

# SOLANO COUNTY

## MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

---

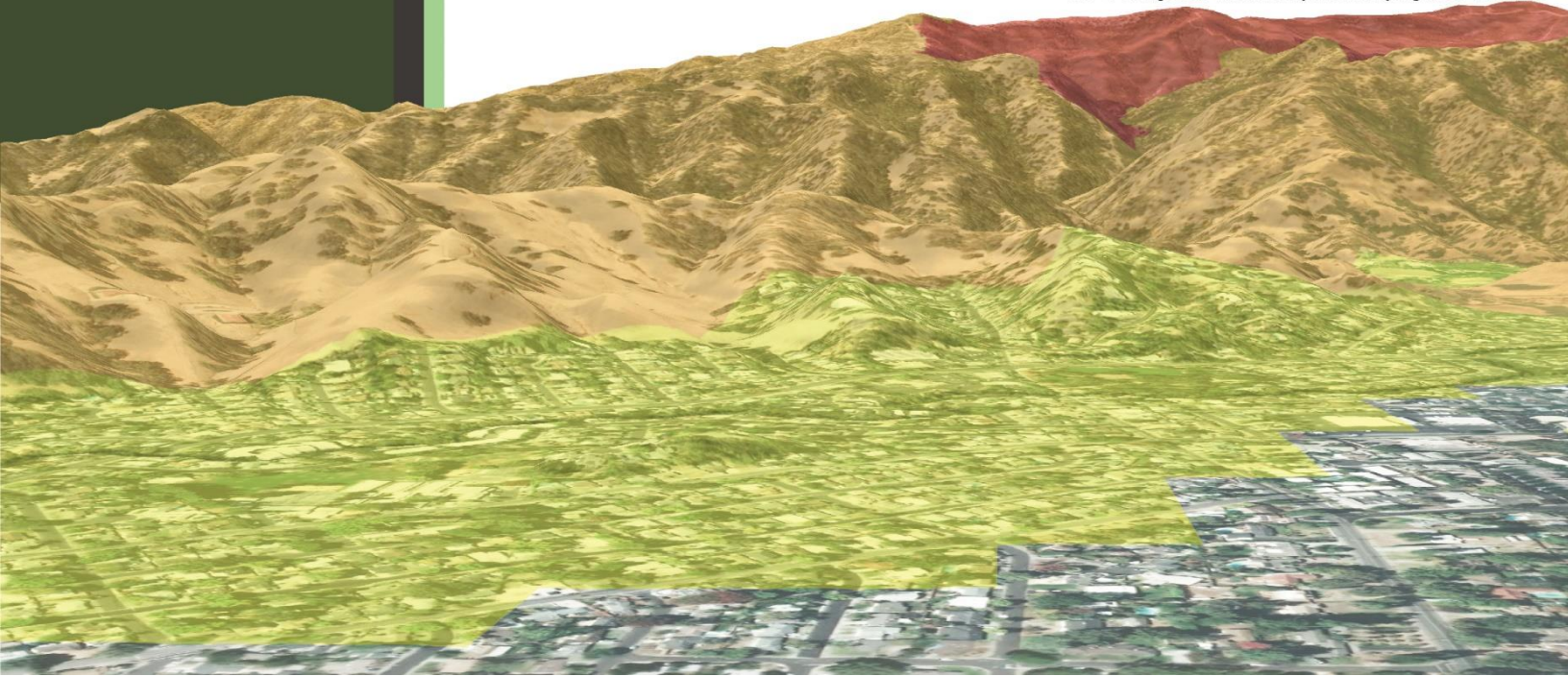
**SOLANO COUNTY OFFICE OF  
EMERGENCY SERVICES**

530 CLAY STREET  
FAIRFIELD, CA 94533-6342

---



**SHOWN BELOW**  
DP+S Composite Wildfire Layer Overlaying West Vacaville





INTENTIONAL BLANK PAGE



# Solano County

## Multi-Jurisdictional Hazard Mitigation Plan

### Volume 1

#### Planning-Area-Wide Elements

<b>Executive Summary.....</b>	<b>xi</b>
What is a hazard mitigation plan?.....	xii
Why have a hazard mitigation plan?.....	xii
Why is the plan updated so often? .....	xiii
Who participated in this plan? .....	xiii
<b>Plan Development and Update Methods .....</b>	<b>xiii</b>
<b>Risk Assessment .....</b>	<b>xiv</b>
Hazard Exposure and Damage Estimation .....	xv
Population and Asset Exposure.....	xv
Damage Assessments.....	xvi
Summary of Vulnerable Assets: People, Property Value, and Infrastructure .....	xvii
Mitigation Goals .....	xxii
<b>Mitigation Strategy .....</b>	<b>xxii</b>
<b>County-Wide Mitigation Actions .....</b>	<b>xxiii</b>
<b>Mitigation Action Implementation .....</b>	<b>xxvi</b>
<b>Section 1. Introduction .....</b>	<b>1-3</b>
1.1 Purpose .....	1-3
1.2 Background and Scope .....	1-3
1.3 Participating Jurisdictions .....	1-4
1.4 Why Update This Plan? .....	1-4
1.4.1 Purposes for Planning .....	1-5
1.5 Who Will Benefit from This Plan? .....	1-6
1.6 How to Use This Plan.....	1-6
<b>Section 2. What's New .....</b>	<b>2-1</b>
2.1 Participating Jurisdictions in the 2014 HMP vs MJHMP Update .....	2-1
2.2 Mitigation Actions .....	2-2



2.3 New Analysis and Risk Assessment Methodology .....	2-3
2.4 Successful Mitigation Activities .....	2-3
2.5 Incorporation into Other Planning Mechanisms .....	2-5
<b>Section 3. Planning Process.....</b>	<b>3-1</b>
STEP 1: Organize Resources .....	3-3
STEP 2: Assess the Risk .....	3-13
STEP 3: Develop a Mitigation Strategy .....	3-15
STEP 4: Adopt and Implement the Plan .....	3-19
<b>Section 4. Risk Assessment.....</b>	<b>4-1</b>
4.1 Hazard Identification and Screening .....	4-1
4.1.1 Hazard Screening .....	4-1
4.1.2 Past Major Hazard Events .....	4-4
4.1.3 Compounding Hazard Events.....	4-6
4.2 Hazard Prioritization .....	4-6
4.3 Solano County Geographic and Demographic Profile.....	4-8
4.3.1 Geography .....	4-8
4.3.2 Transportation Routes .....	4-8
4.3.3 Climate.....	4-10
4.3.4 Demographics and Vulnerable Populations .....	4-10
4.3.5 Economy .....	4-24
4.3.6 Past and Future Trends in Development .....	4-26
4.4 Vulnerability Assessment Methods .....	4-29
4.4.1 Population and Asset Inventory .....	4-29
4.4.2 Hazard Exposure and Damage Estimation .....	4-32
4.4.3 Climate Vulnerability Assessment.....	4-34
4.5 Vulnerability to Specific Hazards .....	4-36
4.5.1 Wildfire Hazard Profile .....	4-37
4.5.2 Flood Hazard Profile.....	4-59
4.5.3 Earthquake Hazard Profile .....	4-105
4.5.4 Extreme Weather Hazard Profile .....	4-147
4.5.5 Drought Hazard Profile.....	4-159
4.5.6 Slope Failure Hazard Profile .....	4-171
4.5.7 Climate Change Hazard Profile .....	4-183





<b>Section 5. Mitigation Strategy .....</b>	<b>5-1</b>
5.1 Mitigation Alternatives.....	5-1
5.2 Identifying the Problem .....	5-8
5.3 Identifying Benefits .....	5-8
5.4 Capabilities and Adaptive Capacity Assessment .....	5-9
5.4.1 Planning and Regulatory Mitigation Capabilities .....	5-10
5.4.2 Administrative and Technical Capabilities .....	5-13
5.4.3 Financial Capabilities .....	5-14
5.4.4 Education and Outreach.....	5-15
5.4.5 Capability and Adaptive Capacity Opportunities.....	5-16
5.4.6 Federal and State Funding Opportunities .....	5-16
5.5 Mitigation Goals .....	5-20
5.6 County-Wide Mitigation Actions .....	5-20
5.6.1 Prioritization of Mitigation Actions .....	5-21
5.6.2 Mitigation Action Plan .....	5-24
<b>Section 6. Plan Implementation and Maintenance .....</b>	<b>6-1</b>
6.1 Plan Adoption .....	6-1
6.2 Plan Implementation .....	6-1
6.2.1 Steering Committee .....	6-2
6.3 Monitoring, Evaluating, and Updating the MJHMP .....	6-2
6.3.1 Schedule.....	6-2
6.3.2 Mitigation Action Support Tool (MAST) Updates.....	6-3
6.3.3 Process.....	6-3
6.3.4 Continuing Public Involvement .....	6-4
6.3.5 HMA Monitoring .....	6-5
6.3.6 Incorporation into Other Planning Mechanisms.....	6-7
6.3.7 Planning Integration Processes .....	6-8
<b>Section 7. Works Cited.....</b>	<b>7-1</b>
<b>Appendix A. Analysis Methodology .....</b>	<b>A-1</b>
A.1. Natural Hazard Exposure .....	A-2
A.1.1. Damage Estimation with Hazus .....	A-2
A.1.2. Distinguishing Results – Natural Hazard Exposure Analysis vs Hazus Results .....	A-4



<b>A.2. Analysis Data</b>	<b>A-4</b>
A.2.1. Assets, Value, and Population	A-4
A.2.2. Natural Hazard Data	A-6
A.2.3. Methodology Overview	A-13
A.2.4. Real Property Damage Estimations	A-14
A.2.5. Insured Assets Roll	A-36
A.2.6. Data Dictionary	A-38
<b>Appendix B. Process Documentation</b>	<b>B-1</b>
<b>Appendix C. Climate Vulnerability Assessment (CVA)</b>	<b>C-1</b>

## List of Figures

Figure ES 1: Risk Assessment Methodology Summary	xv
Figure ES 2: Exposure Explanation Graphic	xvi
Figure ES 3: Hazus Damage Estimation Example	xvi
Figure ES 4: Sea-Level Risk Exposure Summary	xvii
Figure ES 5: Wildfire and FEMA Flood Risk Exposure Summaries	xviii
Figure ES 6: Area Protected by Levee and Concord-Green Valley EQ Exposure Summaries	xix
Figure ES 7: Hayward-Rodger's Creek EQ and Areas with Potential for Liquefaction Exposure Summaries	xx
Figure ES 8: Tsunami Runup Area and Landslide Risk Exposure Summaries	xxi
Figure ES-9: Process for Conferring Mitigation Project Benefits	xxiii
Figure 1-1: Participating Jurisdiction Map	<b>Error! Bookmark not defined.</b>
Figure 3-1: Solano County MHJHMP Planning Process	3-2
Figure 3-2: Sample Graphic from Survey	3-12
Figure 3-3: RAMP Access at mitigatehazards.com	3-14
Figure 3-4: RAMP Example of Properties Exposed to FEMA 100-Year Flood Risk in Portions of Vacaville	3-15
Figure 3-5: Categories of Issues Addressed in Problem Statements	3-16
Figure 3-6: MAST Elements and Cal OES Grant Applications	3-20
Figure 4-1: Prioritized Hazard Assessment Matrix for Solano County	4-7
Figure 4-2: Solano County – Geographic Overview	4-9
Figure 4-3: Total Households & Populations	4-11
Figure 4-4: Owners and Renters	4-12
Figure 4-5: Poverty and Median Income	4-13
Figure 4-6: Households with Minors and Elders	4-16
Figure 4-7: Median Household Income Distribution	4-17
Figure 4-8: Population Under Age 18	4-18
Figure 4-9: Population Over Age 65	4-19
Figure 4-10: Household Language	4-20



Figure 4-11: Hispanic Population.....	4-20
Figure 4-12: Solano County Race Distribution in 2014-2018.....	4-21
Figure 4-13: Public Transportation Dependence & Disabilities.....	4-23
Figure 4-14: Solano County Estimated Percentage Change (%) in Jobs by Industry Sector, 2019 to 2030 .....	4-28
Figure 4-15: Data Source and Method.....	4-29
Figure 4-16: Critical Facilities.....	4-31
Figure 4-17: Hazard Exposure Explanation Graphic .....	4-33
Figure 4-18: Hazus Damage Estimation Example .....	4-34
Figure 4-19: Climate Change Vulnerability Scoring Matrix .....	4-35
Figure 4-20: 2020 LNU Lightning Complex Fires .....	4-43
Figure 4-21: Historic Fire Occurrence Map (Fires Greater than 100 Acres, 2000-2020) .....	4-45
Figure 4-22: Mean Wildfire Return Intervals.....	4-47
Figure 4-23: Wildfire Risk Exposure .....	4-48
Figure 4-24: Population Exposed to Wildfire Risk .....	4-51
Figure 4-25: Exposure Wildfire Vulnerability and Snapshot Map .....	4-52
Figure 4-26: Solano County Flood Exposure .....	4-68
Figure 4-27: Area Protected by Levee.....	4-70
Figure 4-28: BAM 200-YR Flooding and Awareness Zones.....	4-72
Figure 4-29: Repetitive Loss Areas and Loss Data Summary .....	4-74
Figure 4-30: Snug Harbor Repetitive Loss Area .....	4-76
Figure 4-31: Howard's Landing Repetitive Loss Area.....	4-77
Figure 4-32: Heather Lane Repetitive Loss Area .....	4-79
Figure 4-33: Hartly Road Repetitive Loss Area.....	4-80
Figure 4-34: Sweeney Creek Repetitive Loss Area .....	4-81
Figure 4-35: Population Exposure to Flood (Unincorporated County).....	4-89
Figure 4-36: FEMA Flood Risk Exposure and Snapshot Map .....	4-90
Figure 4-37: Area Protected by Levee (NLD) Exposure.....	4-91
Figure 4-38: 100-YR Flood Damage Estimation by Occupancy .....	4-99
Figure 4-39: 500-YR Flood Damage Estimation by Occupancy Type.....	4-100
Figure 4-40: 100-YR Coastal Flood Damage by Occupancy Type .....	4-101
Figure 4-41: Earthquake Faulting.....	4-105
Figure 4-42 Solano County Liquefaction Overview .....	4-106
Figure 4-43: Zones of Required Investigation.....	4-111
Figure 4-44: Fault Probability Map for Solano County .....	4-113
Figure 4-45: Earthquake Shaking Potential.....	4-114
Figure 4-46: M6.8 Concord-Green Valley .....	4-116
Figure 4-47: M7.1 Hayward-Rodger's Creek .....	4-117
Figure 4-48 Solano County Tsunami Runup.....	4-119
Figure 4-49: Concord-Green Valley Exposure and Snapshot Map .....	4-122
Figure 4-50: Hayward-Rodger's Creek Exposure and Snapshot Map.....	4-123
Figure 4-51: Population Exposure to M6.8 Concord-Green Valley Scenario (Unincorporated County) .....	4-124
Figure 4-52: Population Exposure to M7.1 Hayward-Rodger's Creek Scenario (Unincorporated County) .....	4-125



Figure 4-53: M6.8 Concord Green Valley Damage Estimation by Occupancy .....	4-143
Figure 4-54: M7.1 Hayward Rodger's Creek Damage Estimation by Occupancy .....	4-144
Figure 4-55: Solano County - Average Annual Precipitation.....	4-150
Figure 4-56: Annual Average Wind Speed (Power Class).....	4-151
Figure 4-57: 30-Year Normal Maximum Temperature for July.....	4-152
Figure 4-58: Dried Up Lake Bed at Lagoon Valley Park in Vacaville .....	4-163
Figure 4-59: Solano County Drought Severity Timeline 2000-2021 .....	4-165
Figure 4-60: Landslide Risk Exposure.....	4-175
Figure 4-61: Landslide Risk Exposure Snapshot.....	4-177
Figure 4-62: Landslide Prevention Post-Wildfire .....	4-181
Figure 4-63: Sea-Level Rise Potential.....	4-192
Figure 4-64: Annual Average Maximum Temperature (RCP 4.5 Scenario) .....	4-193
Figure 4-65: Annual Average Maximum Temperature (RCP 8.5 Scenario).....	4-193
Figure 4-66: Current Average Max Temperature.....	4-194
Figure 4-67: Projected Average Max Temperature RCP 4.5 2100 .....	4-195
Figure 4-68: Projected Average Max Temperature RCP 8.5 2100 .....	4-196
Figure 4-69: Annual Average Maximum Temperature.....	4-197
Figure 4-70: Population Exposure to Sea-Level Rise (Unincorporated County).....	4-200
Figure 4-71: Sea-Level Rise Vulnerability and Exposure Snapshot .....	4-202
Figure 5-1: Process to Mitigation Project Benefits .....	5-9
Figure 5-2: Mitigation Action Application.....	5-21
Figure 5-3: Mitigation Action Number Key .....	5-24
Figure 6-1: Diagram of MAST Viewing Details.....	6-4
Figure 6-2: MAST and Cal OES Grant Applications .....	6-6
Figure 6-3: HMGP Timeline .....	6-6
Figure 7-1: Hazard Exposure .....	2
Figure 7-2: Flood Depth and Damage Curves.....	3
Figure 7-3: Hazus Damage Estimations .....	3
Figure 7-4: Data Analysis Methodology .....	13

## List of Tables

Table 1-1: Date of Jurisdictional Adoptions .....	<b>Error! Bookmark not defined.</b>
Table 2-1: Participating Jurisdictions .....	2-1
Table 2-2: Cancelled Previous Mitigation Actions .....	2-2
Table 2-3: Completed Previous Mitigation Actions .....	2-3
Table 3-1: MJHMP Steering Committee.....	3-3
Table 3-2: MJHMP Planning Committee.....	3-4
Table 3-3: MJHMP Update Consultant Team .....	3-10
Table 3-4: Planning Committee Meeting Summary.....	3-11
Table 3-5: Planning Process Library .....	3-17
Table 4-1: Document Review Crosswalk .....	4-2
Table 4-2: Hazard Prioritization.....	4-3



Table 4-3: Disaster Declarations in Solano County 1953 to Present .....	4-5
Table 4-4: Household Income and Poverty Levels .....	4-14
Table 4-5: Elderly Households .....	4-15
Table 4-6: Households with Minors and Single Parents.....	4-16
Table 4-7: Disability Status of Non-Institutionalized Population in Solano County in 2014-2018.....	4-23
Table 4-8: Industry by Occupation for the Civilian Employed Population 16 Years and Over .....	4-26
Table 4-9: Unincorporated Solano County Parcel Counts and Value.....	4-32
Table 4-10: Fire Perimeter Sizes and Dates (100 Acres or Greater 2000-2020) .....	4-42
Table 4-11 Populations Exposed to Wildfire Risk (Unincorporated County) .....	4-51
Table 4-12: Improved Parcel and Content within Wildfire Severity Zones (Unincorporated County).....	4-53
Table 4-13: Critical Facility Exposure to Wildfire Severity Zones (Unincorporated County) .....	4-54
Table 4-14: Lifelines in Wildfire Severity Zones (Unincorporated County) .....	4-55
Table 4-15 Wildfire Problem Statements .....	4-56
Table 4-16: Flood Insurance Statistics for Solano County (County-Wide) .....	4-63
Table 4-17: Solano County Flood Events Since 2000.....	4-66
Table 4-18: Summary of Discharges in Solano County .....	4-83
Table 4-19: Summary Population Exposure to Flood (Unincorporated County).....	4-89
Table 4-20: Summary Population Exposure to Levee Failure (Unincorporated County) .....	4-89
Table 4-21: Parcels Exposed to NFIP Flood Zones (Unincorporated County).....	4-92
Table 4-22: Parcels Exposed to Levee Failure (Unincorporated County).....	4-92
Table 4-23: Critical Facility Points in the Floodplain .....	4-93
Table 4-24: Critical Facility Points in Area Protected by Levee .....	4-94
Table 4-25: Lifelines in the Floodplain (Unincorporated County) .....	4-96
Table 4-26: Lifelines in Areas Protected by Levee (Unincorporated County) .....	4-97
Table 4-27: 100-YR Flood Damage Estimation by Occupancy Type .....	4-98
Table 4-28: Damage Estimation Summary for 500-YR. Floodplain .....	4-100
Table 4-29: Damage Estimation Summary for 100-YR. Coastal Floodplain .....	4-101
Table 4-30 Flood Problem Statements.....	4-103
Table 4-31: Moment Magnitude Scale .....	4-107
Table 4-32: Modified Mercalli Intensity Level Descriptions .....	4-108
Table 4-33: Modified Mercalli Scale and Peak Ground Acceleration .....	4-109
Table 4-34: Earthquakes in or Near Solano County 4.5 Magnitude or Greater Since 2005.....	4-110
Table 4-35: Population Exposure to M6.8 Concord-Green Valley Scenario (Unincorporated County).....	4-124
Table 4-36: Population Exposure to M7.1 Hayward-Rodger's Creek Scenario (Unincorporated County) .....	4-125
Table 4-37: Population Count of Required Investigation and Liquefaction Susceptibility.....	4-126
Table 4-38: Seismic Benchmark Years .....	4-127
Table 4-39: Definitions of FEMA Building Types.....	4-128
Table 4-40: Parcel Exposure to M6.8 Concord-Green Valley (Unincorporated County) .....	4-129
Table 4-41: Parcel Exposure to M7.1 Hayward-Rodger's Creek (Unincorporated County) .....	4-129
Table 4-42: Parcel Count of Required Investigation and Liquefaction Susceptibility .....	4-130
Table 4-43: Critical Facility Exposure to M6.8 Concord-Green Valley Scenario (Unincorporated County) .....	4-131
Table 4-44: Critical Facility Exposure to M7.1 Hayward-Rodger's Creek Scenario (Unincorporated County) ....	4-132



Table 4-45: Critical Infrastructure in Zone of Required Investigation and Susceptible to Liquefaction .....	4-133
Table 4-46: Lifeline Exposure M6.8 Concord-Green Valley Scenario (Unincorporated County) .....	4-135
Table 4-47: Lifeline Exposure M7.1 Hayward-Rodger's Creek Scenario (Unincorporated County).....	4-136
Table 4-48: Critical Lines in Zone of Required Investigation and Susceptible to Liquefaction.....	4-137
Table 4-49: Hazus Building Damage Descriptions .....	4-142
Table 4-50: Loss Estimations for M6.8 Concord-Green Valley Scenario .....	4-143
Table 4-51: Loss Estimations for M7.1 Hayward-Rodger's Creek Scenario .....	4-144
Table 4-52: Earthquake Problem Statements .....	4-146
Table 4-53: Classes of Wind Power Density at 10 m and 50 m <sup>a</sup> .....	4-149
Table 4-54: Extreme weather Problem Statements.....	4-157
Table 4-55: USDA Drought Disaster Declarations for Solano County, 2012 - 2021 .....	4-163
Table 4-56: Drought Classifications and Impacts for California .....	4-164
Table 4-57: Drought Problem Statements.....	4-170
Table 4-58: Population Exposure to Landslide Susceptibility .....	4-176
Table 4-59: Property Value Exposed to Landslides.....	4-178
Table 4-60: Critical Facility Points with Slope Failure Hazard Risk (Unincorporated County).....	4-178
Table 4-61: Critical Facilities (Linear) with Slope Failure Hazard Risk (Unincorporated County) .....	4-180
Table 4-62: Slope Failure Problem Statements .....	4-182
Table 4-63: Climate Change-Related Hazards and Cross-References in MJHMP .....	4-183
Table 4-64: Probability of Exceeding Global Mean Sea-level Rise (Median Value) Scenarios in 2100 .....	4-190
Table 4-65: Population Exposure to Sea-Level Rise (Unincorporated County) .....	4-200
Table 4-66: Property Values Exposed to Sea-level Rise .....	4-201
Table 4-67: Critical Infrastructure Points in Sea-Level Rise Regions (Unincorporated County) .....	4-203
Table 4-68: Miles of Critical Infrastructure (Linear) in Sea-Level Rise Regions (Unincorporated County).....	4-204
Table 4-69: Climate Change Problem Statements .....	4-206
Table 5-1: Solano County Planning and Regulatory Mitigation Capabilities .....	5-10
Table 5-2: Solano County Administrative and Technical Capabilities .....	5-13
Table 5-3: Solano County Fiscal Capabilities Summary .....	5-14
Table 5-4: Solano County Education/ Outreach Capabilities Summary .....	5-15
Table 5-5: Federal and State Funding Opportunities .....	5-16
Table 5-6: County Wide Mitigation Action Tracker .....	5-25
Table 7-1: Wildfire Hazard Severity Classification.....	12
Table 7-2: 100-YR Flood Damage Estimations for Improved Assets .....	14
Table 7-3: 500-YR Flood Damage Estimations for Improved Assets .....	15
Table 7-4: EQ M6.8 Concord Green Valley Damage Estimations for Improved Assets.....	17
Table 7-5: EQ M7.1 Hayward Rodger's Creek Flood Damage Estimations for Improved Assets.....	26
Table 7-6: Unincorporated County Insured Asset Roll.....	36
Table 7-7: Critical Facility Data Dictionary .....	38



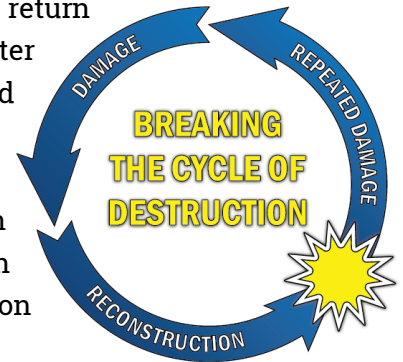
# **Executive Summary**

## **SOLANO COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN**



Solano County prepared this hazard mitigation plan to guide county and city officials in protecting the people and property within the county from the effects of natural disasters and hazard events. This plan demonstrates Solano County's commitment to reducing risk from natural hazards through mitigation and serves as a tool to direct county resources to achieve optimum results with available administrative, technical, and financial resources.

The term **"hazard mitigation"** refers to actions or strategies that can reduce or eliminate long-term risks caused by natural disasters. Mitigation activities can be developed, planned, and implemented before or after a disaster occurs. After disasters, repairs and reconstruction often are completed in such a way as to simply restore damaged property to pre-disaster conditions. These efforts may return property and infrastructure to "the norm", but the replication of pre-disaster conditions may result in a repetitive cycle of damage and reconstruction. Hazard mitigation planning in Solano County can break this repetitive cycle by reducing vulnerability to hazards through smart construction and proper planning of future development and critical infrastructure. Hazard mitigation activities can be conducted through a wide variety of mitigation strategies, such as construction of regional flood control projects or implementing fuel reduction around buildings within high wildfire risk areas.



## What is a hazard mitigation plan?

This hazard mitigation plan provides an explanation of prevalent hazards within the county. It also describes how hazards may affect the county and participating jurisdictions differently based upon various relationships to natural hazards. This plan identifies risks to vulnerable assets, both people and property. Most importantly, the mitigation strategy presented in this plan responds to the identified vulnerabilities within each community and provides prescriptions or actions to achieve the greatest risk reduction based upon available resources. Solano County and participating jurisdictions intend to save lives, reduce injuries, reduce property damage, and protect natural resources for future generations through mitigation activities.

## Why have a hazard mitigation plan?

The purpose of this Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) is twofold. First, it provides the county and participating jurisdictions continued access to grant funding from FEMA to conduct hazard mitigation activities for participating jurisdictions. Secondly, it provides resources for residents wishing to conduct hazard mitigation efforts by identifying areas of extreme risk and providing financial and technical mitigation resources based upon current gaps.

The passage of the Disaster Mitigation Act of 2000 (DMA 2000) requires proactive pre-disaster planning as a condition of receiving certain federal financial assistance under the Robert T. Stafford Act. DMA 2000 encourages state and local authorities to work together on pre-disaster planning to assist local governments

to accurately assess mitigation needs, resulting in faster allocation of funding and more cost-effective risk reduction projects under FEMA's Hazard Mitigation Assistance program.



## Why is the plan updated so often?

Jurisdictions that allow a plan to expire are not able to pursue funding under the Robert T. Stafford Act. As a DMA 2000 requirement, the plan must be updated every five years to remain in compliance with federal mitigation grant conditions. Federal regulations require hazard mitigation plans to include a plan for monitoring, evaluating, and updating the hazard mitigation plan. An update process provides an opportunity to reevaluate recommendations, monitor the impacts of actions that have been accomplished, and determine if there is a need to change the focus of mitigation strategies over time. Grant compliance is contingent on meeting the plan update requirements that are contained in the Code of Federal Regulations.

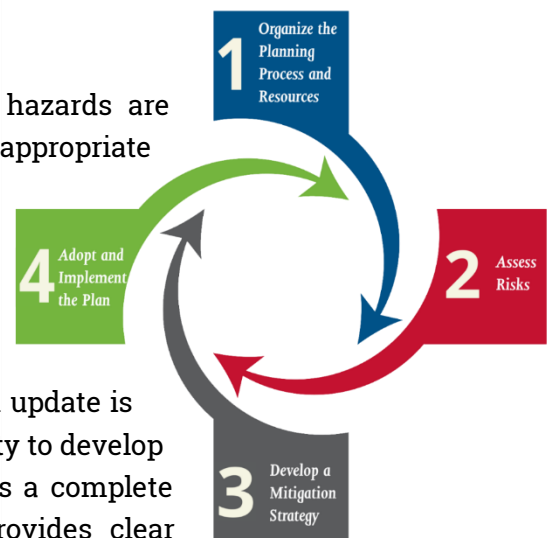
## Who participated in this plan?

The Solano County MJHMP includes all municipalities within the county and geographically covers the entire area within Solano County (hereinafter referred to as the "planning area"). Any local government or non-profit agency with the ability to regulate building or infrastructure development or maintenance may participate in the planning process. However, to obtain FEMA approval, each of the participating jurisdictions must meet all FEMA planning requirements outline in federal regulations at 44 CFR § 201.6 *et seq.* A list of jurisdictions that have elected to participate in this MJHMP can be found in Table 2-1.

A Hazard Mitigation Planning Committee was formed to develop and steer content in this plan. The committee consists of Solano County stakeholders, regional agencies, neighboring jurisdictions, and participating jurisdictions who have worked together to create the goals, objectives, mitigation strategies, and implementation methods to reduce risk.

## Plan Development and Update Methods

Hazard mitigation planning is the process through which hazards are identified, likely impacts determined, mitigation goals set, and appropriate mitigation strategies identified. This plan documents the hazard mitigation planning process the County and participating jurisdictions used to increase natural hazard resiliency in the community. Solano County and all participating jurisdictions followed the recommended FEMA four-step process to develop this 2021 updated plan. This plan update is also the first time all municipalities have joined with the county to develop a multi-jurisdictional plan. In this way, the MJHMP update is a complete revamp and all-inclusive planning process. The update provides clear





delineation of jurisdiction information, development of a new risk assessment, revaluation of goals and objectives, development of new mitigation actions, new enhancements for implementing mitigation actions, updates to all sections of the 2014 plan, and a new website for stakeholder involvement and public information.

## Risk Assessment

The risk assessment measures the potential loss of life, personal injury, economic injury, and property or infrastructure damage resulting from natural hazards in order to determine vulnerability. For this update, the risk assessment utilized new data and technologies that have become available since 2014. The County and participating jurisdictions used risk assessment information to rank risks and to gauge the potential impacts of each hazard of concern in the planning area. The risk assessment includes:

- Hazard identification and profiling,
- Assessment of the impact of hazards on physical, social, and economic assets,
- Identification of particular areas of vulnerability,
- Additional impacts of each hazard due to climate change, and
- Estimates of the cost of potential damage.

The following natural hazard threats were identified and profiled as county-wide priority hazards:

**Wildfire**  
**SECTION 4.5.1**



**Earthquake**  
**SECTION 4.5.3**



**Drought**  
**SECTION 4.5.5**



**Climate Change**  
**SECTION 4.5.7**



**Flood**  
**SECTION 4.5.2**



**Extreme Weather**  
**SECTION 4.5.4**



**Slope Failure**  
**SECTION 4.5.6**



Participating jurisdictions also individually assessed risks applicable to their jurisdictions, and many participating jurisdictions identified fewer than the County-identified hazards. Those jurisdiction-specific profiles are included in Volume 2 of this MJHMP.



# Hazard Exposure and Damage Estimation

In Solano County, earthquakes, flooding, slope failure, sea-level rise, and wildfire have known geographic extents and corresponding spatial information, which make exposure and damage estimation possible. In order to describe vulnerability for each hazard, it is important to understand the total population and total assets at risk. This provides the estimated damage and losses expected during a “worst case scenario” event for each hazard. Figure ES 1 provides a summary of how and what data sources are used to provide exposure and damage estimation results. More detail on the risk assessment analysis is provided in Section 4.4 and Appendix A. Exposure and Damage estimation analysis is briefly described in the sections that follow the summary graphic.

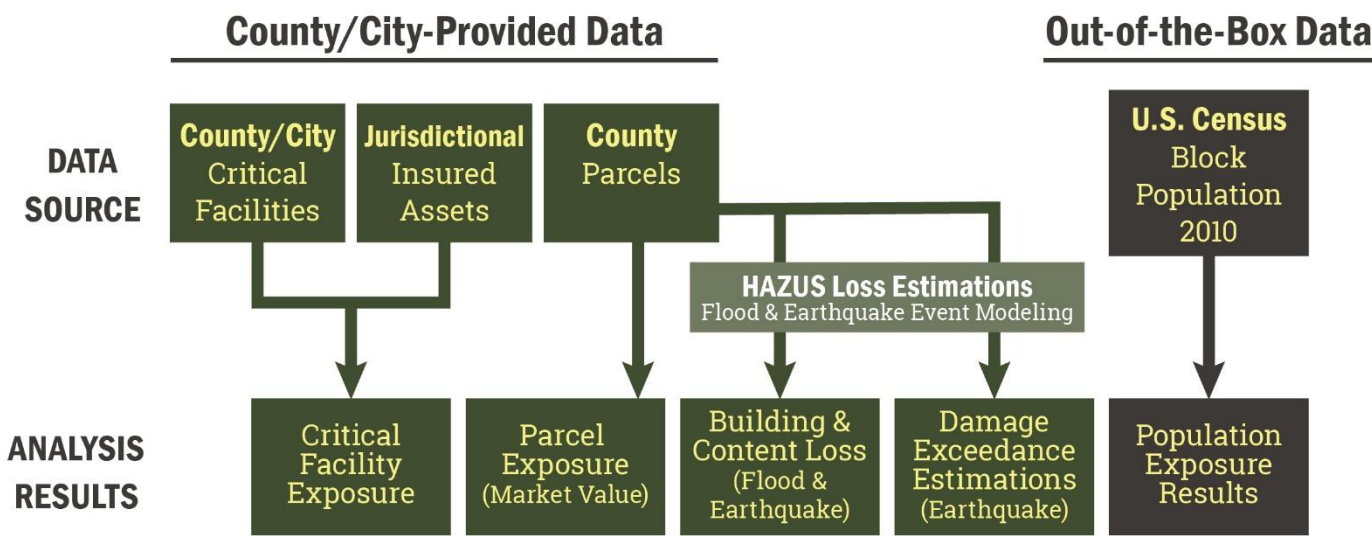


Figure ES 1: Risk Assessment Methodology Summary

## Population and Asset Exposure

The total counts of parcels, people, facilities, assets, and the sum of values within the planning area which could be exposed to a hazard event is referred to as the “exposure” in this plan. A natural hazards overlay was developed to reflect the combination of many known natural hazard spatial footprints. The spatial overlay method enables summarization of building values, parcel counts, population exposure, and critical facility exposure within a hazard’s geographic extents. See Figure ES 2 exposure example. This method has been used to evaluate exposure for sea-level rise, earthquakes, landslides, flooding, and wildfire. For a more detailed explanation on Risk Assessment Methods, see Section 4.4 and Appendix A.





Figure ES 2: Exposure Explanation Graphic

## Damage Assessments

FEMA’s Hazus software was used to conduct a detailed loss estimation for flood and earthquake. Hazus is a nationally-applicable, standardized methodology that contains models for estimating potential losses from earthquakes, floods, and hurricanes. Hazus uses Geographic Information Systems (GIS) technology to estimate physical, economic, and social impacts of disasters. For this planning effort, Hazus was used to generate damage estimations due to possible earthquakes and flooding. The estimated damage and losses provided by the Hazus Software is a “worst case scenario” event and provides the ability to understand possible widescale damage to buildings and facilities.

In the hypothetical map in Figure ES 3, even though both structures are exposed to flooding, it is predicted that the structure with a first-floor height below the depth of flooding will receive significantly more damage than the structure with a first-floor height above the expected water depth. For a more detailed explanation on risk assessment methods, see Section 4.4 and Appendix A.

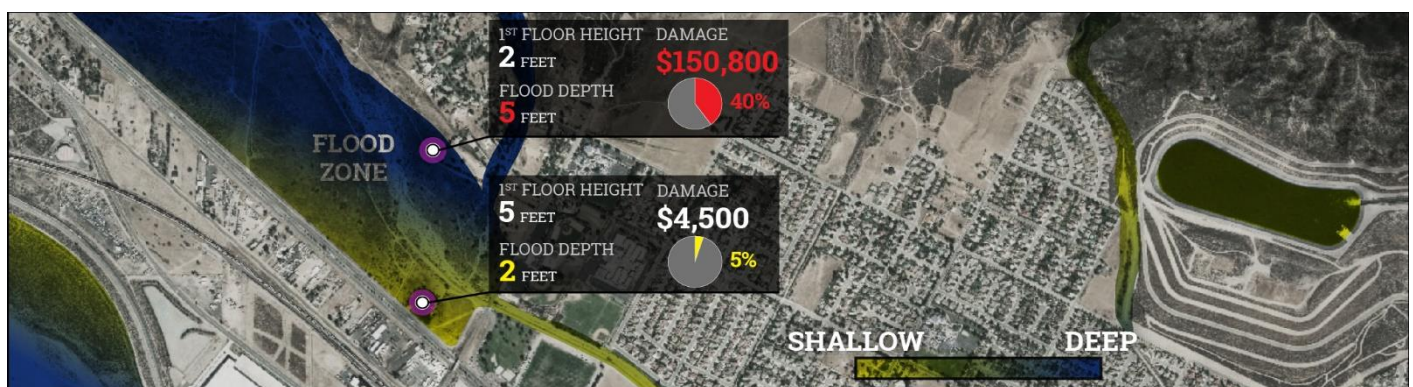


Figure ES 3: Hazus Damage Estimation Example





## Summary of Vulnerable Assets: People, Property Value, and Infrastructure

Hazards with spatial boundaries can be analyzed to demonstrate the amount of population, critical infrastructure, and parcels within each hazard footprint. At-risk populations, critical infrastructure, improved parcels, and loss results for each hazard category are provided in bar chart summary tables throughout this plan to evaluate the percentage of assets exposed to different types of hazards. The side-by-side comparison allows officials to evaluate the impacts of potential hazards to determine toward what hazards to direct energy and financial resources for mitigation activities. For detailed vulnerability assessment information, see the individual hazard specific sections presented in Section 4.5. This Executive Summary provides map summaries for the profiled hazards in Figure ES 5 through Figure ES 8.

The risk assessment for climate change includes an additional climate vulnerability assessment as Appendix C, assessing the county's climate change-related vulnerabilities (also called areas of concern) according to the impact of climate change on the vulnerability and Solano County's capacity to adapt to the vulnerability. Each municipality has a climate vulnerability assessment at the end of its annex with its own unique climate vulnerability assessment.

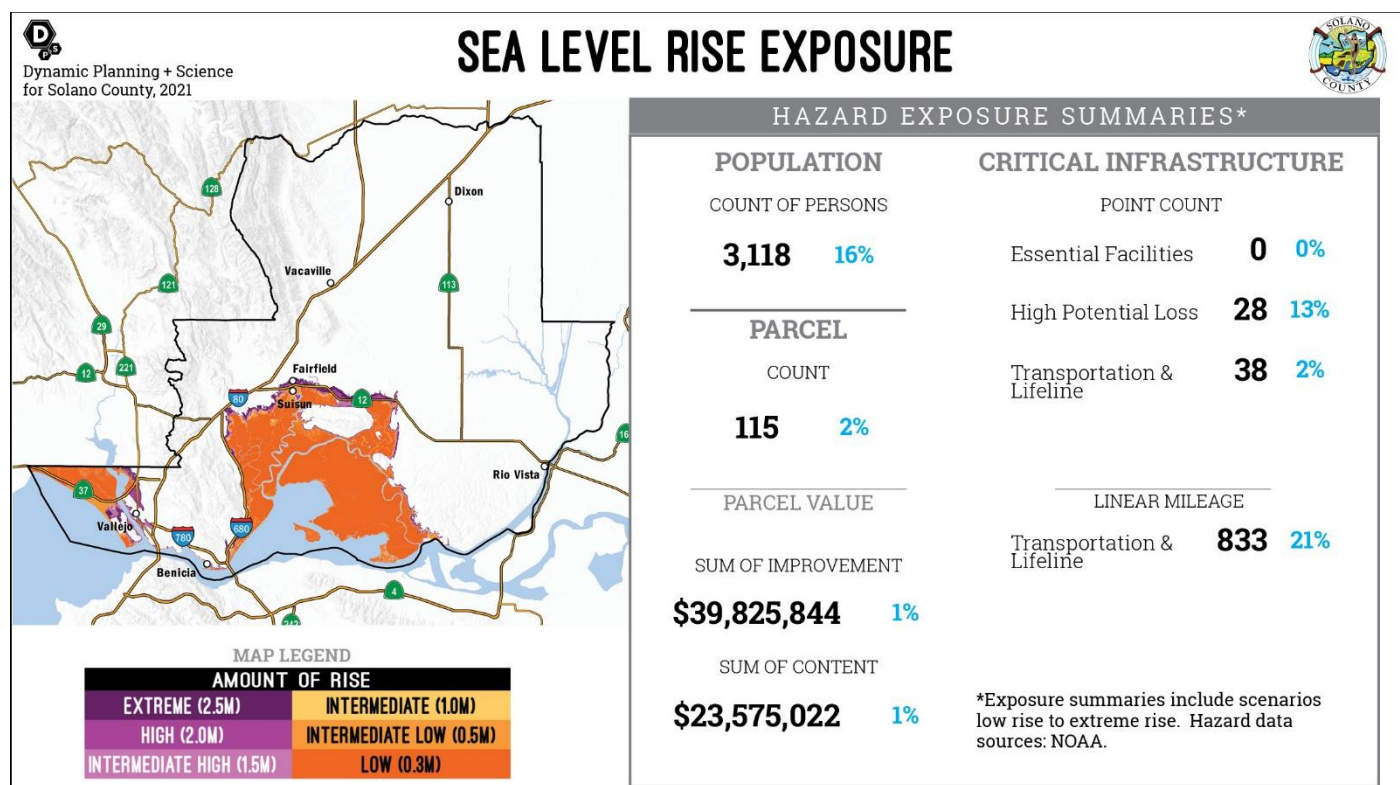
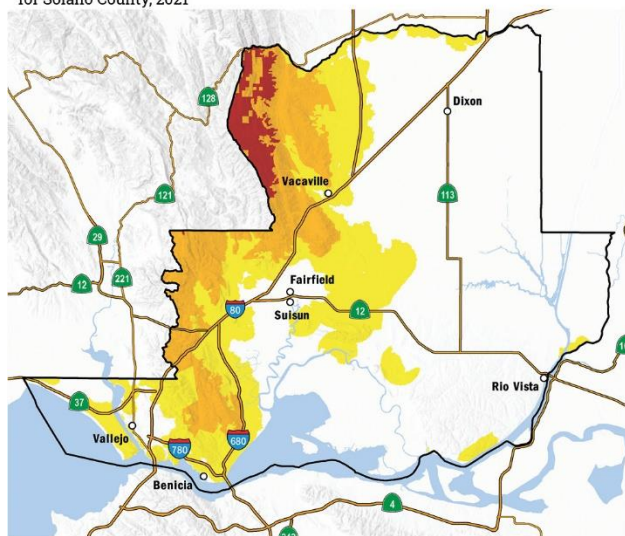


Figure ES 4: Sea-Level Risk Exposure Summary



Dynamic Planning + Science  
for Solano County, 2021

## WILDFIRE RISK EXPOSURE



MAP LEGEND



### HAZARD EXPOSURE SUMMARIES\*

#### POPULATION

COUNT OF PERSONS

**5,063** 26%

#### PARCEL

COUNT

**1,255** 19%

PARCEL VALUE

SUM OF IMPROVEMENT

**\$740,301,130** 23%

SUM OF CONTENT

**\$384,204,119** 18%

#### CRITICAL INFRASTRUCTURE

POINT COUNT

Essential Facilities **2** 17%

High Potential Loss **15** 7%

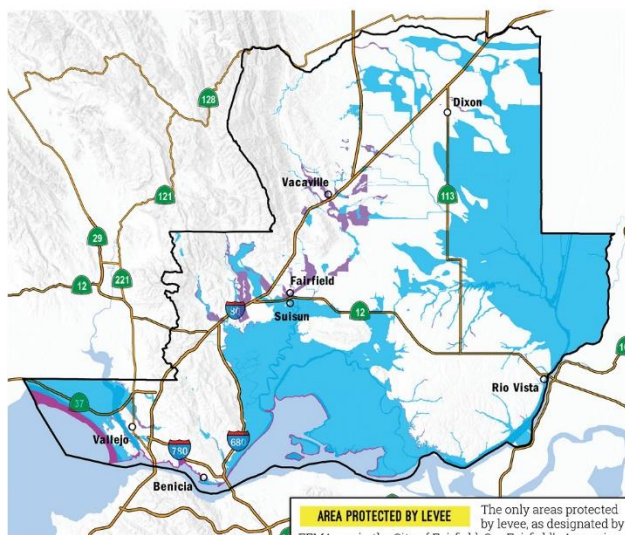
Transportation & Lifeline **209** 9%

LINEAR MILEAGE

Transportation & Lifeline **517** 12%

\*Exposure summaries include high and very high risk areas. Hazard data sources: Cal Fire, CPUC.

## FEMA FLOOD RISK EXPOSURE



MAP LEGEND



### HAZARD EXPOSURE SUMMARIES\*

#### POPULATION

COUNT OF PERSONS

**5,755** 29%

#### PARCEL

COUNT

**1,185** 18%

PARCEL VALUE

SUM OF IMPROVEMENT

**\$470,693,927** 15%

SUM OF CONTENT

**\$313,646,972** 15%

#### CRITICAL INFRASTRUCTURE

POINT COUNT

Essential Facilities **3** 25%

High Potential Loss **62** 30%

Transportation & Lifeline **296** 13%

LINEAR MILEAGE

Transportation & Lifeline **1,844** 46%

\*Exposure summaries include 100-year and 500-year flood zone areas, including coastal and leveed areas. Hazard data sources: FEMA.

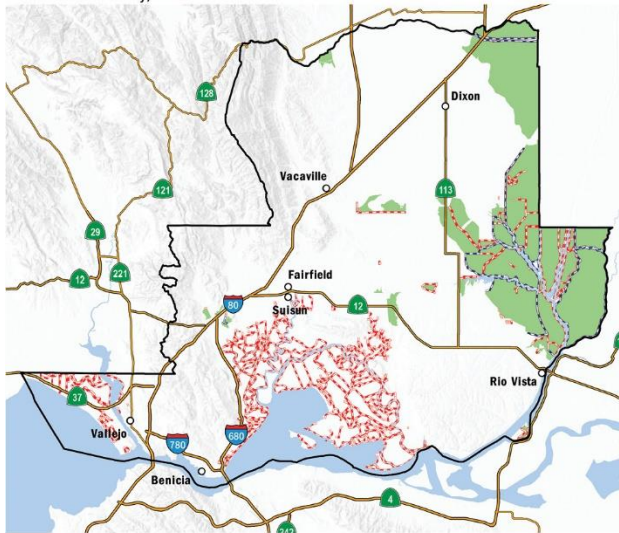
Figure ES 5: Wildfire and FEMA Flood Risk Exposure Summaries





Dynamic Planning + Science  
for Solano County, 2021

## AREA PROTECTED BY LEVEE (NLD) EXPOSURE



MAP LEGEND

**USACE PROTECTED BY LEVEE**

PROJECT LEVEE OTHER KNOWN LEVEES

### HAZARD EXPOSURE SUMMARIES\*

#### POPULATION

COUNT OF PERSONS

**1,198** 6%

#### PARCEL

COUNT

**328** 5%

PARCEL VALUE

SUM OF IMPROVEMENT

**\$90,362,831** 3%

SUM OF CONTENT

**\$69,851,466** 3%

#### CRITICAL INFRASTRUCTURE

POINT COUNT

Essential Facilities **2** 17%

High Potential Loss **1** 0%

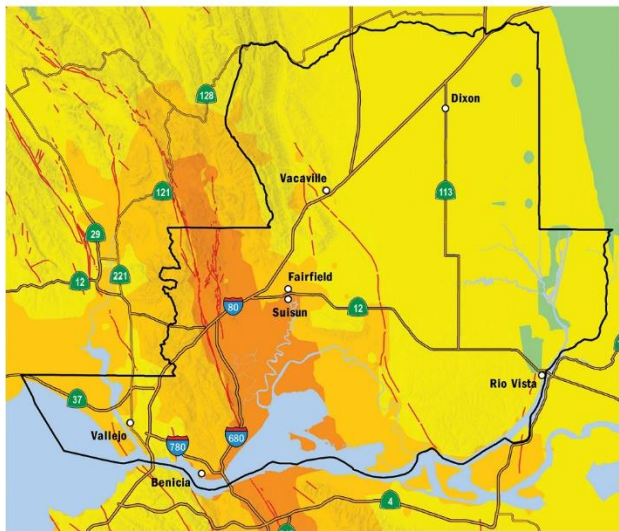
Transportation & Lifeline **81** 4%

LINEAR MILEAGE

Transportation & Lifeline **639** 16%

\*Exposure summaries include all NLD areas protected by levee. Hazard data sources: USACE.

## CONCORD-GREEN VALLEY EQ SCENARIO (M6.8)



MAP LEGEND



### HAZARD EXPOSURE SUMMARIES\*

#### POPULATION

COUNT OF PERSONS

**19,591** 100%

#### PARCEL

COUNT

**6,643** 100%

PARCEL VALUE

SUM OF IMPROVEMENT

**\$3,177,438,530** 100%

SUM OF CONTENT

**\$2,073,046,776** 100%

#### CRITICAL INFRASTRUCTURE

POINT COUNT

Essential Facilities **11** 92%

High Potential Loss **208** 100%

Transportation & Lifeline **2,226** 100%

LINEAR MILEAGE

Transportation & Lifeline **3,965** 99%

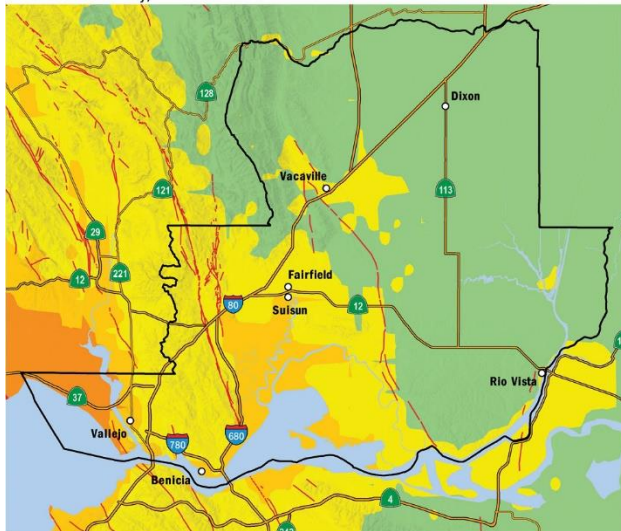
\*Exposure summaries include strong, very strong, violent, and severe MMI classes. Hazard data sources: USGS.

Figure ES 6: Area Protected by Levee and Concord-Green Valley EQ Exposure Summaries



Dynamic Planning + Science  
for Solano County, 2021

## HAYWARD-RODGER'S CREEK EQ SCENARIO (M7.1)



MAP LEGEND



### HAZARD EXPOSURE SUMMARIES\*

#### POPULATION

COUNT OF PERSONS

**11,763** 60%

#### PARCEL

COUNT

**2,926** 44%

PARCEL VALUE

SUM OF IMPROVEMENT

**\$1,443,156,920** 45%

SUM OF CONTENT

**\$871,643,247** 42%

#### CRITICAL INFRASTRUCTURE

POINT COUNT

Essential Facilities **4** 33%

High Potential Loss **129** 62%

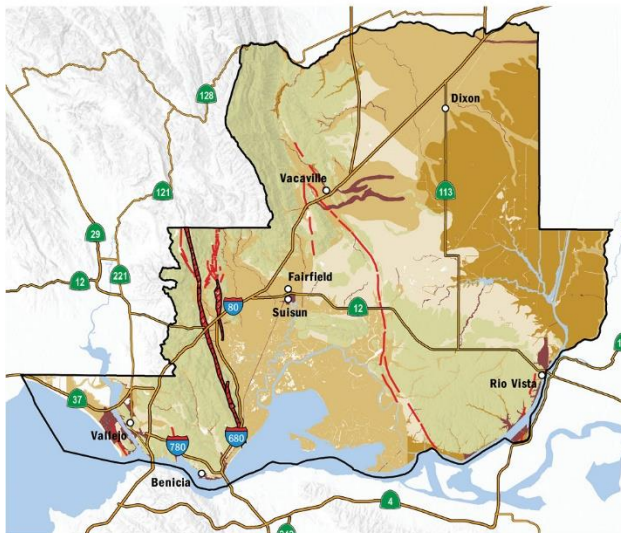
Transportation & Lifeline **386** 17%

LINEAR MILEAGE

Transportation & Lifeline **1,429** 36%

\*Exposure summaries include strong, very strong, violent, and severe MMI classes.  
Hazard data sources: USGS.

## AREAS WITH POTENTIAL FOR LIQUEFACTION



MAP LEGEND

QUATERNARY FAULTS (USGS)

EARTHQUAKE FAULT ZONE  
OF REQUIRED INVESTIGATION (CGS)



### HAZARD EXPOSURE SUMMARIES\*

#### POPULATION

COUNT OF PERSONS

**8,728** 44%

#### PARCEL

COUNT

**2,746** 41%

PARCEL VALUE

SUM OF IMPROVEMENT

**\$1,296,344,558** 41%

SUM OF CONTENT

**\$996,730,754** 48%

#### CRITICAL INFRASTRUCTURE

POINT COUNT

Essential Facilities **7** 58%

High Potential Loss **131** 63%

Transportation & Lifeline **401** 18%

LINEAR MILEAGE

Transportation & Lifeline **2,432** 61%

\*Exposure summaries include medium, high, very high susceptibility. Hazard data sources: USGS.

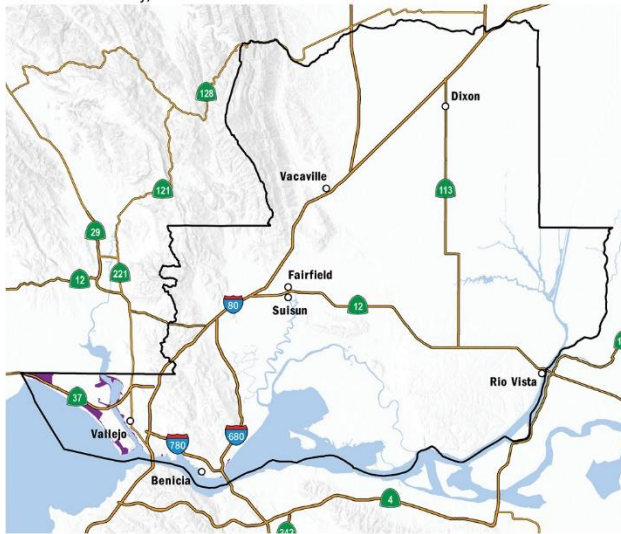
Figure ES 7: Hayward-Rodger's Creek EQ and Areas with Potential for Liquefaction Exposure Summaries





Dynamic Planning + Science  
for Solano County, 2021

## TSUNAMI RUNUP AREA INUNDATION EXPOSURE



MAP LEGEND

**TSUNAMI RUN-UP**

### HAZARD EXPOSURE SUMMARIES\*

#### POPULATION

COUNT OF PERSONS

**233** **1%**

#### PARCEL

COUNT

**34** **1%**

PARCEL VALUE

SUM OF IMPROVEMENT  
**\$12,332,000** **0%**

SUM OF CONTENT

**\$6,166,000** **0%**

#### CRITICAL INFRASTRUCTURE

POINT COUNT

Essential Facilities **0** **0%**

High Potential Loss **0** **0%**

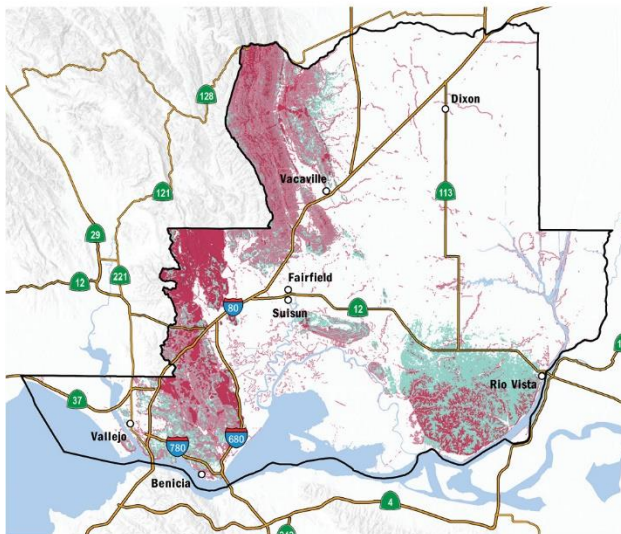
Transportation & Lifeline **11** **0%**

LINEAR MILEAGE

Transportation & Lifeline **31** **1%**

\*Exposure summaries include tsunami runup inundation area. Hazard data sources: CGS.

## LANDSLIDE RISK EXPOSURE



MAP LEGEND



### HAZARD EXPOSURE SUMMARIES\*

#### POPULATION

COUNT OF PERSONS

**1,767** **9%**

#### PARCEL

COUNT

**428** **6%**

PARCEL VALUE

SUM OF IMPROVEMENT  
**\$271,387,583** **9%**

SUM OF CONTENT

**\$141,217,211** **7%**

#### CRITICAL INFRASTRUCTURE

POINT COUNT

Essential Facilities **0** **0%**

High Potential Loss **6** **3%**

Transportation & Lifeline **107** **5%**

LINEAR MILEAGE

Transportation & Lifeline **149** **4%**

\*Exposure summaries include high susceptibility only. Hazard data sources: CGS.

Figure ES 8: Tsunami Runup Area and Landslide Risk Exposure Summaries



## Mitigation Goals

The Hazard Mitigation Planning Committee created a set of goals for this MJHMP based on review of Solano County's 2014 HMP, the California HMP, and other more current jurisdictional HMPs. The HMPC elected to closely align with the State's HMP Goals. The following updated goals guided the HMPC in selecting actions contained in this plan update:

<b>GOAL 1</b> People	<b>GOAL 2</b> Infrastructure	<b>GOAL 3</b> Environment	<b>GOAL 4</b> Resilience
Significantly reduce risk of injuries and loss of life during disaster events.	Minimize damage to critical infrastructure and property and minimize interruption of essential services and activities.	Protect the environment.	Promote community resilience through integration of hazard mitigation with public policy and standard business practices.

## Mitigation Strategy

The mitigation strategies and activities designed to reduce or eliminate losses resulting from natural hazards are the centerpiece of the mitigation planning process. By implementing mitigation actions, participating jurisdictions will become more resilient to disasters. Actions identified in this plan may or may not be geared toward grant funding under Hazard Mitigation Assistance (HMA). Rather, the focus was the effectiveness in achieving the goals of the plan within each jurisdiction's capabilities.

Participating jurisdictions individually selected a range of appropriate mitigation actions to work toward achieving the MJHMP's goals, compiled in Volume 2 jurisdictional annexes to the HMP. In addition, the HMPC and County Steering Committee identified county-wide actions benefiting the whole partnership, as listed in Volume 1.

Mitigation actions are designed to address identified vulnerabilities and to confer community benefits, both indirect governmental benefits to protect the overall community and public benefits that will directly support public landowners, business owners, and other community members.



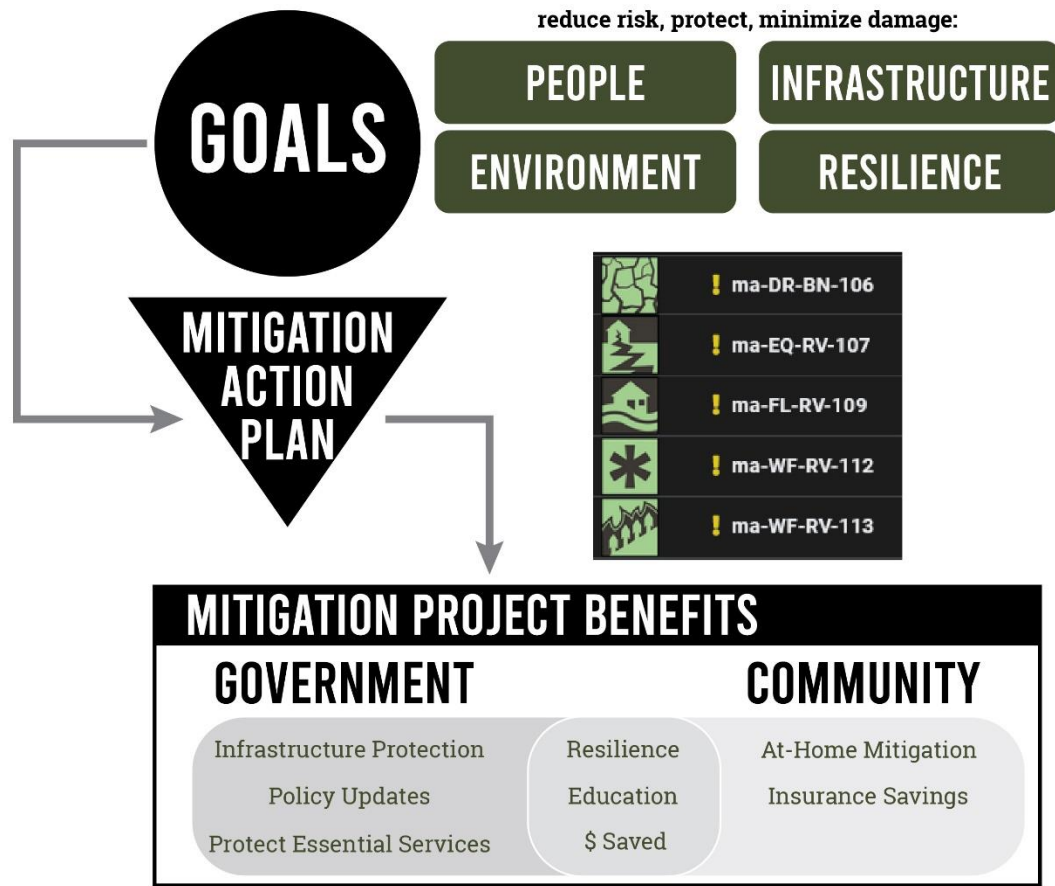


Figure ES-9: Process for Conferring Mitigation Project Benefits

Participating jurisdictions completed mitigation strategies as described in Volume 2. County-wide mitigation actions are summarized in Table ES 1.

## County-Wide Mitigation Actions

Table ES 1: County-Wide Mitigation Actions.

Mitigation No.	Hazard Type	Year	Title/Description	Priority
ma-AH-SC-4	All Hazard	2014	Ensure Hospital Disaster Preparedness Plan is updated	Medium
ma-AH-SC-5	All Hazard	2014	Develop a Multi-Hazard Community Outreach Plan	Medium
ma-AH-SC-7	All Hazard	2014	Sponsor the formation and training of Community Emergency Response Teams (CERTs)	Medium
ma-AH-SC-8	All Hazard	2014	Expand or participate in expanding traditional disaster exercises and drills involving County emergency personnel.	Medium



Mitigation No.	Hazard Type	Year	Title/Description	Priority
ma-AH-SC-9	All Hazard	2014	Convene Hazard Mitigation Group to work together to ensure County resiliency	Medium
ma-AH-SC-10	All Hazard	2014	Update GIS Database/Mapping on infrastructure and systems	Medium
ma-AH-SC-11	All Hazard	2014	Add Sirens to Community Warning System	High
ma-AH-SC-12	All Hazard	2014	Develop Farm and Animal Emergency Preparedness and Response Plans	Medium
ma-AH-SC-14	All Hazard	2014	Conduct Additional Evacuation and Emergency Planning for Solano County	Extreme
ma-DR-SC-162	Drought	2021	Replace irrigated landscaping with drought resistant vegetation and increase use of recycled water for irrigation in County-owned facilities	Medium
ma-DR-SC-163	Drought	2021	Update County's land use code to include incentives for new development to implement drought tolerant landscaping that requires less water.	High
ma-DR-SC-201	Drought	2021	Develop countywide drought and water shortage contingency plan focused on small water systems and individual domestic wells.	High
ma-DR-SC-202	Drought	2021	Strengthen review of groundwater supplies in development review standards.	High
ma-EQ-SC-16	Earthquake	2014	Evaluate critical health facilities	Medium
ma-EQ-SC-17	Earthquake	2014	Conduct storage tank evaluations	Medium
ma-EQ-SC-164	Earthquake	2021	Draft Natural Gas Shut-Off Valve Ordinance	High
ma-EQ-SC-165	Earthquake	2021	Inspect buildings and install seismic shut-off valves on gas fixtures on County-owned critical facilities and lines which currently lack them.	High
ma-EQ-SC-166	Earthquake	2021	Retrofit county-owned historic buildings, and ensure newer building codes are implemented and reinforced throughout the county.	High
ma-EQ-SC-167	Earthquake	2021	Inspect and conduct appropriate retrofits to the 28 County bridges within the 6.8 Concord Green Valley EQ scenario.	High
ma-EQ-SC-168	Earthquake	2021	Conduct annual inspections for weak levees and maintain or improve existing levees in critical condition.	High
ma-EQ-SC-169	Earthquake	2021	Conduct public education campaign on earthquake preparedness and seismic housing retrofits.	High
ma-EW-SC-170	Extreme Weather	2021	Acquire back up generator for Senior Center to ensure ability to provide cooling center.	High



Mitigation No.	Hazard Type	Year	Title/Description	Priority
ma-EW-SC-171	Extreme Weather	2021	Conduct a public education campaign to increase awareness of the negative effects of extreme heat; include information on steps that households can take to mitigate these effects such as the location of emergency cooling centers.	High
ma-EW-SC-172	Extreme Weather	2021	Replace dying or dead evergreen vegetation on City properties and in rights-of-way with wind resistant vegetation and implement annual tree trimming program.	High
ma-FL-SC-19	Flood	2014	Elevate Buildings in the Repetitive Loss Areas	High
ma-FL-SC-20	Flood	2014	Coordinate the Grants for Building Elevation Between the County and SCWA	Medium
ma-FL-SC-21	Flood	2014	Construct priority detention basin projects and/or other flood improvements.	Medium
ma-FL-SC-24	Flood	2014	Initiate an annual notification of flood risk to the owners of all buildings in special flood hazard areas	Medium
ma-FL-SC-25	Flood	2014	Widen channels for the Ulatis Flood Control Project	Medium
ma-FL-SC-26	Flood	2014	Conduct outlet improvements for Green Valley Flood Control Project	High
ma-FL-SC-28	Flood	2014	Maintain flood channel maintenance records.	High
ma-FL-SC-29	Flood	2014	Remove sediment in reservoirs	Medium
ma-FL-SC-32	Flood	2014	Expand protected private and public open space in the County.	High
ma-FL-SC-173	Flood	2021	Maintain clear passage for water flow in the portion of Suisun Creek west of Fairfield by removing debris twice a year at minimum.	High
ma-FL-SC-174	Flood	2021	Inventory drainages requiring routine debris management; develop debris management schedule and maintain database for this purpose	High
ma-SF-SC-175	Slope Failure	2021	Conduct appropriate retrofits for County bridges in high landslide areas and reinforce hazardous slopes	High
ma-SF-SC-176	Slope Failure	2021	Assess 2 child-care facilities in high landslide risk areas; assist property owners in appropriate modifications including slope reinforcements	High
ma-SF-SC-177	Slope Failure	2021	Assess steep slope damages from the 2020 LNU lightning complex fire, including new areas susceptible to slope failure.	High
ma-WF-SC-34	Wildfire	2014	Conduct annual Defensible Space Inspection Program in the Unincorporated County and enforce Code violations.	Extreme
ma-WF-SC-36	Wildfire	2014	Maintain and improve, where needed, wildfire emergency access	Extreme



Mitigation No.	Hazard Type	Year	Title/Description	Priority
ma-WF-SC-37	Wildfire	2014	Develop Community Wildfire Prevention Plan (CWPP) for particularly high threat neighborhoods and communities; support ongoing community efforts to do the same.	High
ma-WF-SC-38	Wildfire	2014	Establish a County Chipper Program	High
ma-WF-SC-40	Wildfire	2014	Develop Spatial Data for Wildfire Emergencies	High
ma-WF-SC-178	Wildfire	2021	Establish egress routes from Travis Air Force Base; potential routes include Walters Road to Highway 12	High

## Mitigation Action Implementation

Despite County efforts, no amount of planning or mitigation can prevent disasters from occurring or eliminate the risk and impacts of such events. Hazard events will continue to occur, and the County and participating jurisdictions will take actions to reduce the risks these hazards pose to life, property, and the economy. While this MJHMP identifies opportunities for reasonable mitigation actions, each individual has a responsibility to be aware of the potential hazards where they live and to minimize their own household's vulnerability.

Solano County's ability to carry out mitigation is limited to those facilities over which it has authority. The county does not have direct authority over schools, water and sanitation districts, private gas, electric and communication utilities, state and federal highways and facilities, private hospitals, or neighboring cities and tribes. The County will focus on actions within its authority while seeking to cooperatively work with other entities to address mutual areas of vulnerability and interdependence.

Full implementation of the plan's recommendations will take time and resources. The measure of the plan's success will be the coordination and pooling of resources within the participating jurisdictions and maintaining these successes over time. Teaming together to seek financial assistance at the state and federal level will be a priority to initiate projects that are dependent on alternative funding sources. This plan was built upon the effective leadership of a multi-disciplined steering committee and a process that relied heavily on public input and support. The plan will succeed for the same reasons.



# Adoption Records

To comply with DMA 2000, the Solano County Board of Supervisors officially adopted this Solano County Multi-Jurisdictional Hazard Mitigation Plan on **DATE TO COME**. The adoption of the MJHMP in its entirety recognizes the County’s commitment to reducing the impacts of natural hazards within the cities and county. Other participating jurisdictions adopted Volume 1 and their respective annex. See the Record of Adoptions, below. Adoption resolutions follow.

Table 1-1: Jurisdictional Adoption Dates

Jurisdiction	Date of Adoption
Solano County	<b>DATES TO COME</b>
City of Vallejo	
City of Fairfield	
City of Vacaville	
City of Suisun City	
City of Benicia	
City of Dixon	
City of Rio Vista	
Vallejo Flood and Wastewater District	
Solano County Water Agency	
Solano Irrigation District	



INTENTIONAL BLANK PAGE



# **Volume 1**

## **SOLANO COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN**



INTENTIONAL BLANK PAGE



# Section 1. Introduction

## 1.1 Purpose

Solano County and many other participating jurisdictions prepared this Multi-Jurisdictional Hazard Mitigation Plan (MJHMP), updated in 2012, and originally approved by the Federal Emergency Management Agency (FEMA) in 2014. The plan in its current form reflects a comprehensive update in 2021. The purpose of this plan is to guide hazard mitigation planning to better protect the people and property of the county from the effects of hazard events. This plan demonstrates the commitment of each participating jurisdiction to reducing risks from hazards and serves as a tool to help decision-makers direct mitigation activities and resources. This plan was also developed to ensure Solano County and participating jurisdictions' continued eligibility for certain federal disaster assistance, specifically the FEMA Hazard Mitigation Assistance (HMA) grants, including the Hazard Mitigation Grant Program (HMGP), Building Resilient Infrastructure and Communities (BRIC), and Flood Mitigation Assistance Program (FMA). The plan is also important for maintaining and improving the standing of the county in the National Flood Insurance Program's Community Rating System (CRS), participation in which provides for lower flood insurance premiums to residents.

## 1.2 Background and Scope

Each year in the United States, natural disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. These monies only partially reflect the true cost of disasters because additional expenses incurred by insurance companies and nongovernmental organizations are not reimbursed by tax dollars. Many natural disasters are predictable, and much of the damage caused by these events can be reduced or even eliminated. Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." The results of a three-year, congressionally mandated independent study to assess future savings from mitigation activities demonstrates that mitigation activities are highly cost-effective. On average, each dollar spent on mitigation saves society an average of \$6 in avoided future losses, in addition to saving lives and preventing injuries. (National Institute of Building Sciences, 2017)

The Solano County Multi-Jurisdictional Hazard Mitigation Plan geographically covers the entire area within Solano County's jurisdictional boundaries (hereinafter referred to as the "planning area"). A planning committee was formed to develop and steer content in this plan. The scope of the plan is all of Solano County, with jurisdictional annexes in Volume 2 for each municipal participating jurisdiction.



## 1.3 Participating Jurisdictions

This MJHMP includes Solano County and all municipalities within the county, referred to as “participating jurisdictions,” along with Vallejo Flood and Wastewater District, Solano County Water Agency, and Solano Irrigation District, who worked together to create the goals, objectives, mitigation strategies, and implementation methods to reduce natural hazard risk within the planning area. Any jurisdiction or organization may participate in the planning process. However, to obtain Federal Emergency Management Agency (FEMA) approval, each local jurisdiction must meet all requirements of hazard mitigation planning outlined in 44 C.F.R. § 201.6. Participating jurisdictions are listed in Table 2-1 and are shown in **Error! Reference source not found.**

## 1.4 Why Update This Plan?

Hazard mitigation is a way to reduce or alleviate the loss of life, personal injury, and property damage that can result from a disaster through long and short-term strategies. It involves strategies such as planning, policy changes, programs, projects, and other activities that can mitigate the impacts of hazards. The responsibility for hazard mitigation lies with many, including private property owners, business and industry, and local, state, and federal governments.

The Federal Disaster Mitigation Act of 2000 (DMA 2000) required state and local governments to develop hazard mitigation plans as a condition of federal disaster grant assistance. (Pub. L. No. 106-390; 42 U.S.C. § 5121 *et seq.*) Prior to 2000, federal disaster funding focused on disaster relief and recovery, with limited funding for hazard mitigation planning. DMA 2000 increased the emphasis on planning for disasters before they occur.

DMA 2000 encourages state and local authorities to work together on pre-disaster planning and promotes sustainability. Sustainable hazard mitigation includes the sound management of natural resources and the recognition that hazards and mitigation must be understood in the broadest possible social and economic context. The enhanced planning network called for by DMA 2000 helps local governments articulate accurate mitigation needs, resulting in faster allocation of funding and more cost-effective risk reduction projects.

### 1.4.1 Purposes for Planning

This hazard mitigation plan identifies resources, information, and strategies for reducing risk from natural hazards. Solano County and participating jurisdictions initiated this planning effort for several key reasons. The planning area has significant exposure to numerous natural hazards that have caused millions of dollars in past damage. Participating jurisdictions want to be proactive in preparing for the probable impacts of natural hazards. Limited local resources make it difficult to implement proactive risk-reduction measures. Federal and state financial assistance is paramount to successful hazard mitigation in the area.

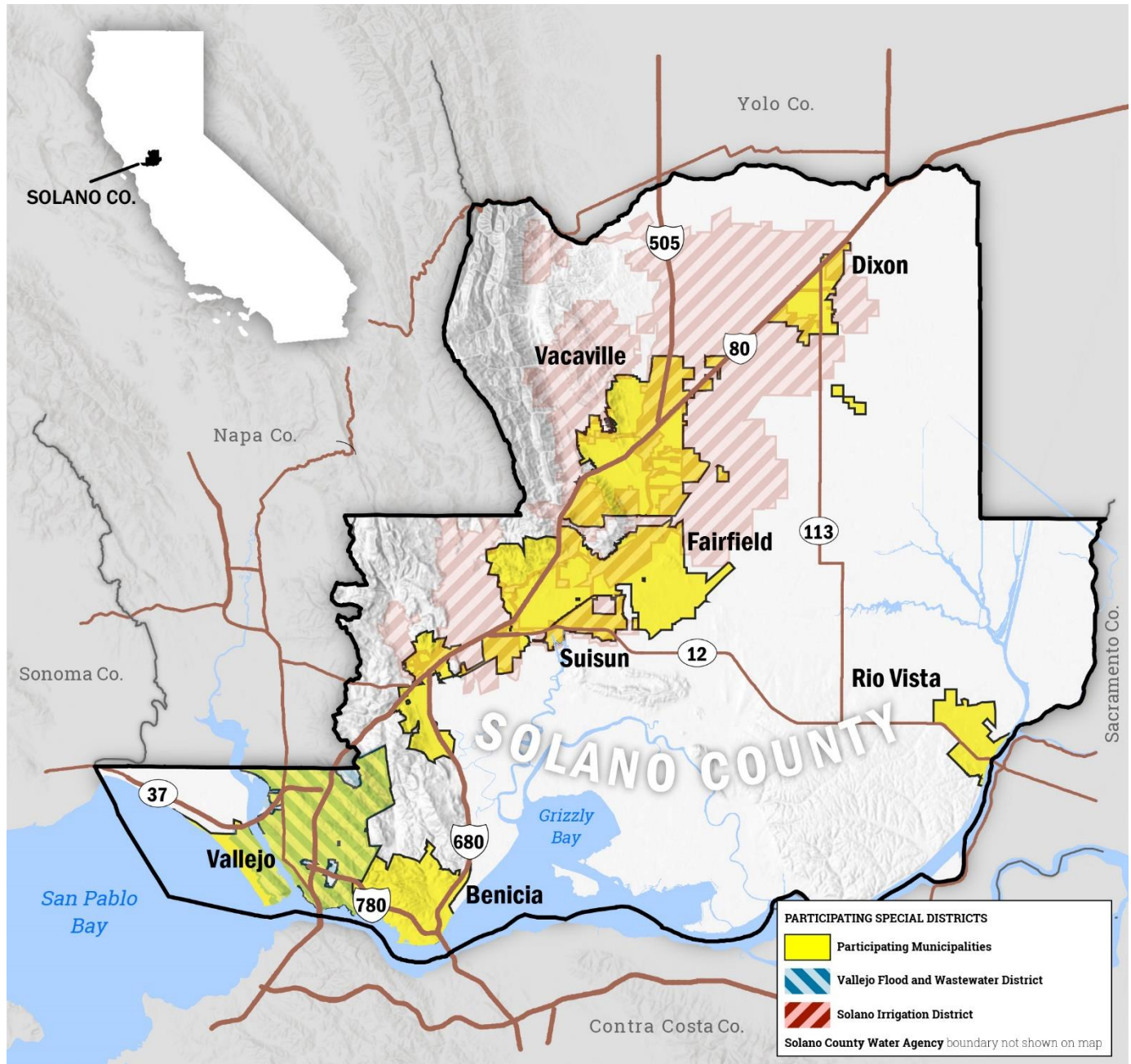


Figure 1-1: Participating Jurisdiction Map

Elements and strategies in the plan were selected because they best meet the needs of the participating jurisdictions and their citizens. The plan was developed to meet the following objectives:

- Meet or exceed requirements of the DMA 2000 and the California legislation requiring the incorporation of climate adaptation strategies into hazard mitigation planning (SB 379).
- Enable participating jurisdictions to continue using federal grant funding to reduce risk through mitigation.





- Meet the needs of all participating jurisdiction members as well as state and federal requirements.
- Create a risk assessment that focuses on Solano County hazards of concern.
- Create a single planning document that integrates all participating jurisdictions into a framework that supports partnerships within the county and puts all members on the same planning cycle for future updates.
- Coordinate existing plans and programs so that high-priority initiatives and projects to mitigate possible disaster impacts are funded and implemented.

## 1.5 Who Will Benefit from This Plan?

One benefit of multi-jurisdictional planning is the ability to pool resources and eliminate redundant activities within a planning area with fairly uniform risk exposure and vulnerabilities. FEMA encourages multi-jurisdictional planning under its guidance for the DMA 2000. The plan will help guide and coordinate mitigation activities throughout Solano County.

All citizens and businesses of Solano County are the ultimate beneficiaries of this MJHMP. The plan reduces risk for those who live in, work in, and visit the county. It provides a viable planning framework for all foreseeable natural hazards that may impact the county. County stakeholder participation helped ensure that plan outcomes will be mutually beneficial. The resources and background information in the plan are applicable county-wide, and the plan's goals and recommendations can lay the groundwork for the development and implementation of local mitigation activities and partnerships.

## 1.6 How to Use This Plan

This plan has been set up in two volumes to separate elements that apply to the whole planning area (Volume 1) from jurisdiction-specific elements (Volume 2):

- **Volume 1**—Volume 1 includes all federally-required elements of a hazard mitigation plan that apply to the entire planning area. This volume includes the description of the planning process, public involvement strategy, goals and objectives, county-wide hazard risk assessment, county-wide mitigation initiatives, and a plan maintenance strategy. Volume 1 includes the following appendices:
  - Appendix A**—Analysis Methodology
  - Appendix B**—Planning Process Documentation
  - Appendix C**—Climate Vulnerability Assessment
- **Volume 2**—Volume 2 includes all federally-required, jurisdiction-specific elements for each participating jurisdiction. All participating jurisdictions have adopted Volume 1 in its entirety and each jurisdiction-specific annex.



