new construction projects are properly surveyed and receive an elevation certificate. The NFIP coordinator uses FEMA-issued Flood Insurance Rate Maps/Digital Flood Insurance (DFIRM) information.

The determination of whether and how to use the Shasta County Multi-Jurisdictional Hazard Mitigation Plan in any NFIP-related processes and decisions will be left to the expertise of the NFIP Coordinator/Floodplain Administrator.

Infrastructure, Development & Construction Projects – All jurisdictions in Shasta County approach infrastructure, development, and construction projects in the same way. The demographics of Shasta County allows for planning to exist through collaboration with the Shasta County Department of Public Works. Completed mitigation actions pertaining to infrastructure from the previous LHMP strengthened the County's resilience and reduced several hazards. These best practices were included in the LHMP update.

Shasta County Local Emergency Planning Committee (LEPC) – Shasta County is included in the Inland Region LEPC – Region 3, which notes that the Shasta County's LEPC is a conduit for mitigation actions and projects. The last update was shared by the LEPC and the current update will be shared with relevant stakeholders. LHMP updates will go through the LEPC.

Mitigation Projects & Actions Implementation – Upon adoption of a hazard mitigation plan update, Shasta County will notify all participating jurisdictions when one of the next meeting topics will be reviewing mitigation project and action selections. Each jurisdiction then approves a list of mitigation actions and projects they want to pursue. During the meeting, Shasta County Public Works will assist the jurisdictions in determining which grant program and path will be appropriate for the project. After selection, the jurisdictions return to the Shasta County Public Works for assistance on funding and managing the project. If additional funding is necessary, the jurisdictions will have to return to their community and pass a resolution to secure the funding. Shasta County Public works facilitated LHMP meetings to update the plan. The County views the LHMP as a living document.

Shasta County Public Works can assist in every facet from project inception to completion as well as working with other external organizations for tasks such as grant writing, project monitoring, and project management where appropriate.

Capital Improvement & Economic Development Planning – Upon adoption of this plan update, Shasta County Public Works will notify each participating jurisdiction's authority. The notification will also contain a special notice to incorporate the following procedure into any capital improvement projects or economic development planning they may initiate. High hazard areas in floodplains and volcanic regions were not developed from data gained from the last LHMP.

Upon project conception a member of the quorum court, city council, school board, mayor, or school superintendent, will contact Shasta County Public Works for funding guidance and grant assistance. Should Shasta County and the participating jurisdictions' improvement and development projects rely on grant funding, Shasta County Public Works will advise the project proposing jurisdiction on which grant program is appropriate.

Following a funding source decision, a project proposal will be written by Shasta County Public Works, or the participating jurisdiction. The proposals will then return to the project proposing jurisdiction and undergo a vote by the appropriate governing body for approval.

Upon approval by the governing body, Shasta County Public Works will assist in applying for and managing the grant funding for the new improvement or development project. Any and all economic

development plans initiated or supported by a jurisdiction will undergo a hazard application process in which all hazard risk assessments from this plan will be weighed into the cost to benefit analysis of a capital improvement project or economic development planning. This can be done at the local level prior to working with Shasta County Public Works or exist as a known future consideration and requirement. However, if done at the local level, it must be reviewed and approved by Shasta County Public Works. If the hazard assessment process is not done at the local level, it will be completed by the Shasta County Public Works.

Table 45: Local Planning Mechanisms

Local Planning Mechanisms			
Organization	Role	Economic Development Authorities	Process Mechanism
Shasta County	Local Government	County Commissioners	Voting
City of Anderson	Local Government	Town Council	Voting
Igo Ono Community Services District	Local Government	Town Council	Voting

Appendix A: FEMA Approval Letter

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

FEMA

June 22, 2023

Rachelle Russell
Accountant Auditor III
Shasta County Public Works
1855 Placer Street
Redding, CA 96001

Dear Rachelle Russell:

The Federal Emergency Management Agency (FEMA) received documentation from Shasta County and the City of Anderson, confirming their adoption of the *Shasta County MJHMP Update 2023*. These jurisdictions are in conformance with the Code of Federal Regulations, Title 44, Part 201, Section 6 (44 C.F.R. 201.6). An updated list of the status of participating jurisdictions is enclosed with this letter.

The adoption of this plan ensures Shasta County and the City of Anderson's continued eligibility for funding under FEMA's Hazard Mitigation Assistance programs, including the Hazard Mitigation Grant Program (HMGP), the Building Resilient Infrastructure and Communities program (BRIC), and the Flood Mitigation Assistance (FMA) program. All requests for funding are evaluated individually according to eligibility and other program requirements. Approved hazard mitigation plans may also be eligible for points under the National Flood Insurance Program's Community Rating System (CRS).

The *Shasta County MJHMP Update 2023* is valid for five years from the plan's original approval date, **April 18, 2023** for all approved participants. Prior to **April 18, 2028**, all participating jurisdictions must review, revise, and submit their plan to FEMA for approval to maintain eligibility for grant funding.

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

Enclosure (1)
Status of Participating Jurisdictions, dated June 22, 2023

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

Status of Participating Jurisdictions as of June 22, 2023

Jurisdictions – Adopted and Approved

#	Jurisdiction	Date of Adoption	HHPD Requirements
1	Shasta County	5-30-2023	Not Met
2	City of Anderson	5-2-2023	Not Met
3	Igo Ono Community Services District	3-14-2023	Met

Jurisdictions – Approvable Pending Adoption

#	Jurisdiction

Appendix B: Jurisdiction Resolution Letters

RESOLUTION NO. 23-21

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF ANDERSON ADOPTING THE SHASTA COUNTY AND CITY OF ANDERSON MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

WHEREAS, the City of Anderson has historically experienced property damage, economic injury, personal injury, and threats to public safety from natural and manmade hazards; and

WHEREAS, in 2012 the County of Shasta and the City of Anderson jointly developed a Multi-Jurisdictional Hazard Mitigation Plan which recommends actions to protect both people and property; and

WHEREAS, in 2017 the County of Shasta and the City of Anderson jointly reviewed and updated the Multi-Jurisdictional Hazard Mitigation Plan; and

WHEREAS, the County of Shasta and the City of Anderson have both reviewed and updated the Multi-Jurisdictional Hazard Mitigation Plan; and

NOW, THEREFORE, BE IT RESOLVED that the City Council of the City of Anderson:

1. Adopts this revised Multi-Jurisdictional Hazard Mitigation Plan as an official plan for Anderson.

2. Directs the respective City Officials identified in the Plan to implement the actions assigned to them.

3. Directs periodic reporting of the status of Plan Implementation as required by law.

PASSED AND ADOPTED by the City Council of the City of Anderson this 2nd day of May, 2023, by the following vote:

AYES: Councilmember Baugh, Gallier, Hunt, Neutze and Mayor Gallagher.
NOES: None.
ABSTAIN: None.
ABSENT: None.

Mike Gallagher, Mayor

ATTEST:

Christy White, City Clerk

RESOLUTION NO. 2023-02

A RESOLUTION OF THE IGO ONO COMMUNITY SERVICES DISTRICT BOARD OF DIRECTORS ADOPTING THE SHASTA COUNTY, CITY OF ANDERSON AND IGO ONO COMMUNITY SERVICES DISTRICT MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

WHEREAS, the County of Shasta, City of Anderson and Igo Ono Community Services District have historically experienced severe damage, property loss, economic injury, personal injury, loss of life and threats to public safety from natural and man-made hazards;

WHEREAS, the County of Shasta, City of Anderson and Igo Ono Community Services District jointly developed a Multi-Jurisdictional Hazard Mitigation Plan which recommends actions to protect both people and property; and

WHEREAS, public meetings were held to develop and review the Multi-Jurisdictional Hazard Mitigation Plan as required by law.

NOW, THEREFORE, BE IT RESOLVED that the Board of Directors of the Igo Ono Community Services District

1. Adopts this Multi-Jurisdictional Hazard Mitigation Plan as an official plan of the District;
2. Directs the respective District Officials identified in the Hazard Mitigation Plan to implement the actions assigned to them; and
3. Directs periodic reporting of the status of Plan Implementation as required by law.

DULY PASSED AND ADOPTED this 14th day of March, 2023 by the Board of Directors of the Igo Ono Community Services District by the following vote:

AYES: Directors Tucker, Sandifer, Shreeve, Tucker and Moore
NOES: None
ABSENT: None
ABSTAIN: None
RECUSE: None

JOHN P. MOORE, JR., CHAIRMAN
Board of Directors
Igo Ono Community Services District

ATTEST:

JOSHUA TUCKER
Secretary of the Board of Directors

RESOLUTION NO. 2023-051

A RESOLUTION OF THE BOARD OF SUPERVISORS OF THE COUNTY OF SHASTA ADOPTING THE SHASTA COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION UPDATED PLAN ENCOMPASSING THE JURISDICTIONS OF SHASTA COUNTY, CITY OF ANDERSON, AND IGO ONO COMMUNITY SERVICES DISTRICT

WHEREAS, the County of Shasta, City of Anderson, and Igo Ono Community Services District have historically experienced severe damage, property loss, economic injury, personal injury, loss of life, and threats to public safety from natural and man-made hazards; and

WHEREAS, the County of Shasta, City of Anderson, and Igo Ono Community Services District jointly developed a Multi-Jurisdictional Hazard Mitigation Plan, dated April 2023, which encompasses each of their respective jurisdictions, makes certain updates, and recommends actions to protect both people and property; and

WHEREAS, public meetings were held to develop and review the Multi-Jurisdictional Hazard Mitigation Plan as required by law.

NOW, THEREFORE, BE IT RESOLVED that the Board of Supervisors of the County of Shasta:

1. Adopts the Shasta County Multi-Jurisdictional Hazard Mitigation Plan, prepared on the County's with the assistance of Consultant BOLDPlanning, Inc., and dated April 2023, which is attached and incorporated hereto as Exhibit A, as an official plan of the County; and

2. Directs the respective County Officials identified in the Hazard Mitigation Plan to promptly and timely implement the actions assigned to them; and

3. Directs periodic reporting of the status of Plan Implementation as required by law.

DULY PASSED AND ADOPTED this 30th day of May, 2023, by the Board of Supervisors of the County of Shasta, by the following vote:

AYES: Supervisors Rickert, Jones, Kelstrom, Crye, and Garman
NOES: None
ABSENT: None
ABSTAIN: None
RECUSE: None

PATRICK JONES, CHAIR
Board of Supervisors
County of Shasta
State of California

ATTEST:

DAVID J. RICKERT
Clerk of the Board of Supervisors

By: _____
Deputy

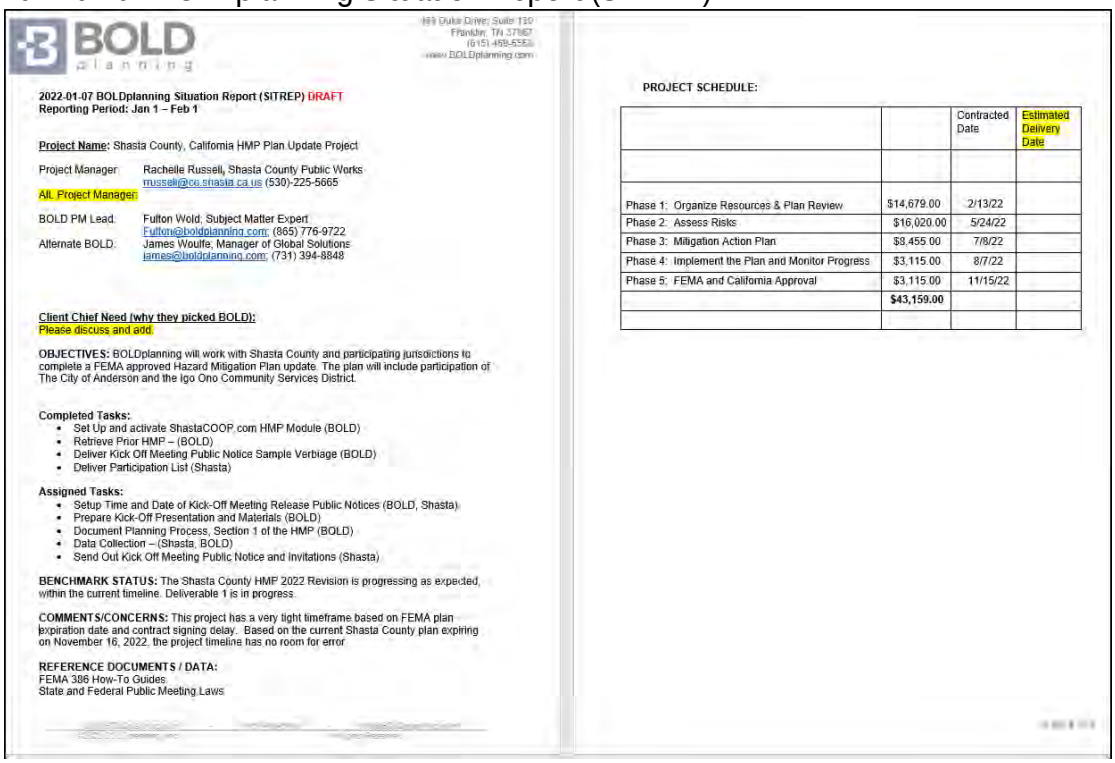
THIS INSTRUMENT IS
A CORRECT COPY OF THE ORIGINAL
ON FILE IN THIS OFFICE

ATTEST MAY 30 2023

CLERK OF THE BOARD
Supervisors of the County of Shasta, State of California
By: _____

Appendix C: Planning Process and Participation

2022-01-07 BOLDplanning Situation Report (SITREP)



BOLD planning

2022-01-07 BOLDplanning Situation Report (SITREP) DRAFT
Reporting Period: Jan 1 – Feb 1

Project Name: Shasta County, California HMP Plan Update Project

Project Manager: Rachelle Russell, Shasta County Public Works
russell@co.shasta.ca.us (530)-225-5665

Alt. Project Manager:

BOLD PM Lead: Fulton Wold, Subject Matter Expert
Fulton@boldplanning.com; (865) 776-9722

Alternate BOLD: James Woulfe, Manager of Global Solutions
jamesi@boldplanning.com; (731) 394-8848

Client Chief Need (why they picked BOLD):
Please discuss and add.

OBJECTIVES: BOLDplanning will work with Shasta County and participating jurisdictions to complete a FEMA approved Hazard Mitigation Plan update. The plan will include participation of The City of Anderson and the Igo Ono Community Services District.

Completed Tasks:
- Set Up and activate ShastaCOOP.com HMP Module (BOLD)
- Retrieve Prior HMP – (BOLD)
- Deliver Kick Off Meeting Public Notice Sample Verbiage (BOLD)
- Deliver Participation List (Shasta)

Assigned Tasks:
- Setup Time and Date of Kick-Off Meeting Release Public Notices (BOLD, Shasta)
- Prepare Kick-Off Presentation and Materials (BOLD)
- Document Planning Process, Section 1 of the HMP (BOLD)
- Data Collection – (Shasta, BOLD)
- Send Out Kick Off Meeting Public Notice and Invitations (Shasta)

BENCHMARK STATUS: The Shasta County HMP 2022 Revision is progressing as expected, within the current timeline. Deliverable 1 is in progress.

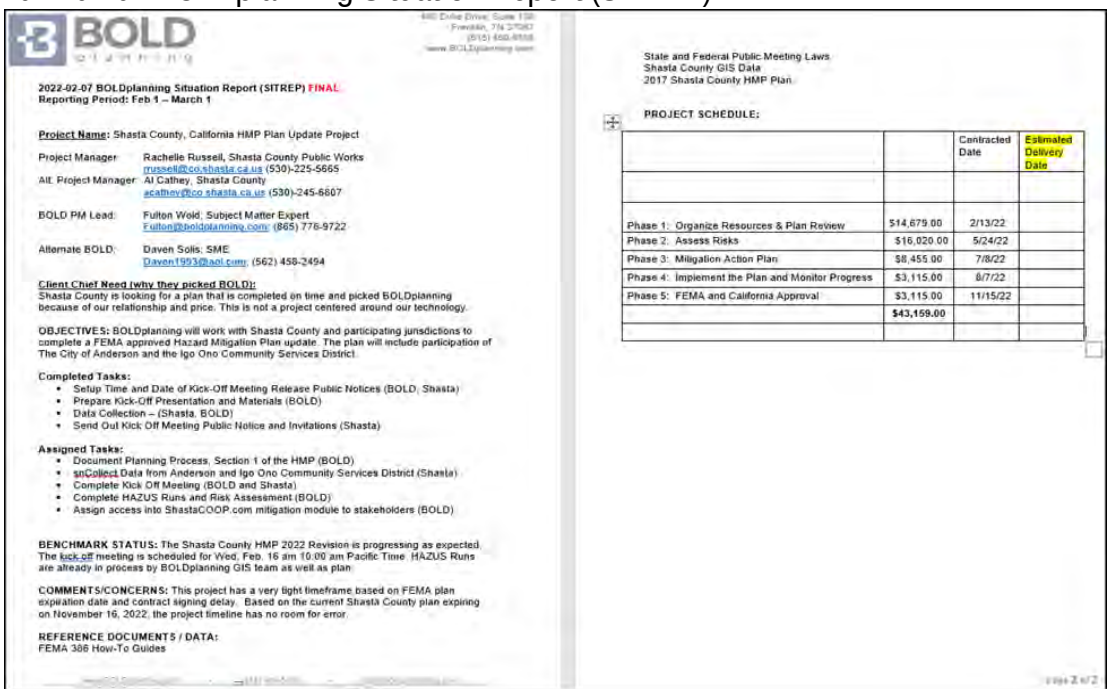
COMMENTS/CONCERNS: This project has a very tight timeframe based on FEMA plan expiration date and contract signing delay. Based on the current Shasta County plan expiring on November 16, 2022, the project timeline has no room for error.

REFERENCE DOCUMENTS / DATA:
FEMA 386 How-To Guides
State and Federal Public Meeting Laws

PROJECT SCHEDULE:

		Contracted Date	Estimated Delivery Date
Phase 1: Organize Resources & Plan Review	$14,679.00	2/13/22	
Phase 2: Assess Risks	$16,020.00	5/24/22	
Phase 3: Mitigation Action Plan	$8,455.00	7/8/22	
Phase 4: Implement the Plan and Monitor Progress	$3,115.00	8/7/22	
Phase 5: FEMA and California Approval	$3,115.00	11/15/22	
	$43,159.00		

2022-02-07 BOLDplanning Situation Report (SITREP)



BOLD planning

2022-02-07 BOLDplanning Situation Report (SITREP) FINAL
Reporting Period: Feb 1 – March 1

Project Name: Shasta County, California HMP Plan Update Project

Project Manager: Rachelle Russell, Shasta County Public Works
russell@co.shasta.ca.us (530)-225-5665

Alt. Project Manager: Al Cathey, Shasta County
acathey@co.shasta.ca.us (530)-245-6607

BOLD PM Lead: Fulton Wold, Subject Matter Expert
Fulton@boldplanning.com; (865) 776-9722

Alternate BOLD: Daven Solis, SME
Daven1993@aol.com; (562) 458-2494

Client Chief Need (why they picked BOLD):
Shasta County is looking for a plan that is completed on time and picked BOLDplanning because of our relationship and price. This is not a project centered around our technology.

OBJECTIVES: BOLDplanning will work with Shasta County and participating jurisdictions to complete a FEMA approved Hazard Mitigation Plan update. The plan will include participation of The City of Anderson and the Igo Ono Community Services District.

Completed Tasks:
- Setup Time and Date of Kick-Off Meeting Release Public Notices (BOLD, Shasta)
- Prepare Kick-Off Presentation and Materials (BOLD)
- Data Collection – (Shasta, BOLD)
- Send Out Kick Off Meeting Public Notice and Invitations (Shasta)

Assigned Tasks:
- Document Planning Process, Section 1 of the HMP (BOLD)
- snCollect Data from Anderson and Igo Ono Community Services District (Shasta)
- Complete Kick Off Meeting (BOLD and Shasta)
- Complete HAZUS Runs and Risk Assessment (BOLD)
- Assign access into ShastaCOOP.com mitigation module to stakeholders (BOLD)

BENCHMARK STATUS: The Shasta County HMP 2022 Revision is progressing as expected. The kick-off meeting is scheduled for Wed, Feb. 16 am 10:00 am Pacific Time. HAZUS Runs are already in process by BOLDplanning GIS team as well as plan.

COMMENTS/CONCERNS: This project has a very tight timeframe based on FEMA plan expiration date and contract signing delay. Based on the current Shasta County plan expiring on November 16, 2022, the project timeline has no room for error.