## Section 2. What's New

This section includes background information on the Solano County 2014 Hazard Mitigation Plan, other jurisdictions' previous hazard mitigation plans, and this MJHMP. This MJHMP is the first multi-jurisdictional plan for Solano County. All participating jurisdictions have previously-developed hazard mitigation plans. Some previously-developed plans are more than a decade old (Vallejo, Dixon), while other plans are currently in effect (Vacaville, Suisun City, Benicia). Some plans expired more recently (Solano County, Fairfield, Rio Vista).

All jurisdictional mitigation actions were reviewed by the jurisdictions' planning committees. Mitigation actions that were more than a decade old proved difficult to identify and trace development or action history and were severely outdated. Those mitigation actions were not carried forward into this 2021 MJHMP. More recent mitigations have been changed, updated, and revised to reflect new priorities in this MJHMP. The sections below describe the planning process for this update. This update profiles the following hazards: wildfire, flood, earthquake, extreme weather (including high wind, heavy rain, high heat), drought, slope failure, and climate change (including sea-level rise).

### 2.1 Participating Jurisdictions in the 2014 HMP vs MJHMP Update

This is the first multi-jurisdictional hazard mitigation plan in Solano County. Each municipality in the county is included in this first MJHMP. Table 2-1 identifies each participating jurisdiction along with the expiration date of the jurisdiction's previous or current HMP.

Table 2-1: Participating Jurisdictions

Planning Area	Approx. Population	Plan Expiration Date
Solano Co. Unincorp.	438,530	4/8/2019; EC Approved by FEMA
City of Vallejo	120,977	4/20/2012; ABAG Regional Effort 2006
City of Fairfield	114,101	3/24/2016; ABAG Regional Effort 2011
City of Vacaville	97,943	1/4/2023
City of Suisun City	29,379	1/17/2023
City of Benicia	28,088	5/14/2022
City of Dixon	19,795	5/16/2011; ABAG Regional Effort 2006
City of Rio Vista	8,618	3/24/2016; ABAG Regional Effort 2011
Vallejo Flood and Wastewater District	Serving the greater Vallejo region. Serving wastewater for ~120,000 people.	5/3/2022
Solano County Water Agency	Wholesale water provider for suppliers serving ~400,000 people.	3/24/2016; ABAG Regional Effort 2011
Solano Irrigation District	Domestic (primarily Suisun City) and agricultural water provider	3/24/2016; ABAG Regional Effort 2011



## 2.2 Mitigation Actions

During this MJHMP update process, each of the 2014 county-wide mitigation actions were examined for relevancy and the potential for future implementation and then evaluated for potential follow-up. Some mitigation actions developed during the 2014 HMP effort are an inherent part of the HMP update process or were not detailed enough for implementation at a local jurisdiction level, and thus were not included in this update. The County has made significant changes to other 2014 Mitigation Actions because of the updated risk assessment and implementation strategy, to include more detail, or to update based on current mitigation practices.

Table 2-2 provides a record of **cancelled** county-wide Mitigation Actions and an explanation for why the mitigation action was cancelled. Successfully **completed** previous Mitigation Actions for the county are detailed in Table 2-3. **Ongoing or pending** mitigations actions from previous HMPs are included within the Mitigation Action Plan in Table 5-6.

Information on mitigation actions for other participating jurisdictions are included in each jurisdiction's annex in Volume 2.

Table 2-2: Cancelled Previous Mitigation Actions

Mitigation No.	Hazard Type	Status	Year	Primary Agency	Title/Description	Responsible Party	Reason Cancelled
ma-EQ-SC-15	Earthquake	Cancelled	2014	Solano County	Replace or retrofit water-retention structures that are determined to be structurally deficient	SID, SCWA, OES	No longer a priority, many new and replaced through SCWA
ma-FL-SC-23	Flood	Cancelled	2014	Solano County	Conduct home raising projects to mitigate flood damage	SCWA; Department of Resource Management	Covered under ma-FL-SC-19
ma-FL-SC-30	Flood	Cancelled	2014	Solano County	Create an interagency flood control effort	General Services, SCWA, BOR, DRM, SID, OES	Not a mitigation action; coordination is an ongoing benefit of hazard mitigation planning.
ma-WF-SC-39	Wildfire	Cancelled	2014	Solano County	Develop a property maintenance inventory for vacant homes and parcels	OES, DRM Public Works, Assessor, Local Fire Districts, Sheriff's Office	Vast majority of homes are currently occupied, a marked difference from 2014.



## 2.3 New Analysis and Risk Assessment Methodology

The County strengthened this plan by using new research methods and web-based information systems. Most import to the risk assessment was the development of a web-based and interactive Risk Assessment Mapping Platform (RAMP), which has allowed interactive discovery of risk, vulnerability, and exposure data developed especially for Solano County and the participating jurisdictions. In addition to RAMP, Geographic Information Systems (GIS) mapping and analysis provided the county and participating jurisdictions with the tools and data to develop more comprehensive data sets than those in the 2014 HMP.

Jurisdictions also much more clearly tracked described vulnerabilities (referred to as “problem statements” or “areas of concern” in this MJHMP). Each jurisdiction developed a set of problem statements based off the quantitative risk assessment and lengthy discussions on unmapped vulnerabilities within the jurisdiction. Mitigation actions were either updated or developed to address these specific vulnerabilities, and Volume 1 and each annex track the connection between problem statement and mitigation action.

This MJHMP also includes a detailed Climate Vulnerability Assessment (CVA) in Appendix C. This CVA examines vulnerabilities for each hazard caused or exacerbated by climate change, assessing the impact of climate change on the vulnerability and Solano County’s capacity to adapt to the vulnerability. Each municipality has an appendix at the end of its annex with its own unique climate vulnerability assessment.

## 2.4 Successful Mitigation Activities

The 2014 Solano County HMP guiding principle, goals, objectives, and mitigation actions have been implemented through various on-going projects, plans, and programs. The County has made improvements toward reducing natural hazard risks to life and property, with significant risk reduction efforts for floodplain management, flood damage prevention, and fire hazard reduction. Table 2-3 summarizes the completed mitigation actions since 2014. These successful policies, programs, and projects are summarized below.

Table 2-3: Completed Previous Mitigation Actions

Mitigation No.	Hazard Type	Status	Year	Primary Agency	Title/Description	Responsible Party
ma-AH-SC-2	All Hazard	Completed	2014	Solano County	Refine Critical Facilities Survey Assessment	Solano County General Services, DRM Building Safety, DRM Public Works
ma-AH-SC-3	All Hazard	Completed	2014	Solano County	Maintain the Critical Facilities Structural Hazard Mitigation Program	Solano County General Services, DRM Building Safety, DRM Public Works
ma-AH-SC-6	All Hazard	Completed	2014	Solano County	Coordinate with Travis Air Force Base to develop joint emergency planning procedures	Travis AFB EMS, OES



Mitigation No.	Hazard Type	Status	Year	Primary Agency	Title/Description	Responsible Party
ma-AH-SC-13	All Hazard	Completed	2014	Solano County	Adopt the MHMP into the Safety Element of the County General Plan	DRM Planning, Board of Supervisors
ma-EQ-SC-18	Earthquake	Completed	2014	Solano County	Update Solano County Debris Management Plan	DRM Public Works
ma-FL-SC-22	Flood	Completed	2014	Solano County	Enhance use of the CA DWR Flood Awareness Maps	DRM, OES, SCWA, Reclamation and Resource Conservation Districts
ma-FL-SC-27	Flood	Completed	2014	Solano County	Develop a flood warning system and plan for Solano County	OES, DWR, SCWA, Reclamation Districts, Levee Districts
ma-FL-SC-31	Flood	Completed	2014	Solano County	Conduct public outreach to high-risk, limited-income families living in flood hazard areas	OES, Local Fire Districts
ma-WF-SC-33	Wildfire	Completed	2014	Solano County	Adopt code compliance with Public Resources Code (PRC) 4291) California's Wildland-Urban Interface Code	Solano County Department of Resource Management
ma-WF-SC-35	Wildfire	Completed	2014	Solano County	Establish a Hazardous Vegetation Abatement Ordinance (HVAO)	DRM

### 2.4.1.1 Mitigation Success Stories

In addition to the completed mitigation actions presented in Table 2-3, this section highlights particular projects that have provided the planning area with significant risk reduction. These mitigation success stories are examples of county departments and stakeholders making Solano County more resilient to hazards within the planning area.

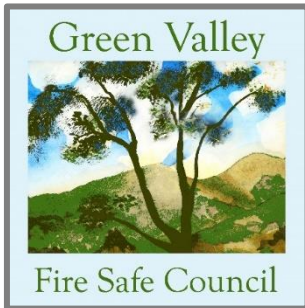
#### Alert Solano

Solano County, along with municipal jurisdictions in the county, instituted the Alert Solano emergency system since the last HMP. The system enables agencies within Solano County to provide critical emergency and hazard information quickly. This effort completed a previous mitigation action and provided a higher level of communication throughout the county during recent hazard events. The County hopes to continue this momentum in this MJHMP through mitigation actions to continue evacuation planning and add sirens to the communication system.





## Green Valley Fire Safe Council



Residents in the Green Valley area of Solano County started the county's only fire safe council, the Green Valley Fire Safe Council (GVFSC), in 2019. The GVFSC was formed to reduce the risk of catastrophic wildfires through public education, fuel reduction strategies, and mobilizing residents to create defensible zones and harden their homes.

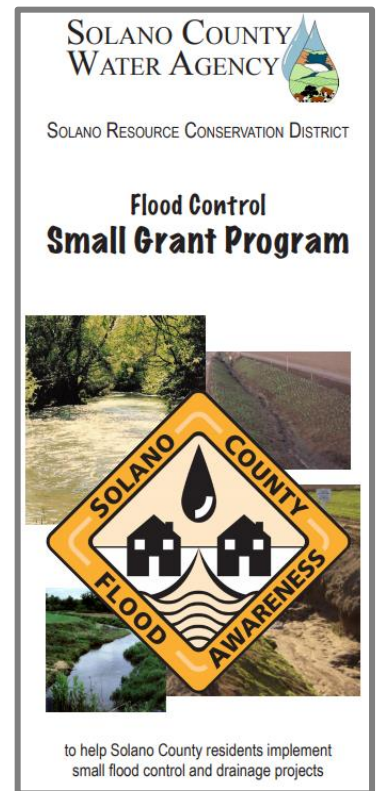
The GVFSC conducted a community wildfire risk assessment in March 2020; developed a community wildfire preparedness action plan; became a nationally recognized Fire Wise designated site; held a Surviving Wildfire Webinar along with numerous presentations to community groups, such as a Rotary and Neighborhood Watch; received a grant from the California Fire Foundation; and launched the first free Community Chipping Program to reduce ladder fuels and encourage residents to create defensible space. GVFSC membership consists of residents, community members, members of the Cordelia Fire Protection District (CFPD) and CAL FIRE. See: [gvfsc.org/](http://gvfsc.org/).

## SCWA Flood Control Grant Program

The Solano County Water Agency (SCWA) instituted a Flood Control Grant Program to help Solano residents with creek vegetation removal, debris removal, and limited erosion control and sediment retention.

"After a break in years of drought, landowners were reminded these past two winters that California's annual rainfall totals are much more variable than those in other parts of the nation," SCWA officials wrote in a 2019 news release. "Preparation efforts are one of the most effective ways to help protect Solano County from flood damages."

The agency has collaborated with the Solano Resource Conservation District (RCD) to identify appropriate project submissions located on private lands, including home raisings as well as levee and drainage improvements. Funding for the program can cover as much as 80 percent of the cost of flood control maintenance and necessary improvements. Flood control would create barriers to suppress high water and prevent erosion while protecting residents' property, personal safety, and water quality.



## 2.5 Incorporation into Other Planning Mechanisms

Over the past five years, the 2014 HMP was incorporated into other planning mechanisms as a demonstration of progress in local hazard mitigation efforts. This newly-updated HMP will be referenced in the Solano County's General Plan Safety Element. This update also will be incorporated into planning documents such as the Capital Improvement Plan, Groundwater Sustainability Plan, Solano County Urban



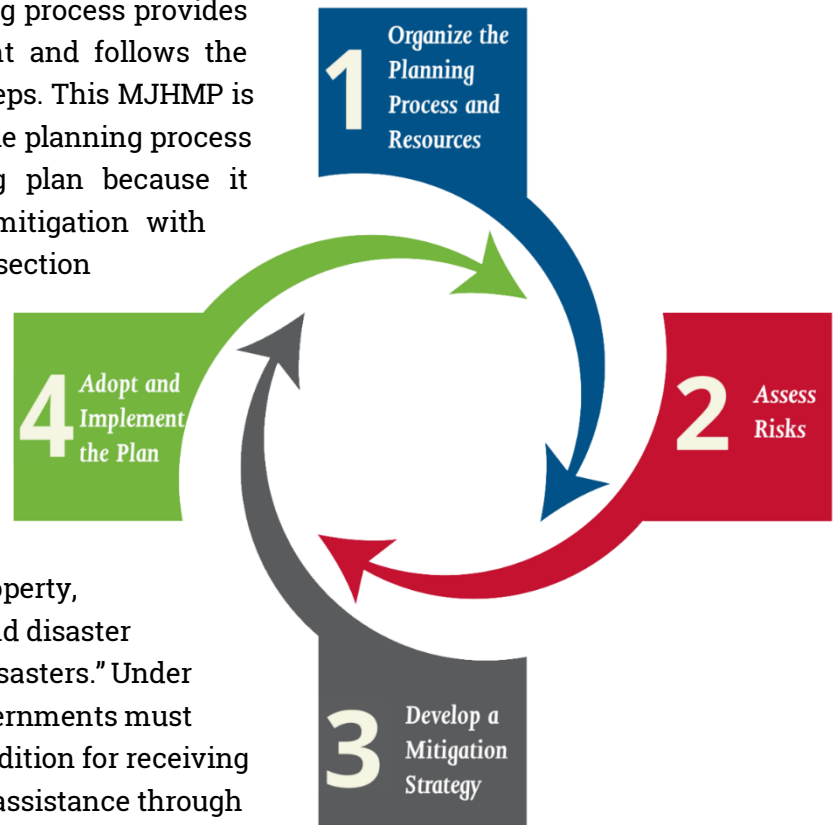
Water Management Plan, Climate Action Plan, and the Solano County Integrated Regional Water Management Plan in the future. Other jurisdictions will similarly update General Plans and other planning documents to incorporate the vulnerability assessment and mitigation action strategy from this MJHMP. Section 6.3.6 outlines planning mechanisms to integrate with the MJHMP and the process for such integration in more detail.



## Section 3. Planning Process

This section describes each stage of the planning process used to develop the MJHMP. The planning process provides a framework for document development and follows the FEMA recommended hazard planning steps. This MJHMP is a community-driven, living document. The planning process itself is as important as the resulting plan because it encourages communities to integrate mitigation with day-to-day decision making. This section describes each stage of the planning process.

The Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended by the Disaster Mitigation Act of 2000 (DMA 2000, 42 U.S.C. § 5165), is intended to “reduce the loss of life and property, human suffering, economic disruption, and disaster assistance costs resulting from natural disasters.” Under this legislation, state, tribal, and local governments must develop a hazard mitigation plan as a condition for receiving certain types of non-emergency disaster assistance through FEMA Hazard Mitigation Assistance. FEMA regulations implementing the DMA 2000 are located at 44 C.F.R. § 201.6 *et seq.*



FEMA prescribes four major planning steps:

- Step 1: Organize Resources
- Step 2: Assess Risk
- Step 3: Develop a Mitigation Strategy
- Step 4: Adopt and Implement the Plan

Each jurisdiction that participated in the MJHMP independently followed the FEMA four-step process. Figure 3-1 provides a detailed, phased breakdown of the planning process that each participating jurisdiction completed. These four steps are integrated with a 10-step planning process that FEMA’s Community Rating System uses to establish floodplain management credit in addition to Flood Mitigation Assistance programs.

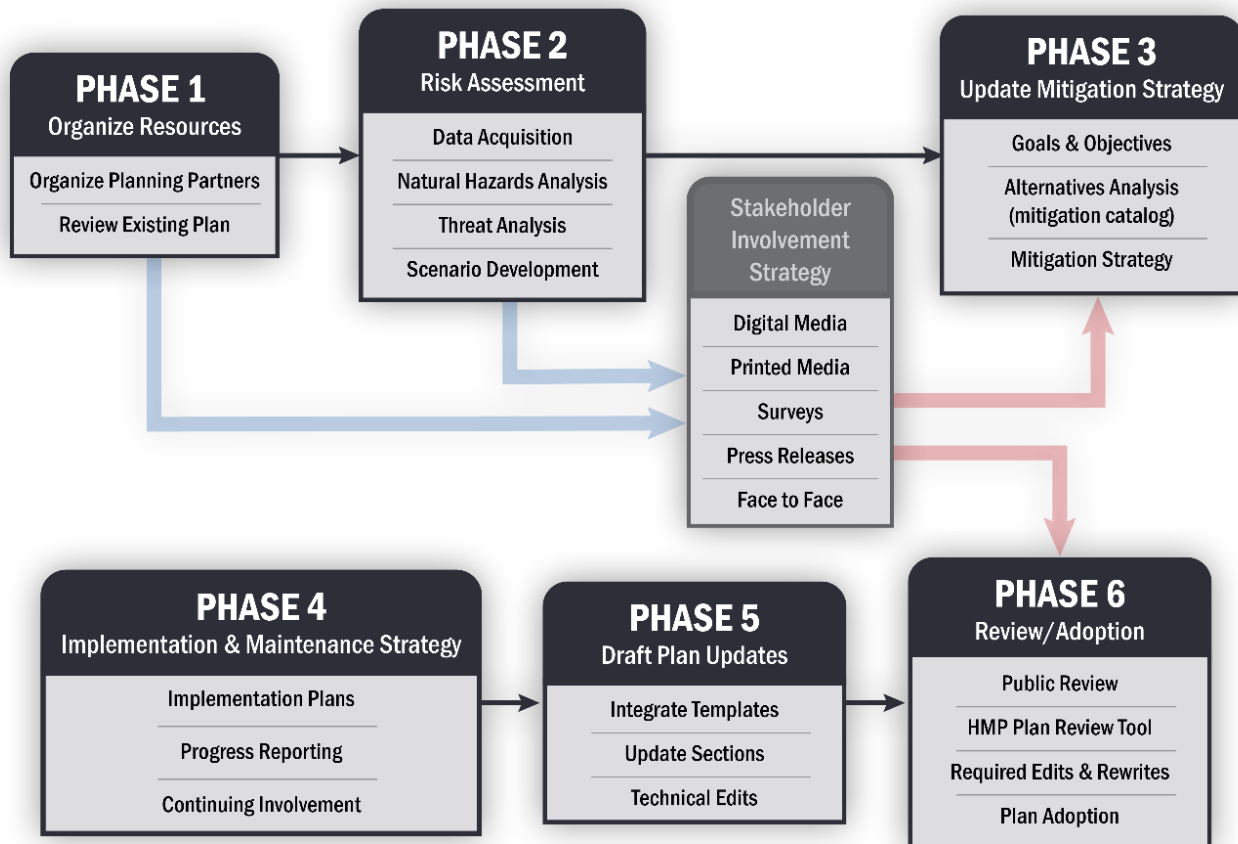


Figure 3-1: Solano County MHJHMP Planning Process



## STEP 1: Organize Resources

The first step of the MJHMP planning process was organizing resources, consisting of developing the Planning Committee, reviewing relevant existing documents, and organizing public outreach.

### Building the Planning Committee

The Hazard Mitigation Planning Committee (HMPC or “Planning Committee”) was comprised of participants from all participating jurisdictions and stakeholders who worked together to develop the MJHMP. The HMPC consisted of a Steering Committee and staff from participating jurisdictions, as well as a broader group of regional stakeholders, agencies, and members of the public, and an HMP consultant used for plan development and facilitation.



### Steering Committee

The Steering Committee was at the core of the MJHMP planning process and was integral to ensuring the success of the planning process, its implementation, and future maintenance. Members of the Steering Committee, listed in Table 3-1, consisted of jurisdictional leads from each jurisdiction and was a part of the HMPC, discussed below and in the individual annexes in Volume 2.

Table 3-1: MJHMP Steering Committee

Jurisdiction	Point of Contact	Title
Solano County Office of Emergency Services	Don Ryan	Emergency Services Manager
City of Benicia	Della Olm	Administrative Secretary
City of Dixon	Todd McNeal	Fire Chief
City of Fairfield	John Sturdee	Fire Battalion Chief
City of Rio Vista	Scott Goodwin	Interim Fire Chief
City of Suisun City	Justin Vincent	Fire Chief
City of Vacaville	Tim Burke	Ass't Director of Public Works
City of Vallejo	Terrance Davis	Director of Public Works
Vallejo Flood and Wastewater District	Keith Sorsdal	Director of Safety/ Risk Management
Solano County Water Agency	Jeff Barich	Senior Water Resources Engineer
Solano Irrigation District	Cary Keaton	General Manager





### Hazard Mitigation Planning Committee

The HMPC was comprised of key decisionmakers with specific expertise to contribute to the planning process from each participating jurisdiction and regional stakeholders. These stakeholders, consisting of relevant regional agencies, neighboring jurisdictions, community groups, and members of the public, were contacted in the early stages of plan development to exchange information and to offer them an opportunity to participate in the process. Many stakeholders joined the HMPC and are listed in Table 3-2. The Planning Committee served as liaisons to the greater community and was involved in the following planning processes:

- Structured coordination and meetings;
- Collection of valuable local information and other requested data;
- Decision making on plan process and content;
- Development of mitigation actions;
- Review and comment on plan drafts; and
- Coordination of the public input process.

All Planning Committee members were included in all communications about the MJHMP and were invited to all Planning Committee meetings. However, not all members attended stakeholder group meetings; some participated by reviewing draft documents or assisting in individual jurisdictional vulnerability assessments and planning committees, with public outreach, or at other stages of the process. Table 3-2 provides a list of the Planning Committee Members. Documentation of Planning Committee invitations and attendance is provided in Appendix B.

County and stakeholder participants also assisted as planning committee members for the update to the county's Floodplain Management Plan in conjunction with this MJHMP. For this reason, the county planning team members and relevant stakeholders are identified according to their expertise under the Community Rating System (CRS) of the National Flood Insurance Program (NFIP).

Table 3-2: MJHMP Planning Committee

Solano County MJHMP Planning Committee			
NAME	TITLE	DEPARTMENT	CRS Expertise (County & Stakeholders only)
<b>SOLANO COUNTY</b>			
Don Ryan	Manager	Office of Emergency Services	Emergency Services, Public Information
Robyn Rains	Assistant Manager	Office of Emergency Services	Emergency Services, Public Information
Saeed Iravani	Building Official	Resource Management	Property Protection (e.g., elevation), Structural Flood Control Projects
Ed King	Agricultural Commissioner	Solano County Board of Supervisors	Public Education
Chris Drake	Manager	Parks Service	Natural Resource Protection



### Solano County MJHMP Planning Committee

NAME	TITLE	DEPARTMENT	CRS Expertise (County & Stakeholders only)
Tom Ferrara	Sheriff	Solano County Sheriff's Office	Emergency Services
Jake Armstrong	Principal GIS Coordinator	Department of Information Technology	Property Protection (e.g., elevation), Structural Flood Control Projects, Public Information
Matt Tuggle	Engineering Manager	Public Works	Property Protection (e.g., elevation), Structural Flood Control Projects
Matt Walsh	Principal Planner	Department of Resource Management	Property Protection (e.g., elevation)
Allan Calder	Planning Manager	Department of Resource Management	Preventative Measures (e.g. codes), Property Protection (e.g., elevation), Natural Resources Protection, Public Information
Stewart Bruce	Senior GIS Analyst	Department of Information Technology	Natural Resource Protection, Structural Flood Control Projects
John Millea	Civil Engineer/ Floodplain Manager	Department of Resource Management	Property Protection (e.g., elevation), Natural Resource Protection, Structural Flood Control Projects
Jorge Goicochea	GIS Coordinator	Department of Information Technology	Natural Resource Protection, Structural Flood Control Projects
Nedzelene Ferrario	Senior Planner	Community Development	Preventative Measures (e.g. codes), Natural Resource Protection
<b>CITY OF BENICIA</b>			
Josh Chadwick	Fire Chief	City of Benicia	
Della Olm	Administration	City of Benicia	
Suzanne Thorsen	Planning Manager	Community Development Department – Planning	
Danielle Crider	Associate Planner	Community Development Department – Planning	
Rachel O'Shea	Chief Building Official/Floodplain Manager	Community Development Department – Building	
Vic Randall	Management Analyst	Parks & Community Services	
Dan Sequeria	Principal Civil Engineer (Public Works/Engineering)	Public Works	



### Solano County MJHMP Planning Committee

NAME	TITLE	DEPARTMENT	CRS Expertise (County & Stakeholders only)
Terri Davena	Economic Development Specialist / City PIO	Economic Development Department	
<b>CITY OF DIXON</b>			
Todd McNeal	Fire Chief	Fire Department	
Jim Lindley	City Manager	City of Dixon	
Joel Engrahm	Building Inspector II	Planning Department	
Scott Greeley	Associate Planner	Planning Department	
Joe Leach	Director/ City Engineer	Public Works	
Dave Horigan	Maintenance Supervisor	Parks & Buildings	
Sandy Soriano	Public Information Officer	City of Dixon	
Rachel Ancheta	Manager	Human Resources & Risk	
<b>CITY OF FAIRFIELD</b>			
John Sturdee	Fire Battalion Chief	Fire Department	
Stefan Chatwin	City Manager	City of Fairfield	
Bill Way	Manager	Communications	
David Gassaway	Ast. City Manager / Community Development	City of Fairfield	
Brian Coy	Building Inspector	Building Department	
Jorge Barrera	Sr. Economic Development Project Manager	Economic Development	
Amy Kreimeier	Senior Planner	Planning Department	
Deanna Cantrell	Chief of Police	Police Department	
Fabe Pariera	Police Support Supervisor	Police Department	
Steven Conti	Fire Marshal	Fire Department	
George Shimboff	Manager	Water Distribution	
Mike Gray	Public Works Operations Superintendent	Public Works Department	
Ryan Panganiban	Assistant Public Works Director	Public Works Department	
<b>CITY OF RIO VISTA</b>			
Rob Hickey	City Manager	City of Rio Vista	
Scott Goodwin	Interim Fire Chief	Fire Department	



### Solano County MJHMP Planning Committee

NAME	TITLE	DEPARTMENT	CRS Expertise (County & Stakeholders only)
Robin Borre	Director of Public Works	Public Works	
Jackson Harris	Police Chief	Police Department	
Jose Jasso	Assistant City Manager / City Clerk	City of Rio Vista	
Greg Malcom	Public Works Superintendent	Public Works Superintendent	
Beth Roberts	Recreation & Facilities Manager	Public Works	
<b>CITY OF SUISUN CITY</b>			
Justin Vincent	Fire Chief	Fire Department	
Greg Folsom	City Manager	City of Suisun City	
Aaron Roth	Police Chief	Police Department	
Matt Medill	Public Works Director / City Engineer	Public Works	
April Conner	Building Technician	Building Department	
John Kearns	Senior Planner	Planning Department	
Alma Hernandez	Council Member	City of Suisun City	
Nick Lozano	Associate Engineer	City of Suisun City	
Harvey Higgs	Contract Building Official	City of Suisun City	
Lakhwinder Deol	Finance Director	Finance Department	
<b>CITY OF VACAVILLE</b>			
Kris Concepcion	Fire Chief	Fire Department	
Alex Nourot	Deputy Fire Chief	Fire Department	
Tim Burke	Assistant Director/ City Engineer	Public Works	
Fred Buder	Community Development Director	Community Development Department	
Reggie Hubbard	Recreation Manager	Parks and Recreation	
Aaron Busch	City Manager	City of Vacaville	
Jay Salazar	Chief Building Official	Community Development Department	
Girum Awoke	Director	Public Works Department	
Brian McLean	Deputy Director	Public Works Department	
Jill Childers	Manager	Fire Prevention Bureau	



### Solano County MJHMP Planning Committee

NAME	TITLE	DEPARTMENT	CRS Expertise (County & Stakeholders only)
Curt Corbett	GIS Coordinator	Information Technology Department	
Justen Cole	Assistant Director	Utilities Department	
Ian Schmutzler	Police Captain	Police Department	
<b>CITY OF VALLEJO</b>			
Byron Berhel	Emergency Manager	Fire Department	
Terrance Davis	Director of Public Works	Public Works Department	
Christina Ratcliffe	Interim Planning and Development Services Director	Planning Department	
Margaret Kavanaugh	Planning Manager	Planning Department	
Melissa Cansdale	Associate Engineer	Water Dept. (Distribution and Treatment Plants)	
Sal Nuno	Maintenance Superintendent – GVRD	Parks	
Armond Sarkis	Risk Manager	City of Vallejo	
Addison LeBlanc	Assistant Engineer	Water Department	
Ben Smith	Risk Analyst	Public Works Department	
<b>VALLEJO FLOOD AND WASTEWATER DISTRICT</b>			
Keith Sorsdal	Director	Safety and Risk Management	
Jeff Tucker	Director	Finance	
Jennifer Harrington	Director	Environmental Services	
Johnson Ho	Director	Operations and Maintenance	
Justin Keating	Director	Field Operations	
Mark Tomko	Director	Engineering	
<b>SOLANO COUNTY WATER AGENCY</b>			
Jeff Barich	Senior Water Resources Engineer	Engineering	
Alex Rabidoux	Principal Water Resources Engineer	Engineering	
Gustavo Cruz	Assistant Water Resources Engineer	Engineering	
Katherine Ashley	Administrative Assistant	Administration	





### Solano County MJHMP Planning Committee

NAME	TITLE	DEPARTMENT	CRS Expertise (County & Stakeholders only)
Rich Marovich	Streamkeeper	Lower Putah Creek Coordinating Committee	
Sandra Willingmyre	Accountant I	Accounting and Human Resources	
Thomas Pate	Water Policy Analyst/District Engineer	Engineering	
<b>SOLANO IRRIGATION DISTRICT</b>			
Cary Keaton	General Manager		
Paul Fuchslin	Director	Engineering	
Matt Hobbs	Director	Operations	
Cammie Morin	Director	Finance	
Bao Nguyen	Engineering GIS	Engineering	
James Daniels	District Engineer	Engineering/ Suisun Solano Water Authority	
<b>NEIGHBORING JURISDICTIONS</b>			
Leah Greenbaum	Emergency Services Officer	Napa County	Emergency Services, Public Information
George Booth	Department of Water Resources	Sacramento County	Structural Flood Control Projects, Public Information
Dana Carey	Manager	Yolo County Office of Emergency Services	Emergency Services, Property Protection (e.g., elevation)
Darryl Brundidge	Travis AFB	US Air Force	Emergency Services, Public Information
David Lin	Travis AFB	US Air Force	Property Protection (e.g., elevation), Public Information
Robert McGaha	Travis AFB	US Air Force	Property Protection (e.g., elevation), Public Information
Rick Kovar	Emergency Manager	Contra Costa County	Emergency Services, Public Information
Meredith Gerhardt	Senior Emergency Management Coordinator	Contra Costa County	Emergency services, Property protection (e.g. elevation)
Kurt Johnson	Emergency Services Planner	Yolo County	Emergency services, Property protection (e.g., elevation)
<b>REGIONAL AGENCY OR COMMUNITY GROUP</b>			
Jesse Payne	Director	Northern Solano Association of Realtors	Property Protection (e.g., elevation), Public Information
Doris Goodrich	General Manager	Suisun Fairfield Cemetery District	Property Protection (e.g., elevation), Public Information



### Solano County MJHMP Planning Committee

NAME	TITLE	DEPARTMENT	CRS Expertise (County & Stakeholders only)
Kelly Huff	District Manager	Dixon Resource Conservation District	Property protection (e.g., elevation), Natural resource protection
Denise Kirchubel	Director	Northern Solano County Association of Realtors	Property protection (e.g., elevation), Public Information
Julie Coffey	Realtor and Fire Victim		Public Information
Leo Callejas	President	Solano County Hispanic Chamber of Commerce	Public Information
Elana Karoulina	Executive Director	Sustainable Solano	Property protection (e.g., elevation), Natural resource protection, Public Information
Jonathan Erwin	Resilient Neighborhoods Program Manager	Sustainable Solano	Property protection (e.g., elevation), Natural resource protection, Public Information
<b>WILDFIRE STAKEHOLDER</b>			
Dave Carpenter	Fire Chief	Cordelia Fire District	Property protection (e.g., elevation), Natural resource protection, Public Information
Paul Speed	Director of Facilities/Ops	Fairfield-Suisun Unified School District	Property protection (e.g., elevation), Natural resource protection, Public Information
Michael O'Connor	Fire Chief	Montezuma Fire Protection District	Property protection (e.g., elevation), Natural resource protection, Public Information

### Consultant Team

The County enlisted consulting firm Dynamic Planning + Science (DP+S) due to its expertise in assisting public sector entities with developing hazard mitigation plans. DP+S facilitated the planning process, collected and analyzed data, produced meeting materials, and produced drafts of the MJHMP for review. The MJHMP Consultant Team, as shown in Table 3-3, consisted of a variety of hazard mitigation and certified urban planning professionals.

Table 3-3: MJHMP Update Consultant Team

HMP Update Project Team	Role
Ethan Mobley, AICP	Project Manager
Brian Greer	GIS Manager/Spatial Analyst
Torie Jarvis	Outreach Manager, Planning Manager
Alex Krebs	GIS Associate
Raini Ott	Hazard Mitigation Planner
Clare Peabody	Hazard Mitigation Planner



### Planning Committee Meetings

The HMPC met throughout the development of the updated MJHMP. Table 3-4 charts those meetings, including date, type, and topics discussed. Meeting documentation, including agendas, hazard maps, PowerPoint presentations, minutes, sign-in sheets, and other relevant handouts are provided in Appendix B.

Table 3-4: Planning Committee Meeting Summary

Date	Meeting Type	Topics
December 16th, 2020	Kickoff Meeting with Steering Committee	<ul style="list-style-type: none"><li>Review Planning Team activities</li><li>Review Scope of Work</li><li>Review expectations of Steering Committee and jurisdictional planning committees</li></ul>
December 16th, 2020	Meeting #1	<ul style="list-style-type: none"><li>Mitigation Planning Defined</li><li>Project and Website Review</li><li>FEMA Hazard Mitigation Program</li><li>2014 Mitigation Plan Review and What has Changed?</li><li>Review Outreach Materials</li></ul>
January 27th, 2021	Meeting #2	<ul style="list-style-type: none"><li>Hazard Prioritization Exercise</li><li>Community Vulnerability and Risk Assessment</li><li>Hazard Problem Statement Review</li><li>Review Preliminary Survey Results &amp; Outreach Materials</li></ul>
February 17th, 2021	Meeting #3	<ul style="list-style-type: none"><li>Review Mitigation Alternatives</li><li>Setting Plan Goals</li><li>Aligning Mitigation Strategy with HMA Funding</li></ul>

### Review and Incorporation of Existing Documents

The Planning Committee and Consulting Team reviewed and incorporated existing plans, studies, reports, and technical information in the formation of this MJHMP. The review of past documents is described more in Section 4.1. Those documents are cited throughout the hazard profiles (Section 4.5) and are examined more closely both in the Capabilities Assessment (Section 5.4) and in each hazard profiles' plans, policies, and regulatory environment section.

All documents cited in this MJHMP are included in Section 7, Works Cited.

### Public Involvement and Outreach

Public involvement is an important and requisite component of any MJHMP. The public outreach strategy for this MJHMP maximized public involvement throughout the planning process and utilized websites, local media, and community efforts. Due to the unfolding COVID-19 pandemic during the development of this HMP, all outreach was conducted digitally.



As required by FEMA, the general public was given an opportunity to be involved in the planning process while developing the MJHMP through surveys, a project website, and public review periods. Each is described below.

### Public Survey

An eight-question community survey was distributed by the County via a number of online platforms. A total of 1,842 survey responses were collected in English and an additional eight in Spanish. The results of the survey were used to ensure that the priorities of the county and participating jurisdictions match those of the community members.

Did you consider the risks of naturally occurring hazards when you chose your home?  
1,841 responses

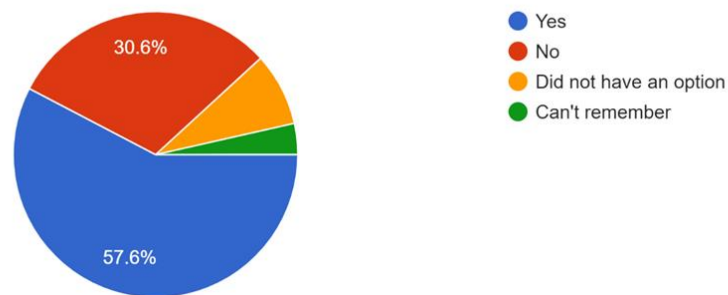


Figure 3-2: Sample Graphic from Survey

### HMP Update Website

For this MJHMP, a project portal at [mitigatehazards.com/solanohmp/](http://mitigatehazards.com/solanohmp/) served and will continue to serve as a centralized project information and file-sharing platform. This website provides a tool for project management, collaborative content, and a one-stop-shop for mitigation planning resources.

In addition to internal coordination, the project portal played a critical role in public involvement throughout the planning process and documenting public involvement, including the community survey, meetings, and working sessions. Resources such as the Risk Assessment Mapping Platform (RAMP) and links to all meeting summaries are available to the public via the website. Project participants and stakeholders used the website as a project resource for the duration of the planning process and will continue to have access during the five-year update cycle and beyond.





### **Public Review of Draft HMP**

The public reviewed the draft MJHMP during August of 2021, including at a public meeting held virtually on August 16, 2021. The County and several other jurisdictions announced the available public draft via their websites, and the drafts were available at <http://mitigatehazards.com/solanohmp/>. The public was able to provide comment via a collaborative PDF, an online submission form, or email. The County made considerable changes to Volume 1 and mitigation actions in particular based on productive public feedback. Notably, given the severe wildfire season of 2020, many comments focused on vulnerabilities and mitigation actions for wildfire. The notice and response to comments received are available in Appendix B.

## **STEP 2: Assess the Risk**

In accordance with FEMA requirements, the HMPC identified and prioritized the natural hazards affecting both Solano County as a whole and each participating jurisdiction individually. It also assessed the vulnerability of those identified hazards. The risk assessment informed appropriate mitigation actions. The process is described in this section, and the substance of this risk assessment is detailed in Section 4.

### **Identify and Profile Hazards**

Based on a review of past hazard events, existing plans, reports, and other technical studies, data, and community knowledge, the Planning Committee determined if regional hazards could affect the planning area. The Planning Committee prioritized hazards based on probability of occurrence and impact upon occurrence. The resulting risk matrices are in Volume 1 for the overall county and in each participating jurisdiction's annex in Volume 2.

### **Assess Vulnerabilities**

Assessing vulnerabilities exposes the unique characteristics of individual hazards and begins the process of narrowing down which areas within Solano County are vulnerable to specific hazard events. The vulnerability assessment included a GIS overlaying method for examining such vulnerabilities more in-depth. Participating jurisdictions reviewed GIS vulnerability information and completed this exercise both singly and jointly with the county and supplemented produced information by meeting and discussing areas of concern regarding each prioritized hazard. Identified hazards varied widely depending on the geographic make-up of, priorities of, and services provided by the participating jurisdiction. Using these methods, jurisdictional planning committees estimated vulnerable populations, infrastructure, and potential losses from hazards.

Participating jurisdictions also assessed areas of concern under each prioritized hazard for climate change-specific vulnerabilities. This step forms each jurisdiction's Climate Vulnerability Assessment. For each area of concern, the participating jurisdiction first considered whether the vulnerability was related to climate change. If so, the jurisdiction then assessed the impact of climate change on the vulnerability and the county's capacity to adapt to the vulnerability. The CVA is found in in Appendix C and as appendices to each jurisdictional annex.



**Updated content for each hazard profile for the county, including vulnerability, is provided in Section 4.5. Participating Jurisdictions have individual, FEMA-compliant annexes in Volume 2.**

### Web-Based Risk Assessment Mapping and Analysis

The web-based and interactive Risk Assessment Mapping Platform (RAMP), accessed via the project website at [mitigatehazards.com/solanohmp/](https://mitigatehazards.com/solanohmp/), allows interactive discovery of risk, vulnerability, and exposure data developed especially for Solano County. RAMP is a mapping platform built specifically for mitigation planning. It displays county facilities and buildings overlaid with natural hazards layers to bring interactivity and individual discovery to the GIS analysis performed for the MJHMP. Figure 3-3 shows the location of RAMP on the project website.

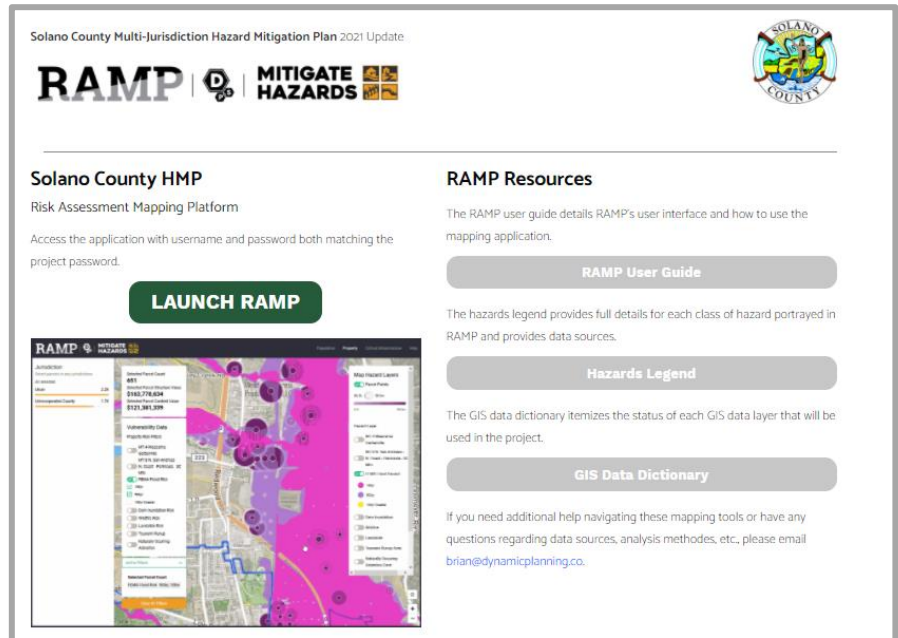


Figure 3-3: RAMP Access at [mitigatehazards.com](https://mitigatehazards.com)

The HMPC used RAMP to understand vulnerabilities to the county and participating jurisdiction populations, critical facilities, and properties exposed to hazards with spatial footprints. Users interactively filter facilities and buildings by natural hazard zones and construction characteristics.

RAMP's robust data filtering and summation calculations allow the user to understand and visualize vulnerabilities at the facility level with detailed information on the number of structures exposed to various natural hazards. RAMP enables Solano County to pinpoint vulnerabilities and reinforces problem statements in the mitigation strategy. Figure 3-4 demonstrates the RAMP web-based interface.



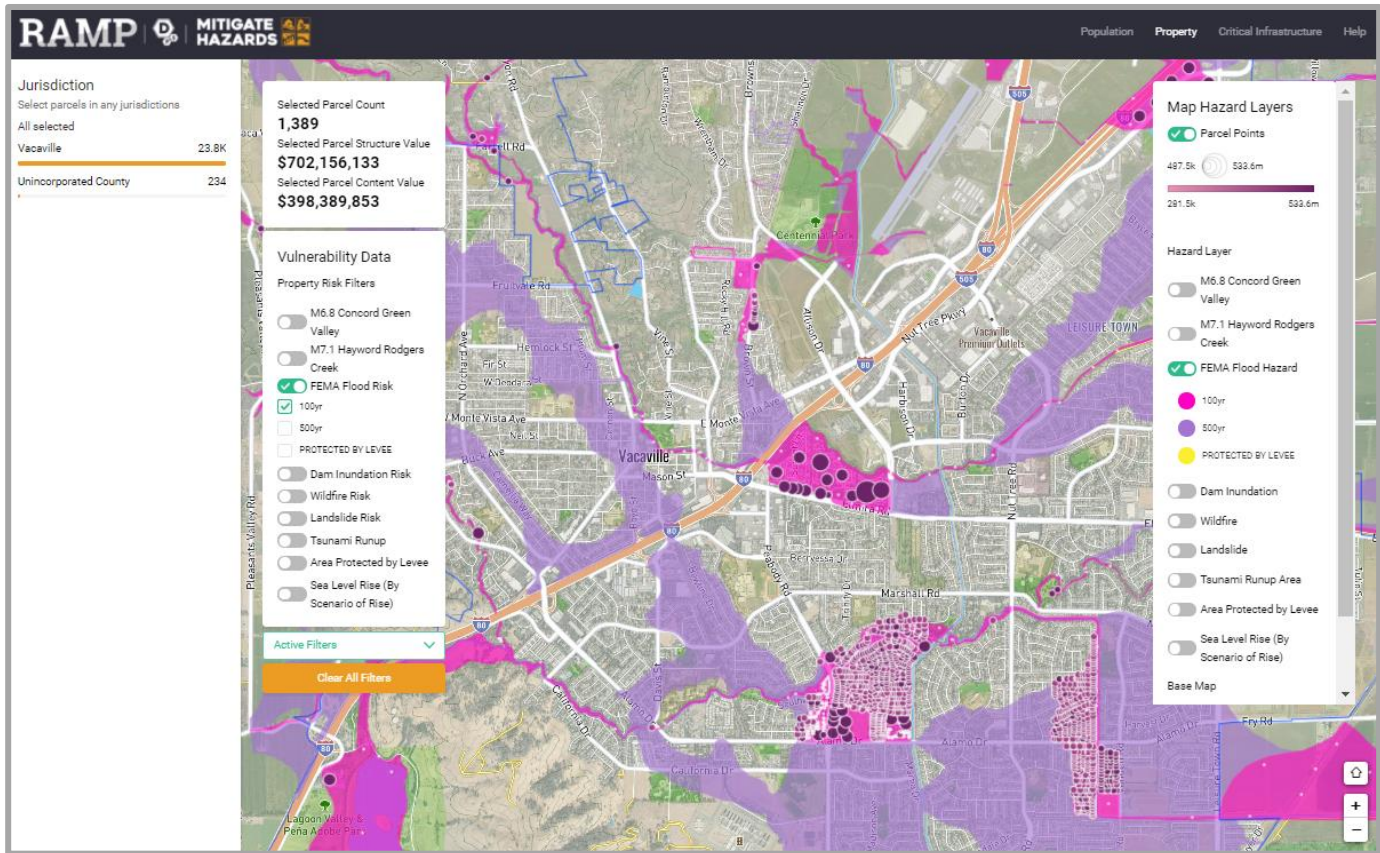


Figure 3-4: RAMP Example of Properties Exposed to FEMA 100-Year Flood Risk in Portions of Vacaville

## STEP 3: Develop a Mitigation Strategy

This plan provides a strategy and blueprint for reducing potential losses identified in the risk assessment based on existing authorities, policies, programs and resources, and participating jurisdictions' abilities to expand on and improve existing tools. MJHMP development included identifying goals, assessing existing capabilities, reviewing goals in the existing HMP, and identifying new mitigation actions. The MJHMP was prepared in accordance with requirements from DMA 2000, the California Office of Planning and Research (OPR), and FEMA's HMP guidance. The process is described below; the substance of the mitigation strategy is detailed in Section 5 for the county and within Volume 2 for each participating jurisdiction.



## Identify Goals

The Planning Committee reviewed the goals of recent jurisdictional HMPs and the California Hazard Mitigation Plan and determined to craft MJHMP goals consistent with the California HMP and consistent with HMP and FEMA requirements. The goals were updated to meet the current hazard environments and to be consistent with the changing policies and goals of participating jurisdictions. The goals are presented in Section 5.4.6.

## Develop Capabilities and Adaptive Capacity Assessment

A capabilities assessment is a comprehensive review of participating jurisdictions' capabilities and tools to implement the mitigation actions in the MJHMP. Capabilities assessments include considerations of a community's adaptive capacity for climate change, which is a community or region's existing ability to moderate climate change impacts. The Planning Committee identified technical, financial, and administrative capabilities to implement mitigation actions, as detailed in Section 5.4) Each participating jurisdiction's planning committee explored varying jurisdictional capabilities in Volume 2 annexes.

## Identify Hazard Problem Statements

The Planning Committee developed mitigation actions to address problems that could originate from hazards identified in the risk assessment, in line with identified capabilities of each jurisdiction. Mitigation actions were created first by developing problem statements for prioritized hazards. Best practice is for each hazard problem statement to be mitigated with a combination of short-term and long-range planning activities, and through both operational and physical projects. Hazard problem statements are located at the conclusion of each hazard profile in table format in Volume 1, in table format for each jurisdictional annex, and are also uploaded in an interactive web-based Mitigation Action Support Tool (MAST), described below. Hazard problem statements for the county and other participating jurisdictions are categorized as impact-related, victim-related, or threat-related, as seen in Figure 3-5.

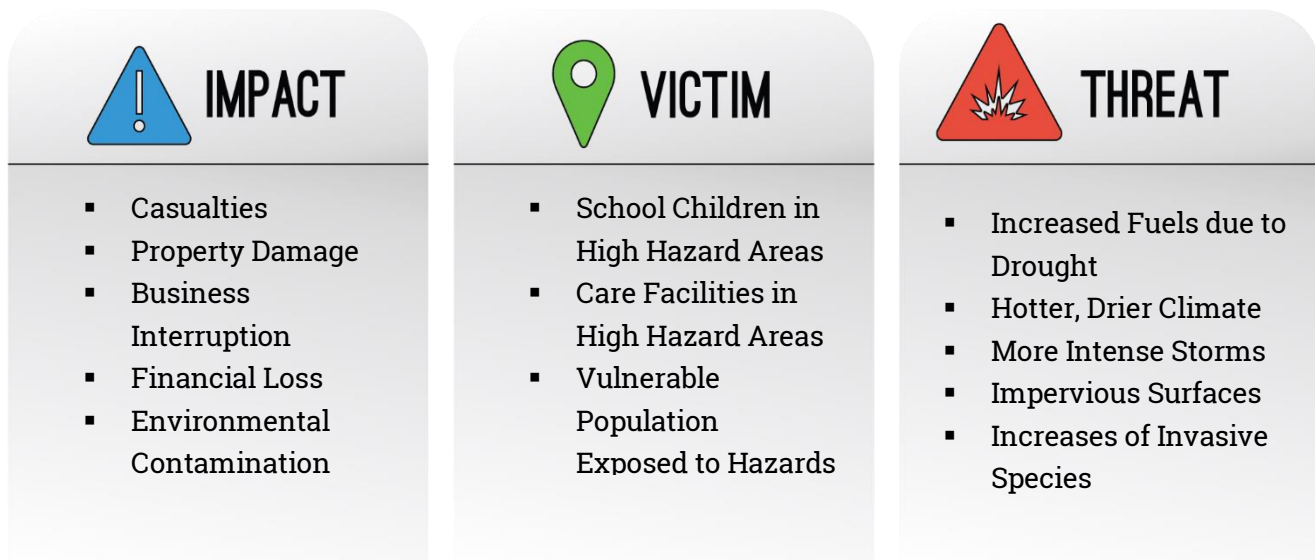


Figure 3-5: Categories of Issues Addressed in Problem Statements



## Identify Mitigation Actions

As part of the MJHMP planning process, the HMPC reviewed and analyzed the status of the mitigation actions identified in jurisdictional HMPs; some jurisdictional HMPs were more than a decade old, and mitigation actions were determined to be outdated. The Planning Committee and participating jurisdictions then worked together to identify and develop new mitigation actions with implementation elements. Additional detail on these mitigation actions is provided in Section 5.6.2).

## Mitigation Action Support Tool (MAST)

Hazard problem statements and mitigation activities are presented and will be updated through a web interface application developed specifically for participating jurisdictions, creating a living document that can continue to be a valuable resource into the future. The Mitigation Action Support Tool (MAST) is accessible through [mitigatehazards.com/solanohmp/](https://mitigatehazards.com/solanohmp/).

MAST is a web-based interactive tool that enables multiple users to search, view, enter, and update mitigation actions, ideas or projects, and other information. MAST provides participating jurisdictions and plan reviewers (Cal OES and FEMA) access to valuable mitigation information that can be leveraged by future planning or other risk reduction efforts within the county. Participating jurisdictions can update the status of their mitigation projects throughout the planning lifecycle, and this web-based tool will improve participating jurisdictions' ability to apply for FEMA's Hazard Mitigation Assistance (HMA) grant programs, including initial grant application processes through Cal OES.

## County Planning Processes Library

Solano County has completed the MJHMP planning process per FEMA guidelines. This process is detailed in this section, and consists of the elements reflected in Table 3-5.

Table 3-5: Planning Process Library

Jurisdiction	Planning Library Links
<b>Solano County</b>	Risk Assessment – <a href="#">View Maps</a> / <a href="#">Download Maps</a>
	Hazard Prioritization – <a href="#">View Risk Matrix</a>
	Areas of Concern – <a href="#">View Problem Statements</a>
	Capability Assessments – <a href="#">View Capability Assessment</a>
<b>City of Vallejo</b>	Risk Assessment – <a href="#">View Maps</a> / <a href="#">Download Maps</a>
	Hazard Prioritization – <a href="#">View Risk Matrix</a>
	Areas of Concern – <a href="#">View Problem Statements</a>
	Capability Assessments – <a href="#">View Capability Assessment</a>
<b>City of Fairfield</b>	Risk Assessment – <a href="#">View Maps</a> / <a href="#">Download Maps</a>
	Hazard Prioritization – <a href="#">View Risk Matrix</a>
	Areas of Concern – <a href="#">View Problem Statements</a>
	Capability Assessments – <a href="#">View Capability Assessment</a>
<b>City of Vacaville</b>	Risk Assessment – <a href="#">View Maps</a> / <a href="#">Download Maps</a>
	Hazard Prioritization – <a href="#">View Risk Matrix</a>
	Areas of Concern – <a href="#">View Problem Statements</a>
	Capability Assessments – <a href="#">View Capability Assessment</a>



Jurisdiction	Planning Library Links
<b>City of Suisun City</b>	Risk Assessment – <a href="#">View Maps</a> / <a href="#">Download Maps</a> Hazard Prioritization – <a href="#">View Risk Matrix</a> Areas of Concern – <a href="#">View Problem Statements</a> Capability Assessments – <a href="#">View Capability Assessment</a>
<b>City of Benicia</b>	Risk Assessment – <a href="#">View Maps</a> / <a href="#">Download Maps</a> Hazard Prioritization – <a href="#">View Risk Matrix</a> Areas of Concern – <a href="#">View Problem Statements</a> Capability Assessments – <a href="#">View Capability Assessment</a>
<b>City of Dixon</b>	Risk Assessment – <a href="#">View Maps</a> / <a href="#">Download Maps</a> Hazard Prioritization – <a href="#">View Risk Matrix</a> Areas of Concern – <a href="#">View Problem Statements</a> Capability Assessments – <a href="#">View Capability Assessment</a>
<b>City of Rio Vista</b>	Risk Assessment – <a href="#">View Maps</a> / <a href="#">Download Maps</a> Hazard Prioritization – <a href="#">View Risk Matrix</a> Areas of Concern – <a href="#">View Problem Statements</a> Capability Assessments – <a href="#">View Capability Assessment</a>
<b>Solano County Water Agency</b>	Risk Assessment – <a href="#">View Maps</a> / <a href="#">Download Maps</a> Hazard Prioritization – <a href="#">View Risk Matrix</a> Areas of Concern – <a href="#">View Problem Statements</a> Capability Assessments – <a href="#">View Capability Assessment</a>
<b>Solano Irrigation District</b>	Risk Assessment – <a href="#">View Maps</a> / <a href="#">Download Maps</a> Hazard Prioritization – <a href="#">View Risk Matrix</a> Areas of Concern – <a href="#">View Problem Statements</a> Capability Assessments – <a href="#">View Capability Assessment</a>
<b>Vallejo Flood and Wastewater District</b>	Risk Assessment – <a href="#">View Maps</a> / <a href="#">Download Maps</a> Hazard Prioritization – <a href="#">View Risk Matrix</a> Areas of Concern – <a href="#">View Problem Statements</a> Capability Assessments – <a href="#">View Capability Assessment</a>

### Multi-Jurisdictional Planning Process

Multi-jurisdictional hazard mitigation planning offers many benefits, such as increased coordination and efficiency in planning and implementation efforts. At the same time, each jurisdiction has specific hazards and specific mitigation actions that must be addressed individually. The MJHMP balances the benefits of a comprehensive, coordinated approach to hazard mitigation with the specific realities of individual participating jurisdictions. Multi-jurisdiction plans are contemplated under FEMA regulations at 44 C.F.R. § 201.6(4).

Volume 2 of this MJHMP documents each jurisdiction's HMP resources. Each participating jurisdiction individually assessed hazards and capabilities, explored hazard vulnerability, developed mitigation strategies, and followed the same planning process as Solano County to create annexes. Volume 2 provides each participating jurisdiction's stand-alone annex.



## STEP 4: Adopt and Implement the Plan

Once the risk assessment and mitigation strategy were completed, information, data, and associated narratives were compiled into the MJHMP. Section 2 provides detailed information on new and updated elements of the MJHMP.

### Plan Review and Revision

Once the draft MJHMP update was completed, a public and government review period was established for official review and revision. Public comments were solicited through social media and a public meeting, then accepted, reviewed, and incorporated into this update. Applicable comments from the public were received and addressed prior to authorization to submit to FEMA and Cal OES. The notice of the public comment period is included in Appendix B.

### Plan Adoption and Submittal

This plan has been submitted and approved by FEMA and adopted by all participating jurisdictions. Copies of the resolutions are provided in Executive Summary section of this document.

### Implement, Evaluate, and Revise the Plan

The true worth of any mitigation plan is its implementation and success under FEMA's grant programs. This MJHMP has been assembled to reduce the risk of natural hazards, and also to meet the requirements of the DMA 2000 and maintain eligibility under FEMA's Hazard Mitigation Assistance (HMA) grant programs.

FEMA administers three programs that provide funding for local agencies with approved mitigation plans:

- **Hazard Mitigation Grant Program (HMGP)**, which assists in implementing long-term hazard mitigation planning and projects following a Presidential major disaster declaration.
- **Building Resilient Infrastructure and Communities (BRIC)**, which provides funds for hazard mitigation planning and projects on an annual basis.
- **Flood Mitigation Assistance (FMA)**, which provides funds for planning and projects to reduce or eliminate risk of flood damage to buildings that are insured under the National Flood Insurance Program (NFIP) on an annual basis.

For more information about FEMA HMA, visit [fema.gov/hazard-mitigation-assistance](https://www.fema.gov/hazard-mitigation-assistance).





## Plan Maintenance

The County will update and monitor this plan in accordance with all FEMA requirements in order to maintain eligibility for FEMA HMA. Evaluation and revision procedures for this plan are detailed in Section 6.

Section 6 includes the measures Solano County and other participating jurisdictions will take to ensure the MJHMP's continuous long-term implementation, including MJHMP monitoring, reporting, evaluation, maintenance, and updates. Most of this implementation and maintenance will be done through MAST. Figure 3-6 demonstrates how MAST information will translate into Cal OES Notices of Interest (NOIs) and grant sub-application requests. Section 6 also contains specifics on integrating mitigation with day-to-day decision making.

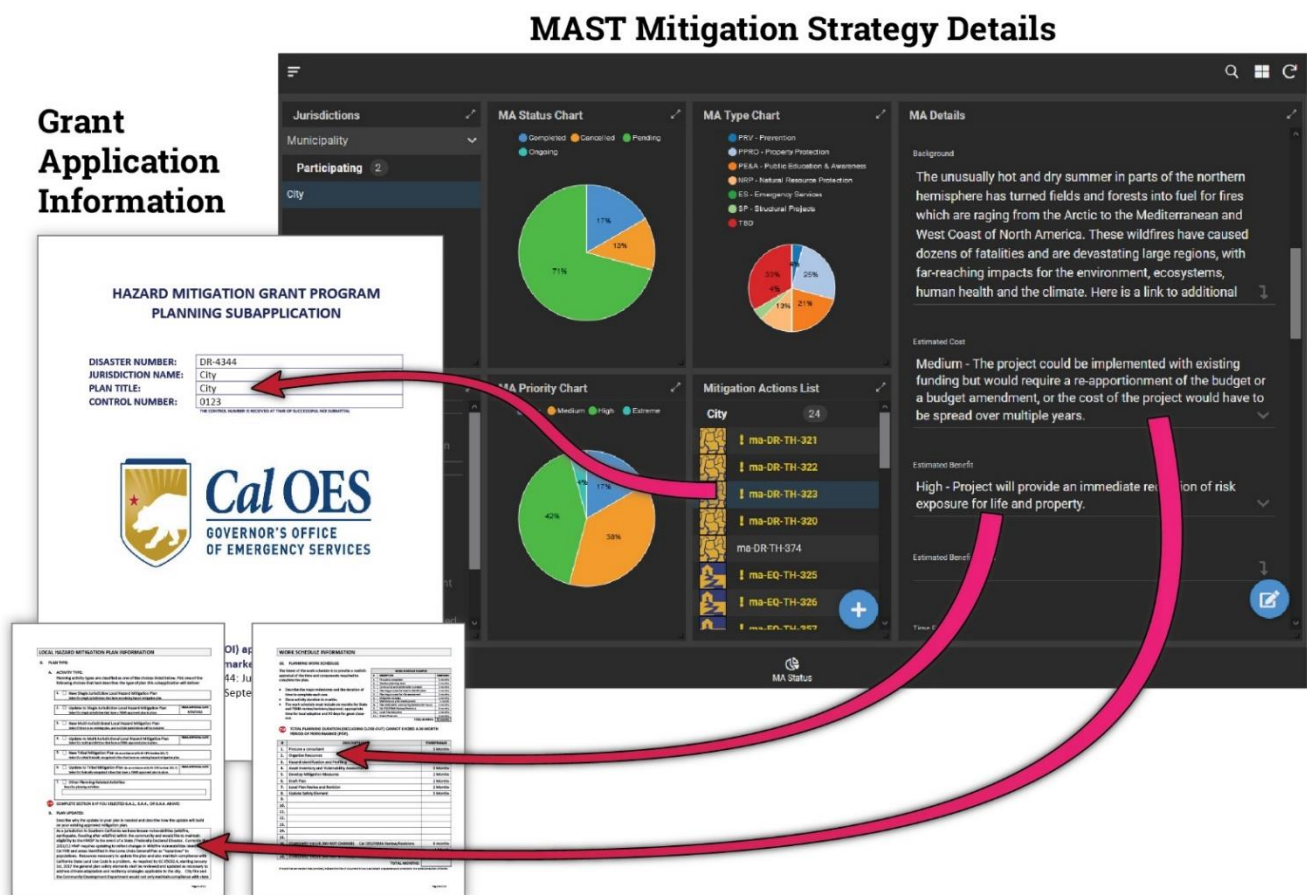


Figure 3-6: MAST Elements and Cal OES Grant Applications





## Section 4. Risk Assessment

The risk assessment measures the potential impact on life, property, and the economy resulting from natural hazards. The intent of the risk assessment is to identify the qualitative and quantitative vulnerabilities of a community to the greatest extent possible given available data. The risk assessment increases understanding of natural hazard impacts to the community and provides a foundation to develop and prioritize mitigation actions. In turn, mitigation actions reduce damage from natural disasters through increased preparedness and focus resources to areas of the greatest vulnerability.

This risk assessment section evaluates potential losses from a hazard event by assessing the vulnerability of buildings, infrastructure, and people. It identifies the characteristics and potential consequences of hazards, explores how much of the county could be affected by a hazard, and assesses the impact on county assets. The risk assessment approach consists of three components:

- Hazard Identification and Screening (Section 4.1)
- Hazard Prioritization (Section 4.1.3)
- Vulnerability Assessment and Hazard Profiles (Section 4.5)

Other sections provide background and context for the risk assessment. Section 4.3 provides a geographic and demographic overview of Solano County. Section 4.4 explains the methods utilized in the risk assessment.

### 4.1 Hazard Identification and Screening

Per FEMA guidance, the first step in developing the risk assessment is identifying the hazards. This step includes two parts. First, the Planning Committee considered and screened a broad set of hazards presented in relevant local, regional, and statewide hazard planning documents. The crosswalk of documents reviewed and the results of screening the relevant hazards are outlined in Section 4.1.1 below. Second, the HMPC considered past hazard events in Solano County to help prioritize hazards to be evaluated in this document, as outlined in Section 4.1.2.

#### 4.1.1 Hazard Screening

The MJHMP Planning Committee first reviewed previously-prepared hazard mitigation plans and other relevant documents to determine the realm of natural hazards that have the potential to affect the county and the nearby region. Table 4-1 provides a crosswalk of hazards identified in the 2014 Solano County HMP, 2008 Solano County General Plan, and the 2018 California State Hazard Mitigation Plan. Through this thorough document review, there were 17 different hazards identified. The crosswalk was used to develop a preliminary hazards list, providing a framework for the MJHMP Planning Committee to evaluate which hazards were truly relevant to participating jurisdictions and which were not. For example, volcanoes were considered to have no relevance to the county, while climate change, earthquake, flood, dam failure, landslide, and wildfire were indicated in every hazard document.



Table 4-1: Document Review Crosswalk

Hazards	2014 Solano County HMP	2008 Solano County General Plan	2018 California State HMP
Agricultural Pests			■
Climate Change	■	■	■
Dam Failure	■	■	■
Drought	■		■
Earthquake	■	■	■
Flood	■	■	■
Insect Hazards			
Landslide	■	■	■
Levee Failure		■	■
Manmade Hazards			■
Pandemic Disease			■
Sea Level Rise	■	■	■
Extreme weather	■		■
Soil Hazards		■	■
Terrorism & Tech Hazards			■
Tsunami			■
Volcano			■
Wildfire	■	■	■

The crosswalk provided the basis for further prioritizing hazards, displayed in Table 4-2. The prioritized hazards have detailed hazard profiles in Section 4.5, the vulnerability assessment.



Table 4-2: Hazard Prioritization

Hazard Type	Explanation
<b>Climate Change</b>	<b>High priority county-wide, profiled hazard.</b>
<b>Dam/ Levee failure</b>	Dam failure is possible in Solano County but is best addressed in other plans, specifically Emergency Action Plans for high hazard dams affecting Solano County.
<b>Drought</b>	<b>High priority county-wide, profiled hazard.</b>
<b>Earthquake/ Geologic Hazards</b>	<b>High priority county-wide, profiled hazard.</b>
<b>Flood</b>	<b>High priority county-wide, profiled hazard.</b>
<b>Hazardous Material</b>	While hazardous materials can release and impact the county, there are better avenues to address this hazard outside of this plan.
<b>High Winds/ Straight Line Winds</b>	<b>High priority county-wide, profiled as part of Extreme Weather.</b>
<b>Insect Hazards</b>	While hazardous insects exist in Solano County, this was not considered a priority and is not profiled in this plan.
<b>Pandemic Disease*</b>	While pandemic disease can impact the county, there are better avenues to address this hazard outside of this plan.*
<b>Extreme Weather, including:</b>	<b>High priority county-wide for high wind, heavy rain, and high heat.</b>
Extreme Heat	<b>Profiled as part of Extreme Weather.</b>
Hail	Hail events are rare in the county and not considered a priority.
High Wind	<b>Profiled as part of Extreme Weather.</b>
Heavy Rain	<b>Profiled as part of Extreme Weather.</b>
Fog	Fog events are rare in the county and not considered a priority.
Lightning	Not a priority as an extreme weather event; discussed as a source of wildfire.
Severe Thunderstorm	Severe thunderstorms were not identified as a priority in this plan.
Winter Storm/ Extreme Cold/ Freeze Events	Winter storms are rare in Solano County and not identified as a priority for this plan.
<b>Slope Failure</b>	<b>High priority county-wide, profiled hazard.</b>
<b>Soil Hazards</b>	While limited soil hazards exist in Solano County (erosion and shifting soils), these are not prioritized in this plan; erosion is discussed under Flood.
<b>Terrorism/Human Caused Threats</b>	While terrorism is certainly a threat to the county and participating jurisdictions, it is best addressed in other plans as this HMP does not address human-caused threats except as discussed under Climate Change.
<b>Tornado</b>	Impacts to the county from tornados are extremely unlikely and this hazard was not considered a priority.
<b>Volcanic Activity</b>	Due to the distance from volcanoes and the limited chance of an eruption, this hazard was not identified as a priority.
<b>Wildfire</b>	<b>High priority county-wide, profiled hazard.</b>

\*Note regarding Pandemic Disease: While in the midst of the COVID-19 pandemic, Solano County determined that pandemic disease was not a priority in this Hazard Mitigation Plan because it is already addressed in the county's Pandemic Influenza Emergency Response Plan (June 2014 draft). This document and work under it reside in the Emergency Medical Services (EMS) office of the Solano County Department of Public Health. Rather than develop a second, possibly overlapping, redundant, or conflicting document, the County elected to defer to the existing and ongoing work of the EMS office.








## 4.1.2 Past Major Hazard Events

One important consideration in identifying and prioritizing hazards is past major hazard events, especially those that triggered federal or state disaster declarations. The MJHMP Planning Committee reviewed and considered past major hazard events in Solano County as part of the screening and identification process.

Most available information on major past hazard events comes from federal or state disaster declarations. These declarations may be granted when the severity and magnitude of an event surpasses the ability of the local government to respond and recover. Additional federal or state disaster funding (or both) is generally available in response to a disaster declaration. State funding assistance is provided when a local government's capacity to respond to the disaster is exceeded. Should the disaster be so severe that both the local and state governments' capacities are exceeded, a federal emergency or disaster declaration may be issued, allowing for the provision of federal assistance.

The federal government may issue a disaster declaration through FEMA, the U.S. Department of Agriculture (USDA), or the Small Business Administration (SBA). FEMA also issues emergency declarations, which are more limited in scope and do not include the long-term federal recovery programs that accompany major disaster declarations. Quantity and types of damage are the determining factors.

Solano County has received 27 federal disaster declarations<sup>1</sup> since 1953, some of which were statewide, including:

 <b>7 Wildfires</b>	 <b>6 Floods</b>
 <b>9 Extreme Weather Events</b>	 <b>1 Drought</b>
 <b>2 Earthquakes</b>	 <b>2 Biological Events</b>

Extreme weather and flooding events are most likely to occur in the winter months, with 25 of the 54 federally-declared disasters occurring in January and February since 1953 in California. Wildfires have typically occurred in late summer and fall, with 188 wildfire declarations from July through October since 1953. Table 4-3 lists federal disaster declarations in Solano County since 1953.

<sup>1</sup> Officially, 28 disasters have been declared, as California was declared as part of the Hurricane Katrina evacuation; however, no disaster occurred in California.



Table 4-3: Disaster Declarations in Solano County 1953 to Present

Year	Incident Description	Disaster Number
8/22/2020	Wildfires	DR-4558-CA
8/18/2020	LNU Lightning Fire Complex	FM-5331-CA
3/22/2020	COVID-19 Pandemic	DR-4482-CA
3/13/2020	COVID-19	EM-3428-CA
10/10/2017	Wildfires	DR-4344-CA
10/9/2017	Atlas	FM-5214-CA
4/2/2017	Severe Winter Storms, Flooding, and Mudslides	DR-4308-CA
2/14/2017	Severe Winter Storms, Flooding, and Mudslides	DR-4301-CA
7/23/2015	Wragg Fire	FM-5091-CA
9/11/2014	Earthquake	DR-4193-CA
6/22/2008	Wildfires	FM-2776-CA
2/3/2006	Severe Storms, Flooding, Mudslides, and Landslides	DR-1628-CA
9/13/2005	Hurricane Katrina Evacuation (National)	EM-3248-CA
2/9/1998	Severe Winter Storms and Flooding	DR-1203-CA
1/4/1997	Severe Storms, Flooding, Mudslides, and Landslides	DR-1155-CA
3/12/1995	Severe Winter Storms, Flooding, Landslides, Mud Flows	DR-1046-CA
1/10/1995	Severe Winter Storms, Flooding, Landslides, Mud Flows	DR-1044-CA
2/11/1991	Severe Freeze	DR-894-CA
10/18/1989	Loma Prieta Earthquake	DR-845-CA
9/29/1988	Wildfires	DR-815-CA
2/21/1986	Severe Storms and Flooding	DR-758-CA
2/9/1983	Coastal Storms, Flooding, Slides, and Tornadoes	DR-677-CA
1/7/1982	Severe Storms, Flooding, Mudslides, and High Tide	DR-651-CA
1/20/1977	Drought	EM-3023-CA
2/8/1973	Severe Storms, High Tides, and Flooding	DR-364-CA
1/26/1969	Severe Storms and Flooding	DR-253-CA
12/24/1964	Heavy Rains and Flooding	DR-183-CA

Source: FEMA Disaster Database via <http://mitigatehazards.com/hazard-mapping/>, accessed 01/06/2021

Disaster declarations may also occur through the USDA, as agricultural areas such as Solano County can be particularly impacted. The USDA has declared 12 drought disaster declarations and 1 excessive rain declaration since 2012. See Section 4.5.5.3 for USDA drought declarations and Section 4.5.4.2 for USDA extreme weather declarations. A USDA disaster declaration certifies that the affected county has suffered at least a 30-percent loss in one or more crop or livestock areas and provides affected producers with access to low-interest loans and other programs to help mitigate the impact of the drought. Importantly, all counties neighboring those receiving disaster declarations are eligible for the same assistance.

Hazard events occurring outside county boundaries can also directly and indirectly impact the county. For instance, dam failures and wildfires may occur outside Solano County but affect watersheds that drain into



the county and result in flooding and longer-term watershed health impacts. Power supply also could be interrupted by hazard occurrences outside of the county.

### 4.1.3 Compounding Hazard Events

This MJHMP generally examines the vulnerabilities of hazard events in Solano County individually. However, hazards often occur in combination as well. Frequently, another hazard occurs as a secondary hazard, such as an earthquake triggering a landslide or tsunami, or severe rain events following a wildfire causing debris flows. Other events are compounded by outside factors, such as wildfire evacuations occurring during Public Safety Power Shutoff (PSPS) events. This hazard mitigation plan highlights multiple hazard risks within the hazard profiles by highlighting secondary hazards and, for wildfire in particular, highlighting local compounding conditions that accelerate wildfire impacts, such as PSPS events. See Section 4.5.1.1.

Of particular concern in this 2021 MJHMP update is the pairing of a hazard event and need for evacuation or response in light of the ongoing COVID-19 pandemic. Local governments are actively considering response and mitigation needs that can help reduce the impacts of a multiple-hazard event that include pandemics and another hazards, such as flood, earthquake, or wildfire. The Solano County Health Department's Pandemic Plan paired with the Office of Emergency Services pandemic planning and EOC expansions to respond to pandemic needs address these intersections, and this MJHMP may discuss pandemics within secondary hazards.

## 4.2 Hazard Prioritization

The Planning Committee's hazard prioritization process combines historical data, local knowledge, and consensus opinions to produce a matrix that illustrates whether each profiled hazard is an extreme or high priority. The criteria below were used to evaluate hazards and identify the highest risk hazard in Solano County. The results of the prioritization process for Solano County are shown in Figure 4-1.

Each participating jurisdiction also completed the hazard prioritization process specifically for the jurisdiction, and this important initial stage informed the rest of the planning process for each jurisdiction. Figure 4-1 provides the guidance that shaped the ranking for each hazard risk matrix, including probability ratings and impact ratings. This figure also includes the outcomes of Solano County's Risk Matrix exercise. Table 4-2 also summarizes reasons why various hazards were not included in the County's prioritization exercise. For example, the County determined that pandemic disease was not a priority in this Hazard Mitigation Plan because it is already addressed in the county's Pandemic Influenza Emergency Response Plan (June 2014 draft). This document and work under it reside in the Emergency Medical Services (EMS) office of the Solano County Department of Public Health. Rather than develop a second, possibly overlapping, redundant, or conflicting document, the County elected to defer to the existing and ongoing work of the EMS office.

Individual prioritization matrices are available in each jurisdiction's annex in Volume 2 of this MJHMP.





## Risk Assessment Matrix Definitions

### PROBABILITY RATING

The likelihood of a hazard event occurring within a time period?

PROBABILITY	Highly Likely	<b>Highly likely</b> - 100% annual probability. Or likely to occur every year in your lifetime.
	Likely	<b>Likely</b> - Between 10 and 100% annual probability. Or will occur several times in your lifetime.
	Possible	<b>Possible</b> - Between 1 and 10% annual probability. Or likely to occur some time in your lifetime.
	Unlikely	<b>Unlikely</b> - Less than 1% annual probability. Or unlikely but possible to occur in your lifetime.

### IMPACT RATING

In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs? The impact could be in terms of one hazard event (flooding from a culvert failure) or a large-scale event (multiple rivers flooding) in the same jurisdictional boundary.

IMPACT			
Minor	Limited	Critical	Catastrophic
<b>Minor</b> - Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of critical facilities.	<b>Limited</b> - Minor injuries only. Approx. 10% or less of property in disaster footprint damaged or destroyed. Complete shutdown of critical facilities for more than one day.	<b>Critical</b> - Multiple deaths/injuries possible. Between 25% and 50% of property in disaster footprint is damaged or destroyed. Complete shutdown of critical facilities for more than one week.	<b>Catastrophic</b> - High number of deaths/injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for 30 days or more.

To concentrate resources on highest priority hazards, the jurisdictional planning team will focus on "High" and "Extreme" risk hazards in this annex. These hazards have higher probability and greater impact as it relates to the jurisdiction's planning area.

Hazard definitions are included in Vol. 1 of this plan.

### Hazard Information / Legend:



**Climate Change** is prioritized for all jurisdictions.



**Sea-Level Rise** is a subhazard of climate change for some jurisdictions (County, Vallejo, Benicia, Suisun City, Fairfield).



**Extreme Weather** in Solano County includes high heat, high wind, and heavy rain.



If a hazard symbol is grey, the planning team did not develop hazard vulnerability information due to lower perceived probability and impact.

### Solano County Risk Matrix

		IMPACT			
		Minor	Limited	Critical	Catastrophic
PROBABILITY	Highly Likely	Medium	High 	WILDFIRE	Extreme
	Likely	Medium	SLOPE FAILURE	FLOOD EARTHQUAKE	Extreme
	Possible	SOIL HAZARD	PANDEMIC	High	High
	Unlikely	Low	Low	DAM FAILURE	Medium

Figure 4-1: Prioritized Hazard Assessment Matrix for Solano County



## 4.3 Solano County Geographic and Demographic Profile

The geographic and demographic profile for Solano County sets the stage for the vulnerabilities assessment. Pairing the vulnerabilities assessment and regional profile can help guide resources and mitigation strategies to key populations and geographic areas. The Planning Committee reviewed geographic and demographic data as part of the risk prioritization and assessment process.

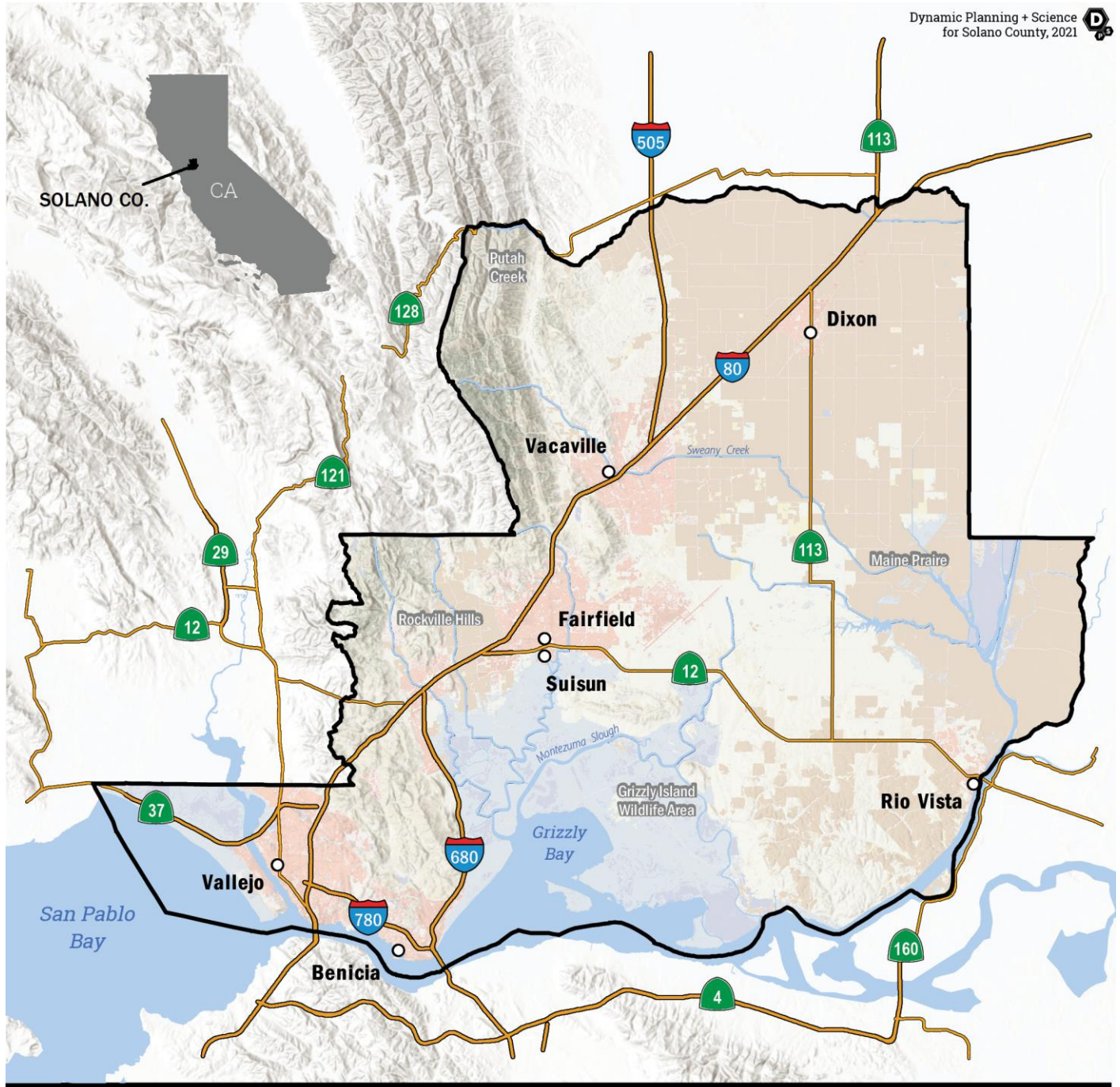
### 4.3.1 Geography

Solano County is located in the San Francisco Bay Area of California. It reaches from the shores of San Pablo Bay in the west to the Central Valley in the east. It is bordered by Yolo County to the north, Sacramento County to the east, Contra Costa County to the south, and Napa and Sonoma Counties to the west. Solano County encompasses approximately 909 square miles (582,233 acres), including 810 square miles of land and 84 square miles of water bodies. Approximately 762 square miles (487,767 acres), or 84 percent of the total land area, is located within the unincorporated areas of the county. The remaining land area comprises the seven incorporated cities of Solano County, as illustrated in Figure 4-2. Allendale, Bird's Landing, Collinsville, Elmira, and Green Valley are some of the larger unincorporated communities within Solano County. (Solano HMP, 2014)

The county includes a variety of wetland areas along its Bay and Delta borders. In the upland areas, there are vernal pool complexes and riparian corridors. The county also features oak woodland areas and extensive marshlands, which are vital to the health and longevity of the estuary ecosystem in the San Pablo Bay and the larger Sacramento-San Joaquin Delta (Bay Delta). The county includes the largest contiguous brackish water marsh that still exists on the west coast of North America. It also includes more than 10 percent of California's remaining natural wetlands. (Solano County General Plan, 2008) Figure 4-2 displays a geographic overview of Solano County.