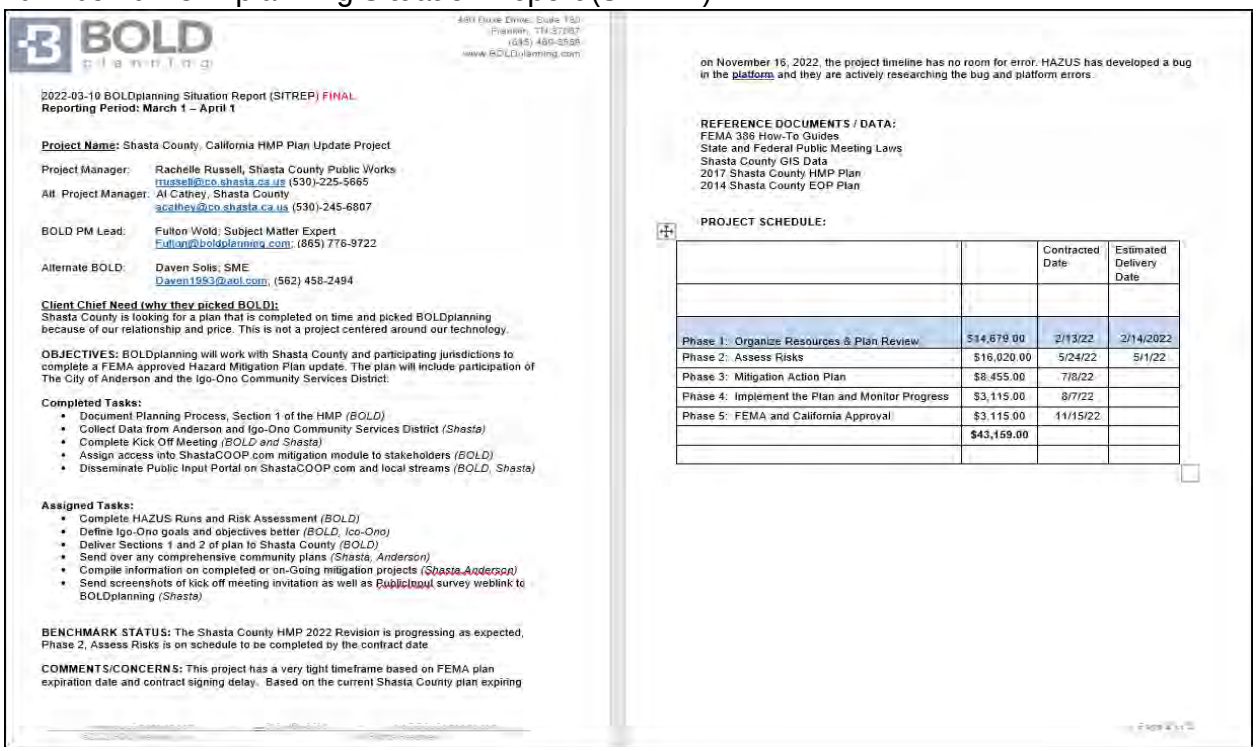
REFERENCE DOCUMENTS / DATA:
FEMA 386 How-To Guides

State and Federal Public Meeting Laws
Shasta County GIS Data
2017 Shasta County HMP Plan

PROJECT SCHEDULE:

		Contracted Date	Estimated Delivery Date
Phase 1: Organize Resources & Plan Review	$14,679.00	2/13/22	
Phase 2: Assess Risks	$16,020.00	5/24/22	
Phase 3: Mitigation Action Plan	$8,455.00	7/8/22	
Phase 4: Implement the Plan and Monitor Progress	$3,115.00	8/7/22	
Phase 5: FEMA and California Approval	$3,115.00	11/15/22	
	$43,159.00		

2022-03-10 BOLDplanning Situation Report (SITREP)



BOLD planning

480 Duke Drive, Suite 150
Franklin, TN 37067
(615) 468-5558
www.BOLDplanning.com

2022-03-10 BOLDplanning Situation Report (SITREP) FINAL
Reporting Period: March 1 – April 1

Project Name: Shasta County, California HMP Plan Update Project

Project Manager: Rachelle Russell, Shasta County Public Works
rrussell@co.shasta.ca.us (530)-225-5665
Alt. Project Manager: Al Cathey, Shasta County
acathey@co.shasta.ca.us (530)-245-6807

BOLD PM Lead: Fulton Wold; Subject Matter Expert
Fulton@boldplanning.com; (865) 776-9722

Alternate BOLD: Daven Solis; SME
Daven1993@aol.com; (562) 458-2494

Client Chief Need (why they picked BOLD):
Shasta County is looking for a plan that is completed on time and picked BOLDplanning because of our relationship and price. This is not a project centered around our technology.

OBJECTIVES: BOLDplanning will work with Shasta County and participating jurisdictions to complete a FEMA approved Hazard Mitigation Plan update. The plan will include participation of The City of Anderson and the Igo-Ono Community Services District.

Completed Tasks:
- Document Planning Process, Section 1 of the HMP *(BOLD)*
- Collect Data from Anderson and Igo-Ono Community Services District *(Shasta)*
- Complete Kick Off Meeting *(BOLD and Shasta)*
- Assign access into ShastaCOOP.com mitigation module to stakeholders *(BOLD)*
- Disseminate Public Input Portal on ShastaCOOP.com and local streams *(BOLD, Shasta)*

Assigned Tasks:
- Complete HAZUS Runs and Risk Assessment *(BOLD)*
- Define Igo-Ono goals and objectives better *(BOLD, Ico-Ono)*
- Deliver Sections 1 and 2 of plan to Shasta County *(BOLD)*
- Send over any comprehensive community plans *(Shasta, Anderson)*
- Compile information on completed or on-Going mitigation projects *(Shasta,Anderson)*
- Send screenshots of kick off meeting invitation as well as PublicInput survey weblink to BOLDplanning *(Shasta)*

BENCHMARK STATUS: The Shasta County HMP 2022 Revision is progressing as expected, Phase 2, Assess Risks is on schedule to be completed by the contract date.

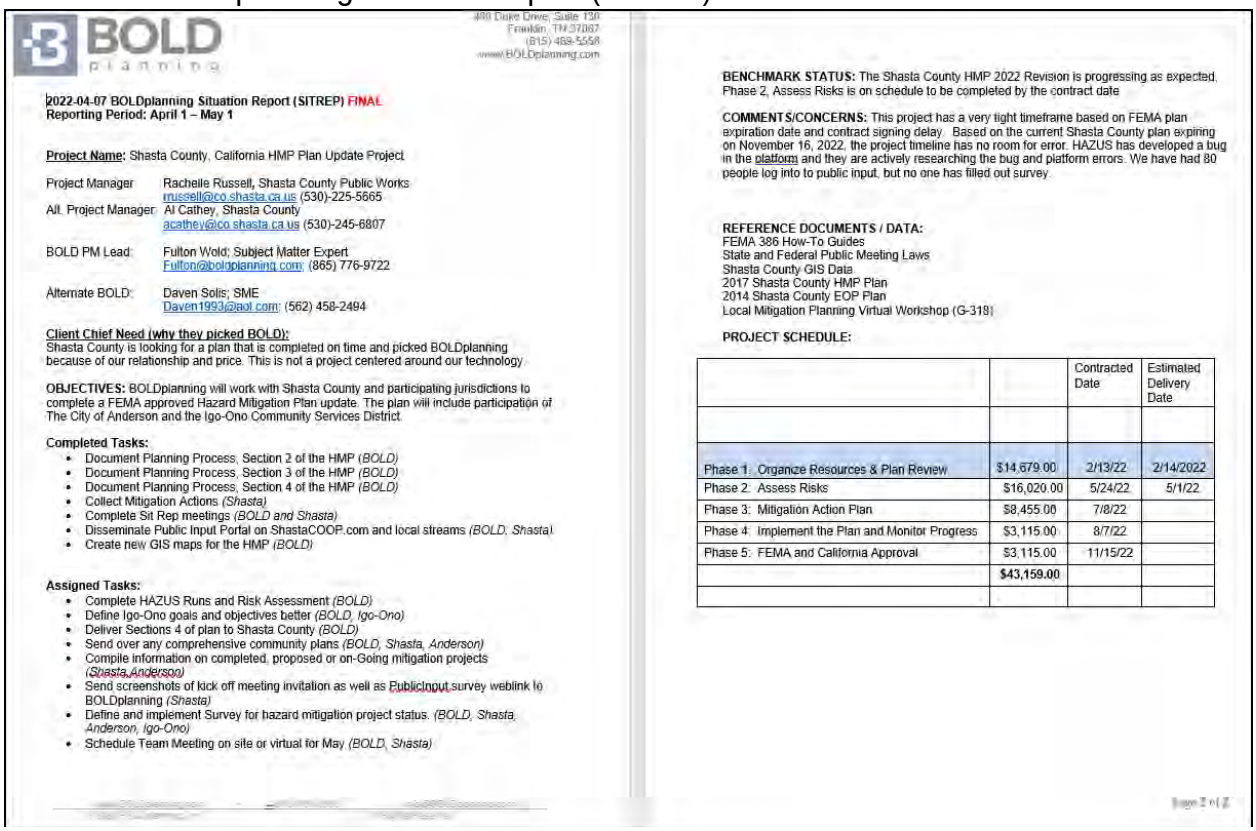
COMMENTS/CONCERNS: This project has a very tight timeframe based on FEMA plan expiration date and contract signing delay. Based on the current Shasta County plan expiring on November 16, 2022, the project timeline has no room for error. HAZUS has developed a bug in the platform and they are actively researching the bug and platform errors.

REFERENCE DOCUMENTS / DATA:
FEMA 386 How-To Guides
State and Federal Public Meeting Laws
Shasta County GIS Data
2017 Shasta County HMP Plan
2014 Shasta County EOP Plan

PROJECT SCHEDULE:

		Contracted Date	Estimated Delivery Date
Phase 1: Organize Resources & Plan Review	$14,679.00	2/13/22	2/14/2022
Phase 2: Assess Risks	$16,020.00	5/24/22	5/1/22
Phase 3: Mitigation Action Plan	$8,455.00	7/8/22	
Phase 4: Implement the Plan and Monitor Progress	$3,115.00	8/7/22	
Phase 5: FEMA and California Approval	$3,115.00	11/15/22	
	$43,159.00		

2022-04-07 BOLDplanning Situation Report (SITREP)



BOLD planning

480 Duke Drive, Suite 150
Franklin, TN 37067
(615) 468-5558
www.BOLDplanning.com

2022-04-07 BOLDplanning Situation Report (SITREP) FINAL
Reporting Period: April 1 – May 1

Project Name: Shasta County, California HMP Plan Update Project

Project Manager: Rachelle Russell, Shasta County Public Works
rrussell@co.shasta.ca.us (530)-225-5665
Alt. Project Manager: Al Cathey, Shasta County
acathey@co.shasta.ca.us (530)-245-6807

BOLD PM Lead: Fulton Wold; Subject Matter Expert
Fulton@boldplanning.com; (865) 776-9722

Alternate BOLD: Daven Solis; SME
Daven1993@aol.com; (562) 458-2494

Client Chief Need (why they picked BOLD):
Shasta County is looking for a plan that is completed on time and picked BOLDplanning because of our relationship and price. This is not a project centered around our technology.

OBJECTIVES: BOLDplanning will work with Shasta County and participating jurisdictions to complete a FEMA approved Hazard Mitigation Plan update. The plan will include participation of The City of Anderson and the Igo-Ono Community Services District.

Completed Tasks:
- Document Planning Process, Section 2 of the HMP *(BOLD)*
- Document Planning Process, Section 3 of the HMP *(BOLD)*
- Document Planning Process, Section 4 of the HMP *(BOLD)*
- Collect Mitigation Actions *(Shasta)*
- Complete Sit Rep meetings *(BOLD and Shasta)*
- Disseminate Public Input Portal on ShastaCOOP.com and local streams *(BOLD, Shasta)*
- Create new GIS maps for the HMP *(BOLD)*

Assigned Tasks:
- Complete HAZUS Runs and Risk Assessment *(BOLD)*
- Define Igo-Ono goals and objectives better *(BOLD, Igo-Ono)*
- Deliver Sections 4 of plan to Shasta County *(BOLD)*
- Send over any comprehensive community plans *(BOLD, Shasta, Anderson)*
- Compile information on completed, proposed or on-Going mitigation projects *(Shasta,Anderson)*
- Send screenshots of kick off meeting invitation as well as PublicInput survey weblink to BOLDplanning *(Shasta)*
- Define and implement Survey for hazard mitigation project status. *(BOLD, Shasta, Anderson, Igo-Ono)*
- Schedule Team Meeting on site or virtual for May *(BOLD, Shasta)*

BENCHMARK STATUS: The Shasta County HMP 2022 Revision is progressing as expected, Phase 2, Assess Risks is on schedule to be completed by the contract date.

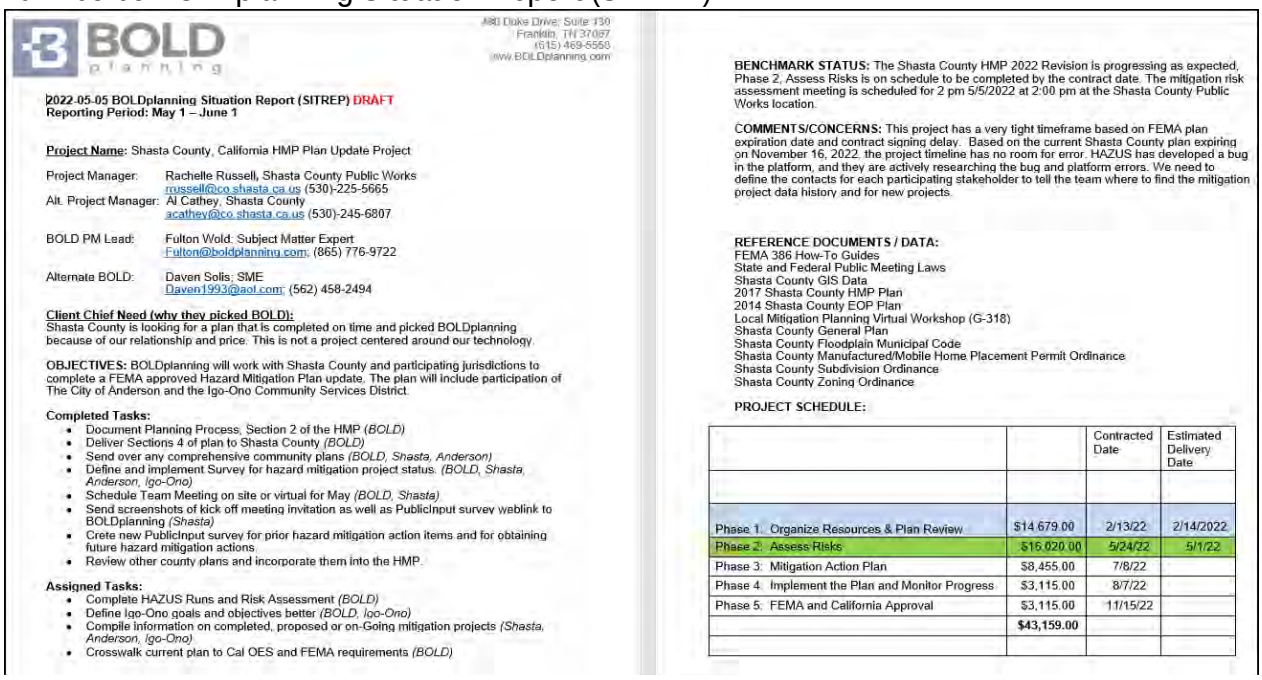
COMMENTS/CONCERNS: This project has a very tight timeframe based on FEMA plan expiration date and contract signing delay. Based on the current Shasta County plan expiring on November 16, 2022, the project timeline has no room for error. HAZUS has developed a bug in the platform and they are actively researching the bug and platform errors. We have had 80 people log into to public input, but no one has filled out survey.

REFERENCE DOCUMENTS / DATA:
FEMA 386 How-To Guides
State and Federal Public Meeting Laws
Shasta County GIS Data
2017 Shasta County HMP Plan
2014 Shasta County EOP Plan
Local Mitigation Planning Virtual Workshop (G-318)

PROJECT SCHEDULE:

		Contracted Date	Estimated Delivery Date
Phase 1: Organize Resources & Plan Review	$14,679.00	2/13/22	2/14/2022
Phase 2: Assess Risks	$16,020.00	5/24/22	5/1/22
Phase 3: Mitigation Action Plan	$8,455.00	7/8/22	
Phase 4: Implement the Plan and Monitor Progress	$3,115.00	8/7/22	
Phase 5: FEMA and California Approval	$3,115.00	11/15/22	
	$43,159.00		

2022-05-05 BOLDplanning Situation Report (SITREP)



BOLD planning

480 Duke Drive, Suite 130
Franklin, TN 37067
(615) 469-5550
www.BOLDplanning.com

2022-05-05 BOLDplanning Situation Report (SITREP) DRAFT
Reporting Period: May 1 – June 1

Project Name: Shasta County, California HMP Plan Update Project

Project Manager: Rachelle Russell, Shasta County Public Works
russell@co.shasta.ca.us (530)-225-5665
Alt. Project Manager: Al Cathey, Shasta County
acathey@co.shasta.ca.us (530)-245-6807

BOLD PM Lead: Fulton Wold; Subject Matter Expert
Fulton@boldplanning.com; (865) 776-9722

Alternate BOLD: Daven Solis; SME
Daven1993@aol.com; (562) 458-2494

Client Chief Need (why they picked BOLD):
Shasta County is looking for a plan that is completed on time and picked BOLDplanning because of our relationship and price. This is not a project centered around our technology.

OBJECTIVES: BOLDplanning will work with Shasta County and participating jurisdictions to complete a FEMA approved Hazard Mitigation Plan update. The plan will include participation of The City of Anderson and the Igo-Ono Community Services District.

Completed Tasks:
- Document Planning Process, Section 2 of the HMP *(BOLD)*
- Deliver Sections 4 of plan to Shasta County *(BOLD)*
- Send over any comprehensive community plans *(BOLD, Shasta, Anderson)*
- Define and implement Survey for hazard mitigation project status. *(BOLD, Shasta, Anderson, Igo-Ono)*
- Schedule Team Meeting on site or virtual for May *(BOLD, Shasta)*
- Send screenshots of kick off meeting invitation as well as PublicInput survey weblink to BOLDplanning *(Shasta)*
- Crete new PublicInput survey for prior hazard mitigation action items and for obtaining future hazard mitigation actions.
- Review other county plans and incorporate them into the HMP.

Assigned Tasks:
- Complete HAZUS Runs and Risk Assessment *(BOLD)*
- Define Igo-Ono goals and objectives better *(BOLD, Igo-Ono)*
- Compile information on completed, proposed or on-Going mitigation projects *(Shasta, Anderson, Igo-Ono)*
- Crosswalk current plan to Cal OES and FEMA requirements *(BOLD)*

BENCHMARK STATUS: The Shasta County HMP 2022 Revision is progressing as expected, Phase 2, Assess Risks is on schedule to be completed by the contract date. The mitigation risk assessment meeting is scheduled for 2 pm 5/5/2022 at 2:00 pm at the Shasta County Public Works location.

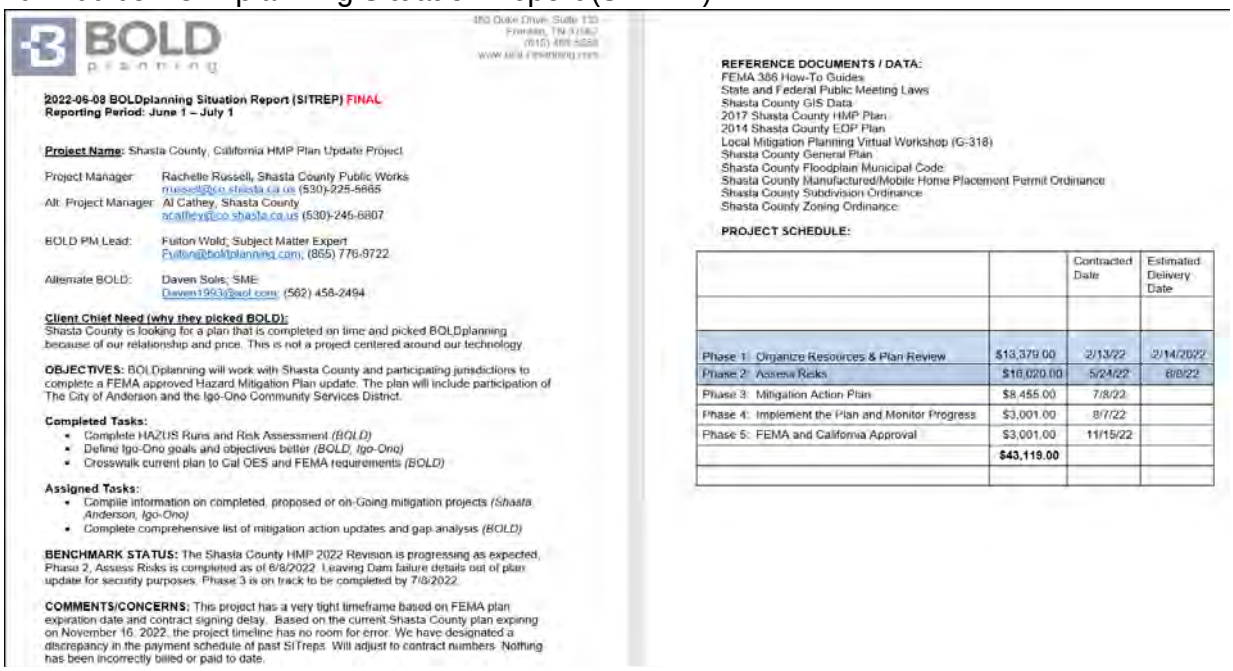
COMMENTS/CONCERNS: This project has a very tight timeframe based on FEMA plan expiration date and contract signing delay. Based on the current Shasta County plan expiring on November 16, 2022, the project timeline has no room for error. HAZUS has developed a bug in the platform, and they are actively researching the bug and platform errors. We need to define the contacts for each participating stakeholder to tell the team where to find the mitigation project data history and for new projects.

REFERENCE DOCUMENTS / DATA:
FEMA 386 How-To Guides
State and Federal Public Meeting Laws
Shasta County GIS Data
2017 Shasta County HMP Plan
2014 Shasta County EOP Plan
Local Mitigation Planning Virtual Workshop (G-318)
Shasta County General Plan
Shasta County Floodplain Municipal Code
Shasta County Manufactured/Mobile Home Placement Permit Ordinance
Shasta County Subdivision Ordinance
Shasta County Zoning Ordinance

PROJECT SCHEDULE:

		Contracted Date	Estimated Delivery Date
Phase 1: Organize Resources & Plan Review	$14,679.00	2/13/22	2/14/2022
Phase 2: Assess Risks	$16,020.00	5/24/22	5/1/22
Phase 3: Mitigation Action Plan	$8,455.00	7/8/22	
Phase 4: Implement the Plan and Monitor Progress	$3,115.00	8/7/22	
Phase 5: FEMA and California Approval	$3,115.00	11/15/22	
	$43,159.00		

2022-06-08 BOLDplanning Situation Report (SITREP)



BOLD planning

2022-06-08 BOLDplanning Situation Report (SITREP) FINAL
Reporting Period: June 1 – July 1

Project Name: Shasta County, California HMP Plan Update Project

Project Manager: Rachelle Russell, Shasta County Public Works
russell@co.shasta.ca.us (530)-225-5665
Alt. Project Manager: Al Cathey, Shasta County
acathey@co.shasta.ca.us (530)-245-6807

BOLD PM Lead: Fulton Wold; Subject Matter Expert
Fulton@boldplanning.com; (865) 776-9722

Alternate BOLD: Daven Solis; SME
Daven1993@aol.com; (562) 458-2494

Client Chief Need (why they picked BOLD):
Shasta County is looking for a plan that is completed on time and picked BOLDplanning because of our relationship and price. This is not a project centered around our technology.