### 4.3.2 Transportation Routes

There are many transportation routes, transit providers, and transit facilities throughout Solano County. Regional access routes include I-80, I-505, I-680, and I-780, as well as State Routes (SRs) 12, 29, 37, 84, and 113. Transit agencies include Benicia Breeze, Fairfield Suisun Transit, Rio Vista Delta Breeze, and Vacaville City Coach, as well as Vallejo Transit, which operates the Baylink Ferry from Solano County to San Francisco. Amtrak passenger trains and Greyhound bus lines provide long-distance inter-city service through the county. In addition, transit routes 2-2 connect with Bay Area Rapid Transit (BART) stations in Contra Costa County and transit links are provided to Napa, Sacramento, and Yolo Counties. Public aviation airports in Solano County include the Nut Tree Airport and Rio Vista Municipal Airport. (Solano HMP, 2014)



## SOLANO COUNTY GEOGRAPHIC OVERVIEW

\*Data sources: Census OSM, Esri, Census, Solano Co., NHD.

### MAP LEGEND

- PARTICIPATING MUNICIPALITY
- SOLANO COUNTY

Figure 4-2. Solano County – Geographic Overview





### 4.3.3 Climate

Climate influences the occurrences of many natural hazards, including drought, flood, slope failure, extreme weather, and wildfire. Climate in the Bay Delta area is generally characterized by a Mediterranean temperature. There are maritime influences, including the presence of tule fog, which make the central Bay Delta cooler along a west-east gradient. Climate also influences tidal energy, which is the amount of water in Delta channels and marshlands. (San Francisco Estuary Institute Aquatic Science Center, 2012)

Solano County has a generally mild climate with an average annual temperature of 60 degrees Fahrenheit (°F). The eastern portions of the county have hotter summer temperatures while the western portions closer to the bay have cooler summer temperatures. Average rainfall is 28 inches. (Solano HMP, 2014) Wind conditions vary throughout the county depending on the location and topographical area. During wildfire season, typically from May through November, Solano County is subject to periods of Diablo winds. These winds bring high temperatures, gusting winds, and low humidity to the county. (Id.)

While the general climate of Solano County may be mild, hazard events often center on the climate extremes, such as high wind, heavy rain or tidal flooding, or drought. Climate change is predicted to intensify these climate extremes (California's Fourth Climate Change Assessment, 2018)

### 4.3.4 Demographics and Vulnerable Populations

Population information directly relates to the impacts of hazards in a community. The composition of the population, how it has changed, and how it may change in the future help with future decision making.

This overview of regional demographics comes primarily from the U.S. Census Bureau's American Community Survey five-year estimate period from 2014-2018 (ACS five-year estimate). For this period, the U.S. Census Bureau estimated Solano County's population to be 438,530 people. Figure 4-3 comparatively displays the population of each jurisdiction and the number of households per jurisdiction.

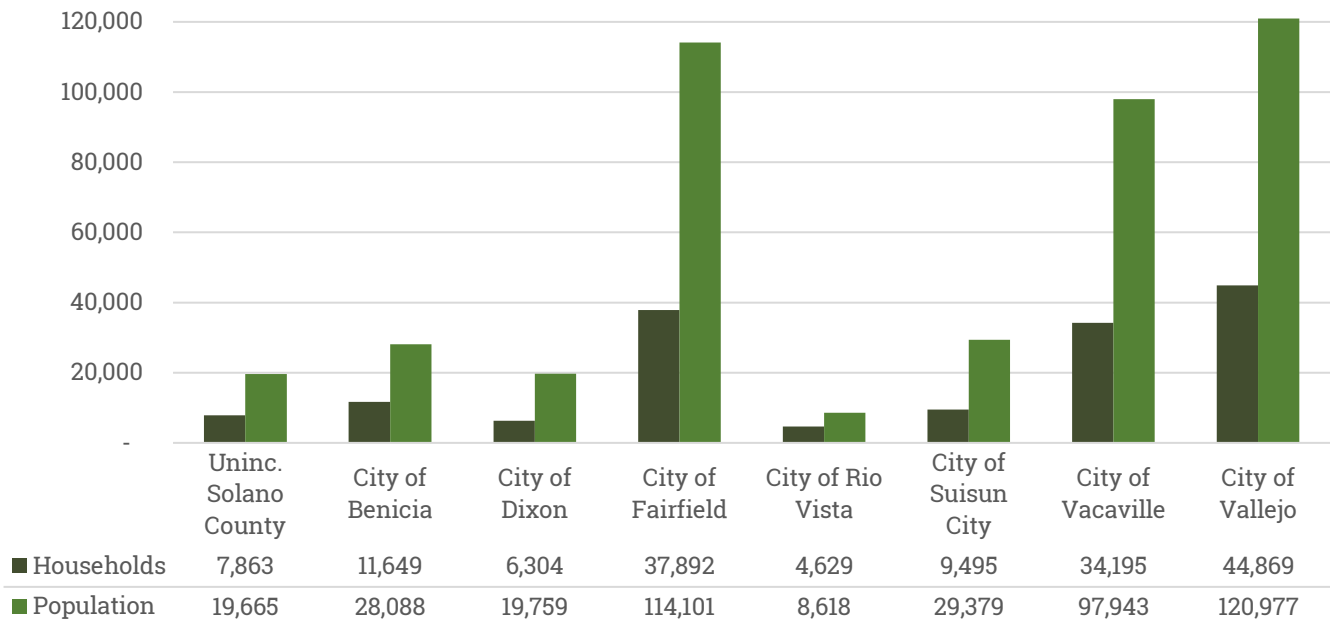


Figure 4-3: Total Households & Populations

Source: 2014-2018 American Community Survey 5-Year Estimates

*Note: The demographics information contained herein has been post-processed based on the U.S. Census Bureau's five-year estimate period from 2014-2018 and will not necessarily match other demographics-based regional studies or plans. In order to examine geometries not available in census reports, including unincorporated county areas, a weighted GIS analysis combined and redistributed block groups. Inherently, the margin of error for this data can be high, especially in more rural areas. This section provides a generalized approximation of specific demographics, reported by various planning study areas. It is not meant to provide any definitive information, but merely to suggest larger trends in the region.*

#### 4.3.4.1 Introduction to Vulnerable Populations

Demographics help identify which populations may be particularly vulnerable to hazard events. Some populations are at greater risk because of age, resources, physical abilities, or other factors. Vulnerability in the face of a hazard event is not a fixed characteristic; the same person may be at risk for some hazards but not at risk for others. For example, a low-income family without a car may be at risk for a wildfire or flood if a quick evacuation is necessary but well-prepared in the event of an earthquake. Some individuals are highly and permanently vulnerable to many hazards, such as the frail elderly, people living with chronic sensory, mobility, or cognitive impairments, and individuals dependent upon assistive devices or complex medical regimens in order to survive. (National Center for Disaster Preparedness, 2020) Vulnerable populations also may be living in hazard-prone areas, compounding their risk.

In the context of all-hazards preparedness and response planning, **at-risk individuals** (often used interchangeably with "**vulnerable populations**") are defined federally as "children, pregnant women, senior citizens, and other individuals who have access or functional needs in the event of a public health emergency." (42 U.S.C. § 2802(b)(4)(B)(2019)) Examples of these populations may include, but are not limited to, individuals with disabilities, who live in institutional settings, from diverse cultures, who have limited



English proficiency or are non-English speaking, who are transportation-disadvantaged, experiencing homelessness, who have chronic medical disorders, or who have pharmacological dependency.

Natural resource managers may be able to reduce the vulnerability of certain populations by increasing the adaptive capacity of affected communities. Examples include cost-sharing to reduce fuels, stabilize structures, or implement flood-reducing measures or educational programs offered in English and Spanish and targeted to specific populations. In particular, planning for vulnerable populations in hazard mitigation can help prioritize resources where they will be the most effective. This section explores the various demographic and economic circumstances surrounding common vulnerable populations.

#### 4.3.4.2 Income and Housing

Income or wealth is one of the most important factors in natural hazard vulnerability. First, low-income populations are less able to afford housing and other infrastructure that can withstand extreme events. Low-income populations typically occupy more poorly-built and inadequately-maintained housing. For example, mobile or modular homes are more susceptible to damage in earthquakes and floods than other types of housing. In urban areas, low-income populations often live in older houses and apartment complexes, which are more likely to be made of unreinforced masonry. This building type is particularly susceptible to damage during earthquakes. Renters are also more vulnerable, as they are less likely to reinforce buildings and buy insurance, and the decision to make major home improvements typically lies with the property owner. Additionally, disaster recovery services target homeowners; renters may not receive as much outreach. See Figure 4-4 for a comparative display of renter-occupied versus owner-occupied buildings per jurisdiction.

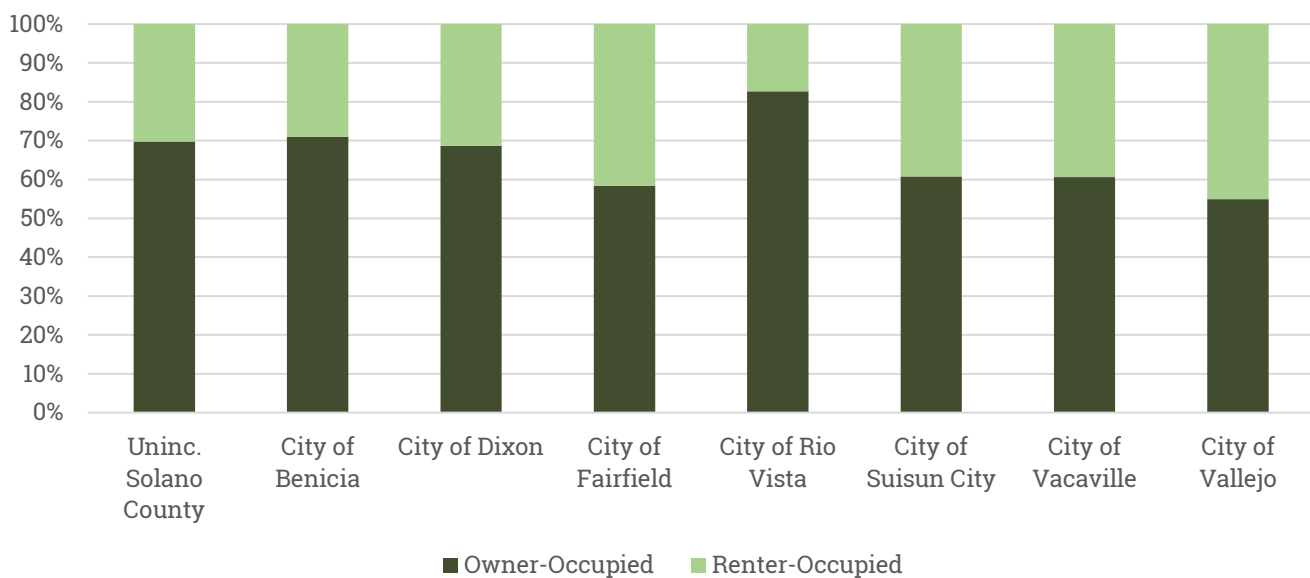


Figure 4-4: Owners and Renters

Source: 2014-2018 American Community Survey 5-Year Estimates

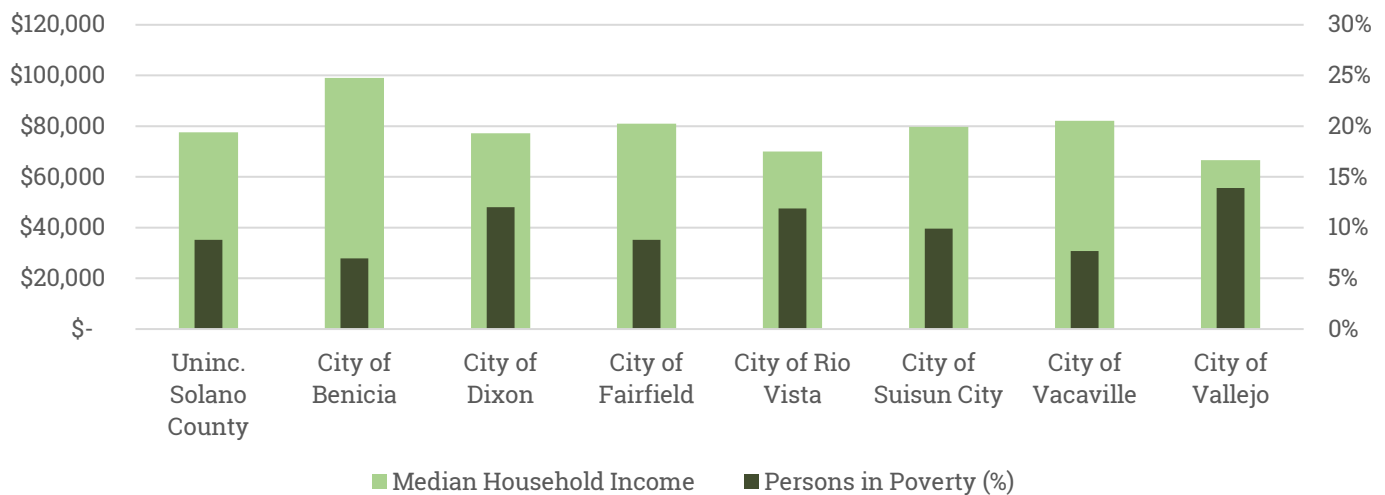




Second, low-income populations are less able to purchase resources needed for disaster response. In the United States, individual households are expected to use private resources to prepare for, respond to, and recover from disasters to a large extent. This means that households living in poverty and minorities are disadvantaged when confronting hazards. The more affluent are able to relocate to safer areas or rebuild following a hazard event. Moreover, individuals who do not own cars or who cannot afford gas for their cars will likely decide not to evacuate. (Krause & Reeves, 2017)

Furthermore, residents below the poverty level are less likely to have insurance to compensate for losses incurred from natural disasters. This means that low-income residents have a great deal to lose during an event and are the least prepared to deal with potential losses. Hurricane events, such as Harvey, Irma, and Katrina, demonstrate that low-income and minority communities are more vulnerable to hazard events and struggle most to recover. (*Id.*)

Figure 4-7 shows the median household income distribution for Solano County. The “median” is the value that divides the distribution of household income into two equal parts (i.e., the middle). The median household income in Solano County in 2019 (in 2019 dollars) was estimated to be \$77,609, compared to \$68,703 across the U.S. (United States Census Bureau, 2019) See Figure 4-5 and Table 4-4 for the median household income per jurisdiction as compared to the persons in poverty for each jurisdiction.



**Figure 4-5: Poverty and Median Income**

Source: 2014-2018 American Community Survey 5-Year Estimates



Table 4-4: Household Income and Poverty Levels

Jurisdiction	Population	Persons in Poverty	Households	Median Household Income
<b>Solano County</b>	<b>438,530</b>	<b>44,427</b>	<b>156,896</b>	<b>\$ 77,609</b>
Uninc. Solano County	19,665	1,728	7,863	n/a
City of Benicia	28,088	1,958	11,649	\$ 99,018
City of Dixon	19,759	2,374	6,304	\$ 77,203
City of Fairfield	114,101	10,049	37,892	\$ 80,950
City of Rio Vista	8,618	1,025	4,629	\$ 70,000
City of Suisun City	29,379	2,912	9,495	\$ 79,759
City of Vacaville	97,943	7,541	34,195	\$ 82,197
City of Vallejo	120,977	16,840	44,869	\$ 66,606

Source: 2014-2018 American Community Survey 5-Year Estimates

#### 4.3.4.3 Age

Children and the elderly may also be more vulnerable during a hazard event. Specific planning attention for the elderly is an important consideration, especially given the current aging of the American population. Elderly vulnerability can vary significantly based on health, age, and economic security. However, as a group, the elderly more often lack physical and economic resources necessary for response to hazard events and are more likely to suffer health-related consequences that can slow recovery.

Elderly persons are more likely to be vision-, hearing-, or mobility-impaired and to experience mental impairment or dementia. Lower-income elderly populations are also less likely to have access to medical care due to financial hardship, and elderly persons in general are more likely to need special medical attention, which may not be readily available during natural disasters.

Additionally, elderly people are often housed in assisted-living facilities where emergency preparedness occurs at the discretion of facility operators. These facilities are typically identified as “critical facilities” by emergency managers because they require extra notice to implement evacuation. Elderly residents living in their own homes may have more difficulty evacuating and could be stranded in dangerous situations.

In many cases, both children and elderly persons depend on others to care for them during day-to-day life. Very young children and the elderly may be vulnerable to injury or sickness; this vulnerability can be worsened during a natural disaster because they may not understand the measures that need to be taken to protect themselves. They also may be weaker and less able to survive a hazard event, even as children often bounce back from illness faster than older populations.

Finally, both children and the elderly have fewer financial resources and are frequently dependent on others for survival. For these populations to remain resilient before and after a natural hazard event, it may be necessary to assist them with resources provided by county, city, state, or federal emergency management agencies and organizations.



Based on the American Community Survey five-year estimates, 29 percent of Solano County households include elderly individuals. Table 4-5 displays age and household information county-wide and for individual jurisdictions, including total households, total number of households with elderly members, households that are 65 and older living alone, and households with someone who is 65 and older living in poverty. Table 4-6 displays county-wide information on households with minors under 18 years old and single parents. Figure 4-6 displays comparative values for jurisdictions with households with minors or with elderly persons over 65. The overall age distribution for Solano County is illustrated in Figure 4-8 for the population under 18 and Figure 4-9 for the population over 65. Figure 4-8 shows that the highest urban concentrations of people under the age of 18 occur in several municipal areas, including the cities of Fairfield, Dixon, Suisun City, and Vacaville.

Table 4-5: Elderly Households

Jurisdiction	Total Households	Total Households w/ 65+	(%)	Households w/ 65+ Living Alone	Households w/ 65+ Living in Poverty
<b>Solano County</b>	<b>156,896</b>	<b>44,832</b>	<b>29%</b>	<b>13,757</b>	<b>2,999</b>
Uninc. Solano County	7,863	2,711	34%	565	93
City of Benicia	11,649	3,830	33%	1,309	189
City of Dixon	6,304	1,584	25%	359	12
City of Fairfield	37,892	9,634	25%	2,623	578
City of Rio Vista	4,629	2,513	54%	742	190
City of Suisun City	9,495	2,280	24%	584	119
City of Vacaville	34,195	9,169	27%	3,477	686
City of Vallejo	44,869	13,111	29%	4,098	1,132

Source: 2014-2018 American Community Survey 5-Year Estimates



Table 4-6: Households with Minors and Single Parents

Jurisdiction	Total Households	Households w/ Minors	(%)	Single Parent Households with Minors <18
<b>Solano County</b>	<b>156,896</b>	<b>52,536</b>	<b>33%</b>	<b>15,236</b>
Uninc. Solano County	7,863	1,721	22%	310
City of Benicia	11,649	3,512	30%	732
City of Dixon	6,304	2,454	39%	658
City of Fairfield	37,892	15,122	40%	3,984
City of Rio Vista	4,629	512	11%	143
City of Suisun City	9,495	3,631	38%	948
City of Vacaville	34,195	11,696	34%	3,296
City of Vallejo	44,869	13,888	31%	5,165

Source: 2014-2018 American Community Survey 5-Year Estimates



Figure 4-6: Households with Minors and Elders

Source: 2014-2018 American Community Survey 5-Year Estimates

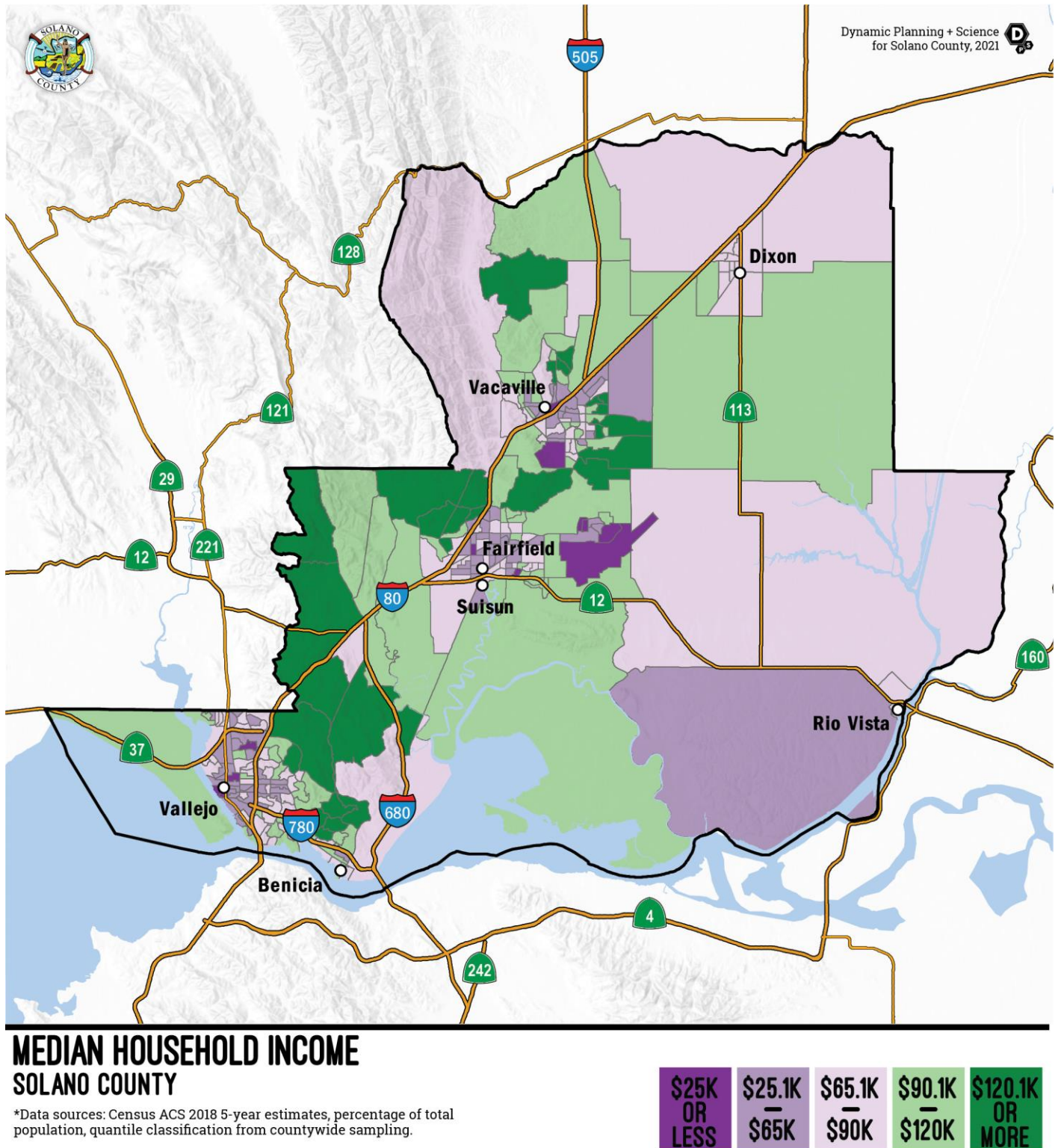


Figure 4-7: Median Household Income Distribution



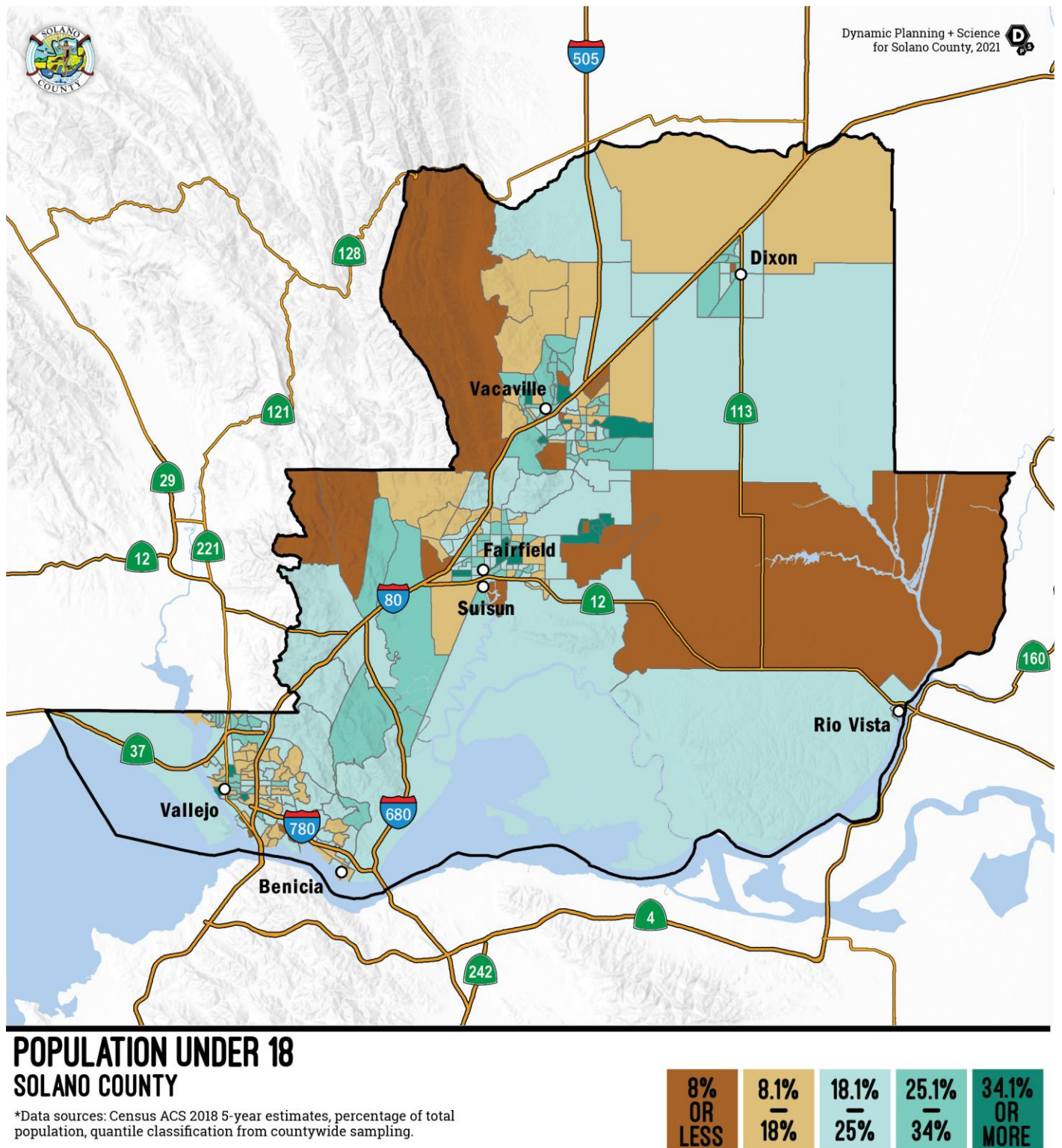


Figure 4-8: Population Under Age 18

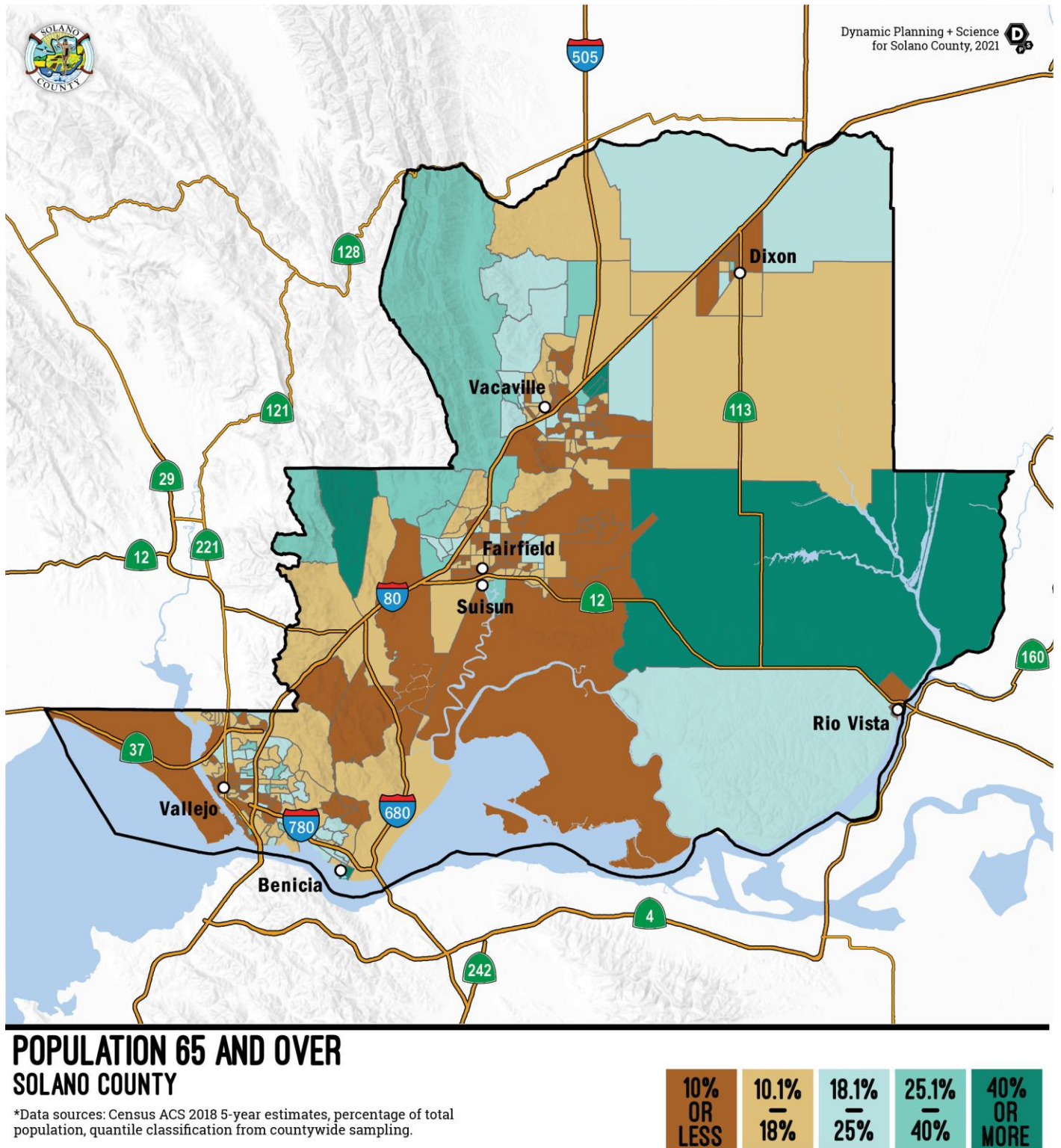


Figure 4-9: Population Over Age 65



#### 4.3.4.4 Race, Ethnicity, and Language

Non-English or limited-English speakers may have difficulty understanding emergency information as a result of language and literacy barriers. Non-white communities in fire-prone areas appear to be less able to adapt to a wildfire event. (Levin, Phil; Davies, Ian, 2019) Farmworkers may be particularly vulnerable during a hazard event, especially those that are non-English speaking and those living in temporary worker housing. (California Employment Development Department, 2019) (U.S. Dep't of Ag, 2017) Disparities in emergency response between white and other racial or ethnic populations may be due to higher proportions of non-white persons living below the poverty line; low-income status can compound vulnerability for many reasons described herein such as access to transportation, adequate housing, and medical services.

According to the American Community Survey five-year estimates, approximately 13 percent of total households speak Spanish, with two percent speaking limited English. Figure 4-10 depicts the non-English-speaking language distribution for Solano County for 2014-2018.

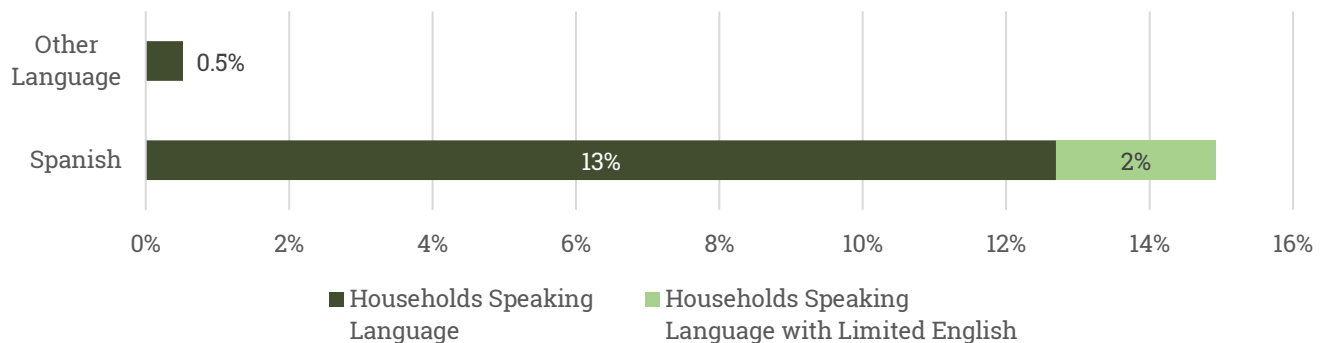


Figure 4-10: Household Language

Source: 2014-2018 American Community Survey 5-Year Estimates

Also according to the ACS five-year estimates, Solano County is predominately white, at more than 50 percent of the total population. The largest minority population is Hispanic, at over 25 percent of the total county population. Figure 4-12 shows the racial distribution within Solano County and Figure 4-11 displays the percentage of population which is Hispanic versus not Hispanic.

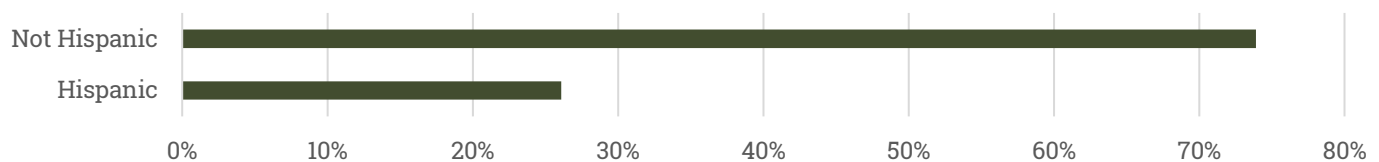


Figure 4-11: Hispanic Population

Source: 2014-2018 American Community Survey 5-Year Estimates

*Note: Hispanic includes all individuals who identify with one or more nationalities or ethnic groups originating in Mexico, Puerto Rico, Cuba, Central and South America, and other Spanish cultures. In Addition, people who are Hispanic may be of any race, people in each race group may be either Hispanic or Not Hispanic, and each person has two attributes, their race (or races) and whether or not they are Hispanic.*



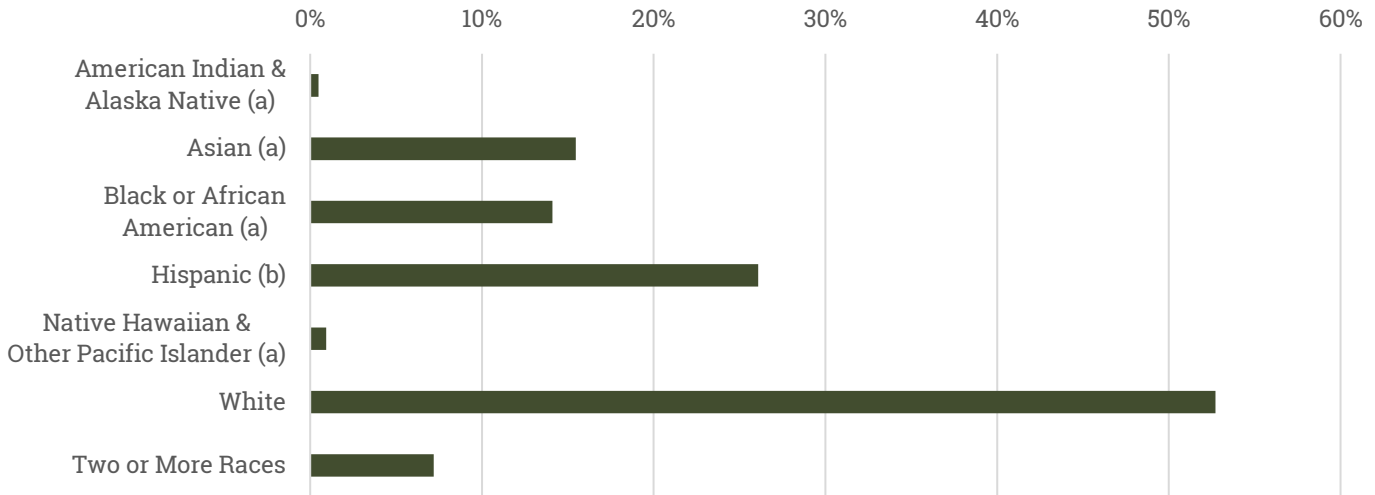


Figure 4-12: Solano County Race Distribution in 2014-2018

Source: 2014-2018 American Community Survey 5-Year Estimates

Note: Hispanic persons may be of any race, so are included in applicable race categories. This has the effect of influencing total population percentage. (a) Includes persons reporting only one race. (b) Hispanics may be of any race, so also are included in applicable race categories.

#### 4.3.4.5 At-Risk Individuals with Access and Functional Needs

Access and functional needs may interfere with the ability to access or receive medical care before, during, or after a disaster or emergency. Irrespective of a specific diagnosis, status, or label, the term “access and functional needs” refers to a broad set of cross-cutting needs, generally distinguished into **access-based** or **function-based** according to the following:

- **Access-based needs** require that resources are accessible to all individuals, such as social services, accommodations, information, transportation, and medications to maintain health.
- **Function-based needs** refer to restrictions or limitations an individual may have that requires assistance before, during, or after a disaster or public health emergency.

At-risk individuals may have additional needs that must be considered in planning for, responding to, and recovering from a disaster or emergency. A recommended approach for integrating the access and functional needs of these individuals is to consider elements based on the following “CMIST” framework:

- **Communication** – Individuals who may have limitations that interfere with the receipt of and response to information require information to be provided in an appropriate and accessible format. This can include individuals who are deaf or hard of hearing, individuals who speak American Sign Language, individuals who have limited or no English proficiency, individuals who are blind or have low vision, and individuals who have cognitive or physiological limitations.
- **Maintaining Health** – Individuals who may require Personal Assistance Services (or personal care assistance) in maintaining their activities of daily living, such as eating, dressing, grooming, transferring, and toileting.



- **Independence** – Includes individuals who function independently if they have their assistive devices, such as consumable medical supplies (e.g., diapers, formula, bandages, ostomy supplies, etc.), durable medical equipment (e.g., wheelchairs, walkers, scooters, etc.), or service animals.
- **Services and Support** – Includes support for individuals with behavioral health needs, those who have psychiatric conditions (e.g., dementia, Alzheimer's disease, Schizophrenia, etc.), pregnant women, nursing mothers, infants, and children.
- **Transportation** – Includes individuals with transportation needs because of age, disability, temporary injury, poverty, addiction, legal restriction, or those who do not have access to a vehicle. This requires coordination to ensure access to mass transit and accessible vehicles, such as para-transit. (U.S. Department of Health & Human Services, 2016)

While most individuals with access and functional needs do not have acute medical needs requiring the support of trained medical professionals, many will require assistance to maintain health and minimize preventable medical conditions. These individuals may require more time and assistance during an evacuation. It is estimated that approximately 12 percent of the total population have a disability, at least six percent of the population between the ages of 18 and 64 have some form of disability, and about five percent of people over age 65 have some form of disability, as shown in Table 4-7. Figure 4-13 depicts the percentage of people who depend on public transportation compared with the percentage of people who are experiencing some kind of disability in each jurisdiction. (American Community Survey, 2018) There is overlap between some of these population subsets and carless and transit-dependent populations.

Of the total number of households in Solano County, approximately 4.8 percent are households with no vehicle available. (American Community Survey, 2018) Vulnerable populations without private transit may be at an increased risk during emergencies due to lack of rapid access to medical services and limited ability to rapidly evacuate an at-risk area. These numbers warrant special attention from planners and emergency managers. Additionally, where cell reception services are limited, individuals may need alternate means of transportation to ensure access to adequate information communication services. Likewise, in addition to preemptively improving cellular service reliability, disseminating maps which indicate the locations of superior cell reception may aid individuals seeking better information communication access during an emergency.



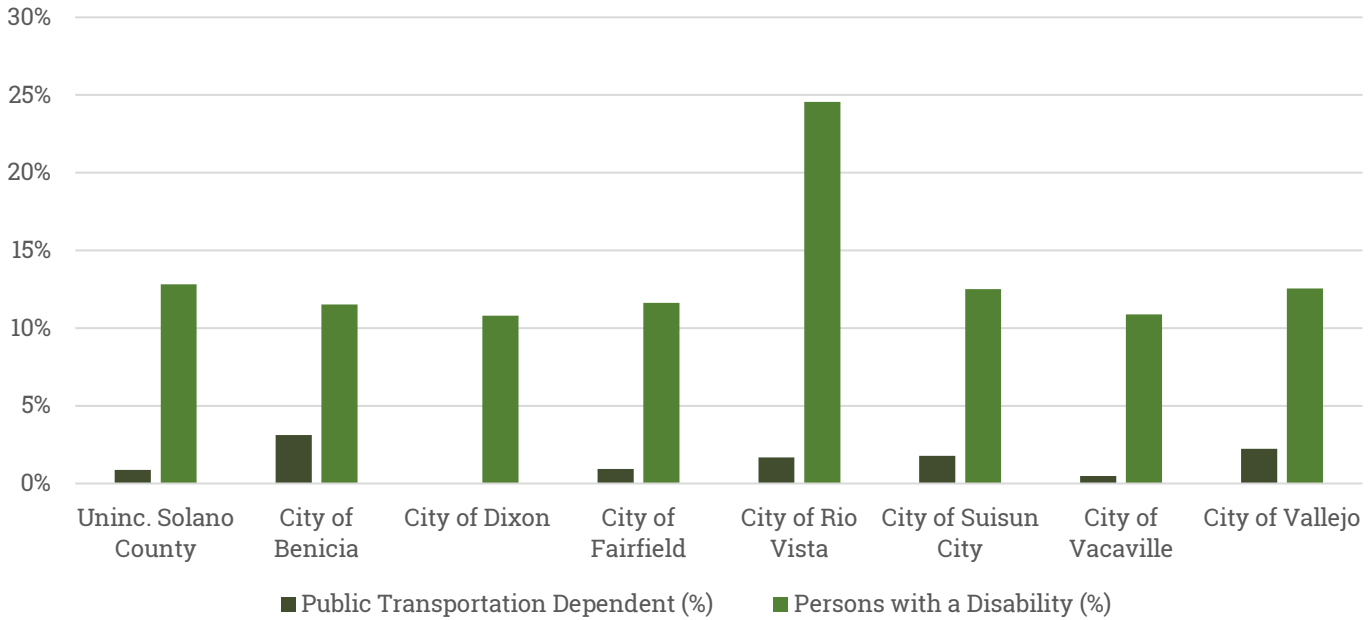


Figure 4-13: Public Transportation Dependence & Disabilities

Source: 2014-2018 American Community Survey 5-Year Estimates

Table 4-7: Disability Status of Non-Institutionalized Population in Solano County in 2014-2018

Jurisdiction	Population	Persons with a Disability	(%)	Persons with a Disability		
				Under 18	18-64	65+
<b>Solano County</b>	<b>438,530</b>	<b>52,805</b>	<b>12%</b>	<b>3,784</b>	<b>26,890</b>	<b>22,131</b>
Uninc. Solano County	19,665	2,522	13%	92	1,269	1,161
City of Benicia	28,088	3,236	12%	191	1,413	1,632
City of Dixon	19,759	2,136	11%	131	1,297	708
City of Fairfield	114,101	13,266	12%	1,136	7,265	4,865
City of Rio Vista	8,618	2,117	25%	61	684	1,372
City of Suisun City	29,379	3,677	13%	382	2,046	1,249
City of Vacaville	97,943	10,669	11%	1,022	5,068	4,579
City of Vallejo	120,977	15,182	13%	769	7,848	6,565

Source: 2014-2018 American Community Survey 5-Year Estimates

Note: Age ranges are sums of multiple male/female and age range fields.

#### 4.3.4.6 Environmental Justice Nexus

Environmental justice issues can often exacerbate public health impacts from hazard events, and vice versa. The United States Environmental Protection Agency (EPA) defines environmental justice as the “fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.” (EPA, 2021)



As discussed above, natural hazards can disproportionately impact low-income and vulnerable populations. Lower-income populations, for instance, are more likely to live in neighborhoods that are more susceptible to flooding, or near industrial areas and hazardous waste sites, which can put them at higher risk to toxic leaks associated with flood and storm damage. (Sherwin, 2019) In California, wildfires have increased in frequency and duration in recent years. Elderly, low-income residents, and Native American populations that are already living in air quality-impacted areas are impacted by the compounding impact of wildfire smoke. Other associated impacts from wildfires include physical, and psychological stress from evacuation, property loss, physical injury or death, and smoke related impacts to health. (Shahir Masri et al., 2021)

Certain locations within Solano County are known to be at higher risk of natural hazard related impacts to vulnerable populations. For instance, western portions of the City of Vallejo are associated with higher levels of diesel particulate matter, toxic releases, lead from housing, and hazardous waste. These same areas are associated with high unemployment, high poverty rates, and relatively high numbers of minority populations. (Office of Environmental Health Hazard Assessment, 2021) The southeastern part of unincorporated Solano County near Rio Vista also experiences environmental vulnerabilities such as groundwater threats, impaired waters, and proximity to hazardous waste. (*Id.*) These environmental justice concerns may contribute to adverse public health impacts in the event of flooding or high rain events in the area. It is vital that environmental laws and regulations as well as natural hazard mitigation planning meaningfully include these communities in their efforts at accounting for public health and safety.

#### **4.3.4.7 Mental Health Impacts of Hazard Events**

Natural hazard events are associated with mental health impacts. Specifically, natural hazards can precipitate anxiety, depression, shock, extreme stress, or Post Traumatic Stress Disorder (PTSD). (Makwana, 2019) Natural hazards also cause socio-economic loss through damages to housing and displacement, which can lead to mental health challenges. The death or injury of a family member or a loved one can lead to substantial psychological vulnerabilities as well. (*Id.*)

#### **4.3.5 Economy**

Solano County is generally divided economically into east and west regions. The western portion of the county, which includes the cities of Vallejo and Benicia, has large concentrations of petrochemical and associated heavy industry production. Its labor force is also more closely associated with the San Francisco Bay Area. The eastern region of the county extends along the Interstate 80 corridor and includes the cities of Fairfield, Vacaville, and Dixon and Travis Airforce Base (Travis AFB). Travis AFB is a vital base for military airlift operations and humanitarian aid throughout the world and, as the largest employer in the county, is a singular driver for Solano County's economy. The annual economic impact of the base is more than \$1.6 billion. Travis AFB has a workforce of 13,400; about 60 percent of this workforce resides in the county. (Solano County 2017-2020 Comprehensive Economic Development Strategy, 2017) In addition to Travis AFB, the major employers in Solano County include Genentech, Janssen/ALZA Corporation, Kaiser Permanente,



NorthBay Healthcare, and the Jelly Belly Candy Company.

The Association of Bay Area Governments (ABAG) has predicted a number of anticipated high-growth industry sectors. These include health, education, recreational services, manufacturing, wholesale, and transportation sectors. The County will increase employment in the sectors of health, education, and recreational industries by approximately 25,030, through the year 2030. (Solano HMP, 2014)

Solano County is a largely rural area, with most of its urban growth occurring in incorporated cities. The unincorporated portions of the county are characterized by agriculture. Approximately 327,000 acres of the unincorporated county, or 66.6 percent, has been designated as agricultural. (Solano HMP, 2014, p. 2.10) Fruits and nuts are produced in the largest quantities, followed by vegetable crops, field crops, and animal production. In the unincorporated areas, businesses have traditionally included food and animal processing, wineries, and limited commercial, industrial, and retail development. The Suisun Valley is a burgeoning wine region with wine tasting venues, wineries, fruit stands, and small commercial areas. Solano County has been supporting this growing agricultural tourism market. (Solano County 2017-2020 Comprehensive Economic Development Strategy, 2017) Many of the cities and unincorporated areas also offer recreation and tourism economic opportunities.

Labor force participation in Solano County experienced a downturn in 2009, which only recently began to increase after a decade of falling levels. In 2018, the participation rate increased from 60.2 to 60.4 percent. The impacts of the ongoing COVID-19 crisis are likely to have a mixed effect on labor force levels; some workers may retire, some may involuntarily exit, and some may be able to re-enter the labor force. (County of Solano and Solano Economic Development Corporation, 2020)

In recent years, Solano County has concentrated on diversifying the number and type of industries within the county. Large sectors include educational services, health care and social assistance, retail trade, as well as professional, scientific, management, administrative, and waste services. The arts, entertainment, recreation, and food services are also large employers. According to the U.S. Census Bureau, for the 2019 five-year estimates there were 206,978 jobs in all sectors in Solano County. Table 4-8 shows the number of jobs by major sector in the county in 2019.



Table 4-8: Industry by Occupation for the Civilian Employed Population 16 Years and Over

Occupation	Total	Percent of total employment (in %)
<b>Educational services, and health care and social assistance</b>	48,593	26.2
<b>Retail trade</b>	23,492	4.5
<b>Professional, scientific, management, administrative, and waste services</b>	20,238	23.3
<b>Arts, entertainment, recreation, accommodation, and food services</b>	18,927	63.4
<b>Construction</b>	17,713	0.7
<b>Manufacturing</b>	17,696	3.4
<b>Public administration</b>	14,177	32.6
<b>Transportation, warehousing, and utilities</b>	13,538	2.6
<b>Finance and insurance, and real estate and rental leasing</b>	11,610	4.2
<b>Other services, except public administration</b>	9,619	44.5
<b>Wholesale trade</b>	4,786	4.1
<b>Information</b>	3,542	1.6
<b>Agriculture, forestry, fishing and hunting, and mining</b>	3,047	7.3

Source: U.S. Census Bureau American Community Survey 2019 5-Year Estimates via  
<https://data.census.gov/cedsci/table?q=solano%20county&tid=ACST5Y2019.S2405&hidePreview=false>

### 4.3.6 Past and Future Trends in Development

Solano County has historically been known for Travis Air Force Base as a major military and government employer, as well as its agricultural base, which encompasses about 66 percent of the unincorporated county. The unincorporated areas of the county are known for agricultural production and limited commercial, industrial, and retail development. Past practices relating to agricultural production may not always have appreciated the secondary effects of this kind of development. Such effects could have exacerbated natural hazards, such as flooding or soil instability. (Solano County 2017-2020 Comprehensive Economic Development Strategy, 2017)

For future development, the County has implemented a Comprehensive Economic Development Strategy which includes measurable actions for business retention and expansion, marketing and business attraction, competitiveness, and the development of a resource hub. The strategy also includes a summary of the capital improvements and other economic development projects that have been planned for the county and incorporated cities. These include enhancing the flow of goods and services in the industrial and major commercial areas and opening up new areas for future development. (Solano County 2017-2020 Comprehensive Economic Development Strategy, 2017)

Likewise, the General Plan for Solano County identifies targeted industries for economic development. In particular, the County has identified commercial and industrial services that are supportive of agricultural growth as being vital to future economic development. Additionally, the County has identified alternative energy industries, including solar, wind, biofuels, and land uses or processes with the potential to generate energy, as an important potential economic focus. (Solano County General Plan, 2008)



Past development that most increased the risk of hazards in the county happened many decades and even more than a century ago. The County and other participating jurisdictions are well aware of areas of increased hazard risk from older development.

Development in the last few decades has occurred with minimized hazard risk because of the existing overlay of federal, state, and local regulations. First, the County and its municipal, participating jurisdictions all adopt general plans (GPs), which serve as blueprints for establishing long-range development policies as directed by California's General Planning Law. A GP provides a basis for private development proposals and public projects to remain consistent with existing city, regional, and state policies. The GP is designed to help the county and participating jurisdictions address issues related to land use, circulation (traffic), housing, open space, conservation, noise, and safety. The Land Use Element of the GP serves as a guide to the county and participating jurisdictions in determining the location of future development, to include possible future annexations for municipal jurisdictions. The Safety Element helps to decrease the risk of and impacts from various natural hazards through multiple required components and subsections, including health and public safety as required by the California State Law.

All participating jurisdictions reviewed their GPs under the capabilities assessments undertaken for this hazard mitigation plan. Deficiencies revealed by these reviews are identified as mitigation actions to decrease risks and move beyond past trends.

Moreover, while past development has occurred in hazard areas and increased hazard risks to some degree, development standards and performance measures, oftentimes incorporated into specific plans, are now employed to reduce risk. These development standards are continually being improved and will continue to be strengthened in the future.

General trends in job growth predictions for Solano County depict a positive growth estimate of 5.5 percent in net gain from 2019 to 2030. (County of Solano and Solano Economic Development Corporation, 2020) All industry sectors are projected to grow in Solano County, except for construction, farm-related, and information-related jobs (e.g., software and publishing). See Figure 4-14. Construction jobs are predicted to decrease, potentially due to initial growth in the early 2020s followed by a decrease as home and commercial construction reaches a short-lived peak. Health and education, as well as professional services, are predicted to grow the most, with a percentage change of 11 percent and 10 percent, respectively. (Caltrans, 2021)



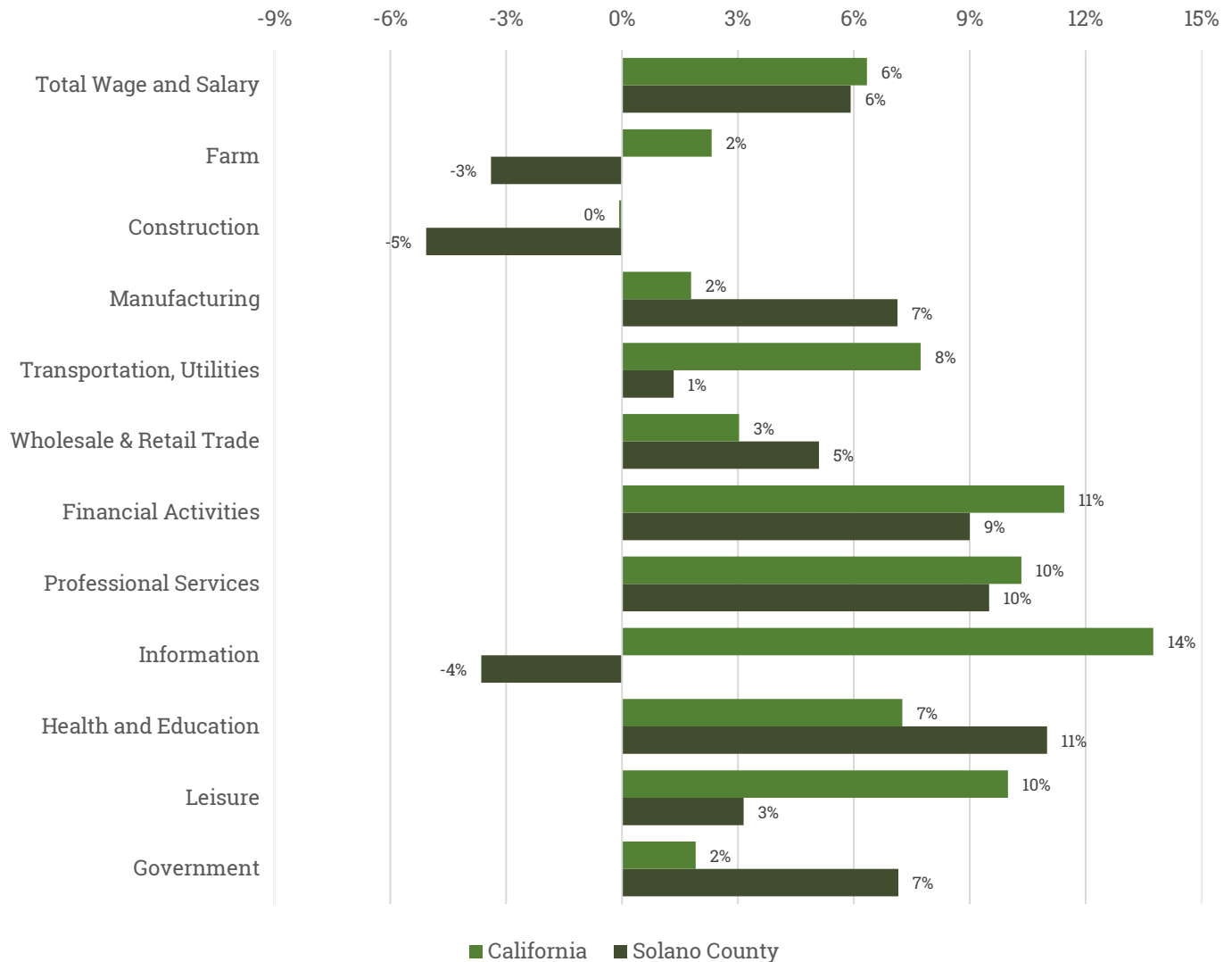


Figure 4-14: Solano County Estimated Percentage Change (%) in Jobs by Industry Sector, 2019 to 2030

Source: (Caltrans) Long-Term Socio-Economic Forecasts by County

Participating jurisdictions have gone to great lengths to ensure future development within hazard areas is minimized and mitigated to the greatest extent possible. Solano County’s capabilities assessment in Section 5.4 of Volume 1 and each jurisdiction’s capabilities assessment in Volume 2 of this MJHMP explain those proactive steps in greater detail. Buildings are increasingly more resilient to hazards through California’s building codes, some of the strongest in the country. Nationally, building codes have continually improved disaster resilience, and since 1990 those great improvements have added approximately one percent to construction costs. (National Institute of Building Sciences, 2019)



## 4.4 Vulnerability Assessment Methods

This section provides an overview of the methods used in the vulnerability assessments in Section 4.5. Vulnerabilities to Specific Hazards. Each hazard included in Section 4.5 is assessed in a two-step process. First, population, critical facilities, and county parcels are inventoried to develop a “lay of the land.” Second, the inventories are used to calculate estimated exposure and damage from hazards at various levels of severity. A more detailed explanation of the methodology is included in Appendix A. The Climate Vulnerability Assessment in Appendix C includes additional methods outlined at the end of this section.

The vulnerability assessment uses geospatial data along with local knowledge of past events. Geospatial data is essential in determining population and assets exposed to hazards identified in this plan. Geospatial analysis can be conducted if a natural hazard has a spatial footprint that can be analyzed against the locations of people and assets. In Solano County, wildfire, flood, earthquake, tsunami, slope failure, and landslide hazards have identifiable geographic extents and corresponding spatial information.

### 4.4.1 Population and Asset Inventory

To describe vulnerability for each hazard, it is important to first understand the total population and assets at risk. Population and asset inventories provide a baseline to measure the vulnerability for natural hazard events. Asset inventories can also be used to estimate damages and losses expected during a “worst-case scenario” event for each hazard. Figure 4-15 provides a summary of how and what data sources are used to provide exposure and damage estimation results. More detail on the risk assessment analysis is provided in Appendix A. The following sections describe the total population, critical facilities, and parcel inventory inputs.

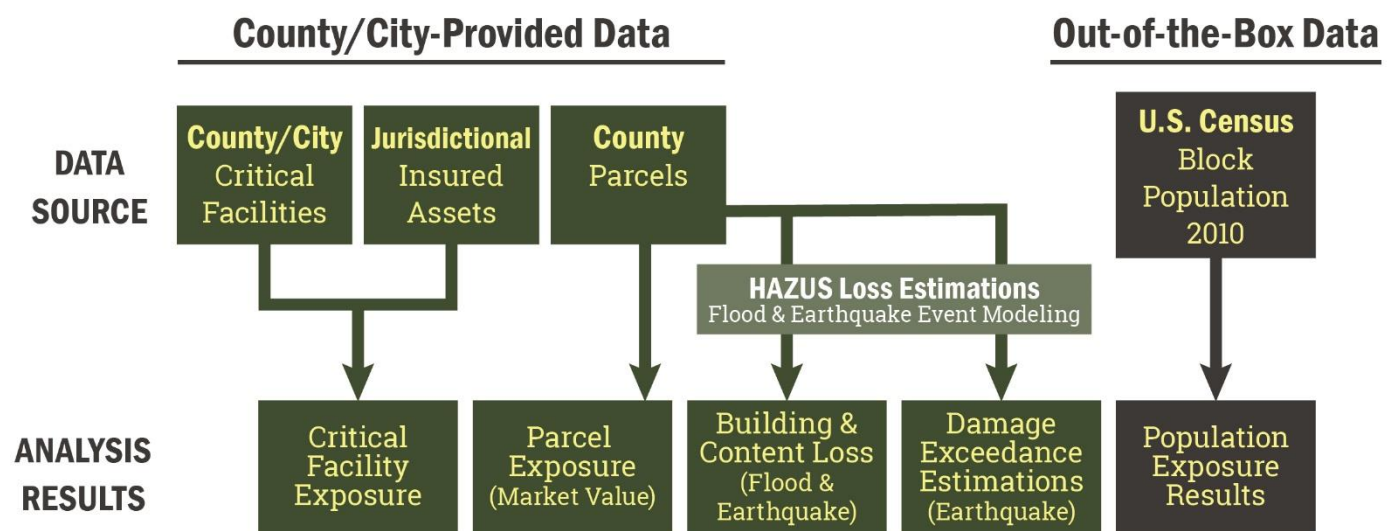


Figure 4-15: Data Source and Method



#### 4.4.1.1 Population

An initial step in producing the hazard-specific vulnerability assessments is to determine the population near each natural hazard. Each natural hazard scenario affects county residents differently depending on the location of the hazard and the population density where the hazard event could occur. For hazards that potentially affect the whole county, such as earthquake or drought, the vulnerability assessment assumes 438,530 persons or 100 percent of Solano County's population is exposed.<sup>2</sup> Vulnerability assessments presented in Section 4.5 summarize the population exposure for each natural hazard, if available.

#### 4.4.1.2 Critical Facilities Inventory

Critical facilities are of particular concern when planning to mitigate hazards. A critical facility is a structure or other improvement that, because of its function, size, service area, or uniqueness, has the potential to cause disruption of vital socioeconomic activities if it is destroyed, damaged, or functionally impaired.

Critical facilities inventory data was developed from a combination of datasets, including from county, city, special purpose district, state, federal, and private industry sources. A critical infrastructure spatial database was developed to translate critical facilities information into georeferenced<sup>3</sup> points and lifelines.

**Critical facility points** include facilities such as police stations, fire stations, hospitals, elder care facilities, child care facilities, schools, transportation infrastructure, utilities, and government buildings. **Lifelines** include facilities related to electric power, liquid fuel, natural gas, and transportation routes. A current representation of the critical facility points and lifelines are provided in Figure 4-16. Some critical facility information may have been omitted from this document due to national security purposes. For additional information on included critical facilities, see Appendix A.

Critical facilities and transportation and lifeline data comes from a collection of sources, listed in Appendix A. All data sources have a level of accuracy acceptable for planning purposes. Due to the sensitivity of this information, a detailed list of facilities is not provided. More detailed critical facilities lists are on file with each jurisdiction. The risk assessment for each hazard qualitatively discusses critical facilities with regard to each hazard's severity footprint.

---

<sup>2</sup> Population estimates were derived from 2014-2018 Census American Community Survey 5-Year information.

<sup>3</sup> To georeference something means to define its existence in physical space. That is, establishing its location in terms of map projections or coordinate systems. The term is used both when establishing the relation between raster or vector images and coordinates, and when determining the spatial location of other geographical features.

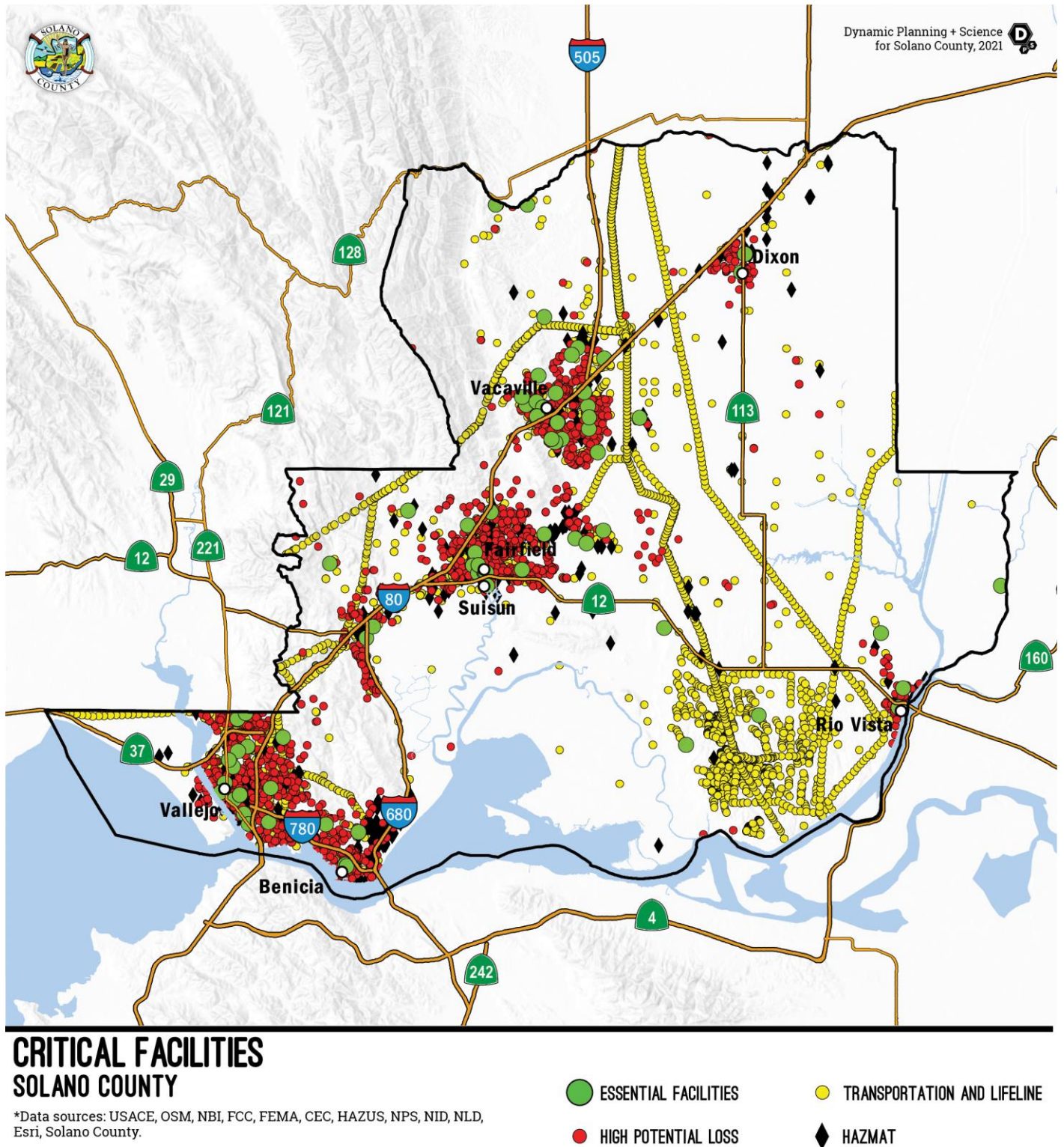


Figure 4-16: Critical Facilities





### 4.4.1.3 Parcel Value Inventory

The Solano County Assessor's data is essential to developing parcel values exposed to each hazard and includes the current fair market value of at-risk assets. The Solano County Parcel Value Inventory is summarized in Table 4-9. This table only includes parcels that are located in unincorporated Solano County. The Parcel Value Inventory includes the market value,<sup>4</sup> content replacement value, and total assessed value ("total value"), and each hazard profile outlines predicted impacts to this inventory for each hazard's geographic extent. These elements are called out in the table because, in the event of a disaster, the value of the infrastructure or improvements to the land is usually the focus of concern. Generally, the land is not a total loss, and structures can be rebuilt and contents replaced.

"Total market value" as presented in this plan reflects Solano County Assessor data. Where building areas were available, a replacement value of \$250 per square foot was used. If no area was available for a given property, the value reflects the assessed improvement value.

"Total content value" was calculated based on the Assessor's use codes, translated to occupancy-based multipliers. Each occupancy class prescribes a specific content cost multiplier used to calculate the content cost values shown in the summary and in the hazard profiles in Section 4.5. Occupancy-based content cost multipliers used in this plan reflect those found in the FEMA Hazus-MH 4.2 technical manuals.

Table 4-9: Unincorporated Solano County Parcel Counts and Value

	Total Parcels	Total Market Value (\$)	Total Content Value (\$)	Total Value (\$)
Unincorporated County	6,668	\$3,186,640,275	\$2,078,097,240	\$5,264,737,515

*Note: Total market value as provided by County Assessor's Office and based on \$250/sqft where available. Content value calculated using content multipliers per Hazus occupancy classes per county land use designation. Total value is the sum of total market value and total content value. Improved Parcels Only.*

### 4.4.2 Hazard Exposure and Damage Estimation

Population and inventory information are used to generate specific exposure and damage estimations based on the severity of specific hazard events. The hazards in the county which have known geographic extents and corresponding spatial information, and thus have exposure and damage estimations, are:

Profiled Hazards	Other Hazard Information
Earthquake	Liquefaction
Flooding	Zone of Investigation
Sea-Level Rise	NLD Leveed Areas
Slope Failure	Dam Inundation
Wildfire	

<sup>4</sup> Market Value includes a long-term asset which indicates the cost of the constructed improvements to land, such as buildings, driveways, walkways, lighting, and parking lots.



## Population and Asset Exposure

“Exposure” of assets and population refers to the total counts of parcels, people, facilities, and assets within the planning area in which a hazard event may occur. A natural hazards overlay was developed to reflect the combination of many known natural hazard spatial footprints. The spatial overlay method enables summarization of building values, parcel counts, population exposure, and critical facility exposure within a hazard’s geographic extents. Figure 4-17 illustrates hypothetical flooding exposure. Exposure numbers were generated using Solano County Assessor data, address points, and parcel data for replacement and content cost estimates.



Figure 4-17: Hazard Exposure Explanation Graphic

## Damage Estimation

For flood and earthquake, detailed damage estimations were conducted through FEMA’s Hazus software. Hazus is a nationally applicable, standardized methodology that contains models for estimating potential losses from earthquakes, floods, and hurricanes. Hazus uses Geographic Information Systems (GIS) technology to estimate the physical, economic, and social impacts of disasters. The estimated damage and losses provided by the Hazus Software is based upon chosen severity of events and provides the ability to understand possible widescale damage to buildings and facilities.

In the hypothetical geography shown in Figure 4-18, even though both structures are exposed to flooding, it is expected that the structure with a first-floor height below the depth of flooding will receive significantly more damage than the structure with a first-floor height above the expected water depth. For a more detailed explanation of risk assessment methods, see Appendix A.

At-risk populations, critical infrastructure, improved parcels, and loss results for each hazard category are provided in bar chart summary tables in Section 4.5 to evaluate the percentage of assets exposed to different types of hazards. The side-by-side comparison allows participating jurisdictions to evaluate the impacts of potential hazards to prioritize hazard mitigation energy and resources.

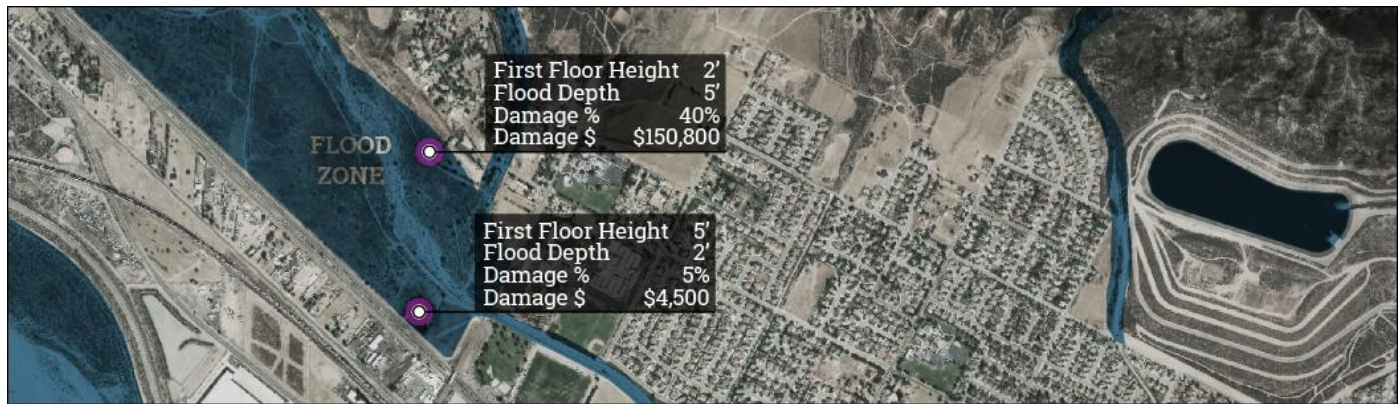


Figure 4-18: Hazus Damage Estimation Example

### 4.4.3 Climate Vulnerability Assessment

Appendix C is a detailed Climate Vulnerability Assessment (CVA), conducted for each climate change-related vulnerability identified by the County, with additional CVAs conducted for each participating jurisdiction as an appendix to each annex.

Jurisdictions considered whether specific vulnerability descriptions identified for each prioritized hazard, also called areas of concern or problem statements, contained a nexus with climate change. An area of concern has a climate nexus if climate change is worsening or predicted to worsen impacts of the hazard to the population or asset in question.

If the area of concern had a nexus with climate change, each jurisdiction then assessed both the impact of climate change to the area of concern and the jurisdiction's capacity to adapt to the predicted future impact, also known as "adaptive capacity." Adaptive capacity is a community or region's existing ability to moderate climate change impacts. Assessing adaptive capacity includes analysis of policies, plans, programs, funding, and staffing capacity. (Cal. Adaptation Planning Guide, 2020, p. 94)

Jurisdictions evaluated potential climate change impacts and jurisdictional adaptive capacity according to the matrix in Figure 4-19, where impacts range from low to high and adaptive capacity ranges from high to low. These rankings are qualitative and incorporate jurisdictional feedback, existing studies and resources, and an understanding of population demographics and vulnerabilities. See Section 4.3.4.

The impact and adaptive capacity ranking combine to give the climate change vulnerability score. The scoring is then used to prioritize mitigation actions based on vulnerability to climate change. This assessment is completed as a part of the overall MJHMP; jurisdictions may want to complete a more detailed Climate Vulnerability Assessment as part of in-depth climate adaptation planning.



POTENTIAL IMPACTS				
<b>CLIMATE CHANGE VULNERABILITY SCORING</b>  Source: CalOES Adaptation Planning Guide, 2020	<b>HIGH</b> Impact is <b>highly likely</b> based on projected exposure; would result in <b>substantial consequences</b> to public health, safety, and/or other metrics of concern.	3	4	5
	<b>MEDIUM</b> Impact is <b>somewhat likely</b> based on projected exposure; would result in <b>some consequences</b> to public health, safety, and/or other metrics of concern.	2	3	4
	<b>LOW</b> Impact is <b>unlikely</b> based on projected exposure; would result in <b>minor consequences</b> to public health, safety, and/or other metrics of concern.	1	2	3
		ADAPTIVE CAPACITY		
		HIGH	MEDIUM	LOW
		The population or asset has <b>high capacity</b> to manage climate impact; <b>minimal to no changes</b> are required.	The population or asset has <b>some capacity</b> to manage climate impact; <b>some changes</b> would be required.	The population or asset <b>lacks capacity</b> to manage climate impact; <b>major changes</b> would be required.

Figure 4-19. Climate Change Vulnerability Scoring Matrix

This climate vulnerability assessment method closely follows the process outlined in the CalOES's June 2020 [Adaptation Planning Guide](#), leveraging overlapping processes in place for this MJHMP.



## 4.5 Vulnerability to Specific Hazards

This section introduces prevalent hazards within the unincorporated portions of Solano County and analyzes how each may affect populations, property, and critical facilities within the jurisdiction. Importantly, the hazard mitigation strategy presented in Section 5 is informed by, and responds to, the particular vulnerabilities outlined in this section. The mitigation strategy provides prescriptions or actions to achieve the greatest reduction of vulnerability based on this section, which results in saved lives, reduced injuries, reduced property damage, and protection for the environment in the event of a natural hazard. Methods for calculating exposure and loss estimates are described in Section 4.4 and Appendix A.

*For the below prioritized hazards, this section provides quantifiable exposures to people and property, as well as damage and loss estimates for the unincorporated portions of the county. Participating jurisdiction annexes in Volume 2 of this MJHMP contain jurisdiction-specific vulnerabilities to hazards.*

### Wildfire SECTION 4.5.1



### Extreme Weather SECTION 4.5.4



### Slope Failure SECTION 4.5.6



### Flood SECTION 4.5.2



### Drought SECTION 4.5.5



### Climate Change SECTION 4.5.7



### Earthquake SECTION 4.5.3







## 4.5.1 Wildfire Hazard Profile

A wildfire is any uncontrolled fire occurring on undeveloped land that requires fire suppression. Wildfires can be ignited by lightning or by human activity, such as smoking, campfires, equipment use, or arson. The 2018 California State Hazard Mitigation Plan defines wildfires as:



*Any free-burning vegetative fire that initiates from an unplanned ignition, whether natural (e.g., lightning) or human-caused (e.g., powerlines, mechanical equipment, escaped prescribed fires), where the management objective is full suppression.*

(California Office of Emergency Services, 2018, p. 507)

Wildfires are costly, putting lives and property at risk and compromising rivers and watersheds, open space, timber, range, recreational opportunities, wildlife habitats, endangered species, historic and cultural assets, scenic assets, and local economies. Vulnerability to flooding increases following wildfires due to the destruction of forest and ground cover within watersheds. The potential for significant damage to life and property increases in areas where development is adjacent to densely vegetated areas, known as wildland-urban interface areas. (FEMA, 2020) While some fires are allowed to burn naturally in order to maintain or restore the health of forest lands, out of control wildfires need to be prevented through cooperative, community, and land management planning. (United States Forest Service, n.d.)

### 4.5.1.1 Local Conditions Relating to Wildfire

The areas with the highest risk for wildfire are located in western Solano County, in the foothills and mountainous watershed areas, as well as in grasslands located throughout the county. In particular, portions of the Vaca Mountains, west of Pleasants Valley, have been designated as Very High Fire Hazard Severity Zones. Prior to the urbanization of nearby lowlands, the vegetation in these mountainous areas was naturally maintained by periodic wildfire. As nearby lands continued to be developed, natural wildfires were suppressed, resulting in the further buildup of fire-prone brush and woodlands. ([Solano County General Plan, 2008](#))

Solano County has dry summers where little to no rain falls from early June through late October. The county experiences 28 inches of annual rainfall, depending on location, elevation, and weather patterns, and the declared fire season typically lasts from early June to mid or late October. The fire season is a time of increased risk of conflagration to residential and other development within the county. Conflagration is an extensive fire that destroys a great deal of land or property. The hilly and mountainous terrain on the north and west sides of the county strongly influence both wildland fire behavior and fire suppression capabilities. Wind is also a significant factor in the spread of fire, as wildfires spread faster and burning embers are carried with the wind to adjacent exposed areas. In densely-populated areas, flying ember production is the principal driver of wildfire. A related concern in built-out areas is the relative density of vegetative fuels that can serve as sites for new spot fires within the urban core and spread fire to adjacent structures. (*Id.*)





#### **4.5.1.1.1 Sudden Oak Death**

The county is also at risk of increased wildfire due to what is referred to as sudden oak death. Sudden oak death is caused by the pathogen *Phytophthora ramorum*, which has been responsible for massive die-offs of true oak (*Quercus* spp.) and tanoak (*Lithocarpus densiflorus*) in coastal and inland regions of both California and Oregon. These die-offs become a source of fuel and have consequently become an increasing concern for their potential to increase fire intensity throughout the region. (Yana S. Valachovic et al., 2011) Climate change, more frequent droughts, and pathogen exposure are all necessary risks to consider when taking a proactive approach to ensuring long-term oak health and mitigating wildfire risk.