OBJECTIVES: BOLDplanning will work with Shasta County and participating jurisdictions to complete a FEMA approved Hazard Mitigation Plan update. The plan will include participation of The City of Anderson and the Igo-Ono Community Services District.

Completed Tasks:
- Complete HAZUS Runs and Risk Assessment *(BOLD)*
- Define Igo-Ono goals and objectives better *(BOLD, Igo-Ono)*
- Crosswalk current plan to Cal OES and FEMA requirements *(BOLD)*

Assigned Tasks:
- Compile information on completed, proposed or on-Going mitigation projects *(Shasta, Anderson, Igo-Ono)*
- Complete comprehensive list of mitigation action updates and gap analysis *(BOLD)*

BENCHMARK STATUS: The Shasta County HMP 2022 Revision is progressing as expected, Phase 2, Assess Risks is completed as of 6/8/2022. Leaving Dam failure details out of plan update for security purposes. Phase 3 is on track to be completed by 7/8/2022.

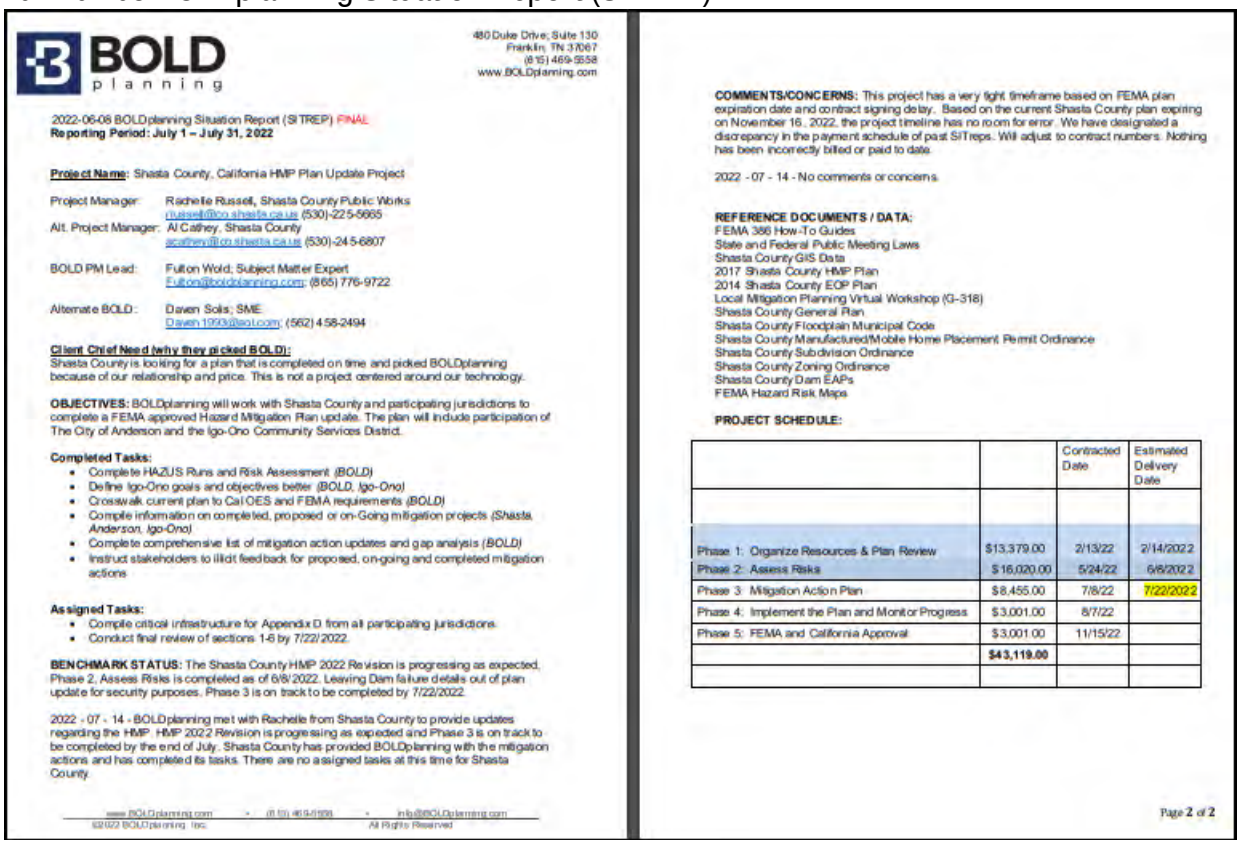
COMMENTS/CONCERNS: This project has a very tight timeframe based on FEMA plan expiration date and contract signing delay. Based on the current Shasta County plan expiring on November 16, 2022, the project timeline has no room for error. We have designated a discrepancy in the payment schedule of past SITreps. Will adjust to contract numbers. Nothing has been incorrectly billed or paid to date.

REFERENCE DOCUMENTS / DATA:
FEMA 386 How-To Guides
State and Federal Public Meeting Laws
Shasta County GIS Data
2017 Shasta County HMP Plan
2014 Shasta County EOP Plan
Local Mitigation Planning Virtual Workshop (G-318)
Shasta County General Plan
Shasta County Floodplain Municipal Code
Shasta County Manufactured/Mobile Home Placement Permit Ordinance
Shasta County Subdivision Ordinance
Shasta County Zoning Ordinance

PROJECT SCHEDULE:

		Contracted Date	Estimated Delivery Date
Phase 1: Organize Resources & Plan Review	$13,379.00	2/13/22	2/14/2022
Phase 2: Assess Risks	$16,020.00	5/24/22	8/8/22
Phase 3: Mitigation Action Plan	$8,455.00	7/8/22	
Phase 4: Implement the Plan and Monitor Progress	$3,001.00	8/7/22	
Phase 5: FEMA and California Approval	$3,001.00	11/15/22	
	$43,119.00		

2022-07-08 BOLDplanning Situation Report (SITREP)



BOLD planning

480 Duke Drive, Suite 130
Franklin, TN 37067
(615) 469-5558
www.BOLDplanning.com

2022-06-08 BOLDplanning Situation Report (SITREP) FINAL
Reporting Period: July 1 – July 31, 2022

Project Name: Shasta County, California HMP Plan Update Project

Project Manager: Rachelle Russell, Shasta County Public Works
rrussell@co.shasta.ca.us (530)-225-5665
Alt. Project Manager: Al Cathey, Shasta County
acathey@co.shasta.ca.us (530)-245-6807

BOLD PM Lead: Fulton Wold; Subject Matter Expert
Fulton@boldplanning.com; (865) 776-9722

Alternate BOLD: Daven Solis; SME
Daven1993@aol.com; (562) 458-2494

Client Chief Need (why they picked BOLD):
Shasta County is looking for a plan that is completed on time and picked BOLDplanning because of our relationship and price. This is not a project centered around our technology.

OBJECTIVES: BOLDplanning will work with Shasta County and participating jurisdictions to complete a FEMA approved Hazard Mitigation Plan update. The plan will include participation of The City of Anderson and the Igo-Ono Community Services District.

Completed Tasks:
- Complete HAZUS Runs and Risk Assessment *(BOLD)*
- Define Igo-Ono goals and objectives better *(BOLD, Igo-Ono)*
- Crosswalk current plan to Cal OES and FEMA requirements *(BOLD)*
- Compile information on completed, proposed or on-Going mitigation projects *(Shasta, Anderson, Igo-Ono)*
- Complete comprehensive list of mitigation action updates and gap analysis *(BOLD)*
- Instruct stakeholders to illicit feedback for proposed, on-going and completed mitigation actions

Assigned Tasks:
- Compile critical infrastructure for Appendix D from all participating jurisdictions
- Conduct final review of sections 1-6 by 7/22/2022.

BENCHMARK STATUS: The Shasta County HMP 2022 Revision is progressing as expected. Phase 2, Assess Risks is completed as of 6/8/2022. Leaving Dam failure details out of plan update for security purposes. Phase 3 is on track to be completed by 7/22/2022.

2022 - 07 - 14 - BOLDplanning met with Rachelle from Shasta County to provide updates regarding the HMP. HMP 2022 Revision is progressing as expected and Phase 3 is on track to be completed by the end of July. Shasta County has provided BOLDplanning with the mitigation actions and has completed its tasks. There are no assigned tasks at this time for Shasta County.

www.BOLDplanning.com • (615) 469-5558 • Info@BOLDplanning.com
©2022 BOLDplanning, Inc. All Rights Reserved

COMMENTS/CONCERNS: This project has a very tight timeframe based on FEMA plan expiration date and contract signing delay. Based on the current Shasta County plan expiring on November 16, 2022, the project timeline has no room for error. We have designated a discrepancy in the payment schedule of past SITreps. Will adjust to contract numbers. Nothing has been incorrectly billed or paid to date.

2022 - 07 - 14 - No comments or concerns.

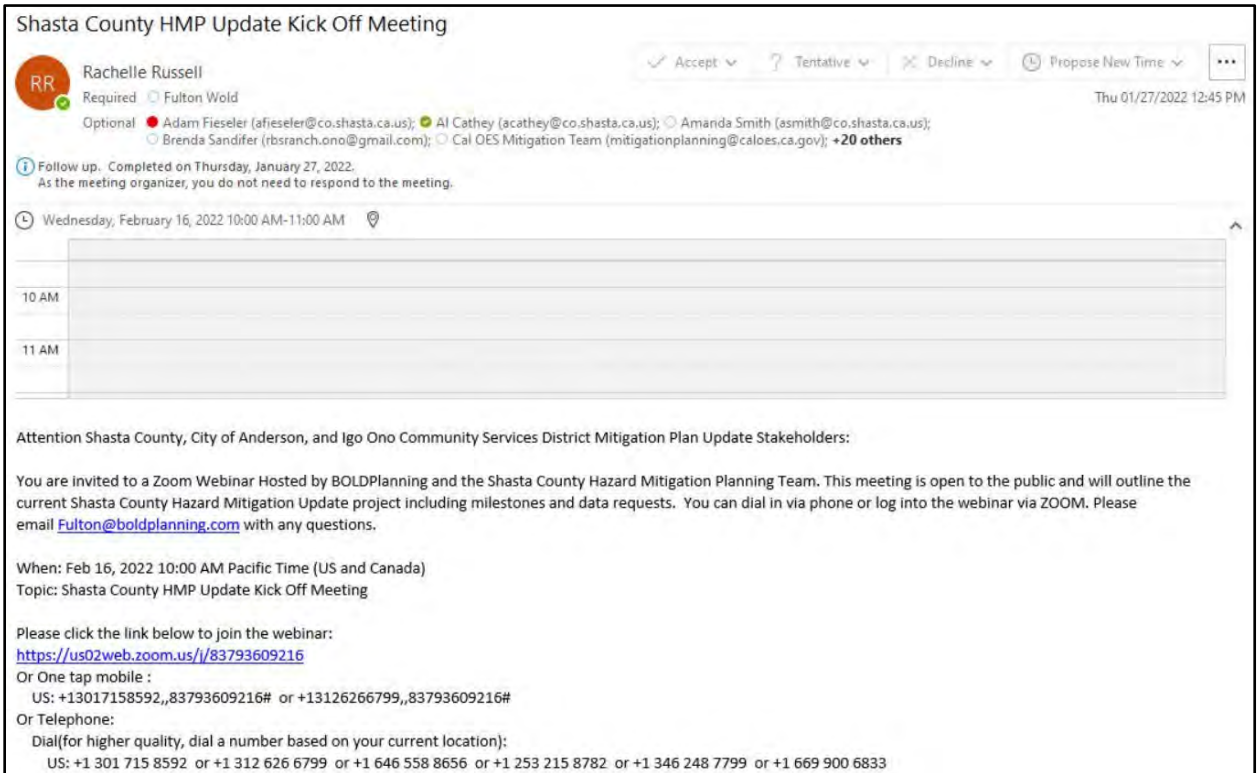
REFERENCE DOCUMENTS / DATA:
FEMA 386 How-To Guides
State and Federal Public Meeting Laws
Shasta County GIS Data
2017 Shasta County HMP Plan
2014 Shasta County EOP Plan
Local Mitigation Planning Virtual Workshop (G-318)
Shasta County General Plan
Shasta County Floodplain Municipal Code
Shasta County Manufactured/Mobile Home Placement Permit Ordinance
Shasta County Subdivision Ordinance
Shasta County Zoning Ordinance
Shasta County Dam EAPs
FEMA Hazard Risk Maps

PROJECT SCHEDULE:

		Contracted Date	Estimated Delivery Date
Phase 1: Organize Resources & Plan Review	$13,379.00	2/13/22	2/14/2022
Phase 2: Assess Risks	$16,020.00	5/24/22	6/8/2022
Phase 3: Mitigation Action Plan	$8,455.00	7/8/22	7/22/2022
Phase 4: Implement the Plan and Monitor Progress	$3,001.00	8/7/22	
Phase 5: FEMA and California Approval	$3,001.00	11/15/22	
	$43,119.00		

Page 2 of 2

Shasta County HMP Kickoff Meeting Invite



Shasta County HMP Update Kick Off Meeting

RR Rachelle Russell

Accept | Tentative | Decline | Propose New Time | ...

Required: Fulton Wold
Optional: Adam Fieseler (afieseler@co.shasta.ca.us); Al Cathey (acathey@co.shasta.ca.us); Amanda Smith (asmith@co.shasta.ca.us); Brenda Sandifer (rbsranch.ono@gmail.com); Cal OES Mitigation Team (mitigationplanning@caloes.ca.gov); **+20 others**

Thu 01/27/2022 12:45 PM

Follow up. Completed on Thursday, January 27, 2022.
As the meeting organizer, you do not need to respond to the meeting.

Wednesday, February 16, 2022 10:00 AM-11:00 AM

10 AM
11 AM

Attention Shasta County, City of Anderson, and Igo Ono Community Services District Mitigation Plan Update Stakeholders:

You are invited to a Zoom Webinar Hosted by BOLDPlanning and the Shasta County Hazard Mitigation Planning Team. This meeting is open to the public and will outline the current Shasta County Hazard Mitigation Update project including milestones and data requests. You can dial in via phone or log into the webinar via ZOOM. Please email Fulton@boldplanning.com with any questions.

When: Feb 16, 2022 10:00 AM Pacific Time (US and Canada)
Topic: Shasta County HMP Update Kick Off Meeting

Please click the link below to join the webinar:
https://us02web.zoom.us/j/83793609216
Or One tap mobile :
US: +13017158592,,83793609216# or +13126266799,,83793609216#
Or Telephone:
Dial(for higher quality, dial a number based on your current location):
US: +1 301 715 8592 or +1 312 626 6799 or +1 646 558 8656 or +1 253 215 8782 or +1 346 248 7799 or +1 669 900 6833

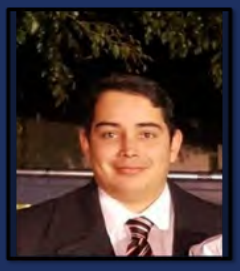

WELCOME!
REMINDERS:
• Please type your name and organization or if a member of the public, please type your city of residence in the chat feature.
• Please keep your mic on mute.
• Please type any questions or comments in the chat feature.
Thank you for joining today!
COUNTY OF SHASTA CALIFORNIA
CITY OF ANDERSON
Established 1872
Incorporated January 16, 1956
BOLD planning


Hazard Mitigation Strategy Planning Presentation for:
COUNTY OF SHASTA CALIFORNIA
CITY OF ANDERSON
Established 1872
Incorporated January 16, 1956
HMP Kickoff Meeting
Wednesday, February 16, 2022
BOLD planning

Your BOLDplanning Team

Fulton Wold, CBCP, PCP
VP, Government Solutions
(865) 776-9722
Fulton.Wold@Agilityrecovery.com

James Woulfe, CBCP, PCP
Manager, Global Solutions
(731) 394-8848
James.Woulfe@agility.recovery.com



Daven Solis, MS
Hazard Mitigation Specialist
(562) 458-2494
Daven1993@aol.com

BOLD planning

Who is BOLDplanning?

Leading Provider of Preparedness Planning Services and Software

More than 10,000 Plans Nationwide

Customer Base Covering 41 States

96% Customer Retention Rate

BOLD planning

Who is BOLDplanning?

1. 18 years: Emergency Management & Disaster Planning through web-based platforms

2. The company has a 100% FEMA approval rate for over 50 state, local and tribal mitigation plans since 2014, including numerous first-submission approvals.

3. Success with a **broad scope of jurisdictions**:
   - Paskenta Band of Nomlaki Indians– Tribal Hazard Mitigation Plan
   - City of Alamogordo, NM– City Hazard Mitigation Plan
   - Douglas County, GA– County Hazard Mitigation Plan
   - Cobb County, GA- County Hazard Mitigation Plan
   - Liberty County, GA- County Hazard Mitigation Plan

BOLDplanning's Mitigation Experience

State Mitigation Plans
- State of Arkansas – *3x, FEMA Approved*
- State of Florida – *FEMA Approved, Enhanced*
- State of Kansas – *FEMA Approved*
- State of Tennessee – *FEMA Approved*

Tribal Mitigation Plans
- Mescalero Apache Nation, New Mexico– *FEMA Approved*
- The Pueblo of Zia, New Mexico – *FEMA Approval Pending*
- *Jicarilla Apache Nation, New Mexico - In Development*
- Paskenta Band of Nomlaki Indians, California– *FEMA Approved (2020)*

Multi-Jurisdictional Mitigation Plans
- Atlanta-Fulton County, Georgia– *In Development*
- Berrien County, Michigan – *In Development*
- Chaves County, New Mexico – *FEMA Approved*
- *Curry County, New Mexico – In Development*
- San Juan County, New Mexico – *FEMA Approved (2021)*
- *Luna County, New Mexico– In Development*
- *Cobb County, Georgia – FEMA Approval Pending Adoption (2021)*
- Douglas County, Georgia– *FEMA Approved (2021)*
- Liberty County, Georgia– *FEMA Approved (2021)*
- Wahkiakum County, Washington – *FEMA Approved*

BOLD Experience

✓ Completed or currently developing hazard mitigation plans in eight states and five FEMA regions

✓ Completed hazard mitigation plans for states, universities, school districts, tribes, and local jurisdictions (single and multi), including the State of Tennessee, Arkansas, Florida, and Kansas Hazard Mitigation Plan

What is Mitigation?

- The Disaster Mitigation Act of 2000 made it mandatory for state, tribal, and local governments to have in place a FEMA-approved mitigation plan prior to receiving any HMGP, BRIC, PDM, or FMA grant funds under the Stafford Act
  - Hazard Mitigation Grant Program (HMGP)
  - Building Resilient Infrastructure and Communities (BRIC)
  - Pre-Disaster Mitigation (PDM)
  - Flood Mitigation Assistance (FMA)
- Plans must be updated and approved every 5 years

BOLD planning

Why Do We Mitigate?

BOLD planning

California State Natural Hazards

- Earthquake
- Landslide
- Volcano
- River, Stream and Alluvial flooding
- Climate Change
- Erosion
- Tsunami
- Levee Failure
- Dam Failure
- Wildfires
- Urban Fires
- Severe Weather
- Terrorism
- Drought
- Avalanche

Shasta County Storm Data

- From January 1950 to June 2021
- There were 19 different event types
- 473 total days that were affected by the events
- Eight (8) counties were affected by these events
- Property damage totaling $19.048 billion
- Crop damage totaling $16.5 million
- 128 deaths
- 94 injury/injuries

BOLD planning

Financial Assistance for Mitigation Projects

- Hazard Mitigation Grant Program (HMGP)
- Building Resilient Infrastructure and Communities (BRIC)
- Pre-Disaster Mitigation Program (PDM) - phasing out
- Flood Mitigation Assistance Program (FMA)
  - FEMA match is 75% to local 25%
  - Hazard mitigation plans can be used to apply for grants to help fund various hazard relief projects

FEMA

BOLD planning

Mitigation Plan Development

Project Management

- Monthly SITREPs
- Zoom meetings with Shasta County, CA Office of Emergency Management once per month
- Cloud-based online CRM/Project Management Software

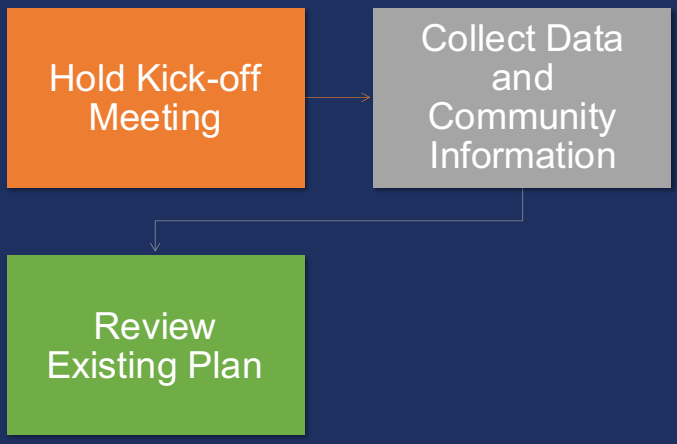
BOLD planning

Mitigation Plan Development

		Contracted Date
Phase 1: Organize Resources & Plan Review	$14,679.00	2/13/22
Phase 2: Assess Risks	$16,020.00	5/24/22
Phase 3: Mitigation Action Plan	$8,455.00	7/8/22
Phase 4: Implement the Plan and Monitor Progress	$3,115.00	8/7/22
Phase 5: FEMA and California Approval	$3,115.00	11/15/22
	$43,159.00	

BOLD planning

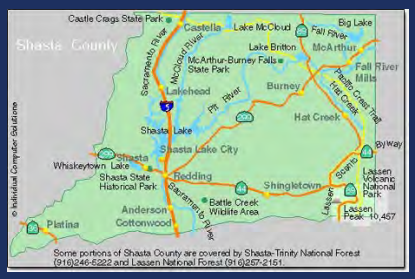
Deliverable 1- Organize Resources



BOLD planning

Shasta County Participating Jurisdictions

- Shasta County
- City of Anderson
- Ico Ono Community Services District



Map Source: Shasta County

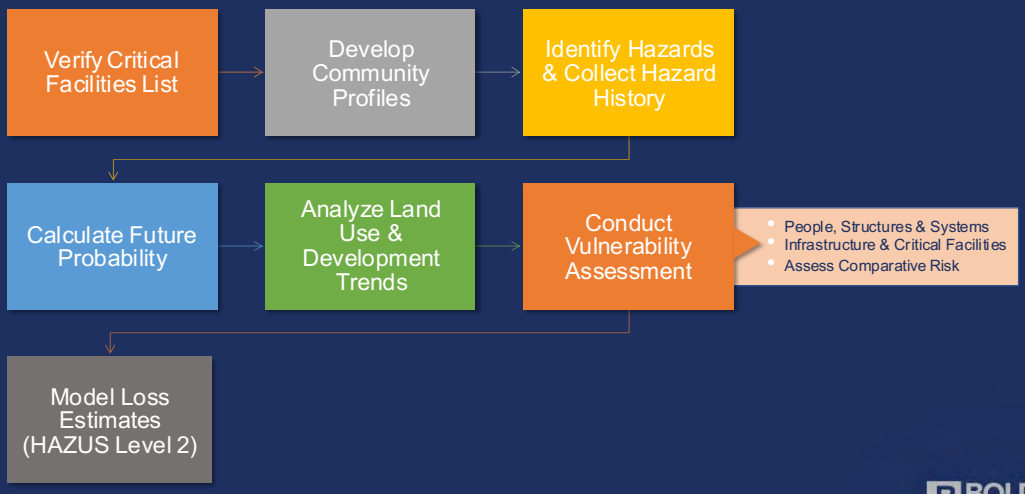
Resources, Team, & Involving the Public

- The community must make a commitment to have functional, comprehensive and inclusive mitigation plans
- Interested parties and pertinent stakeholders should be invited and included in the development process
  - Individuals include everyone from neighboring jurisdictions and response professionals, to include county and city planners.
  - Expertise and experience is invaluable in developing the most accurate risk assessment and effective mitigation strategy
- The public should be given a chance to ask questions and review the plan in order to encourage and influence their support

Data Collection

- Collect information from team, agencies and stakeholders.
- Determine what information needs to be collected.
  - Contact team members, agencies, and or stakeholders for the information.
    - Examples: council (County and City) members and county representatives

Deliverable 2 – Assess Risk



Shasta County Hazards

- Earthquake
- Wildfire
- Extreme Weather
- Hazmat Materials
- Volcano
- Chemical, Biological, Radiological, and Nuclear (CBRN) Incident
- Pandemic
- Mass Casualty Incidents

BOLD planning

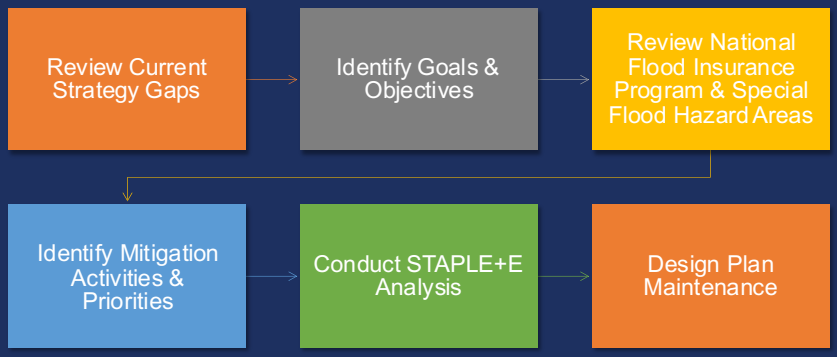
Source: Shasta County Countywide Hazard Mitigation Plan (2017)

Hazard Vulnerability & Risk Assessment

- Analyses for jurisdictions:
  - Hazards
  - History
  - Vulnerability
- Conducted Final Risk Assessment
  - Where appropriate, usedHAZUS-MH to model losses.

BOLD planning

Deliverable 3 – Develop the Mitigation Plan



Objectives and Strategy

- Set the Objectives
- Develop the Mitigation Strategies
- Based on risk and local input, determine the strategy
  - Set objectives for all vulnerable hazards
  - Develop a long-term, comprehensive and inclusive strategy
  - Determine mitigation project options and alternatives
  - Assess mitigation projects using STAPLE+E
  - Determine integration procedures

Evaluate and Prioritize

- Evaluate the Risk
- Prioritize the Hazard
- Prioritize based on:
  - Ability to mitigate
  - Cost to mitigate
  - Alternative measures
  - Cost effectiveness

Deliverable 4 – Implement the Plan & Monitor Progress

Conduct Closeout Meetings with the Public & Stakeholders
- Integrate Comments & Feedback

Review Draft Plan with Stakeholders
- Integrate Comments& Feedback

Submit to Cal OES & FEMA
- Plan Review
- Cross Walk Feedback

Revise and Edit

Per State of California and FEMA's Recommendations

Draft the Plan

- Hold a review meeting for the team
- Hold a public review meeting for the public
- Include any new information
- Edit and finalize
- Submit to California Office of Emergency Services (CalOES) & FEMA
- Make revisions as necessary
- **ACHIEVE PLAN APPROVAL!**

BOLD planning

Deliverable 5 – Adoption and Maintenance

FEMA Approval & Adoption

FEMA

BOLD planning

Adopt the Plan

- Upon FEMAAPA (Approval Pending Adoption), draft adoption letter.
- Disseminate adoption letters,sign adoption letters, and complete adoption package forFEMA

Implement, Evaluate, & Review

- Over the next five (5) years following the adoption of the plan update, Shasta County, The City of Anderson and the Ico Ono Community Services District must:
  - **Begin to implement the plan**
  - **Regularly evaluate it's effectiveness**
  - **Review it for necessary changes**

Public Involvement: Surveys

- BOLDplanning Inc. created an online HMP survey for Shasta County, CA using Public Input, a community engagement survey tool
- Link to HMP Survey: https://publicinput.com/B4137

HMP Surveys are due by May 18, 2022 Remember, complete 1 survey per stakeholder or household!

BOLD planning

QUESTIONS & COMMENTS

BOLD planning

Planning Meeting Kickoff Attendees

2022 Multi-Jurisdictional Hazard Mitigation Plan Update Agency Participation List			
Agency	**Names**	**Email**	**Position**
CAL FIRE & Shasta County - Fire	Scott Corn	scott.corn@fire.ca.gov	Assistant Chief
Cal OES Mitigation Planning Team	Multiple	mitigationplanning@caloes.ca.gov	Multiple
Caltrans	Kurt Schneider	kurt.m.schneider@dot.ca.gov	Transportation Engineer
	Mike Haigh	michael.haigh@dot.ca.gov	CT Maintenance Area/Superintendent/HAZ MAT Coordinator
CHP	Kevin Alexander	kalexander@chp.ca.gov	Captain
	Mike Berry	mberry@chp.ca.gov	Lieutenant
	Greg Ross	grross@chp.ca.gov	Sergeant

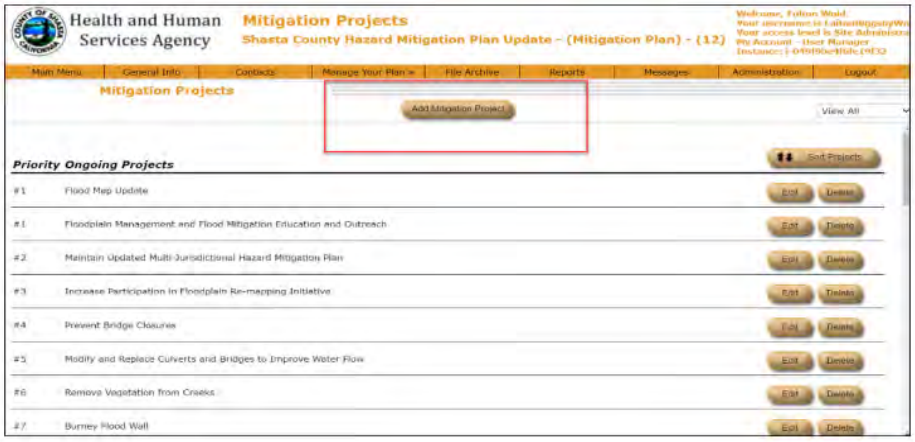
City of Anderson	Matt Baker	mbaker@ci.anderson.ca.us	Engineering Services Manager
	Peter Wickenheiser	pwickenheiser@ci.anderson.ca.us	Engineering Services Manager
Igo-Ono CSD	John Moore	eroomjay@gmail.com	Board of Directors, Chairman
	Brenda Sandifer	rbsranch.ono@gmail.com	Board of Directors
	Joshua Tucker	jjttuck@hotmail.com	Board of Directors
	Irene Ledbetter	ibetter44@msn.com	Board of Directors
Shasta County Fire Safe Council	Dr. Richard Sealana	rsealana@gmail.com	President/CEO
	Tania Greenwood	tgreenwood79@gmail.com	Vice President
	Ed Stewart	4skeets2@gmail.com	CFO
	Fran Belden	belden1777@gmail.com	Secretary-Treasurer
Shasta County - Public Works	Pat Minturn	pminturn@co.shasta.ca.us	Public Works Director
	Rachelle Russell	rrussell@co.shasta.ca.us	Accountant Auditor III
	Al Cathey	acathey@co.shasta.ca.us	Deputy Public Works Director - Eng
Shasta County - Resource Management	Paul Hellman	phellman@co.shasta.ca.us	Resource Management Director
	Jim Whittle	jwhittle@co.shasta.ca.us	Director Environmental Health
	Adam Fieseler	afieseler@co.shasta.ca.us	Planning Division Manager
	Lio Salazar	lsalazar@co.shasta.ca.us	Senior Planner
Shasta County - Public Health	Amanda Smith	asmith@co.shasta.ca.us	Community Education Specialist II
Shasta County - Sheriff's Office	Mike Lindsey	mlindsey@co.shasta.ca.us	Chief Fiscal Officer
	Tennille Doerschel	tldoerschel@co.shasta.ca.us	Accountant Auditor III
	Rob Sandbloom	rsandbloom@co.shasta.ca.us	Lieutenant
Western Shasta RCD	Kelli England	kengland@westernshastarcd.org	Chief of Field Operations
	Maureen Teubert	maureen@westernshastarcd.org	District Manager
	Ross Perry	rperry@westernshastarcd.org	Project Manager

480 Duke Drive; Suite 130
Franklin, TN 37067
(615) 469-5558
www.BOLDplanning.com

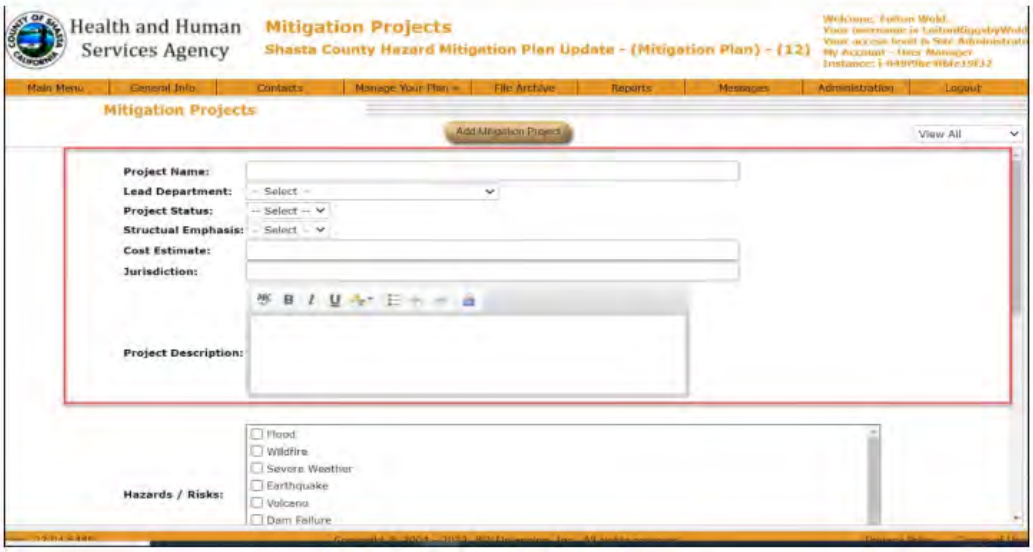
Please add your proposed mitigation actions in the ShastaCOOP.com platform. Or, update already listed projects from the 2017 plan.

Step 1

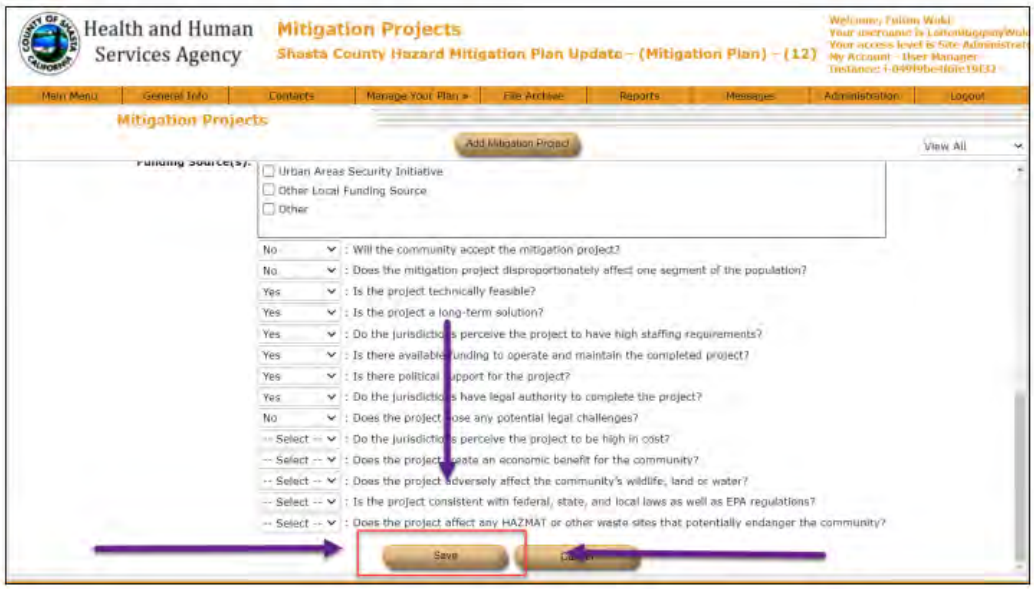
Step 2



Step 3



Step 4 – HIT SAVE!!!!!!



May Project Update Meeting Attendees

Name (Original Name)	User Email	Join Time	Leave Time	Duration (Minutes)	Guest
Fulton Wold (BOLDplanning MeetingRoom1)	meeting1@boldplanning.com	5/5/2022 15:44	5/5/2022 16:29	46	No
John Moore		5/5/2022 15:45	5/5/2022 16:29	44	Yes
Kim Acker		5/5/2022 15:54	5/5/2022 16:29	36	Yes
Daven Solis		5/5/2022 15:56	5/5/2022 16:29	33	Yes
Adam Fieseler-Shasta County		5/5/2022 15:58	5/5/2022 16:29	31	Yes
Peter Wickenheiser - COA		5/5/2022 15:59	5/5/2022 16:29	30	Yes
Amanda Smith-SCPH		5/5/2022 15:59	5/5/2022 16:29	30	Yes
Megan		5/5/2022 15:59	5/5/2022 16:29	30	Yes
Rob Sandbloom		5/5/2022 16:00	5/5/2022 16:29	30	Yes
Ross Perry (Ross Perry)		5/5/2022 16:01	5/5/2022 16:29	29	Yes
Jim Whittle		5/5/2022 16:07	5/5/2022 16:29	22	Yes
M, Teubert		5/5/2022 16:20	5/5/2022 16:29	9	Yes

Appendix D: Additional Federal and State Requirements

Environmental compliance and historic preservation are essential components of the mitigation project planning, approval, and implementation process. The following is a listing of some federal laws, state laws and executive orders that may apply to the proposed or future mitigation actions in this HMP.

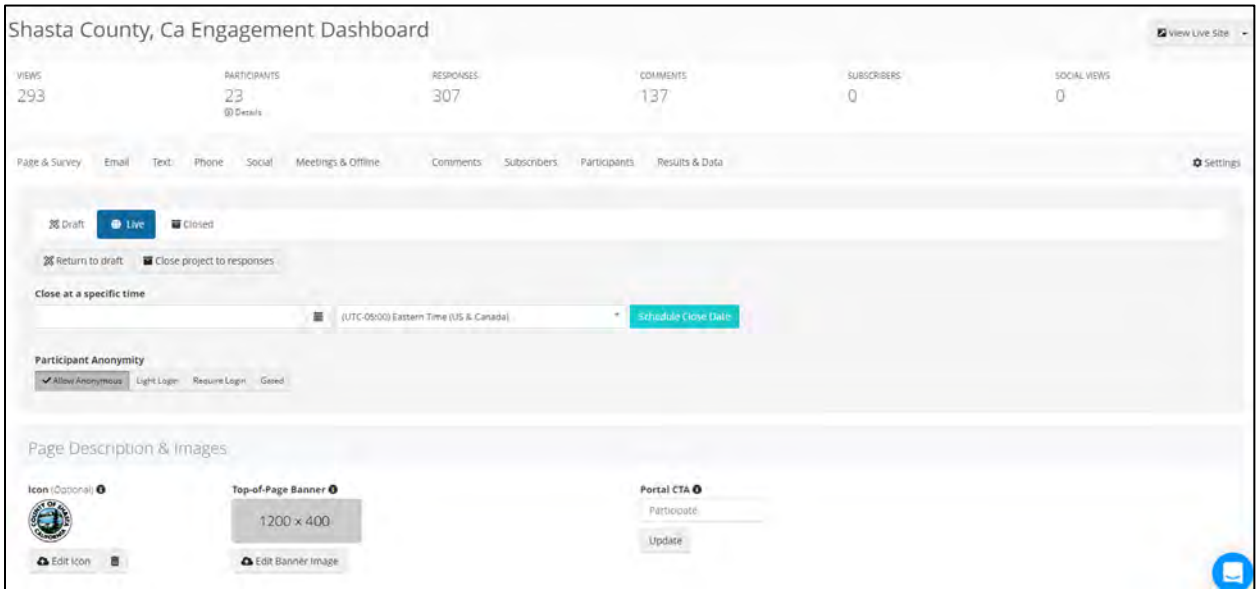
California Environmental Quality Act (CEQA)
Clean Water Act (Section 401)
Clean Water Act (Section 404)
Endangered Species Act
Executive Order 1190 Wetland Protection
Executive Order 11988 Floodplain Management
Executive Order 12898 Environmental Justice
National Environmental Policy Act (NEPA)
National Historic Preservation Act
Wild and Scenic Rivers Act

Federal and State Requirements Resources

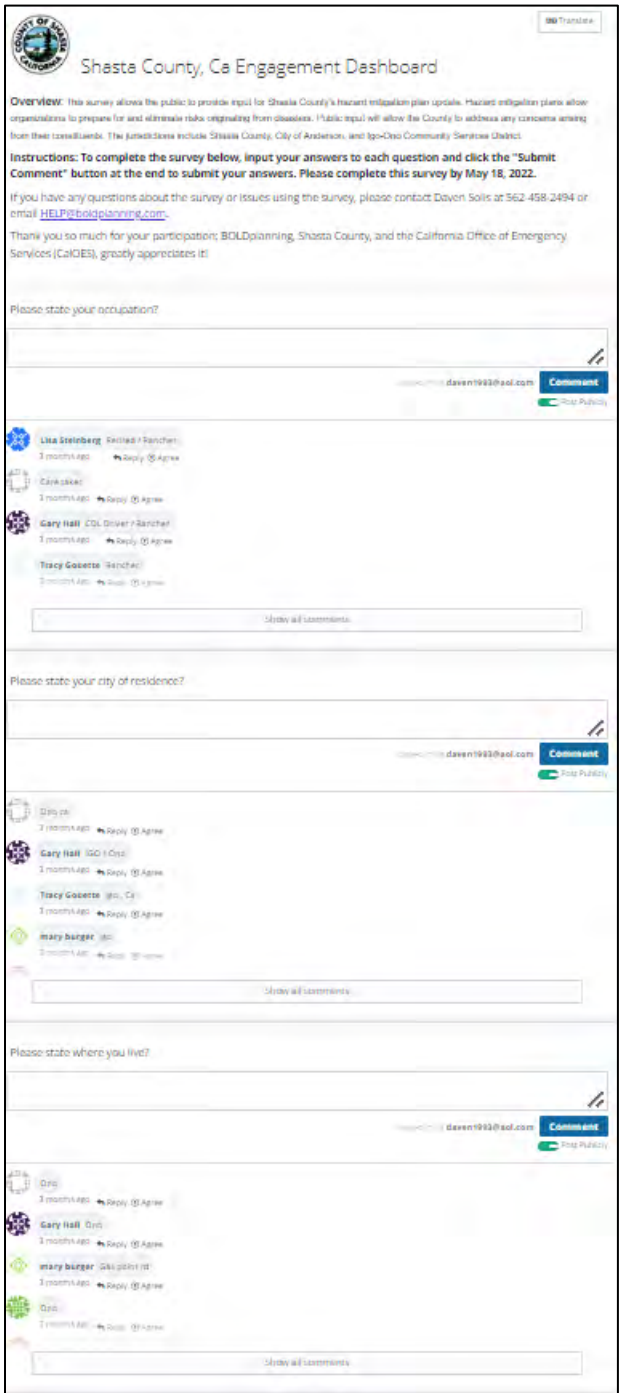
Institution, Organization, or Agency Website	**Website**
Federal Emergency Management Agency	www.fema.gov
Environmental Protection Agency	www.epa.gov
U.S. Fire Administration	www.usfa.fema.gov
National Fire Protection Association	www.nfpa.org
U.S. Army Corps of Engineers	www.usace.army.mil
U.S. Geological Survey	www.usgs.gov
U.S. Department of Agriculture Natural Resources Conservation Service	www.nrcs.usda.gov
ESRI/FEMA Hazards Awareness Site	www.esri.com/hazards
California Department of Fish and Game	www.dfg.ca.gov
California Law	www.leginfo.ca.gov
California Governor's Office of Planning and Research	www.opr.ca.gov
California Governor's Office of Emergency Services	www.oes.ca.gov
California Department of Water Resources	www.dwr.ca.gov
California Department of Forestry-Fire and Resource Assessment Program	http://frap.cdf.ca.gov