#### **4.5.1.1.2 Human-Caused Wildfires and Urban Conflagration**

One of the primary causes of wildfire ignition is humans. Nearly 85 percent of wildland fires in the United States are caused by humans. Human-caused wildland fires can be initiated by campfires that are left unattended, equipment use or malfunction, intentional acts of arson, or carelessly discarded cigarettes. (National Park Service, 2018)

Urban conflagration is typically characterized as a fire that occurs in the built environment, beginning with one structure and quickly spreading to many more. It can be caused by criminal acts, such as illegal explosives; civil unrest; residential accidents, such as improper use of electrical or heating appliances; or industrial accidents, such as transportation accidents.

#### **4.5.1.1.3 Lightning**

While humans cause the vast majority of wildfires, lightning-triggered wildfires burn about 60 percent of all acreage. (Climate Central, 2013) Climate change is predicted to increase the occurrence of lightning as much as 12 percent for every degree Celsius (about two degrees Fahrenheit) rise in global temperature, which could be as much as a 50 percent increase in lightning by the end of the century. (Thompson, 2014) This prediction is a blanket average increase across the continental United States; increases could be higher or lower depending on the distribution of increases over seasons or geographical area. (*Id.*)

#### **4.5.1.1.4 Wildland-Urban Interface**

Human-caused wildfires are prevalent in the wildland-urban interface (WUI). As development in many places in California has encroached on wildlands, wildfire risks have increased. Forests and grasslands are located throughout Solano County, side by side with residences and small communities. Population growth has been accelerating in the population centers of Vacaville, Fairfield, and Vallejo. All of these areas have been characterized by a growing WUI problem. (California Department of Forestry and Fire Protection, 2005) These are boundary areas where structures and other human development meet or intermingle with undeveloped wildland or vegetation fuels. (National Wildfire Coordinating Group, n.d.)



#### 4.5.1.1.5 De-Energization and PSPS Events

Recent wildfire events have been linked to faulty electric transmission equipment, which in turn has led to public safety power shutoffs (PSPS), also referred to as de-energization. (California Public Utilities Commission, 2020) Pacific Gas and Electric (PG&E) reached a \$13.5 billion settlement and pled guilty to 84 counts of manslaughter as its transmission facilities sparked wine country blazes in 2017 and the fire that nearly destroyed the town of Paradise in 2018. (Blume, 2019) In order to avoid these catastrophic wildfire events, electric utility companies have started massive and preemptive power shutoffs in high wind events to avoid sparking fires. This leaves communities and essential facilities without power, a particular challenge in preparing for and responding to hazard events and assisting vulnerable populations. (California Public Utilities Commission, 2020, p. 5) The increased frequency of PSPS events renewed focus on addressing the loss of power in hazard mitigation planning in Solano County and around the state even as PSPS events grow more narrowly focused, creating less mass power losses in municipalities.

#### 4.5.1.2 Plans, Policies, and Regulatory Environment

##### Wildfire Protection Responsibility in California

Local, state, tribal, and federal organizations all have legal and financial responsibilities for wildfire protection. In many instances, two fire organizations have dual primary responsibility on the same parcel of land—one for wildfire protection and the other for structural fire protection. To address wildfire jurisdiction responsibilities, the California State Legislature outlined various wildfire responsibilities in Cal. Pub. Res. Code § 4291.5 and Cal. Health & Safety Code § 13108.5:

- **Federal Responsibility Areas (FRAs)**—FRAs are fire-prone wildland areas that are owned or managed by a federal agency, such as the U.S. Forest Service, National Park Service, U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, or U.S. Department of Defense. Primary financial and rule-making jurisdiction authority rests with the federal land agency. In many instances, FRAs are interspersed with private land ownership or leases. Fire protection for developed private property is usually the responsibility of the relevant local government agency, not the relevant federal land management agency. (California Department of Forestry and Fire Protection, 2013-2018, p. 7)
- **State Responsibility Areas (SRAs)**—SRAs are lands in California where the California Department of Forestry and Fire Protection (CAL FIRE) has legal and financial responsibility for wildfire protection. CAL FIRE administers fire hazard classifications and building standard regulations in these areas. SRAs are classified into types of land based on cover, beneficial use of water from watersheds, probable damage from erosion, and fire risks and hazards. (California Legislative Information, pp. § 4102, § 4130 )

CAL FIRE adopts SRA boundaries and updates them every 5 years. Where SRAs contain structures or development, the relevant local government agencies have fire protection responsibility for those improvements. (Office of the State Fire Marshal, 2021)



- **Local Responsibility Areas (LRAs)**—LRAs include land in cities, cultivated agriculture lands, unincorporated non-flammable areas, and lands that do not meet the criteria for SRA or FRA. LRA fire protection is typically provided by city or county fire departments, fire protection districts, or by CAL FIRE under contract to local governments. LRAs may still include areas of flammable vegetation and WUI. (Office of the State Fire Marshal, 2021)

In 2012, as part of General Plan requirements, California began requiring local governments in State Responsibility Areas (SRAs) and Very High Fire Hazard Severity Zones (VHFHSZ) to:

- Update their general plan safety elements to recognize specific wildfire risks in such areas,
- Adopt special findings when approving subdivisions in such areas, and
- Use wildfire safety guidelines and California Environmental Quality Act (CEQA) initial study wildfire hazards checklist updates issued by the Governor's Office of Planning and Research (OPR) when those become available. Cal. Gov. Code § 65040.20 and § 65302.5. (Governor's Office of Planning and Research, 2017, p. 144)

For further information on the details and implications of these safety element requirements, see Progress Summaries 3.F and 8.A of the 2018 California State Hazard Mitigation Plan.

#### **Healthy Forests Restoration Act (2003)**

The federal Healthy Forests Restoration Act (HFRA) appropriates funding to address five main sub-categories of the National Fire Plan (NFP): preparedness, suppression, reduction of hazardous fuels, burned-area rehabilitation, and state and local assistance to firefighters.

#### **California Fire Code (2019)**

Solano County has adopted the 2019 Edition of the California Fire Code to safeguard public health, safety, and general welfare from the hazards of fire, explosion, or dangerous conditions in new and existing buildings, structures, and premises. The adopted code also provides safety and assistance to firefighters and emergency responders during emergency operations. The 2019 California Fire Code is applied through the Solano County Code (§ 6.03-03), which describes what is required for a Fire Protection Plan, applicable to all new development within the Wildland-Urban Interface Fire Area. It stipulates that such a plan addresses water supply, access, fire resistance of buildings, fire protection systems and equipment, defensible space, and vegetation management.

#### **California Building Code (2019)**

Solano County has adopted the 2019 California Building Code, which includes materials and construction methods for exterior wildfire exposure and standards of quality for fire-resistant buildings. See Cal. Building Codes, Chapter 7a (2019).

#### **CAL FIRE Strategic Fire Plan, Sonoma-Lake-Napa Unit (2017)**

The California Department of Forestry and Fire Protection (CAL FIRE) Sonoma-Lake-Napa Unit (LNU) serves the counties of Sonoma, Lake, Napa, Solano, Yolo, and Colusa. The LNU Strategic Fire Plan is a product of the implementation of the 2018 State Fire Plan.



The State Fire Plan provides an analysis procedure to assess fire fuel hazards and risks in order to design and implement mitigating activities. The LNU Fire Management Plan provides background information, fuels and fire data, proposed projects, and individual Battalion reports outlining mitigating activities commonly carried out each year. The Plan is a local road map for the fire service and the public to create and maintain defensible landscapes to protect those assets vital to the state and its citizens.

The LNU Strategic Fire Plan outlines a comprehensive program designed to reduce total government costs and citizen losses from wildland fire in the Unit. It also strives to support the public with assistance and education to create fire adapted communities that can more safely withstand a wildland fire.

To accomplish this, CAL FIRE continues to implement this plan to address such factors as:

- Firefighter and Public Safety
- Hazardous Fuel Treatment
- Fire Suppression
- Information and Education
- Inter-Agency Cooperation

#### **Title 24 California Code of Regulations**

The California Building Standards Code, Title 24, which incorporates the California Fire Code, is adopted every three years by order of the California Legislature with supplements published in intervening years. Title 24 mandates specific requirements for new building construction, placing strong emphasis on proper address signage, apparatus access, water requirements, and defensible space.

#### **California Code, Public Resources Code § 4290**

The Public Resources Code § 4290 became effective in September of 1991. These regulations require the future design and construction of structures, subdivisions, and developments in SRA to provide wildfire protection measures for basic emergency access and perimeter. These measures provide for emergency access, signing and building numbering, private water supply reserves for emergency fire use, and vegetation modification.

#### **California Code, Public Resources Code § 4291**

The Public Resources Code § 4291 require property owners in mountainous areas, forest-covered lands, or any land that is covered with flammable material to create, at a minimum, a 100-foot defensible space buffer around their homes and other structures. Defensible space must at least extend to the property line if a 100-foot buffer cannot be achieved.

#### **Solano County General Plan**

The 2008 Solano County General Plan includes a number of policies in the Public Health and Safety Element to mitigate the effects of wildfires. These policies aim to prevent wildfires through the requirement of defensible space associated with building construction, the prohibition of development in areas of extreme risk, required incorporation of fire-safe building methods in development, and the consolidation of efforts to prevent or abate fuel buildup.



## Fire Protection Features in Solano County Code

The Solano County Code aids in reducing fire risks by allowing a county officer, who's responsibility is fire protection in the unincorporated area of the county, to alert the relevant fire protection district of the existence of flammable material that might endanger public safety as a potential fire hazard. The relevant fire protection district consequently has the authority to order the clearing of land or the removal of dry grass, stubble, brush, rubbish, litter, or other flammable material (§ 12.5-20).

### 4.5.1.3 Past Events

There are four major factors that contribute to historic wildfire events:

1. Extreme vegetation diversity,
2. Diverse fire weather and fire behavior,
3. Dynamic fire history, and
4. Complex land use patterns.

From 2005-2020, there were 15 wildfires in Solano County, some of which overlapped with neighboring counties, each burning over 100 acres in the region. Some burned considerably more acreage, most notably the 2017 Atlas Fire and the 2020 LNU Lightning Complex. These events are listed in Table 4-10 and displayed in Figure 4-21.

Table 4-10: Fire Perimeter Sizes and Dates (100 Acres or Greater 2000-2020)

Date	Name	Size in Acres
2005	Gordon	194
2000	Winters	404
2004	Cement	1,007
2002	128	188
2003	Sacket	192
2004	Mix	296
2006	Sky Valley	226
2008	Wild	4,102
2011	Beacon	703
2015	Wragg	8,049
2017	Timm	126
2017	Atlas	51,625
2018	Nelson	2,158
2019	American	527
2020	LNU Lightning Complex	160,260

Source: California Fire, Incident Database

Note: Perimeters shown for those fires on or after year 2000 that had perimeter sizes of greater than or equal to 100 acres.

#### 4.5.1.3.1 Recent Large Wildfire Events

##### LNU Lightning Complex and Hennessey Fire (2020)

The LNU Lightning Complex was a series of lightning-sparked fires that began in August and continued through October of 2020 in Northern California. Lightning struck California approximately 14,000 times over a three-day period and started more than 650 fires. In total, the fires burned 363,220 acres and were active for 47 days. (CAL FIRE, 2020)



The Hennessey Fire, which started on August 17, 2020, impacted Solano County along with Colusa, Lake, Napa, and Yolo Counties. The Hennessey Fire extended along a north-south longitude through the western portion of Solano County. In Solano County, the fires killed two people and destroyed 711 structures, including 302 residential homes. The fire burned approximately 42,000 acres in the county. (Solano County, 2020) See Figure 4-20 for an image of damages suffered outside Vacaville from the LNU Lightning Complex fires.



Figure 4-20: 2020 LNU Lightning Complex Fires  
Photo: Jose Carlos Fajardo (Patch, August 2020)

A handful of key response-related mitigation actions have been identified as lessons learned from the LNU Lightning Complex, both from the still-draft After Action Report ("AAR," Solano OES, October 2020) and the Watershed Emergency Response Team Evaluation ("WERT Eval," CAL FIRE, October 2020). While much of the lessons learned focus on response, mitigation-related lessons include:

- Install a fire siren system in fire prone areas. Power outages in the area prevented cellular communication during the wildfire, and first responders had to resort to door-to-door alerts in order to warn residents of impending danger. (AAR)
- Ensure new EOC staff members are trained for future wildfire hazards and ensure Solano Office of Emergency Services is fully staffed. (AAR)
- Enhance county field communications by creating a joint powers authority to build out a modern trunked radio system for the county. (AAR)
- Develop emergency response and evacuation plans based upon the identified post-fire hazards. (WERT Eval)
- Perform monitoring and maintenance of road drainage and storm drain infrastructure. Drainage facilities were noted to be undersized for larger storm events in many locations, and the post-fire environment can create conditions that quickly overwhelm even drainage facilities normally considered to be adequately sized. (WERT Eval)
- Cities and counties with municipal water supply reservoirs should consider conducting detailed hydrologic evaluations of the potential post-fire impacts, including evaluating possible mitigation measures designed to minimize the potential for debris and ash to impact the water supply. (WERT Eval)

The county's response was successful in maintaining a careful adherence to Public Health recommendations in light of the active COVID-19 pandemic. They were also effective in their use of a Local



Assistance Center (LAC). Using a LAC sped up the recovery process and put the county well ahead of neighboring counties in their recovery process. (Solano County, 2020)

*See Figure 4-21 for locations of historic fires since 2000 greater than 100 acres.*

#### **4.5.1.4 Fire Hazard Severity Zones (FHSZs)**

Solano County's hilly areas contain major wildland fire hazard risks for residential structures and other development, characterized by steep slopes, poor fire suppression delivery access, inadequate emergency water supply, and highly flammable vegetation. To help better define areas of wildfire concern, CAL FIRE establishes and maps **Fire Hazard Severity Zones (FHSZ)**, or areas of significant fire hazards based on factors such as fuel, weather, terrain, and the number of days of moderate, high, and extreme fire hazard. These zones define the application of various mitigation strategies to reduce the risk associated with wildfires.

The FHSV model inputs frequency of fire weather, ignition patterns, expected rate-of spread, and past fire history. It also accounts for flying ember production based on the area of influence where embers are likely to land and cause ignitions. The FHSZ model is built from existing data and hazard constructs and, thus, does not necessarily take into consideration significant land use and structural resiliency. The geography, weather patterns, and vegetation in the planning area provide ideal conditions for recurring wildfires.

*See Figure 4-22 and Figure 4-23 for wildfire return intervals and fire severity zones. These maps are the basis for this wildfire risk assessment.*

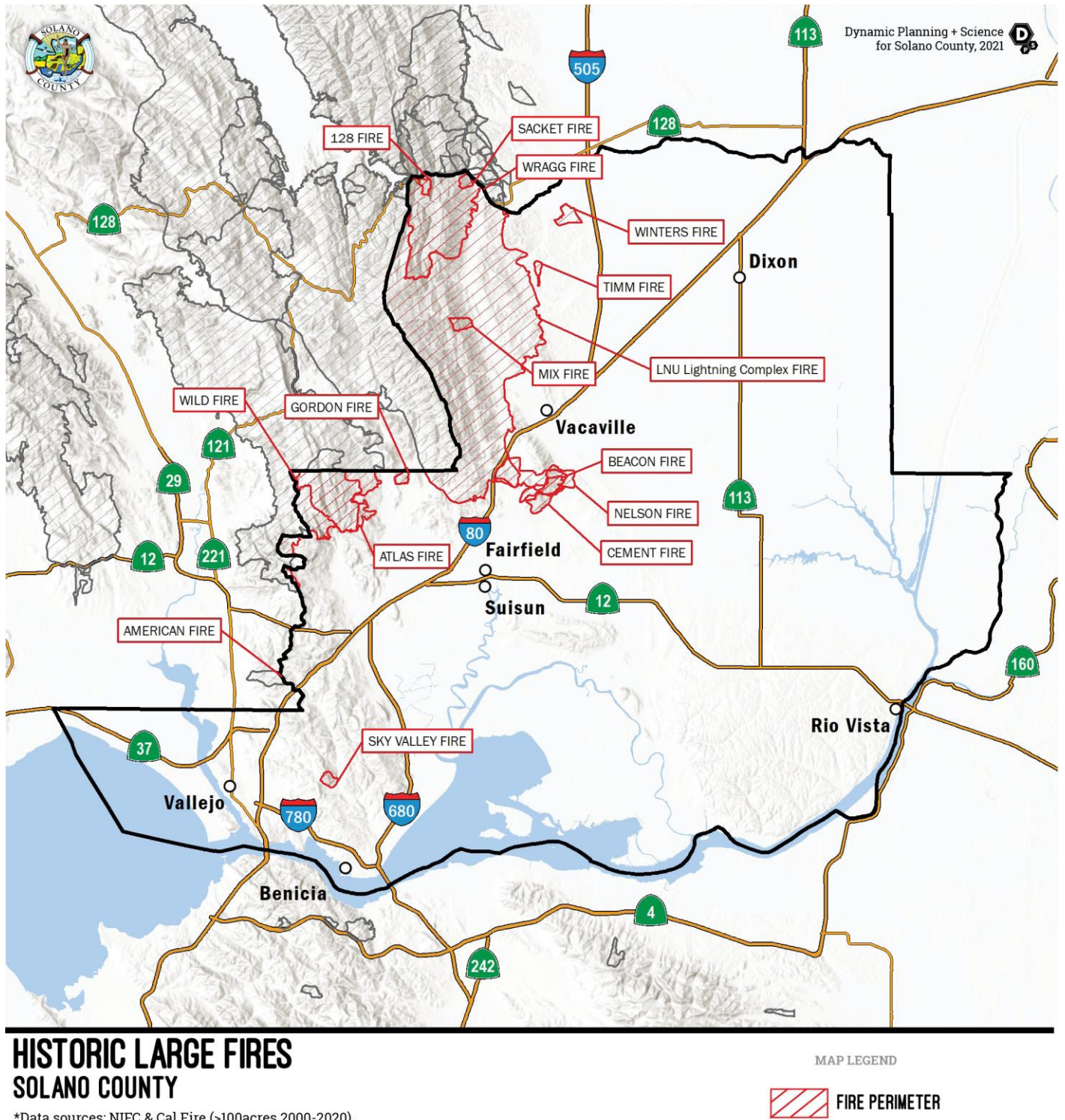


Figure 4-21: Historic Fire Occurrence Map (Fires Greater than 100 Acres, 2000-2020)





#### 4.5.1.5 Frequency and Probability of Future Occurrences

Generally, Solano County faces a wildland fire threat annually. Fire conditions arise from a combination of hot weather, an accumulation of vegetation, and low moisture content in the air. These conditions, when combined with high winds and years of drought, increase the potential for a wildfire to occur. Urban wildfires often occur in those areas where development has expanded into the rural areas. A fire along this urban-rural interface can result in major losses of property and structures. There are three major factors that sustain wildfires and allow for predictions of a given area's potential to burn: fuel, topography, and weather.

Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is generally classified by type and by volume. Fuel sources are diverse and include everything from dead tree needles, leaves, twigs, and branches to dead standing trees, live trees, brush, and cured grasses. Man-made structures and other associated combustibles are also considered fuel sources. The type of prevalent fuel in an area directly influences the behavior of wildfire. Light fuels, such as grasses, burn quickly and serve as a catalyst for fire spread. The volume of available fuel is described in terms of fuel loading. Certain areas in and surrounding Solano County are extremely vulnerable to fires as a result of dense grassy vegetation combined with a growing number of structures being built near and within rural lands.

An area's topography also affects its susceptibility to wildfire spread. Fire intensities and rates of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. Where fire quickly spreads up a canyon, gully, or other similarly constrained topographic feature, this is referred to as the "chimney effect." The natural arrangement of vegetation throughout a hillside can also contribute to increased fire activity on slopes.

Weather components, such as temperature, relative humidity, wind, and lightning, also affect the potential for wildfire. High temperatures and low relative humidity dry out the fuels that feed the wildfire creating a situation where fuel will more readily ignite and burn more intensely. Wind is the most treacherous weather factor. The greater a wind, the faster a fire will spread and the more intense it will be. Winds can be significant at times in Solano County. In addition to high winds, wind shifts can occur suddenly due to temperature changes or the interaction of wind with topographical features, such as slopes or steep hillsides. Related to weather is the issue of recent drought conditions contributing to concerns about wildfire vulnerability. During periods of drought, the threat of wildfire increases. (NOAA, 2018)

The majority of past wildfire events in Solano County were in the late summer months (typically June through October). Frequency of wildfire events may increase because of increasingly drier conditions caused by climate change. Fire risk will also continue to grow as more people build in WUI areas, which increases fuel loads and the risk of human-caused fires. (FEMA, 2020)

As seen in Figure 4-21, fire occurrences are the most common in mountainous areas in the northwestern portion of Solano County. The probability of a wildfire occurring in Solano County is highly likely, with a 100 percent annual chance.

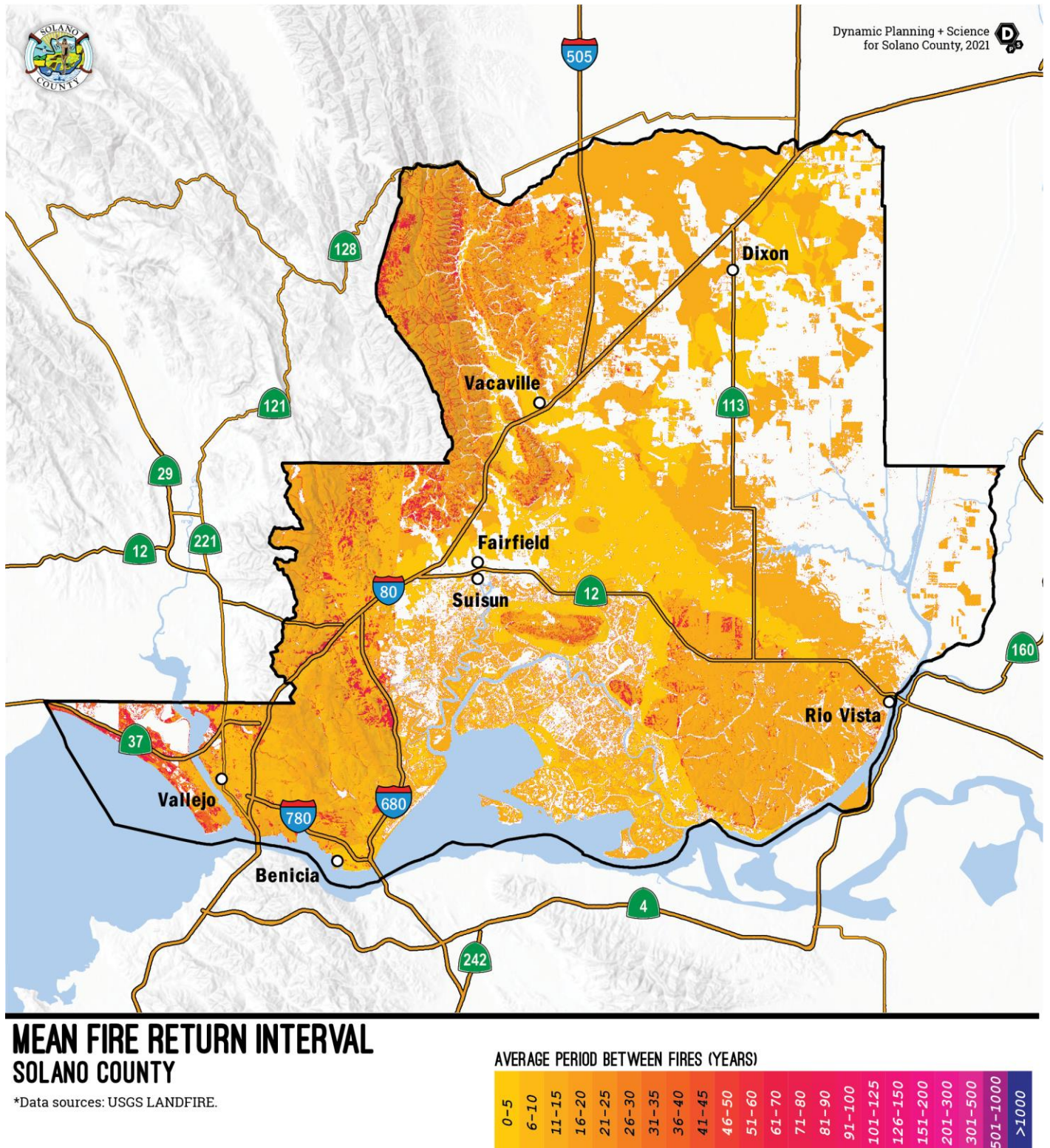


Figure 4-22: Mean Wildfire Return Intervals



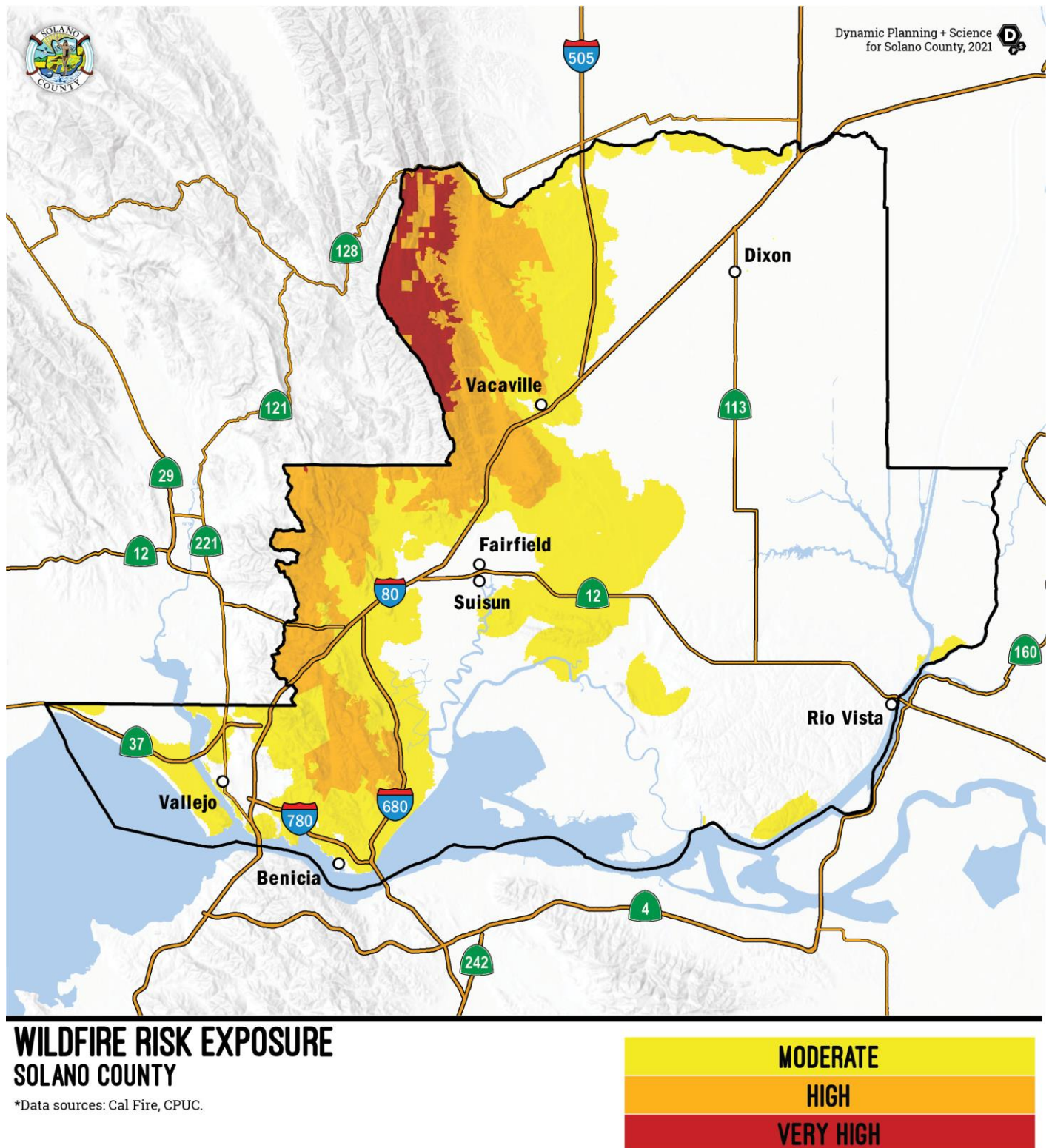


Figure 4-23: Wildfire Risk Exposure



#### **4.5.1.6 Severity and Extent**

The severity of the wildland fire hazard is determined by the relationship between three factors: fuel classification, topographic slope, and critical fire weather frequency. Solano County has a significant amount of wildfire fuels and susceptible topographic slope. Critical fire weather conditions also occur in periods of low relative humidity, high heat, and high winds.

Smoke and air pollution from wildfires can be a health hazard, especially for sensitive populations such as children, the elderly, and those with respiratory and cardiovascular diseases. Wildfire may also threaten the health and safety of those fighting the fires. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke. In addition, wildfire can lead to ancillary impacts, such as landslides in steep ravine areas and flooding due to the impacts of silt in local watersheds.

#### **4.5.1.7 Warning Time**

Response time can be rapid and warning time short for wildfires. Wildfires are often caused by humans, intentionally or accidentally. There is no way to predict when one might occur. The Fourth of July can be a time of heightened concern and outreach around wildfires since fireworks can cause fires and usage is high. Dry seasons and droughts greatly increase fire likelihood. Lightning from dry thunderstorms, where precipitation evaporates before reaching the ground, may also trigger wildfires. Extreme weather can be predicted, so special attention should be paid during weather events that may include lightning or high wind. Reliable National Weather Service lightning warnings are available on average 24 to 48 hours prior to a significant electrical storm.

If a fire does break out and spread rapidly, residents may need to evacuate within days or hours. A fire's peak burning period generally is between 1 p.m. and 6 p.m. Once a fire has started, fire alerting is reasonably rapid in most cases. The rapid spread of cellular and two-way radio communications in recent years has contributed to a significant improvement in warning time. (California Fire, 2020)

#### **4.5.1.8 Secondary Hazards**

Wildfires can generate a range of secondary effects, which in some cases may cause more widespread and prolonged damage than the fire itself. Fires can cause direct economic losses in the reduction of harvestable timber and indirect economic losses in reduced tourism and commerce. Wildfires also cause the contamination of reservoirs, destroy transmission lines, and contribute to flooding. They strip slopes of vegetation, exposing them to greater amounts of runoff, weakening soils, and causing slope failures. Major landslides can occur several years after a wildfire. Wildfires that burn hot and for long durations can bake soils, especially those high in clay content, creating hydrophobic soils that repel water. When it rains in burned areas, more soil washes off the hills and into roads, ditches, and streams and increases flooding. (United States Department of Agriculture, n.d.)



#### **4.5.1.9 Climate Change Impacts**

Fire in western ecosystems is determined by climate variability, local topography, and human intervention. Climate change has the potential to affect multiple elements of the wildfire system: fire behavior, ignitions, fire management, and vegetation fuels. Hot, dry spells create the highest fire risk. Drought and increased temperatures intensify wildfire danger by warming and drying out vegetation. Climate change also may increase winds that spread fires. Faster fires are harder to contain and, thus, are more likely to expand into residential neighborhoods. (Center for Climate and Energy Solutions, n.d.)

A changing climate is expected to subject forests to increased stress due to drought, disease, invasive species, and insect pests. These stressors are likely to make forests more vulnerable to catastrophic fires. While periodic fires are natural processes and fulfill an important ecological function, catastrophic fire events that cannot be contained or managed can cause serious threats to homes and infrastructure, especially for properties located at the wildland urban interface.

Moreover, rain events are predicted to become more severe in our changing climate. This could worsen post-rain flood events. (*Id.*) With or without rain, climate change also may bring an increased occurrence of lightning, which is responsible for a significant number of wildfires and amount of acreage burned, as discussed above in Section 4.5.1.1.3.

It is predicted that Solano County will see higher daily temperatures, more heatwaves, increased wildfires, and a diminished snowpack within this century as a result of climate change. By the year 2064, Solano County is projected to experience an increase in wildfire risk. A moderate greenhouse gas emission scenario projects an increase of 3.8°F while a high emission scenario projects an increase of 4.6°F by the year 2064. (Cal-Adapt, 2021)

#### **4.5.1.10 Wildfire Vulnerability Analysis**

This section describes vulnerabilities to wildfire in terms of population, property, and infrastructure. Wildfire population, parcel value, critical facilities, and lifeline exposure numbers were generated by overlaying the inventory outlined in Section 4.3 with CalFire Wildfire Hazard Severity Zones. Figure 4-25 shows a Snapshot Map of wildfire vulnerability in Solano County. Details for all data found in the Snapshot Map can be found in this section. All data sources have a level of accuracy acceptable for planning purposes.

##### **4.5.1.10.1 Population**

Smoke and air pollution from wildfires can be a severe health hazard, especially for sensitive populations such as children, the elderly, and those with respiratory and cardiovascular diseases. Smoke generated by wildfire contains visible and invisible emissions, including particulate matter such as soot, tar, water vapor, and minerals; gases such as carbon monoxide, carbon dioxide, and nitrogen oxides; and toxins such as formaldehyde and benzene. Emissions from wildfires depend on the type of fuel, the moisture content of the fuel, the efficiency or temperature of combustion, and the weather. Public and mental health impacts



associated with wildfire include difficulty breathing, odor, reduction in visibility, depression, and anxiety. Likewise, first responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke.

Wildfire is of greatest concern to populations residing in the moderate, high, and very high fire hazard severity zones. U.S. Census Bureau block data was used to estimate populations within the CAL FIRE identified hazard zones. See Figure 4-25, Figure 4-24, and Table 4-11 for detail on populations residing in wildfire risk areas.

Table 4-11 Populations Exposed to Wildfire Risk (Unincorporated County)

		Total Population
Unincorporated County		19,665

Wildfire Severity Zone	Population Count	% of Total
Very High	83	0.42%
High	4,979	25.32%
Moderate	6,773	34.44%
<b>Total</b>	<b>11,836</b>	<b>60.19%</b>

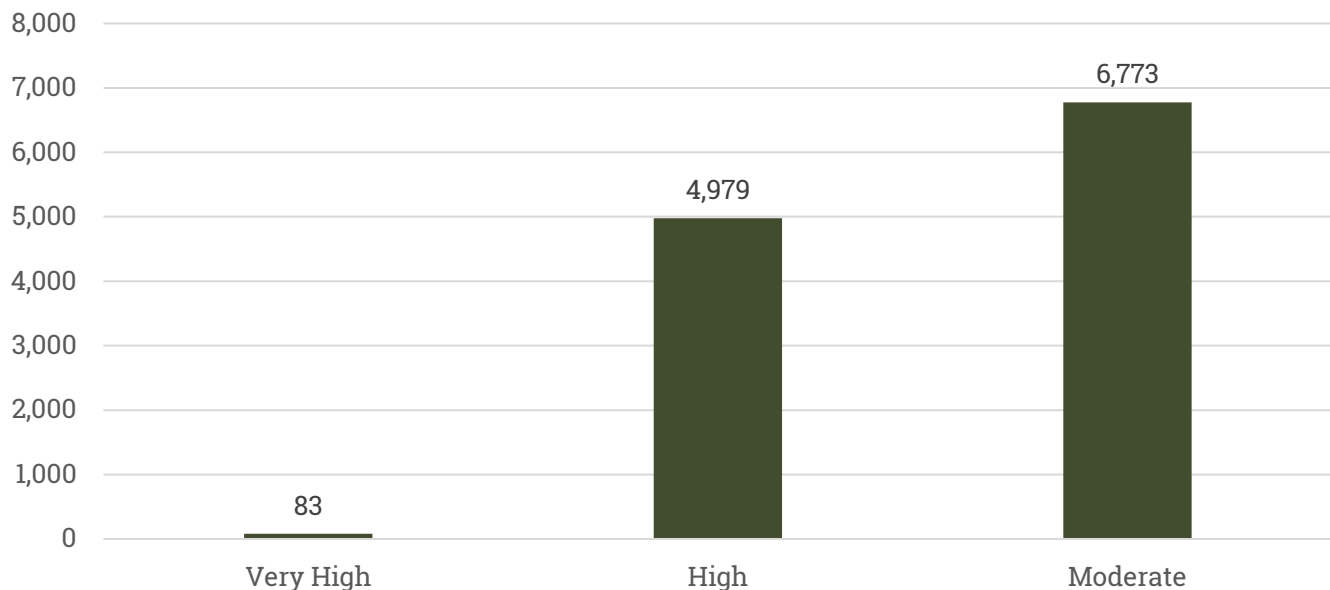


Figure 4-24: Population Exposed to Wildfire Risk





## WILDFIRE RISK EXPOSURE

SOLANO COUNTY

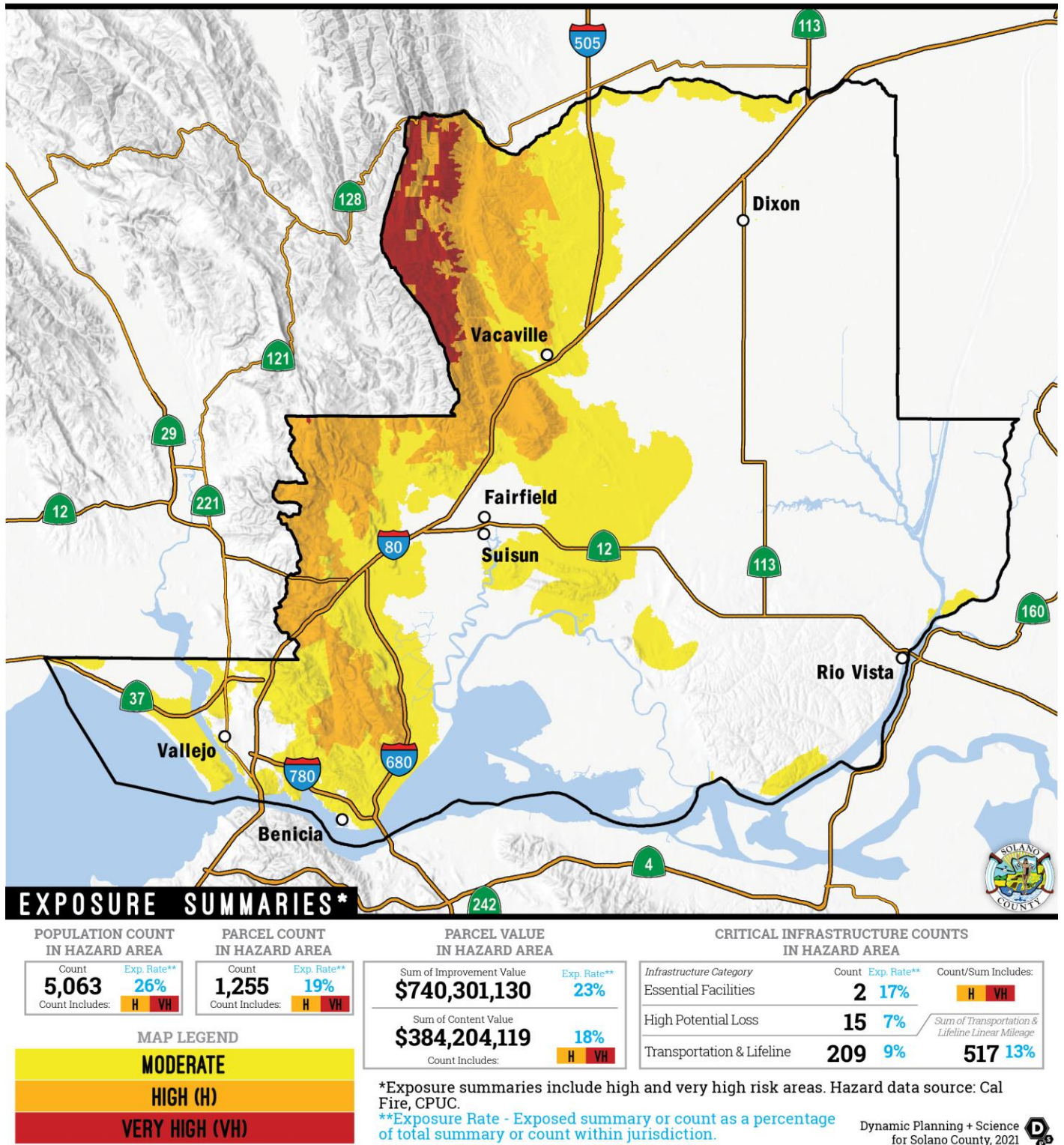


Figure 4-25: Exposure Wildfire Vulnerability and Snapshot Map





#### 4.5.1.10.2 Property

This section calculates the considerable assets at risk of wildfire in those severity zones. More rural properties are associated with lower income residents and higher wildfire risk. See Table 4-12, which uses county parcel information to calculate exposure in wildfire severity zones. In some cases, a parcel will be within multiple fire threat zones. For this exercise, every parcel with a square footage value greater than zero was developed in some way. Only improved parcels were analyzed.

Table 4-12: Improved Parcel and Content within Wildfire Severity Zones (Unincorporated County)

	Total Parcels		Total Market Value (\$)	Total Content Value (\$)	Total Value (\$)	
Unincorporated County	6,668		\$3,186,640,275	\$2,078,097,240	\$5,264,737,515	

Fire Hazard Severity Zone	Parcel Count	% of Total	Market Value Exposure (\$)	Content Value Exposure (\$)	Total Exposure (\$)	% of Total
Very High	29	0.4%	\$7,858,861	\$4,116,326	\$11,975,187	0.2%
High	1,226	18.4%	\$732,442,269	\$380,087,793	\$1,112,530,062	21.1%
Moderate	2,731	41.0%	\$1,361,834,480	\$831,115,924	\$2,192,950,404	41.7%
<b>Total</b>	<b>3,986</b>	<b>59.8%</b>	<b>\$2,102,135,610</b>	<b>\$1,215,320,043</b>	<b>\$3,317,455,653</b>	<b>63.0%</b>

#### Critical Facilities and Infrastructure

Critical facilities of wood frame construction are especially vulnerable during wildfire events. Power lines are also at risk from wildfire because some poles are made of wood and are susceptible to burning.

In many cases, roads and railroads would not be susceptible to damage except in the worst scenarios, but a wildfire event could create response issues, if affected. Fires can create conditions that block or prevent access and can isolate residents and emergency service providers. Wildfire typically does not have a major direct impact on bridges, but it can create conditions in which bridges are obstructed. Many bridges in areas of high to moderate fire risk are important because they provide the only ingress and egress to large areas and, in some cases, to isolated neighborhoods. Additionally, wildfires may cause the loss of function of cellular phone sites or cell towers, which can limit emergency services, including tracking and evacuation.

Critical facilities data was overlain with fire hazard severity zone data to determine the type and number of facilities within each risk classification. Table 4-13 lists the critical facilities in wildfire hazard severity zones for Solano County, and Table 4-14 similarly lists critical infrastructure.



Table 4-13: Critical Facility Exposure to Wildfire Severity Zones (Unincorporated County)

Critical Infrastructure - Wildfire Severity Zone			
Infrastructure Type	Very High	High	Moderate
<b>Essential Facility</b>	-	2	4
EOC	-	-	-
Law Enforcement	-	-	-
Fire Station	-	2	4
Emergency Services	-	-	-
Hospital	-	-	-
<b>High Potential Loss</b>	1	14	104
Dam	-	5	5
Historic Building	-	-	-
Library	-	-	-
School	-	-	4
Historic Site	-	-	-
Community Center	-	-	-
Jurisdiction Real Property Asset*	-	-	-
Park	-	2	1
Wastewater Treatment Facility	-	-	1
Emergency Shelter	-	1	1
Administrative	-	-	-
Child Care Facility	-	1	4
Healthcare Facility	-	-	-
Senior Center	-	-	-
County Real Property Asset*	1	5	86
Early Learning	-	-	2
<b>Transportation and Lifeline</b>	1	208	278
Airport	-	-	-
Bridge	1	18	56
Power Plant	-	-	3
Substation	-	-	2
Bus Facility	-	-	-
NG Station	-	1	3
Bus Stop	-	-	3
Railway Bridge	-	1	-
Cell Tower	-	6	8
Breakout Tank	-	-	-
Oil Facility	-	-	-
Transmission Line Tower	-	182	187
Wind Turbine	-	-	16
Ferry	-	-	-



Critical Infrastructure - Wildfire Severity Zone			
Infrastructure Type	Very High	High	Moderate
Amtrak Station	-	-	-
Train Station	-	-	-
<b>Hazmat</b>	-	20	22
Hazmat	-	20	22
Hazardous Waste facility	-	-	-
<b>Grand Total</b>	<b>2</b>	<b>244</b>	<b>408</b>

Table 4-14: Lifelines in Wildfire Severity Zones (Unincorporated County)

Lifelines (miles) - Wildfire Severity Zone			
Infrastructure Type (Linear)	Very High	High	Moderate
Bus Route	-	9.83	25.91
Levee (FEMA)	-	1.48	89.11
Levee Flood Wall	-	-	-
Levee Cross Section	-	-	0.26
NG Pipeline	-	14.50	37.89
Railroad	-	2.93	15.60
Street	96.07	331.50	485.52
<i>4WD trail</i>	-	10.15	-
<i>Alley</i>	-	-	0.03
<i>Cul-de-sac</i>	-	0.09	0.23
<i>Driveway</i>	6.25	43.66	79.47
<i>Ferry</i>	-	-	0.08
<i>Interstate</i>	-	4.75	37.01
<i>Local road</i>	76.76	169.56	197.24
<i>Local road, major</i>	12.31	66.68	117.74
<i>Primary highway</i>	-	-	-
<i>Ramp</i>	-	0.55	5.58
<i>Service road</i>	-	-	1.46
<i>State/county highway</i>	0.75	32.82	45.94
<i>Traffic circle</i>	-	-	0.00
<i>Walkway</i>	-	3.23	0.74
Transmission Line	-	60.83	69.29
<b>Grand Total</b>	<b>96.07</b>	<b>421.07</b>	<b>723.59</b>



#### 4.5.1.11 Changes in Development and Future Trends

Fuel reduction projects are ongoing on federal, state, and private lands in Solano County. Such projects include vegetation management, broadcast burning, pre-commercial thinning, and the removal of dead, dying, and diseased trees. Historically, Solano County has not had much presence of citizen groups around wildfire prevention, such as Fire Safe Councils. This is slowly changing, with the recent establishment of the Green Valley Fire Safe Council (GVFSC). GVFSC is currently providing a community chipping program, and other communities in the county are looking at replicating GVFSC's successes. These efforts could result in Solano County's first Community Wildfire Protection Plan (CWPP).

#### 4.5.1.12 Wildfire Hazard Problem Statements

As part of the mitigation action identification process, the Planning Committee for the county and for each jurisdiction identified issues and weaknesses, also called problem statements, for their respective facilities. Identification was based on the risk assessment and vulnerability analysis utilizing the RAMP mapping tool and wildfire hazard data. Wildfire problem statements for all participating jurisdictions are listed in Table 4-15; problem statements for all other participating jurisdictions are accessed in Volume 2 of this plan.

Identifying these common issues and weaknesses assists the Planning Committee in understanding the realm of resources needed for mitigation. The goal is to have at least one mitigation action for every problem statement. See Table 5-6 for a full list of mitigation actions and the corresponding problem statements that they address. Each problem statement is coded with a problem number for cross-referencing between Table 4-15 and Table 5-6.

Table 4-15 Wildfire Problem Statements

Problem No.	Hazard Type	Area of Concern	Mitigation Alternatives	Primary Agency	Problem Description	Related MA
ps-WF-SC-104	Wildfire	Impact	PRV - Prevention , PPRO - Property Protection , PE&A - Public Education & Awareness , SP - Structural Projects	Solano County	The following are residential areas of particular concern and vulnerable to the impacts of wildfire due to close proximity to open space and fuels: residential area around Foxboro Pkwy, Rancho Solano Neighborhood, Paradise Valley, Lagoon Valley, and Green Valley.	ma-WF-SC-33, ma-WF-SC-36, ma-AH-SC-14
ps-WF-SC-106	Wildfire	Impact	PRV - Prevention , PE&A - Public Education & Awareness	Solano County	The County currently does not have a code enforcement presence related to wildfire.	ma-WF-SC-33, ma-WF-SC-35, ma-WF-SC-34



Problem No.	Hazard Type	Area of Concern	Mitigation Alternatives	Primary Agency	Problem Description	Related MA
<b>ps-WF-SC-107</b>	Wildfire	Impact	PE&A - Public Education & Awareness, ES - Emergency Services	<b>Solano County</b>	The County does not have identified evacuation zones to facilitate evacuation in the event of a wildfire.	ma-WF-SC-36, ma-AH-SC-14
<b>ps-WF-SC-108</b>	Wildfire	Impact	PRV - Prevention, PE&A - Public Education & Awareness, ES - Emergency Services	<b>Solano County</b>	Identification of evacuation routes out of Travis Air Force Base is needed.	ma-WF-SC-36, ma-WF-SC-178, ma-WF-SC-40, ma-WF-SC-37, ma-WF-SC-36
<b>ps-WF-SC-109</b>	Wildfire	Victim	PRV - Prevention, PPRO - Property Protection, PE&A - Public Education & Awareness, ES - Emergency Services	<b>Solano County</b>	Approximately 4,716 people live in a high or very high wildfire severity zone in the Unicorp. County.	ma-WF-SC-37, ma-WF-SC-36, ma-WF-SC-38, ma-AH-SC-12, ma-AH-SC-11
<b>ps-WF-SC-110</b>	Wildfire	Threat	PE&A - Public Education & Awareness, ES - Emergency Services, SP - Structural Projects	<b>Solano County</b>	The choke point just south of Cordelia at I-80 and I-680 is vulnerable to wildfire due to high winds in the area and proximity to open space.	ma-WF-SC-34
<b>ps-WF-SC-111</b>	Wildfire	Threat	PPRO - Property Protection, NRP - Natural Resource Protection, ES - Emergency Services	<b>Solano County</b>	Ongoing vegetation management is needed throughout the Unicorp. County to manage wildfire fuels.	ma-WF-SC-34, ma-WF-SC-35





INTENTIONAL BLANK PAGE



## 4.5.2 Flood Hazard Profile

Flooding is one of the three primary hazards in California, along with earthquake and wildfire, and represents the second most destructive source of hazard, vulnerability, and risk statewide. (Cal OES, 2018) Flooding is a priority hazard for Solano County as well.



Connections between a river and its floodplain are most apparent during and after major flood events. A **floodplain** is the area adjacent to a river, creek, or lake that becomes inundated during a flood. Floodplains may be broad, such as when a river crosses an extensive flat landscape, or narrow, as when a river is confined in a canyon. These areas form a complex physical and biological system that supports a variety of natural resources and provides natural flood and erosion control. When a river is separated from its floodplain with levees and other flood control facilities, its natural, built-in benefits can be lost, altered, or significantly reduced. (FEMA, 2020)

There are six types of flood events that might occur within the Solano County area: riverine, flash, urban stormwater, levee or canal, and coastal delta flooding. Regardless of the type, the cause is primarily the result of extreme weather and excessive rainfall, either in the flood area or upstream reach. (The National Severe Storms Laboratory, 2020)

Riverine flooding, the most common type of flood event, occurs when a watercourse exceeds its bank-full capacity. Riverine flooding occurs as a result of prolonged rainfall that is combined with saturated soils from previous rain events, or combined with snowmelt, and is characterized by high peak flows of moderate duration and by a large volume of runoff. Riverine flooding occurs in river systems whose tributaries drain large geographic areas and can include many watersheds and sub-watersheds. The duration of riverine floods varies from a few hours to many days. Factors that directly affect the amount of flood runoff include precipitation amount, intensity and distribution, soil moisture content, channel capacity, seasonal variation in vegetation, snow depth, and water-resistance of the surface due to urbanization. (*Id.*)

In Solano County, riverine flooding can occur anytime during the period from November through May. Flooding is more severe when antecedent rainfall has resulted in saturated ground conditions and often results in flooding to a number of streams. Specifically, flood risk is intensified in the lower stream reaches by the probability of coincident high tides and strong offshore winds during heavy rainfall. (Solano County General Plan, 2008)

The term "flash flood" describes localized floods of great volume and short duration, generally in less than four hours. In contrast to riverine flooding, this type of flood usually results from a heavy rainfall in a relatively small drainage area. Precipitation of this sort usually occurs in the spring and summer. (*Id.*)

Urbanization may increase peak flow runoff, as well as the total volume of stormwater runoff from a site. The increase is dependent upon the type of soil and its topography in relation to the proposed development.



Comparison of the peak flow and volume impacts to the watershed should be analyzed whenever development is proposed to assure that any increases are accommodated. (USGS, 2016)

Flooding may be a secondary impact from an earthquake, which may cause failure of dams, canal banks, or landslides that block drainage channels, streams, or rivers. See Section 4.5.6 for the Earthquake Hazard Profile.

### **FEMA Floodplain Definitions**

#### **100-YR Floodplain**

The boundaries of the 100-YR floodplain coincide with an annual risk of one percent and are a FEMA study product consisting of both floodway and flood fringe.

#### **500-YR Floodplain**

The boundaries of the floodplain coincide with an annual risk of 0.2 percent and are a FEMA study product. The 500-YR floodplain includes the 100-YR.

#### **Floodway**

This includes the channel of the tributary and the land adjacent to it. This zone needs to remain free from obstruction so the 100-YR flood can be conveyed downstream.

#### **Flood Fringe**

This is the remaining portion of the 100-YR floodplain, excluding the floodway. This zone can be obstructed or developed if criteria are met.

#### **Special Flood Hazard Area (SFHA)**

An area having special flood, mudflow, or flood-related erosion hazards and shown on a Flood Insurance Rate Map (FIRM). The SFHA is the area where the National Flood Insurance Program's (NFIP) floodplain management regulations must be enforced.

### **Floodplain Ecosystems**

Floodplains can support ecosystems that are rich in quantity and diversity of plant and animal species. A floodplain can contain 100 or even 1,000 times as many species as a river. Wetting of the floodplain soil releases an immediate surge of nutrients left over from the last flood resulting from the rapid decomposition of organic matter that had accumulated. Microscopic organisms thrive, and larger species enter a rapid breeding cycle. Opportunistic feeders, particularly birds, move in to take advantage. The production of nutrients peaks and falls away quickly; however, the surge of new growth endures for some time. This makes floodplains particularly valuable for agriculture. Species growing in floodplains are markedly different from those that grow outside floodplains. For instance, trees in floodplains and riparian areas tend to be very tolerant of root disturbance and very quick-growing compared to non-riparian trees.

Floodplains that are undisturbed or have been restored to a natural state provide many benefits to both human and natural systems. In their natural vegetative state, undisturbed floodplains provide the following benefits:



- Slow the rate at which incoming surface runoff reaches the main body of water, slowing down the impact of flood events.
- Maintain water quality by allowing surface runoff to drop sediment into the natural soil, preventing it from depositing in streams and rivers.
- Recharge groundwater. The slowing of runoff allows additional time for the runoff to recharge existing groundwater aquifers.
- Provide habitat for large and diverse populations of plants and animals.

Floodplains are often compromised by human development. Because they border water bodies, floodplains have historically been popular sites to establish settlements. Human activities tend to concentrate on floodplains because water is readily available, the land is fertile and suitable for farming, transportation by water is easily accessible, and the land is flatter and easier to develop.

Human activity in floodplains frequently interferes with the natural function of floodplains. It can affect the distribution and timing of drainage, thereby increasing flood problems. Human development can create local flooding problems by altering or confining drainage channels. This increases flood potential in two ways: it reduces the stream's capacity to contain flows and it increases flow rates or velocities downstream during all stages of a flood event. Human activities can interface effectively with a floodplain as long as steps are taken to mitigate the activities' adverse impacts on floodplain functions.

#### **4.5.2.1 Plans, Policies, and Regulatory Environment**

##### **National Flood Insurance Program (NFIP)**

The NFIP makes federally-backed flood insurance available to homeowners, renters, and business owners in participating communities. Solano County and the cities of Benicia, Dixon, Fairfield, Rio Vista, Suisun, Vacaville, and Vallejo participate in NFIP.

For most participating communities, FEMA has prepared a detailed Flood Insurance Study (FIS). The study presents water surface elevations for floods of various magnitudes, including the one-percent annual chance flood (the 100-YR flood) and the 0.2-percent annual chance flood (the 500-YR flood).

Base Flood Elevations (BFEs) and the boundaries of the 100- and 500-YR floodplains are shown on Flood Insurance Rate Maps (FIRMs), which are the principal tool for identifying the extent and location of the flood hazard. FIRMs also designate and display the floodway, which is the channel of the river or stream and adjacent land that must remain free from obstruction so that the 100-YR flood can be conveyed downstream. FIRMs are the most detailed and consistent data source available, and for many communities, they represent the minimum area of oversight under their floodplain management program. The most recent county-wide FIRM was completed on August 2, 2012.

Participants in the NFIP must, at a minimum, regulate development in floodplain areas in accordance with NFIP criteria. Before issuing a permit to build in a floodplain, participating jurisdictions must ensure that three criteria are met:



- New buildings and those undergoing substantial improvements must, at a minimum, be elevated to protect against damage by the 100-YR flood;
- New floodplain development must not aggravate existing flood problems or increase damage to other properties; and
- New floodplain development must exercise a reasonable and prudent effort to reduce its adverse impacts on threatened salmonid species.

Structures permitted or built in the county before December 31, 1974, are called “pre-FIRM” structures, and structures built afterward are called “post-FIRM.” Post-FIRM properties are eligible for reduced flood insurance rates. Such structures are less vulnerable to flooding since they were constructed after regulations and codes were adopted to decrease vulnerability. Pre-FIRM properties are more vulnerable to flooding because they do not meet code or are located in hazardous areas. The insurance rate is different for the two types of structures.

Compliance is monitored by FEMA regional staff and by the California Department of Water Resources under a contract with FEMA. Maintaining compliance under the NFIP is an important component of flood risk reduction. All participating jurisdictions that participate in the NFIP have identified initiatives to maintain their compliance and good standing.

#### **Community Rating System (CRS)**

The Community Rating System (CRS) is a voluntary program within the NFIP that encourages floodplain management activities that exceed minimum NFIP requirements. Flood insurance premiums are discounted to reflect the reduced flood risk resulting from community actions that meet the three goals of the CRS: 1) reduce flood losses, 2) facilitate accurate insurance rating, and 3) promote awareness of flood insurance.

For participating communities, flood insurance premium rates are discounted in increments of five percent according to the community’s classification. For example, a Class 1 community would receive a 45 percent premium discount, and a Class 9 community would receive a five percent discount. Class 10 communities are those that do not participate in the CRS; they receive no discount. The CRS classes for local communities are based on 18 creditable activities related to public information, mapping and regulations, flood damage reduction, and flood preparedness.

CRS activities can help to save lives and reduce property damage. Communities participating in the CRS represent a significant portion of the nation’s flood risk; over 66 percent of the NFIP’s policy base are communities in the CRS. Communities receiving premium discounts through the CRS range from small to large and represent a broad mixture of flood risks, including both coastal and riverine flood risks. Table 4-16 lists NFIP and CRS statistics for the county; annexes list NFIP and repetitive loss information for participating jurisdictions.





Table 4-16: Flood Insurance Statistics for Solano County (County-Wide)

NFIP and CRS Status & Information	
Solano County (County-Wide)	
NFIP Status	8/2/1982
CRS Class	7
Policies in Force	2,568
Policies in SFHA	1,312
Policies in non-SFHA	1,256
Total Claims Paid	\$10,441,655
Paid Losses	584
Repetitive Loss Properties	56
Severe Repetitive Loss Properties	4
Repetitive Loss Payment by NFIP on Building	\$3,748,598
Repetitive Loss Payment by NFIP on Contents	\$1,231,370

*Source: OpenFEMA Data, FIMA RUL Solano County*

*Note: Policies and claims tabulation by jurisdiction is derived from the "reported city." Repetitive loss tabulations by jurisdiction derived via GIS-based intersect of data available at OpenFEMA Data (<https://www.fema.gov/about/openfema/data-sets>). County-wide data reported for entire county area including municipalities. The Privacy Act of 1974 (5 U.S.C. 522a) restricts the release of certain types of data to the public. Flood insurance policy and claims data are included in the list of restricted information. FEMA can only release such data to state and local governments, and only if the data are used for floodplain management, mitigation, or research purposes. Therefore, this plan does not identify the repetitive loss properties or include claims data for any individual property.*

### Cobey-Alquist Floodplain Management Act

The Cobey-Alquist Floodplain Management Act of 1965 provided state-level guidance and review of floodplain management, including the review of floodplain management plans, establishment of floodplain management regulations, and the use of designated floodways. The California Department of Water Resources (DWR) adopts regulations, maintains a statewide flood management data collection and planning program, manages a statewide grant program, and helps coordinate emergency flood response operations.

### Central Valley Flood Protection Board and Sacramento-San Joaquin Drainage District

The Central Valley Flood Protection Board (CVFPB), formerly known as the California State Reclamation Board, is the regulating authority over flood risk management in the Central Valley, and the Sacramento-San Joaquin Drainage District. In addition, CVFPB is charged with the review and adoption of the Central Valley Flood Protection Plan (CVFPP). The CVFPB's governing body consists of seven Governor-appointed and Senate-confirmed members. This board works in close partnership with DWR, the U.S. Army Corp of Engineers (USACE), and stakeholders to implement the CVFPP. The CVFPB also works closely with the California Department of Fish and Wildlife, U.S. Fish and Wildlife, and the National Marine Fisheries Service to evaluate the environmental impacts of flood control.



The area of the board's jurisdiction includes the entire Central Valley, including all tributaries and distributaries of the Sacramento and San Joaquin Rivers and the Tulare and Buena Vista basins. Eastern Solano County encompasses parts of the lower Sacramento watershed under CVFPB jurisdiction.

The Sacramento-San Joaquin Drainage District (SSJDD), which includes floodplains in the lower Sacramento basin in eastern Solano County, is managed by the CVFPP and authorized to acquire, own, hold, use, and enjoy any and all properties necessary for the purposes of the district in order to carry out specified flood management activities. All moneys collected upon sales or otherwise are deposited in the Sacramento and San Joaquin Drainage District Fund. Amendments in 2015-16 authorized the district to sell, lease or rent, or otherwise dispose of rights-of-way, easements, or property, as specified, and to take, receive, and apply for purposes of flood control the revenue received from the lease or rental of the property.

### **Solano County General Plan**

The 2008 Solano County General Plan includes a number of policies in the Public Health and Safety Element that provide for county-wide flood protection. These policies prioritize the maintenance of riparian corridors and water channels and the requirement of safe development standards for greater flood management protection throughout Solano County.

### **Urban Water Management Plans (UWMP)**

Jurisdictions either supplying over 3,000 acre-feet of water annually or serving more than 3,000 urban connections are required to submit an Urban Water Management Plan (UWMP) and update the plan every five years. Most jurisdictions participating in this MJHMP have a UWMP, explored in more detail in the jurisdictional annex capabilities assessments. The Solano County Water Agency also voluntarily authors an Urban Water Management Plan for areas of the county served by Solano Project supply and the State Water Project.

Most relevant to flood mitigation, UWMPs explore stormwater capacity and assist in planning and funding future stormwater needs. They also contain important information on long-term water supply planning and managing demands in times of drought. UWMPs are important for drought hazard planning and discussed in Section 4.5.5.2. (CDWR, 2021)

### **Solano County Reclamation and Levee Districts**

Flood protection services are often provided by reclamation and levee maintenance districts in Solano County. Both types of special districts operate and maintain levee and drainage systems to protect adjoining land from flooding. These levees and drainage systems protect agricultural and rural areas, critical infrastructure such as highways, and important environmental resources.

Solano County reclamation and levee districts maintain over 400 miles of levees located in the Suisun Marsh, Collinsville, and the Sacramento Delta. Levees in the area are either "project levees," built and maintained in compliance with the U.S. Army Corps of Engineer guidelines, or "non-project levees," which include all other levees built and maintained by private landowners or local reclamation districts. Only about a third of the levees in Solano County are project levees that are regularly inspected by DWR.



The Suisun Marsh Protection Plan, White Slough Specific Area Plan, and the Delta Plan all provide levee maintenance standards for non-project levees. For additional information, see the Solano County Local Agency Formation Commission Municipal Service Review of Reclamation and Levee Districts from 2020. (Solano LAFCO MSR, 2020, pp. i-ii)

### **Suisun Marsh Protection Area and Plan**

According to the 2018 Solano County Component of the Suisun Marsh Local Protection Program:

*The Suisun Marsh represents an area of significant aquatic and wildlife habitat and is an irreplaceable and unique resource to the residents of Solano County, the State, and Nation. The Suisun Marsh consists of approximately 85,000 acres of tidal marsh, managed wetlands, and waterways, as well as adjacent lowland and upland grassland areas, in southern Solano County. It is the largest remaining wetland around San Francisco Bay and comprises about ten percent of California's remaining wetland area. The Marsh is also a wildlife habitat of nationwide importance in that it provides wintering habitat for waterfowl of the Pacific Flyway. Because of its size and estuarine location, it supports a diversity of plant communities that provide habitats for a variety of fish and wildlife, including several rare and endangered species.*

In 1974, the San Francisco Bay Conservation and Development Commission (BCDC) adopted the Suisun Marsh Protection Plan to regulate development for the protection of Suisun Marsh. The purpose of the plan and permitting are to ensure new development outside the Marsh but within the watershed do not adversely affect water quality within the Marsh due to sedimentation and increased urban runoff. (Solano County, 2018, p. 4) Solano County was delegated responsibility for preparing and administering a local protection program.

BCDC serves as the land use permitting agency for major projects within areas encompassing tidal marshes, managed wetlands, adjacent lowland grasslands, and waterways ("primary management area") and as an appellate review body with limited function within significant buffer lands ("secondary management area"). As part of the plan, all jurisdictions within the Marsh<sup>5</sup> were required to bring general and specific plans, ordinances and zoning maps, land use regulations, and other standards and controls into conformity with the Marsh Act and Protection Plan. (*Id.*)

---

<sup>5</sup> Agencies include Solano County, the cities of Benicia, Fairfield, and Suisun City, the Solano County Local Agency Formation Commission, the Solano County Mosquito Abatement District, and the Suisun Resource Conservation District. (Solano County, 2018, p. 4)



## White Slough Specific Area Plan

Pursuant to a 1990 amendment to the McAteer-Petris Act, The White Slough Specific Area Plan was prepared by Solano County and the City of Vallejo and approved by the San Francisco Bay Conservation and Development Commission. The plan provides for the protection and enhancement of habitat value, and the improvement of transportation, flood control, and other infrastructure facilities in the plan area.

### Flood Damage Prevention in Solano County Code, § 12.2.

The Solano County Code contains provisions designed to reduce flood loss and to protect loss of property and life. New development in the floodplain must meet strict standards and be approved by the floodplain administrator. This includes special attention to the management of altered natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters; the management of filling, grading, dredging, and other development which may increase flood damage; and the prevention and regulation of the construction of flood barriers which will unnaturally divert floodwaters or which might increase flood hazards in alternate areas. The code prohibits encroachments, which include fill, new construction, substantial improvement, and other new development unless certified by a registered Professional Engineer or licensed surveyor and approved by the county.

## 4.5.2.2 Major Flood Events

Table 4-17 shows the flood events that took place in Solano County since the year 2000 that caused either property or crop damage. Flooding on New Year's Eve 2005 and New Year's Day 2006 was particularly damaging, with \$15 million in reported damages. (NOAA, 2020) More than 2,000 homes were damaged in the Vacaville area and flows overtopped Interstate 80 in Fairfield. (Murphy, 2006)

Table 4-17: Solano County Flood Events Since 2000

Date	Flood Type	Property Damage Value (\$)
1/23/2000	Flood	N/A
1/23/2000	Flood	N/A
1/23/2000	Flood	\$25,000
1/23/2000	Flood	N/A
1/23/2000	Flood	N/A
1/23/2000	Flood	N/A
1/30/2000	Flood	N/A
2/10-11/2000	Flood	N/A
2/22/2000	Flood	N/A
2/26/2000	Flood	N/A
1/1/2006	Flood	\$15,000,000
2/6/2017	Flood	N/A
2/13/2019	Flood	N/A

Source: NOAA Storm Events Database – N/A – No Damage was reported in database



### 4.5.2.3 Location

Solano County has a significant number of potential flood sources due to its varied geography and climate. Figure 4-26 depicts FEMA flood zones within Solano County. More detailed views of FEMA flood zones are available for participating jurisdictions through the Risk Assessment Mapping Platform (RAMP) on [mitigatehazards.com/solanohmp/ramp/](https://mitigatehazards.com/solanohmp/ramp/).

Flood risk within Solano County may be compounded by inundation from levee failure and heavy rainfall resulting in stream and drainage canal overflows. In the unincorporated portions of Solano County, flooding is often most impactful near the drainage canals that are used to collect local runoff and areas close to regional watershed floodways, such as the Sacramento River.

The western portion of Solano County tributaries drain generally southward into Suisun Bay through the Suisun Marsh. The Fairfield-Suisun City area is drained by McCoy, Union, Pennsylvania Avenue, Ledgewood, Laurel, and Union Avenue Creeks, which discharge into tidal channels tributary to Suisun Slough. American Canyon, Suisun, Jameson Canyon, and Green Valley Creeks drain the area generally west and north of Fairfield and discharge into tidal channels tributary to Cordelia Slough. Eastern Solano County, including portions of Putah Creek, Ulati Creek, and the Dixon Ditch System, generally drain east to south eastward into the Yolo Bypass Cache Slough Complex of the Sacramento - San Joaquin Delta. (*Id*)

The extent of flooding associated with a one percent annual probability of occurrence (the base flood or 100-YR flood) is used as the regulatory boundary by many agencies and helps identify the location and extent of flooding in areas across Solano County. This area, the Special Flood Hazard Area (SFHA), is a convenient tool for assessing vulnerability and risk in flood-prone communities. Figure 4-26 shows the FEMA 100-YR and 500-YR floodplain zones, calculated based on a flood that has a one percent (100-YR) and 0.2 percent (500-YR) chance of occurring in any given year. Vulnerabilities to flood within these flood zones are included in Section 4.5.2.11.

Spreading urbanization further exacerbates the potential for stormwater flood damage in the county by reducing floodplain area available to absorb stormwater in low-lying areas and by preventing natural absorption of stormwater in the higher land, upstream watersheds. Consequently, uncurbed urbanization is leading to an increased rate and volume of stormwater runoff in the county. (Solano County General Plan, 2008)

There are also two flood control projects that are operated and maintained by the Solano County Water Agency (SCWA). The two projects consist of unlined earthen channels with some vegetation for slope reinforcement. The larger of the two projects is the Ulati Flood Control Project. This project is located in the Vacaville-Elmira drainage basin and is designed to handle a 10-year flood event. The purpose of the Ulati project is to protect agricultural land downstream of Vacaville. The second project is the Green Valley Flood Project. It is located partially in the unincorporated community of Cordelia and partially within the City of Fairfield. The Green Valley project is comprised of 3.2 miles of channel and is designed to handle a 40-year flood event. (*Id*) (Solano County General Plan, 2008)



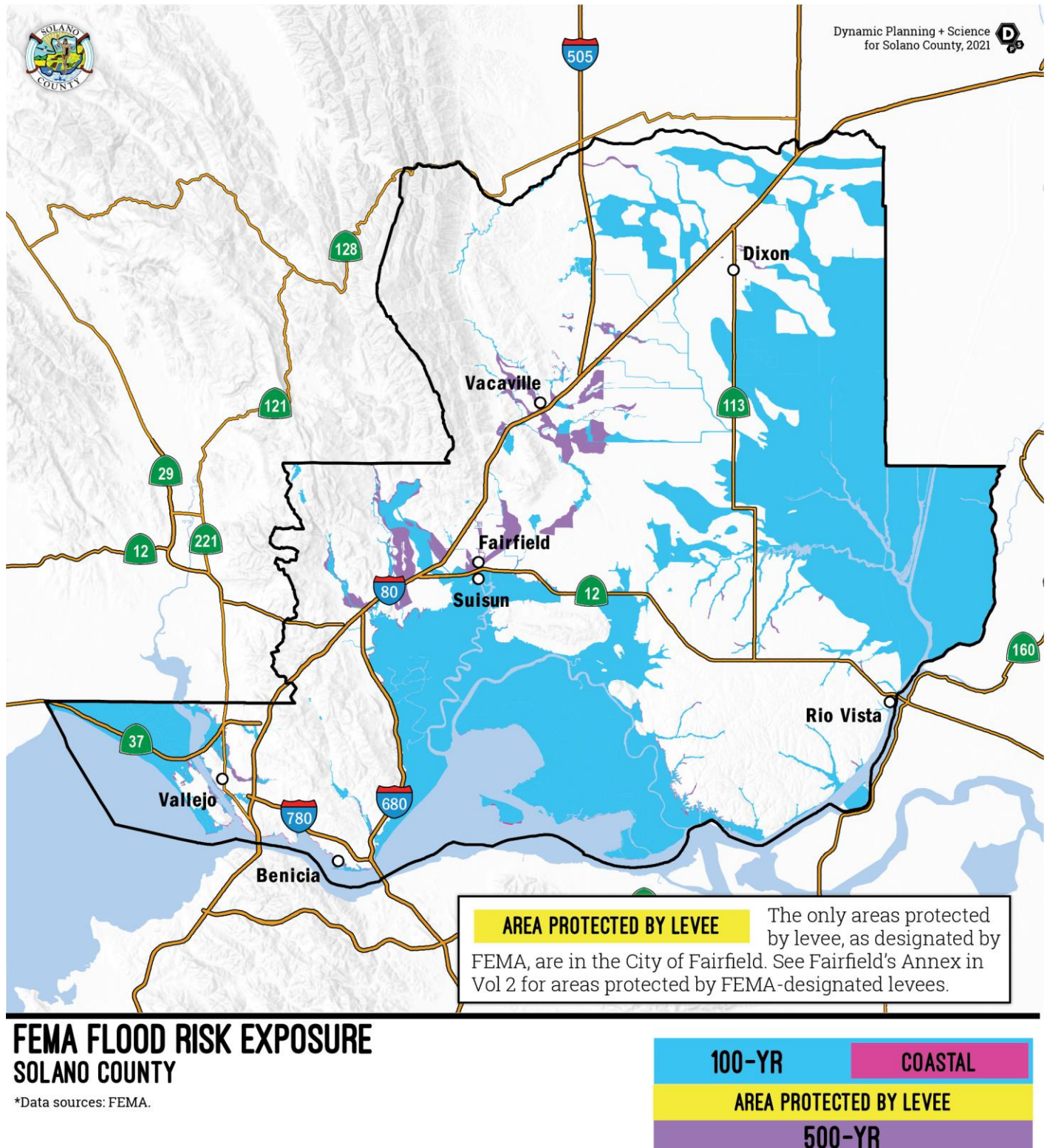


Figure 4-26: Solano County Flood Exposure



#### 4.5.2.3.1 Areas Protect by Levees

Levee failures are sometimes difficult to predict; even inspected levees can be susceptible to failure under certain conditions. Levees are maintained and improved by many reclamation and levee maintenance districts throughout Solano County. There are over 400 miles of levees located in Suisun Marsh, Collinsville, and the Sacramento Delta.

The flood management system is generally divided into two broad categories: 1) **Project levees** that were built, rebuilt, or adopted as part of the State-Federal Sacramento River Flood Control System and are maintained to the highest standards that comply with U.S. Army Corps of Engineer guidelines, and 2) **Non-project levees** which includes all other levees built and maintained by private landowners or local reclamation districts. Only about a third of the levees in Solano County are project levees that are regularly inspected by DWR. (Solano LAFCO MSR, 2020, pp. i-ii)

The California Department of Water Resources has used the best available information to identify areas within the county where flood levels are predicted to be more than three feet deep if a project levee were to fail; these areas are known as **Levee Flood Protection Zones (LFPZ)**. Most of these zones are located in the eastern portion of the county within the Sacramento-San Joaquin Delta. (Solano County General Plan, 2008) See Figure 4-27 for areas that are protected by Army Corps of Engineers levees within the National Levee Database. It is important to note this mapping does not display all land protected by levees within the county.

The potential failure of levees as a result of liquefaction also constitutes a flood hazard. Significant parts of the county are within liquefaction zones. See Section 4.5.3.

Subsidence is also a factor for increased flood severity. Certain areas of the county lie at least three feet below sea level and are subsiding at a rate of up to three inches per year. Most of these are leveed areas and are currently used for agriculture. In particular, the failure of levees protecting the eastern portions of the county could impact residential areas. Roads in the Suisun Marsh and in the east county are constructed almost exclusively on levees. Consequently, levee failures could also cause the disruption of travel through these areas. (*Id*)



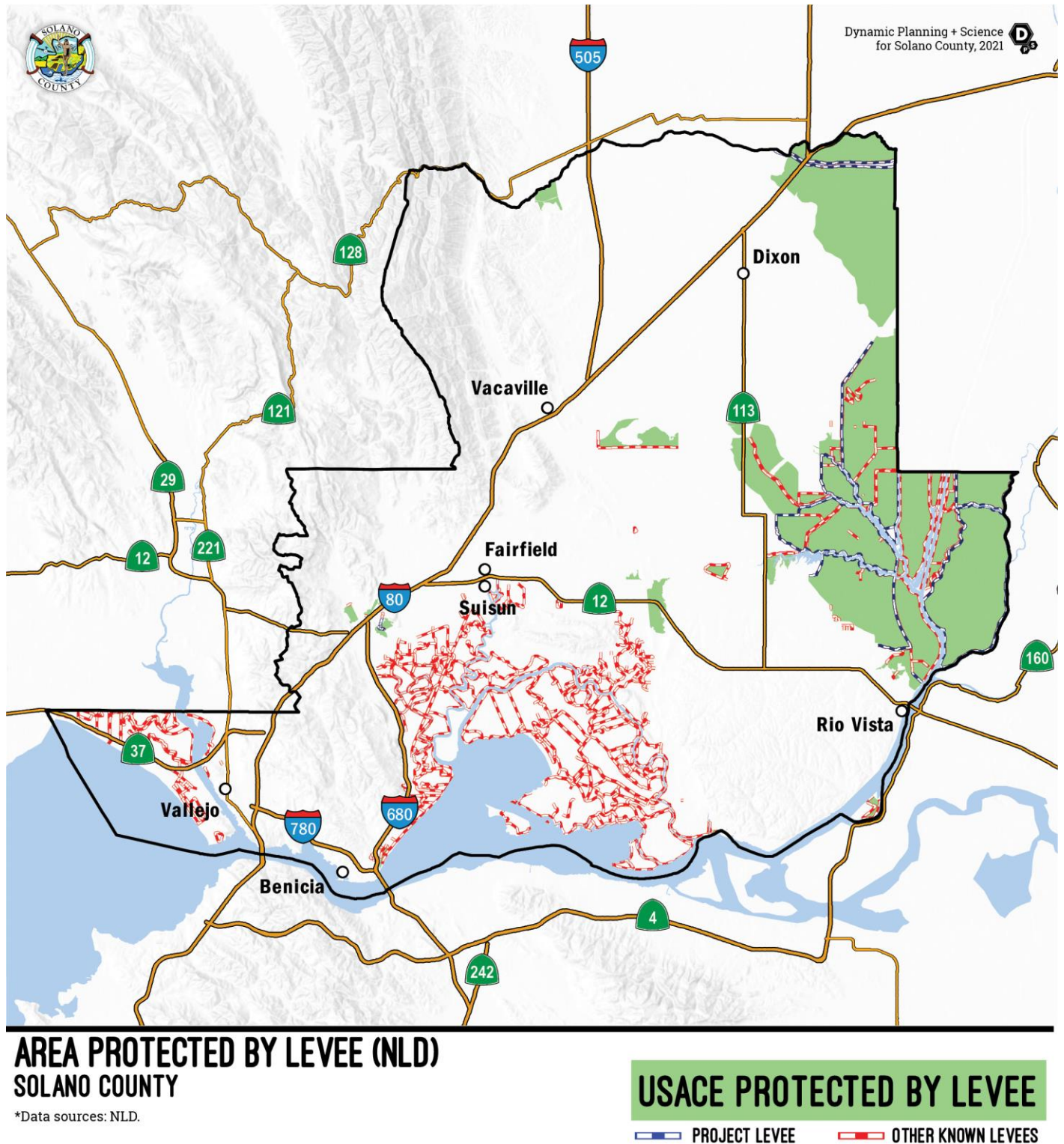


Figure 4-27: Area Protected by Levee



#### **4.5.2.3.2 DWR Flood Awareness Zones and 200-year Floodplain in Sacramento Watershed**

DWR designates Flood Awareness Zones to highlight areas of additional flood, extending beyond FEMA-designated floodplains, that pose a threat throughout the state. The mapping provides communities and residents an additional tool in understanding potential flood hazards. These floodplains are shown simply as flood-prone areas without specific depths and other flood hazard data. Flood awareness zones for Solano County are shown in the repetitive loss area maps if present.

DWR's best available mapping also includes the 200-year floodplain as identified by the Army Corps of Engineers from the 2002 Sacramento and San Joaquin River Basins Comprehensive Study. The 200-year floodplain is only mapped for the areas of Solano County within the lower Sacramento watershed, within the Sacramento-San Joaquin Drainage District.