Appendix E: Public Participation

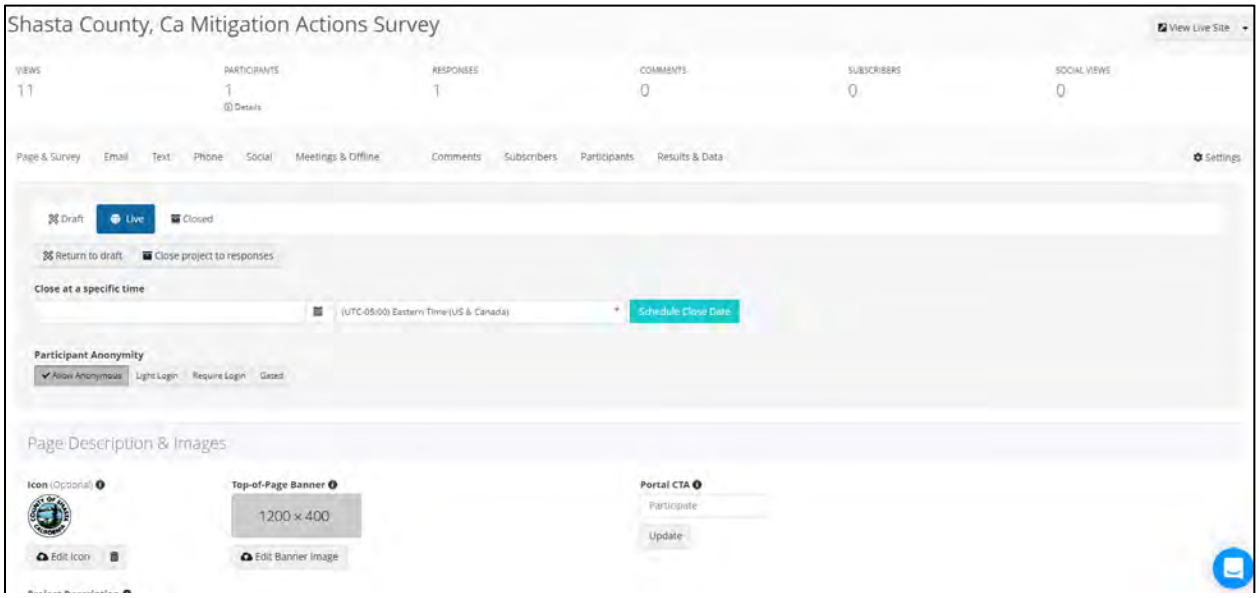
Shasta County, CA Engagement Dashboard Internal Site



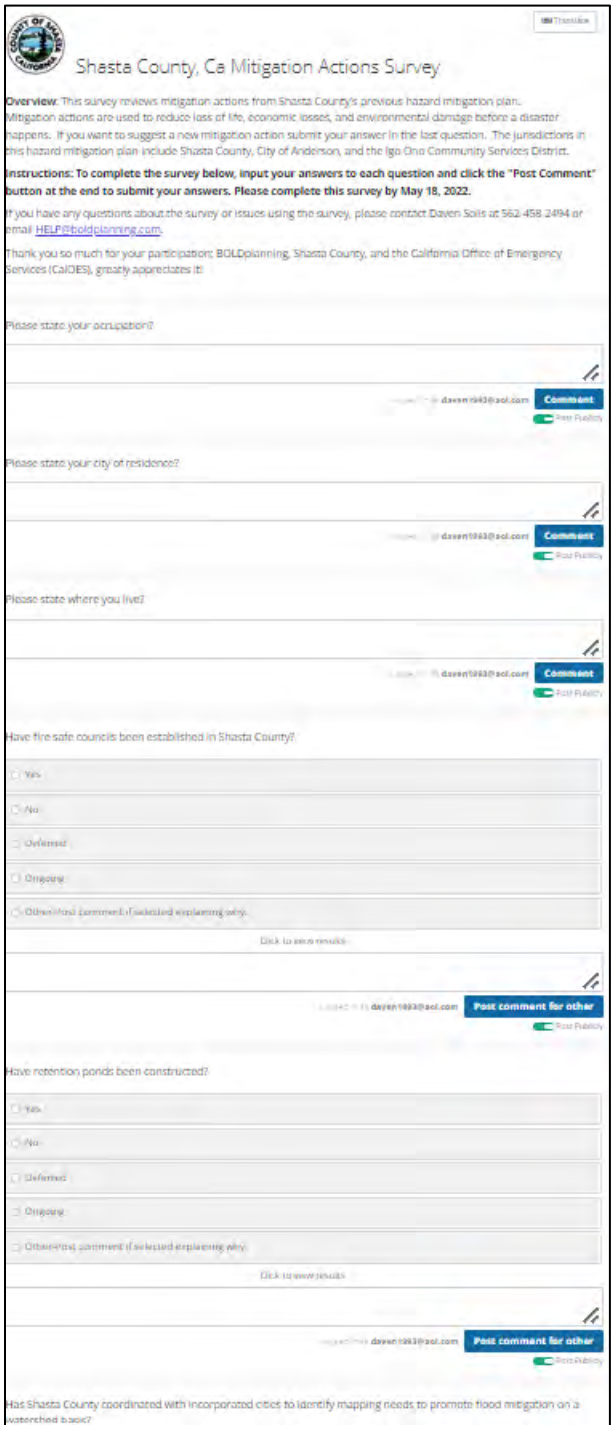
Shasta County, CA Engagement Dashboard External Site



Shasta County, Ca, Mitigation Actions Survey Internal Site



Shasta County, Ca, Mitigation Actions Survey External Site



Shasta County, Ca Mitigation Actions Survey

Overview: This survey reviews mitigation actions from Shasta County's previous hazard mitigation plan. Mitigation actions are used to reduce loss of life, economic losses, and environmental damage before a disaster happens. If you want to suggest a new mitigation action submit your answer in the last question. The jurisdictions in this hazard mitigation plan include Shasta County, City of Anderson, and the Igo-Ono Community Services District.

Instructions: To complete the survey below, input your answers to each question and click the "Post Comment" button at the end to submit your answers. Please complete this survey by May 18, 2022.

If you have any questions about the survey or issues using the survey, please contact Daven Solis at 562.458.2494 or email HELP@boldplanning.com.

Thank you so much for your participation; BOLDplanning, Shasta County, and the California Office of Emergency Services (CalOES), greatly appreciates it!

Please state your occupation?

Comment

Please state your city of residence?

Comment

Please state where you live?

Comment

Have fire safe councils been established in Shasta County?

Yes
No
Deferred
Ongoing
Other(Post Comment) (selected explaining why)

Post comment for other

Have retention ponds been constructed?

Yes
No
Deferred
Ongoing
Other(Post Comment) (selected explaining why)

Post comment for other

Has Shasta County coordinated with incorporated cities to identify mapping needs to promote flood mitigation on a watershed basis?

Newspaper Article

Record Searchlight

PART OF THE USA TODAY NETWORK

SHASTA COUNTY CLERK
1450 COURT ST
REDDING CA 96001--168

Account	AD#	Net Amount	Gross Amount	Total Amount	Payment Method	Payment Amount	Amount Due
1210664	0005114385	$1,148.00	$1,148.00	$1,148.00	Invoice	$0.00	$1,148.00

Sales Rep: asathisarg Order Taker: asathisarg Order Created 01/31/2022

Product		# Ins		Column	Lines	Start Date	End Date		
RRS-Redding Record Searchl	2	4	14	2.00	41	02/02/2022	02/15/2022	4.00	7
RRS-Redding.com	2	4	14	2.00	41	02/02/2022	02/15/2022	4.00	7

* ALL TRANSACTIONS CONSIDERED PAID IN FULL UPON CLEARANCE OF FINANCIAL INSTITUTION

Text of Ad: 01/31/2022

Shasta County Public Works, City of Anderson and Igo Ono Community Services District Multi-Jurisdictional Hazard Mitigation Plan Kick Off Meeting

Hazard Mitigation planning is an initiative to lessen the impact of natural hazards that the County and its jurisdiction face. This is done by completing an assessment of the hazards and how vulnerable the County is to those hazards. The next step is to develop mitigation projects for each hazard that affects the County and its jurisdictions. Best of all, by completing an approved Hazard Mitigation Plan it will open a stream of funds for the County.

This is where each one of you come in!

We need your input into the plan because you know this area better than anyone else. By participating in this meeting, you can represent your community and provide valuable experiences and ideas to the planning process.

To learn more, please join us at our virtual meeting:
Wednesday, February 16, 2022, 10:00 a.m.

Please enter the information below in your browser to join the webinar:
https://us02web.zoom.us/j/83793609216

Or join via telephone by dialing and using the assigned Webinar ID below:
+1 (669) 900-6833
Webinar ID: 837 9360 9216

After registering, you will receive a confirmation email containing details about joining. For any questions related to the upcoming Shasta County, City of Anderson and Igo Ono CSD Multi-Jurisdictional HMP Kick-Off Meeting, or if you would like someone invited who is not on the initial participant list, please contact the contractor Fulton Wold at fulton@boldplanning.com. We look forward to your participation in this important meeting.
Pub: February 2 to 15, 2022 #5114385

Appendix F: Critical Infrastructure and Facilities

Shasta County Critical Infrastructure

ID	Name	Address	City	State	Zip Code	Contact	Phone	Class	Description	Year Built
CA000039	PATIENTS' HOSPITAL OF REDDING	2900 EUREKA WAY	REDDING	CA	96001		NOT AVAILABLE	EFHS	Small Hospital (less than 50 Beds)	1973
CA000055	MAYERS MEMORIAL HOSPITAL	43563 STATE HWY. 299 E	FALL RIVER MILLS	CA	96028		NOT AVAILABLE	EFHM	Medium Hospital (50 to 150 Beds)	1972
CA000148*	SHASTA REGIONAL MEDICAL CENTER	1100 BUTTE STREET	REDDING	CA	96001		NOT AVAILABLE	EFHL	Large Hospital (greater than 150 beds)	1959
CA000292*	MERCY MEDICAL CENTER - REDDING	2175 ROSALINE AVENUE	REDDING	CA	96001		NOT AVAILABLE	EFHL	Large Hospital (greater than 150 beds)	1965
CA000395	VIBRA HOSPITAL OF NORTHERN CALIFORNIA	2801 EUREKA WAY	REDDING	CA	96001		(530) 246-9000	EFHM	Medium Hospital (50 to 150 Beds)	1973
CA000476	RESTPADD PSYCHIATRIC HEALTH FACILITY	2750 EUREKA WAY	REDDING	CA	96001		(530) 262-6700	EFHS	Small Hospital (less than 50 Beds)	1973
CA000623	REDDING VETERANS AFFAIRS	351 HARTNELL AVENUE	REDDING	CA	96002		(530) 226-7555	EFHS	Small Hospital (less than 50 Beds)	1988

	OUTPATIENT CLIN									
CA000126	SHASTA COUNTY OFFICE OF EMERGENCY SER...	1525 COURT STREET	REDDING	CA	96001		530-245-6059	EFEO	Emergency Operation Centers	1959
N/A	SHASTA COUNTY OFFICE OF EMERGENCY SERVICES (FUTURE 2024)	6590 LOCKHEED DR.	REDDING	CA	96002				Emergency Operation Centers	
N/A	SHASTA COUNTY OFFICE OF EMERGENCY SERVICES (CURRENT)	2486 PROGRESS DR #UNIT 3	REDDING	CA	96001				Emergency Operation Centers	
CA000073	FRENCH GULCH-WHISKEYTOWN ELEMENTARY	11442 CLINE GULCH RD.	FRENCH GULCH	CA	96033		(530) 359-2151	EFS1	Grade Schools (Primary and High Schools)	1974
CA000124*	CALIFORNIA HERITAGE YOUTHBUILD ACADEMY	8544 AIRPORT RD.	REDDING	CA	96002		(530) 378-5254	EFS1	Grade Schools (Primary and High Schools)	1987
CA000148*	REDDING COLLEGIATE ACADEMY	3200 ADAMS LN.	REDDING	CA	96002		(530) 224-4240	EFS1	Grade Schools (Primary and High Schools)	1976

CA000421	WHITMORE ELEMENTARY	30611 WHITMORE RD.	WHITMORE	CA	96096		(530) 472-3243	EFS1	Grade Schools (Primary and High Schools)	1978
CA000464	FOOTHILL PLUS	9733 DESCHUTES RD.	PALO CEDRO	CA	96073		(530) 245-2715	EFS1	Grade Schools (Primary and High Schools)	1979
CA000567	BELLA VISTA ELEMENTARY	22661 OLD ALTURAS RD.	BELLA VISTA	CA	96008		(530) 549-4415	EFS1	Grade Schools (Primary and High Schools)	1978
CA000784*	ANDERSON COMMUNITY DAY	20083 OLINDA RD.	ANDERSON	CA	96007		(530) 365-6054	EFS1	Grade Schools (Primary and High Schools)	1972
CA000785	PARSONS JUNIOR HIGH	750 HARTNELL AVE.	REDDING	CA	96002		(530) 224-4190	EFS1	Grade Schools (Primary and High Schools)	1973
CA000943*	SHASTA CHARTER ACADEMY	1401 GOLD ST.	REDDING	CA	96001		(530) 245-2600	EFS1	Grade Schools (Primary and High Schools)	1959
CA001042	MILLVILLE ELEMENTARY	8570 BROOKDALE RD.	MILLVILLE	CA	96062		(530) 547-4471	EFS1	Grade Schools (Primary and High Schools)	1981
CA001089	PHOENIX PROGRAM	3711 OASIS RD.	REDDING	CA	96003		(530) 245-7833	EFS1	Grade Schools (Primary and High Schools)	1975
CA001116	CYPRESS ELEMENTARY	2150 CIVIC CENTER DR.	REDDING	CA	96001		(530) 225-0040	EFS1	Grade Schools (Primary and High Schools)	1965
CA001171*	REDDING STEM ACADEMY	3711 OASIS RD.	REDDING	CA	96003		(530) 275-5480	EFS1	Grade Schools (Primary and High Schools)	1975

CA001196	PACHECO ELEMENTARY	7430 PACHECO SCH RD.	REDDING	CA	96002		(530) 224-4585	EFS1	Grade Schools (Primary and High Schools)	1977
CA001200*	ENTERPRISE HIGH	3411 CHURN CREEK RD.	REDDING	CA	96002		(530) 222-6601	EFS1	Grade Schools (Primary and High Schools)	1976
CA001559	ANDERSON COMMUNITY DAY TRANSITION	5250 W. ANDERSON DR.	ANDERSON	CA	96007		(530) 365-6054	EFS1	Grade Schools (Primary and High Schools)	1972
CA001640	TURTLE BAY	1330 ARBORETUM DR.	REDDING	CA	96003		(530) 225-0035	EFS1	Grade Schools (Primary and High Schools)	1982
CA002077	COTTONWOOD CREEK CHARTER	3425 BRUSH ST.	COTTONWOOD	CA	96022		(530) 347-7200	EFS1	Grade Schools (Primary and High Schools)	1977
CA002425	OAKVIEW HIGH (ALTERNATIVE)	20083 OLINDA RD.	ANDERSON	CA	96007		(530) 378-6895	EFS1	Grade Schools (Primary and High Schools)	1972
CA002614	STELLAR CHARTER	5885 E. BONNYVIEW RD.	REDDING	CA	96001		(530) 245-7730	EFS1	Grade Schools (Primary and High Schools)	1985
CA002711	CAREER PATHWAYS TO SUCCESS COMMUNITY ...	3711 OASIS RD.	REDDING	CA	96003		(530) 225-0360	EFS1	Grade Schools (Primary and High Schools)	1975
CA002721	CHRYSALIS CHARTER	21945 OLD FORTY-FOUR DR.	PALO CEDRO	CA	96073		(530) 547-9726	EFS1	Grade Schools (Primary and High Schools)	1972

CA002839	ALTA MESA ELEMENTARY	2301 SATURN SKYWAY	REDDING	CA	96002		(530) 224-4130	EFS1	Grade Schools (Primary and High Schools)	1987
CA003022	FALL RIVER ELEMENTARY COMMUNITY DAY	24977 CURVE ST.	BURNEY	CA	96013		(530) 336-5551	EFS1	Grade Schools (Primary and High Schools)	1972
CA003070	HAPPY VALLEY PRIMARY	16300 CLOVERDALE RD.	ANDERSON	CA	96007		(530) 357-2131	EFS1	Grade Schools (Primary and High Schools)	1977
CA003111	OAK RUN ELEMENTARY	27635 OAK RUN TO FERN RD.	OAK RUN	CA	96069		(530) 472-3241	EFS1	Grade Schools (Primary and High Schools)	1981
CA003241	HAPPY VALLEY COMMUNITY DAY	1967 W. MILL ST	ANDERSON	CA	96007		(530) 357-2111	EFS1	Grade Schools (Primary and High Schools)	1977
CA003246*	MEADOW LANE ELEMENTARY	2770 BALLS FERRY RD.	ANDERSON	CA	96007		(530) 378-7030	EFS1	Grade Schools (Primary and High Schools)	1968
CA003257	MOUNTAIN VIEW HIGH (CONTINUATION)	20375 TAMARACK AVE.	BURNEY	CA	96013		(530) 335-5189	EFS1	Grade Schools (Primary and High Schools)	1971
CA003568	MT. BURNEY SPECIAL EDUCATION CENTER	37577 MOUNTAIN VIEW RD.	BURNEY	CA	96013		(530) 335-3852	EFS1	Grade Schools (Primary and High Schools)	1971
CA003683	NORTHERN SUMMIT ACADEMY	3435 MAIN ST. STE. C	COTTONWOOD	CA	96022		(530) 949-0154	EFS1	Grade Schools (Primary and High Schools)	1974

CA003726	WEST VALLEY HIGH	3805 HAPPY VALLEY RD.	COTTONWOOD	CA	96022		(530) 347-7171	EFS1	Grade Schools (Primary and High Schools)	1977
CA003733	BUCKEYE SCHOOL OF THE ARTS	3407 HIATT DR.	REDDING	CA	96003		(530) 225-0420	EFS1	Grade Schools (Primary and High Schools)	1975
CA004005*	INDIAN SPRINGS ELEMENTARY	25299 BIG BEND RD.	BIG BEND	CA	96011		(530) 337-6219	EFS1	Grade Schools (Primary and High Schools)	1981
CA004006	GRAND OAKS ELEMENTARY	5309 GRAND AVE.	SHASTA LAKE	CA	96019		(530) 275-7040	EFS1	Grade Schools (Primary and High Schools)	1969
CA004034*	SHASTA LAKE	4620 VALLECITO ST.	SHASTA LAKE	CA	96019		(530) 275-7020	EFS1	Grade Schools (Primary and High Schools)	1975
CA004079	COLUMBIA ELEMENTARY	10142 OLD OREGON TRAIL	REDDING	CA	96003		(530) 223-4070	EFS1	Grade Schools (Primary and High Schools)	1989
CA004091	NORTH WOODS DISCOVERY	14732 BASS DR.	REDDING	CA	96003		(530) 275-5480	EFS1	Grade Schools (Primary and High Schools)	1977
CA004164	MONARCH LEARNING CENTER	5307 CEDARS RD.	REDDING	CA	96001		(530) 247-7307	EFS1	Grade Schools (Primary and High Schools)	1972
CA004334	ACADEMY OF PERSONALIZED LEARNING	2195 LARKSPUR LN. STE. 100	REDDING	CA	96002		(530) 222-9280	EFS1	Grade Schools (Primary and High Schools)	1972

CA004348*	CENTRAL VALLEY HIGH	4066 LA MESA AVE.	SHASTA LAKE	CA	96019		(530) 275-7075	EFS1	Grade Schools (Primary and High Schools)	1975
CA004675	COLUMBIA-EAST VALLEY 6-8 COMMUNITY DAY	10146 OLD OREGON TRAIL	REDDING	CA	96003		(530) 223-4070	EFS1	Grade Schools (Primary and High Schools)	1989
CA004711**	ANDERSON NEW TECHNOLOGY HIGH	2098 N. ST.	ANDERSON	CA	96007		(530) 365-3100	EFS1	Grade Schools (Primary and High Schools)	1968
CA004755**	CASCADE COMMUNITY DAY	1500 SPRUCE ST.	ANDERSON	CA	96007		(530) 378-7056	EFS1	Grade Schools (Primary and High Schools)	1972
CA004986	SYCAMORE ELEMENTARY	1926 SYCAMORE DR.	REDDING	CA	96001		(530) 225-0055	EFS1	Grade Schools (Primary and High Schools)	1972
CA005013**	MOUNTAIN LAKES HIGH	17752 SHASTA DAM BLVD.	SHASTA LAKE	CA	96019		(530) 275-7000	EFS1	Grade Schools (Primary and High Schools)	1975
CA005044	NORTH STATE INDEPENDENCE HIGH	2200 EUREKA WAY	REDDING	CA	96001		(530) 245-2760	EFS1	Grade Schools (Primary and High Schools)	1973
CA005122	BURNEY ELEMENTARY	37403 TORONTO ST.	BURNEY	CA	96013		(530) 335-2279	EFS1	Grade Schools (Primary and High Schools)	1971
CA005303	MANZANITA ELEMENTARY	1240 MANZANITA HILLS AVE.	REDDING	CA	96001		(530) 225-0050	EFS1	Grade Schools (Primary and High Schools)	1973

CA005304**	MOUNTAIN VIEW MIDDLE	675 SHASTA VIEW DR.	REDDING	CA	96003		(530) 221-5224	EFS1	Grade Schools (Primary and High Schools)	1997
CA005307**	MISTLETOE ELEMENTARY	1225 MISTLETOE LN.	REDDING	CA	96002		(530) 224-4160	EFS1	Grade Schools (Primary and High Schools)	1975
CA005308**	PRAIRIE ELEMENTARY	20981 DERSCH RD.	ANDERSON	CA	96007		(530) 365-1801	EFS1	Grade Schools (Primary and High Schools)	1977
CA005314**	SHASTA HIGH	2500 EUREKA WAY	REDDING	CA	96001		(530) 241-4161	EFS1	Grade Schools (Primary and High Schools)	1973
CA005325**	FREEDOM HIGH	2650 EIGHTH ST.	REDDING	CA	96001		(530) 243-1880	EFS1	Grade Schools (Primary and High Schools)	1965
CA005420	ROCKY POINT CHARTER	3500 TAMARACK DR.	REDDING	CA	96003		(530) 225-0456	EFS1	Grade Schools (Primary and High Schools)	1982
CA005795	ROTHER ELEMENTARY	795 HARTNELL AVE.	REDDING	CA	96002		(530) 224-4170	EFS1	Grade Schools (Primary and High Schools)	1976
CA005967	SHASTA MEADOWS ELEMENTARY	2825 YANA AVE.	REDDING	CA	96002		(530) 224-4180	EFS1	Grade Schools (Primary and High Schools)	1973
CA005969	LASSEN VIEW ELEMENTARY	705 LOMA VISTA DR.	REDDING	CA	96002		(530) 224-4150	EFS1	Grade Schools (Primary and High Schools)	1972
CA006284	SOLDIER MOUNTAIN HIGH	44144 A ST.	MCARTHUR	CA	96056		(530) 336-7159	EFS1	Grade Schools (Primary and High Schools)	1972

	(CONTINUATION)									
CA006297	BLACK BUTTE JUNIOR HIGH	7946 PONDEROSA WAY	SHINGLETOWN	CA	96088		(530) 474-3441	EFS1	Grade Schools (Primary and High Schools)	1978
CA006363**	MONTGOMERY CREEK ELEMENTARY	30365 HIGHWAY 299 E.	MONTGOMERY CREEK	CA	96065		(530) 337-6214	EFS1	Grade Schools (Primary and High Schools)	1981
CA006364**	GATEWAY EDUCATIONAL OPTIONS	3500 TAMARACK DR.	REDDING	CA	96003		(530) 245-7960	EFS1	Grade Schools (Primary and High Schools)	1975
CA006519**	BONNY VIEW ELEMENTARY	5080 BIDWELL RD.	REDDING	CA	96001		(530) 225-0030	EFS1	Grade Schools (Primary and High Schools)	1963
CA006728**	SHASTA ELEMENTARY	10446 RED BLUFF RD.	SHASTA	CA	96087		(530) 243-1110	EFS1	Grade Schools (Primary and High Schools)	1974
CA006795**	JUNIPER	375 ELLIS ST.	REDDING	CA	96001		(530) 225-0045	EFS1	Grade Schools (Primary and High Schools)	1963
CA006796	STELLAR SECONDARY CHARTER HIGH	5885 E. BONNYVIEW RD.	REDDING	CA	96001		(530) 245-7730	EFS1	Grade Schools (Primary and High Schools)	1985
CA006826	SOUTH COUNTY COMMUNITY DAY	1500 SPRUCE ST	ANDERSON	CA	96007		(530) 378-7000	EFS1	Grade Schools (Primary and High Schools)	1972

CA006872	BLACK BUTTE ELEMENTARY	7752 PONDEROSA WAY	SHINGLETOWN	CA	96088		(530) 474-3125	EFS1	Grade Schools (Primary and High Schools)	1978
CA006940	GATEWAY COMMUNITY DAY	17752 SHASTA DAM BLVD.	SHASTA LAKE	CA	96019		(530) 275-7000	EFS1	Grade Schools (Primary and High Schools)	1969
CA007193	REDDING COMMUNITY DAY	5885 E. BONNYVIEW RD.	REDDING	CA	96001		(530) 225-0160	EFS1	Grade Schools (Primary and High Schools)	1963
CA007247	SHASTA PLUS	2500 EUREKA WAY	REDDING	CA	96001		(530) 245-2716	EFS1	Grade Schools (Primary and High Schools)	1973
CA007275	PIONEER CONTINUATION HIGH	2650 EIGHTH ST.	REDDING	CA	96001		(530) 243-1880	EFS1	Grade Schools (Primary and High Schools)	1973
CA007367	WEST COTTONWOOD JUNIOR HIGH	20512 W. FIRST ST.	COTTONWOOD	CA	96022		(530) 347-3123	EFS1	Grade Schools (Primary and High Schools)	1977
CA007541**	ENTERPRISE PLUS	3411 CHURN CREEK RD.	REDDING	CA	96002		(530) 245-2714	EFS1	Grade Schools (Primary and High Schools)	1976
CA007546**	SHASTA COUNTY JUVENILE COURT	2684 RADIO LN.	REDDING	CA	96001		(530) 338-3170	EFS1	Grade Schools (Primary and High Schools)	1963
CA007689	HAPPY VALLEY ELEMENTARY	17480 PALM AVE.	ANDERSON	CA	96007		(530) 357-2111	EFS1	Grade Schools (Primary and High Schools)	1977

CA007778	UNIVERSITY PREPARATORY	2200 EUREKA WAY	REDDING	CA	96001		(530) 245-2790	EFS1	Grade Schools (Primary and High Schools)	1973
CA007875	FALL RIVER JUNIOR-SENIOR HIGH	44215 WALNUT ST.	MCARTHUR	CA	96056		(530) 336-5515	EFS1	Grade Schools (Primary and High Schools)	1972
CA008195	PLATINA ELEMENTARY	3955 PLATINA SCH RD.	PLATINA	CA	96076		(530) 352-4341	EFS1	Grade Schools (Primary and High Schools)	1974
CA008196	PACE ACADEMY	3200 ADAMS LN.	REDDING	CA	96002		(530) 224-4236	EFS1	Grade Schools (Primary and High Schools)	1976
CA008197	FOOTHILL HIGH	9733 DESCHUTES RD.	PALO CEDRO	CA	96073		(530) 547-1700	EFS1	Grade Schools (Primary and High Schools)	1979
CA008441	IGO-ONO ELEMENTARY	6429 PLACER ST.	IGO	CA	96047		(530) 396-2841	EFS1	Grade Schools (Primary and High Schools)	1974
CA008443	SHASTA-TRINITY ROP	4659 E. SIDE RD.	REDDING	CA	96001		(530) 246-3302	EFS1	Grade Schools (Primary and High Schools)	1963
CA008460	BURNEY COMMUNITY DAY	20375 TAMARACK AVE.	BURNEY	CA	96013		(530) 335-5189	EFS1	Grade Schools (Primary and High Schools)	1971
CA008472	COLUMBIA-EAST VALLEY K-6 COMMUNITY DAY	10144 OLD OREGON TRAIL	REDDING	CA	96003		(530) 223-4070	EFS1	Grade Schools (Primary and High Schools)	1989
CA008748**	NORTH COTTONWOOD	19920 GAS POINT RD.	COTTONWOOD	CA	96022		(530) 347-1698	EFS1	Grade Schools (Primary and High Schools)	1977

CA008921	NORTH COW CREEK ELEMENTARY	10619 SWEDE CREEK RD.	PALO CEDRO	CA	96073		(530) 549-4488	EFS1	Grade Schools (Primary and High Schools)	1978
CA008942	BURNEY ELEMENTARY COMMUNITY DAY	20375 TAMARAC K AVE.	BURNEY	CA	96013		(530) 335-5189	EFS1	Grade Schools (Primary and High Schools)	1971
CA009090	MAGNOLIA INDEPENDENT LEARNING CENTER	1524 MAGNOLI A AVE.	REDDING	CA	96001		(530) 225-0163	EFS1	Grade Schools (Primary and High Schools)	1965
CA009204	SEQUOIA MIDDLE	1805 SEQUOIA ST.	REDDING	CA	96001		(530) 225-0020	EFS1	Grade Schools (Primary and High Schools)	1965
CA009205	FALL RIVER ELEMENTARY	24977 CURVE ST.	FALL RIVER MILLS	CA	96028		(530) 336-5551	EFS1	Grade Schools (Primary and High Schools)	1972
CA009353*	GREAT PARTNERSHIP SPECIAL EDUCATION C...	3450 TAMARAC K DR.	REDDING	CA	96003		(530) 225-0411	EFS1	Grade Schools (Primary and High Schools)	1980
CA009438*	SHASTA COUNTY INDEPENDENT STUDY CHARTER	11555 OREGON TRAIL	REDDING	CA	96049		(530) 225-0360	EFS1	Grade Schools (Primary and High Schools)	1965
CA009443	CASTLE ROCK	29373 MAIN ST.	CASTELLA	CA	96017		(530) 235-0101	EFS1	Grade Schools (Primary and High Schools)	1974

	ELEMENTARY									
CA009453	BURNEY JUNIOR-SENIOR HIGH	37571 MOUNTAIN VIEW RD.	BURNEY	CA	96013		(530) 335-4576	EFS1	Grade Schools (Primary and High Schools)	1971
CA009459	ANDERSON HEIGHTS ELEMENTARY	1530 SPRUCE ST.	ANDERSON	CA	96007		(530) 378-7050	EFS1	Grade Schools (Primary and High Schools)	1972
CA009480*	ANDERSON MIDDLE	1646 W. FERRY ST.	ANDERSON	CA	96007		(530) 378-7060	EFS1	Grade Schools (Primary and High Schools)	1972
CA009581*	REDDING SCHOOL OF THE ARTS II	955 INSPIRATION PL.	REDDING	CA	96002		(530) 243-7145	EFS1	Grade Schools (Primary and High Schools)	1973
CA009647	NORTH VALLEY HIGH	20083 OLINDA RD.	ANDERSON	CA	96007		(530) 365-6054	EFS1	Grade Schools (Primary and High Schools)	1972
CA009725*	SHASTA COUNTY SPECIAL EDUCATION	3711 OASIS RD.	REDDING	CA	96003		(530) 410-6079	EFS1	Grade Schools (Primary and High Schools)	1975
CA010052*	GRANT ELEMENTARY	8835 SWASEY DR.	REDDING	CA	96001		(530) 243-0561	EFS1	Grade Schools (Primary and High Schools)	1975
CA010053*	BOULDER CREEK ELEMENTARY	505 SPRINGER DR.	REDDING	CA	96003		(530) 224-4140	EFS1	Grade Schools (Primary and High Schools)	1992
CA010054	JUNCTION ELEMENTARY	9087 DESCHUTES RD.	PALO CEDRO	CA	96073		(530) 547-3274	EFS1	Grade Schools (Primary and High Schools)	1979

CA010055	ANDERSON HIGH	1471 FERRY ST.	ANDERSON	CA	96007		(530) 365-2741	EFS1	Grade Schools (Primary and High Schools)	1972
CA010356	FALL RIVER COMMUNITY DAY	44144 A ST.	MCARTHUR	CA	96056		(530) 336-7159	EFS1	Grade Schools (Primary and High Schools)	1972
CA010955	BEACON HILL CHRISTIAN ACADEMY	32439 STATE HIGHWAY 299 E	MONTGOMERY CREEK	CA	96065		NOT AVAILABLE	EFS1	Grade Schools (Primary and High Schools)	1981
CA011242	INDEPENDENT EDUCATIONAL PROGRAMS	1756 SOUTH ST	ANDERSON	CA	96007		NOT AVAILABLE	EFS1	Grade Schools (Primary and High Schools)	1972
CA011245*	MONTESSORI CHILDREN'S HOUSE OF SHADY ...	1410 VICTOR AVE	REDDING	CA	96003		NOT AVAILABLE	EFS1	Grade Schools (Primary and High Schools)	1975
CA011246*	NORTH VALLEY SCHOOL	855 CANYON RD	REDDING	CA	96001		NOT AVAILABLE	EFS1	Grade Schools (Primary and High Schools)	1977
CA011250*	TRINITY LUTHERAN SCHOOL	2440 HILLTOP DR	REDDING	CA	96002		NOT AVAILABLE	EFS1	Grade Schools (Primary and High Schools)	1975
CA012453*	BETHEL CHRISTIAN SCHOOL	933 COLLEGE VIEW DR	REDDING	CA	96003		NOT AVAILABLE	EFS1	Grade Schools (Primary and High Schools)	1992
CA012455*	COUNTRY CHRISTIAN SCHOOL	873 CANBY RD	REDDING	CA	96003		NOT AVAILABLE	EFS1	Grade Schools (Primary and High Schools)	1992

CA012464*	LIBERTY CHRISTIAN SCHOOLS	3782 CHURN CREEK RD	REDDING	CA	96002		NOT AVAILABLE	EFS1	Grade Schools (Primary and High Schools)	1976
CA012467*	MOUNT CALVARY LUTHERAN SCHOOL	3961 ALTA MESA DR	REDDING	CA	96002		NOT AVAILABLE	EFS1	Grade Schools (Primary and High Schools)	1994
CA012473*	REDDING ADVENTIST ACADEMY	1356 E CYPRESS AVE	REDDING	CA	96002		NOT AVAILABLE	EFS1	Grade Schools (Primary and High Schools)	1975
CA012862	NAWA ACADEMY	17351 TRINITY MOUNTAIN RD	FRENCH GULCH	CA	96033		NOT AVAILABLE	EFS1	Grade Schools (Primary and High Schools)	1974
CA012863	MOUNTAIN CHRISTIAN ACADEMY	23139 SANDPIT RD	CASSEL	CA	96016		NOT AVAILABLE	EFS1	Grade Schools (Primary and High Schools)	1971
CA012864*	SHASTA BAPTIST SCHOOLS	6600 WESTSIDE RD	REDDING	CA	96001		NOT AVAILABLE	EFS1	Grade Schools (Primary and High Schools)	1972
CA012865	REDDING CHRISTIAN SCHOOL	21945 OLD 44 DR	PALO CEDRO	CA	96073		NOT AVAILABLE	EFS1	Grade Schools (Primary and High Schools)	1972
CA012866*	ST JOSEPH SCHOOL	2460 GOLD ST	REDDING	CA	96001		NOT AVAILABLE	EFS1	Grade Schools (Primary and High Schools)	1965
CA013761	WIDE HORIZONS RANCH	27442 OAK RUN TO FERN RD	OAK RUN	CA	96069		NOT AVAILABLE	EFS1	Grade Schools (Primary and High Schools)	1981
CA013987	RIVER VIEW CHRISTIAN ACADEMY	12069 TINTAGEL LN	WHITMORE	CA	96096		NOT AVAILABLE	EFS1	Grade Schools (Primary and High Schools)	1978

CA014064	SHASTA CHRISTIAN ACADEMY	3005 E CENTER ST	ANDERSON	CA	96007		NOT AVAILABLE	EFS1	Grade Schools (Primary and High Schools)	1968
CA014250*	SHASTA SCHOOL OF COSMETOLOGY	678 N MARKET ST	REDDING	CA	96003		(530) 243-7990	EFS2	Colleges/Universities	1982
CA014592*	SHASTA COLLEGE	11555 OLD OREGON TRAIL	REDDING	CA	96003		(530) 242-7500	EFS2	Colleges/Universities	1992
CA014593*	SIMPSON UNIVERSITY	2211 COLLEGE VIEW DRIVE	REDDING	CA	96003		(530) 224-5600	EFS2	Colleges/Universities	1997
CA014789*	SHASTA BIBLE COLLEGE AND GRADUATE SCHOOL	2951 GOODWATER AVE.	REDDING	CA	96002		(530) 221-4275	EFS2	Colleges/Universities	1973
CA000016	FRENCH GULCH-WHISKEYTOWN ELEMENTARY	11442 CLINE GULCH RD.	FRENCH GULCH	CA	96033		(530) 359-2151	EFS1	Grade Schools (Primary and High Schools)	1974
CA000066*	CALIFORNIA HERITAGE YOUTHBUILD ACADEMY	8544 AIRPORT RD.	REDDING	CA	96002		(530) 378-5254	EFS1	Grade Schools (Primary and High Schools)	1987
CA000027	SHASTA LAKE WWTF	3700 TIBBITS ROAD	SHASTA LAKE	CA	9.6E+08				Default Facility	1974

CA000028	WINTER RUN REARING FACILITY	16349 SHASTA DAM BLVD	SHASTA LAKE	CA	96019				Default Facility	1987
CA000090*	ANDERSON WPCP	3701 RUPERT RD	ANDERSON	CA	96007				Default Facility	
CA000154*	STILLWATER WWTF	6475 AIRPORT ROAD	ANDERSON	CA	96007-9732				Default Facility	
CA000195*	CLEAR CREEK WWTP	2220 METZ ROAD	ANDERSON	CA	96007				Default Facility	
CA000269	COLEMAN FISH HATCHERY	24411 COLEMAN FISH HATCHERY RD	ANDERSON	CA	96007				Default Facility	
CA000311	COTTONWOOD WWTP	3425 LIVE OAK RD	COTTONWOOD	CA	96022				Default Facility	
CA000346	DUNSMUIR WWTP	1100 SOUTH FIRST STREET	DUNSMUIR	CA	96025				Default Facility	
CA000361	SHASTA LAKE WWTF	3700 TIBBITS ROAD	SHASTA LAKE	CA	9.6E+08				Default Facility	
CA000362	WINTER RUN REARING FACILITY	16349 SHASTA DAM BLVD	SHASTA LAKE	CA	96019				Default Facility	

CA000415*	ANDERSON WPCP	3701 RUPERT RD	ANDERSON	CA	96007				Default Facility	
CA000504*	STILLWATER WWTF	6475 AIRPORT ROAD	ANDERSON	CA	96007-9732				Default Facility	
CA000545*	CLEAR CREEK WWTP	2220 METZ ROAD	ANDERSON	CA	96007				Default Facility	
CA000619*	COLEMAN FISH HATCHERY	24411 COLEMAN FISH HATCHERY RD	ANDERSON	CA	96007				Default Facility	
CA000641	COTTONWOOD WWTP	3425 LIVE OAK RD	COTTONWOOD	CA	96022				Default Facility	
CA000696	DUNSMUIR WWTP	1100 SOUTH FIRST STREET							Default Facility	
CA000025	JUDGE F CARR	NOT AVAILABLE	FRENCH GULCH	CA	96003		(530) 275-1554	EPPM	Medium Power Plants (100 - 500 MW)	
CA000037	BURNEY FOREST PRODUCTS	35586-B HIGHWAY 299 EAST	BURNEY	CA	96013			EPPS	Small Power Plants (< 100 MW)	
CA000038	BURNEY MOUNTAIN POWER	HWY 299 EAST ENERGY DRIVE	BURNEY	CA	96013			EPPS	Small Power Plants (< 100 MW)	
CA000050*	COLEMAN PH	COLEMAN FISH HATCHERY ROAD	ANDERSON	CA	96022		(415) 973-7000	EPPS	Small Power Plants (< 100 MW)	

CA000091	KESWICK	NOT AVAILABLE	REDDING	CA	96003		(530) 275-1554	EPPM	Medium Power Plants (100 - 500 MW)	
CA000189	SHASTA	NOT AVAILABLE	REDDING	CA	96003		(530) 275-1554	EPPL	Large Power Plants (> 500 MW)	
CA000289	PIT 7	FENDER'S FERRY ROAD	MONTGOMERY CREEK	CA	96065		(415) 973-7000	EPPM	Medium Power Plants (100 - 500 MW)	
CA000291	PIT 3	PITT 3 ROAD STAR ROUTE 1	BURNEY	CA	96013		(415) 973-7000	EPPS	Small Power Plants (< 100 MW)	
CA000318	HATCHET RIDGE WIND PROJECT	19400 BUNCH GRASS LOOKOUT RD	BURNEY	CA	96013		(917) 363-1333	EPPM	Medium Power Plants (100 - 500 MW)	
CA000395	PIT 4	PIT RIVER ROAD	BIG BEND	CA	96011		(415) 973-7000	EPPM	Medium Power Plants (100 - 500 MW)	
CA000400*	WHEELABRATOR SHASTA	20811 INDUSTRY RD	ANDERSON	CA	96007			EPPS	Small Power Plants (< 100 MW)	
CA000403	SIERRA PACIFIC BURNEY FACILITY	36336 HIGHWAY 299 EAST	BURNEY	CA	96013			EPPS	Small Power Plants (< 100 MW)	
CA000431*	REDDING POWER	17120 CLEAR CREEK ROAD	REDDING	CA	96001			EPPM	Medium Power Plants (100 - 500 MW)	

CA000440	PIT 6	BIG BEND ROAD	MONTGOMERY CREEK	CA	96065		(415) 973-7000	EPPS	Small Power Plants (< 100 MW)	
CA000493*, **	SPRING CREEK	NOT AVAILABLE	REDDING	CA	96003		(530) 275-1554	EPPM	Medium Power Plants (100 - 500 MW)	
CA000496*, **	JAMES B BLACK	PITT 5 ROAD	BIG BEND	CA	96065		(415) 973-7000	EPPM	Medium Power Plants (100 - 500 MW)	
CA000583	PIT 1	PIT 1 ROAD STAR ROUTE 1	BURNEY	CA	96013		(415) 973-7000	EPPS	Small Power Plants (< 100 MW)	
CA000600	PIT 5	PIT 5 ROAD	BIG BEND	CA	96011		(415) 973-7000	EPPM	Medium Power Plants (100 - 500 MW)	
CA000635	SPI ANDERSON 2	19758 RIVERSIDE AVE	ANDERSON	CA	96007			EPPS	Small Power Plants (< 100 MW)	
CA000032*	K47GR CH 47		REDDING	CA				CBT	TV stations or transmitters	
CA000098*	KRCR-TV CH 7		REDDING	CA				CBT	TV stations or transmitters	
CA000151*	KIXE-TV CH 9		REDDING	CA				CBT	TV stations or transmitters	
CA000324**	DKAZT 600		REDDING	CA				CBR	AM or FM radio stations or transmitters	
CA000335**	KQMS 1400		REDDING	CA				CBR	AM or FM radio stations or transmitters	
CA000347**	KCNR 1460		SHASTA	CA				CBR	AM or FM radio stations or transmitters	
CA000348**	KCNR 1460		SHASTA	CA				CBR	AM or FM radio stations or transmitters	