Senate Bill (SB) 5 requires a 200-year level of flood protection from urban and urbanized areas within the Central Valley. All cities and counties in the Central Valley are required to incorporate the data and analysis of the CVFPP into their general plans and zoning ordinances. Solano County will be required to include CVFPP data relating to the following categories as they are relevant to flood-specific outcome categories: public safety outcomes, ecosystem vitality, and economic stability outcomes. Under SB 5, development in moderate or special hazard areas within the Central Valley is allowed if the local agency can provide substantial evidence that the development would be subject to less than three feet of flooding during a 200-year flood event. Figure 4-28 depicts the flood awareness zones in Solano County and the 200-year floodplain with the lower Sacramento Watershed, as designated by the Army Corps of Engineers, compared to the FEMA-designated flood zones.



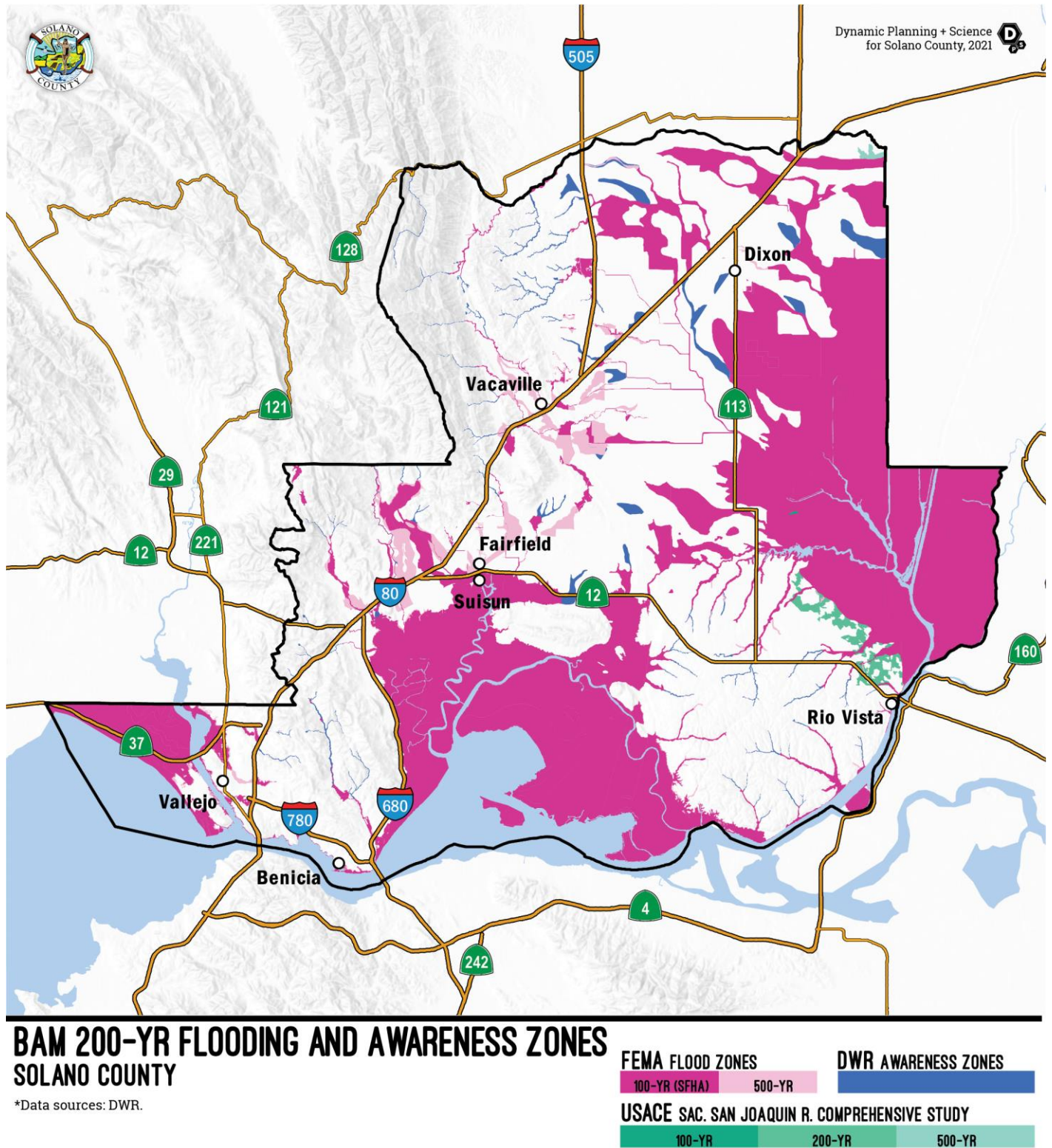


Figure 4-28: BAM 200-YR Flooding and Awareness Zones





#### 4.5.2.4 Repetitive Loss Areas Analysis

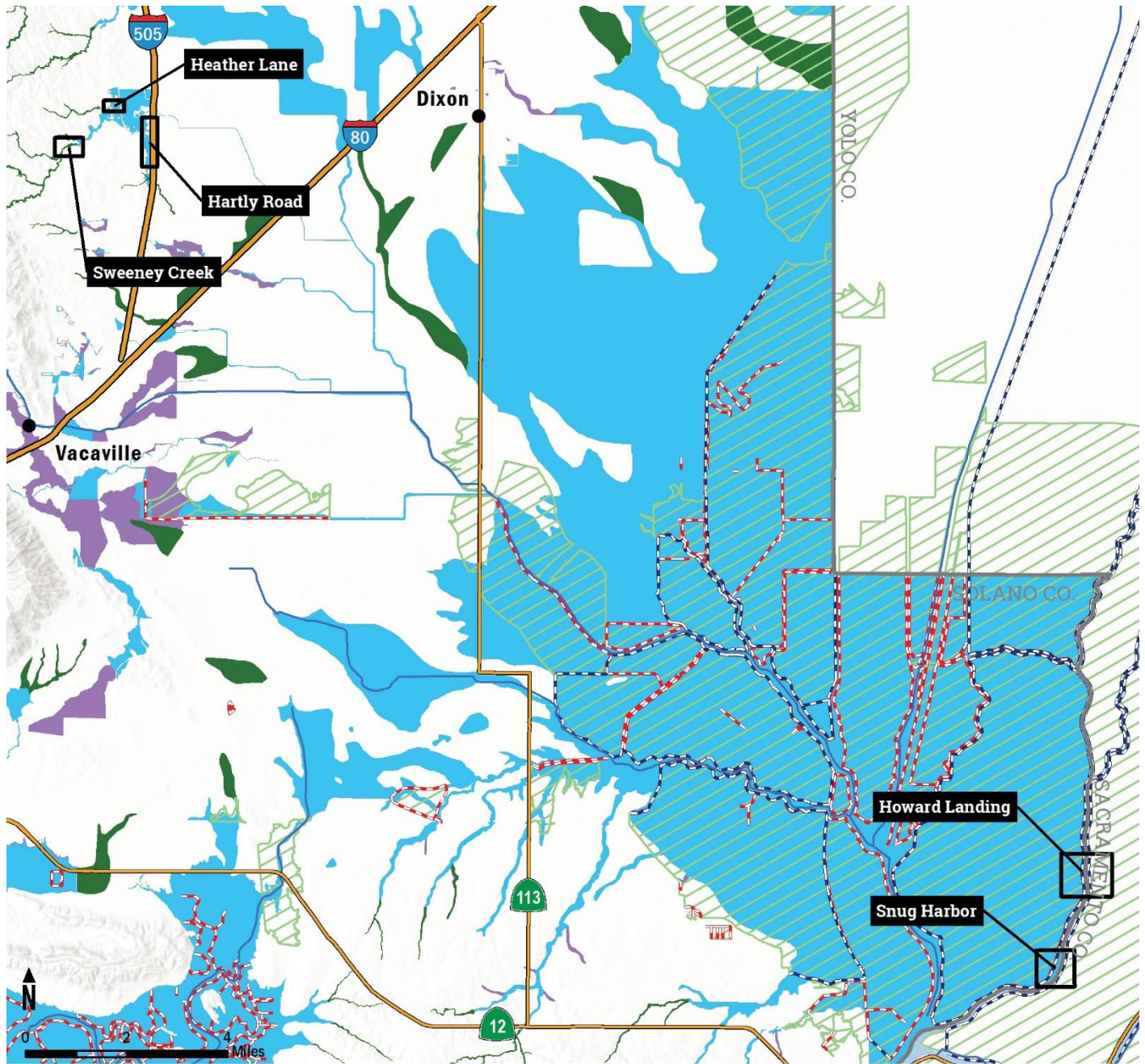
A repetitive loss (RL) property is a FEMA designation, defined as an insured property (or formerly insured) that has made two or more claims of more than \$1,000 in any rolling 10-year period since 1978. Claims must be at least 10 days apart but within 10 years of each other. The term “rolling 10-year period” means that a claim of \$1,000 can be made in 1991 and another claim for \$2,500 in 2000, or one claim in 2001 and another in 2007, as long as both qualifying claims happen within 10 years of each other. A RL property may be classified as a Severe Repetitive Loss (SRL) property under certain conditions. A Severe Repetitive Loss property has had four or more claims of at least \$5,000, or at least two claims that cumulatively exceed the buildings reported value.

Extensive FEMA NFIP databases are used to track claims for every participating community, including Solano County. Currently, the county contains 56 RL properties county-wide. The total dollar amount of claims paid to date by the NFIP for RL properties is \$3,748,598 of structural and \$1,231,370 content claims. The total claims paid by the NFIP are \$10,091,592 county-wide. See Table 4-16.

A property does not have to be currently carrying a flood insurance policy to be considered a RL or SRL property. Often homes in communities do not carry flood insurance but are still on the community's repetitive loss list. The “repetitive loss” designation follows a property from owner to owner, from insurance policy to no insurance policy, and even after the property has been mitigated. Having an insurance policy and making claims that fall into the repetitive loss criteria will put a property on the RL list. Even after the policy on a property has lapsed or been terminated, the property will remain on Solano County's RL list.

This Repetitive Loss Areas Analysis (RLAA) examines areas where multiple RL properties exist in close proximity to each other and share similar flooding source conditions. Five RL areas have been identified as part of Solano County's RLAA: three in the Allendale area and two in the lower-lying Delta region of the county. Figure 4-29 shows the repetitive loss areas in Solano County.

The Privacy Act of 1974 (5 U.S.C. 522a) restricts the release of certain types of data to the public. Flood insurance policy and claims data are included in the list of restricted information. FEMA can only release such data to state and local governments, and only if the data are used for floodplain management, mitigation, or research purposes. Therefore, this plan does not identify the repetitive loss properties or include claims data for any individual property.



### SOLANO COUNTY - REPETITIVE LOSS AREAS

- Repetitive Loss Area
- Project Levees
- Other Known Levees
- Areas Protected by Levee (USACE)
- Flood Awareness Zone
- 100yr FEMA Flood Zones
- 500yr

#### FEMA REPETITIVE LOSS DATA SUMMARY

PROPERTY COUNT:	<b>23</b>	BUILDING PAYOUTS:	<b>\$1,974,706</b>
LOSSES:	<b>59</b>	CONTENT PAYOUTS:	<b>\$716,321</b>
AVERAGE PAYOUT:	<b>\$48,900</b>	TOTAL PAID:	<b>\$2,691,028</b>

Figure 4-29. Repetitive Loss Areas and Loss Data Summary



#### **4.5.2.4.1 Delta Repetitive Loss Areas**

The Sacramento-San Joaquin Delta ("Delta") covers approximately 1,300 square miles (or 730,880 acres) of land and water bodies and includes portions of five counties in Northern California: Contra Costa, Sacramento, San Joaquin, Solano, and Yolo counties. Fed by runoff from the northern Sierra Nevada Mountains and the Southern Cascades, the Sacramento River flows south to meet the northbound San Joaquin River just south of the City of Sacramento. Smaller tributaries and tidal flows combine with these rivers prior to their junction to form a 700-mile maze of sloughs and waterways surrounding more than 60 leveed tracts of land or "islands." Properties located in the Delta are at a high risk of flooding. Much of the property in the Delta is rural in character and used for farming. However, the residential development that does exist in the Delta, particularly in the eastern part of Solano County, is at risk of flooding and has experienced repetitive flood loss. The Delta Repetitive Loss Areas consists of one area located on Snug Harbor at Ryer Island and one at Howard Landing.

##### **Snug Harbor Repetitive Loss Area**

Ryer Island is located in the Sacramento-San Joaquin River Delta in Solano County, about 6.5 miles north-northeast of Rio Vista and surrounded by Miner Slough and Steamboat Slough. This repetitive loss area consists of seven properties on Snug Harbor, located on the eastern portion of Ryer Island on the "water side" of the Ryer Island levee. Figure 4-30 indicates the area of generalized repetitive loss claims at Snug Harbor. Most properties on Snug Harbor have significant risk to flooding, as indicated by past flood occurrences and past claims. One property on Snug Harbor Island is a SLR property with more than seven different claims dating back to 1983. All properties within the Snug Harbor Repetitive Loss Area are within the FEMA 100-YR Floodplain. The SFHA "Effective" FIRM indicates Base Flood Elevations (BFEs) of 14 feet for the Steamboat Slough Floodway and, thus, for most of Snug Harbor Island. BFEs eventually rise to 17 feet farther up the reach near the confluences of Miner Slough and Steamboat Slough.

##### **Howard Landing Repetitive Loss Area**

Howard's Landing is also located on Steamboat Slough, just upstream from the Snug Harbor RL area. This RL area consists of two properties on Beaver Island, located on the eastern portion of Ryer Island on the "water side" of the Ryer Island levee. Figure 4-31 indicates the area of generalized repetitive loss claims at Beaver Island. Most properties on Beaver Island have significant risk to flooding, as indicated by past flood occurrences and past claims. There have been four claims in this area totaling over \$138,000. All properties within the Howard's Landing Repetitive Loss Area are within the FEMA 100-YR Floodplain. The SFHA "Effective" FIRM indicates BFEs of 14 feet for the Steamboat Slough Floodway for most of Beaver Island with no protection against high water events.



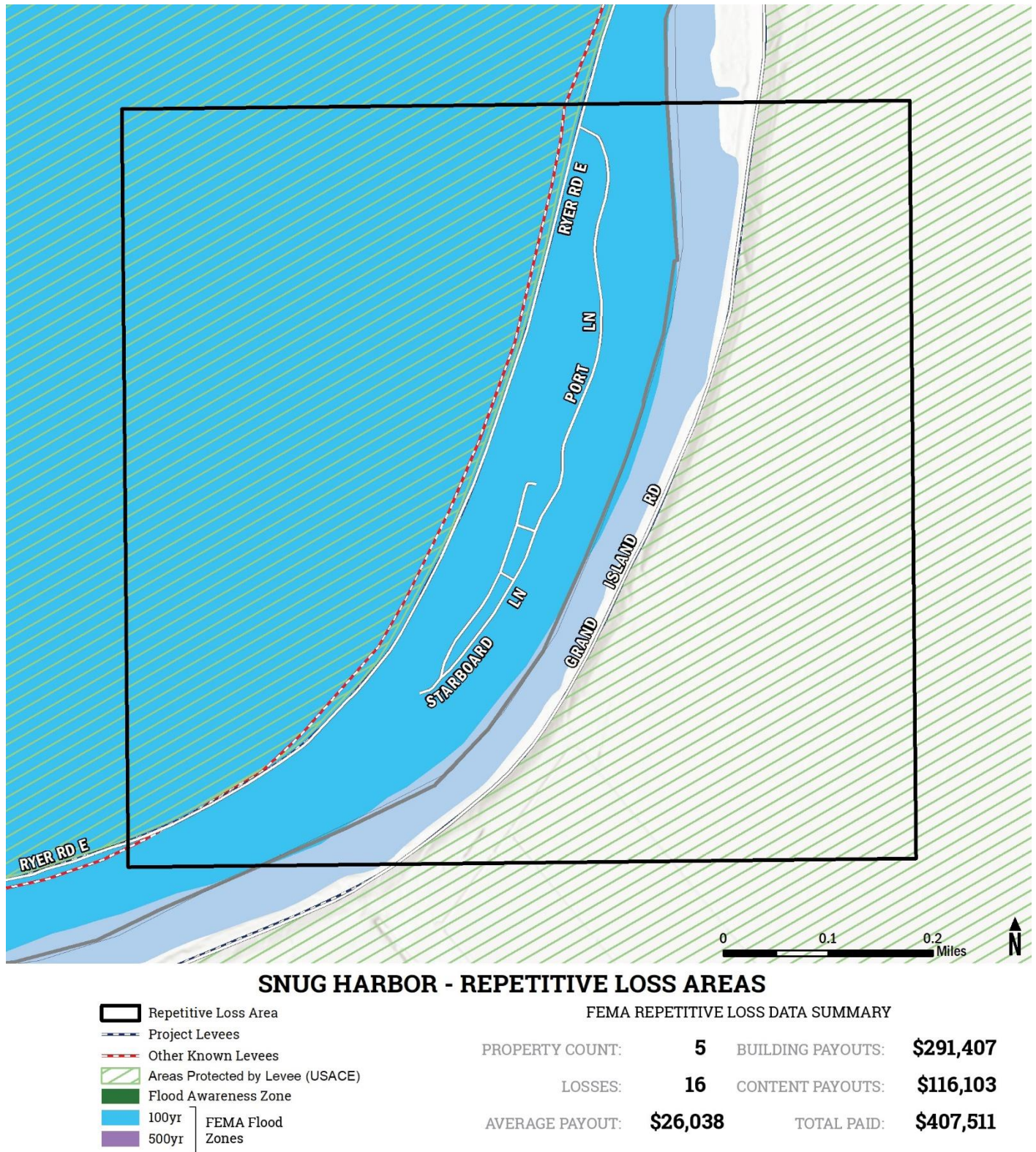
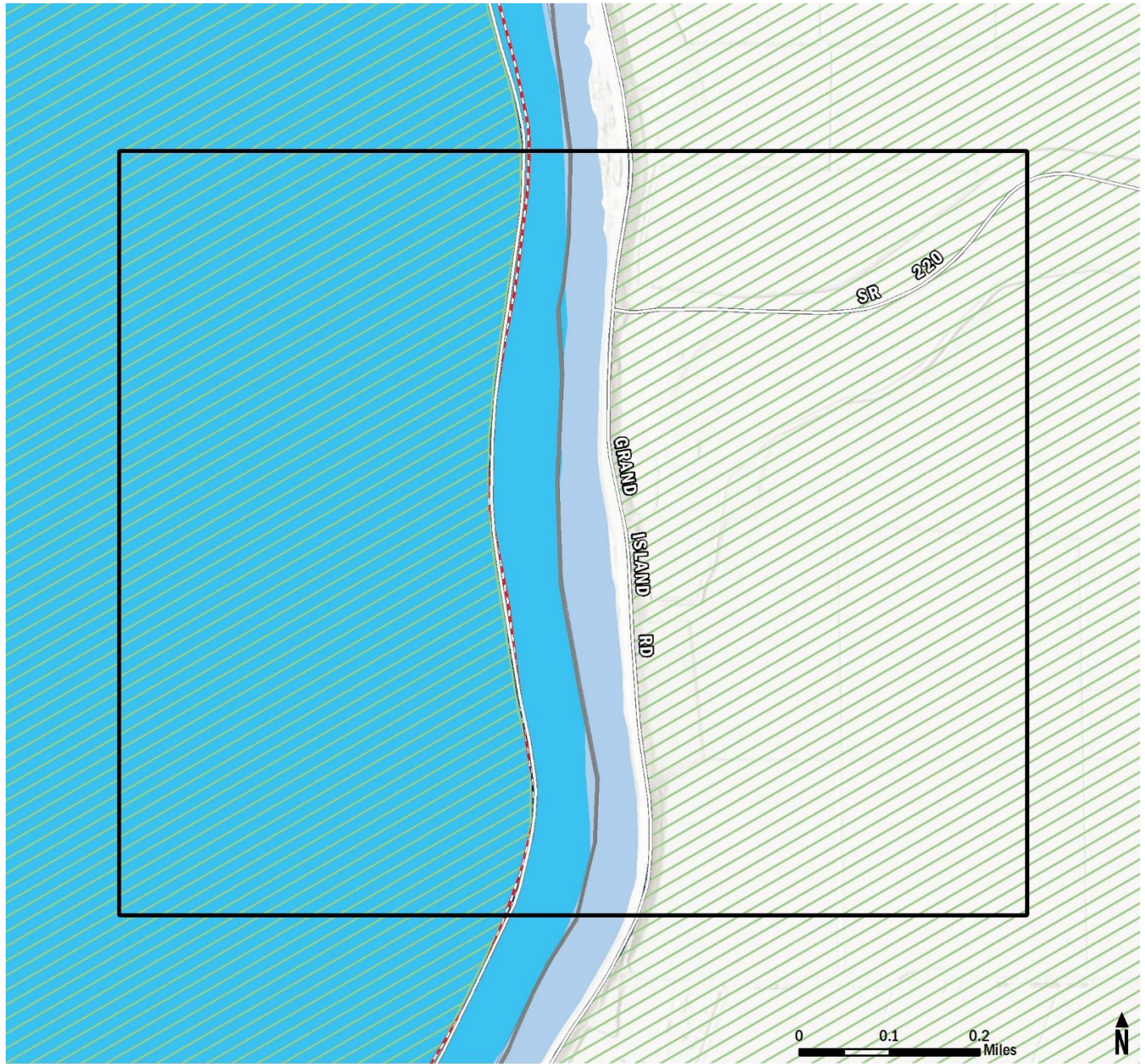


Figure 4-30: Snug Harbor Repetitive Loss Area





### HOWARD LANDING - REPETITIVE LOSS AREAS

- Repetitive Loss Area
- Project Levees
- Other Known Levees
- Areas Protected by Levee (USACE)
- Flood Awareness Zone
- 100yr FEMA Flood Zones
- 500yr FEMA Flood Zones

#### FEMA REPETITIVE LOSS DATA SUMMARY

PROPERTY COUNT:	<b>2</b>	BUILDING PAYOUTS:	<b>\$111,136</b>
LOSSES:	<b>4</b>	CONTENT PAYOUTS:	<b>\$27,264</b>
AVERAGE PAYOUT:	<b>\$34,600</b>	TOTAL PAID:	<b>\$138,400</b>

Figure 4-31: Howard's Landing Repetitive Loss Area





#### 4.5.2.4.2 Allendale Repetitive Loss Areas

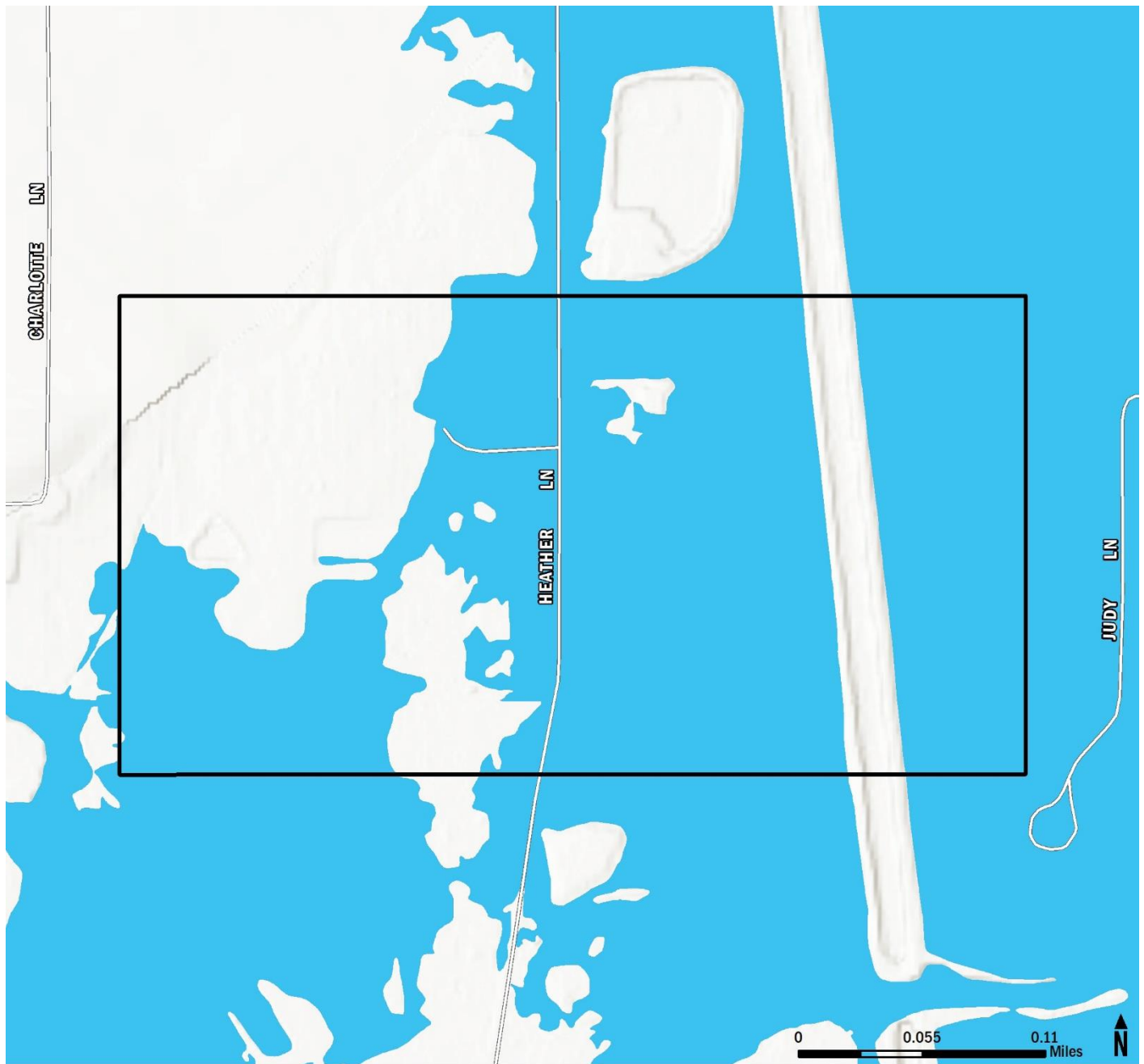
Allendale is a census-designated place in northern Solano County, located 6.5 miles west of Dixon along Highway 505. Allendale is a rural area consisting of large-lot, single-family detached residential development. It has experienced more repetitive loss than any other area in Solano County and has three RL areas: Heather Lane, Hartley Road, and Sweeney Creek. The flooding source is primarily Sweeney Creek; however, there are multiple drainage and water supply canals that contribute to flooding issues.

In 1996, the Sweeney Creek Workgroup was formed to address flood issues along the creek. The Solano County Water Agency (SCWA) also requested easements from landowners between the Putah South Canal and the Ulati Project, but landowners were unwilling to grant SCWA easements at that time. After 1998 and several large storm events, landowners became interested in improving Sweeney Creek. SCWA was then able to obtain easements from landowners and now maintains a majority of the stretch between Sweeney Creek from the Putah South Canal down to the Ulati Project. SCWA also completed a watershed study for the area, which proposed enlarging Sweeney Creek; however, landowners were not interested in the project. Landowners were also not interested in other proposed projects, such as forming an assessment district to fund maintenance of the Putah South Canal or improving the Heather Lane ditch. SCWA did establish the Home Raising Program to help landowners in the Sweeney Creek area to raise or berm their homes and SCWA administers a small grants program to assist landowners. FEMA has worked with the county to identify, assess, and communicate the Allendale community's flood hazards. Revised FIRM mapping for Solano County became effective on August 2, 2012. Previous to the FEMA remapping study, none of the RL homes were reported to be in a SFHA. As a result of the recent restudy, property owners and the county have a more accurate picture of what properties are at risk of flooding and where to focus flood mitigation efforts.

**Heather Lane Repetitive Loss Area:** The Heather Lane Repetitive Loss area consists of three repetitive loss properties located on Heather Lane just north of Sweeney Creek, as shown in Figure 4-32. All three of these properties are located in the 100-YR flood zone. Repeated flooding in this area is attributed to Sweeney Creek at the crossing with the Putah South Canal. The low-lying nature of these properties along with an undersized crossing at the canal contribute to flooding in this area.

**Hartley Road Repetitive Loss Area:** The Hartley Road Repetitive Loss Area consists of three repetitive loss properties located between Store Road and Udell Road, just west of Hartley Road, as shown in Figure 4-33. The low-lying nature of these single-family properties and their location in the 100-YR flood zone contribute to repeated flooding in the area. Flooding is also attributed to issues associated with Sweeney Creek.

**Sweeney Creek Repetitive Loss Area:** The Sweeney Creek Repetitive Loss Area consists of two repetitive loss properties on Peaceful Glen Road that are in close proximity to Sweeney Creek. This area is depicted in Figure 4-34. Only one of the two properties in this area is located in the 100-YR flood zone; DWR Flood Awareness Zones are also mapped to show additional flood risks in the area. The location of both properties in proximity to Sweeney Creek contributes to repeated flooding in this area. These areas are privately-owned, and all maintenance is the responsibility of the landowners. The County will work with these landowners in the future to identify and mitigate flood risks.



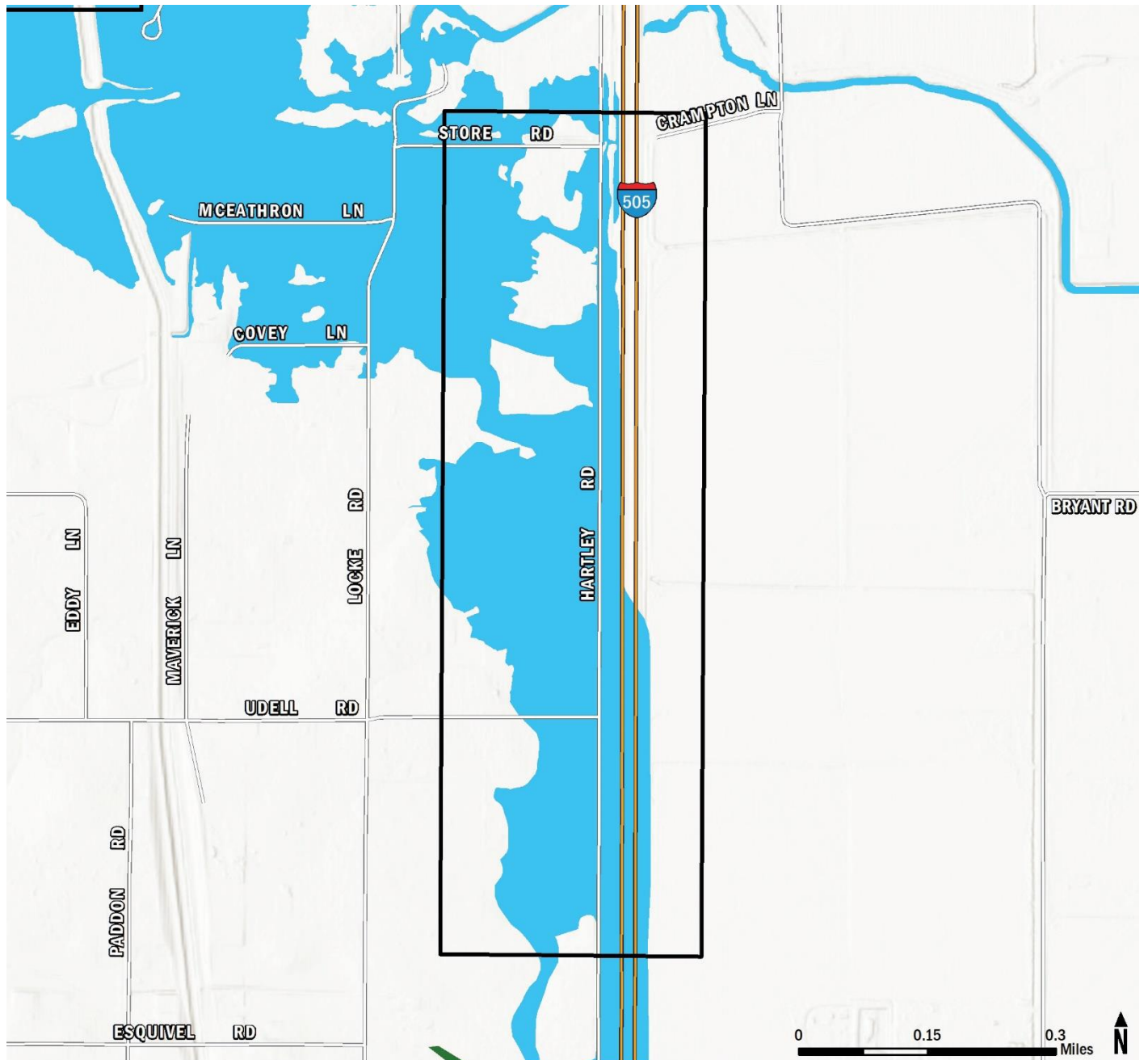
### HEATHER LANE - REPETITIVE LOSS AREAS

- Repetitive Loss Area
- Project Levees
- Other Known Levees
- Areas Protected by Levee (USACE)
- Flood Awareness Zone
- 100yr FEMA Flood Zones
- 500yr FEMA Flood Zones

#### FEMA REPETITIVE LOSS DATA SUMMARY

PROPERTY COUNT:	<b>4</b>	BUILDING PAYOUTS:	<b>\$425,853</b>
LOSSES:	<b>8</b>	CONTENT PAYOUTS:	<b>\$196,768</b>
AVERAGE PAYOUT:	<b>\$77,828</b>	TOTAL PAID:	<b>\$622,621</b>

Figure 4-32: Heather Lane Repetitive Loss Area



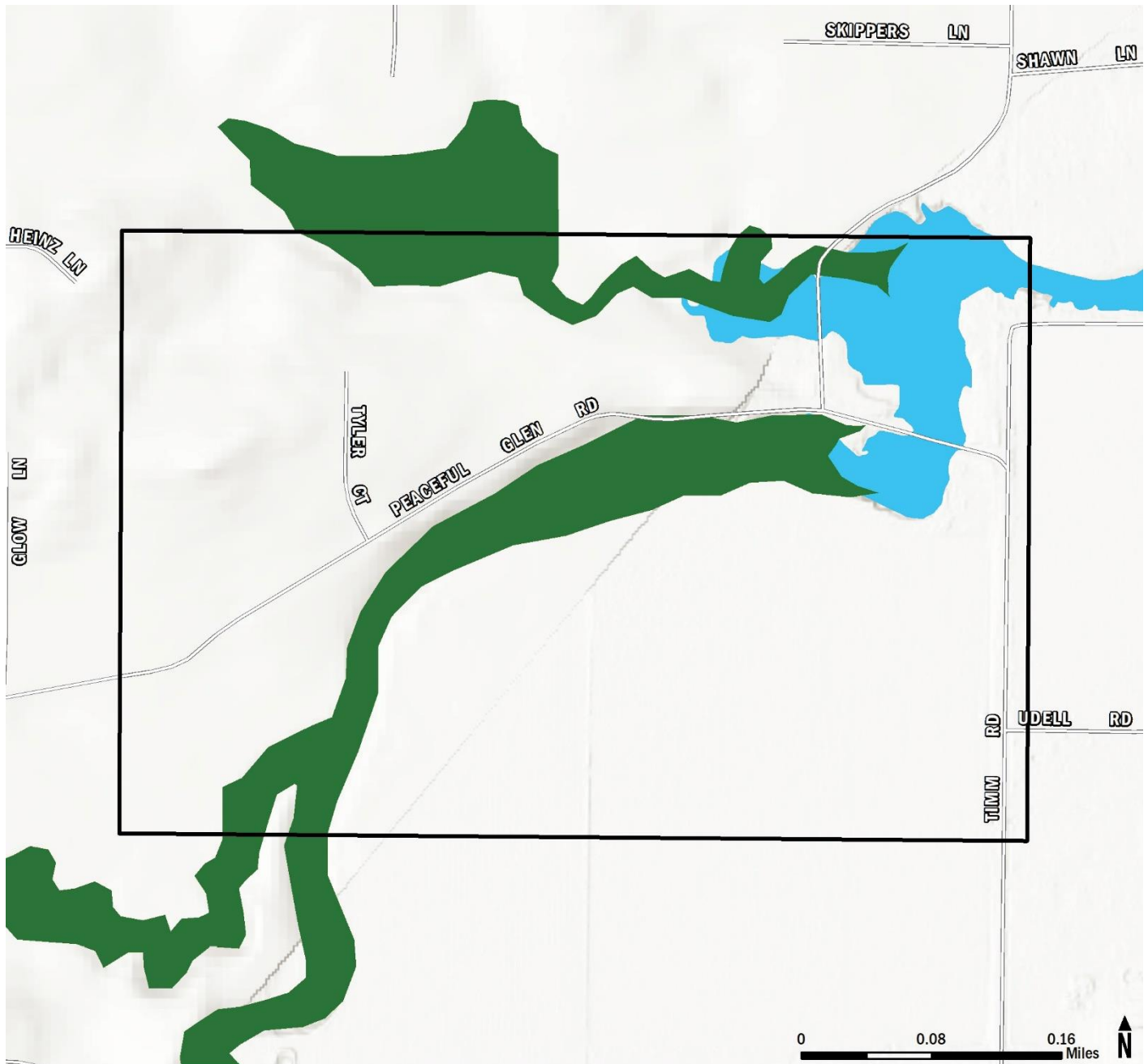
### HARTLY ROAD - REPETITIVE LOSS AREAS

- Repetitive Loss Area
- Project Levees
- Other Known Levees
- Areas Protected by Levee (USACE)
- Flood Awareness Zone
- 100yr FEMA Flood Zones
- 500yr FEMA Flood Zones

#### FEMA REPETITIVE LOSS DATA SUMMARY

PROPERTY COUNT:	3	BUILDING PAYOUTS:	\$174,858
LOSSES:	6	CONTENT PAYOUTS:	\$45,930
AVERAGE PAYOUT:	\$36,798	TOTAL PAID:	\$220,787

Figure 4-33: Hartly Road Repetitive Loss Area



### SWEENEY CREEK - REPETITIVE LOSS AREAS

- Repetitive Loss Area
- Project Levees
- Other Known Levees
- Areas Protected by Levee (USACE)
- Flood Awareness Zone
- 100yr FEMA Flood Zones
- 500yr FEMA Flood Zones

#### FEMA REPETITIVE LOSS DATA SUMMARY

PROPERTY COUNT:	<b>2</b>	BUILDING PAYOUTS:	<b>\$241,643</b>
LOSSES:	<b>4</b>	CONTENT PAYOUTS:	<b>\$101,906</b>
AVERAGE PAYOUT:	<b>\$85,887</b>	TOTAL PAID:	<b>\$343,549</b>

Figure 4-34: Sweeney Creek Repetitive Loss Area



#### **4.5.2.5 Measuring Frequency and Severity**

The frequency and severity of flooding are measured using a discharge probability, a statistical tool that defines the probability that a certain river discharge or flow level will be equaled or exceeded within a given year. Flood studies use historical records to determine the probability of occurrence for the different discharge levels. The flood frequency equals 100 divided by the discharge probability. For example, the 100-YR discharge has a one percent chance of being equaled or exceeded in any given year. The “annual flood” is the greatest flood event expected to occur in a typical year. These measurements reflect statistical averages only; it is possible for two or more floods with a 100-YR or higher recurrence interval to occur in a short time period. The same flood can have different recurrence intervals at different points on a river.

The extent of flooding associated with a one percent annual probability of occurrence (the base flood or 100-YR flood) is used as the regulatory boundary by many agencies. Also referred to as the Special Flood Hazard Area (SFHA), this boundary is a convenient tool for assessing vulnerability and risk in flood-prone communities. Many communities have maps that show the extent and likely depth of flooding for the base flood. Corresponding water surface elevations describe the elevation of water that will result from a given discharge level, which is one of the most important factors used in estimating flood damage.

#### **4.5.2.6 Frequency and Probability of Future Occurrences**

Solano County will experience flooding in the future, with the probability of flooding in Solano County between 10 and 100 percent annually. The majority of the floods in Solano County have occurred from winter-through-spring rainfall. The Pacific high is known to cause increased intensity in weather patterns. As it moves southwards, it encourages storm formation across the state, producing widespread rain at low elevations and snow at high elevations. It is responsible for occasional heavy rains that are known to cause serious flooding. The semi-permanent high-pressure area of the north Pacific Ocean is also responsible for storms, causing heavy rains and widespread flooding during winter months. (Western Regional Climate Center, 2020)

Flooding in California is often associated with the El Niño weather phenomenon. El Niño is a term originally used to describe the appearance of warm (surface) water from time to time in the eastern equatorial Pacific region along the coasts of Peru and Ecuador. This ocean warming can strongly affect weather patterns all over the world. El Niño events are often associated with above-normal precipitation in the southwestern United States and often occur during the winter. La Niña is the opposite or “cold phase” of the El Niño cycle. Current understanding suggests that El Niño has a return period of four to five years. When an El Niño event occurs, it often lasts from 12 to 18 months. (National Oceanic and Atmospheric Administration, 2020)





#### 4.5.2.7 Severity and Extent

The main factors affecting flood damage are water depth and velocity. Deeper and faster flood flows can cause more damage. Shallow flooding with high velocities can cause as much damage as deep flooding with low velocity. This is especially true when a channel migrates over a broad floodplain, redirecting high velocity flows and transporting debris and sediment. Figure 4-36 shows FEMA predictions for the extent of a 100-YR and 500-YR flood in Solano County.

Flood severity is often evaluated by examining peak discharges; FEMA Flood Insurance Mapping Studies (FIS) use peak flows to map Solano County Floodplains. Table 4-18 provides some highlights of peak flows in the 2013 FEMA Preliminary FIS.

Table 4-18: Summary of Discharges in Solano County

	Drainage Sq. Miles	Peak Discharge (cubic feet/second)			
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Flooding Source/Location					
Alamo Creek					
Pleasant Valley Road	N/D	2,000	2,700	2,900	3,600
Interstate Highway 80	N/D	2,700	3,200	3,400	3,500
Alamo Drive	N/D	4,400	5,700	6,200	6,700
Leisure Town Road	25.1	3,500	3,700	3,700	3,900
Blue Rock Springs Creek					
At Confluence with Rindler Creek	2.36	806	987	1,049	1,135
Just Downstream of Interstate 80	2.32	791	978	1,040	1,126
Just Upstream of Interstate 80	2.28	776	968	1,030	1,117
Gibson Canyon Creek					
At Browns Valley Road	1.16	390	530	580	710
Upstream of Putah South Canal	1.93	620	850	940	1,200
Downstream of Putah South Canal	1.93	440	480	490	520
Approximately 675 feet downstream of Eubanks Road	2.10	470	520	530	570
At Interstate Highway 505	2.78	620	730	770	850
Upstream of Confluence of South Branch Gibson Canyon Creek	2.81	630	740	780	860
At Leisure Town Road	4.19	510	520	520	530
At Sewage Treatment Plant	4.63	600	730	810	790
Upstream of Interstate Highway 80	7.36	1,800	2,300	2,400	2,900
Downstream of Interstate Highway 80	7.62	1,800	2,300	2,500	3,000
At Byrnes Road	8.03	1,900	2,500	2,700	3,100



Flooding Source/Location	Drainage Sq. Miles	Peak Discharge (cubic feet/second)			
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Green Valley Creek					
At Cordelia Road	18.0	1,225	2,400	2,950	4,350
At Interstate Highway 80	17.8	1,225	2,350	3,300	5,100
At Green Valley Road (Lower Crossing)	16.3	1,130	2,200	3,350	6,600
At Mason Road	10.6	990	1,800	2,150	2,700
At Rockville Road	8.2	770	1,550	1,750	2,350
At Wild Horse Creek	6.8	710	1,550	2,500	4,800
At Green Valley Road (Upper Crossing)	3.2	350	790	1,260	2,520
Horse Creek					
Upstream of Putah South Canal	1.10	370	500	560	680
Downstream of Putah South Canal	1.10	370	420	425	430
Upstream of Confluence with South Branch Horse Creek	1.18	400	460	460	480
At Interstate Highway 505	2.38	800	890	910	970
Upstream of Confluence with Pine Tree Creek	2.42	810	900	920	990
At Interstate Highway 80 (Westbound)	3.88	1,200	1,300	1,400	1,500
At Orange Drive	5.19	1,600	1,900	1,900	2,000
At Leisure Town Road	7.84	2,200	2,700	2,700	3,300
At Willow Avenue	8.24	2,300	2,800	2,900	3,500
Lagoon Drain					
At Interstate Highway 80	3.5	370	650	850	1,400
Lemon Street Canal					
At Lemon Street	1.95	989	1,275	1,397	1,649
At Fahey Court	1.78	884	1,143	1,234	1,446
At Confluence with Magazine Street Canal	1.29	667	711	734	783
At the Upstream Limit of Study	0.91	390	403	417	444
Miller Ditch					
At Vervais Avenue	1.77	1,274	1,475	1,647	2,027
Approximately 1,500 Feet Upstream of Carolina Street	1.68	1,072	1,432	1,612	1,990
At Thelma Avenue	1.43	896	1,303	1,490	1,859
At Oakwood Avenue	1.28	819	1,195	1,368	1,708
At Heartwood Drive	0.36	232	334	339	521
Pine Tree Creek					



Flooding Source/Location	Drainage Sq. Miles	Peak Discharge (cubic feet/second)			
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Upstream of Union Pacific Railroad	0.20	75	100	110	140
Upstream of Putah South Canal	0.84	340	450	500	750
Downstream of Putah South Canal	1.11	280	300	320	370
At Interstate Highway 505	1.46	390	440	460	520
At Interstate Highway 80	1.4	225	500	650	825
At Nut Tree Airport	0.9	225	425	525	1,250
At Putah South Canal	0.8	225	425	800	2,000
At Browns Valley Road	0.6	240	425	950	2,200
<b>Suisun Creek</b>					
At Cordelia Road	49.5	2,550	3,300	3,300	3,300
At Interstate Highway 80	48.8	2,550	3,610	3,610	3,610
At Rockville Road	48.3	2,500	4,200	4,200	4,310
At Suisun Valley Road	47.3	2,550	4,900	5,850	6,400
At Wooden Valley Road	44.0	2,450	5,000	6,900	10,270
At Napa County-Solano County Limits	40.7	2,200	4,800	6,500	12,400
<b>Sweeney Creek</b>					
Upstream of Conf. with McCune Creek	15.5	N/D	N/D	2,660	N/D
At Putah South Canal Bridge	10.1	N/D	N/D	3,780	N/D
At Peaceful Valley Road Bridge	7.65	N/D	N/D	3,830	N/D
<b>Ulatris Creek</b>					
Leisure Town Road	16.6	2,700	2,800	2,800	2,800
At Interstate Highway 80	N/D	3,300	4,700	5,200	6,100
Farrell Road	N/D	3,000	4,200	4,700	5,800
Putah South Canal	N/D	3,300	4,400	4,500	4,700

Source: Selection taken from Table 8 Summary of Discharges from FEMA Preliminary FIS Text, 2013.

Note: N/D signifies no data. See original text for additional information, including footnotes.



#### 4.5.2.8 Warning Time

The type and rate of flooding experienced in Solano County varies. In general, warning times for floods can be between 24 and 48 hours to prepare communities to reduce flood damages. Seasonal notification for flooding can enhance awareness for citizens at risk, and, when communicated effectively, advance notification can reach target audiences on a large scale.

##### 4.5.2.8.1 DWR Awareness Zones Notification

The Flood Risk Notification Program (FRN Program) is part of DWR's FloodSAFE California Initiative. The program's key goal is to increase flood risk awareness by effectively communicating that risk to individual property owners, the public, and local, state, and federal agencies. This includes encouraging people to understand the levee system that protects them; be prepared and aware of their flood risk; and take appropriate actions before, during, and after flooding to protect themselves, minimize damage to their property or personal possessions, and facilitate recovery.

To achieve this goal, the FRN Program:

- Sends out an annual notice to property owners whose property is at risk of flooding,
- Maintains accurate Levee Flood Protection Zone (LFPZ) maps<sup>6</sup> and an associated parcel information database,
- Provides people with useful ways to assess risk and reduce flood loss,
- Establishes outreach and educational projects with public involvement,
- Expands its interactive Flood Risk Notification website, and
- Collaborates with federal agencies, local agencies, and communities.

In September of 2010, DWR provided the first annual written notice of flood risks to each landowner whose property is protected by State Plan of Flood Control (SPFC) levees and is within an LFPZ. The notice informs recipients of their property's potential flood risks and potential sources of flooding and offers flood emergency planning and preparedness tips. It also encourages recipients to take preventative actions, such as purchasing flood insurance, elevating or "floodproofing" their buildings, and preventing blockage of channels, drains, and ditches.

#### 4.5.2.9 Secondary Hazards

The most problematic secondary hazard for flooding is levee failure and bank erosion, which in some cases can be more harmful than actual flooding. Flooding is also responsible for landslides when high flows oversaturate soils on steep slopes cause them to fail. Hazardous materials spills are a secondary hazard of flooding if storage tanks rupture and spill into streams or storm sewers. (Department of Environmental

---

<sup>6</sup> These maps are different from Federal Emergency Management Agency regulatory maps.



Conservation, 2020) Wildland fires within a watershed can exacerbate flood hazards by virtue of increased rate and volume of runoff and attendant erosion and sediment discharge. (USGS, 2020)

A majority of the flood risk within Solano County is particularly subject to inundation as a result of levee failure and heavy rainfall. This plan includes a vulnerability analysis for levee failure; this is not a separate subhazard, but an additional source of information to understand flood hazard.

#### **Public Health**

Following any natural disaster that leaves excess moisture or standing water in its wake, such as a flood, the risk of mold growth in homes or other buildings greatly increases. Controlling moisture within a structure is the most critical factor for preventing mold growth. Any exposed buildings should be cleaned up and dried out quickly, within about 24 to 48 hours if possible, and any remaining wet porous items should be removed. People with asthma, allergies, respiratory conditions, or immune suppression are at the greatest risk for health effects from contact with mold. (CDC, 2020)

#### **4.5.2.10 Climate Change Impacts**

The effects of climate change are numerous and include warmer and more varied weather patterns, melting ice caps, and poor air quality, for example. As a result, climate change will likely worsen a number of natural hazards, including flooding. Climate change will shift rainfall patterns, making heavy rains more frequent in many areas. An increase in heavy rain events will lead to more flooding, including flash floods that happen suddenly as a result of heavy rain, as well as localized flooding. Heavy rain events can inundate and overwhelm stormwater drainage systems resulting in localized flooding where pooling of water in low-lying areas can cause significant damage to buildings. Overwhelmed stormwater drainage facilities can also cause hazardous conditions on roadways where pooled water creates dangerous driving conditions. (US EPA, 2020)

#### **4.5.2.11 Flood Vulnerability Analysis**

Both an exposure analysis and Hazus loss estimation analysis were conducted to develop the flood vulnerability analysis for Solano County. Flood exposure numbers were generated using the inventories outlined in Section 4.5.2.11.1. County inventories were overlaid with FEMA delineated flood plains to determine exposure. These risk assessment exposure analysis values do not include Hazus-generated results.

Hazus flood vulnerability data was generated using a Level 2 Hazus 4.2 analysis. Hazus is a FEMA software product that uses a GIS to analyze 100-YR depth grids derived from FEMA 100-YR "A" zones with Base Flood Elevations to estimate loss. Parcel data defined in Section 4.5.2.11.1 was imported into Hazus as User Defined Facilities (UDF) and serves as the basis for replacement and content cost estimations, as well as associated loss. Where flood vulnerability is mentioned absent of Hazus, exposure analysis figures are used. Figure 4-36 displays a snapshot of flood exposure and damage estimation in unincorporated Solano County.





#### 4.5.2.11.1 Flood Exposure

The tables and graphs in this section detail the populations, properties, and infrastructure exposed to flooding in unincorporated Solano County. Flood exposure is categorized by exposure to different flood hazard zones, including the floodway, flood fringe, 100-YR floodplain, and 500-YR floodplain. The tables and graphs also include a category of the 100-year total, which is a combined total of floodway, flood fringe, and 100-YR floodplain categories. The 500-YR sans 100-YR category includes only the 500-YR floodplain, and the 500-YR total includes all of the categories combined. Refer to Section 4.5.2 for floodplain definitions to better understand these flood hazard areas.

##### Population

Population counts of those living in the floodplain were generated by analyzing County Assessor and parcel data that intersect with the 100-YR and 500-YR floodplains identified on FIRMs. Using GIS, U.S. Census Bureau information was used to intersect the floodplain, and an estimate of population was calculated by weighting the population within each census block and track with the percentage of the flood risk area. Using this approach, Table 4-19 and Figure 4-35 display the results of this analysis showing how much of the county population is exposed to flood hazard zones. Population exposure counts were also generated using the same method for areas protected by levee and exposed to potential levee failure, summarized in Table 4-20. Figure 4-37 depicts areas within Solano County that are protected by levee and subject to potential inundation from levee failure. Impacts from levee failure would primarily affect the eastern region of Solano County and approximately six percent of the population would be exposed.

Flooding can disproportionately impact vulnerable communities. Lower-income populations, for instance, are more likely to live near industrial areas and hazardous waste sites, which can put them at higher risk to toxic leaks associated with flood and storm damage or in rental homes that may not adequately address mold issues. In areas with greater risk of flooding, housing prices are often cheaper which can lead to greater numbers of lower income populations living in higher risk areas. Additionally, lower-income populations are less likely to be able to afford flood insurance. (Sherwin, 2019)

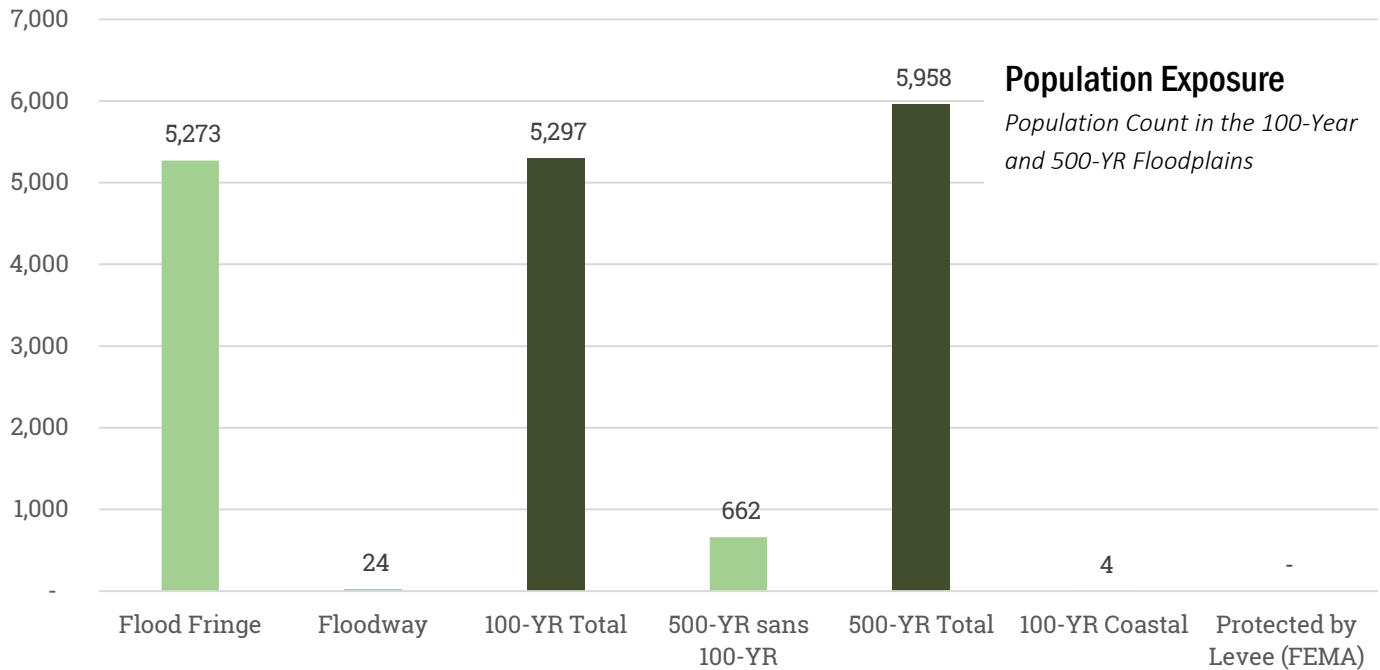


Figure 4-35: Population Exposure to Flood (Unincorporated County)

Table 4-19: Summary Population Exposure to Flood (Unincorporated County)

	Total Population
Unincorporated County	19,665

Flood Hazard Zone	Population Count	% of Total
Flood Fringe	5,054	25.70%
Floodway	24	0.12%
100-YR Coastal	4	0.02%
100-YR Total	5,082	25.84%
500-YR sans 100-YR	672	3.42%
500-YR Total	5,754	29.26%
Protected by Levee (FEMA)	-	0.00%

Table 4-20: Summary Population Exposure to Levee Failure (Unincorporated County)

	Total Population
Unincorporated County	19,665

Area Protected by Levee (NLD)	Population Count	% of Total
Leveed Area	1,198	6.09%



## FEMA FLOOD RISK EXPOSURE

SOLANO COUNTY

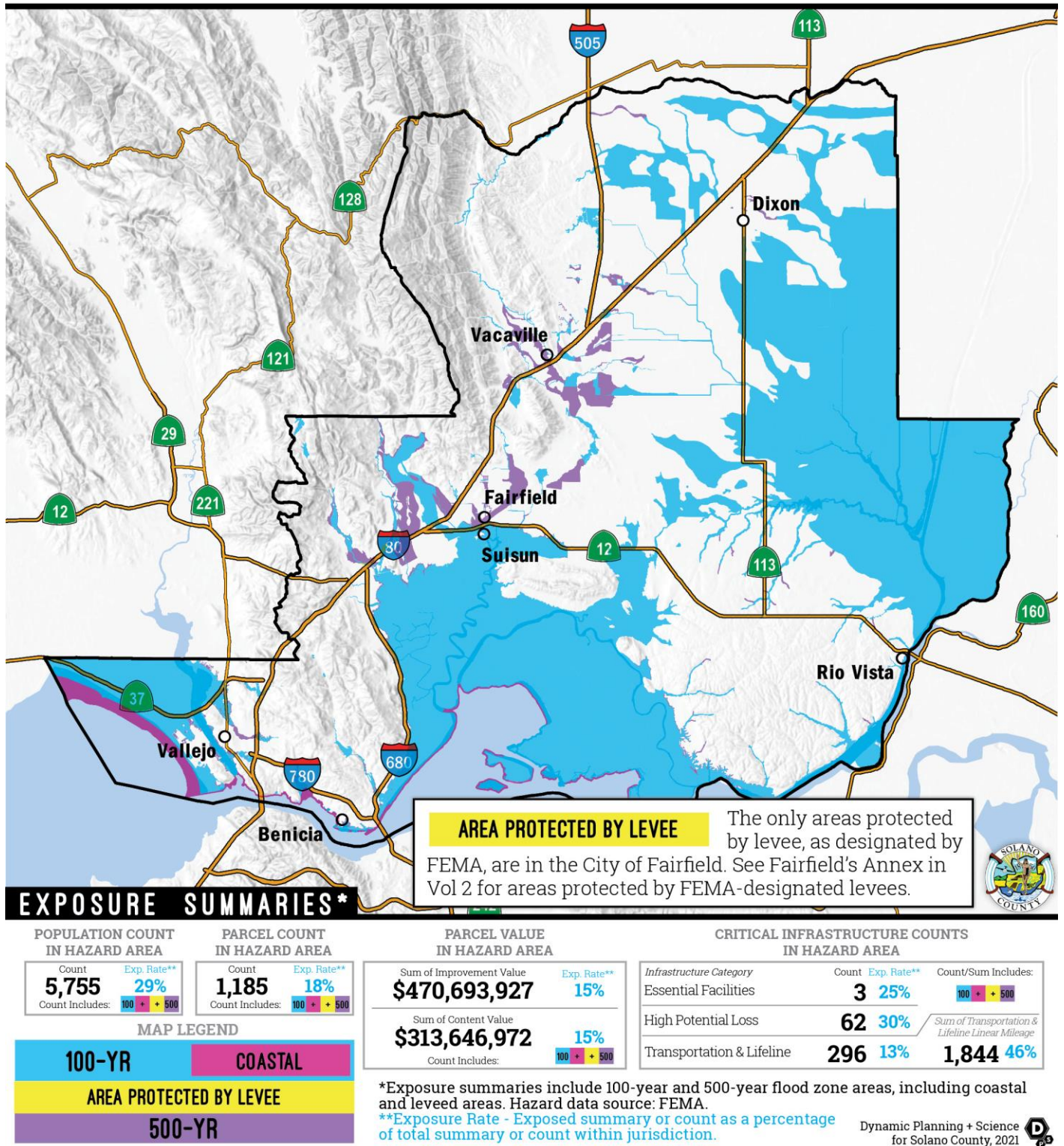


Figure 4-36: FEMA Flood Risk Exposure and Snapshot Map





## USACE AREA PROTECTED BY LEVEE EXPOSURE

SOLANO COUNTY

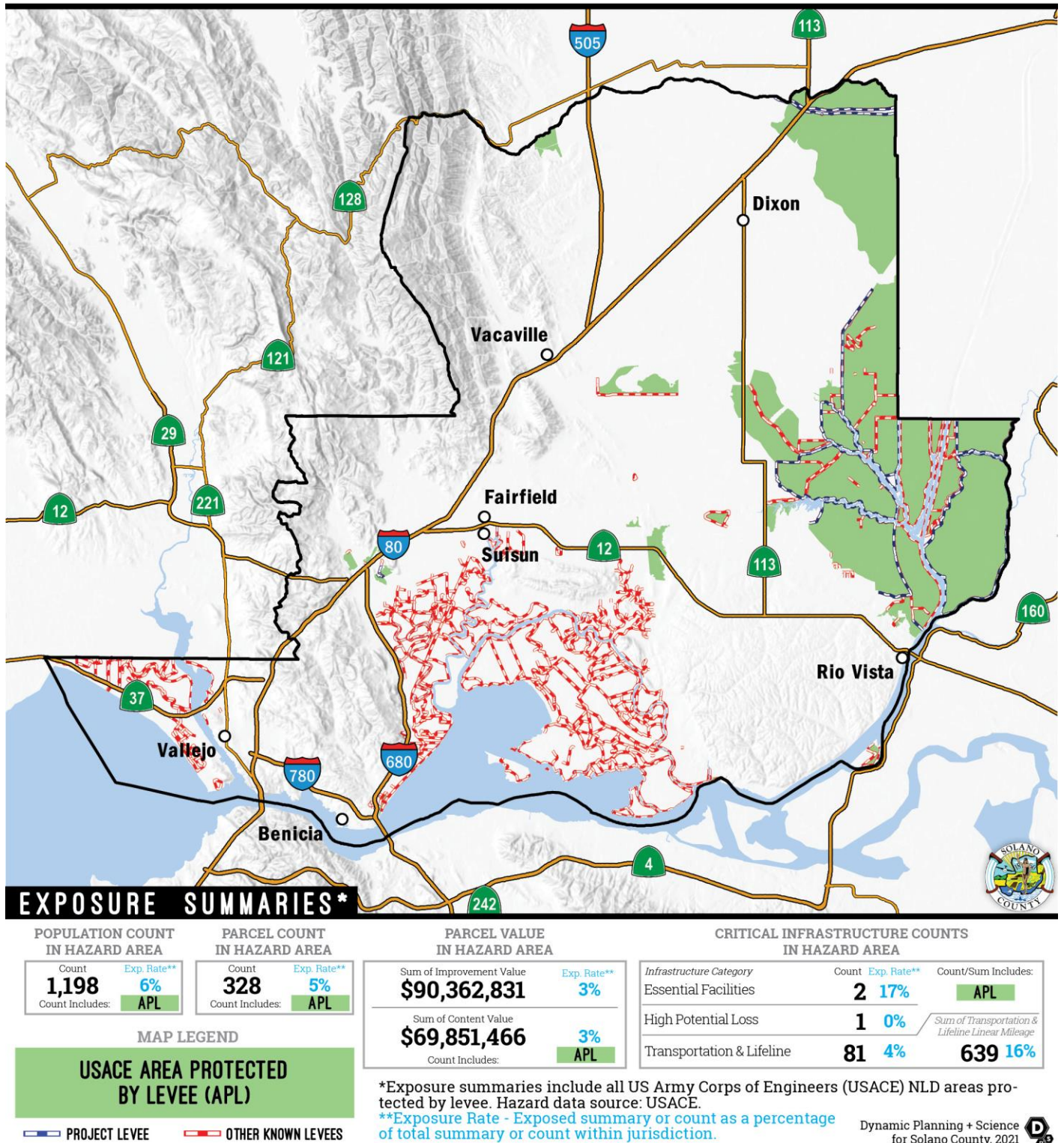


Figure 4-37: Area Protected by Levee (NLD) Exposure



## Economy

Flooding can significantly impact the agricultural industry, including wine producers, which was recorded at \$363,977,000 in 2018 and is a large driver of Solano County's economy. (County of Solano and Solano Economic Development Corporation, 2020) Flooding interferes with crop production and impacts the growth of wine grapes and other produces by preventing oxygen absorption, leading to plant death and affecting yields. Oxygen deprivation is the primary source of damage to plants from flooding, other than from lodging. Surface floodwaters and water-logged soils significantly reduce the amount of oxygen available to plants, which require oxygen to produce high-energy compounds used in nearly all life reactions, and also cause build-up of harmful chemicals. The effect is drastically reduced metabolism and, eventually, death if oxygen levels are reduced for more than 36 to 48 hours; the effects are often reversible if the duration of low oxygen conditions are limited within this tolerance. (Wiebold, 2007)

## Structures and Parcel Value

Table 4-21 summarizes parcels in unincorporated Solano County that are exposed to flood hazard areas. The beginning of Section 4.5.2 includes definitions of the various flood hazard areas. Table 4-22 summarizes parcels in unincorporated Solano County that are exposed to levee failure.

Table 4-21: Parcels Exposed to NFIP Flood Zones (Unincorporated County)

	Total Parcels		Total Market Value (\$)	Total Content Value (\$)	Total Value (\$)	
Unincorporated County	6,668		\$3,186,640,275	\$2,078,097,240	\$5,264,737,515	

Flood Hazard Zone	Parcel Count	% of Total	Market Value Exposure (\$)	Content Value Exposure (\$)	Total Exposure (\$)	% of Total
Flood Fringe	923	13.8%	\$333,411,569	\$221,999,250	\$555,410,819	10.5%
Floodway	18	0.3%	\$15,956,000	\$11,654,500	\$27,610,500	0.5%
100-YR Coastal	38	0.6%	\$13,158,000	\$6,579,000	\$19,737,000	0.4%
100-YR Total	979	14.7%	\$362,525,569	\$240,232,750	\$602,758,319	11.4%
500-YR sans 100-YR	206	3.1%	\$108,168,358	\$73,414,222	\$181,582,580	3.4%
500-YR Total	1,185	17.8%	\$470,693,927	\$313,646,972	\$784,340,899	14.9%
Protected by Levee (FEMA)	0	0.0%	\$0	\$0	\$0	0.0%

*Note: The table above does not display loss estimation results; the table exhibits total value at risk based upon the hazard overlay and Solano County Assessor data.*

Table 4-22: Parcels Exposed to Levee Failure (Unincorporated County)

	Total Parcels		Total Market Value (\$)	Total Content Value (\$)	Total Value (\$)	
Unincorporated County	6,668		\$3,186,640,275	\$2,078,097,240	\$5,264,737,515	

Area Protected by Levee (NLD)	Parcel Count	% of Total	Market Value Exposure (\$)	Content Value Exposure (\$)	Total Exposure (\$)	% of Total
Leveed Area	328	4.9%	\$90,362,831	\$69,851,466	\$160,214,297	3.0%





## Critical Facilities and Infrastructure

Table 4-23 summarizes the critical facilities and infrastructure located in the flood fringe, floodway, and 100-YR and 500-YR floodplains of Solano County. Table 4-24 and Table 4-26 summarize the critical facilities and infrastructure located in areas protected by levees.

Table 4-23: Critical Facility Points in the Floodplain

Infrastructure Type	Flood Fringe	Floodway	100-YR Coastal	100-YR Total	500-YR sans 100-YR	500-YR Total	Protected by Levee (FEMA)
<b>Essential Facility</b>	3	-	-	3	-	3	-
EOC	-	-	-	-	-	-	-
Law Enforcement	-	-	-	-	-	-	-
Fire Station	3	-	-	3	-	3	-
Emergency Services	-	-	-	-	-	-	-
Hospital	-	-	-	-	-	-	-
<b>High Potential Loss</b>	28	-	-	28	34	62	-
Dam	3	-	-	3	1	4	-
Historic Building	-	-	-	-	-	-	-
Library	-	-	-	-	-	-	-
School	2	-	-	2	-	2	-
Historic Site	-	-	-	-	-	-	-
Community Center	-	-	-	-	-	-	-
Jurisdiction Real Property Asset*	-	-	-	-	-	-	-
Park	2	-	-	2	-	2	-
Wastewater Treatment Facility	1	-	-	1	-	1	-
Emergency Shelter	1	-	-	1	-	1	-
Administrative	-	-	-	-	-	-	-
Child Care Facility	1	-	-	1	-	1	-
Healthcare Facility	-	-	-	-	-	-	-
Senior Center	-	-	-	-	-	-	-
County Real Property Asset*	15	-	-	15	33	48	-
Early Learning	3	-	-	3	-	3	-
<b>Transportation and Lifeline</b>	265	4	-	269	27	296	-
Airport	-	-	-	-	-	-	-
Bridge	75	4	-	79	2	81	-
Power Plant	1	-	-	1	2	3	-
Substation	3	-	-	3	1	4	-
Bus Facility	-	-	-	-	-	-	-
NG Station	14	-	-	14	1	15	-
Bus Stop	-	-	-	-	-	-	-
Railway Bridge	-	-	-	-	-	-	-
Cell Tower	-	-	-	-	-	-	-



Infrastructure Type	Flood Fringe	Floodway	100-YR Coastal	100-YR Total	500-YR sans 100-YR	500-YR Total	Protected by Levee (FEMA)
Breakout Tank	-	-	-	-	-	-	-
Oil Facility	-	-	-	-	-	-	-
Transmission Line Tower	172	-	-	172	21	193	-
Wind Turbine	-	-	-	-	-	-	-
Ferry	-	-	-	-	-	-	-
Amtrak Station	-	-	-	-	-	-	-
Train Station	-	-	-	-	-	-	-
<b>Hazmat</b>	27	-	-	27	2	29	-
Hazmat	27	-	-	27	2	29	-
Hazardous Waste facility	2	-	-	2	-	2	-
<b>Grand Total</b>	<b>323</b>	<b>4</b>	<b>-</b>	<b>327</b>	<b>63</b>	<b>390</b>	<b>-</b>

*\*Note: Real Property Assets are digitized insurance rolls for demonstrating value and ownership and may have overlapping points with other categories such as fire stations and law enforcement.*

Table 4-24: Critical Facility Points in Area Protected by Levee

Infrastructure Type	Leveed Area
<b>Essential Facility</b>	<b>2</b>
EOC	-
Law Enforcement	-
Fire Station	2
Emergency Services	-
Hospital	-
<b>High Potential Loss</b>	<b>1</b>
Dam	-
Historic Building	-
Library	-
School	-
Historic Site	-
Community Center	-
Jurisdiction Real Property Asset*	-
Park	-
Wastewater Treatment Facility	-
Emergency Shelter	-
Administrative	-
Child Care Facility	-
Healthcare Facility	-
Senior Center	-



Infrastructure Type	Leveed Area
County Real Property Asset*	1
Early Learning	-
<b>Transportation and Lifeline</b>	<b>81</b>
Airport	-
Bridge	13
Power Plant	-
Substation	2
Bus Facility	-
NG Station	10
Bus Stop	-
Railway Bridge	-
Cell Tower	-
Breakout Tank	-
Oil Facility	-
Transmission Line Tower	56
Wind Turbine	-
Ferry	-
Amtrak Station	-
Train Station	-
<b>Hazmat</b>	<b>6</b>
Hazmat	6
Hazardous Waste facility	1
<b>Grand Total</b>	<b>90</b>

*\*Note: Real Property Assets are digitized insurance rolls for demonstrating value and ownership and may have overlapping points with other categories such as fire stations and law enforcement.*



## Linear Utilities

It is important to determine who may be at risk if infrastructure is damaged by flooding. Roads or railroads that are blocked or damaged can isolate residents and can prevent access throughout the county, including for emergency service providers needing to get to vulnerable populations or to make repairs. Bridges washed out or blocked by floods or debris also can cause isolation. Water and sewer systems can be flooded or backed up, causing health problems, and underground utilities can be damaged. Levees can fail or be overtopped, inundating the land that they protect. Table 4-25 shows critical facilities (linear) in the floodplain and Table 4-26 shows critical facilities (linear) in levee protected areas for the county.

Table 4-25: Lifelines in the Floodplain (Unincorporated County)

### Lifelines (miles) - Flood Risk Exposure

Infrastructure Type (linear)	Flood Fringe	Floodway	100-YR Coastal	100-YR Total	500-YR sans 100-YR	500-YR Total	Protected by Levee (FEMA)
Bus Route	2.2	0.1	0.2	2.5	2.9	5.4	-
Levee (FEMA)	635.0	-	0.1	635.1	0.3	635.4	0.1
Levee Flood Wall	0.1	-	-	0.1	-	0.1	-
Levee Cross Section	2.1	-	-	2.1	-	2.1	-
NG Pipeline	66.4	0.0	0.3	66.7	1.8	68.5	-
Railroad	17.4	-	-	17.4	0.7	18.1	-
Street	987.6	2.0	0.1	989.7	29.5	1,019.2	0.0
4WD trail	5.0	-	-	5.0	-	5.0	-
Alley	-	-	-	-	-	-	-
Cul-de-sac	0.2	-	-	0.2	0.0	0.2	-
Driveway	86.7	0.2	-	86.9	5.0	91.9	-
Ferry	0.2	-	-	0.2	-	0.2	-
Interstate	15.7	0.0	0.1	15.9	0.9	16.7	-
Local road	630.2	0.8	0.0	631.1	12.4	643.5	-
Local road, major	184.8	0.8	-	185.6	7.8	193.4	0.0
Primary highway	-	-	-	-	-	-	-
Ramp	0.8	-	-	0.8	0.0	0.9	-
Service road	0.0	-	-	0.0	0.0	0.1	-
State/county highway	63.4	0.2	-	63.6	3.3	67.0	-
Traffic circle	0.0	-	-	0.0	-	0.0	-
Walkway	0.3	-	-	0.3	-	0.3	-
Transmission Line	85.7	0.5	0.9	87.1	7.8	95.0	-
<b>Grand Total</b>	<b>1,796.5</b>	<b>2.6</b>	<b>1.7</b>	<b>1,800.7</b>	<b>43.1</b>	<b>1,843.8</b>	<b>0.1</b>



Table 4-26: Lifelines in Areas Protected by Levee (Unincorporated County)

Lifelines (miles) - Area Protected by Levee (NLD)

Infrastructure Type (Linear)	Leveed Area
Bus Route	-
Levee (FEMA)	131.3
Levee Flood Wall	-
Levee Cross Section	-
NG Pipeline	33.6
Railroad	3.7
Street	436.4
<i>4WD trail</i>	3.1
<i>Alley</i>	-
<i>Cul-de-sac</i>	0.2
<i>Driveway</i>	51.0
<i>Ferry</i>	-
<i>Interstate</i>	8.2
<i>Local road</i>	264.5
<i>Local road, major</i>	78.4
<i>Primary highway</i>	-
<i>Ramp</i>	5.6
<i>Service road</i>	-
<i>State/county highway</i>	24.4
<i>Traffic circle</i>	-
<i>Walkway</i>	0.3
Transmission Line	28.4
<b>Grand Total</b>	<b>633.4</b>

## Roads

Solano County Office of Emergency Services maintains a hazard map that can be used to find which roads in the county may be closed during a flood event. This list can be viewed at the following link:

<https://doitgis.maps.arcgis.com/apps/webappviewer/index.html?id=c5dedd9f30934a99bc34439244c957fa>.

## Water and Sewer Infrastructure

Water and sewer systems can be affected by flooding. Floodwaters can back up drainage systems, causing localized flooding. Culverts can be blocked by debris from flood events, also causing localized urban flooding. Floodwaters can get into drinking water supplies, causing contamination. Sewer systems can be backed up, causing wastewater to spill into homes, neighborhoods, rivers, and streams.





#### 4.5.2.11.2 Flood Damage Estimation

Hazus calculates losses to structures from flooding by analyzing the depth of flooding and type of structure. Using historical flood insurance claim data, Hazus estimates the percentage of damage to structures and their contents by applying established damage functions to an inventory. For this analysis, all non-vacant parcels with current market values were used instead of the default inventory data provided with Hazus. Table 4-27 and Figure 4-38 show the 100-YR flood loss estimation (based on depth) in NFIP flood zones by occupancy type. Figure 4-39 and Table 4-28 show the 500-YR flood loss estimation (based on depth) in NFIP flood zones by occupancy type.

Solano County's insurance data was obtained and formatted for use in Hazus for a detailed damage estimation of county-owned facilities. This combined government dataset has additional information, including the number of floors, building value, content value, and construction type that greatly enhances Hazus results.

##### Damage Estimation for 100-YR Floodplain

Table 4-27 and Figure 4-38 display damage estimation summaries for the 100-YR floodplain in unincorporated Solano County by improved parcel and government property loss. Appendix A provides a full list of critical facilities and damage estimations.

Table 4-27: 100-YR Flood Damage Estimation by Occupancy Type

Building Type	Building Damage (\$)	Building Damage (% of total loss)	Content Damage (\$)	Content Damage (% of total loss)	Total Damage (\$)	Proportion of Loss (%)
Agriculture	\$9,376,380	8.1%	\$13,882,650	11.9%	\$23,259,031	20%
Commercial	\$1,575,984	1.4%	\$3,614,943	3.1%	\$5,190,927	4%
Education*	\$0	0.0%	\$0	0.0%	\$0	0%
Emergency	\$0	0.0%	\$0	0.0%	\$0	0%
Government	\$53,252	0.0%	\$319,509	0.3%	\$372,761	0%
Industrial	\$891,820	0.8%	\$2,164,317	1.9%	\$3,056,138	3%
Religion	\$199,289	0.2%	\$1,551,641	1.3%	\$1,750,930	2%
Residential	\$63,816,768	54.8%	\$18,999,999	16.3%	\$82,816,767	71%
<b>Total</b>	<b>\$75,913,494</b>	<b>65%</b>	<b>\$40,533,060</b>	<b>35%</b>	<b>\$116,446,553</b>	

\*School district asset information not available during time of Hazus analysis.

Note: Total Inventory Values

1 - Building Replacement Costs = \$3,773,922,295

2 - Content Replacement Costs = \$2,667,166,517

3 - Total Value = \$6,441,088,812

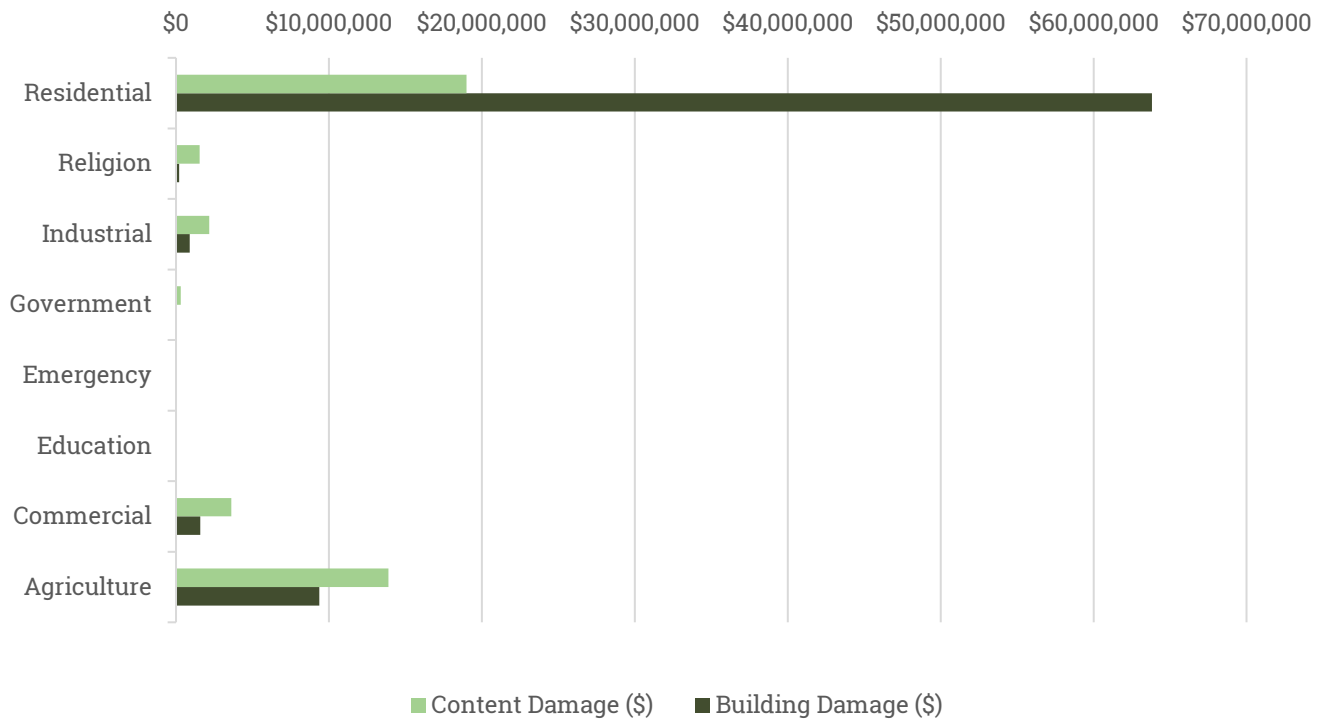


Figure 4-38: 100-YR Flood Damage Estimation by Occupancy

#### Damage Estimation for 500-YR Floodplain

Table 4-28 displays the damage estimation for the 500-YR floodplain in unincorporated Solano County by improved parcel. Appendix A provides a full list of critical facilities and damage estimations. Appendix A provides a full list of critical facilities and damage estimations.