CA000364	KVIP 540		REDDING	CA				CBR	AM or FM radio stations or transmitters
CA000380	KLXR 1230		REDDING	CA				CBR	AM or FM radio stations or transmitters
CA000424	KNRO 1670		REDDING	CA				CBR	AM or FM radio stations or transmitters
CA000491**	KIBC CH 213		BURNEY	CA				CBR	AM or FM radio stations or transmitters
CA000641**	KNCQ CH 247		REDDING	CA				CBR	AM or FM radio stations or transmitters
CA000663**	KRRX CH 291		BURNEY	CA				CBR	AM or FM radio stations or transmitters
CA000727**	KRDG CH 287		SHINGLETOWN	CA				CBR	AM or FM radio stations or transmitters
CA000759**	KNCA CH 209		BURNEY	CA				CBR	AM or FM radio stations or transmitters
CA000763**	KVIP-FM CH 251		REDDING	CA				CBR	AM or FM radio stations or transmitters
CA000777**	KSHA CH 282		REDDING	CA				CBR	AM or FM radio stations or transmitters
CA000797**	KNNN CH 257		SHASTA LAKE CITY	CA				CBR	AM or FM radio stations or transmitters
CA000802**	KEWB CH 234		ANDERSON	CA				CBR	AM or FM radio stations or transmitters
N/A**	CA000033	Redding (Amtrak Station), California	1620 Yuba Street	Redding	CA				
N/A**	CA000097	Redding Station	1530 Yuba St	Redding	CA	96001		BDF LT	

*items with one asterisk are vulnerable to dam failures
**items with two asterisks are vulnerable to wildfires

City of Anderson Critical Infrastructure

Location Number	Sub-Location	Site Description	Building Description	Address	City	State	ZIP Code	Occupied As
1		City Hall*	City Hall / Community Center	1887 Howard Street	Anderson	CA	96007	COMMUNITY CENTER, KITCHEN, STORAGE, OFFICES, MEET
2		Office/Medical Building*	Office/Medical Building	2801 SILVER ST	Anderson	CA	96007	OFFICE BUILDING
3		Police Station*	Police Station	2220 NORTH ST	Anderson	CA	96007	Police Station
3	A	POLICE STATION*	POLICE STATION AUXILIARY BUILDING	2220 NORTH ST	Anderson	CA	96007	OFFICE
3	B	POLICE STATION*	POLICE STATION - STORAGE CONTAINER	2220 NORTH ST	ANDERSON	CA	96007	STORAGE CONTAINER - 320 SF
4		PUBLIC WORKS YARD*	SHOP/OFFICE BUILDING	2450 BARNEY ROAD	Anderson	CA	96007	PUBLIC WORKS GARAGE
4	A	PUBLIC WORKS YARD*	WATER DEPARTMENT	2450 BARNEY ST	Anderson	CA	96007	PUBLIC WORKS GARAGE
4	B	PUBLIC WORKS YARD*	Sign Shop	2450 BARNEY ST	Anderson	CA	96007	PUBLIC WORKS GARAGE

4	C	PUBLIC WORKS YARD*	Tool Shed	2450 BARNEY ST	Anderson	CA	96007	PUBLIC WORKS GARAGE
4	D	PUBLIC WORKS YARD*	Pesticide Building	2450 BARNEY ST	Anderson	CA	96007	PUBLIC WORKS SHED
4	E	PUBLIC WORKS YARD*	ARCHIVES BUILDING	2450 BARNEY ST	ANDERSON	CA	96007	ARCHIVES
4	F	PUBLIC WORKS YARD*	VEHICLE SHELTER	2450 BARNEY ST	ANDERSON	CA	96007	SHELTER
4	G	PUBLIC WORKS YARD*	STORAGE CONTAINER	2450 BARNEY ST	ANDERSON	CA	96007	STORAGE CONTAINER
4	H	PUBLIC WORKS YARD*	ELECTRICAL SHED	2450 BARNEY ST	Anderson	CA	96007	PUBLIC WORKS SHED
4	I	PUBLIC WORKS YARD*	STORAGE SHED	2450 BARNEY ST	Anderson	CA	96007	PUBLIC WORKS SHED
4	K	PUBLIC WORKS YARD*	STORAGE CONTAINER #1	2450 BARNEY ST	Anderson	CA	96007	STORAGE CONTAINER
4	L	PUBLIC WORKS YARD*	STORAGE CONTAINER - EVIDENCE/ARCHIVES	2450 BARNEY ST	Anderson	CA	96007	PUBLIC WORKS SHED
4	M	PUBLIC WORKS YARD*	STORAGE CONTAINER - EVIDENCE	2450 BARNEY ST	Anderson	CA	96007	PUBLIC WORKS SHED
8		WASTEWATER TREATMENT PLANT*	LAB BUILDING/OFFICE	3701 RUPERT ROAD	Anderson	CA	96007	WASTE - ADMINISTRATION BUILDING

8	A	WASTEWATER TREATMENT PLANT*	Chlorine Building	3701 Rupert Road	Anderson	CA	96007	WASTE - CHLORINE CONTACT BLDG
8	B	WASTEWATER TREATMENT PLANT*	Filter Building	3701 Rupert Road	Anderson	CA	96007	WASTE - FILTER BUILDING
8	C	WASTEWATER TREATMENT PLANT*	Storage Building	3701 Rupert Road	Anderson	CA	96007	WASTE - STORAGE BLDG
8	D	WASTEWATER TREATMENT PLANT*	Headworks	3701 Rupert Road	Anderson	CA	96007	WASTE - HEADWORKS BUILDING
8	E	WASTEWATER TREATMENT PLANT*	Aeration Basin #1	3701 Rupert Road	Anderson	CA	96007	WASTE - AERATION BASIN
8	F	WASTEWATER TREATMENT PLANT*	Clarifier #1	3701 Rupert Road	Anderson	CA	96007	WASTE - PRIMARY CLARIFIER
8	G	WASTEWATER TREATMENT PLANT*	Clarifier #2	3701 Rupert Road	Anderson	CA	96007	WASTE - CLARIFIER
8	H	WASTEWATER TREATMENT PLANT*	Aeration Basin #2	3701 Rupert Road	Anderson	CA	96007	WASTE - AERATION BASIN
8	I	WASTEWATER TREATMENT PLANT*	DIGESTER	3701 Rupert Road	Anderson	CA	96007	WASTE - DIGESTER
8	J	WASTEWATER TREATMENT PLANT*	DIGESTER (NOT IN SERVICE)	3701 Rupert Road	Anderson	CA	96007	WASTE - DIGESTER W/FIXED COVER
8	K	WASTEWATER TREATMENT PLANT*	Ballast Pond	3701 Rupert Road	Anderson	CA	96007	WASTE - BALLAST POND

8	L	WASTEWATER TREATMENT PLANT*	Contact Chamber	3701 Rupert Road	Anderson	CA	96007	WASTE - CHEMICAL FEED BUILDING
8	M	WASTEWATER TREATMENT PLANT*	DRYING BED (NOT IN USE)	3701 Rupert Road	Anderson	CA	96007	WASTE - DRYING BEDS
8	N	WASTEWATER TREATMENT PLANT*	Storage Pond #1	3701 Rupert Road	Anderson	CA	96007	WASTE - STORAGE POND
8	O	WASTEWATER TREATMENT PLANT*	Storage Pond #2	3701 Rupert Road	Anderson	CA	96007	WASTE - STORAGE POND
8	P	WASTEWATER TREATMENT PLANT*	EMERGENCY STORAGE POND	3701 RUPERT ROAD	ANDERSON	CA	96007	WASTE - STORAGE POND
8	Q	WASTEWATER TREATMENT PLANT*	STORAGE POND #3	3701 RUPERT ROAD	ANDERSON	CA	96007	WASTE - STORAGE POND
8	R	WASTEWATER TREATMENT PLANT	STORAGE POND #4	3701 RUPERT ROAD	ANDERSON	CA	96007	WASTE - STORAGE POND
8	S	WASTEWATER TREATMENT PLANT*	STORAGE SHED	3701 RUPERT ROAD	ANDERSON	CA	96007	PUBLIC WORKS SHED
8	T	WASTEWATER TREATMENT PLANT*	STORAGE SHED	3701 RUPERT ROAD	ANDERSON	CA	96007	PUBLIC WORKS SHED
8	U	WASTEWATER TREATMENT PLANT*	STORAGE POND #5	3701 RUPERT ROAD	ANDERSON	CA	96007	WASTE - STORAGE POND
8	V	WASTEWATER TREATMENT PLANT*	PROCESS PIPING	3701 RUPERT ROAD	ANDERSON	CA	96007	PROCESS PIPING

9		Balls Ferry Well	BALLS FERRY WELL	BALLS FERRY ROAD	Anderson	CA	96007	WATER - PUMPING STATION
10		DIAMOND ST PUMP STATION	PUMP STATION	Diamond Street	Anderson	CA	96007	WATER - PUMPING STATION
11		Beacon Pump Station*	PUMP STATION	Beacon Street	Anderson	CA	96007	WATER - PUMPING STATION
12		Reservoir*	RESERVOIR - 2 MG	Aspen Road	Anderson	CA	96007	WATER TANK - GROUND 2,000,000
13		Timber Lift Station	LIFT STATION	Timber Street	Anderson	CA	96007	WASTE - LIFT STATION - MANHOLE
14		Tucker Oaks Pump Station	PUMP STATION	Tucker Street	Anderson	CA	96007	WATER - PUMPING STATION
15		RHYNE WELL	WELL	Meadow View Road	Anderson	CA	96007	WATER - PUMPING STATION
16		OLD HWY 273 WELL	WELL	OLD HWY 273	Anderson	CA	96007	WATER - PUMPING STATION
17		WATER TANK - FERRY ST*	WATER TANK - 1.5 MG	FERRY ST	Anderson	CA	96007	WATER TANK - GROUND 1,500,000
18		Stingy Lane Well	WELL 04-STINGY LANE WELL	2990 Stingy Lane	Anderson	CA	96007	WELL 04-STINGY LANE WELL
19		Volante Well	WELL	Bruce Street	Anderson	CA	96007	WATER - PUMPING STATION

20		DRY CREEK LIFT STATION	LIFT STATION	2200 CULPEPPER LANE	ANDERSON	CA	96007	WASTE - LIFT STATION - MANHOLE
34	A	Ox Yoke Pump Station #1	PUMP STATION	Hirsch Court	Anderson	CA	96007	WATER - PUMPING STATION
34	B	Ox Yoke Pump Station #2	PUMP STATION	Hirsch Court	Anderson	CA	96007	WATER - PUMPING STATION
37		STINGY LANE LIFT STATION*	WELL 04-STINGY LANE LIFT STATION	STINGY LANE, 550 WEST OF NORTH LANE	ANDERSON	CA	96007	
38		1787 THIRD STREET	VACANT LAND	1787 THIRD STREET	ANDERSON	CA	96007	
40		Automall Pump Station	PUMP STATION	Automall Road	Anderson	CA	96007	WATER - PUMPING STATION
41		NORTH ST PUMP STATION	PUMP STATION	North Street	Anderson	CA	96007	WATER - PUMPING STATION
42		STINGY LANE PUMP STATION	PUMP STATION	Stingy Lane	Anderson	CA	96007	WATER - PUMPING STATION
42	A	KNIGHT LIFT STATION*, **	LIFT STATION	KNIGHT STREET	ANDERSON	CA	96007	WASTE - LIFT STATION
43		SOUTHWEST BOOSTER STATION*	BOOSTER STATION	1262 ASPEN ROAD	ANDERSON	CA	96007	WATERM - PUMPING STATION

*items with one asterisk are vulnerable to dam failures
**items with two asterisks are vulnerable to wildfires

Igo-Ono CSD Critical Infrastructure

Name	Address	Lat	Long	Year Built
Misselbeck Dam*	9250 Rainbow Lake Road	40.500302	122.69711	1920
Rainbow Lake*	9250 Rainbow Lake Road	40.500302	122.69711	1920
Hoover Diversion Dam*		40.491835	122.70372	1920
Hoover Tunnel - Start		40.491763	122.70364	1920
Hoover Tunnel - End		40.487565	122.6805	1920
Hoover Creek Diversion Dam		40.479329	122.67316	1920
Water Conveyance Canal - Start		40.479329	122.67316	1875
End of Upper Canal		40.504355	122.54111	1875
End of Lower Canal		40.509633	122.53972	1875
Eagle Creek Diversion Dam		40.504154	122.6102	1920
Eagle Creek Spur Canal - Start		40.504154	122.6102	1920
Eagle Creek Spur Canal - End		40.495387	122.60226	1920
Rector Creek Flume		40.492471	122.62833	1875
Eagle Creek Flume		40.496707	122.61109	1875

*items with one asterisk are vulnerable to dam failures
**items with two asterisks are vulnerable to wildfires

This page intentionally left blank.

Appendix G: Severe Storm Index

Event	Location	Date	Deaths	Injuries	Property Damage	Crop Damage	Narrative
Wildfire	Shasta County	7/23/2018	2	0	$1,500,000,000	$0	Large wildfires developed across Northern California at the end of July during a period of high temperatures, low humidity and unusually dry fuels. A powerful fire whirl developed with the Carr Fire, creating significant wind damage to western Redding and rapid-fire growth. The Mendocino Complex became the largest wildfire in California history. A state of emergency was declared at state and federal levels due to the fires. The Carr Fire began on the afternoon of July 23, 2018, at the intersection of Highway 299 and Carr Powerhouse Road, near French Gulch in Shasta County. The fire is reported to have been started accidentally by a vehicle towing a trailer that had a tire blow out, causing the steel rim to scrape along the pavement, generating sparks that ignited dry vegetation along the edge of the highway. Local winds generated by the fire are reported to have caused the fire to spread quickly. At the end of July, the fire was the sixth most destructive fire in California history at 112,888 acres, with 1,378 structures destroyed, 965 of them homes. The fire was not fully contained until August 30, reaching 229,651 acres in size with a total of 1,079 residences, 22 commercial structures, 503 outbuildings destroyed. There were also 190 residences, 26 commercial structures, and 61 outbuildings damaged. About 38,000 people

							were evacuated from their homes. There was a total of 8 deaths from the fire, 3 of them firefighters. A large fire whirl in Redding has been reported as being responsible for 4 of the deaths, and this has been listed as a separate event. Damage costs to insured buildings are estimated at $1.5 billion for the Carr Fire.

Wildfire	Shasta County	7/27/2018	1	16	$56,000,000	$0	Large wildfires developed across Northern California at the end of July during a period of high temperatures, low humidity and unusually dry fuels. A powerful fire whirl developed with the Carr Fire, creating significant wind damage to western Redding and rapid-fire growth. The Mendocino Complex became the largest wildfire in California history. A state of emergency was declared at state and federal levels due to the fires. The Mendocino Complex Fire (made up of the River and Ranch Fires) spread across Colusa County, Glenn County, Lake County, and Mendocino County, becoming the largest wildfire in California history at 459,123 acres. The Mendocino Complex Fire was not contained until September 18. There were 157 residential buildings destroyed, 123 others destroyed. In addition, there were 13 residential buildings and 24 other buildings damaged. The fires caused at least $56 million in insured property damage. The city of Lakeport, communities of Kelseyville, Lucerne, Upper Lake, Nice, Saratoga Springs, Witter Springs, Potter Valley, and Finley, parts of Hopland, and the tribal communities of Hopland Rancheria and Big Valley Rancheria were evacuated. There was 1 firefighter killed (on August 13), 4 firefighters were injured.

Wildfire	Shasta County	11/8/2018	86	12	$17,000,000,000	$0	An extended period of dry weather through the summer and fall with above normal temperatures coupled with a gusty north to northeast wind event created a situation for extremely rapid-fire growth. A large wildfire developed, the deadliest and most destructive in history for California. The Camp Fire began on the morning of November 8, 2018, by Camp Creek Road, near Pulga in Butte County. The fire was not fully contained until November 25. This fire was the most destructive wildfire in California history, destroying much of the city of Paradise, the community of Concow, and damaging the towns of Pulga and Magalia. There were 18,804 structures destroyed, 13,696 of them single homes, along with 514 commercial structures and 3,718 outbuildings and 153,336 acres burned. There was a total of 86 deaths from the fire, with 12 civilians and 5 firefighters injured. There were 3 people missing as of 1/24/2019, when Butte County Sheriff closed their missing persons call center for the Camp Fire. Damage costs to insured buildings has been estimated to be at least $10 billion. Conditions which lead to this fire included several recent years with drought conditions, late spring rainfall bringing additional growth of grass for fuel, dry weather for seven months prior to the fire, very low humidity due to several north wind events, record dry fuel and gusty northeast winds the day of the fire. Local wind gusts to 40 to 50 mph were measured nearby at Jarbo Gap, with a peak gust in the early morning of 52 mph. These winds caused the fire to spread very quickly. The fire forced the rapid

							evacuation of over 27,000 people from Paradise, Magalia, Centerville, Concow, Pulga, Butte Creek Canyon, Berry Creek, and Yankee Hill. The fire also threatened the communities of Butte Valley, Chico, Forest Ranch, Helltown, Inskip, Oroville, and Stirling City. All residents were not allowed to return home until December 15, when the final evacuation orders were lifted. Smoke from the fire was dense at times across much of Northern California, concentrated by strong atmospheric inversions. Air quality was reported by the Air Resources Board as some of the worst on record, causing many schools to close and events to be canceled across the area. Visibility was below 1/2 mile at times. The cause of the fire is under investigation, though their evidence suggests it occurred near damaged power lines.

Wildfire	Shasta County	8/22/2019	0	3	$0	$0	High pressure brought hot and dry weather to northern California from August 23 through August 26, 2019. Temperatures were forecast to be 5 to 10 degrees above normal. CalFire reported that a wildfire occurred on the morning of August 22 and lasted through the evening of August 26. This fire was named the Mountain Fire and burned 600 acres of land. It damaged 5 residential buildings and 2 additional structures in addition to destroying 7 residential buildings and 7 other structures. A local newspaper also reported that about 14 wooden power poles were damaged and that the local power company worked actively to replace them. CalFire also noted that there were 3 cases of minor injuries, and that all the victims were treated and released. There were numerous evacuations, around 3,885 residents, and road closures within the area which were all lifted on the by the evening of August 24.

Wildfire	Shasta County	9/7/2020	16	0	$0	$0	September started off extremely hot, as high pressure built over the area. This led to unseasonably hot temperatures for most of northern California with widespread triple digit heat forecast, accompanied by little overnight relief for the Labor Day weekend. Between September 5 and September 8, one county in the Sacramento Valley recorded five heat related visits to the emergency room; however, as of this time, no deaths were reported. On the tail of this heat wave, critical fire weather conditions occurred due to a trough sliding into the Great Basin area. Gusty winds led to 83 reports of wind related damage or hazards to a utility company across all of northern California, including areas served by NWS Eureka and NWS Monterey. Damage locations in the events are estimated by the map provided to the public. Gusty winds also wreaked havoc on the North Complex. Immediate evacuation orders were given to Berry Creek, Brush Creek, Forbestown, Clipper Mills, and Feather Falls areas the evening of September 8. Later that night gusty north and east winds continued to push the fires from the North Complex down the terrain, which would eventually make a run into Butte County and down to the Lake Oroville area. The US Forest Service and CalFire reported that the event led to 16 casualties and around 2,455 structures being destroyed.

Wildfire	Shasta County	9/27/2020	4	0	$0	$0	Another round of critical fire weather conditions occurred from September 26 through September 28 due to a trough sliding into the Rockies and ridge building behind it. Gusty north to east winds generally ranged from 25 to 50 mph, however, some of the highest elevations along the Sierra Crest reported gusts up to 76 mph. This led to the Zogg Fire and 11 reports of wind related damage or hazards to a utility company across all of northern California, 10 of which occurred in along the west slopes of the northern Sierra. Damage locations in the events are estimated by the map provided to the public. A wildfire started on September 27 on Zogg Mine Road and Jenny Bird Lane, North of Igo in Shasta County and would span portions of zone 15 and 63 in Shasta and Tehama counties. The fire would eventually claim 4 lives, cause an injury to a firefighter, destroy 204 structures, damage 27 structures, and burn 56,338 acres.
Wildfire	Shasta County	7/13/2021	1	3	$0	$0	The Dixie Fire started under drought conditions with hot weather, strong winds, and exceptionally dry vegetation in the area. The Dixie Fire began in Butte County in the Feather River Canyon, CA the evening of July 14, 2021, and quickly spread into Plumas County, CA. The first few days the fire saw significant growth. The fire grew from 19,000 acres the evening of July 18th to 30,000 acres by the early morning of July 19th. The fire eventually burned in five counties: Butte, Lassen, Plumas, Shasta, and Tehama. This includes the Plumas National Forest, Lassen National Forest, and Lassen Volcanic National Park. The fire has burned

							963,309 acres and caused evacuations and road closures through the area. 1,329 structures were destroyed and damaged 95 additional buildings as of 9,30,2021. 1 fatality was reported. The fire was not fully contained in the month of July.
Flash Flood	Bella Vista	3/27/2019	0	0	$1,000	$0	Training thunderstorms brought flooding in Shasta County. Over a foot of snow caused travel problems at the Sierra passes. Severe flooding reports continued as of 6:35 pm with flooded roads around Anron Ln and Old Alturas Rd. Clough Creek expanded from a normal 5-foot width to 100-200 feet wide. There were 3 inches deep of hail, some as large as a nickel.
Flash Flood	Bella Vista	3/27/2019	0	0	$1,000	$0	Training thunderstorms brought flooding in Shasta County. Over a foot of snow caused travel problems at the Sierra passes.
Flash Flood	Bella Vista	3/27/2019	0	0	$25,000	$0	Training thunderstorms brought flooding in Shasta County. Over a foot of snow caused travel problems at the Sierra passes. There were 8 inches of water over Dry Creek and Deschutes Rd. in Bella Vista. Water was over the small bridge by the post office. The fire station flooded out and 1-2 inches of water was flowing through the station.