Table 4-28: Damage Estimation Summary for 500-YR. Floodplain

Building Type	Building Damage (\$)	Building Damage (% of total loss)	Content Damage (\$)	Content Damage (% of total loss)	Total Damage (\$)	Proportion of Loss (%)
Agriculture	\$240,642	0.8%	\$958,992	3.1%	\$1,199,634	4%
Commercial	\$832,636	2.7%	\$2,755,509	8.9%	\$3,588,145	12%
Education*	\$0	0.0%	\$0	0.0%	\$0	0%
Emergency	\$0	0.0%	\$0	0.0%	\$0	0%
Government	\$2,035,426	6.6%	\$12,058,289	39.1%	\$14,093,715	46%
Industrial	\$0	0.0%	\$0	0.0%	\$0	0%
Religion	\$0	0.0%	\$0	0.0%	\$0	0%
Residential	\$8,953,888	29.0%	\$2,990,903	9.7%	\$11,944,791	39%
<b>Total</b>	<b>\$12,062,592</b>	<b>39%</b>	<b>\$18,763,694</b>	<b>61%</b>	<b>\$30,826,286</b>	

\*School district asset information not available during time of Hazus analysis.

Note: Total Inventory Values

1 - Building Replacement Costs = \$3,773,922,295

2 - Content Replacement Costs = \$2,667,166,517

3 - Total Value = \$6,441,088,812

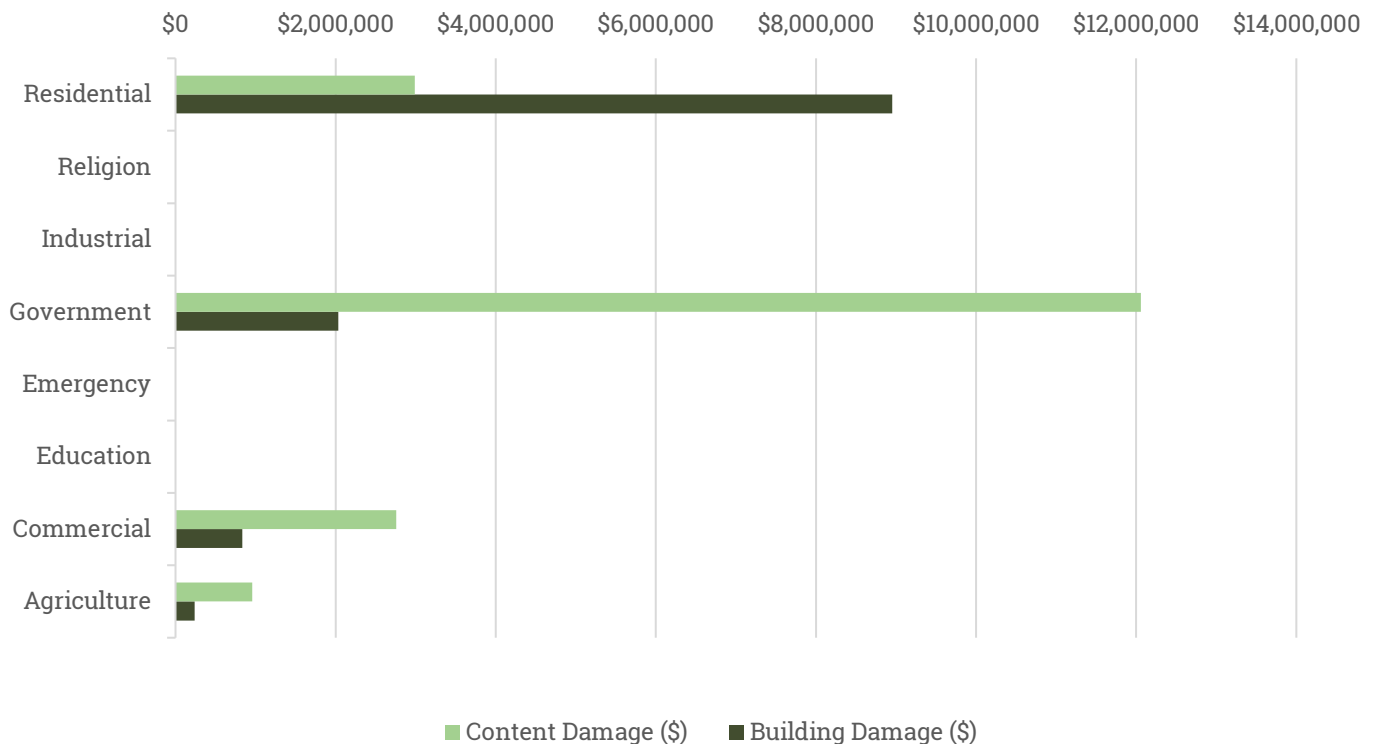


Figure 4-39: 500-YR Flood Damage Estimation by Occupancy Type



## Damage Estimation for 100-YR Coastal Floodplain

Table 4-28 displays the damage estimation for the 100-YR coastal floodplain in unincorporated Solano County by improved parcel. Appendix A provides a full list of critical facilities and damage estimations.

Table 4-29: Damage Estimation Summary for 100-YR. Coastal Floodplain

Building Type	Building Damage (\$)	Building Damage (% of total loss)	Content Damage (\$)	Content Damage (% of total loss)	Total Damage (\$)	Proportion of Loss (%)
Agriculture	\$0	0.0%	\$0	0.0%	\$0	0%
Commercial	\$0	0.0%	\$0	0.0%	\$0	0%
Education*	\$0	0.0%	\$0	0.0%	\$0	0%
Emergency	\$0	0.0%	\$0	0.0%	\$0	0%
Government	\$0	0.0%	\$0	0.0%	\$0	0%
Industrial	\$0	0.0%	\$0	0.0%	\$0	0%
Religion	\$0	0.0%	\$0	0.0%	\$0	0%
Residential	\$9,544,477	80.3%	\$2,346,896	19.7%	\$11,891,373	100%
<b>Total</b>	<b>\$9,544,477</b>	<b>80%</b>	<b>\$2,346,896</b>	<b>20%</b>	<b>\$11,891,373</b>	

\*School district asset information not available during time of Hazus analysis.

Note: Total Inventory Values

1 - Building Replacement Costs = \$3,773,922,295

2 - Content Replacement Costs = \$2,667,166,517

3 - Total Value = \$6,441,088,812

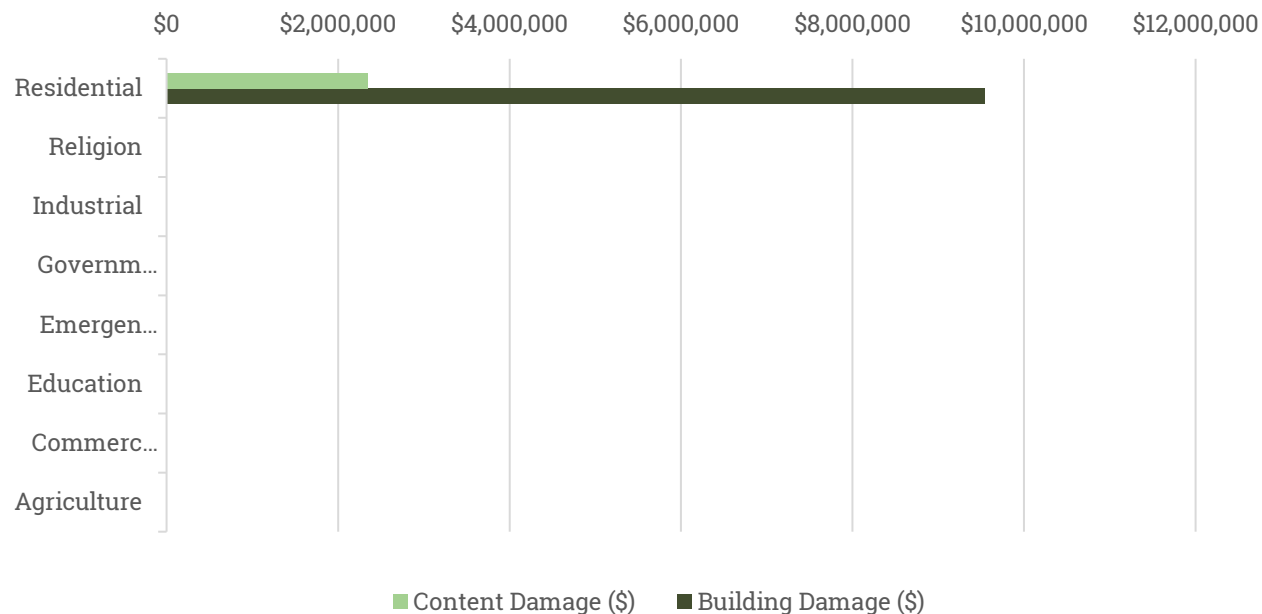


Figure 4-40: 100-YR Coastal Flood Damage by Occupancy Type



#### **4.5.2.12 Future Trends in Development**

Infrastructure has been developed to protect communities from flood damage, the Green Valley Project in particular. The county is equipped to handle future growth within flood hazard areas and the county's General Plan offers goals and policies to avoid and mitigate flood impacts from new development. The County Code (Article V. Provision for Flood Hazard Reduction) further limits and mitigates new development in floodplains.

Solano County also institutes additional review measures in sensitive, flood-prone marsh areas in Suisun Marsh and White Slough. See Plans, Policies, and Regulatory Environment in Section 4.5.2.1. These plans provide additional oversight to ensure properties are not flooded and to ensure marshlands continue to provide important environmental services.

#### **4.5.2.13 Flood Hazard Problem Statements**

As part of the mitigation action identification process, the Planning Committee for the county and for each jurisdiction identified issues and weaknesses, also called problem statements, for their respective facilities. Identification was based on the risk assessment and vulnerability analysis utilizing the RAMP mapping tool and flood data. Flood problem statements for the county are listed in Table 4-30; problem statements for all other participating jurisdictions are accessed in Volume 2 of this plan.

Identifying these common issues and weaknesses assists the Planning Committee in understanding the realm of resources needed for mitigation. The goal is to have at least one mitigation action for every problem statement. See Table 5-6 for a full list of mitigation actions and the corresponding problem statements that they address. Each problem statement is coded with a problem number for cross-referencing between Table 4-30 and Table 5-6.





Table 4-30 Flood Problem Statements

Problem No.	Hazard Type	Area of Concern	Mitigation Alternatives	Primary Agency	Problem Description	Related MA
ps-FL-SC-112	Flood	Impact	PPRO - Property Protection , PE&A - Public Education & Awareness , SP - Structural Projects	Solano County	The Allendale area north of Vacaville is an area of concern and experiences routine flooding.	ma-FL-SC-21
ps-FL-SC-113	Flood	Impact	PPRO - Property Protection , PE&A - Public Education & Awareness , SP - Structural Projects	Solano County	Midway and Vineyard RV Parks off of Midway Rd. are vulnerable to impacts of flooding.	ma-FL-SC-25
ps-WF-SC-114	Flood	Impact	SP - Structural Projects	Solano County	There are 79 County bridges located in the 100-YR flood zone.	ma-FL-SC-174, ma-FL-SC-173
ps-FL-SC-115	Flood	Impact	PRV - Prevention , SP - Structural Projects	Solano County	The Cordelia Slough, south of Cordelia, experiences flooding and needs further investigation for flood mitigation.	ma-FL-SC-26
ps-FL-SC-116	Flood	Victim	PPRO - Property Protection , PE&A - Public Education & Awareness , ES - Emergency Services , SP - Structural Projects	Solano County	There are approximately 4,917 people living in the 100-YR flood zone in Unicorp. County.	ma-FL-SC-22, ma-FL-SC-32, ma-AH-SC-8, ma-AH-SC-5, ma-FL-SC-24, ma-AH-SC-14, ma-FL-SC-19, ma-FL-SC-21
ps-FL-SC-117	Flood	Threat	PRV - Prevention , SP - Structural Projects	Solano County	Suisun Creek west of Fairfield gets backed up due to debris and impacts I-80.	ma-EQ-SC-18, ma-FL-SC-173
ps-FL-SC-118	Flood	Threat	PRV - Prevention	Solano County	Identification of drainages requiring routine debris management is needed.	ma-EQ-SC-18, ma-FL-SC-174, ma-AH-SC-10, ma-FL-SC-28



INTENTIONAL BLANK PAGE

### 4.5.3 Earthquake Hazard Profile

Earthquake is the sudden shaking of the ground caused by the passage of seismic waves through the Earth's rocks. Seismic waves are produced when some form of energy stored in the Earth's crust is suddenly released, usually when masses of rock straining against one another abruptly fracture and "slip." Earthquakes associated with this type of energy release are called tectonic earthquakes. The energy also can be released by elastic strain, gravity, chemical reactions, or even the motion of massive bodies. Earthquakes occur most often along geologic **faults**, narrow zones where rock masses move in relation to one another. (United States Geological Survey, n.d.)



Earthquakes have different properties depending on the type of fault that causes them. See Figure 4-41. The usual fault model has a "strike" (that is, the direction from north taken by a horizontal line in the fault plane) and a "dip" (the angle from the horizontal shown by the steepest slope in the fault). The lower wall of an inclined fault is called the footwall. Lying over the footwall is the hanging wall. When rock masses slip past each other parallel to the strike, the movement is known as strike-slip faulting. Movement parallel to the dip is called

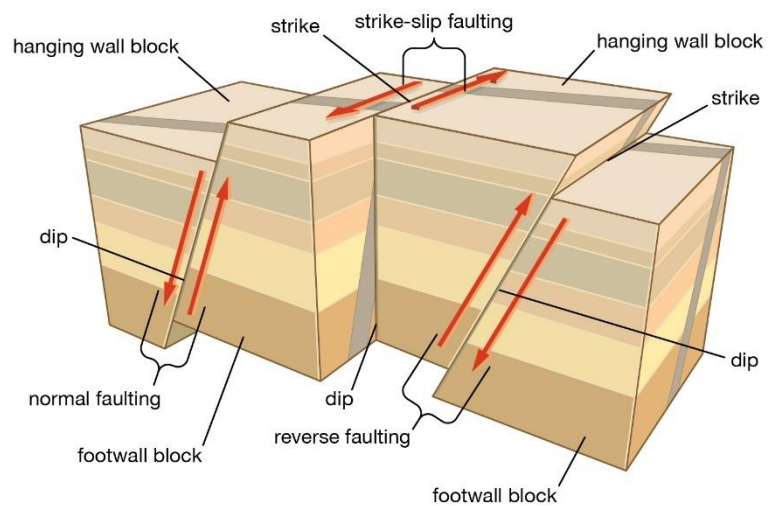


Figure 4-41: Earthquake Faulting

dip-slip faulting. In dip-slip faults, if the hanging-wall block moves downward relative to the footwall block, it is called "normal" faulting. The opposite motion, with the hanging wall moving upward relative to the footwall, produces reverse or thrust faulting. (*Id.*)

As a fault rupture progresses along or up the fault, rock masses are flung in opposite directions and then spring back to a position where there is less strain. (*Id.*)

#### Soil Liquefaction

Soil liquefaction is when loosely packed, water-logged soils lose strength in response to an earthquake, which can cause major structural damage. (United States Geological Survey, n.d.) Soil liquefaction is an important characteristic to understand earthquake impacts in Solano County, as a significant amount of the county lies within moderate, high, or very high liquefaction potential. See Figure 4-42 for locations of various liquefaction probability ratings from the U.S. Geological Survey (USGS).

***Note: Liquefaction is not a subhazard of earthquake, but is instead one very important impact to consider in examining earthquake vulnerability.***

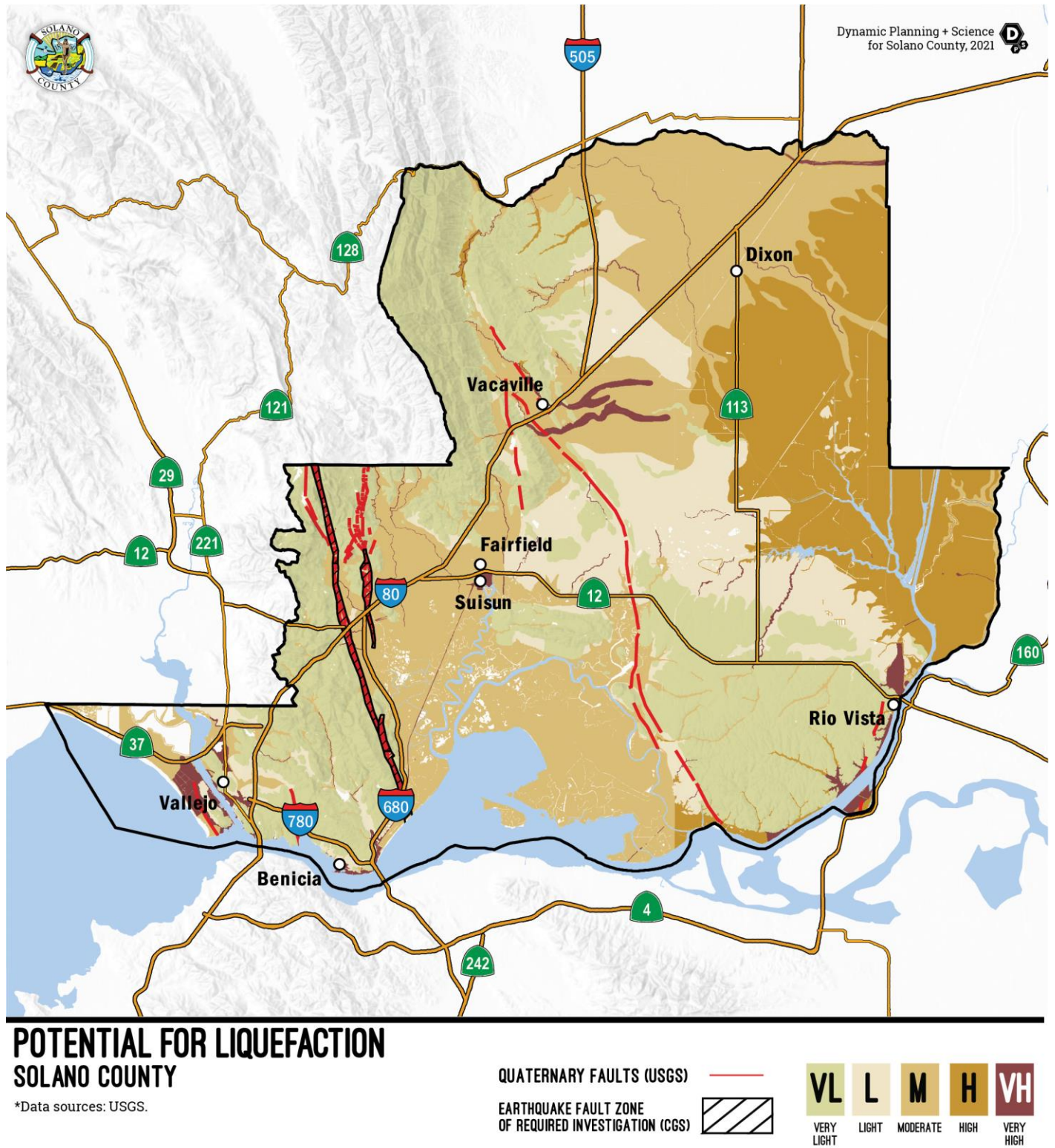


Figure 4-42 Solano County Liquefaction Overview



## Artificial Induction

Earthquakes are sometimes caused by human activities, including the injection of fluids into deep wells, pumping of groundwater, the excavation of mines, and the filling of large reservoirs. In fluid injection, the slip is thought to be induced by premature release of elastic strain, as in the case of tectonic earthquakes, after fault surfaces are lubricated by the liquid. (United States Geological Survey, n.d.)

## Earthquake Classifications

Earthquakes are typically classified either 1) by the amount of energy released, measured as **magnitude**; or 2) by the impact on people and structures, measured as **intensity**. (United States Geological Survey, n.d.)

The most common method for measuring earthquakes is magnitude, which measures the strength of earthquakes. While the majority of scientists generally use the **Moment Magnitude (M<sub>w</sub>) Scale** to measure earthquake magnitude, the **Richter (M) Scale** is the most universally-known measurement. The magnitude of an earthquake is related to the total area of the fault that ruptured, as well as the amount of offset (displacement) across the fault. As shown in Table 4-31, there are seven earthquake magnitude classes on the M<sub>w</sub> scale, ranging from great to micro. A magnitude class of great can cause tremendous damage to infrastructure, compared to a micro class, which results in minor damage to infrastructure. (*Id.*)

Table 4-31: Moment Magnitude Scale

Earthquake Magnitude Classes (M <sub>w</sub> )		
Magnitude Class	Magnitude Range (M = Magnitude)	Description
Great	M > 8	Tremendous damage
Major	7 ≤ M < 7.9	Widespread heavy damage
Strong	6 ≤ M < 6.9	Severe damage
Moderate	5 ≤ M < 5.9	Considerable damage
Light	4 ≤ M < 4.9	Moderate damage
Minor	3 ≤ M < 3.9	Rarely causes damage.
Micro	M < 3	Minor damage

## Intensity

The effects of an earthquake are also measured by intensity. Earthquake intensity decreases with increasing distance from the epicenter of the earthquake. 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. (United States Geological Survey)

The **lower** numbers of the intensity scale generally deal with the manner in which 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. Table 4-32 is an abbreviated description of the levels of Modified Mercalli Intensity. (*Id.*)





Table 4-32: Modified Mercalli Intensity Level Descriptions

Intensity	Shaking	Description/Damage
<b>I</b>	<b>Not felt</b>	Not felt except by a very few under especially favorable conditions.
<b>II</b>	<b>Weak</b>	Felt only by a few persons at rest, especially on upper floors of buildings.
<b>III</b>	<b>Weak</b>	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 are similar to the passing of a truck. Duration estimated.
<b>IV</b>	<b>Light</b>	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Similar to a heavy truck striking a building. Standing motor cars rocked noticeably.
<b>V</b>	<b>Moderate</b>	Felt by nearly everyone, many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
<b>VI</b>	<b>Strong</b>	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
<b>VII</b>	<b>Very strong</b>	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.
<b>VIII</b>	<b>Severe</b>	Damage slight in specially designed 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.
<b>IX</b>	<b>Violent</b>	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
<b>X</b>	<b>Extreme</b>	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Source: USGS, Abridged from *The Severity of an Earthquake*, USGS General Interest Publication 1989-288-913

## Ground Motion

Earthquake hazard assessment is based on expected ground motion. This involves determining the annual probability that certain ground motion accelerations will be exceeded, then summing the annual probabilities over the time period of interest. The most commonly-mapped ground motion parameters are the horizontal and vertical peak ground accelerations (PGA) for a given soil or rock type. Instruments called accelerographs record levels of ground motion due to earthquakes at stations throughout a region. These readings are recorded by state and federal agencies that monitor and predict seismic activity. (Pacific Northwest Seismic Network)

Maps of PGA values form the basis of seismic zone maps that are included in building codes such as the International Building Code. Building codes that include seismic provisions specify the horizontal force due to lateral acceleration that a building should be able to withstand during an earthquake. PGA values are



directly related to these lateral forces that could damage “short period structures,” such as single-family dwellings. Longer-period response components determine the lateral forces that damage larger structures with longer natural periods, such as apartment buildings, factories, high-rises, and bridges. Table 4-33 lists the damage potential and perceived shaking by PGA factors, compared to the Mercalli scale. (USGS)

Table 4-33: Modified Mercalli Scale and Peak Ground Acceleration

Modified Mercalli Scale	Perceived Shaking	Potential Structure Damage		Estimated PGA (%g)
		Resistant Buildings	Vulnerable Buildings	
I	Not Felt	None	None	<0.17%
II-III	Weak	None	None	0.17% - 1.4%
IV	Light	None	None	1.4% - 3.9%
V	Moderate	Very Light	Light	3.9% - 9.2%
VI	Strong	Light	Moderate	9.2% - 18%
VII	Very Strong	Moderate	Moderate/Heavy	18% - 34%
VIII	Severe	Moderate/Heavy	Heavy	34% - 65%
IX	Violent	Heavy	Very Heavy	65% - 124%
X - XII	Extreme	Very Heavy	Very Heavy	>124%

Sources: USGS, 2008; USGS, 2010

Note: PGA measured in percent of  $g$ , where  $g$  is the acceleration of gravity

#### 4.5.3.1 Plans, Policies, and Regulatory Environment

##### Alquist-Priolo Earthquake Fault Zoning Act and Seismic Hazards Mapping Act (1972)

The 1971 San Fernando Earthquake resulted in the destruction of numerous structures built across its path. This led to passage of the Alquist-Priolo Earthquake Fault Zoning Act in 1972. This Act prohibits the construction of buildings for human occupancy across active faults in the State of California. Similarly, extensive damage caused by ground failures during the 1989 Loma Prieta Earthquake focused attention on decreasing the impacts of landslides and liquefaction. This led to the creation of the Seismic Hazards Mapping Act, which increases construction standards at locations where ground failures are probable during earthquakes. Figure 4-43 displays these zones of required investigation in Solano County.

##### 2019 California Building Standards Code

The 2019 California Building Code, adopted by Solano County in December 2019, includes materials requirements, construction methods, and maintenance standards for earthquake protection and resiliency.

##### Solano County General Plan

The 2008 Solano County General Plan includes a number of policies in the Public Health and Safety Element to mitigate the effects of earthquakes. Its policies require new development proposals in seismic hazard areas to limit development in those areas or consider seismic risks, as well as include project features that minimize such risks.



### 4.5.3.2 Past Events

A number of significant (more than M4.5) earthquakes have occurred in and near Solano County over the last 16 years. See Table 4-34 for earthquake events M4.5 or higher since 2005. The South Napa earthquake was one of the most recent earthquakes to occur nearest to Solano County. Its epicenter was just north of Vallejo, and it was one of the largest in the Bay Area in about 25 years. ([USGS, 2014](#))

Table 4-34: Earthquakes in or Near Solano County 4.5 Magnitude or Greater Since 2005

Date	Location	Magnitude (M)
08/24/2014	South Napa	6.0
10/31/2007	San Francisco Bay Area	5.5
08/03/2006	Northern California	4.5

Source: USGS

### 4.5.3.3 Location

The Alquist-Priolo Act established earthquake fault zones in California. These Alquist-Priolo Earthquake Fault Zones encompass surface traces of active faults that have a potential for future surface fault rupture and are mapped as estimated fault locations across California. These fault zones require future investigation to determine the location of the fault and are referred to as **zones of required investigation**. Not all fault lines require additional investigation for development. Figure 4-43 shows the location of quaternary faults in Solano County, with required zones of investigation shown outlined in black.

These zones have been established by the State Geologist and indicate an active fault within the zone. The fault may pose a risk to existing or future structures from a surface fault rupture. The major faults include the Green Valley fault system, running north and south through the county; the Great Valley 06 (Midland) fault zone, which extends north to south through most of the western side of the county; the Great Valley 04b Gordon Valley; the Great Valley 05 Pittsburg – Kirby Hills; and the Franklin fault, which extends through most of the westernmost tip of the county.

Exposure to the zones of required investigation is shown in the earthquake vulnerability assessment, Section 4.5.3.8, to illustrate population, parcel, and critical infrastructure exposure to more active faulting in the county.

### 4.5.3.4 Frequency and Probability of Future Occurrences

According to the California State Hazard Mitigation Plan, earthquakes large enough to cause moderate damage to structures—those of M5.5 or larger—occur three to four times a year statewide. Strong earthquakes of M6 to M6.9 strike on an average of once every two to three years. Major earthquakes of M7 to M7.9 occur in California about once every 10 years.

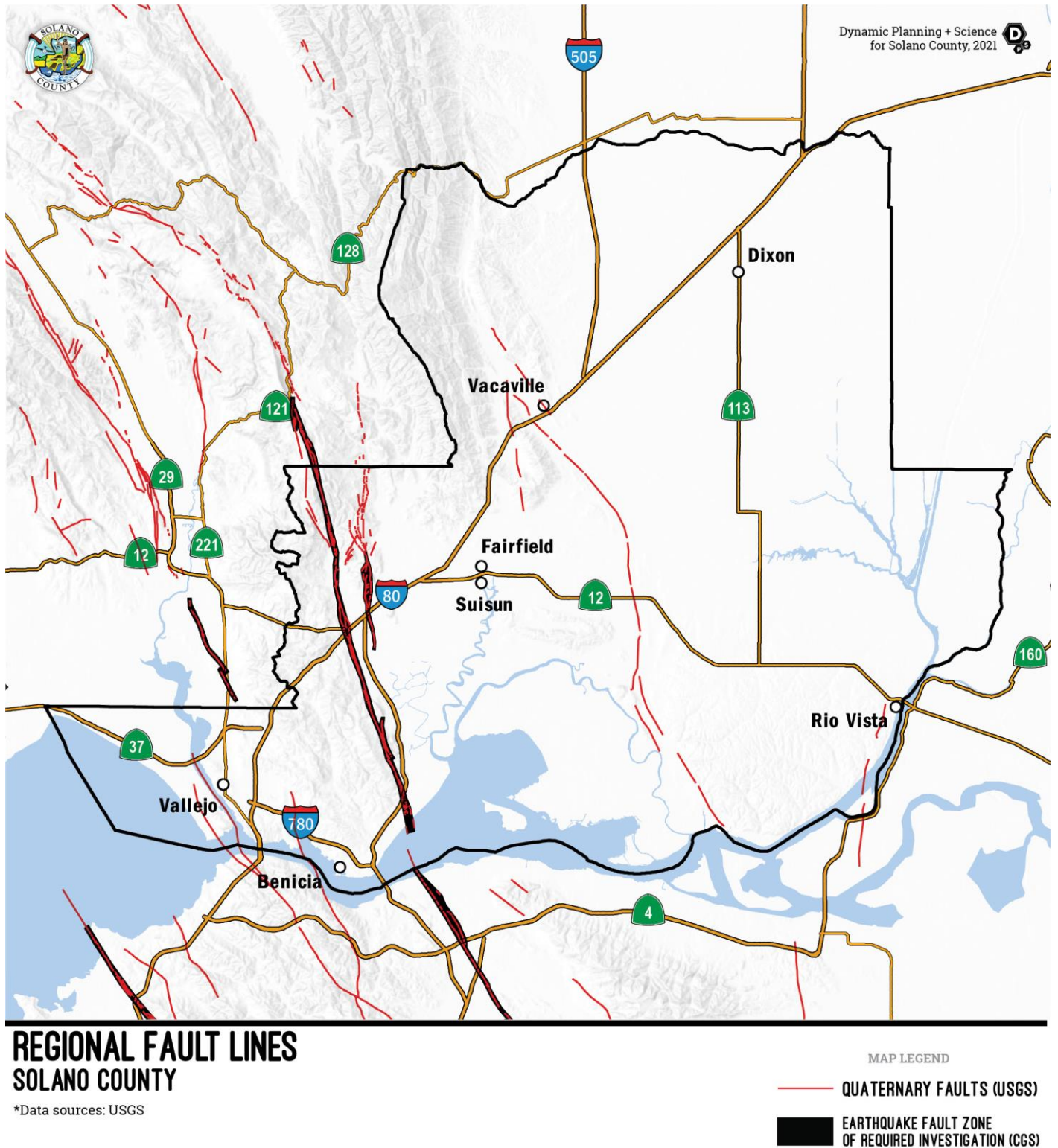


Figure 4-43: Zones of Required Investigation

*Note: Quaternary faults, as illustrated in red in Figure 4-43, are those active faults that have been recognized at the surface and which have evidence of movement in the past 1.6 million years (the duration of the Quaternary Period).*





Both mapping tools are described in more detail below. Importantly, these probabilistic maps were used to determine the earthquake scenarios for the vulnerability analysis. This plan focuses on the Concord-Green Valley and the Hayward-Rodger's Creek scenarios because they are the scenarios with the highest likelihood of severe shaking and of producing a M6.7 earthquake within the next 30 years. See Figure 4-46 for an overview map of the scenarios and Section 4.5.3.4.3 for further explanation on why these scenarios were chosen.

#### **4.5.3.4.1 30-Year Earthquake Probability (UCERF3)**

Probability of earthquake events is based on the approximate location of earthquake faults within and outside the Solano County region. The Uniform California Earthquake Rupture Forecast, Version 3 (UCERF3)<sup>7</sup> is a comprehensive model of earthquake occurrence for California. It represents the best available science for authoritative estimates of the magnitude, location, and likelihood of potentially damaging earthquakes in California. According to UCERF3 and as shown in Figure 4-44, the Hayward-Rodger's Creek fault has a 10 percent to 100 percent probability of occurrence within 30 years, the highest probability affecting the county. The most recent earthquake to happen in the Solano area was a M6.0 earthquake along the West Napa fault line, south of Napa City in 2014. (*Id*)

#### **4.5.3.4.2 Earthquake Shaking Potential**

The Earthquake Shaking Potential Map, Figure 4-45, shows potential seismic shaking from anticipated future earthquakes. It is probabilistic in the sense that the analysis takes into consideration the uncertainties in the size and location of earthquakes and the resulting ground motions that can affect a particular site. (CGS, 2020) It is also useful in understanding the probability of severe shaking in different locations throughout the county, as discussed in Section 4.5.3.4.

The map is expressed in terms of the probability of exceeding a certain ground motion. The map shows a two percent probability of exceeding one second of ground motion in 50 years. Earthquake shaking potential in California is calculated based on the USGS National Seismic Hazard Model and in partnership with California Geological Survey (CGS). Earthquake shaking potential also considers historic earthquakes, slip rates on major faults, deformation throughout the region, and the potential for amplification of seismic waves by near-surface geologic materials. (CGS, 2020)

Figure 4-44 depicts a range of lower hazard to higher hazard probability, where higher hazard areas are those regions near major, active faults that will on average experience stronger earthquake shaking more frequently. This intense shaking can damage even strong, modern buildings.

---

<sup>7</sup> Quaternary faults are those active faults that have been recognized at the surface and which have evidence of movement in the past 1.6 million years (the duration of the Quaternary Period).



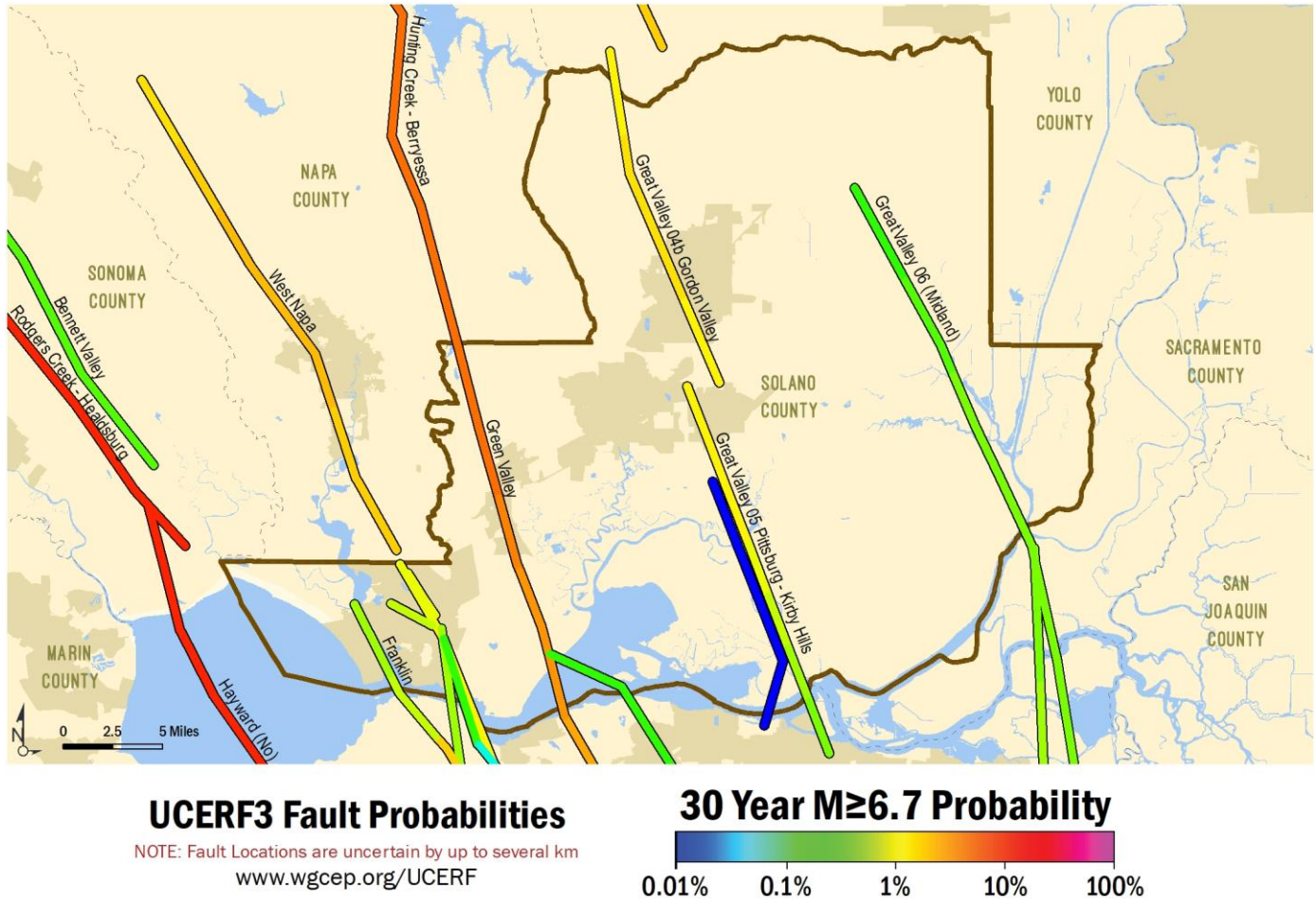


Figure 4-44: Fault Probability Map for Solano County

Lower hazard areas are those regions that are distant from known, active faults that will experience lower levels of shaking less frequently. In most earthquakes, only weaker, masonry buildings would be damaged. However, very infrequent earthquakes could still cause strong shaking in those locations. (D. Branum, 2016)

The shaking potential is calculated as the level of ground motion that has a two percent chance of being exceeded in 50 years, which is the same as the level of ground-shaking with about a 2500-year average repeat time. Relatively long-period (1.0 second) earthquake shaking is shown. Long-period shaking affects tall, relatively flexible buildings, but also correlates with overall earthquake damage. Although the greatest hazard is in areas of highest intensity, as shown in Figure 4-45, no region is immune from potential earthquake damage. (*Id.*)

The potential for earthquake ground shaking, as defined by the U.S. National Seismic Hazard Model, is used by engineers to design buildings for larger ground motions than what we think will occur during a 50-year interval, which will make buildings safer than if they were only designed for the ground motions that we expect to occur in the next 50 years. (USGS, 2020)

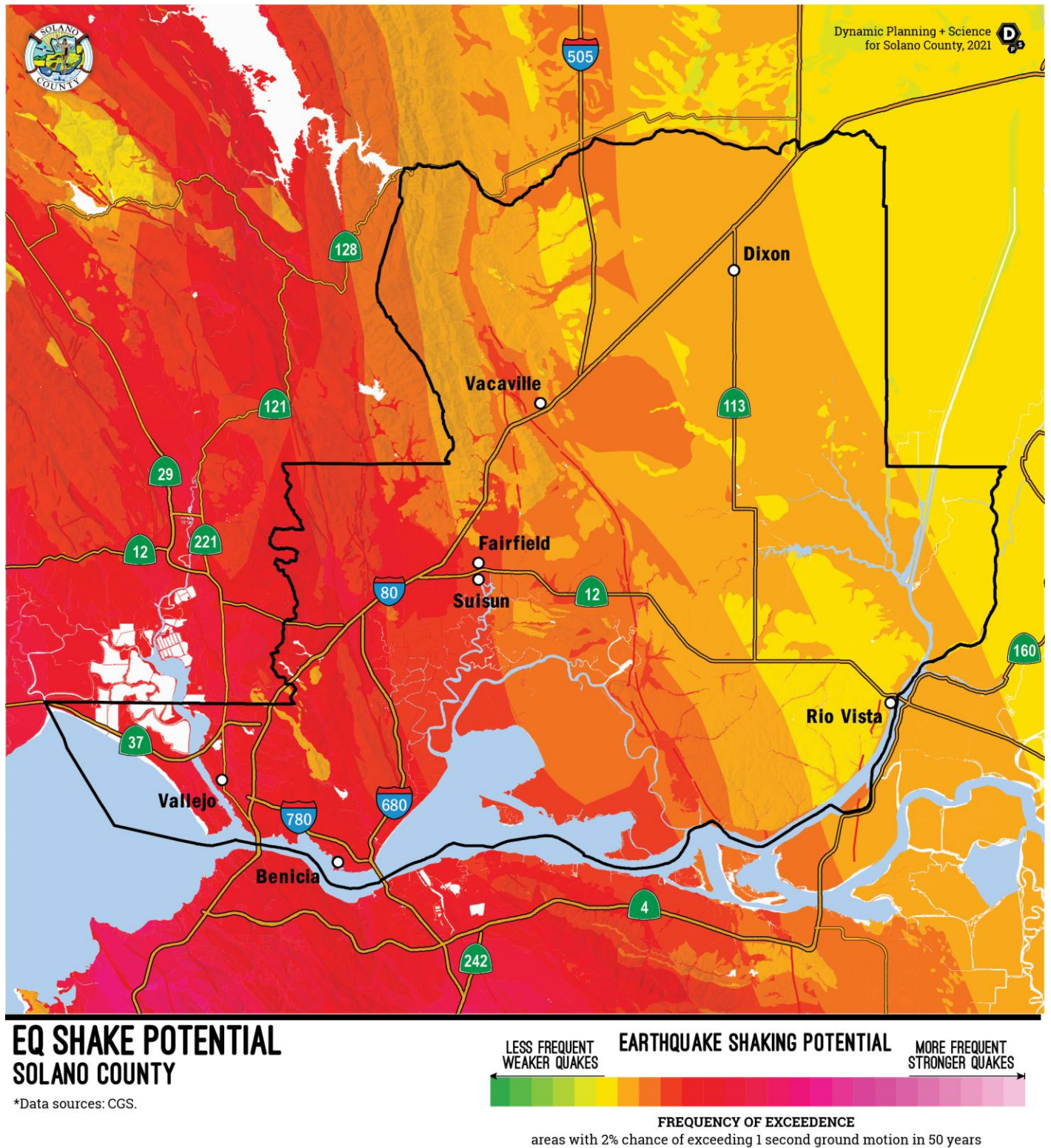


Figure 4-45: Earthquake Shaking Potential





#### **4.5.3.4.3 Concord-Green Valley and the Hayward-Rodger's Creek Earthquake Scenarios**

The Concord-Green Valley and the Hayward-Rodger's Creek earthquake scenarios were chosen for the vulnerability analysis from a range of regional, scenario-based shaking potential maps available from USGS. The shaking potential data consist of peak ground velocity, peak ground acceleration, and peak spectral accelerations in an earthquake scenario. The Hayward-Rodger's Creek fault has the near highest probability of an earthquake greater than M6.7 within Solano County, with a greater than 10 percent annual probability. The Concord-Green Valley fault also has a greater than 10 percent annual probability. See Figure 4-44 for these probabilities. Likewise, the most significant shaking potential depicted in the ShakeMap in Figure 4-45 centers around the Concord-Green Valley and the Hayward-Rodger's Creek fault systems, the epicenter of which is shown on the same.

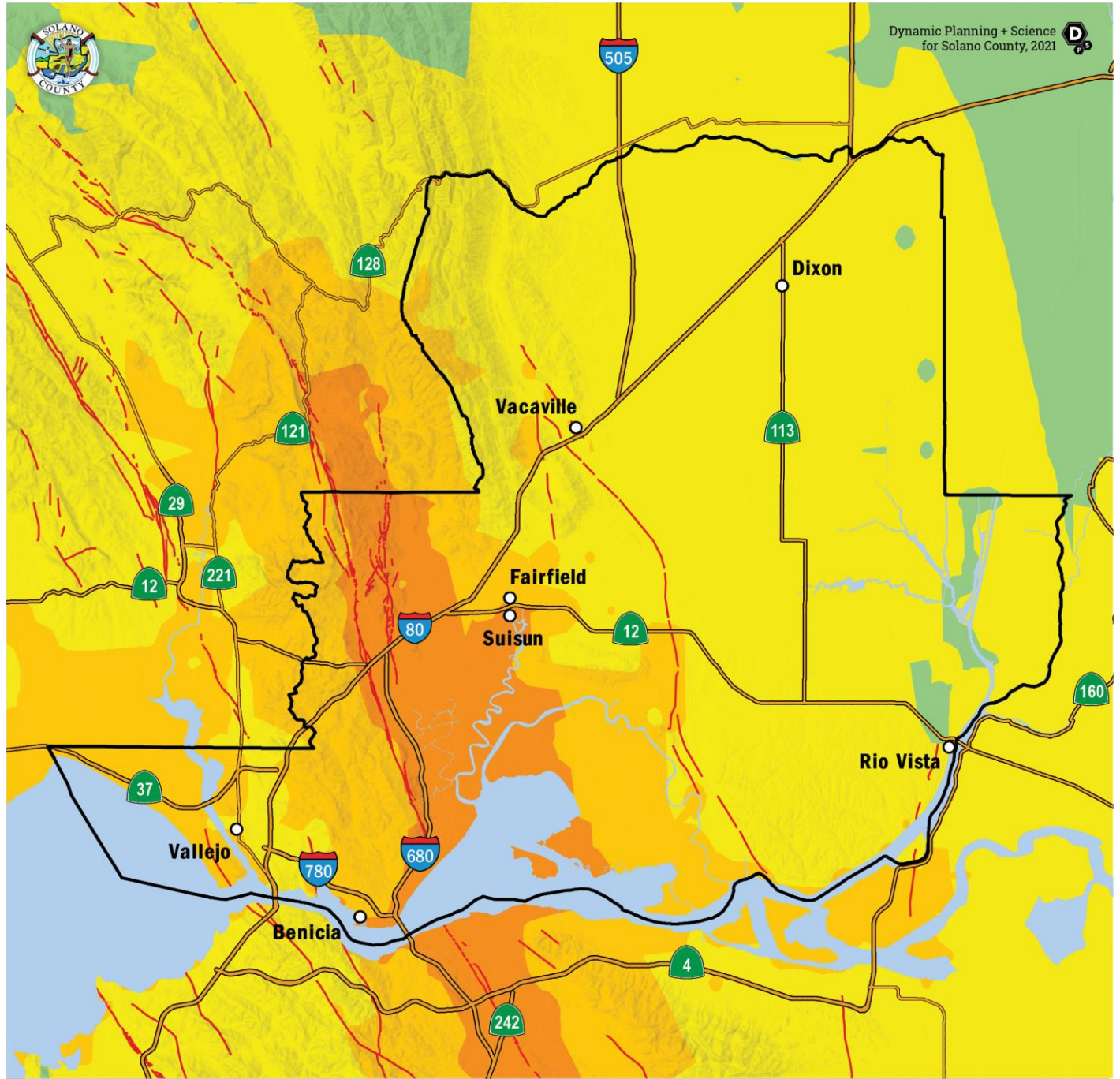
The M6.8 Concord-Green Valley scenario is shown in Figure 4-46 and the M7.1 Hayward-Rodger's Creek fault scenario is shown in Figure 4-47. Section 4.5.3.8.1 analyzes Solano County's exposure to these scenarios and Section 4.5.3.8.2 details damage estimation to residential properties and county facilities for these scenarios.

#### **4.5.3.5 Severity and Extent**

As we know from past events, even a moderate earthquake occurring in or near the Solano County region could result in deaths, casualties, property and environmental damage, and disruption of normal services and activities. The severity of the event could be aggravated by collateral emergencies, such as fires, hazardous material spills, utility disruptions, landslides, transportation emergencies, or inundation from levee failure.

Neither the occurrence of an earthquake nor the severity can be predicted. Instead, scientists can only calculate the probability that a significant earthquake will occur in a specific area within a certain number of years.

The probabilistic Earthquake Shake Potential Map, Figure 4-45, illustrates the areas of the county most likely to experience an earthquake exceeding one second of ground motion in 50 years, which aids in understanding locations in Solano County with the greatest probability of experiencing a severe earthquake. The greatest probability of a severe earthquake focuses on the Concord-Green Valley and Hayward-Rodger's Creek faults. This is merely a probability, as the same map also illustrates that most of the county is susceptible to moderate-to-severe earthquakes depending on the location, intensity, and magnitude of the earthquake.



Dynamic Planning + Science  
for Solano County, 2021

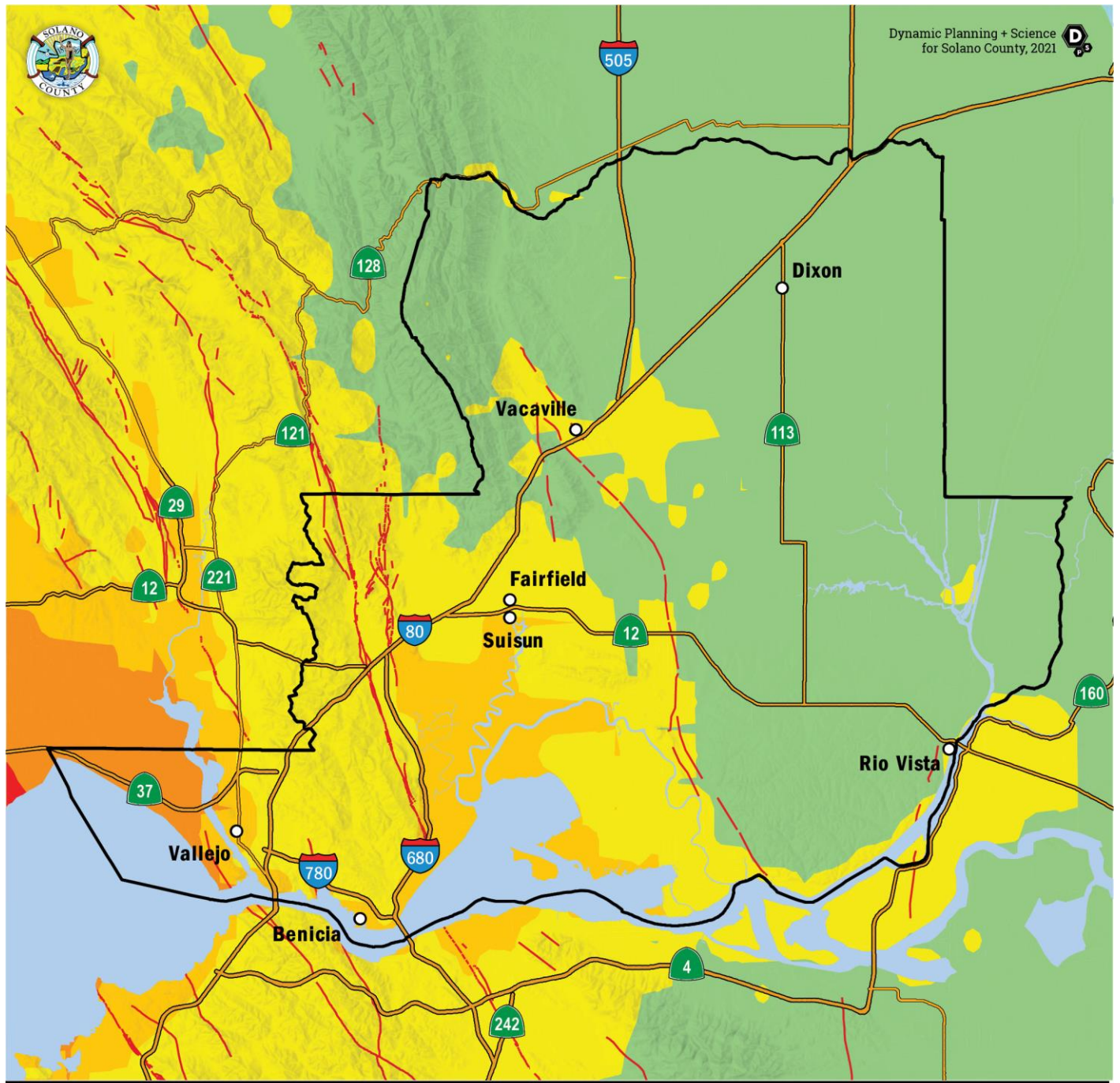
## M6.8 CONCORD-GREEN VALLEY SOLANO COUNTY

\*Data sources: USGS.



Figure 4-46: M6.8 Concord-Green Valley





## M7.1 HAYWARD-RODGER'S CREEK SOLANO COUNTY

\*Data sources: USGS.



Figure 4-47: M7.1 Hayward-Rodger's Creek





#### 4.5.3.6 Warning Time

There is currently no reliable way to predict the day or month that an earthquake will occur at any given location. Research is being done with warning systems that use the low energy waves that precede major earthquakes. Seconds and minutes of advance warning can allow people and systems to take actions to protect life and property from destructive shaking. Even a few seconds of warning can enable protective actions specific to various sectors of the population, such as:

- **Public:** Citizens, including schoolchildren, drop, cover, and hold on; turn off stoves; safely stop vehicles.
- **Businesses:** Personnel move to safe locations; automated systems ensure elevator doors open; production lines are shut down; sensitive equipment is placed in a safe mode.
- **Medical services:** Surgeons, dentists, and others stop delicate procedures.
- **Emergency responders:** Open firehouse doors; personnel prepare and prioritize response decisions.
- **Power infrastructure:** Protect power stations and grid facilities from strong shaking.

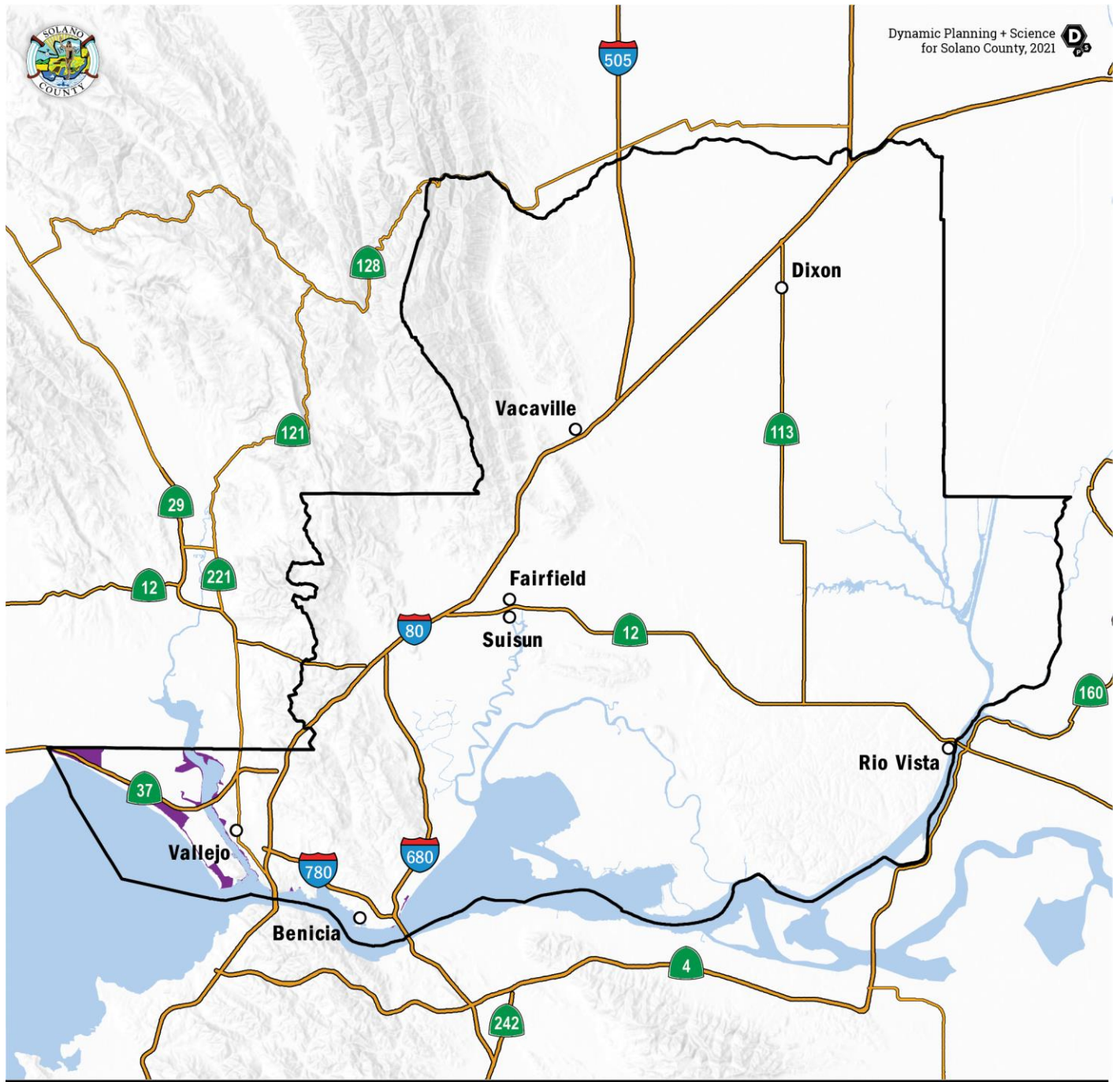
#### 4.5.3.7 Secondary Hazard – Tsunami

Earthquakes can create tsunamis as a secondary hazard, which have the potential to affect the coastal delta areas of Solano County. Tsunamis are typically caused by earthquakes generated in subduction zones, areas where ocean plates are forced down into the mantle by plate tectonic forces. This creates an enormous friction between the plates and eventuates in an accumulated seismic energy released in the form of a tsunami when the plates spring back into unrestrained positions.

The actual height of a tsunami wave in open water is generally only one to three feet and can often be unnoticeable to people aboard ships. However, the energy of a tsunami passes through the entire water column to the seabed, unlike surface waves which typically reach only to a depth of 30 feet or so. A tsunami wave travels across the ocean at speeds up to 700 miles per hour. As the tsunami enters shallower water near coastal shorelines, it slows to about 20 to 30 miles per hour and the wave can increase to a height of 90 feet or more as it approaches the coastline and compresses. (National Oceanic and Atmospheric Administration, 2018) Tsunamis can result in severe property damages and loss of life. They can also disrupt emergency services and transportation routes. (Geology.com, 2020)

Tsunamis affect beaches that are open to the ocean, bay mouths, tidal flats, and the shores of large coastal rivers. Tsunami waves can also diffract around land masses. Because tsunamis are not symmetrical, the waves may be much stronger in one direction than another, depending on the nature of the source and the surrounding geography.

Figure 4-48 illustrates the area of Solano County that may be subject to tsunami run-up, primarily near Vallejo and the mouth of the Napa River, according to the California Geological Survey.



## TSUNAMI RUN-UP AREA SOLANO COUNTY

\*Data sources: CGS.

# TSUNAMI RUN-UP

Figure 4-48 Solano County Tsunami Runup



#### 4.5.3.8 Earthquake Vulnerability Analysis

Earthquakes are a considerable threat to life and property in Solano County. A moderate to severe seismic incident on any fault zone in close proximity to the county is expected to cause:

- Extensive property damage, particularly to pre-1930's unreinforced masonry structures.
- Possible fatalities and injuries.
- Damage to water and sewage systems.
- Disruption of communications systems.
- Broken gas mains and petroleum pipelines.
- Disruption to electrical utility lines.
- Disruption of transportation arteries.
- Competing requests for regional aid resources.

Community needs would quickly exceed the response capability of the Solano County Office Emergency Management, requiring mutual assistance from state, federal, volunteer, and private agencies.

In an earthquake, the primary consideration is saving lives. Time and effort must also be given to providing for people's mental health by reuniting families, providing shelter to displaced persons, and restoring basic needs and services. A major effort will be needed to remove debris and clear roadways, demolish unsafe structures, assist in reestablishing public services and utilities, and provide continuing care and temporary housing for affected residents.

After an earthquake, there will be a loss of income both in private and public sectors. Individuals can lose wages due to businesses inability to function because of damaged goods or facilities. Resulting from business losses, Solano County and the cities in the planning area will lose revenue. Economic recovery from even a minor earthquake is critical.

Note the earthquake exposure analysis includes liquefaction exposure and exposure to zones of required investigation. These are not subhazards of earthquake but are meant to further illustrate the types of impacts to which the population, parcels, and infrastructure are exposed.



#### 4.5.3.8.1 Earthquake Exposure

An exposure analysis was conducted to develop earthquake vulnerability data throughout Solano County using the methods outlined in Section 4.4. To develop earthquake exposure data for the county, asset inventories for people, property, and critical facilities were superimposed with several overlays that illustrate potential earthquake impacts: 1) exposure to two earthquake scenarios, 2) exposure to zones of required investigation, and 3) exposure to liquefaction.

This section first provides summary mapping for all three types, scenarios, zones of required investigation, and liquefaction, and then discusses individually the population, property types, and critical infrastructure that would be exposed.

##### Summaries of earthquake exposure include:

- **Exposure to Scenarios:** Exposure to shaking magnitudes in two earthquake scenarios (M6.8 Concord-Green Valley and M7.1 Hayward-Rodger's Creek faults). As discussed in Section 4.5.3.4, these scenarios were selected because they present the highest probability for a severe earthquake and severe shaking in Solano County. An exposure analysis was conducted to develop earthquake vulnerability data throughout Solano County using the methods outlined in Section 4.4. To develop earthquake exposure data for the county, asset inventories for people, property, and critical facilities were superimposed with earthquake shaking intensity data from the USGS. Figure 4-49 and Figure 4-50 depict the exposure summaries for both fault lines. Most Solano County residents and structures would be exposed to moderate to severe shaking in these scenarios.
- **Exposure to Zones of Required Investigation:** The Alquist-Priolo Act established earthquake fault zones in California, referred to as "zones of required investigation." These zones encompass surface traces of active faults that have a potential for future surface fault rupture and are mapped as estimated fault locations across California. Figure 4-51 summarizes exposure to zones of required investigation.
- **Exposure to Liquefaction:** The Colorado Geological Survey assesses susceptibility to liquefaction during an earthquake event, rated from very light to very high susceptibility. This exposure summary shows exposure to moderate, high, and very high liquefaction susceptibility. Figure 4-42 summarizes exposure to liquefaction.





CONCORD-GREEN VALLEY EARTHQUAKE SCENARIO (M6.8)

SOLANO COUNTY

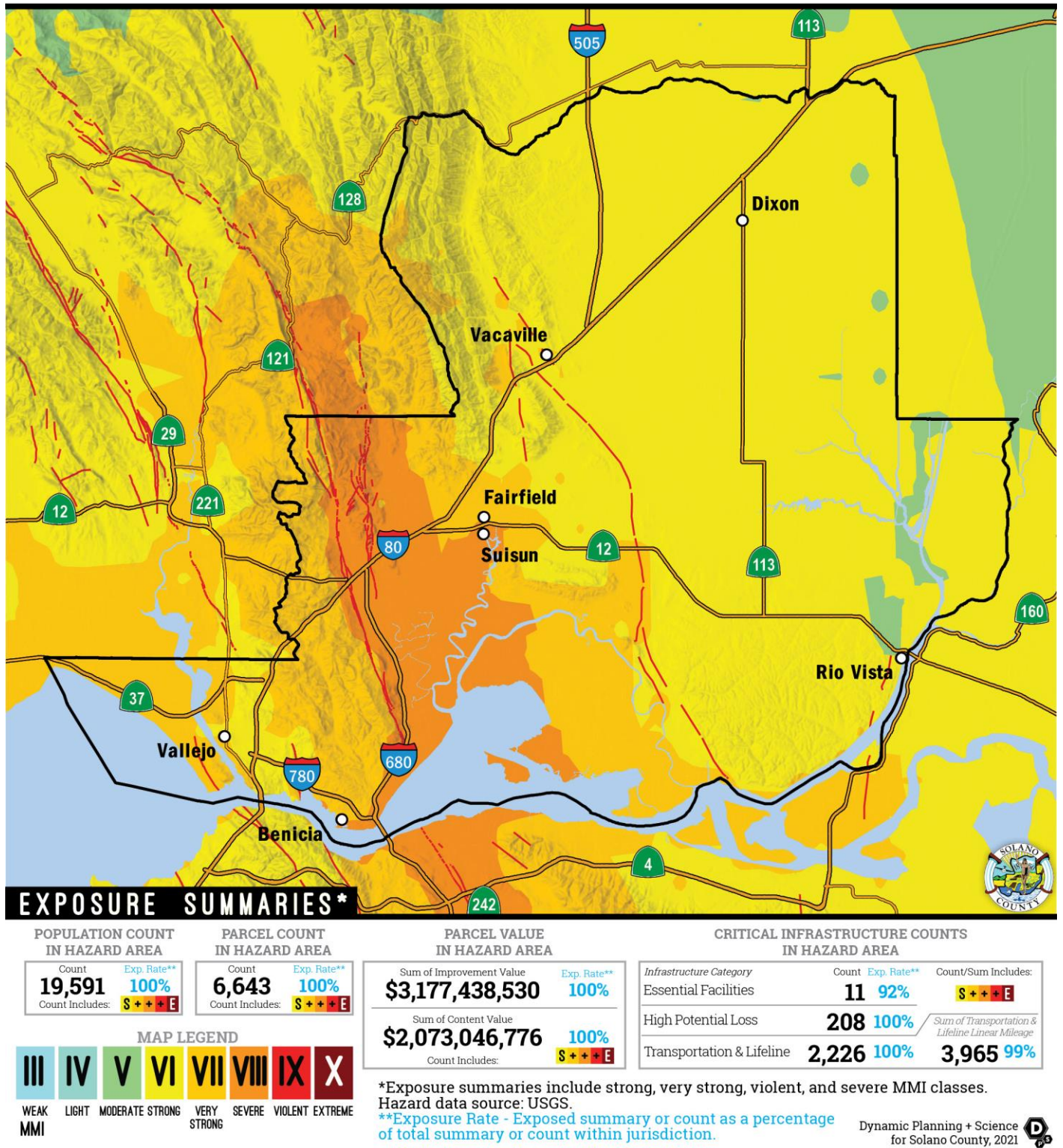


Figure 4-49: Concord-Green Valley Exposure and Snapshot Map





# HAYWARD-RODGER'S CREEK EARTHQUAKE SCENARIO (M7.1)

SOLANO COUNTY

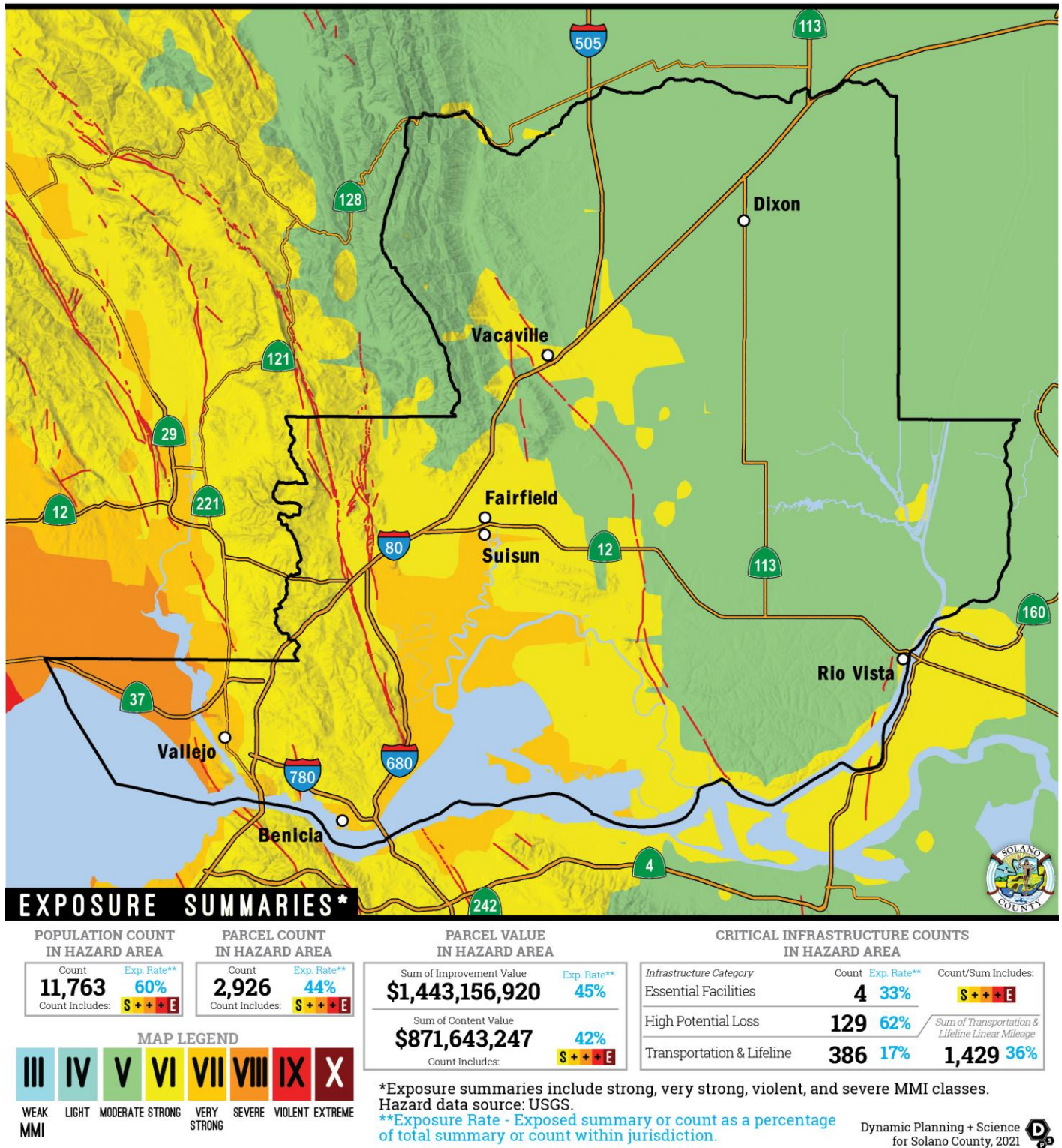


Figure 4-50: Hayward-Rodger's Creek Exposure and Snapshot Map



## Population

A significant number of people in Solano County are exposed to earthquake impacts based on assessing two scenarios, the zones of required investigation, and liquefaction. Vulnerable populations, including low-income communities, in particular might be located in areas with older housing which is more susceptible to damage from earthquakes.

**Scenarios:** Figure 4-51 and Table 4-35 summarize population exposure results for the M6.8 Concord-Green Valley Scenario. Figure 4-52 and Table 4-36 summarize population exposure results for the M7.1 Hayward-Rodger's Creek Scenario. The entire population of Solano County is potentially exposed to direct and indirect impacts from both earthquake scenarios. The degree of exposure depends on many factors, including the age and construction type of dwellings, the soil types on which their homes are constructed, and proximity to fault location. Whether directly or indirectly impacted, the entire population will have to deal with the consequences of earthquakes to some degree. Business interruption could keep people from working, road closures could isolate populations, and loss of functions of utilities could impact populations that suffered no direct damage from an event itself.

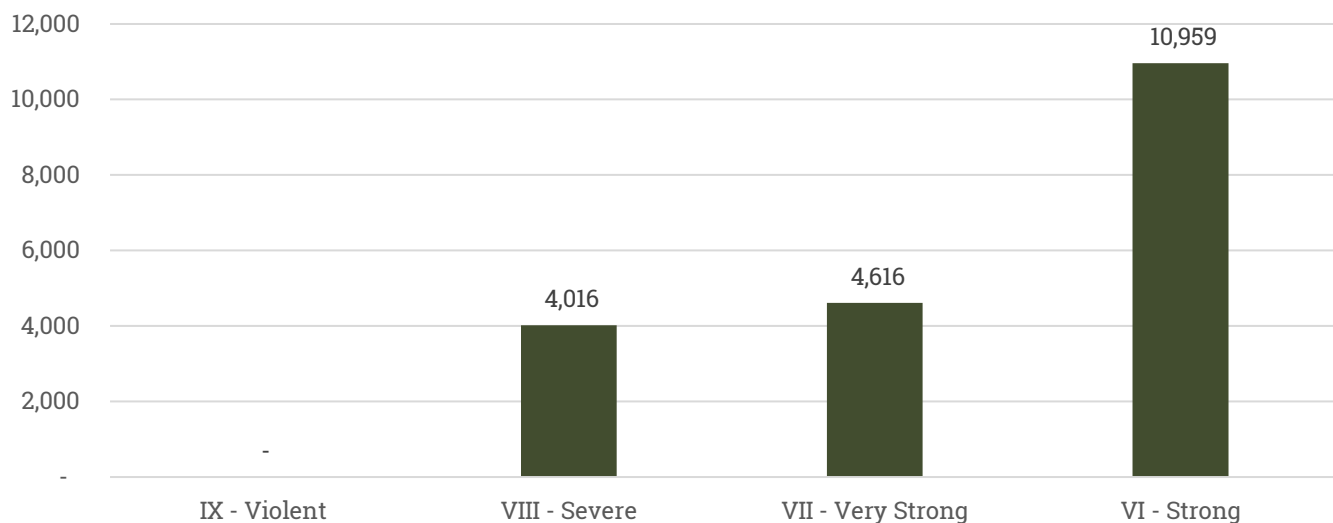


Figure 4-51: Population Exposure to M6.8 Concord-Green Valley Scenario (Unincorporated County)

Table 4-35: Population Exposure to M6.8 Concord-Green Valley Scenario (Unincorporated County)

Total Population		
Unincorporated County	19,665	

Shake Severity Zone	Population Count	% of Total
IX - Violent	-	0.00%
VIII - Severe	4,016	20.42%
VII - Very Strong	4,616	23.47%
VI - Strong	10,959	55.73%
<b>Total</b>	<b>19,591</b>	<b>99.62%</b>

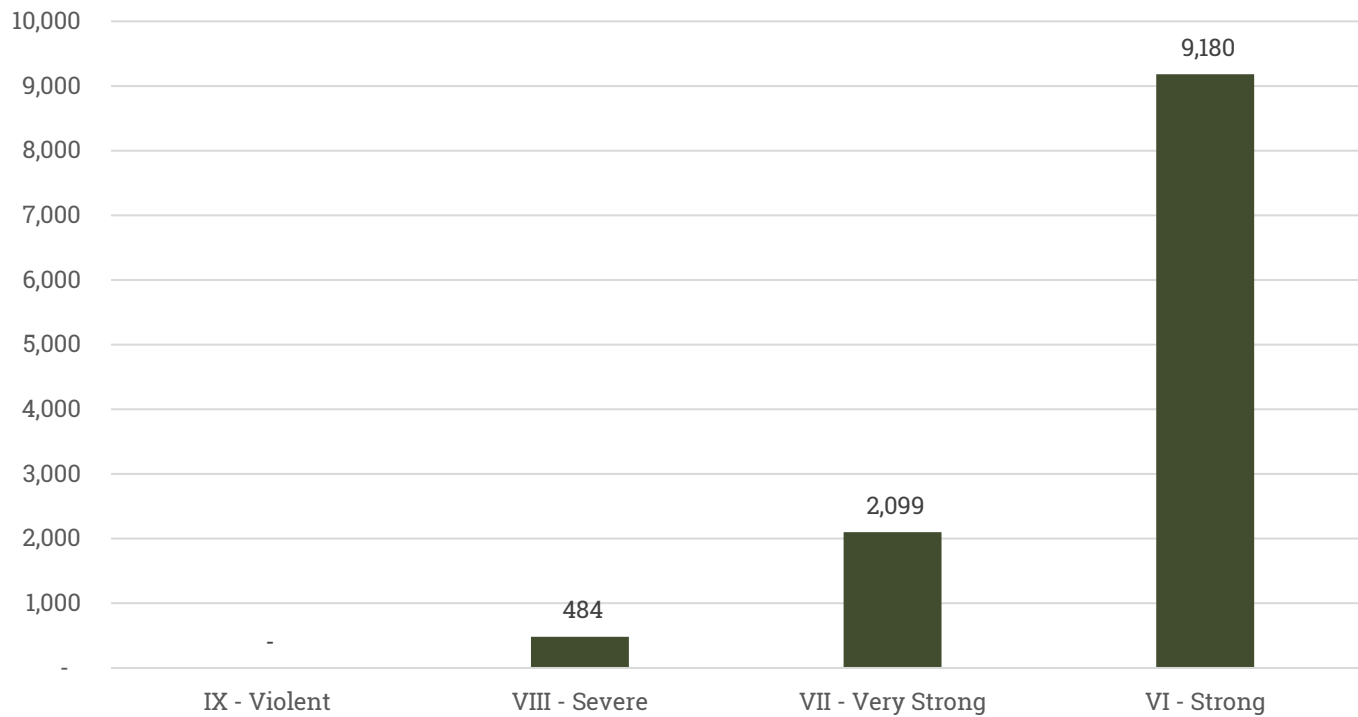


Figure 4-52: Population Exposure to M7.1 Hayward-Rodger's Creek Scenario (Unincorporated County)

Table 4-36: Population Exposure to M7.1 Hayward-Rodger's Creek Scenario (Unincorporated County)

Total Population		
Unincorporated County	19,665	

Shake Severity Zone	Population Count	% of Total
IX - Violent	-	0.00%
VIII - Severe	484	2.46%
VII - Very Strong	2,099	10.67%
VI - Strong	9,180	46.68%
Total	11,763	59.81%



**Zone of Required Investigation and Liquefaction Susceptibility:** Table 4-37 depicts the population count within a zone of required investigation in the county. It also depicts the susceptibility of the population to liquefaction.

Table 4-37: Population Count of Required Investigation and Liquefaction Susceptibility

	Total Population	
Unincorporated County	19,665	
	Population Count	% of Total
Zone of Investigation	336	1.71%
Liquefaction Susceptibility	Population Count	% of Total
Very Low	7,625	38.77%
Low	2,817	14.32%
Medium	7,321	37.23%
High	1,108	5.63%
Very High	300	1.52%
<b>Total</b>	<b>19,170</b>	<b>97.48%</b>

#### Property and Building Ages

The vulnerability of buildings and structures to an earthquake depends on determining two important factors:

- (1) The year in which seismic codes were initially adopted and enforced by the jurisdiction having authority, and
- (2) The year in which seismic codes were improved and enforced.

These are known as **benchmark years**, marking significant milestones in California Building Code requirements that directly affect the structural integrity of development in California.

Solano County adheres to the 2019 California Building Code. Table 4-38 provides a listing of code improvements. Benchmark years are indicated in bold. For reference, Table 4-39 provides the definitions of building types.



Table 4-38: Seismic Benchmark Years

Code Edition	Effective Date	Building Type
(2019 CBC)	January 1, 2020	
(2016 CBC)	January 1, 2017	
(2013 CBC)	January 1, 2014	N/A
(2012 IBC)		
(2010 CBC)	January 1, 2011	N/A
(2009 IBC)		
(2007 CBC)	January 1, 2008	N/A
(2006 IBC)		
(2001 CBC)	November 1, 2002	N/A
(1997 UBC)		
(1998 CBC)	July 1, 1999	W1a, S2, S2a, RM1, PC1, PC1a
(1997 UBC)		
(1994 UBC)	January 7, 1996	S1, S1a, C1, C2, C2a, RM2
(1991 UBC)	November 29, 1992	URM
(1988 UBC)	April 29, 1990	S2 & S2a
(1985 UBC)	November 8, 1987	N/A
(1982 UBC)	December 9, 1984	N/A
(1979 UBC)	June 21, 1981	N/A
(1976 UBC)	November 1, 1977	W1 and W2
(1973 UBC)	April 13, 1975	N/A
(1970 UBC)	August 29, 1971	N/A
(1967 UBC)	July 12, 1968	N/A
(1964 UBC)	July 1, 1965	N/A
(1961 UBC)	August 17, 1962	N/A
(1958 UBC)	October 1, 1958	N/A
(1955 UBC)	January 1, 1956	N/A
(1955 UBC)	January 1, 1956	N/A
(1946 UBC)	June 18, 1948	N/A
(1943 UBC)	July 13, 1944	N/A
(1940 UBC)	April 4, 1941	N/A
(1937 UBC)	September 10, 1937	N/A
(1930 UBC)	March 20, 1933	N/A

Source: ASCE 41-13. County Building Dept.





Table 4-39: Definitions of FEMA Building Types

FEMA Building Type	Definition
<b>W1</b>	Wood Light Frame
<b>W1A</b>	Wood Light Frame (multi-unit residence)
<b>W2</b>	Wood Frame (commercial and industrial)
<b>S1</b>	Steel Moment Frames
<b>S2</b>	Steel-Braced Frames
<b>S3</b>	Steel Light Frames
<b>S4</b>	Steel Frames with Concrete Shear Walls
<b>S5</b>	Steel Frames with Infill Masonry Walls
<b>C1</b>	Concrete Moment Frames
<b>C3</b>	Concrete Frames with Infill Masonry Shear Walls
<b>C2</b>	Concrete Shear Walls
<b>PC1</b>	Tilt-Up Concrete Shear Walls
<b>PC2</b>	Precast Concrete Frames with Shear Walls
<b>RM1</b>	Reinforced Masonry Walls with Flexible Diaphragms
<b>RM2</b>	Reinforced Masonry Walls with Stiff Diaphragms
<b>URM</b>	Unreinforced Masonry Bearing Walls

### Soft-Story Buildings

A soft-story building is a multi-story building with one or more floors that are “soft” due to structural design. If a building has a floor that is 70 percent less stiff than the floor above it, it is considered a soft-story building. These floors can be especially dangerous in earthquakes because they cannot cope with the lateral forces caused by the swaying of the building during a quake. As a result, the soft story may fail, causing what is known as a soft-story collapse. Soft stories are typically associated with retail spaces and parking garages, often on the lower stories of a building. A soft-story collapse can cause the rest of the building to collapse as well, resulting in serious structural damage that may render the structure totally unusable.

Soft-story collapse is one of the leading causes of earthquake damage to private residences. The level of vulnerability due to this type of construction within the planning area is not currently known. This type of data should be generated to support future earthquake risk assessments.



## Property Value Exposure

A significant number of properties in Solano County are exposed to earthquake impacts based on assessing the two scenarios, the zones of required investigation, and liquefaction.

**Scenarios:** An inventory of current market values and the content value was completed using the County Assessor's parcel data. GIS was used to create centroids, or points, to represent the center of each parcel polygon, assumed to be the location of the structure for analysis purposes. The centroids were then superimposed with the USGS probabilistic shaking severity zones to determine the at-risk structures. Table 4-40 shows the count of at-risk parcels and their associated building and content exposure values to the M6.8 Concord-Green Valley earthquake scenario. Table 4-41 shows the count of at-risk parcels and their associated building and content exposure values to the M7.1 Hayward-Rodger's Creek scenario.

Table 4-40: Parcel Exposure to M6.8 Concord-Green Valley (Unincorporated County)

	Total Parcels		Total Market Value (\$)	Total Content Value (\$)	Total Value (\$)	
Unincorporated County	6,668		\$3,186,640,275	\$2,078,097,240	\$5,264,737,515	

Shake Severity Zone	Improved Res. Parcel Count	% of Total	Market Value Exposure (\$)	Content Value Exposure (\$)	Total Exposure (\$)	% of Total
IX - Violent	0	0%	\$0	\$0	\$0	0%
VIII - Severe	1,162	17.4%	\$682,609,232	\$423,333,201	\$1,105,942,433	21.0%
VII - Very Strong	410	6.1%	\$238,170,107	\$157,194,829	\$395,364,936	7.5%
VI - Strong	5,071	76.0%	\$2,256,659,191	\$1,492,518,746	\$3,749,177,937	71.2%
<b>Total</b>	<b>6,643</b>	<b>99.6%</b>	<b>\$3,177,438,530</b>	<b>\$2,073,046,776</b>	<b>\$5,250,485,306</b>	<b>99.7%</b>

Table 4-41: Parcel Exposure to M7.1 Hayward-Rodger's Creek (Unincorporated County)

	Total Parcels		Total Market Value (\$)	Total Content Value (\$)	Total Value (\$)	
Unincorporated County	6,668		\$3,186,640,275	\$2,078,097,240	\$5,264,737,515	

Shake Severity Zone	Improved Res. Parcel Count	% of Total	Market Value Exposure (\$)	Content Value Exposure (\$)	Total Exposure (\$)	% of Total
IX - Violent	0	0%	\$0	\$0	\$0	0%
VIII - Severe	1	0.0%	\$437,750	\$218,875	\$656,625	0.0%
VII - Very Strong	59	0.9%	\$22,278,263	\$13,576,262	\$35,854,525	0.7%
VI - Strong	2,866	43.0%	\$1,420,440,907	\$857,848,110	\$2,278,289,018	43.3%
<b>Total</b>	<b>2,926</b>	<b>43.9%</b>	<b>\$1,443,156,920</b>	<b>\$871,643,247</b>	<b>\$2,314,800,167</b>	<b>44.0%</b>



**Zone of Required Investigation and Liquefaction Susceptibility:** Figure 4-58 depicts the parcel count within a zone of required investigation in the county. It also depicts the susceptibility of parcels to liquefaction.

Table 4-42: Parcel Count of Required Investigation and Liquefaction Susceptibility

	Total Parcels		Total Market Value (\$)	Total Content Value (\$)	Total Value (\$)	
Unincorporated County	6,668		\$3,186,640,275	\$2,078,097,240	\$5,264,737,515	

	Parcel Count	% of Total	Market Value Exposure (\$)	Content Value Exposure (\$)	Total Exposure (\$)	% of Total
Zone of Investigation	235	3.5%	\$135,306,585	\$68,568,236	\$203,874,821	3.9%

Liquefaction Susceptibility						
Very Low	2,627	39.4%	\$1,356,495,026	\$766,331,869	\$2,122,826,895	40.3%
Low	1,274	19.1%	\$524,012,865	\$309,479,585	\$833,492,450	15.8%
Medium	2,183	32.7%	\$1,115,652,219	\$863,157,091	\$1,978,809,310	37.6%
High	409	6.1%	\$116,839,985	\$93,660,543	\$210,500,528	4.0%
Very High	154	2.3%	\$63,852,354	\$39,913,120	\$103,765,474	2.0%
<b>Total</b>	<b>6,647</b>	<b>99.7%</b>	<b>\$3,176,852,449</b>	<b>\$2,072,542,208</b>	<b>\$5,249,394,657</b>	<b>99.7%</b>

### Critical Facilities and Infrastructure

A significant number of critical facilities and infrastructure in Solano County are exposed to earthquake impacts based on assessing the two scenarios, the zones of required investigation, and liquefaction. Earthquakes pose numerous risks to critical facilities and infrastructure. Seismic risks, or losses, that are likely to result from exposure to seismic hazards include:

- Utility outages;
- Economic losses for repair and replacement of critical facilities, roads, buildings, etc.;
- Indirect economic losses, such as income lost during infrastructure downtime; and
- Roads or railroads that are blocked or damaged, preventing access throughout the area and isolating residents and emergency service providers that need to reach vulnerable populations or make repairs.

Linear utilities and transportation routes are vulnerable to rupture and damage during and after a significant earthquake event. The cascading impact of a single failure can have effects across multiple systems and utility sectors. Degrading infrastructure systems and future large earthquakes with epicenters close to critical regional infrastructure could result in system outages that last weeks for the most reliable systems, and multiple months for others. Additionally, earthquakes may cause the loss of function of cellular phone sites or cell towers, which can limit emergency services such as tracking and evacuation.

**Scenarios:** A significant number of critical facilities in Solano County are exposed to the two earthquake hazard scenarios, as shown in Table 4-43 and Table 4-44.



Table 4-43: Critical Facility Exposure to M6.8 Concord-Green Valley Scenario (Unincorporated County)

Critical Infrastructure - M6.8 Concord-Green Valley

Infrastructure Type	IX - Violent	VIII - Severe	VII - Very Strong	VI -Strong
<b>Essential Facility</b>	-	2	1	8
EOC	-	-	-	-
Law Enforcement	-	-	-	-
Fire Station	-	2	1	8
Emergency Services	-	-	-	-
Hospital	-	-	-	-
<b>High Potential Loss</b>	-	26	54	128
Dam	-	3	6	3
Historic Building	-	-	-	2
Library	-	-	-	-
School	-	3	-	2
Historic Site	-	-	-	-
Community Center	-	-	-	-
Jurisdiction Real Property Asset*	-	-	-	-
Park	-	4	-	3
Wastewater Treatment Facility	-	1	-	-
Emergency Shelter	-	2	-	1
Administrative	-	-	-	-
Child Care Facility	-	2	-	6
Healthcare Facility	-	-	-	-
Senior Center	-	-	-	-
County Real Property Asset*	-	9	48	108
Early Learning	-	2	-	3
<b>Transportation and Lifeline</b>	-	92	116	2018
Airport	-	-	-	-
Bridge	-	28	11	109
Power Plant	-	-	-	25
Substation	-	2	-	20
Bus Facility	-	-	-	-
NG Station	-	-	5	45
Bus Stop	-	3	-	5
Railway Bridge	-	1	-	-
Cell Tower	-	5	6	6
Breakout Tank	-	-	-	-
Oil Facility	-	-	-	-
Transmission Line Tower	-	53	94	889
Wind Turbine	-	-	-	919
Ferry	-	-	-	-
Amtrak Station	-	-	-	-
Train Station	-	-	-	-
<b>Hazmat</b>	-	18	23	65
Hazmat	-	18	23	65
Hazardous Waste facility	-	-	-	5
<b>Grand Total</b>	-	138	194	2219

\*Note: Real Property Assets are digitized insurance rolls for demonstrating value and ownership and may have overlapping points with other categories such as fire stations and law enforcement.



Table 4-44: Critical Facility Exposure to M7.1 Hayward-Rodger's Creek Scenario (Unincorporated County)

**Critical Infrastructure - M7.1 Hayward-Rodger's Creek**

Infrastructure Type	IX - Violent	VIII - Severe	VII - Very Strong	VI - Strong
<b>Essential Facility</b>	-	-	-	4
EOC	-	-	-	-
Law Enforcement	-	-	-	-
Fire Station	-	-	-	4
Emergency Services	-	-	-	-
Hospital	-	-	-	-
<b>High Potential Loss</b>	-	1	8	120
Dam	-	-	-	10
Historic Building	-	-	-	1
Library	-	-	-	-
School	-	-	-	5
Historic Site	-	-	-	-
Community Center	-	-	-	-
Jurisdiction Real Property Asset*	-	-	-	-
Park	-	-	2	2
Wastewater Treatment Facility	-	-	-	1
Emergency Shelter	-	-	-	2
Administrative	-	-	-	-
Child Care Facility	-	-	-	4
Healthcare Facility	-	-	-	-
Senior Center	-	-	-	-
County Real Property Asset*	-	1	6	93
Early Learning	-	-	-	2
<b>Transportation and Lifeline</b>	-	24	11	351
Airport	-	-	-	-
Bridge	-	-	6	43
Power Plant	-	-	-	2
Substation	-	-	-	2
Bus Facility	-	-	-	-
NG Station	-	-	-	9
Bus Stop	-	-	-	8
Railway Bridge	-	-	-	1
Cell Tower	-	-	5	6
Breakout Tank	-	-	-	-
Oil Facility	-	-	-	-
Transmission Line Tower	-	24	-	236
Wind Turbine	-	-	-	44
Ferry	-	-	-	-
Amtrak Station	-	-	-	-
Train Station	-	-	-	-
<b>Hazmat</b>	-	4	4	40
Hazmat	-	4	4	40
Hazardous Waste facility	-	-	-	-
<b>Grand Total</b>	-	29	23	515

\*Note: Real Property Assets are digitized insurance rolls for demonstrating value and ownership and may have overlapping points with other categories such as fire stations and law enforcement.





**Zone of Required Investigation and Liquefaction Susceptibility:** Table 4-45 depicts the amount of critical infrastructure within the county that lie within a zone of required investigation. It also depicts the susceptibility of the county's critical infrastructure number to liquefaction.

Table 4-45: Critical Infrastructure in Zone of Required Investigation and Susceptible to Liquefaction

Infrastructure Type	Liquefaction Susceptibility					Zone of Investigation
	Very Low	Low	Medium	High	Very High	
<b>Essential Facility</b>	4	1	5	-	2	1
EOC	-	-	-	-	-	-
Law Enforcement	-	-	-	-	-	-
Fire Station	4	1	5	-	2	1
Emergency Services	-	-	-	-	-	-
Hospital	-	-	-	-	-	-
<b>High Potential Loss</b>	46	29	113	10	8	6
Dam	5	2	2	2	-	2
Historic Building	1	-	1	-	-	-
Library	-	-	-	-	-	-
School	1	2	2	-	-	-
Historic Site	-	-	-	-	-	-
Community Center	-	-	-	-	-	-
Jurisdiction Real Property Asset*	-	-	-	-	-	-
Park	2	-	3	1	1	1
Wastewater Treatment Facility	-	-	1	-	-	-
Emergency Shelter	-	-	2	1	-	1
Administrative	-	-	-	-	-	-
Child Care Facility	3	1	3	1	-	1
Healthcare Facility	-	-	-	-	-	-
Senior Center	-	-	-	-	-	-
County Real Property Asset*	34	24	97	2	7	1
Early Learning	-	-	2	3	-	-
<b>Transportation and Lifeline</b>	1466	340	284	70	47	16
Airport	-	-	-	-	-	-
Bridge	8	14	66	19	36	3
Power Plant	17	5	2	1	-	-
Substation	9	4	5	4	-	1
Bus Facility	-	-	-	-	-	-
NG Station	21	14	8	7	1	-
Bus Stop	2	3	3	-	-	-
Railway Bridge	1	-	-	-	-	1
Cell Tower	14	-	3	-	-	-
Breakout Tank	-	-	-	-	-	-



Infrastructure Type	Liquefaction Susceptibility					Zone of Investigation
	Very Low	Low	Medium	High	Very High	
Oil Facility	-	-	-	-	-	-
Transmission Line Tower	475	300	197	39	10	11
Wind Turbine	919	-	-	-	-	-
Ferry	-	-	-	-	-	-
Amtrak Station	-	-	-	-	-	-
Train Station	-	-	-	-	-	-
<b>Hazmat</b>	49	11	38	5	2	-
Hazmat	49	11	38	5	2	-
Hazardous Waste facility	1	1	3	-	-	-
<b>Grand Total</b>	<b>1565</b>	<b>381</b>	<b>440</b>	<b>85</b>	<b>59</b>	<b>23</b>

*\*Note: Real Property Assets are digitized insurance rolls for demonstrating value and ownership and may have overlapping points with other categories such as fire stations and law enforcement.*

### HazMat Fixed Facilities

Earthquakes can produce hazardous materials (HazMat) threats at extremely high levels. Depending on the year of build and construction of each facility containing HazMat, the earthquake-initiated hazardous material release (EIHR) potential will vary. HazMat contained within masonry or concrete structures built before certain benchmark years may be particularly vulnerable.

### Utilities

A significant number of utilities in Solano County are exposed to earthquake impacts based on assessing the two scenarios, the zones of required investigation, and liquefaction.

**Scenarios:** Linear utilities and transportation infrastructure would likely suffer considerable damage in the event of an earthquake. Due to the amount of infrastructure and sensitivity of utility data, linear utilities are difficult to analyze without further investigating individual system components. Table 4-46 and Table 4-47 provide the best available linear utility data; it should be assumed that these systems are exposed to breakage and failure.

**Zone of Required Investigation and Liquefaction Susceptibility:** Table 4-48 depicts the number of critical lines within the county that lie within a zone of required investigation. It also depicts the susceptibility of critical lines to liquefaction.



Table 4-46: Lifeline Exposure M6.8 Concord-Green Valley Scenario (Unincorporated County)

Lifelines (miles) - M6.8 Concord-Green Valley

Infrastructure Type (Linear)	IX - Violent	VIII - Severe	VII - Very Strong	VI - Strong
Bus Route	-	30.6	8.5	24.5
Levee (FEMA)	-	169.0	220.5	238.1
Levee Flood Wall	-	-	-	0.1
Levee Cross Section	-	0.1	-	2.2
NG Pipeline	-	9.5	30.9	232.1
Railroad	-	15.5	2.4	44.1
Street	-	290.3	368.1	1,902.4
4WD trail	-	-	8.0	10.5
Alley	-	-	-	0.0
Cul-de-sac	-	0.1	0.1	0.6
Driveway	-	33.6	29.0	280.5
Ferry	-	-	-	0.2
Interstate	-	16.9	17.8	36.5
Local road	-	146.5	231.3	969.2
Local road, major	-	66.8	65.0	400.0
Primary highway	-	-	-	-
Ramp	-	4.5	0.2	12.1
Service road	-	1.5	-	-
State/county highway	-	20.4	16.6	188.0
Traffic circle	-	0.1	-	0.0
Walkway	-	-	0.1	4.3
Transmission Line	-	36.1	49.6	290.6
<b>Grand Total</b>	<b>-</b>	<b>551.0</b>	<b>679.9</b>	<b>2,734.1</b>



Table 4-47: Lifeline Exposure M7.1 Hayward-Rodger's Creek Scenario (Unincorporated County)

Lifelines (miles) - M7.1 Hayward-Rodger's Creek

Infrastructure Type (Linear)	IX - Violent	VIII - Severe	VII - Very Strong	VI - Strong
Bus Route	-	30.6	8.5	24.5
Levee (FEMA)	-	169.0	220.5	238.1
Levee Flood Wall	-	-	-	0.1
Levee Cross Section	-	0.1	-	2.2
NG Pipeline	-	9.5	30.9	232.1
Railroad	-	15.5	2.4	44.1
Street	-	290.3	368.1	1,902.4
4WD trail	-	-	8.0	10.5
Alley	-	-	-	0.0
Cul-de-sac	-	0.1	0.1	0.6
Driveway	-	33.6	29.0	280.5
Ferry	-	-	-	0.2
Interstate	-	16.9	17.8	36.5
Local road	-	146.5	231.3	969.2
Local road, major	-	66.8	65.0	400.0
Primary highway	-	-	-	-
Ramp	-	4.5	0.2	12.1
Service road	-	1.5	-	-
State/county highway	-	20.4	16.6	188.0
Traffic circle	-	0.1	-	0.0
Walkway	-	-	0.1	4.3
Transmission Line	-	36.1	49.6	290.6
<b>Grand Total</b>	<b>-</b>	<b>551.0</b>	<b>679.9</b>	<b>2,734.1</b>



Table 4-48: Critical Lines in Zone of Required Investigation and Susceptible to Liquefaction

Infrastructure Type (Linear)	Liquefaction Susceptibility					Zone of Investigation
	Very Low	Low	Medium	High	Very High	
Bus Route	-	-	-	-	-	-
Levee (FEMA)	2.9	1.6	388.3	222.7	7.3	2.8
Levee Flood Wall	-	-	-	-	-	-
Levee Cross Section	-	-	-	-	-	-
NG Pipeline	97.8	67.2	68.6	27.0	3.9	2.0
Railroad	4.8	30.9	11.3	0.8	13.5	1.4
Street	770.2	270.3	956.5	513.1	46.2	18.3
<i>4WD trail</i>	9.2	-	4.0	5.2	0.0	-
<i>Alley</i>	-	0.0	0.0	-	-	-
<i>Cul-de-sac</i>	0.3	0.1	-	0.2	0.2	-
<i>Driveway</i>	162.6	49.4	88.5	43.9	3.3	2.6
<i>Ferry</i>	0.0	-	-	-	-	-
<i>Interstate</i>	13.0	10.9	40.3	0.8	3.0	1.3
<i>Local road</i>	377.9	102.8	533.3	298.4	23.9	6.0
<i>Local road, major</i>	149.3	77.7	186.6	109.4	10.9	6.9
<i>Primary highway</i>	-	-	-	-	-	-
<i>Ramp</i>	2.5	3.3	10.2	0.0	0.1	0.5
<i>Service road</i>	0.2	-	1.2	-	0.0	-
<i>State/county highway</i>	51.8	25.5	91.6	54.7	4.6	1.0
<i>Traffic circle</i>	0.0	-	0.1	0.0	-	-
<i>Walkway</i>	3.3	0.5	-	0.5	-	-
Transmission Line	128.5	88.8	94.2	33.1	5.3	2.5
<b>Grand Total</b>	<b>1,004.1</b>	<b>458.8</b>	<b>1,518.9</b>	<b>796.6</b>	<b>76.2</b>	<b>27.0</b>

### Water Supply Utilities

Solano water supply is sourced primarily from the Solano Project and the North Bay Aqueduct. The Solano Project includes Monticello Dam and Lake Berryessa. The North Bay Aqueduct is a State Water Project facility. The Solano County Water Agency provides water for municipal, industrial, and agricultural uses in Fairfield, Suisun City, Vacaville, Vallejo, Benicia, the Solano Irrigation District and Maine Prairie Water District service areas, UC Davis, and the California State Prison in Solano County. Other water sources in the unincorporated county are the Rural North Vacaville Water District, the City of Vallejo, Suisun-Solano Water Authority, and private and community wells. Additionally, some wastewater from the Fairfield/Suisun area is recycled and used for agricultural purposes. (Solano County General Plan, 2008)





An earthquake could impact water supply delivery from breaking of water delivery lines, wellheads, and the loss of power critical for pumping. Exposure to liquefaction and zones of required investigation could also cause large amounts of damage to water supply lines.

### **Natural Gas Utilities**

Pacific Gas and Electric (PG&E), Solano County's natural gas and electricity utility, is responsible for designing, constructing, maintaining, and operating natural gas infrastructure safely and efficiently. This includes all the facilities used in the delivery of gas to any customer up to and including the point of delivery to a customer's gas piping system.

Damage to natural gas systems primarily results from damage on the customer side to the structures in which the systems are housed or damage to the equipment to which gas lines are connected. The shifting or toppling of gas appliances, such as water heaters or stoves, is the principal cause of post-earthquake fire ignitions that are gas-related; however, building collapse and deformation of structural components can also cause damage to interior gas piping. (California Seismic Safety Commission, 2002)

In addition, utility natural gas systems can be damaged through ground displacements, including surface faulting, landslide-like movements, and soil failure or liquefaction produced by strong ground shaking. However, this is mainly a concern for older pipelines that may be weakened by corrosion or were constructed using outdated methods and materials. Cast iron, aging bare steel pipe, and pipe with threaded connections are the most susceptible to damage from ground shaking. (*Id.*) Breaks in the system will affect large portions of the county, and restoration of natural gas service could be significantly delayed.

Common characteristics of earthquakes and their impacts on natural gas safety include:

- Ground shaking generally leads to substantially more instances of building damage than fire ignitions.
- Building damage caused by substantial ground shaking is the most likely to impact utility and customer gas systems and lead to gas-related fire ignitions.
- Twenty percent to 50 percent of post-earthquake fire ignitions will be related to natural gas.
- The consequences of post-earthquake fire ignitions for residential gas customers are largely financial. A fire ignition only becomes a life safety concern when inhabitants are unable to exit the building following earthquakes. While experience in past earthquakes indicates that egress from earthquake-damaged single-family homes is generally possible, residents in larger multifamily units, especially on higher floors, may be at risk since they provide a greater chance for damaging the structure and trapping the occupants and greater difficulty evacuating. (*Id.*)

Gas customers and Solano County residents are responsible for using gas safely on their property and within their buildings and other facilities. Customers meet this responsibility by maintaining their gas appliances in good working condition, assuring that only qualified individuals are engaged to modify or maintain their gas service and facility piping, and knowing what to do before and after earthquakes to maintain the safe operation of their natural gas service.



The following conditions, when combined, pose the greatest risk for post-earthquake fire damage:

- Unoccupied buildings, as they pose problems with mitigating damage to gas systems or control small fires.
- Liquefaction.
- High building density.
- Dense vegetation that could catch fire.
- High wind and low humidity weather conditions.
- Damage to water systems to limit firefighting capabilities.
- Impaired communications, numerous requests for assistance, direct damage to fire stations, restricted access because of traffic congestion and damaged roadways, and delays in mutual aid from neighboring fire districts, which can create delays in firefighting response. (Id.)

### **Telecommunication**

Telecommunication systems will be affected by a system failure, overloads, loss of electrical power, and possible failure of some alternate power systems. Immediately following an event, numerous failures will occur, compounded by system use overloads. This will likely disable up to 80 percent of the telephone system for one day. County UHF/VHF and microwave radio systems are expected to operate at 40 percent effectiveness for the first 12 hours following an earthquake, increase to 50 percent effectiveness for the second 12-hour period, then begin to slowly decline to approximately 40 percent effectiveness within 36 hours. (City and County of San Francisco Hazard Mitigation Plan, 2014) Microwave systems will likely be 30 percent or less effective following a major earthquake.

### **Public Schools**

The Field Act was enacted on April 10, 1933, one month after the Long Beach Earthquake in which many schools were destroyed or suffered major damage. Since then, public school construction has been governed by the Act and enforced by the Division of the State Architect. In any community, public schools constructed under the Field Act after 1978 are likely to be among the safest buildings in which to experience a major earthquake. The Field Act requires:

- School building construction plans to be prepared by qualified California licensed structural engineers and architects.
- Designs and plans to be checked by the Division of the State Architect (DSA) for compliance with the Field Act before a contract for construction can be awarded.
- Qualified inspectors, independent of the contractors and hired by the school districts, to continuously inspect construction and verify full compliance with plans.
- The responsible architects and structural engineers to observe the construction periodically and prepare changes to plans, if needed, subject to approval by DSA.
- Architects, engineers, inspectors, and contractors to file reports, under penalty of perjury, to verify compliance of the construction with the approved plans emphasizing the importance of testing and inspections to achieve seismically safe construction. Any person who violates the provisions



or makes any false statement in any verification report or affidavit required pursuant to the Act is guilty of a felony. (Seismic Safety Commission, 2009)

Private schools are not subject to the Field Act and fall solely under the jurisdiction of the local building departments and building code requirements. Private schools are covered under the Private Schools Building Act of 1986, with the legislative intent that children attending private schools be afforded life safety protection similar to that of children attending public schools. (*Id.*)

In the late 1960s, regulations were put in place to have pre-Field Act (1933) buildings retrofitted, removed from school use, or demolished. (Cal. Edu. Code § 15516, Appendix X, 1968) The Field Act also prohibits the use of unreinforced masonry buildings as school buildings. Seismic building standards, in general, were greatly strengthened after significant damage to buildings was observed, especially in the 1971 San Fernando earthquake. The Field Act regulations in place since 1978 are considered adequate for public school buildings in most cases. (*Id.*)

### **Transportation**

Earthquake events can significantly impact bridges and overpasses, which often provide the only access to some neighborhoods. Since soft soil regions generally follow floodplain boundaries, bridges that cross watercourses are considered vulnerable. Areas which experience liquefaction or zones of required investigation are also particularly vulnerable and transportation in these areas is susceptible to increased risk.

There are multiple transportation routes and transit providers and facilities throughout Solano County. Regional access routes in the county include Interstates 80, 505, 680, and 780, and State Routes (SRs) 12, 29, 37, 84, and 113. Portions of these routes could become impassable after an earthquake event, which could isolate portions of the county until road crews are able to complete road restoration. Throughout Solano County, Amtrak and Greyhound bus lines provide long-distance inter-city service. In addition, transit routes 2-2 connect with Bay Area Rapid Transit (BART) stations in Contra Costa County and transit links are provided to Napa, Sacramento, and Yolo Counties. Public aviation airports in Solano County include the Nut Tree Airport and Rio Vista Municipal Airport. Table 4-46 and Table 4-47 show transportation infrastructure exposed to shake severity zones in the event of the Concord-Green Valley and the Hayward-Rodger's Creek earthquake scenarios. (Solano HMP, 2014)



#### 4.5.3.8.2 Earthquake Damage Estimation

Damage estimations for the two scenarios in this MJHMP were calculated using FEMA's Hazus software, namely a Level 2 Hazus 4.2 analysis. For the Solano County Hazus analysis, the M6.8 Concord-Green Valley and M7.1 Hayward-Rodger's Creek earthquake scenarios were used.

Hazus uses GIS to analyze multiple factors influencing earthquake damage estimates, including peak ground velocity (PGV), peak ground acceleration (PGA) and soil of a given scenario, and geographic area. Once the location and size of a hypothetical earthquake is identified, Hazus software estimates the intensity of the ground shaking, number of buildings damaged, number of casualties, damage to transportation systems and utilities, number of people displaced from their homes, and the estimated cost of repair and clean up.

The parcel data defined in Section 4.3 was imported into Hazus as User Defined Facilities (UDF) serving as the basis for replacement and content cost, as well as associated damage estimation and loss. Building damage outputs from Hazus are categorized into slight, moderate, and extensive damage. Ranges of damage are used to provide the user with an understanding of a building's physical condition. Table 4-49 provides a physical description of each damage state.

County Assessor data does not include detailed information for tax-exempt structures, such as federal and local government buildings. These data were added through the development of GIS data by utilizing insurance schedule tables for each municipality's insured assets.

While there are several limitations to the FEMA Hazus earthquake models, it does allow for potential loss estimation for each building construction category. County-wide loss estimation results are summarized by building category type in Table 4-50 (Concord-Green Valley) and Table 4-51 (Hayward-Rodger's Creek). It is important to understand that the Hazus loss estimation values for earthquakes are categorized in exceedance values. From reviewing Table 4-50 and Table 4-51, one might infer the probability of structures exceeding extensive damage is relatively low. However, if damage were to occur, the economic loss is averaged and summarized for each building type defined in the software.

***Important to note: Loss estimation is the worst-case scenario. Loss estimation does not include damage to transportation routes, infrastructure, and other public and private utilities located throughout the county. An important concept in loss data is the "probability" of damage to exceed a certain degree. It is unlikely that buildings in county would receive "extensive" damage from earthquake shaking.***



Table 4-49: Hazus Building Damage Descriptions

Damage State	Damage Description
<b>Slight</b>	Small plaster cracks at corners of door and window openings and wall/ceiling intersections; small cracks in masonry chimneys and masonry veneers. Small cracks are assumed to be visible with a maximum width of less than 1/8 inch (cracks wider than 1/8 inch are referred to as "large" cracks).
<b>Moderate</b>	Large plaster or gypsum-board cracks at corners of door and window openings; small diagonal cracks across shear wall panels exhibited by small cracks in stucco and gypsum wall panels; large cracks in brick chimneys; toppling of tall masonry chimneys.
<b>Extensive</b>	Large diagonal cracks across shear wall panels or large cracks at plywood joints; permanent lateral movement of floors and roof; toppling of most brick chimneys; cracks in foundations; splitting of wood sill plates and/or slippage of structure over foundations.
<b>Complete</b>	Structure may have large permanent lateral displacement or be in imminent danger of collapse due to cripple wall failure or failure of the lateral load resisting system; some structures may slip and fall off the foundation; large foundation cracks. Three percent of the total area of buildings with Complete damage is expected to be collapsed, on average.

#### Damage Estimation Improved Parcel and Government Property Loss

Hazus 4.2 was used to estimate the loss potential to residential properties and government service facilities exposed to both the M6.8 Concord-Green Valley and M7.1 Hayward-Rodger's Creek earthquake scenarios. Hazus reports the damage potential and loss potential from a given earthquake scenario in four categories: slight damage, moderate damage, extensive damage, and economic loss. Economic loss consists of estimations on the cost of repair and replacement to damaged or destroyed buildings and contents, relocation expenses, capital-related income, wage losses, and rental income losses. County insurance data was obtained and formatted for use in Hazus for a detailed damage estimation. This dataset has additional information, including number of floors, building value, content value, and construction type, that greatly enhances results from the default Hazus database.

The results shown in Table 4-50 and Table 4-51 summarize improved parcels and government property loss. Appendix A provides a full list of critical facilities and damage estimations.





Table 4-50: Loss Estimations for M6.8 Concord-Green Valley Scenario

Building Type	Average of Potential Damage to Exceed "Slight"	Average of Potential Damage to Exceed "Moderate"	Average of Potential Damage to Exceed "Extensive"	Average Economic Loss for Each Building Category	Sum of Economic Loss	Proportion of Loss (%)
Agriculture	36%	20%	5%	\$25,899	\$34,730,830	14%
Commercial	33%	11%	2%	\$114,743	\$11,359,604	4%
Education*	31%	15%	2%	\$13,569	\$13,569	0%
Emergency	80%	64%	37%	\$609,376	\$1,828,128	1%
Government	26%	5%	0%	\$287,316	\$24,421,897	10%
Industrial	41%	23%	7%	\$501,339	\$42,613,850	17%
Religion	29%	10%	2%	\$40,505	\$688,585	0%
Residential	29%	7%	1%	\$26,992	\$138,146,977	54%
<b>Total</b>					<b>\$253,803,439</b>	

\*School district asset information not available during time of Hazus analysis.

Note: Total Inventory Values

1 - Building Replacement Costs = \$3,773,922,295

2 - Content Replacement Costs = \$2,667,166,517

3 - Total Value = \$6,441,088,812

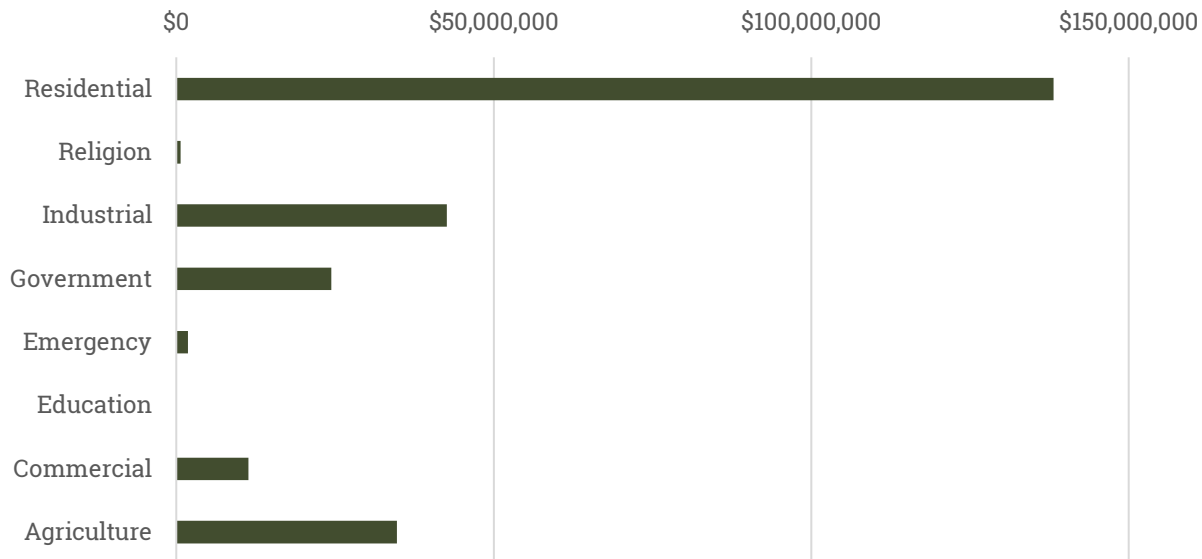


Figure 4-53: M6.8 Concord Green Valley Damage Estimation by Occupancy



Table 4-51: Loss Estimations for M7.1 Hayward-Rodger's Creek Scenario

Building Type	Average of Potential Damage to Exceed "Slight"	Average of Potential Damage to Exceed "Moderate"	Average of Potential Damage to Exceed "Extensive"	Average Economic Loss for Each Building Category	Sum of Economic Loss	Proportion of Loss (%)
Agriculture	15%	6%	1%	\$ 7,170	\$ 9,614,998	18%
Commercial	12%	3%	0%	\$ 27,082	\$ 2,681,139	5%
Education	15%	6%	1%	\$5,537	\$5,537	0%
Emergency	0%	0%	0%	\$-	\$-	0%
Government	4%	0%	0%	\$3,337	\$ 23,360	0%
Industrial	17%	7%	1%	\$ 121,050	\$ 10,289,286	20%
Religion	12%	2%	0%	\$ 11,167	\$189,834	0%
Residential	9%	1%	0%	\$ 5,758	\$29,471,403	56%
<b>Total</b>					<b>\$52,275,556</b>	

*Note: Total Inventory Values*

1 - Building Replacement Costs = \$73,954,683,046

2 - Content Replacement Costs = \$47,728,130,547

3 - Total Value = \$121,682,813,593

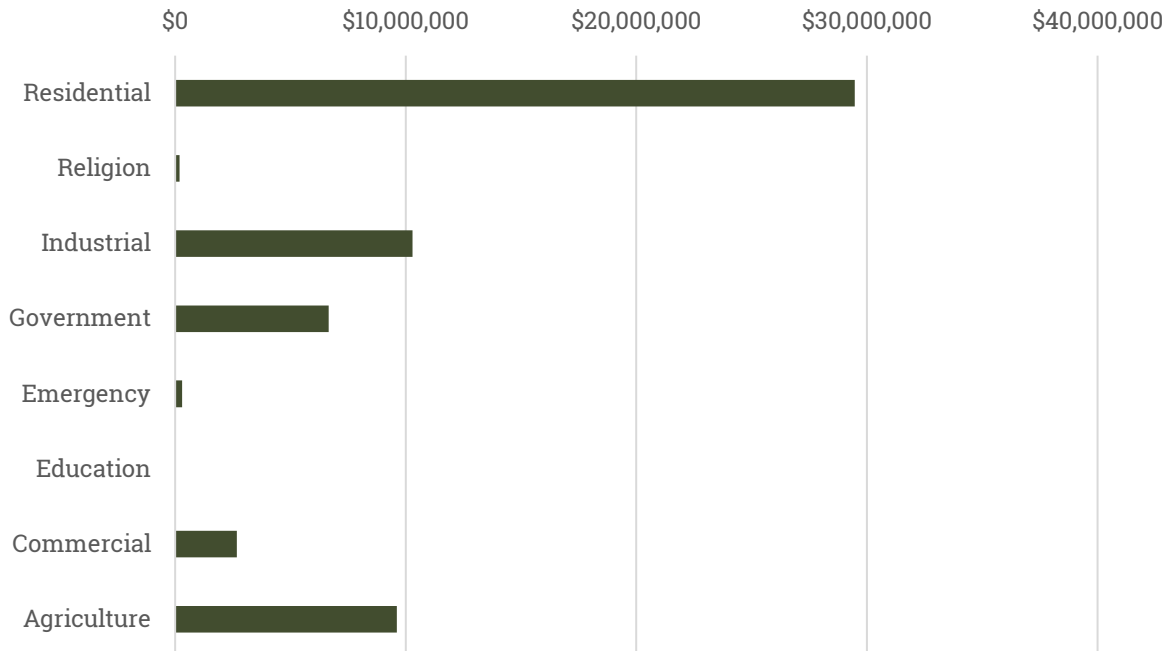


Figure 4-54: M7.1 Hayward Rodger's Creek Damage Estimation by Occupancy



#### **4.5.3.9 Future Trends in Development**

Land use in the planning area will be directed by general plans adopted under California's General Planning Law. The safety elements of these general plans establish standards and policies for the protection of the community from hazards. The information in this plan provides the participating jurisdictions a tool to ensure that there is no increase in exposure in areas of high seismic risk. Development in the planning area will be regulated through building standards and performance measures so that the degree of risk will be reduced. The geologic hazard portions of the planning area are heavily regulated under California's Building Code, which has some of the most stringent seismic building standards in the nation.

#### **4.5.3.10 Earthquake Hazard Problem Statements**

As part of the mitigation action identification process, the Planning Committee for the county and for each jurisdiction identified issues and weaknesses, also called problem statements, for their respective facilities. Identification was based on the risk assessment and vulnerability analysis utilizing the RAMP mapping tool and earthquake data. Earthquake problem statements for all participating jurisdictions are listed in Table 4-52; problem statements for all other participating jurisdictions are accessed in Volume 2 of this plan.

Identifying these common issues and weaknesses assists the Planning Committee in understanding the realm of resources needed for mitigation. The goal is to have at least one mitigation action for every problem statement. See Table 5-6 for a full list of mitigation actions and the corresponding problem statements that they address. Each problem statement is coded with a problem number for cross-referencing between Table 4-52 and Table 5-6.



Table 4-52 Earthquake Problem Statements

Problem No.	Hazard Type	Area of Concern	Mitigation Alternatives	Primary Agency	Problem Description	Related MA
ps-EQ-SC-119	Earthquake	Impact	PRV - Prevention , ES - Emergency Services	Solano County	The County does not have a seismic gas shut off valve ordinance or program.	ma-EQ-SC-164
ps-EQ-SC-120	Earthquake	Impact	PRV - Prevention , PE&A - Public Education & Awareness	Solano County	Some County facilities may lack seismic gas shut off valves to prevent gas leaks. Further investigation is needed.	ma-EQ-SC-165
ps-EQ-SC-121	Earthquake	Impact	PRV - Prevention , PPRO - Property Protection , SP - Structural Projects	Solano County	Historic buildings are more susceptible to ground shaking since many of these buildings have weakened with age and were built under old building codes.	ma-AH-SC-3, ma-EQ-SC-166
ps-EQ-SC-122	Earthquake	Impact	PE&A - Public Education & Awareness , SP - Structural Projects	Solano County	Older construction and unreinforced masonry (URM) buildings within the County are susceptible to the impacts of an earthquake.	ma-EQ-SC-166
ps-EQ-SC-123	Earthquake	Impact	SP - Structural Projects	Solano County	There are 28 County bridges located in a severe shake zone for the 6.8 Concord Green Valley EQ scenario.	ma-EQ-SC-167, ma-AH-SC-14
ps-EQ-SC-124	Earthquake	Impact	SP - Structural Projects	Solano County	Infrastructure in the Delta is particularly vulnerable to the impacts of EQ due to the presence of weak levees.	ma-EQ-SC-168, ma-EQ-SC-17, ma-AH-SC-14
ps-EQ-SC-125	Earthquake	Victim	PPRO - Property Protection , PE&A - Public Education & Awareness , SP - Structural Projects	Solano County	There are 3,941 people living in a severe shake zone in the Unicorp. County for the 6.8 Concord Green Valley EQ scenario.	ma-AH-SC-14, ma-EQ-SC-169, ma-AH-SC-11, ma-AH-SC-4, ma-AH-SC-7, ma-EQ-SC-16



## 4.5.4 Extreme Weather Hazard Profile

Extreme weather refers to any dangerous meteorological phenomena with the potential to cause damage, serious social disruption, or loss of human life. Extreme weather may form over wide geographic areas or occur within a more limited geographic area.



The MJHMP Planning Committee identified three types of extreme weather events that typically impact Solano County:

- High Wind
- Heavy Rain
- High Heat

These three types of extreme weather are also discussed in the context of climate change. The following are characteristics of extreme weather events that can occur in Solano County.

### High Wind

Damaging winds are classified as those exceeding 60 mph. Damage from such wind accounts for half of all extreme weather reports in the lower 48 states and is more common than damage from tornadoes. Wind speeds can reach up to 100 mph and can produce a damage path extending for hundreds of miles.

### Heavy Rain

Heavy rain can lead to flooding even on dry soil and especially on impervious surfaces. In urban areas, direct runoff is relatively extensive, not only because of the density of roofs and impermeable pavements which allow less rain to infiltrate the ground, but also because storm-sewer systems carry more water directly to streams and lakes. The average annual rainfall in Solano County is about 28 inches. Most of the precipitation falls during the winter, and substantial snowfall is limited to higher elevations. Rainfall is often from storms that move in from the northwest. Virtually no rainfall occurs during the summer months.

### High Heat

Heat waves are periods of abnormally hot weather lasting days to weeks. The number of heat waves has been increasing in recent years across the United States and locally. Climate change will continue to cause extreme heat events more often. Studies show that, by the end of this century, the number of days with temperatures reaching 100°F or more is projected to increase dramatically as a result of climate change. What the public now considers to be an exceptional event could become routine across much of the country. As temperatures rise and extreme heat events become longer, more severe, and more frequent, experts expect to see more health problems and deaths caused by heat. (CDC, 2013)

Extreme heat events are defined by summertime weather that is substantially hotter and more humid than average for a given location at that time of year. (CDC, 2017) While there is no universal definition, the California Adaptation Tool calculated extreme as a day in a year when the daily maximum/minimum temperature exceeds the 98th historical percentile of daily maximum/minimum temperatures based on





observed historical data from 1961–1990 between April and October. (CalAdapt, 2021) For Solano County, CalAdapt reports 103.1 is the average threshold high heat temperature; however, the threshold for the area around Benicia is 97.3 degrees.

Heat kills by taxing the human body beyond its abilities. Among natural hazards, only the cold of winter—not lightning, hurricanes, tornados, floods, or earthquakes—takes a greater toll. (Ready.gov, 2021) In a normal year, about 600 Americans succumb to the demands of extreme heat. (CDC, 2021) In California, a record number of heat-related deaths occurred in 2006. That year, at least 140 deaths occurred between July 15 and August 1 and about 16,000 additional emergency room visits occurred due to a record-breaking heat wave. (California Office of Environmental Health Hazard Assessment, 2019)

#### **4.5.4.1 Plans, Policies, and Regulatory Environment**

There are very few formal regulations that pertain directly to extreme weather events. The California Building Code,<sup>8</sup> adopted by Solano County and the participating jurisdictions, is generally adequate to properly address development impacts from extreme weather events.

#### **4.5.4.2 Past Events**

Solano County extreme weather events include heavy rain, high wind, and high heat. Since 2000, the National Oceanic and Atmospheric Administration (NOAA) has recorded the following number of extreme weather events (noteworthy injuries, death, or property damage and year shown in parenthesis):

- 34 days with high/ strong wind events
  - \$7.4 million in damage on 1/4/2008
  - \$1 million on 12/30/2014
  - \$1 million on 2/27/2019
  - Since 2000, 3 reported deaths and 2 reported injuries
- 7 heavy rain events
  - \$7,000 property damage on 2/11/2000
- 25 days with high heat events
  - 30 injuries reported since 2000 with
  - 12 injuries on 6/13/2000
  - Note this number does not include the summer of 2021.

The USDA also issues disaster declaration for agriculture-related natural disaster events. The USDA has issued one excessive rain declaration for Solano County since 2012 (S4656) for damages associated with heavy rain events from 5/15/2019 – 5/30/2019. (United States Department of Agriculture, 2021) These declarations are issued by the Secretary of Agriculture and qualify producers in affected primary and

---

<sup>8</sup> Available at <https://www.dgs.ca.gov/BSC/Codes>.



contiguous counties to receive emergency (EM) loans as well as other emergency assistance programs.

While extreme cold does occur in Solano County, the Hazard Mitigation Planning Committee did not prioritize this subhazard as the vulnerabilities are minimal compared with other extreme weather hazard events and NOAA reports no property damage, injuries, or death.

#### 4.5.4.3 Location

Extreme weather events have the potential to happen anywhere in the planning area. Wind events are most damaging to areas that are heavily wooded. Heavy rain events can be more impactful in more populous areas with greater impervious surfaces. The following figures show average weather conditions for Solano County, including:

- Figure 4-55: Solano County - Average Annual Precipitation
- Figure 4-56: Annual Average Wind Speed (Power Class)
- Figure 4-57: 30-Year Normal Maximum Temperature for July

#### 4.5.4.4 Frequency and Probability of Future Events

Extreme weather events since the year 2000 have caused a total of \$8,007,000 worth of property damage in Solano County. Extreme weather events occur annually in Solano County to a varying degree, not always with property damage involved. **High Wind:** Figure 4-56 displays average annual wind speeds by power class in Solano County and Table 4-53 describes wind power classes. **Heavy Rain:** Even if overall precipitation does not significantly depart from average in the future, heavy rainfall events are predicted to increase with climate change. (United States Geological Survey, n.d.) **High Heat:** Figure 4-57 displays the 30-year normal maximum temperature for July in Solano County

Table 4-53: Classes of Wind Power Density at 10 m and 50 m<sup>a</sup>

Wind Power Class	10 m (33 ft) Wind Power Density (W/m <sup>2</sup> )	Speed <sup>b</sup> m/s (mph)	50 m (164 ft) Wind Power Density (W/m <sup>2</sup> )	Speed <sup>b</sup> m/s (mph)
1	0	0	0	
	100	4.4 (9.8)	200	5.6 (12.5)
2	150	5.1 (11.5)	300	6.4 (14.3)
3	200	5.6 (12.5)	400	7.0 (15.7)
4	250	6.0 (13.4)	500	7.5 (16.8)
5	300	6.4 (14.3)	600	8.0 (17.9)
6	400	7.0 (15.7)	800	8.8 (19.7)
7	1000	9.4 (21.1)	2000	11.9 (26.6)

<sup>a</sup> Vertical extrapolation of wind speed based on the 1/7 power law.

<sup>b</sup> Mean wind speed is based on Rayleigh speed distribution of equivalent mean wind power density. Wind speed is for standard sea-level conditions. To maintain the same power density, speed increases 3%/1000 m (5%/5000 ft) elevation.

Note: Each wind power class should span two power densities. For example, Wind Power Class = 3 represents the Wind Power Density range between 150 W/m<sup>2</sup>



and 200 W/m2. The offset cells in the first column attempt to illustrate this concept.

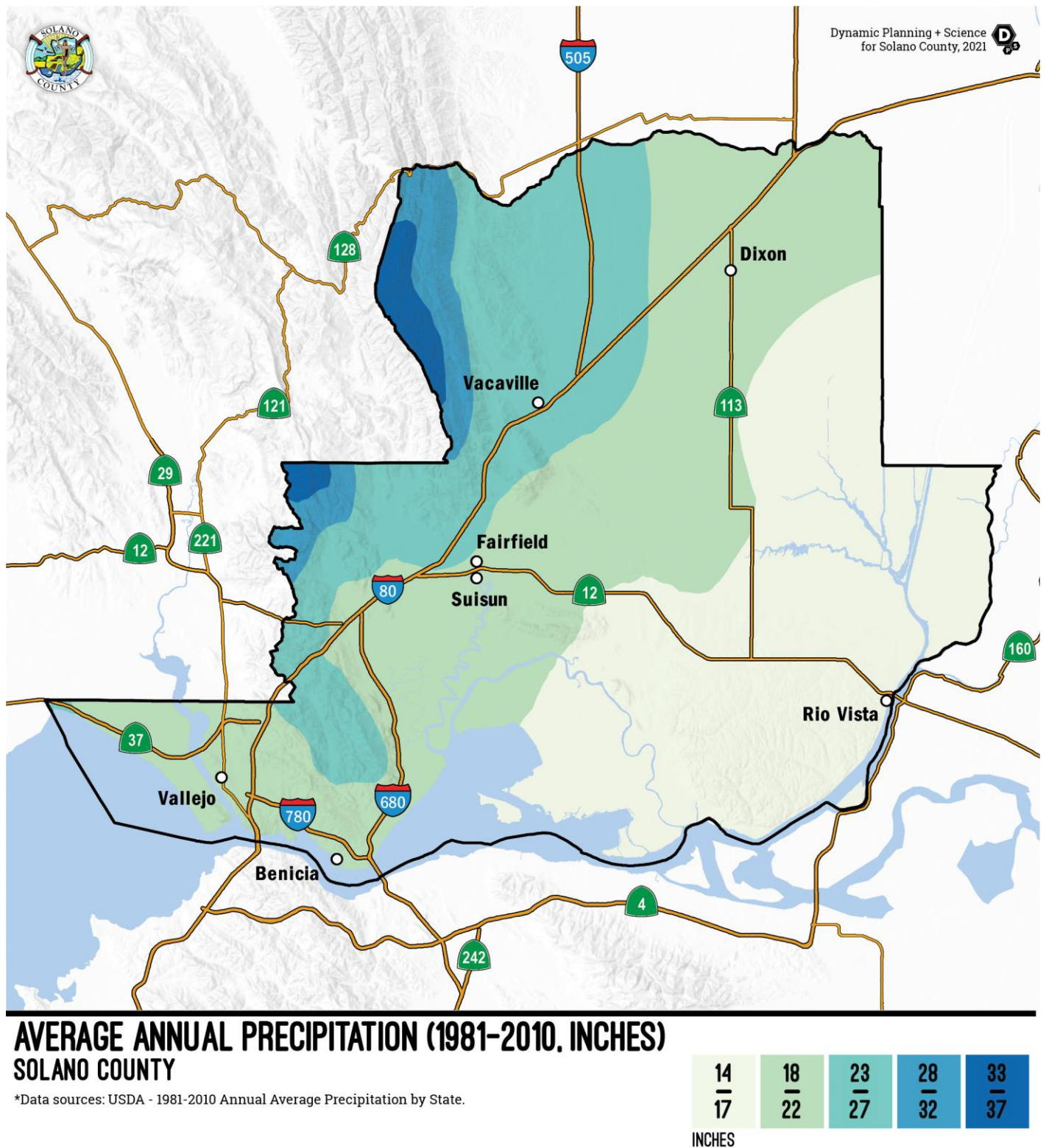


Figure 4-55: Solano County - Average Annual Precipitation



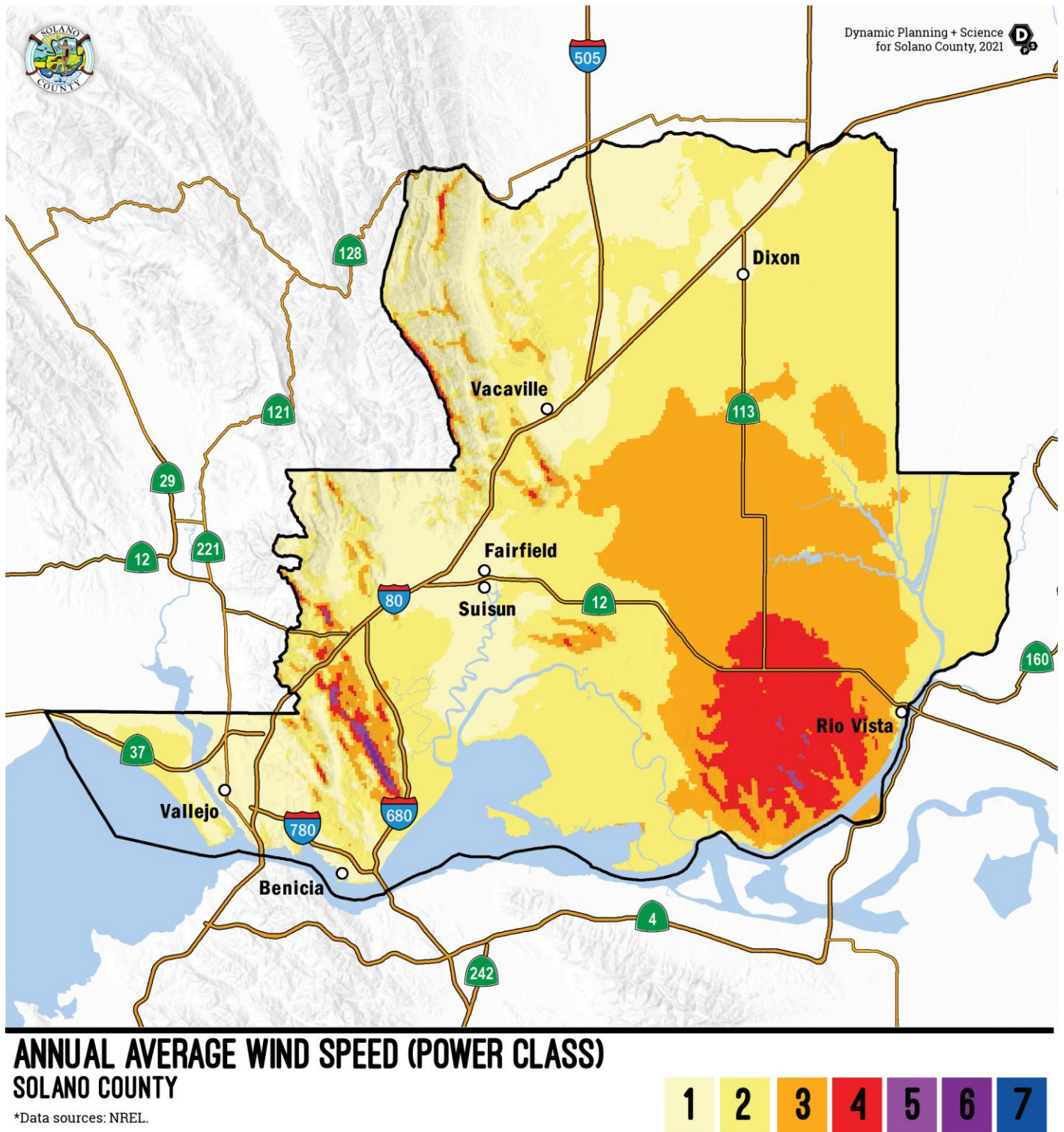


Figure 4-56: Annual Average Wind Speed (Power Class)

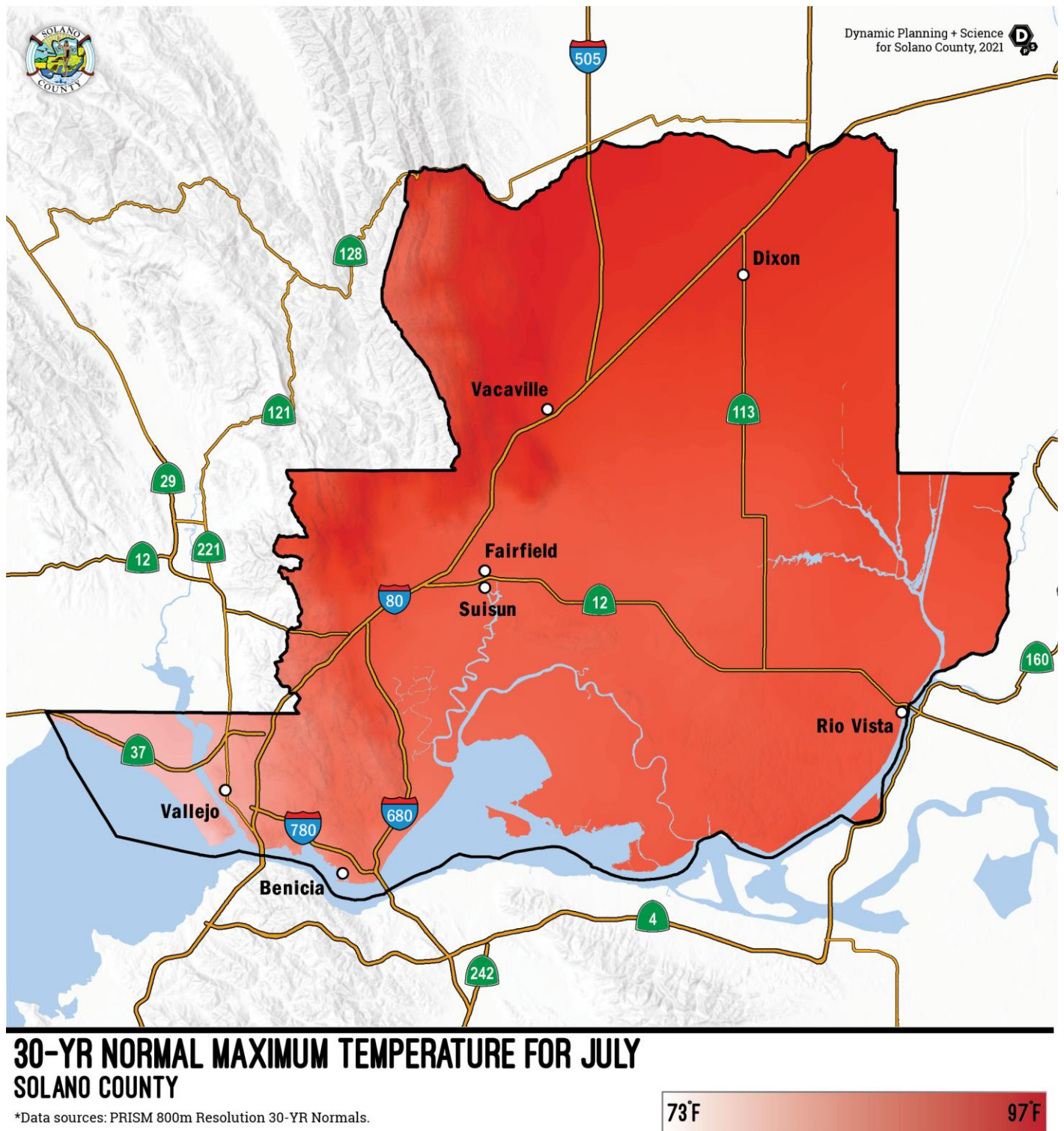


Figure 4-57: 30-Year Normal Maximum Temperature for July





#### 4.5.4.5 Severity and Extent

The most common problems associated with high wind and heavy rain are immobility and loss of utilities. Fatalities are uncommon but can occur. In heavy rain or high wind events, roads may become impassable due to flooding, downed trees, or a landslide. Power lines may be downed due to high winds, and services such as water or phone may not be able to operate without power.

**High Wind:** Windstorms can be a problem in the planning area and could cause damage to utilities. It is important to note that the predicted wind speed given in wind warnings issued by the National Weather Service is for a one-minute average; gusts may be 25 to 30 percent higher.

**Heavy Rain:** Heavy rain has been a problem in Solano County and could cause future damage to facilities and utilities in the planning area. From 2000 to 2020, heavy rain events caused the second highest dollar amount in property damages of extreme weather, resulting in property damages of \$70,000.

**High Heat:** High heat has been a problem in Solano County in the past and will likely cause future damage to facilities, utilities, and residents in the planning area. Climate change will exacerbate heat extremes within the county.

#### 4.5.4.6 Warning Time

**High Wind:** Meteorologists can often predict the likelihood of high winds with several days of warning time. However, meteorologists cannot predict the exact time of onset or severity of high winds. Some storms may come on more quickly and have only a few hours of warning time. A Red Flag Warning is issued when warm temperatures, very low humidity, and stronger winds are expected to combine in order to produce an increased risk of fire danger. (National Weather Service)

**Heavy Rain:** As with high winds, meteorologists can often predict the likelihood of a storm with heavy rains. This can give several days of warning time. However, meteorologists cannot predict the exact time of onset or severity of heavy rain, or the precise locations of heavy rainfall. Some storms may come on more quickly and have only a few hours of warning time.

**High Heat:** Meteorologists can often predict the likelihood of high heat weeks in advance by monitoring ocean temperatures and world-wide weather patterns. The Solano County Office of Emergency Services offers extreme heat emergency information on their webpage (<https://www.solanocounty.com/depts/oes/emergency.asp>), including links for obtaining information on extreme heat forecasts. Interested individuals can also sign up for emergency alerts from the same webpage.



#### 4.5.4.7 Secondary Hazards

**High Wind:** The most significant secondary hazards associated with high winds are falling and downed trees, downed power lines, and wildfire. High winds can cause damage to properties and destruction of roadways. Strong winds can magnify wildfires and increase the rate of fire spread.

**Heavy Rain:** The most significant secondary hazards associated with heavy rains are flooding, which also includes falling and downed trees, landslides, and downed power lines. Heavy rain can cause damage to properties and destruction of roadways. Landslides occur when the soil on slopes becomes oversaturated and fails. Landslides are further outlined as slope failure in Section 4.5.6, while flooding is analyzed in Section 4.5.2.

**High Heat:** High heat can dry out local vegetation, consequently contributing to an increase in vegetative fuels and wildfire risk.

#### 4.5.4.8 Climate Change

The effects of climate change are varied and include warmer and more diverse weather patterns, such as melting ice caps and poor air quality. As a result, climate change will likely worsen a number of natural hazards, including extreme weather. The likely effects of climate change on extreme weather are to create more frequent and prolonged periods of extreme heat. However, climate change will also result in unpredictable temperature fluctuations that could lead to freezing events during warmer months, potentially devastating the agricultural industry. (United States Environmental Protection Agency, 2016)

**High Wind:** Climate change is expected to increase the frequency and severity of high winds in portions of Solano County. (Ackerly, 2018)

**Heavy Rain:** The number of extreme precipitation events each year is expected to increase in Solano County under Representative Concentration Pathways (RCPs) 4.5 and 8.5, which are greenhouse gas emission scenarios. (Cal-Adapt, 2021)

**High Heat:** Currently, the average number of consecutive days of extreme heat in Solano County reaches between two and three days at a temperature of 100.2°F. Model projections for the longest stretch of consecutive extreme heat days per year (under an RCP 8.5 scenario and for a temperature at or above 100.2°F) in Solano County predict an average of 13 days per year during the years 2070 to 2099. (Cal-Adapt, 2021)



#### 4.5.4.9 Extreme Weather Vulnerability Analysis

##### 4.5.4.9.1 Population

The entire planning area is exposed to extreme weather events to some extent, including high wind, high rain, and high heat. Certain areas are more exposed due to geographic location and local weather patterns. Populations living at higher elevations with large stands of trees or overhead power lines may be more susceptible to wind damage and blackout.

Vulnerable populations, such as the elderly, low-income or linguistically isolated populations, or people with life-threatening illnesses, and residents living in rural areas may become isolated from major roads in extreme weather events. Power outages can be life-threatening to those dependent on electricity for life support systems, like oxygen. These populations face isolation and exposure during extreme weather events and could suffer more secondary effects of the hazard.

**High Wind:** High wind can impact the mobility of vulnerable populations, particularly the elderly and people with disabilities. Associated impacts from downed power infrastructure can also negatively impact these populations, many of whom rely on power for life support systems.

**Heavy Rain:** Heavy rain can pose a similar risk to vulnerable populations as high wind. In addition, heavy rain can limit mobility, decrease visibility, and isolate people who live more remotely.

**High Heat:** High heat can be dangerous for vulnerable populations and even fatal, especially for the elderly or very young children. Extreme heat is associated with cardiovascular and respiratory disorders, as well as heat stroke. End of century predictions for annual average maximum temperatures in Solano County depict an increase in temperature of 4.9°F and 7.9°F under RCP 4.5 and 8.5 scenarios, respectively. (Cal-Adapt, 2021)

##### 4.5.4.9.2 Property

All property is vulnerable during extreme weather events, but properties in poor condition or in particularly vulnerable locations may risk the most damage. Those located in higher elevations and on ridges may be more prone to wind damage and high rain. Property located under or near overhead power lines or near large trees may be vulnerable or may be damaged in the event of a collapse. Crops may be damaged by high wind, high heat, or heavy rain.

**High Wind:** High winds can cause significant property damage. Associated impacts to property include roofs being blown off, trees and branches falling onto property, fences being blown down, and damage to surrounding infrastructure.

**Heavy Rain:** Heavy rain can cause extensive property damage. It can flood properties and cause secondary impacts, such as waterlogged branches or trees falling onto property.

**High Heat:** High heat can cause property damages in some cases. High temperatures can cause roofs to expand and warp and can weaken the structural integrity of buildings.



#### 4.5.4.9.3 Critical Facilities and Infrastructure

All critical facilities are likely exposed to high wind, heavy rain, and high heat. Facilities on higher ground may also be more exposed to wind damage or damage from falling trees. The most common problem associated with extreme weather is the loss of utilities. Downed power lines can cause blackouts, leaving large areas isolated and phone, water, and sewer systems inoperable. Roads may become impassable due to flooding, downed trees, or landslides.

**High Wind:** High winds can knock down critical infrastructure, such as powerlines, which can prevent information communication systems from functioning sufficiently. Severe winds can also cause structural and non-structural damage to critical facilities.

**Heavy Rain:** Heavy rains, especially when accompanied by a windstorm, can cause water damage to critical facilities and compromise functionality.

**High Heat:** High heat can impact the performance of critical facilities, especially ones which provide emergency services such as hospitals. Hospitals rely on well-regulated air temperatures and may not have the capacity to deal with extreme temperatures. Additionally, high temperatures can cause materials like concrete and asphalt to expand. This can cause infrastructure, like sidewalks, to expand and buckle at points where two pieces of concrete or asphalt meet. (Federal Highway Administration, 2013)

#### 4.5.4.9.4 Lifelines

Loss of roads or power and communication lines are the primary transportation failures resulting from extreme weather and are mostly due to secondary hazards, such as floods, downed trees, landslides, and wildfire. Prolonged obstruction of major routes due to landslides, debris, or floodwaters can disrupt the shipment of goods and other commerce. Large, prolonged storms can have negative economic impacts on an entire region.

**High Wind:** Severe windstorms and downed trees can create serious impacts on power and above-ground communication lines. Loss of electricity and phone connection would leave certain populations isolated because residents would be unable to call for assistance. High winds can also cause significant damage to trees and power lines, blocking roads with debris, damaging transportation infrastructure, isolating populations, and disrupting ingress and egress routes.

**Heavy Rain:** Heavy rains can cause secondary hazards, such as landslides and floods, and they can cause trees to fall. These secondary hazards can compromise roads or power and communication lines.

**High Heat:** High heat can cause transmission lines to function less efficiently. The combination of an increase in demand and warmer air can cause the lines to swell and, consequently, compromise parts of the infrastructure. (US Department of Energy, 2019, p. 12)



#### 4.5.4.9.5 Future Trends in Development

All future development will be affected by severe storms. The ability to withstand impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction. Participating jurisdictions have adopted the California Building Code, which corresponds to the International Building Code, to meet California mandates. This code is equipped to deal with the impacts of extreme weather events, including high wind, heavy rain, and high heat. Land use policies identified in general plans within the planning area also address many of the secondary impacts of extreme weather, such as floods and landslides. With these tools, the participating jurisdictions are well equipped to deal with future growth and the associated impacts of extreme weather.

#### 4.5.4.9.6 Extreme Weather Hazard Problem Statements

As part of the mitigation action identification process, the Planning Committee for the county and for each jurisdiction identified issues and weaknesses, also called problem statements, for their respective facilities. Identification was based on the risk assessment and vulnerability analysis utilizing the RAMP mapping tool and extreme weather hazard data. Extreme weather problem statements for Solano County are listed in Table 4-54; problem statements for all other participating jurisdictions are accessed in Volume 2 of this plan.

Identifying these common issues and weaknesses assists the Planning Committee in understanding the realm of resources needed for mitigation. The goal is to have at least one mitigation action for every problem statement. See Table 5-6 for a full list of mitigation actions and the corresponding problem statements that they address. Each problem statement is coded with a problem number for cross-referencing between Table 4-54 and Table 5-6.

Table 4-54 Extreme weather Problem Statements

Problem No.	Hazard Type	Area of Concern	Mitigation Alternatives	Primary Agency	Problem Description	Related MA
ps-EW-SC-128	Extreme Weather	Impact	SP - Structural Projects	Solano County	Heavy rain events can create localized flooding around County facilities including County roads.	ma-FL-SC-19, ma-FL-SC-22, ma-FL-SC-29, ma-FL-SC-20
ps-EW-SC-129	Extreme Weather	Victim	PE&A - Public Education & Awareness, ES - Emergency Services	Solano County	High heat events disproportionately impact senior citizens and lower income residents who lack access to air conditioning.	ma-EW-SC-170, ma-EW-SC-171
ps-EW-SC-130	Extreme Weather	Threat	PPRO - Property Protection, PE&A - Public Education & Awareness, ES - Emergency Services	Solano County	High winds will exacerbate the threat and impact of wildfire.	ma-WF-SC-37, ma-WF-SC-34





Problem No.	Hazard Type	Area of Concern	Mitigation Alternatives	Primary Agency	Problem Description	Related MA
ps-EW-SC-131	Extreme Weather	Threat	PRV - Prevention , PPRO - Property Protection , PE&A - Public Education & Awareness , NRP - Natural Resource Protection , SP - Structural Projects	Solano County	High winds can increase the risk of older and weaker tree species breaking, posing a threat to people, roads, and bridges.	ma-EW-SC-172



## 4.5.5 Drought Hazard Profile

California's water resources have been stressed by periodic drought cycles and overuse in some places, creating the need for unprecedented state and local restrictions in water use. Climate change is expected to increase drought and extreme weather, including high heat. While the duration and severity of drought is always in question, it is certain that California and Solano County will continue to be impacted by drought. (California Drought Contingency Plan, 2010)



Drought has impacted almost every county in California at one time or another, causing more than \$2.6 million in damage. Droughts exceeding three years are relatively rare in northern California, the source of much of the state's water supply. The 1929 to 1934 drought established the criteria commonly used in designing storage capacity and yield for large northern California reservoirs. The driest single year in California's measured hydrologic history was 1977. (California Department of Water Resources, 2015)

Drought impacts in California are felt first by those most dependent on annual rainfall, including agencies fighting wildfires, ranchers engaged in dryland grazing, rural residents relying on wells in low-yield rock formations, or small water systems lacking a reliable water source. (*Id.*)

Most of California's precipitation comes from storms moving across the Pacific Ocean. The path followed by the storms is determined by the position of an atmospheric high-pressure belt that normally shifts southward during the winter, allowing low-pressure systems to move into the state. On average, 75 percent of California's annual precipitation occurs between November and March, with 50 percent occurring between December and February. If a persistent Pacific high-pressure zone takes hold over California mid-winter, the water year tends to be dry. (Western Regional Climate Center, 2020)

A typical water year produces about 100 inches of rainfall over the North Coast and 50 inches of precipitation (a combination of rain and snow) over the Northern Sierra compared to 18 inches in the Sacramento area and 15 inches in the Los Angeles area. In extremely dry years, these annual totals can fall to as little as one half or one third of these average amounts. (*Id.*)

### 4.5.5.1 Solano County Water Supplies

Solano County obtains its water supply from local surface water resources and groundwater, as well as imported water from the Solano Project and the State Water Project. Solano County has an array of surface water resources, such as creeks, drainages, sloughs, and marshes, and extensive infrastructure for delivering water for irrigation and municipal uses. Through the Solano Project, Putah Creek and Lake Berryessa provide the majority of the county's surface water for urban and agricultural consumption. The Sacramento, San Joaquin Delta, and the Cache Slough Complex also provide a significant urban and agricultural water supply source. The Suisun Marsh and other marshlands located along the Bay-Delta play an important role in maintaining and protecting water quality for human and natural communities. (Solano County General Plan, 2008)



Solano County uses groundwater for both municipal and agricultural water supply. The cities of Rio Vista and Dixon are served solely by groundwater, while the city of Vacaville obtains approximately a third of its municipal water supply from groundwater. A majority of the agricultural producers within the Solano Irrigation District, Maine Prairie Water District, and Reclamation District No. 2068 use surface water. Agricultural producers located outside the jurisdiction of districts that provide surface water rely exclusively on groundwater. Many rural residential landowners use individual shallow groundwater wells. A number of small rural residential water systems also provide groundwater to their customers. (*Id.*)

#### **4.5.5.2 Plans, Policies, and Regulatory Environment**

##### **California Sustainable Groundwater Management Act**

On September 16, 2014, Governor Brown signed into law a package of bills (SB1168, AB1739 and SB1319) collectively called the Sustainable Groundwater Management Act (SGMA). SGMA requires governments and water agencies of high and medium priority basins to halt overdraft and bring groundwater basins into balanced levels of pumping and recharge. Under SGMA, these basins should reach sustainability within 20 years of implementing the sustainability plans. For critically over-drafted basins, that date will be 2040. For the remaining high and medium priority basins, 2042 is the deadline.

##### **California Drought Contingency Plan**

The 2010 California Drought Contingency Plan was created to minimize drought impacts. The plan identifies strategies for improving agency coordination, enhancing monitoring and early warning capabilities, conducting water shortage impact assessments, and ensuring preparedness, response, and recovery programs. The plan uses an integrated regional approach in addressing drought, drought action levels, and appropriate agency responses as drought conditions change.

##### **Statewide Emergency Water Conservation Regulations**

In 2016, the State Water Resources Control Board (Water Board) adjusted emergency water conservation regulations in recognition of the differing water supply conditions and ongoing drought across the state to comply with an Executive Order from the California Governor declaring a drought emergency. Executive Order B-37-16 Making Water Conservation a California Way of Life updates temporary emergency water restrictions and transitions to permanent, long-term improvements in water use by:

- Providing for wiser water use,
- Eliminating water waste,
- Strengthening local drought resilience, and
- Improving agricultural water use efficiency and drought planning.

In April of 2017, a new Executive Order lifted the drought emergency but retained many of the conservation requirements. Most regulations are still in effect with the exception of water supply “stress test” requirements and conservation standards for urban water suppliers. The temporary restrictions established a baseline of the types of benefits that are possible from water conservation requirements. The Executive Orders are here. [waterboards.ca.gov/executive\\_orders](http://waterboards.ca.gov/executive_orders) (abbreviated link).



### **California Water Plan**

The California Water Plan presents strategic plan elements, including a vision, mission, goals, guiding principles, and recommendations for current water conditions, challenges, and activities. The plan includes future uncertainties and climate change impacts, scenarios for 2050, and a roadmap for improving data and analytical tools needed for integrated water management and sustainability. The California Water Plan was updated most recently in 2018. See: <https://water.ca.gov/Programs/California-Water-Plan>.

### **Urban Water Management Plans (UWMP)**

Jurisdictions either supplying over 3,000 acre-feet of water annually or serving more than 3,000 urban connections are required to submit an Urban Water Management Plan (UWMP) and update these plans every five years. Most jurisdictions participating in this MJHMP have UWMPs, which are explored in more detail in jurisdictional annex capabilities assessments in Volume 2. The Solano County Water Agency also voluntarily authors an UWMP for areas of the county served by Solano Project water.

UWMPs contain information on long-term water supply planning and managing demands in times of drought, and are important for drought hazard planning. UWMPs also explore stormwater capacity and assist in planning and funding future stormwater needs, further described in Section 4.5.2. (CDWR, 2021)

### **County-Wide Drought and Water Shortage Contingency Plans**

Drought can be particularly impactful to small, rural water systems or residents on individual wells. Urban water management and drought contingency planning are not required for these smaller systems. In the 2016 drought, this gap left these systems and residents unaware of how to react and opportunities for assistance during drought. A 2018 law, [AB 1668](#), directed the California Department of Water Resources to identify small suppliers and rural communities at risk of drought and water shortage vulnerability and to develop recommendations for improving drought contingency planning for those areas. (DWR, 2021)

Solano County does not currently have a county-wide drought and water shortage contingency plan; the County developed a mitigation action to initiate the first plan during the life of this iteration of the MJHMP.

### **Solano County General Plan**

The 2008 Solano County General Plan includes a number of policies in its public facilities and services element that encourage water conservation. These provisions ensure adequate water supplies by promoting water conservation through water-efficient landscaping, reuse of treated wastewater, rainwater harvesting, and water conserving appliances.

### **Solano Project Members' Agreement**

The Solano Project is a federal project maintained by the Bureau of Reclamation which stores water in Lake Berryessa for supply to water users throughout Solano County. The Solano Project Members' Agreement (Drought Agreement) was created to provide a phased response to drought among its members. When the water in Lake Berryessa falls below certain levels, the Drought Agreement mandates each party to reserve amounts of Solano Project water.



As lake levels return to normal, initial allocations are resumed. Members of the agreement include Solano Irrigation District, Maine Prairie Water District, Fairfield, Vacaville, Vallejo, and Suisun City.

#### **4.5.5.3 Past Events**

California experienced massive changes over the course of the twentieth century, as evidenced by dramatic population increases and land use conversion. (Cal. Dep't of Water Resources, 2015) The driest single year in California's measured hydrologic history is 1977. This drought period began in November 1975. It first drained the state's reservoirs, which then lead to widespread water shortages in 1977. Additionally, 1976 is on record as the fourth driest year for California. During this period 47 of the 58 California counties declared emergencies.

The most extreme drought conditions in Solano County's more recent history were experienced in 1991. This was part of a drought period that lasted for six years for much of California, from 1987 to 1992, and one of three significant statewide droughts during the 20th century. By the end of 1991, 23 counties had declared local drought emergencies. Other notable historic statewide droughts include the multi-year events of 1929 to 1934, 1976 to 1977, 2007 to 2009, and, most recently, 2012 to 2016. (Department of Water Resources, 2020)

With California facing water shortfalls in the driest year in recorded state history, California State Governor Jerry Brown declared a drought state of emergency on January 17, 2014. In the emergency declaration, Governor Brown directed state officials to assist farmers and communities that are economically impacted by dry conditions and to ensure the state can respond if Californians face drinking water shortages. The governor also directed state agencies to use less water and hire more firefighters and initiated a greatly expanded water conservation public awareness campaign. Figure 4-58 shows a drought-impacted lake bed in Lagoon Valley Park in Vacaville in 2015. On April 17, 2017, Brown issued Executive Order B-40-17, officially ending the drought state of emergency in all California counties except Fresno, Kings, Tulare, and Tuolumne. As is the case with some of California's other iconic droughts, the 2012 to 2016 drought came to an abrupt end after a significantly wet year in 2017.

The USDA also issues disaster declaration for agriculture-related natural disaster events. The USDA has declared 12 drought disaster declarations for Solano County since 2012. See Table 4-55). These declarations are issued by the Secretary of Agriculture and qualify producers in affected primary and contiguous counties to receive emergency (EM) loans as well as other emergency assistance programs. (United States Department of Agriculture, 2021) The declaration process is significantly expedited for severe drought which occurs during the growing season – that is, eight consecutive weeks of D2 drought intensity value, or any duration of D1 or D0 drought intensity as reported by the U.S. Drought Monitor.





Table 4-55: USDA Drought Disaster Declarations for Solano County, 2012 - 2021

Designation Number	Approval Date	Begin Date	End Date	Conditions Present	Fast Track?
S3379	9/5/2012	1/1/12	continuing	Drought	No
S3452	12/19/2012	1/1/12	continuing	Drought	No
S3569	8/21/2013	5/25/2013	8/19/2013	Drought, Wind, Wildfire, Heat, Insects	Yes
S3626	1/15/2014	1/1/2014	continuing	Drought, Wind, Wildfire, Heat, Insects	Yes
S3637	1/23/2014	1/14/2014	continuing	Drought, Wind, Wildfire, Heat, Insects	Yes
S3743	9/17/2014	1/1/2014	continuing	Drought	No
S3797	2/25/2014	1/1/2014	continuing	Drought	No
S3784	2/4/2015	1/1/2015	continuing	Drought, Wind, Wildfire, Heat, Insects	Yes
S3952	2/17/2016	1/1/2016	N/A	Drought, Wind, Wildfire, Heat, Insects	Yes
S4163	3/22/2017	10/1/2016	N/A	Drought	Yes
S4697	6/16/2020	4/21/2020	N/A	Drought	Yes
S4916	3/5/2021	10/1/2020	N/A	Drought	Yes

The National Drought Monitor provides drought data and maps nationally and on a localized, watershed scale. The National Drought Monitor is the product of 11 agencies, including the NDMC, NOAA and USDA, and is available at <http://droughtmonitor.unl.edu/>. The National Drought Monitor categorizes the level of drought from D0 through D4, with D4 being the highest "exceptional drought." Table 4-56 depicts drought classifications and impacts from the level of drought occurrence in California.



Figure 4-58: Dried Up Lake Bed at Lagoon Valley Park in Vacaville  
Source: Photo by Aaron Rosenblatt Daily Republic File

Figure 4-59 shows a time series of the level of drought in Solano County from 2000 to 2020 according to the National Drought Monitor, as well as the watersheds in Solano County. The National Drought Monitor also classifies drought on a watershed scale according to hydrologic units established by USGS. The participating jurisdiction annexes for those jurisdictions that prioritized drought hazards depict the past 20 years of droughts within applicable watersheds.