Flash Flood	Whiskeytown	4/5/2019	0	0	$50,000	$0	Redeveloping thunderstorms brought road flooding and a minor debris flow from heavy rain, An avalanche closed Highway 50 at Echo Summit. Up to 3 inches of snow fell in the Sierra. Heavy rainfall around 9 pm Friday caused flooding near Rock Creek and Paige Boulder Creek near the community of Old Shasta. Rock Creek jumped its banks and occupied portions of the flood plain along Rock Creek Road and over topped several crossings.
Flood	Shasta County	2/20/2017	0	0	$200,000	$0	Storms brought additional rain and widespread flooding and debris flows, as well as mountain snow. Several large trees blocking Big Bend Road.
Flood	Shasta County	2/26/2019	0	0	$10,000	$0	A strong atmospheric river brought heavy precipitation with widespread impacts across interior Northern California. These impacts included heavy high elevation snow, flooding, debris flows, strong mountain winds, and periods of whiteout conditions. A vehicle was submerged in 2 feet of water.
Hail	Enterprise	5/24/2019	0	0	$7,500	$0	An unusually cold storm for late May brought damaging hail over the northern Sacramento Valley, up to 2-3 inches in diameter. Flash flooding, damaging winds, funnel clouds, and high mountain snow were also observed. There were numerous reports of large hail across the Redding area, including a photo of hail from the family of an NWS employee showing oblong hail as large as 3 inches in diameter. Hail this size is rare in California and is near record size. Many cars were dented or had back windows or windshields broken. A preliminary estimate of damage to hail is based on a KRCR story of up to 3000 cars damaged and a national average of

							$2500 for damage repairs (Auto Trends). This works out to rough estimated of around $7.5 million for auto damage alone. Some building damage was also reported, including the Northern California Geographic Area Coordination Center, which suffered damage to a new roof.
Heat	Shasta County	8/15/2019	0	1	$0	$0	High pressure brought extensive heat to the region from August 14 to August 16. On August 15th, a wildfire was reported in the community of Millville in Shasta County. This fire burned 156 acres over a period of two days during a brief heatwave over northern California. On CalFire's web page for the Cottage Fire, it notes that one fire fighter was injured due to heat related illness. An Excessive Heat Warning was in place from 1100 August 14 to 2100 August 16.

High Wind	Shasta County	7/26/2018	4	6	$0	$0	Large wildfires developed across Northern California at the end of July during a period of high temperatures, low humidity and unusually dry fuels. A powerful fire whirl developed with the Carr Fire, creating significant wind damage to western Redding and rapid-fire growth. The Mendocino Complex became the largest wildfire in California history. A state of emergency was declared at state and federal levels due to the fires. A powerful fire whirl developed within the Carr Fire in western Redding, CA on July 26th, with winds estimated more than 143 mph, equivalent to an EF3 tornado. The fire whirl was estimated to be on ground from 7:30-8:00 p.m. The fire whirl caused extensive tornado-like damage while rapidly spreading the fire. The winds crumpled high tension electrical transmission towers, damaged homes, and debarked and uprooted trees. Wind damaged areas included locations untouched by fire and included signs of ground scouring. The damage path was 2 miles long, with an estimated width of about half a mile. Three people were killed inside their Redding home after the structure's walls were blown out and the roof collapsed on the occupants. Several other homes suffered significant roof damage. A firefighter was killed while driving his vehicle near the fire whirl. Three bulldozers were impacted by flying debris, rocks, embers, smoke, and intense heat, with the operators suffering injuries including burns and cuts from broken glass.

High Wind	Shasta County	10/27/2019	0	0	$15,000	$0	Critical fire weather conditions were forecast for Oct 23-24 and again on October 27-28 with the eastern Pacific High allowing trough to slide into the Great Basin/Nevada areas. This caused the pressure gradients to tighten over the county warning area, which lead to additional rounds of strong northerly and easterly winds. With these winds forecast, dry conditions still in place, and fuels still being primed a Red Flag Warning was issued for most of interior northern California. Fortunately, no major wildfires resulted from this, but utility power lines did suffer from wind and tree damage across much of northern California. Time stamps for events are based on strongest wind gusts that occurred between Oct 23-38. The mesonet station, Jarbo Gap, near Big Bend reported a non-thunderstorm related wind gust up to 70 mph, with strong wind gusts of 50-70 mph lasting through 11AM PST. The local utility company for Lake County reported tree and wind related damage to power lines near the Oro Fino and Wyandotte areas.

High Wind	Shasta County	10/27/2019	0	0	$39,000	$0	Critical fire weather conditions were forecast for Oct 23-24 and again on October 27-28 with the eastern Pacific High allowing trough to slide into the Great Basin/Nevada areas. This caused the pressure gradients to tighten over the county warning area, which lead to additional rounds of strong northerly and easterly winds. With these winds forecast, dry conditions still in place, and fuels still being primed a Red Flag Warning was issued for most of interior northern California. Fortunately, no major wildfires resulted from this, but utility power lines did suffer from wind and tree damage across much of northern California. Time stamps for events are based on strongest wind gusts that occurred between Oct 23-38. Redding Airport a non-thunderstorm related wind gust up to 66 mph. Within Shasta and Tehama counties, a utility company reported tree and wind related damage to power lines near the Cottonwood, Deschutes, Jessup, Volta, Anderson, Girvan, Oregon Trail, Pit No 5, Stillwater, Gerber, Rawson, Red Bluff, and Volta-South areas.

High Wind	Shasta County	9/7/2020	0	0	$55,000	$0	September started off extremely hot, as high pressure built over the area. This led to unseasonably hot temperatures for most of northern California with widespread triple digit heat forecast, accompanied by little overnight relief for the Labor Day weekend. Between September 5 and September 8, one county in the Sacramento Valley recorded five heat related visits to the emergency room; however, as of this time, no deaths were reported. On the tail of this heat wave, critical fire weather conditions occurred due to a trough sliding into the Great Basin area. Gusty winds led to 83 reports of wind related damage or hazards to a utility company across all of northern California, including areas served by NWS Eureka and NWS Monterey. Damage locations in the events are estimated by the map provided to the public. Gusty winds also wreaked havoc on the North Complex. A utility company reported 9 reports of wind related damage or hazards in Shasta County, 5 of which occurred in zone 66. There were 5 other reports of wind related damage or hazards in zone 66, 1 report in Tehama County and 4 reports in Butte County. Mesonet stations reported peak wind gusts between 40 and 66 mph. Damage related costs are estimated.

High Wind	Shasta County	1/26/2021	0	2	$0	$0	A cold trough from the Gulf of Alaska dropped into Northern California which brought a high impact winter storm to the region. Widespread precipitation, low snow levels of 500 to 2500 feet, and strong and damaging wind resulted. Impacts ranged from fallen trees, downed power and phone lines, treacherous driving conditions including chain controls and highway closures due to wind and/or snow, multiple accidents and spin outs due to snow, widespread power outages, damaged property due to wind, and injuries. Sacramento County was investigating several homeless related deaths due to cold weather; however, no reports have come back linking the two together. High winds resulted in fallen trees throughout the Sacramento Valley. Media reported an incident that resulted in 2 injuries just east of Chico, CA along Centerville Road in Butte Creek Canyon. 1 individual was taken the hospital; the other injury was minor. Peak wind gusts, reported by a myriad of weather stations, for the zone ranged from 30 to 67 mph.
High Wind	Shasta County	1/26/2021	0	0	$100,000	$0	A cold trough from the Gulf of Alaska dropped into Northern California which brought a high impact winter storm to the region. Widespread precipitation, low snow levels of 500 to 2500 feet, and strong and damaging wind resulted. Impacts ranged from fallen trees, downed power and phone lines, treacherous driving conditions including chain controls and highway closures due to wind and/or snow, multiple accidents, and spin outs due to snow, widespread power outages, damaged property due to wind, and injuries. Sacramento County was

							investigating several homeless related deaths due to cold weather; however, no reports have come back linking the two together. Public works of Butte County reported that many trees and limbs came down in the valley and foothill communities, including Camp Burn Scar. There is no count on the trees, but a lot of calls came from south county foothills, Forbestown area.
High Wind	Shasta County	1/26/2021	0	0	$200,000	$0	A cold trough from the Gulf of Alaska dropped into Northern California which brought a high impact winter storm to the region. Widespread precipitation, low snow levels of 500 to 2500 feet, and strong and damaging wind resulted. Impacts ranged from fallen trees, downed power and phone lines, treacherous driving conditions including chain controls and highway closures due to wind and/or snow, multiple accidents, and spin outs due to snow, widespread power outages, damaged property due to wind, and injuries. Sacramento County was investigating several homeless related deaths due to cold weather; however, no reports have come back linking the two together. Local news site reported that the foothills, specifically in the Sierra, Nevada, Placer, and El Dorado areas, reported widespread power outages due to wind. Additionally, many local highways were closed for snow and wind debris removal. Peak wind gusts, reported by a myriad of weather stations, for the zone ranged from 30 to 58 mph. Damage costs are estimated.

High Wind	Shasta County	12/13/2021	0	0	$1,000	$0	A weather system brought winter weather to the Sierra Nevada and southern Cascades. Reports of 52 to 66 inches of new snow were received. Low elevation snow also occurred with snow accumulation reported down to approximately 2,500 feet in elevation in the western foothills of the Sierra Nevada. Chain controls were in place on Interstate 80 and Highway 50 during the event. Traffic was also briefly closed to through traffic on I-80 for 34 minutes on the 13th due to downed powerlines. A rockslide also closed state route 70 at 3:30 am on the 13th. Highway 49 was closed during the event due to a down tree. Power outages were also reported across the region. Several counties also opened warming centers for the cold temperatures. Law enforcement reported that winds caused downed trees and power lines, which led to blocked lanes on roadways and hazardous driving conditions. Peak wind gusts for the zone reached from 35 to 45 mph.
High Wind	Shasta County	12/13/2021	0	0	$1,000	$0	A weather system brought winter weather to the Sierra Nevada and southern Cascades. Reports of 52 to 66 inches of new snow were received. Low elevation snow also occurred with snow accumulation reported down to approximately 2,500 feet in elevation in the western foothills of the Sierra Nevada. Chain controls were in place on Interstate 80 and Highway 50 during the event. Traffic was also briefly closed to through traffic on I-80 for 34 minutes on the 13th due to downed powerlines. A rockslide also closed state route 70 at 3:30 am on the 13th. Highway 49 was closed during the event due to a down

							tree. Power outages were also reported across the region. Several counties also opened warming centers for the cold temperatures. Law enforcement reported that winds caused a downed power line. Peak wind gusts for the zone reached around 42 mph. Damage costs are estimated.
Lightning	Enterprise	3/27/2019	0	0	$10,000	$0	Training thunderstorms brought flooding in Shasta County. Over a foot of snow caused travel problems at the Sierra passes. Two people on social media sent in pictures of a tree hit by lightning. One of them estimated debris landed up to 100 feet away from the location. Time was estimated by radar.
Strong Wind	Shasta County	10/6/2019	0	0	$2,000	$0	High pressure brought warm, dry, and breezy conditions to northern California which led to elevated fire weather concerns. Fortunately, no major wildfires resulted from this, but utility power lines did suffer from some wind damage. The mesonet stations for Jarbo Gap and Concow Road observed strong non-thunderstorm related wind gusts that ranged from 30-51 mph. Once the wind event was completed, the local power utility company surveyed the area for damage and found a downed tree near some power lines and an ensnared branch in the power lines. These items were removed the company stated that no damage was done to their equipment.

Strong Wind	Shasta County	11/20/2019	0	0	$32,000	$0	An upper-level trough dipped into central California, which brought rain and even some isolated snow showers to the higher elevation Sierra. Snow accumulation was minimal and south of highway 50. Elsewhere, fuels were still primed for fire growth if ignited The incoming threat of gusty northerly and easterly winds and poor daytime humidity (15-25%) led to a Red Flag Warning. In the end, no major fires broke out from this event, but a utility company did suffer from wind and vegetation related damages. The Redding ASOS station reported a 45-mph wind gust. Gusty northerly winds were observed across the zone and caused damage. The local utility in Shasta County reported tree and wind related damages and hazards to power distribution equipment in the Cedar Creek, Girvan, Jessup, and Volta areas. The timing for this event is based on the Redding ASOS report.
Strong Wind	Shasta County	9/7/2020	0	0	$22,000	$0	September started off extremely hot, as high pressure built over the area. This led to unseasonably hot temperatures for most of northern California with widespread triple digit heat forecast, accompanied by little overnight relief for the Labor Day weekend. Between September 5 and September 8, one county in the Sacramento Valley recorded five heat related visits to the emergency room; however, as of this time, no deaths were reported. On the tail of this heat wave, critical fire weather conditions occurred due to a trough sliding into the Great Basin area. Gusty winds led to 83 reports of wind related damage or hazards to a utility company across all of northern California, including

							areas served by NWS Eureka and NWS Monterey. Damage locations in the events are estimated by the map provided to the public. Gusty winds also wreaked havoc on the North Complex. A utility company reported 9 reports of wind related damage or hazards in Shasta County, 4 of which occurred in zone 13. Mesonet stations reported peak wind gusts between 50 and 56 mph. Damage related costs are estimated.
Strong Wind	Shasta County	9/7/2020	0	0	$36,000	$0	September started off extremely hot, as high pressure built over the area. This led to unseasonably hot temperatures for most of northern California with widespread triple digit heat forecast, accompanied by little overnight relief for the Labor Day weekend. Between September 5 and September 8, one county in the Sacramento Valley recorded five heat related visits to the emergency room; however, as of this time, no deaths were reported. On the tail of this heat wave, critical fire weather conditions occurred due to a trough sliding into the Great Basin area. Gusty winds led to 83 reports of wind related damage or hazards to a utility company across all of northern California, including areas served by NWS Eureka and NWS Monterey. Damage locations in the events are estimated by the map provided to the public. Gusty winds also wreaked havoc on the North Complex. A utility company

							reported 9 reports of wind related damage or hazards in or near Plumas County. Peak gusts are estimated to be between 45 and 60 based on mesonet stations surrounding zone 68. Damage related costs are estimated.
Strong Wind	Shasta County	9/26/2020	0	0	$11,000	$0	Another round of critical fire weather conditions occurred from September 26 through September 28 due to a trough sliding into the Rockies and ridge building behind it. Gusty north to east winds generally ranged from 25 to 50 mph, however, some of the highest elevations along the Sierra Crest reported gusts up to 76 mph. This led to the Zogg Fire and 11 reports of wind related damage or hazards to a utility company across all of northern California, 10 of which occurred in along the west slopes of the northern Sierra. Damage locations in the events are estimated by the map provided to the public. A utility company reported 2 reports of wind related damage or hazards in Butte County. Mesonet stations reported wind gusts between 25 and 50 mph. The Pulga, Paradise, and Jarbo Gap areas reported slightly stronger gusts up to 58 to 72 mph. Damage related costs and are estimated.

Strong Wind	Shasta County	10/19/2020	0	0	$24,000	$0	Extremely dry conditions and periods of gusty winds lead to elevated to critical fire weather conditions for this week of October. This was due to shortwave troughs sliding down high pressure sitting over the eastern Pacific. Wind gusts ranged anywhere from 20 to 56 mph across interior northern California throughout the week, with the strongest winds being observed Wednesday night through Friday. No major fires were reported this week; however, a local utility company reported 8 instances of wind related damages or hazards. Shasta County had 7 reports of damage while the other happened in Butte. Locations are estimated by the map the utility company provided to the public. Mesonet, RAWS, and ASOS stations in zone 15 reported peak wind gusts between 20 and 35 mph for this stretch of critical fire weather conditions. A local utility reported 4 instances of wind related damages or hazards in this zone. Damage values are estimated.
Strong Wind	Shasta County	10/19/2020	0	0	$12,000	$0	Extremely dry conditions and periods of gusty winds lead to elevated to critical fire weather conditions for this week of October. This was due to shortwave troughs sliding down high pressure sitting over the eastern Pacific. Wind gusts ranged anywhere from 20 to 56 mph across interior northern California throughout the week, with the strongest winds being observed Wednesday night through Friday. No major fires were reported this week; however, a local utility company reported 8 instances of wind related damages or hazards. Shasta County had 7 reports of damage while the other happened in Butte. Locations are estimated by the map the utility

							company provided to the public. Mesonet and stations in zone 66 reported peak wind gusts between 25 and 55 mph for this stretch of critical fire weather conditions. A local utility reported 2 instances of wind related damages or hazards in this zone. Damage values are estimated.
Strong Wind	Shasta County	10/19/2020	0	0	$12,000	$0	Extremely dry conditions and periods of gusty winds lead to elevated to critical fire weather conditions for this week of October. This was due to shortwave troughs sliding down high pressure sitting over the eastern Pacific. Wind gusts ranged anywhere from 20 to 56 mph across interior northern California throughout the week, with the strongest winds being observed Wednesday night through Friday. No major fires were reported this week; however, a local utility company reported 8 instances of wind related damages or hazards. Shasta County had 7 reports of damage while the other happened in Butte. Locations are estimated by the map the utility company provided to the public. Mesonet, RAWS, and ASOS stations in zone 13 reported peak wind gusts between 25 and 56 mph for this stretch of critical fire weather conditions. A local utility reported 2 instances of wind related damages or hazards in this zone. Damage values are estimated.

Strong Wind	Shasta County	10/25/2020	0	0	$18,000	$0	A powerful offshore wind event unfolded from October 24 through October 27th as an upper-level trough slid into the Great Basin area and high pressure filled in its wake. This led to a tight pressure gradient developing over much of northern California which would lead to strong and damaging winds. In combination with the winds, low relative humidity values and dry fuels would lead to extreme weather conditions during this time frame. Most of the damage reports from this event came from the foothill and mountain locations via a utility company. They noted that were 126 instances of wind related damages or hazards across northern California. 49 of them are estimated to be within NWS Sacramento's county warning area, which are estimated from the map provided online. Peak wind gusts across the Valley were in the 35 to 50 mph range. The Redding ASOS reported wind gusts up to 49 mph at 11:24am pst on October 25. Additional mesonet weather stations in zone 13 also had wind gusts up to this speed. Finally, a utility company reported 3 instances of wind related damages or hazards in the zone. Damages are estimated.

Strong Wind	Shasta County	10/25/2020	0	0	$24,000	$0	A powerful offshore wind event unfolded from October 24 through October 27th as an upper-level trough slid into the Great Basin area and high pressure filled in its wake. This led to a tight pressure gradient developing over much of northern California which would lead to strong and damaging winds. In combination with the winds, low relative humidity values and dry fuels would lead to extreme weather conditions during this time frame. Most of the damage reports from this event came from the foothill and mountain locations via a utility company. They noted that were 126 instances of wind related damages or hazards across northern California. 49 of them are estimated to be within NWS Sacramento's county warning area, which are estimated from the map provided online. Peak wind gusts across the Valley were in the 35 to 50 mph range. The Redding ASOS reported wind gusts up to 49 mph at 11:24am pst on October 25. Additionally, a utility company reported 4 instances of wind related damages or hazards in the zone. Damages are estimated.

Strong Wind	Shasta County	10/25/2020	0	0	$18,000	$0	A powerful offshore wind event unfolded from October 24 through October 27th as an upper-level trough slid into the Great Basin area and high pressure filled in its wake. This led to a tight pressure gradient developing over much of northern California which would lead to strong and damaging winds. In combination with the winds, low relative humidity values and dry fuels would lead to extreme weather conditions during this time frame. Most of the damage reports from this event came from the foothill and mountain locations via a utility company. They noted that were 126 instances of wind related damages or hazards across northern California. 49 of them are estimated to be within NWS Sacramento's county warning area, which are estimated from the map provided online. Peak wind gusts across the Valley were in the 35 to 50 mph range. Mesonet stations across zone 66 reported peak wind gusts of 45 to 55 mph. Additionally, a utility company reported 3 instances of wind related damages or hazards in the zone. Damages are estimated.
Strong Wind	Shasta County	1/26/2021	0	0	$50,000	$0	A cold trough from the Gulf of Alaska dropped into Northern California which brought a high impact winter storm to the region. Widespread precipitation, low snow levels of 500 to 2500 feet, and strong and damaging wind resulted. Impacts ranged from fallen trees, downed power and phone lines, treacherous driving conditions including chain controls and highway closures due to wind and/or snow, multiple accidents and spin outs due to snow, widespread power outages, damaged property due to wind, and injuries.

							Sacramento County was investigating several homeless related deaths due to cold weather; however, no reports have come back linking the two together. Power outage for full Zogg fire area due to damaged trees down on powerlines. Peak wind gusts, reported by a myriad of weather stations, for the zone ranged from 30 to 51 mph. Damage costs are estimated.
Strong Wind	Shasta County	10/10/2021	0	0	$0	$0	Strong north winds impacted portions of interior northern California late Sunday the 10th through Monday the 11th. CHP reported numerous down trees, tree limbs and powerlines across the region. A wind gust of 53 mph was recorded in Calaveras County on October 11th.
Winter Storm	Shasta County	3/15/2018	0	0	$150,000	$0	A series of cool storms brought travel impacts in the mountains from heavy snow. Thunderstorms in the Sacramento Valley had dime sized hail. A series of cool storms brought travel impacts in the mountains from heavy snow. Thunderstorms in the Sacramento Valley had dime sized hail. Heavy snow fell, impacting travel on mountain roads with chain controls and delays. There was 7 of new snow at Quincy.

*Only hazards causing monetary losses, injuries and deaths were reported.

BOLD
planning

480 Duke Drive, Suite 130
Franklin, TN 37067
615.469.5558
boldplanning.com