Table 4-56: Drought Classifications and Impacts for California

Category	Description	Possible Impacts
<b>D0</b>	<b>Abnormally Dry</b>	<ul style="list-style-type: none"> <li>Soil is dry; irrigation delivery begins early</li> <li>Dryland crop germination is stunted</li> <li>Active fire season begins</li> <li>Winter resort visitation is low; snowpack is minimal</li> </ul>
<b>D1</b>	<b>Moderate Drought</b>	<ul style="list-style-type: none"> <li>Dryland pasture growth is stunted; producers give supplemental feed to cattle</li> <li>Landscaping and gardens need irrigation earlier; wildlife patterns begin to change</li> <li>Stock ponds and creeks are lower than usual</li> </ul>
<b>D2</b>	<b>Severe Drought</b>	<ul style="list-style-type: none"> <li>Producers increase water efficiency methods and drought-resistant crops</li> <li>Grazing land inadequate</li> <li>Fire season is longer, with high burn intensity, dry fuels, and large fire spatial extent; more fire crews on staff</li> <li>Lake- and river-based tourism declines; boat ramps close</li> <li>Trees are stressed; plants increase reproductive mechanisms; wildlife diseases increase</li> <li>Water temperatures increase; programs to divert water to protect fish begin</li> <li>River flows decrease; reservoir levels are low and banks are exposed</li> </ul>
<b>D3</b>	<b>Extreme Drought</b>	<ul style="list-style-type: none"> <li>Federal water not adequate to meet irrigation contracts; extracting supplemental groundwater is expensive</li> <li>Fire season lasts year-round; fires occur in typically wet parts of the state; burn bans are implemented</li> <li>Ski and rafting business is low; mountain communities suffer</li> <li>Low water levels impede fish migration and cause lower survival rates</li> <li>Wildlife encroach on developed areas; little native food and water is available for bears, which hibernate less</li> <li>Water sanitation is a concern; reservoir levels drop significantly; surface water is nearly dry, flows are very low; water theft occurs</li> <li>Livestock need expensive supplemental feed, cattle and horses are sold; little pasture remains</li> <li>Well and aquifer levels decrease; homeowners drill new wells</li> </ul>
<b>D4</b>	<b>Exceptional Drought</b>	<ul style="list-style-type: none"> <li>Fire season is very costly; number of fires and areas burned are extensive</li> <li>Many recreational activities are affected</li> <li>Fields are left fallow; orchards are removed; vegetable yields are low; honey harvest is small; agricultural unemployment is high, food aid is needed</li> <li>Fish rescue and relocation begins; pine beetle infestation occurs; forest mortality is high; wetlands dry up; fewer wildflowers bloom; wildlife death is widespread; algae blooms appear</li> <li>Poor air quality affects health; greenhouse gas emissions increase as hydropower production decreases; West Nile outbreaks rise</li> <li>Water shortages are widespread; surface water is depleted; federal irrigation water deliveries are curtailed; water prices are extremely high; wells are dry, more and deeper wells are drilled; water quality is poor</li> </ul>

Source: Adapted from U.S. Drought Monitor Drought Classifications and Impacts via <https://droughtmonitor.unl.edu/DmData/StateImpacts.aspx>



## Drought Severity Timeline

## Solano County

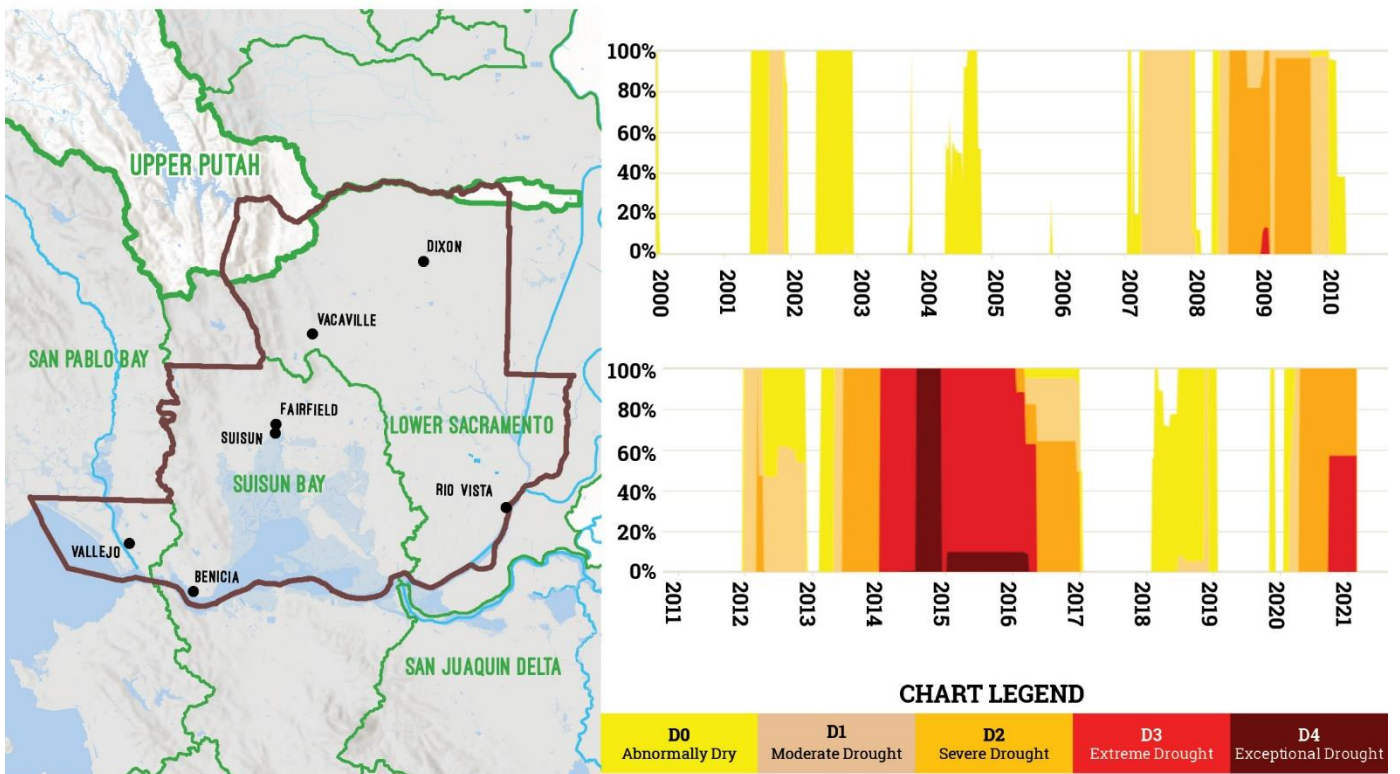


Figure 4-59: Solano County Drought Severity Timeline 2000-2021

### 4.5.5.4 Location

Drought is one of the few hazards with the potential to impact the entire population of Solano County directly or indirectly through water restrictions, higher water and food prices, reduced air and water quality, or restricted access to recreational areas. No portion of the county is immune from drought conditions.

Lack of winter snowfall in the mountains can eventually lead to agricultural impacts due to decreased stream flows. Reduced base flows may introduce additional challenges for communities that depend on direct drinking water supplies from rivers and tributaries. Droughts of just a few weeks during critical periods of plant development can have disastrous effects on agriculture production. Reduced reservoir storage from decreased runoff in the mountains can lead to water shortages. Droughts that occur in populated areas may not have direct effects on the residents but may increase the threat of wildfire in wildland urban interface areas.



#### **4.5.5.5 Frequency and Probability of Future Occurrences**

Predicting the precise probability of future drought depends on comprehensive and reliable data. Cal-Adapt, an authority on climate variance in California, projects an extended period of drought over a 20-year period. (Cal-Adapt, 2020) Empirical studies conducted over the past century have shown that meteorological drought is never the result of a single cause. It is the result of many causes, often synergistic in nature. These include global weather patterns that produce persistent, upper-level high-pressure systems along the West Coast with warm, dry air, resulting in less precipitation.

According to the results of the risk factor exercises for the participating jurisdictions, the probability of drought occurring in Solano County is highly likely (100 percent annual probability). Figure 4-59 provides a time series from the National Drought Monitor that shows Solano County has been in some form of drought for much of the period from 2000 to 2020.

#### **4.5.5.6 Severity and Extent**

The severity and extent of a drought depends on the degree of moisture deficiency, the duration, and the size and location of the affected area. The longer the duration of the drought and the larger the area impacted, the more severe the potential impacts. Droughts are not usually associated with direct impacts on people or property, but they can have significant impacts on agriculture, which can impact people indirectly.

Unlike most disasters, droughts normally occur slowly and last a long time. On average, the nationwide annual impacts of drought are greater than the impacts of any other natural hazard. They are estimated to be between \$6 billion and \$8 billion annually in the United States and occur primarily in the agriculture, transportation, recreation and tourism, forestry, and energy sectors. Social and environmental impacts are also significant, although it is difficult to put a precise cost on these impacts.

Drought eventually affects groundwater sources but generally not as quickly as surface water supplies; groundwater supplies often take longer to recover. Reduced precipitation during a drought means that groundwater supplies are not replenished at a normal rate. This can lead to a reduction in groundwater levels and problems, such as reduced pumping capacity or wells going dry. Shallow wells are more susceptible than deep wells. Reduced replenishment of groundwater affects streams. Much of the flow in streams comes from groundwater, especially during the summer when there is less precipitation and after snowmelt ends. Reduced groundwater levels mean that even less water will enter streams when stream flows are lowest.

A drought directly or indirectly impacts all people in affected areas. A drought can result in farmers not being able to plant crops or the failure of planted crops. This results in loss of work for farm workers and those in food processing and winemaking jobs. Other water-dependent industries are commonly forced to shut down all or a portion of their facilities, resulting in further layoffs. A drought can harm recreational companies that use water (e.g., swimming pools, water parks, and river rafting companies), as well as



landscape and nursery businesses because people will not invest in new plants if water is not available to sustain them.

Table 4-56 describes the impacts of the various severity levels of drought in California according to the National Drought Monitor classifications.

#### **4.5.5.7 Warning Time**

Droughts are climatic patterns that occur over long periods of time. Only generalized warnings can take place due to the numerous variables that scientists have not pieced together well enough to make accurate and precise predictions. Predicting drought depends on the ability to forecast precipitation and temperature. Anomalies of precipitation and temperature may last from several months to several decades. How long they last depends on interactions between the atmosphere and the oceans, soil moisture and land surface processes, topography, internal dynamics, and the accumulated influence of weather systems on a global scale. (National Institute of Water and Atmospheric Research, 2016)

#### **4.5.5.8 Secondary Hazards**

The secondary hazard most associated with drought is wildfire. A prolonged lack of precipitation dries out vegetation, which becomes increasingly susceptible to ignition as the duration of the drought extends. The Rush Fire and the Rough Fires are examples of how drought conditions, combined with increased fuel loads, can cause more frequent and intense wildfires. (Syphard, 2019)

#### **4.5.5.9 Climate Change Impacts**

The long-term effects of climate change on regional water resources are less known, but globally, water resources are already stressed from a growing population, poor water quality, groundwater overdrafts, and aging urban water infrastructure. Climate change will likely exacerbate many of these stresses.

With a warmer climate, droughts are projected to increase in severity, frequency, and duration. The associated costs from diminished water resources will also be significant. According to the University of California Davis Center for Watershed Sciences, water shortages in 2016 were projected to cost the agricultural industry a total of \$550 million in direct costs and 1,815 lost jobs. More frequent extreme events like droughts could end up being more cause for concern than the long-term change in temperature and precipitation averages. (University of California, Davis Center for Watershed Sciences, 2020) According to California's Fourth Climate Change Assessment, variances in precipitation trend toward shorter winters and prolonged dry seasons, in addition to increased frequency of drought, which could limit water supplies from more local sources. (Grantham, 2018)





#### **4.5.5.10 Drought Vulnerability Analysis**

All people, property, and environments in the county planning area would be exposed to the impacts of moderate to extreme drought conditions to some degree.

Drought produces a complex web of impacts that spans many sectors of the economy and reaches well beyond the area experiencing physical drought. This complexity exists because water is integral to the ability to produce goods and provide services. The drought vulnerability of an activity usually depends on its water demand, how the demand is met, and what water supplies are available to meet the demand. California's 2018 Water Plan indicates that water demand in the state will continue to increase.

##### **4.5.5.10.1 Population**

The residents of the county rely on healthy watersheds to provide adequate water for domestic and agricultural purposes. Solano County has experienced population growth and is projected to continue growing, with the city of Vallejo being one of the fastest-growing cities in the county. No significant life or health impacts are anticipated as a result of drought within the planning area, however, low-income populations may be disproportionately impacted by increased water shortages and mandatory water use cutbacks due to drought.

##### **4.5.5.10.2 Property**

During drought years, property owners with shallow wells can be impacted by drought with increased demand on groundwater resources. Surface water supplies are often lower, which can reduce available supplies and increase cost. This sometimes encourages growers who historically use surface water to switch to groundwater, which has an impact on those reliant on groundwater.

No structures will be directly affected by drought conditions, though some structures may become more vulnerable to wildfires, which are highly likely following years of drought. Droughts can also have significant impacts on landscapes, which could cause a financial burden to property owners, especially low-income populations who may not be able to afford to maintain their properties during water shortages. However, these impacts are not considered critical in planning for impacts from the drought hazard.

The agricultural sector is particularly susceptible to drought impacts. Agricultural drought impacts are normally felt earliest by those relying on unmanaged water supplies, such as entities carrying out dryland grazing and non-irrigated crop production, usually grain crops. Impacts on irrigated agriculture depend on the source and nature of the irrigation water supply, whether it be local groundwater, local surface water, or imported surface water, and any water rights or contractual provisions that may be associated with the source. The extent to which producers may mitigate water shortage impacts depends on multiple factors but is heavily influenced by economic considerations. Factors involved in making decisions about mitigating irrigation water shortages include availability and costs of pumping groundwater, price of alternative surface water sources, capital investments associated with maintaining permanent plantings, and status of international crop markets. (California Drought Contingency Plan, 2010)



#### **4.5.5.10.3 Critical Facilities**

Critical facilities, as defined for this plan, will continue to be operational during a drought. Critical facility elements, such as landscaping, may not be maintained due to limited resources, but the risk to the planning area's critical facilities will be largely aesthetic. For example, when water conservation measures are in place, landscaped areas will not be watered and may die. These aesthetic impacts are not considered significant.

#### **4.5.5.11 Future Trends in Development**

The county will face challenges in providing sufficient water supplies in the future due to climate change effects, coupled with an increasing population, mostly in the incorporated areas, and increasing water demand. While Solano County has already taken steps toward achieving long-term groundwater sustainability, there is still a possibility that water supply availability may change in the future and will need to be further addressed.

The Solano Resource Conservation District exists to inform and educate the public and water community about water and land issues in Solano County. They are a resource for information on water issues in the county and provide tips for water conservation. The Solano County Water Agency also offers a water-efficient landscape rebate program. Water customers are incentivized to replace their lawns with water efficient landscaping and receive \$1 per square foot rebate, up to a \$1,000 maximum.

Each participating jurisdiction has an established general plan that includes policies directing land use and dealing with issues of water supply and the protection of water resources. These plans provide the capability at the local level to protect future development from the impacts of drought. All participating jurisdictions reviewed their general plans as part of their hazard mitigation capability assessments. Deficiencies identified by these reviews can be identified as mitigation actions to increase jurisdictions' capabilities to deal with future trends in development.

#### **4.5.5.12 Drought Hazard Problem Statements**

As part of the mitigation action identification process, the Planning Committee for the county and for each jurisdiction identified issues and weaknesses, also called problem statements, for their respective facilities. Identification was based on the risk assessment and vulnerability analysis utilizing the RAMP mapping tool and drought hazard data. Drought hazard problem statements for the county are listed in Table 4-57; problem statements for all other participating jurisdictions are accessed in Volume 2 of this plan.

Identifying these common issues and weaknesses assists the Planning Committee to understand the realm of resources needed for mitigation. The goal is to have at least one mitigation action for every problem statement. See Table 5-6 for a full list of mitigation actions and corresponding problem statements that they address. Each problem statement is coded with a problem number for cross-referencing between Table 4-57 and Table 5-6.



Table 4-57: Drought Problem Statements

Problem No.	Hazard Type	Area of Concern	Mitigation Alternatives	Primary Agency	Problem Description	Related MA
ps-DR-SC-126	Drought	Threat	PRV - Prevention , NRP - Natural Resource Protection	Solano County	County buildings and facilities have irrigated landscaping including turf grass.	ma-DR-SC-162
ps-DR-SC-127	Drought	Threat	PRV - Prevention , NRP - Natural Resource Protection	Solano County	There is an opportunity to update the County's land use code to include incentives for new development to implement drought tolerant landscaping that requires less water.	ma-DR-SC-163
ps-DR-SC-179	Drought	Victim	PRV - Prevention , PE&A - Public Education & Awareness	Solano County	Residents who rely on groundwater and small water systems may be extraordinarily impacted by future drought.	ma-DR-SC-201,



## 4.5.6 Slope Failure Hazard Profile

Landslide, mudflow, debris flow, and rockfall, collectively known as slope failure, may cause damage across the county. These types of slope failure are addressed as one collective slope failure hazard in this profile, as the vulnerability assessment and mitigation strategies are similar among all types of slope failure.



Slope failures rarely present a threat to human life, but often result in a disruption of everyday services, including emergency response capabilities. Landslides can block transportation routes, dam creeks and drainages, and contaminate water supplies. When these hazards affect transportation routes, they are frequently expensive to clean-up and can have significant economic impacts on the county. (United States Geological Survey, 2004)

The four most common types of slope failure (landslide, mudflow and debris flow, rockfall, and alluvial fans) are briefly described below.

### Landslide

The many types of landslides are categorized based on form and type of movement. They range from slow-moving rotational slumps and earth flows, which can distress structures over time but are less threatening to personal safety, to fast-moving rock avalanches and debris flows that are a serious threat to structures and have been responsible for most fatalities during landslide events. Many large landslides are complex and a combination of more than one landslide type. (United States Geological Survey, n.d.)

### Mudflow and Debris Flow

When slope material becomes saturated with water, a debris flow may develop. Debris flows can also occur from horizontal seismic inertia forces induced in a slope from ground shaking. From a geologic perspective, there are generally two types of debris flows: debris flows related to shallow landslides and post-wildfire debris flows. (United States Geological Survey, 2005)

Debris flows related to shallow landslides occur on hillslopes due to soil failure in which soil liquefies and runs downhill. This type of debris flow generally results from a shallow landslide (less than 10 to 15 feet deep) and has a discrete initiation zone and depositional area. Shallow landslides tend to occur in winter but are most likely after prolonged periods of heavy rainfall when soil materials are saturated. Debris flows are typically more dangerous because they are fast-moving, causing both property damage and loss of life. (*Id.*)

**Post-wildfire debris flows** are a result of post-fire conditions, where burned soil surfaces enhance rainfall runoff that concentrates in a channel and picks up debris as it moves. The post-fire debris flow has a less discrete initiation zone but is similar to a debris flow derived from hillslopes in that it may result in inundation and a detrimental impact on lives and property within its zone of runout and deposition. It can also result in downstream flooding. (*Id.*)



## **Rockfall**

Rockfall is the falling of a newly detached mass of rock from a cliff or rock outcrop, or a loose rock that erodes out of unconsolidated debris on a hillside and rolls or falls down a very steep slope. Over-steepened slopes, like those along roadcuts or in glaciated terrain, are susceptible to rockfall due to the steep slopes that are not highly vegetated or benched, which help attenuate rockfall. Rock outcrops that are highly fractured or undercut by weaker rock layers are also susceptible to rockfall. (CGS, 2020)

## **Alluvial Fan**

Alluvial fans consist of sediment deposits leftover from a flood event. The sediment is carried by a flood and distributed in a fan-like shape. Alluvial fans represent a high risk of natural hazards in the form of debris flows as the deposited soil remains unstable after the flood event. Alluvial fan channels are located on footslope landforms in the transition space between valley floodplains and steep mountain slopes and are preceded by high-gradient, contained channels. Coarse material deposits are formed by the rapid change in transport capacity as the high energy mountain slope streams spill onto the valley floor. Riparian areas resemble the shape of the landform, which is narrow at the apex and broader at the bottom where the fan widens. (United States Department of Agriculture)

### **4.5.6.1 Plans, Policies, and Regulatory Environment**

#### **Solano County General Plan**

The 2008 Solano County General Plan includes a number of policies in the Health and Safety Element which are meant to aid in mitigating for slope failure. These policies require new development in areas with known slope instability to consider risks in their plans and mitigate against these risks by making soil information readily available, minimizing development in these areas, and adapting structural designs to local soil conditions.

#### **Design Guidelines for Site Grading in Solano County Code, § 26-73.1**

The Solano County Code discusses the regulation of site grading requirements for subdivisions. The guidelines include, but are not limited to, a requirement that building pads be situated on slopes not exceeding a 25 percent grade, as well as instructions to avoid grading in order to achieve flat areas atop ridge lines and knolls.

#### **General Design Principles and Standards in Solano County Code, § 31-30**

The Solano County Code includes design principles and standards for grading, drainage, land leveling, and erosion control. Its design principles and standards require finished slopes, for both cut and fill, to not be steeper than a ratio of two horizontal feet to one vertical foot (2:1) unless a thorough geological and engineering analysis finds that steeper slopes are stable. Appropriate erosion control measures are also specified.





#### 4.5.6.2 Past Events

The majority of landslides in the unincorporated areas of Solano County have happened during the late fall and early spring seasons. Landslides are typically caused by severe weather events in the county. There have been no federally-declared landslide events in Solano County. During the fall through spring rainy seasons of 1968 to 1969, 1972 to 1973, 1981 to 1982, and 1997 to 1998, landslides were widespread throughout the county. Between 1968 to 2007, 51 recorded historical damaging landslide events occurred in Solano County. Additionally in 2006, a mudslide event occurred in the county affecting Clayton Road, Gibson Canyon, and Lynch Canyon. (Solano HMP, 2014)

#### 4.5.6.3 Location

The best available predictor of where slope failure might occur is the location of past movements. Past landslides can be recognized by their distinctive topographic shapes, which can remain in place for thousands of years. Most landslides recognizable in this fashion range from a few acres to several square miles. Most show no evidence of recent movement and are not currently active. A small proportion of them may become active in any given year, with movements concentrated within all or part of the landslide masses or around the periphery.

Recognizing ancient dormant mass movement sites is important to identify current areas susceptible to flows and slides because they can be reactivated by earthquakes or by exceptionally wet weather. Those ancient scars also consist of broken materials, frequently involve disruption of groundwater flow, and are vulnerable to construction-triggered sliding.

Solano County will be at increased risk from future landslides and debris flows due to recent large wildfires in the hilly northwestern portions of unincorporated Solano County. Debris flows in these areas are projected to occur at a degree of probability ranging from 60 to 100 percent in certain basins. (Watershed Emergency Response Team, 2020)

Figure 4-60 shows low, moderate, and high landslide risk exposure. The map depicts a general characteristic of higher risk throughout the county. This map should be used with caution, as site-specific conditions can make some locations in low to moderate instability areas highly unstable and some high instability locations more stable. Geotechnical investigation is often required to determine the stability of a given site.

#### 4.5.6.4 Frequency and Probability of Future Occurrences

Slope failures are most frequently triggered in periods of high rainfall. The hazard is greatest in areas with steep slopes, although landslides may occur on slopes of 15 percent or less under certain conditions. Slope steepness and underlying soils are the most important factors affecting the landslide hazard. However, surface and subsurface drainage patterns also have an affect, and vegetation removal can increase the likelihood of a landslide. (United States Geological Survey, 2004)



Slope failures are often triggered by other natural hazards, such as earthquakes, heavy rain, floods, or wildfires. Consequently, landslide frequency is often related to the frequency of these other hazards. The probability of slope failure occurring in Solano County is likely, between a 10 and 100 percent annual probability.

#### **4.5.6.5 Severity and Extent**

The severity of landslide problems depends upon the local bedrock and soil conditions, including moisture content, slope, and vegetation. Small landslides are common in the mountain areas of the county as loose material moves naturally down slope or fires cause loss of soil-stabilizing vegetative cover. In addition, many human activities tend to make earth material less stable and, thus, increase the chance of slope failure. Some of the natural non-seismic causes of ground instability are lakeshore erosion, heavy rainfall, and poor-quality natural materials (e.g., gravel or sand). Human activities contribute to soil instability through grading of steep slopes, overloading them with artificial fill, extensive irrigation, construction of impermeable surfaces, excessive groundwater withdrawal, and removal of stabilizing vegetation. (USGS, 2020)

#### **4.5.6.6 Warning Time**

Some geologic hazards occur slowly but can have significant property or health consequences, like erosion and some forms of slope movement or land sliding. The identification of those hazards generally takes site-specific analysis to determine if the soils and geology are susceptible to these hazards and what mitigation is most relevant and prudent. For these types of hazards, warning time is long.

For other hazards, such as debris flows, rockfalls, and landslides, warning time is often short and may not occur at all. Identifying areas where these events are known to have occurred or which have ideal characteristics for these hazards to occur could help with hazard preparedness when triggering-type events like intense rainfall occur. This identification will not increase the warning time, but it will make proactive response and mitigation to potential triggering events more effective. (Manconi, 2016)

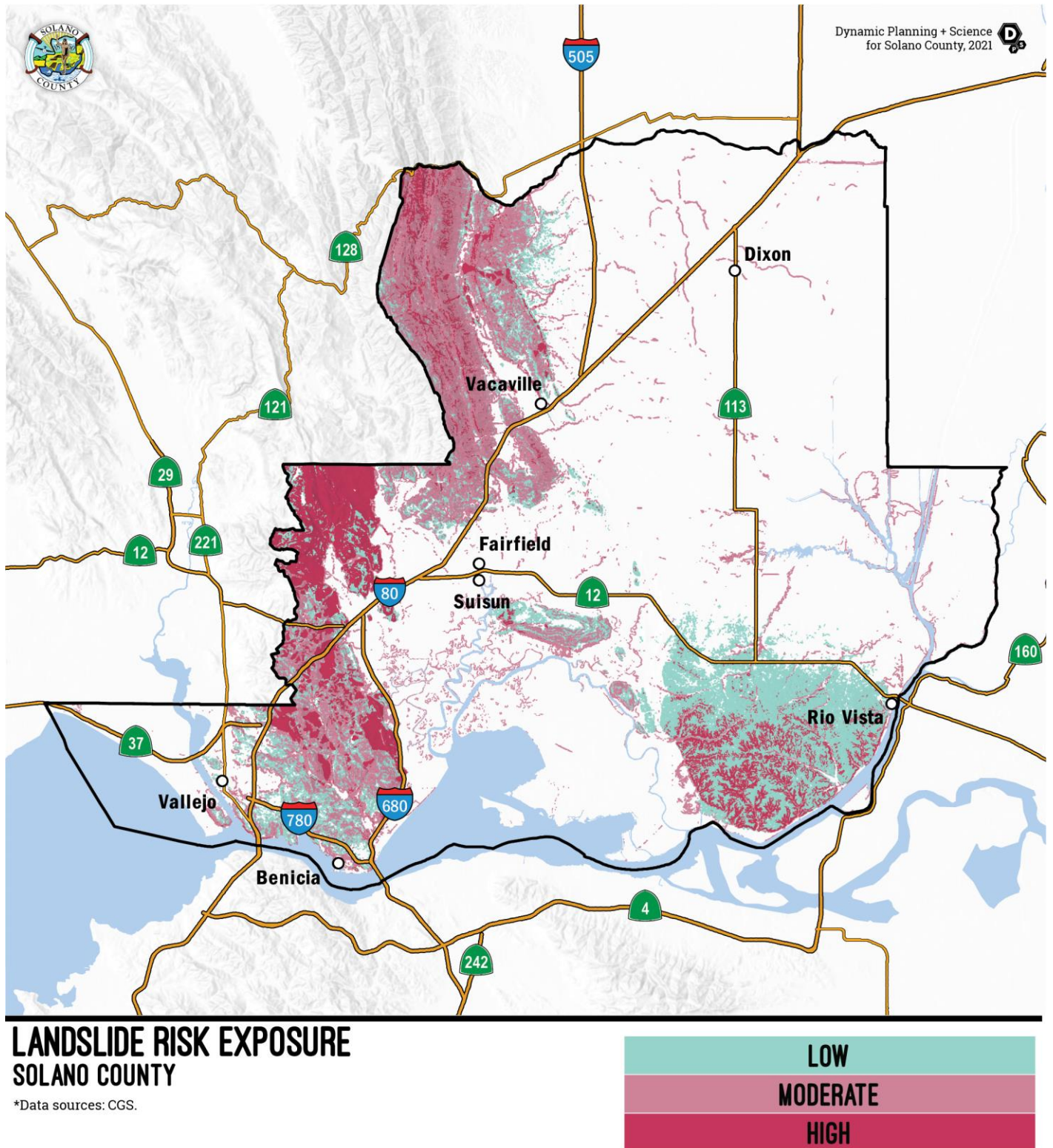


Figure 4-60: Landslide Risk Exposure



#### 4.5.6.7 Secondary Hazards

There are some hazards that can trigger or exacerbate slope failure. Flooding, for example, can erode and undercut the toe of a slope, removing the support for that slope and causing a landslide or rockfall. Wildfires create an immediate hazard of their own and create long-term impacts by altering the soil structure, impeding its ability to absorb moisture, and destroying vegetation that binds the soil with roots and absorbs rainfall and runoff with foliage. Post wildfire, even small rainfall events can create devastating mudflows, debris flows, or landslides. Areas that are mapped currently as low to moderate risk of these hazards may have high risk after a wildfire.

#### 4.5.6.8 Slope Failure Vulnerability Assessment

Figure 4-61 displays the Snapshot Map of slope failure susceptibility for population and infrastructure in Solano County. This section discusses exposure to this vulnerability.

##### 4.5.6.8.1 Population

An estimated 7,126 persons, or approximately 36 percent of the county population, are exposed to slope failure areas, as shown in Table 4-58. Population estimates within slope failure areas were generated by analyzing County Assessor and parcel data that intersect with landslide hazard areas identified by California Geological Survey. U.S. Census Bureau information was then used to intersect slope failure hazards with an estimate of the population using GIS, calculated by weighting the population within each census block and track with the percentage of slope hazard areas.

Table 4-58: Population Exposure to Landslide Susceptibility

		Total Population
Unincorporated County		19,665

Landslide Susceptibility	Population Count	% of Total
High	1,767	8.98%
Moderate	3,261	16.58%
Low	2,098	10.67%
<b>Total</b>	<b>7,126</b>	<b>36.23%</b>





## LANDSLIDE RISK EXPOSURE

SOLANO COUNTY

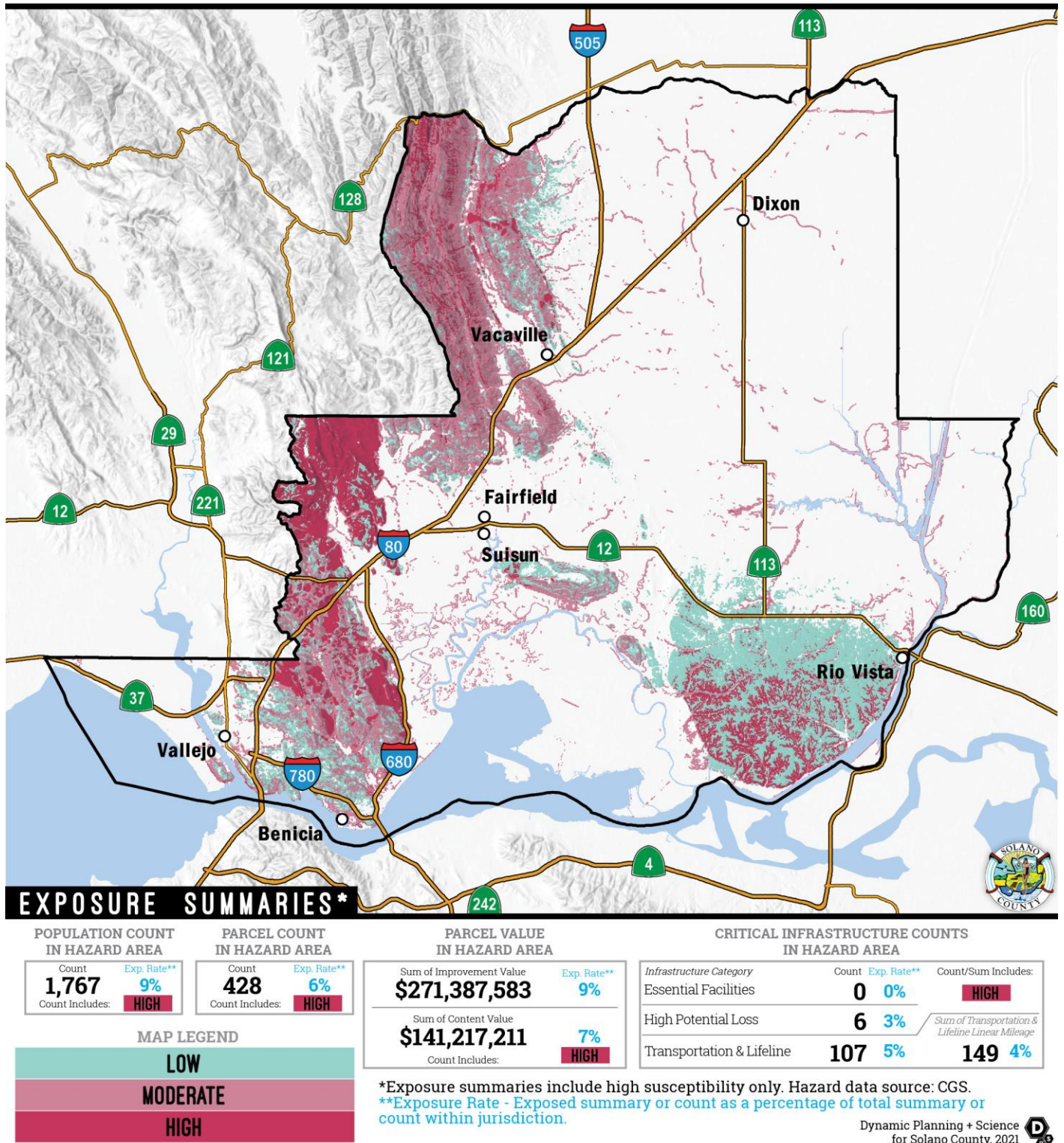


Figure 4-61: Landslide Risk Exposure Snapshot





#### 4.5.6.8.2 Property

Table 4-59 shows the number of parcels, market value exposure, and content value exposure in the steep-slope risk areas. The predominant zoning classes within these areas are single-family, vacant, and manufactured homes. Low-income housing may be located in areas at higher risk of slope failure, which may disproportionately impact low-income property owners who cannot afford areas at lesser risk.

Table 4-59: Property Value Exposed to Landslides

	Total Parcels	Total Market Value (\$)	Total Content Value (\$)	Total Value (\$)
Unincorporated County	6,668	\$3,186,640,275	\$2,078,097,240	\$5,264,737,515

Landslide Susceptibility	Parcel Count	% of Total	Market Value Exposure (\$)	Content Value Exposure (\$)	Total Exposure (\$)	% of Total
Low	775	11.6%	\$386,667,089	\$212,333,302	\$599,000,391	11.4%
Moderate	978	14.7%	\$462,229,899	\$248,587,504	\$710,817,403	13.5%
High	428	6.4%	\$271,387,583	\$141,217,211	\$412,604,794	7.8%
<b>Total</b>	<b>2,181</b>	<b>32.7%</b>	<b>\$1,120,284,571</b>	<b>\$602,138,017</b>	<b>\$1,722,422,589</b>	<b>32.7%</b>

#### 4.5.6.8.3 Critical Facilities and Infrastructure

Several types of infrastructure are exposed to mass movements, including transportation, water, sewer, and power infrastructure. At this time, all infrastructure and transportation corridors identified as exposed to the slope failure hazard are considered vulnerable until more information becomes available. Table 4-60 and Table 4-61 summarize the critical facilities exposed to the slope failure hazard.

Table 4-60: Critical Facility Points with Slope Failure Hazard Risk (Unincorporated County)

##### Critical Infrastructure - Landslide Susceptibility

Infrastructure Type	High	Moderate	Low
<b>Essential Facility</b>	-	3	4
EOC	-	-	-
Law Enforcement	-	-	-
Fire Station	-	3	4
Emergency Services	-	-	-
Hospital	-	-	-
<b>High Potential Loss</b>	6	25	6
Dam	4	3	-
Historic Building	-	1	1
Library	-	-	-
School	-	1	-
Historic Site	-	-	-



### Critical Infrastructure - Landslide Susceptibility

Infrastructure Type	High	Moderate	Low
Community Center	-	-	-
Jurisdiction Real Property Asset*	-	-	-
Park	-	2	-
Wastewater Treatment Facility	-	-	-
Emergency Shelter	-	1	-
Administrative	-	-	-
Child Care Facility	-	1	-
Healthcare Facility	-	-	-
Senior Center	-	-	-
County Real Property Asset*	2	16	5
Early Learning	-	-	-
<b>Transportation and Lifeline</b>	<b>107</b>	<b>171</b>	<b>1157</b>
Airport	-	-	-
Bridge	2	63	1
Power Plant	1	-	11
Substation	-	2	7
Bus Facility	-	-	-
NG Station	-	2	14
Bus Stop	-	1	-
Railway Bridge	-	-	1
Cell Tower	5	-	9
Breakout Tank	-	-	-
Oil Facility	-	-	-
Transmission Line Tower	79	103	245
Wind Turbine	20	-	869
Ferry	-	-	-
Amtrak Station	-	-	-
Train Station	-	-	-
<b>Hazmat</b>	<b>2</b>	<b>7</b>	<b>23</b>
Hazmat	2	7	23
Hazardous Waste facility	-	-	1
<b>Grand Total</b>	<b>115</b>	<b>206</b>	<b>1190</b>

*\*Note: Real Property Assets are digitized insurance rolls for demonstrating value and ownership and may have overlapping points with other categories such as fire stations and law enforcement.*



Table 4-61: Critical Facilities (Linear) with Slope Failure Hazard Risk (Unincorporated County)

Lifelines (miles) - Landslide Susceptibility

Infrastructure Type (Linear)	High	Moderate	Low
Bus Route	5.6	15.9	3.5
Levee (FEMA)	1.0	104.4	1.3
Levee Flood Wall	-	-	-
Levee Cross Section	-	0.3	-
NG Pipeline	9.3	14.2	61.1
Railroad	0.8	7.3	0.7
Street	106.0	397.0	338.7
<i>4WD trail</i>	1.9	4.1	3.4
<i>Alley</i>	-	-	-
<i>Cul-de-sac</i>	0.1	0.1	0.2
<i>Driveway</i>	15.1	40.3	93.8
<i>Ferry</i>	-	0.0	-
<i>Interstate</i>	3.8	12.7	2.2
<i>Local road</i>	54.6	228.0	154.0
<i>Local road, major</i>	25.6	70.1	58.0
<i>Primary highway</i>	-	-	-
<i>Ramp</i>	0.1	4.0	0.4
<i>Service road</i>	-	0.1	0.3
<i>State/county highway</i>	4.7	35.8	25.2
<i>Traffic circle</i>	-	0.0	0.0
<i>Walkway</i>	0.1	1.7	1.3
Transmission Line	26.6	37.5	55.6
<b>Grand Total</b>	<b>149.3</b>	<b>576.7</b>	<b>460.8</b>

#### 4.5.6.8.4 Lifelines

A significant amount of linear infrastructure (or lifelines) can be exposed to slope failure and mass movements:

- **Roads:** Access to major roads is crucial to life-safety, response, and recovery operations after a disaster event. Slope failures can block egress and ingress on roads, causing isolation for neighborhoods, traffic problems, and delays for public and private transportation. This can result in economic losses for businesses.
- **Bridges:** Slope failures can significantly impact bridges, by knocking out bridge abutments or significantly weaken the soil supporting them.
- **Power Lines:** Power lines are generally elevated above steep slopes, but the towers supporting them can be subject to slope failures. A landslide could trigger the failure of the soil underneath a tower, causing it to collapse and rip down the lines. Power and communication failures then create problems for vulnerable populations and businesses.

#### 4.5.6.9 Future Trends in Development

Solano County is equipped to handle future growth within landslide hazard areas. The 2008 Solano County General Plan addresses development in areas susceptible to slope failure, and the County Code implements the grading ordinance and other protective measures.

Following the 2020 Hennessey Fire, part of the larger LNU Lightning Complex, areas of the county are more vulnerable to increased runoff and post-fire rockfalls and debris flows. The Middle and Lower Putah Creek



Figure 4-62: Landslide Prevention Post-Wildfire  
Source: *The San Francisco Gate*

and Ulatis Creek-Alamo Creek watersheds are particularly vulnerable. Much of the threat from debris flows exists in areas already in high or medium landslide susceptibility, and the County will focus mitigation on those high priority areas. Figure 4-62 depicts landslide prevention measures that are being enacted in areas which have recently been impacted by wildfires.



#### 4.5.6.10 Slope Failure Hazard Problem Statements

As part of the mitigation action identification process, the Planning Committee for the county and for each jurisdiction identified issues and weaknesses, also called problem statements, for their respective facilities. Identification was based on the risk assessment and vulnerability analysis utilizing the RAMP mapping tool and slope failure hazard data. Slope failure hazard problem statements for the county are listed in Table 4-62; problem statements for all other participating jurisdictions are accessed in Volume 2 of this plan.

Identifying these common issues and weaknesses assists the Planning Committee in understand the realm of resources needed for mitigation. The goal is to have at least one mitigation action for every problem statement. See Table 5-6 for a full list of mitigation actions and corresponding problem statements that they address. Each problem statement is coded with a problem number for cross-referencing between Table 4-62 and Table 5-6.

Table 4-62 Slope Failure Problem Statements

Problem No.	Hazard Type	Area of Concern	Mitigation Alternatives	Primary Agency	Problem Description	Related MA
ps-SF-SC-132	Slope Failure	Impact	SP - Structural Projects	Solano County	There are 5 County bridges located in a high landslide risk area.	ma-SF-SC-175
ps-SF-SC-133	Slope Failure	Victim	PPRO - Property Protection , PE&A - Public Education & Awareness , SP - Structural Projects	Solano County	There are approximately 1,641 people in the Unicorp. County living in a high landslide risk area.	ma-AH-SC-5, ma-AH-SC-9, ma-AH-SC-7
ps-SF-SC-134	Slope Failure	Victim	PPRO - Property Protection , PE&A - Public Education & Awareness , SP - Structural Projects	Solano County	There are 2 child-care facilities located in high landslide risk area in the Unincorporated County.	ma-AH-SC-14, ma-SF-SC-176
ps-SF-SC-135	Slope Failure	Threat	PRV - Prevention , PPRO - Property Protection , PE&A - Public Education & Awareness , SP - Structural Projects	Solano County	The 2020 LNU lightning complex fire has created new areas that are susceptible to slope failure. Further investigation is needed.	ma-SF-SC-177



## 4.5.7 Climate Change Hazard Profile

Climate change refers to any distinct change in measures of climate lasting for a long period of time, more specifically major changes in temperature, rainfall, snow, or wind patterns. Climate change may be limited to a specific region or may occur across the whole Earth. Climate change may result from:



- Natural factors, such as changes in the sun's energy or slow changes in the Earth's orbit around the sun;
- Natural processes within the climate system, such as changes in ocean circulation; or
- Human activities that change the atmosphere's make-up and the land surface, such as burning fossil fuels, cutting down forests, planting trees, or building developments in cities and suburbs.

Changes in extreme weather and climate events, like heatwaves and droughts, are the primary way that most people experience climate change. Human-induced climate change has already increased the number and strength of these extreme events. Over the last 50 years, much of the United States has seen increases in prolonged periods of excessively high temperatures, heavy downpours, severe floods, and droughts. (United States Environmental Protection Agency, 2021)

The effects of climate change are varied and include extremes in precipitation and temperature. Slower average increases in temperature, precipitation, and sea-level rise can result in compounding impacts, such as ocean acidification, increases insect outbreaks, and shifts in biological patterns, to name a few. (Food and Agriculture Organization of the United Nations, 2014) Table 4-63 is a list of localized climate change impacts relevant to California's Bay Area Delta and the reference to where it is addressed in this MJHMP. Sea-level rise has the potential to inundate homes, businesses, and infrastructure and cause erosion near shorelines and in delta areas of rivers, including southern parts of Solano County and the Cities of Vallejo, Benicia, Suisun City, and Fairfield.

Table 4-63: Climate Change-Related Hazards and Cross-References in MJHMP

Climate change hazard	Reference in MJHMP
Agriculture and Forestry Pests and Diseases	Section 4.5.1 (Sudden Oak Death in Wildfire Profile)
Drought	Section 4.5.5 (Drought Hazard Profile)
Extreme Heat	Section 4.5.7.5 (Climate Change Severity & Extent)
Inland and Shoreline Flooding	Section 4.5.2 (Flood Hazard Profile)
Landslides and Debris Flows	Section 4.5.6 (Slope Hazard Profile)
Sea-Level Rise	Section 4.5.7 (Sea-Level Rise)
Extreme Weather	Section 4.5.4 (Extreme Weather Hazard Profile)
Wildfire	Section 4.5.1 (Wildfire Hazard Profile)

California is already experiencing the impacts of climate change, including prolonged drought, increased coastal flooding and erosion, and tree mortality. The state has also seen increased average temperatures, more extreme heat days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle



with less winter precipitation falling as snow, a decreased summertime fog of 33 percent, and both snowmelt and rainwater running off sooner in the year. (Cal OES, 2018) Long term trends in fog depict a decline of some 12 to 20 percent in California from 1900 through 2070. Climate experts suggest that warmer temperatures resulting from climate change create conditions where air fails to reach cool enough temperatures necessary for the production of fog. Warmer temperatures are simultaneously able to evaporate any fog which is able to form. (Grantham, Theodore; University of California, Berkeley, 2018)

The intensity of extreme weather events is also increasing. Extreme weather events and resulting hazards, such as heatwaves, wildfires, droughts, and floods, are already being experienced. (Leah Fisher, Sonya Ziaja, 2018, p. 22) The vulnerability analysis herein touches on extreme weather impacts from climate change.

### **Sea-Level Rise**

This climate change hazard profile includes sea-level rise as a subhazard for Solano County and for the Cities of Vallejo, Benicia, Suisun City, and Fairfield. Sea-level rise has delineated hazard boundaries and quantifiable exposure and damage estimations. Sea-level rise is called out within each subsection of this climate change hazard profile.

Sea-level rise, a direct result of climate change, affects communities in the Northern California Coastal Area and Bay Area Delta. Sea-level rise has the potential to inundate homes, businesses, and infrastructure located near the shorelines, as well as to cause erosion of coastal lands over time. The sea level rose during the 20th century, and observations and projections suggest that it will rise at a higher rate during the 21st century. Rising seas increase the risk of coastal flooding, storm surge inundation, coastal erosion and shoreline retreat, and wetland loss. The cities and infrastructure that line many coasts are already vulnerable to damage from storms, which will likely increase as the sea level continues to rise and inundate areas further inland.

This MJHMP highlights sea-level rise within the climate change section because this hazard has delineated hazard boundaries and quantifiable exposure and damage estimations directly related to climate change.

### **Methodology for Predicting Climate Change Impacts**

Climate change impacts will vary depending on the amount of greenhouse gas (GHG) emissions and atmospheric GHG concentrations may change over time. Various climate models explore a range of emission scenarios globally. There are six representative GHG emission scenarios, called Representative Concentration Pathways (RCPs). The three most used representative scenarios include a low-end scenario of GHG emissions (RCP2.6), which incorporates strong GHG emission reductions now and in the future, a moderate scenario (RCP4.5), which incorporates stabilizing GHG emissions through 2050, and a high-end (RCP8.5), which maintains a fossil fuel-intensive, "business-as-usual" emission scenario.

Mapping in this HMP uses the moderate RCP 4.5 emissions scenario and the high emissions RCP 8.5 scenario to consider both the ramifications of a worst-case scenario for adaptive planning and to consider



how curbing emissions might reduce the most dramatic consequences. (OPR Planning and Investing for a Resilient California, p. 19)

#### **4.5.7.1 Policies, Plans, and Regulatory Environment**

Successful efforts to address the challenges of climate change begin at the local level and include the implementation of environmentally sustainable practices designed to meet present and future energy needs.

##### **2019 California Green Building Standards**

Solano County has adopted the 2019 California Green Building Standards, also known as the CALGreen Code. The CALGreen Code establishes regulations for green building for both nonresidential and residential construction. Topics covered in the regulations include planning and design, energy efficiency, water efficiency and conservation, material conservation and resource efficiency, and environmental quality. The code also includes voluntary measures for residential and nonresidential buildings and health facilities.

##### **California Sustainable Communities and Climate Protection Act of 2008**

The Sustainable Communities and Climate Protection Act of 2008 (Sustainable Communities Act, SB 375, Chapter 728, Statutes of 2008) looks to reduce GHG emissions through coordinated transportation and land use planning with the goal of more sustainable communities. Regional targets are established for GHG emissions reductions from passenger vehicle use by the sustainable communities strategy (SCS) established by each metropolitan planning organization (MPO). The SCS is an integral part of regional transportation plans (RTP) and contains land use, housing, and transportation strategies to meet GHG reductions targets.

##### **2018 California Coastal Commission Sea Level Rise Policy Guidance**

The 2018 California Coastal Commission Sea Level Rise Policy Guidance document provides an overview of the best available science on sea-level rise for California, and recommended methodology for addressing sea-level rise in Coastal Commission planning and regulatory actions. It is intended to serve as a multi-purpose resource for a variety of audiences and includes a high level of detail on many subjects.

##### **2018 California's Fourth Climate Change Assessment**

California's Fourth Climate Change Assessment promotes actionable science that serves the growing needs of state and local-level decision-makers from a diverse number of sectors. The Fourth Assessment provides information in a number of ways. Regional reports summarize climate impacts and adaptation needs around the state as a resolution useful for local decision-makers. Statewide impacts are summarized in the Statewide Summary Report, as well as reports on Tribal and Indigenous Communities, Climate Justice, and California's Ocean and Coast. The Technical Reports are the foundation of the Fourth Assessment and include climate projections and analyses of expected impacts in various sectors across the state.



## **2020 California Adaptation Planning Guide (APG)**

California has been taking action to address climate change for over 20 years, focusing on both GHG reduction and adaptation. The California Adaptation Planning Guide (APG) provides guidance and support for communities addressing the unavoidable consequences of climate change. The 2020 APG presents an updated, step-by-step process that communities can use to plan for climate change.

### **California Senate Bill 379: General Plan Safety Element and Climate Adaption**

California Senate Bill 379 requires all cities and counties to include climate adaptation and resiliency strategies in the Safety Elements of their General Plans upon the next revision, beginning January 1, 2017. The bill requires the climate adaptation update to include a set of goals, policies, and objectives for their communities based on the vulnerability assessment, as well as implementation measures, including the conservation and implementation of natural infrastructure that may be used in adaptation projects.

### **California Senate Bill 1000: General Plan Safety and Environmental Justice Elements**

Senate Bill 1000 requires local governments to include an Environmental Justice element in General Plans. It has four basic requirements, whether those requirements are combined into a single Environmental Justice element or distributed throughout other existing elements, including:

- Identifying disadvantaged communities;
- Incorporating policies to reduce the environmental health impacts that adversely affect residents in disadvantaged communities;
- Incorporating policies to include residents of disadvantaged communities in decision-making processes; and
- Incorporating policies that prioritize improvements and projects in disadvantaged communities.

### **California Assembly Bill 2516: Database for Sea-Level Rise Planning**

Assembly Bill 2516 was passed in 2014 and directed the Natural Resources Agency, in collaboration with the Ocean Protection Council, to conduct biannual surveys of sea-level rise planning information to catalog California's efforts to prepare for rising sea levels. The resources collected in service to this task include studies, vulnerability assessments, and local coastal programs. The future collection of resources will be stored in the Adaption Clearinghouse.

### **Delta Adapts: Creating a Climate Resilient Future**

The Delta Stewardship Council recently developed a vulnerability assessment for climate change for the broader Sacramento- San Joaquin Delta region, completed June 2021. The plan, titled [Delta Adapts: Creating a Climate Resilient Future](#), was developed to enhance the Council's understanding of regionally specific climate change vulnerabilities and risks and address how Delta communities, infrastructure, and ecosystems can adapt to future conditions. The plan's planning horizon is through 2100 while also incorporating a 2050 planning increment as used by the Delta Plan.



### **County of Solano 2011 Climate Action Plan**

Solano County published a 2011 Climate Action Plan (CAP) as a requirement of their 2008 General Plan, which mandates a CAP and a Sea-Level Rise Strategic Plan. The primary objective of the CAP is to address climate change and reduce the community's GHG emissions at a more local level. The plan recommends 31 measures and 94 implementation actions which the county can use to reduce emissions. As part of the general objective of the CAP, Solano County has set a goal to reduce county-wide GHG emissions by 20 percent below 2005 levels by 2020.

### **County of Solano 2011 Sea-Level Rise Strategic Program**

Solano County created a Sea-Level Rise Strategic Program (SLRSP) consistent with its 2008 General Plan Health and Safety Element. The SLRSP examines potential impacts from sea-level rise on Solano County, including impacts to more specific properties and resources susceptible to sea-level rise. It also provides protection and adaptation strategies.

### **Solano County General Plan**

The 2008 Solano County General Plan includes a number of goals and policies in the Public Health and Safety Element to mitigate the effects of Climate Change. These goals and policies encourage greater awareness of human caused climate change, in addition to preparation and adaptation to the effects of climate change.

## **4.5.7.2 Past Events**

Climate change has never been directly responsible for any declared disasters. Past flooding, wildfire, extreme weather, and drought disasters may have been exacerbated by climate change, but it is difficult to make direct connections to individual disasters. Hazard profiles for flood, wildfire, extreme weather, and drought include information on past events that show an increase in occurrences in many instances, especially considering wildfire, extreme heat, and drought events.

Climate change is an on-going hazard, and many communities are already experiencing the effects. Other effects may not be seriously experienced for decades or may be avoided altogether by mitigation actions taken today.

### **Sea-Level Rise**

Historic records from the San Francisco tidal gage, CA Station ID: 9414290, show that the sea level in the San Francisco Bay has risen eight inches from 1897 to 2006. Similarly, water level measurements from the tidal gage at Port Chicago, CA Station ID: 9415144, show an increase in mean sea level of 2.08 millimeters a year, which is equivalent to a change of 8.6 inches in 100 years. Communities in Solano County report increased damage from king tide events, especially when paired with heavy rain, and community members are attributing these changes to sea-level rise.





### 4.5.7.3 Location

The effects of climate change are not limited by geographical borders; the entire county is subject to various effects of climate change which may differ by location. Each jurisdiction explored impacts of climate change specific to that jurisdiction. For example, municipalities bordering the San Joaquin Bay will experience sea-level rise impacts, while northwesterly parts of the county may face increased wildfire dangers.

#### Sea-Level Rise

Sea-level rise varies greatly depending on a number of factors. Globally, sea level is rising primarily because global temperatures are rising, causing ocean water to expand and land ice to melt. However, sea-level rise varies from place to place. Along the Pacific coast, sea-level rise depends on the global mean sea-level rise and also on regional factors, including ocean and atmospheric circulation patterns in the northern Pacific Ocean, gravitational and deformational effects of land ice mass changes, and tectonics along the coast. The comparative importance of these factors determines whether local sea level is higher or lower than the global mean, and how fast it is changing, which has enormous implications for coastal planning. (National Research Council, 2012)

Sea-level rise within the Western Pacific is different than the global average. In some places within the Western Pacific, sea-level rise has been greater than 10 mm per year. In other places, such as in the Eastern Pacific, sea-level rise has been much less. The differences in rate and region are primarily associated with multi-decadal fluctuations that are linked with the Pacific Decadal Oscillation (PDO), which has appeared to switch phases in the last couple of years. A PDO phase switch could signal the start of higher amounts of relative sea-level rise along the United States West Coast within the coming decades. This is a trend similar to the higher relative sea-level rise rates which have occurred in this region during portions of the last century. (NOAA, 2017)

For Solano County, sea-level rise will primarily affect the shoreline, tidal marsh areas, and wetlands along the border with the San Francisco Bay Area Delta. Some sea-level rise impacts are already being experienced in low lying municipal areas of Vallejo, Benicia, Suisun City, and Fairfield, especially during king tide events. Volume 1 herein describes sea-level rise for the county, while some participating jurisdictions prioritized sea-level rise in their annexes. Much of the Solano County border of the San Francisco Bay Area Delta is shallow marshland, and a large acreage of land could be inundated with small amounts of sea-level rise, as shown in Figure 4-63.

### 4.5.7.4 Frequency and Probability of Future Occurrences

Climate change is one of the few natural hazards where the probability of occurrence is influenced by human action. In addition, unlike earthquakes and floods that occur over a finite time period, climate change is an ongoing hazard.



Temperature-related impacts are the most likely near-term climate change exposure facing the county and should be addressed and prioritized in future adaptation planning efforts. While sea-level rise has a high certainty rating and is already occurring, its onset is not expected to occur until closer to the end of the century in terms of changes in areas already vulnerable to flooding or causing permanent inundation in tidally-influenced areas of the county. (National Oceanic and Atmospheric Administration, n.d.)

California's Fourth Climate Change Assessment (2018) delineates how climate change may impact and exacerbate natural hazards in the future, including wildfires, extreme heat, floods, drought, and levee failure:

- Climate change is expected to lead to increases in the frequency, intensity, and duration of extreme heat events and heat waves in Solano County and the rest of California, which are likely to increase the risk of mortality and morbidity due to heat-related illness and exacerbation of existing chronic health conditions. Those most at risk and vulnerable to climate-related illness are the elderly; individuals with chronic conditions such as heart and lung disease, diabetes, and mental illnesses; infants; the socially or economically disadvantaged; and those who work outdoors.
  - Higher temperatures will melt the Sierra snowpack earlier and drive the snowline higher, resulting in less snowpack to supply water to California users.
  - Droughts are likely to become more frequent and persistent in the 21st century.
  - Intense rainfall events, periodically ones with larger than historical runoff, will continue to affect California with more frequent and more extensive flooding.
  - Storms and snowmelt may coincide and produce higher winter runoff from the landward side, while accelerating sea-level rise will produce higher storm surges during coastal storms.
- (California's Fourth Climate Change Assessment, 2018)

Warmer weather, reduced snowpack, and earlier snowmelt can be expected to increase wildfire through fuel hazards and ignition risks. These changes can also increase plant moisture stress and insect populations, both of which affect forest health and reduce forest resilience to wildfires. An increase in wildfire intensity and extent will increase public safety risks, property damage, fire suppression and emergency response costs, watershed and water quality impacts, vegetation conversions, and habitat fragmentation. Climate change is also predicted to increase frequency and probability of various hazards. Climate change impacts on frequency and severity are discussed in other hazard profiles.

### **Sea-Level Rise**

The probability for sea-level rise varies depending on the amount of sea-level rise predicted. Global mean sea-level rise predictions vary from a low of 0.3 meters to a high of 2.5 meters. The probability of different levels of sea-level rise also depends on the amount of future GHG emissions and reductions made. Table 4-64 shows the probability of various levels of sea-level rise by 2100, based on three RCPs. Under a business-as-usual scenario, RCP 8.5, there is a 96 percent chance of global mean sea-level rise of 0.5 meters. With reduced emissions under RCP 4.5, that chance is reduced to 73 percent. The probability of a one-meter global rise in sea levels is 17 percent under RCP 8.5, decreasing to a three percent chance with emission reductions under RCP 4.5. The exposure and damage estimations for sea-level rise for Solano County are discussed further in the Vulnerability Assessment, Section 4.5.7.8.



Table 4-64: Probability of Exceeding Global Mean Sea-level Rise (Median Value) Scenarios in 2100

GMSL Rise Scenario	RCP 2.6	RCP 4.5	RCP 8.5
<b>Low (0.3 m)</b>	94%	98%	100%
<b>Intermediate-Low (0.5 m)</b>	49%	73%	96%
<b>Intermediate (1.0 m)</b>	2%	3%	17%
<b>Intermediate-High (1.5 m)</b>	0.4%	0.5%	1.3%
<b>High (2.0 m)</b>	0.1%	0.1%	0.3%
<b>Extreme (2.5 m)</b>	0.05%	0.05%	0.1%

Source: National Oceanic and Atmospheric Administration (based upon Kopp et al. 2014).

#### 4.5.7.5 Severity and Extent

Climate change severity and extent in Solano County is varied and can generally be categorized into several key effects. These effects are identified in the San Francisco Bay Area Region<sup>9</sup> Report from California's Fourth Climate Change Assessment (2018). General climate change impacts for this North Coast Region include:

- Predicted annual maximum temperatures will increase by 4.2°F under the RCP 4.5 scenario and 7.2°F under the RCP 8.5 scenario by the end of the 21st century. (Ackerly, 2018, p. 14). See Figure 4-69 to compare current annual average maximum temperatures with those predicted for Solano County in 2100.
- Annual precipitation is likely to be delivered in more intense storms, with shorter wet seasons and prolonged dry seasons.
- An "average" rainfall year will become less common with a higher occurrence of extreme wet and dry years.
- Increased extreme weather events will increase the severity and extent of flooding.
- Stream flows in the summer dry season are predicted to decline, and peak flows in the wetter winter months are likely to increase.
- Sea-level rise is predicted to increase by at least two meters over the next several centuries.
- Wildfires will continue, with projections for a longer wildfire season, increased frequency, and expansion of the area susceptible to fire. (Grantham, 2018)
- Frost occurrences may become longer and more frequent. In February 2018, for example, grape growers prepared for extended frost threat, while coping with a lack of rainfall during what are typically the wettest months of the year. As climate change continues, bud break or the appearance of shoots that will eventually yield grapes will begin sooner, leaving the delicate new growth exposed to the hazards of frost and rain for a longer stretch of the growing season. (Lutz, 2018)

<sup>9</sup> The San Francisco Bay Area Region for California's Fourth Climate Change Assessment includes Marin, Napa, Sonoma, Solano, Alameda, San Mateo, Contra Costa, Santa Clara, and San Francisco Counties.



These impacts are predicted to significantly effect communities through habitat loss, including cold-water fish species such as salmon; increased flood and landslide risks to critical infrastructure; and increased public health risks from wildfire, floods, heatwaves, and disease vectors. (*Id.*)

*Note: Mapping in this HMP uses the moderate range RCP 4.5 as well as the high-end range RCP 8.5, as HMP mapping depicts projected sea-level rise and temperature increases in the later half of the century with an adaptive lens. (OPR Planning and Investing for a Resilient California, p. 19)*

### **Sea-Level Rise**

Generally, some level of sea-level rise is projected for the shoreline of Solano County. The severity and extent of sea-level rise depends greatly on the future pathways for emission levels and how far into the future the analysis looks. Figure 4-63 and Figure 4-71 show predicted sea-level rise in Solano County based on low through extreme amounts of rise. See Section 4.5.7.4 for an overview of frequency and probability of occurrence, which plays directly into the severity and extent of sea-level rise.

### **Current and Projected Average Maximum Temperatures Under RCP 4.5 and 8.5 Scenarios**

Overall, temperatures in California are projected to rise by 5.6°F under an RCP 4.5 scenario and by 8.8°F under an RCP 8.5 scenario by the end of this century. (Bedsworth, 2018, p. 23) Figure 4-66 depicts the current average maximum temperature for Solano County. Figure 4-64 and Figure 4-65 illustrate the average maximum annual temperature for Solano County from 1950 through 2100 under the RCP 4.5 and RCP 8.5 scenarios, respectively. Figure 4-67 and Figure 4-68 depict average maximum temperature projections through 2100 under the RCP 4.5 and RCP 8.5 scenarios, respectively. The final figure, Figure 4-69, summarizes this information by juxtaposing the current average maximum temperature in the county with projected average annual maximum temperatures in 2100 under the RCP 4.5 and RCP 8.5 scenarios.

These projections differ depending on the time of year and the type of measurement (highs vs. lows), all of which have different potential effects to the county's ecosystem health, agricultural production, water use and availability, and energy demand. Under the RCP 4.5 scenario, the county is projected to experience increases in maximum temperatures near 80°F. Under the RCP 8.5 scenario, portions of the county are projected to experience maximum temperatures closer to 90°F.

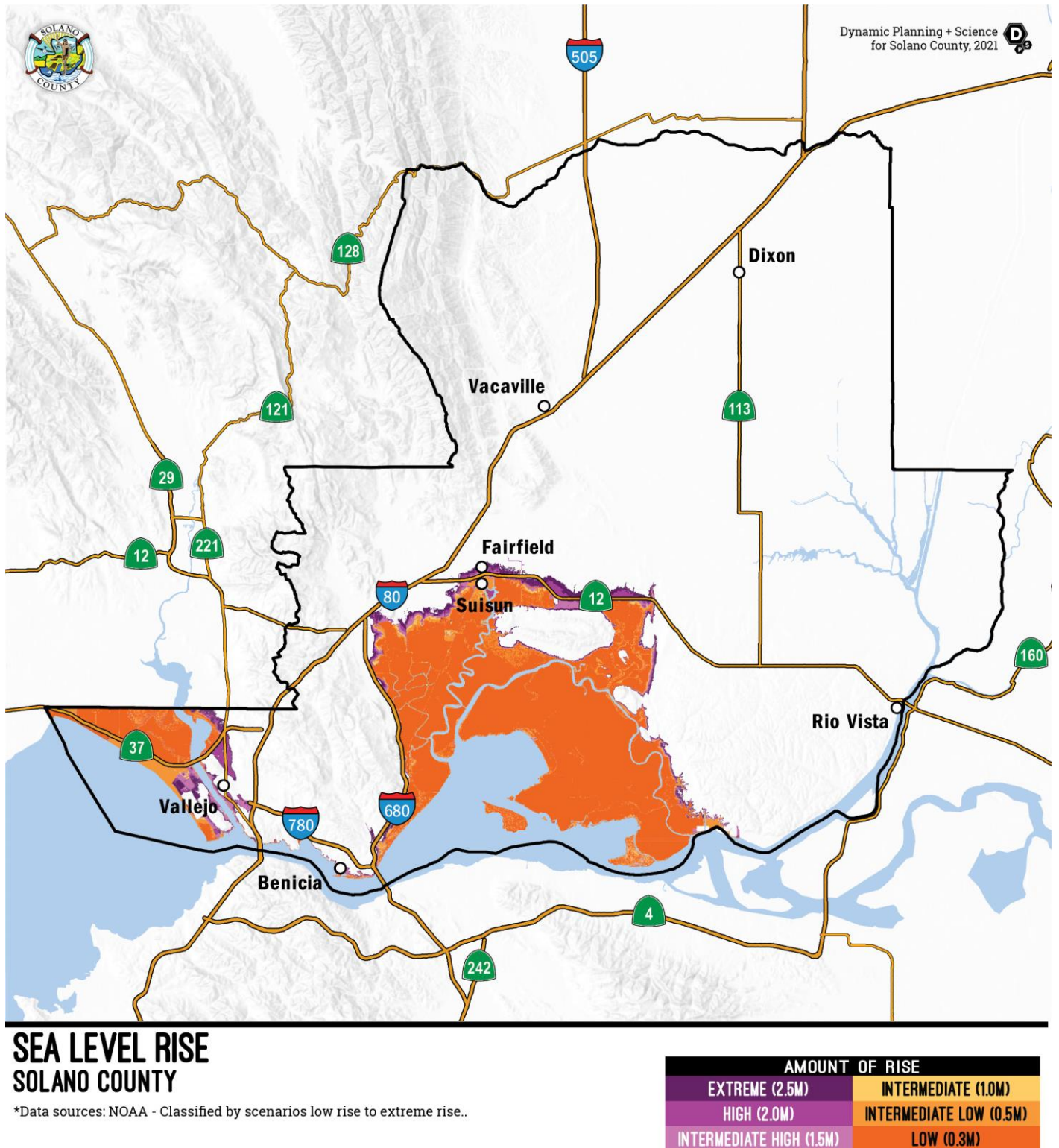


Figure 4-63: Sea-Level Rise Potential





### Annual Average Maximum Temperature

Data is shown for Solano County, California under the RCP 4.5 scenario in which emissions peak around 2040, then decline.

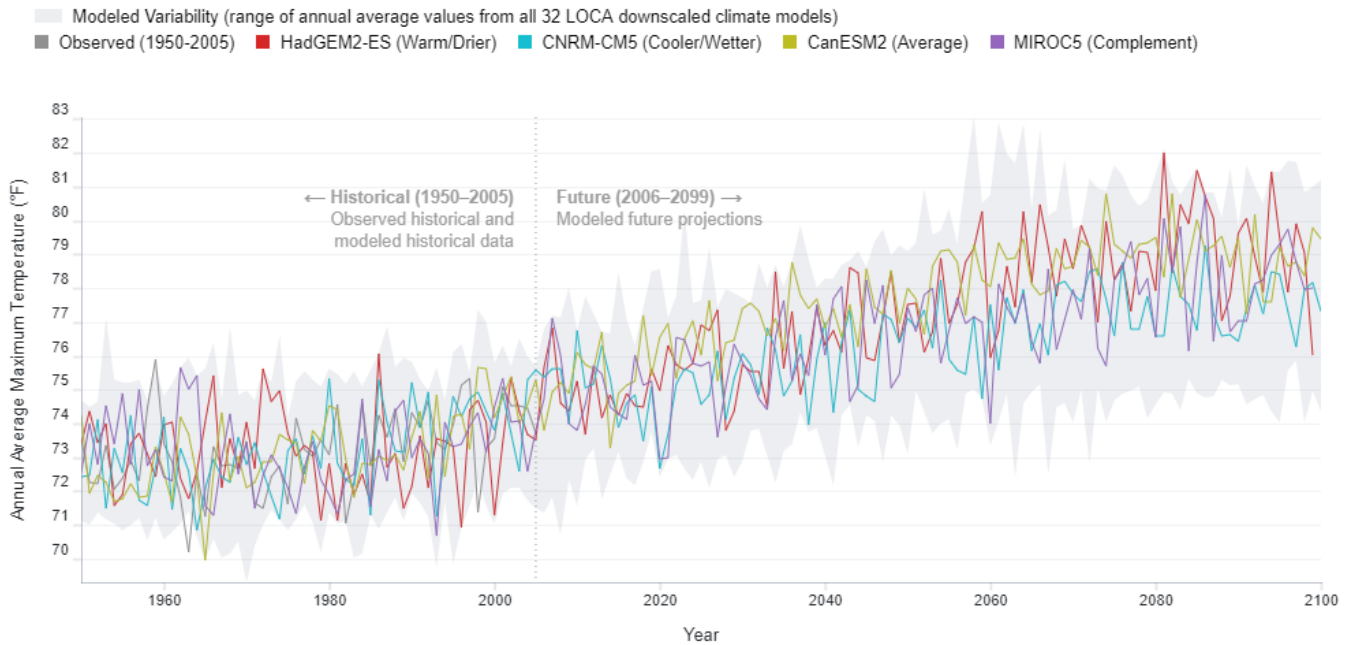


Figure 4-64: Annual Average Maximum Temperature (RCP 4.5 Scenario)

Source: cal-adapt.org

### Annual Average Maximum Temperature

Data is shown for Solano County, California under the RCP 8.5 scenario in which emissions continue to rise strongly through 2050 and plateau around 2100.

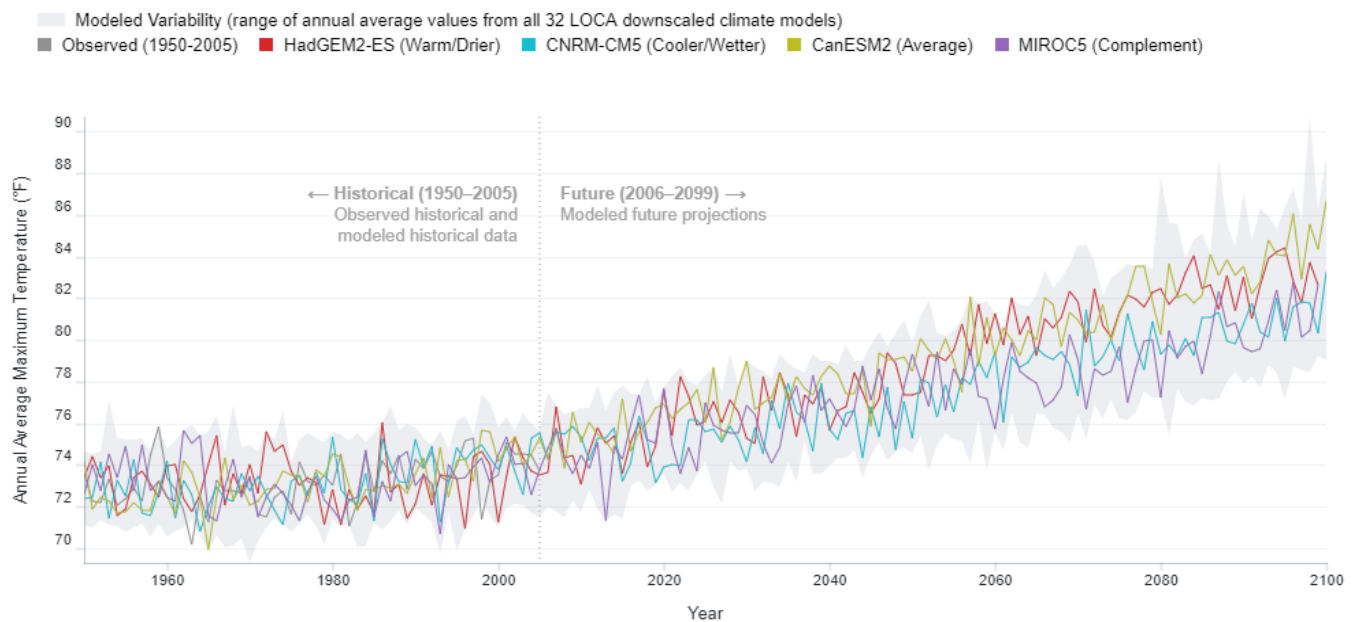


Figure 4-65: Annual Average Maximum Temperature (RCP 8.5 Scenario)

Source: cal-adapt.org

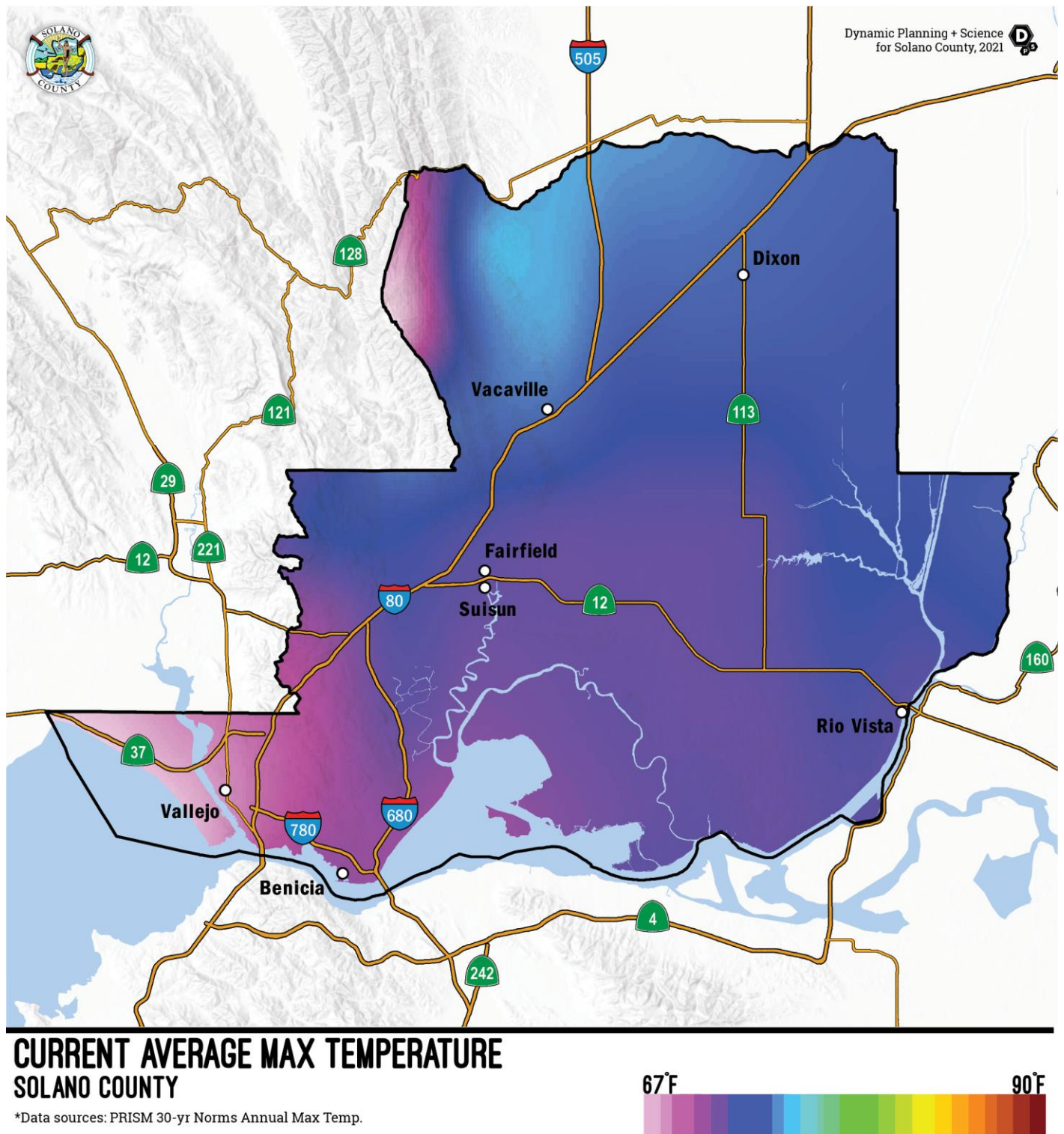


Figure 4-66: Current Average Max Temperature



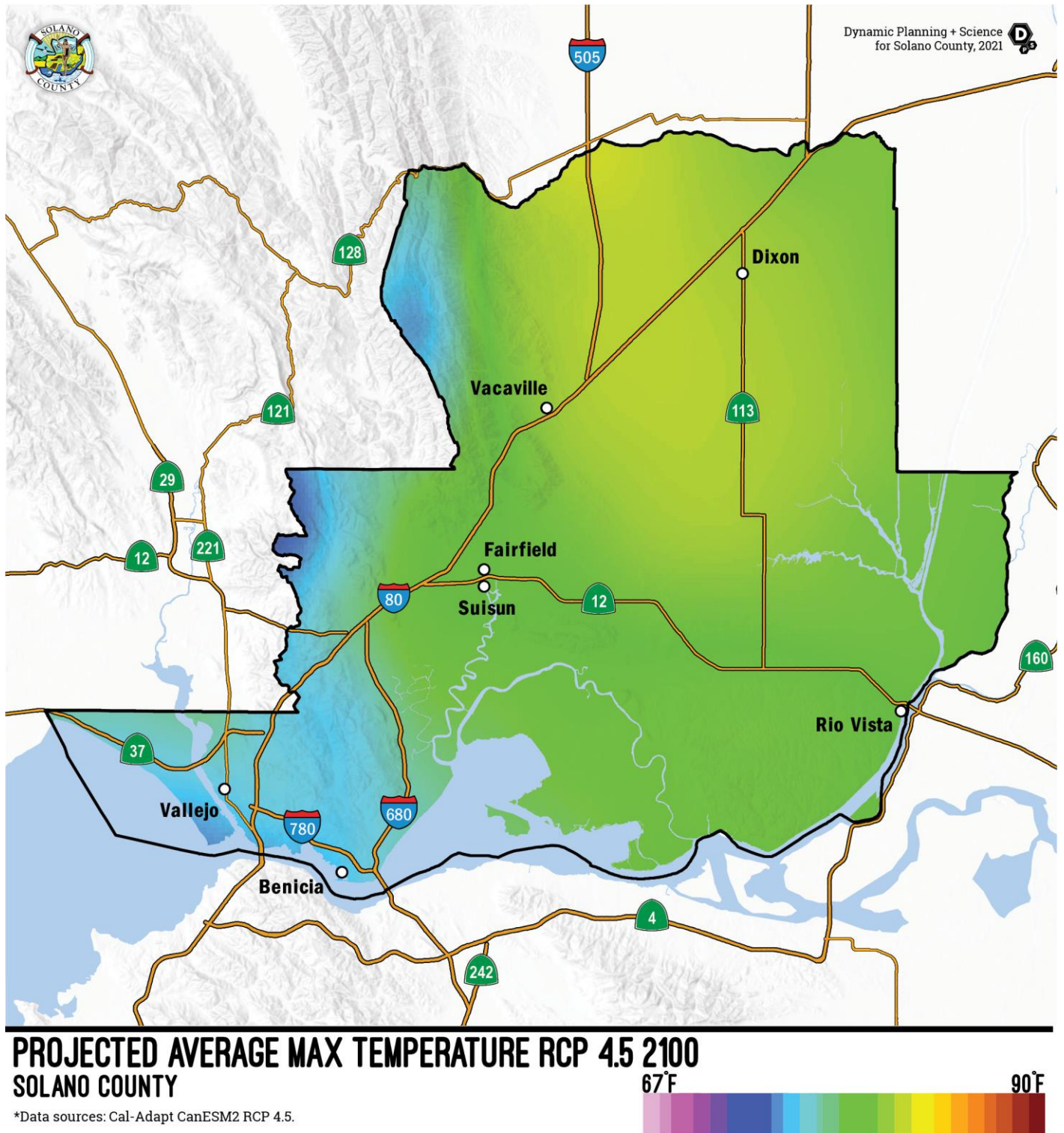


Figure 4-67: Projected Average Max Temperature RCP 4.5 2100

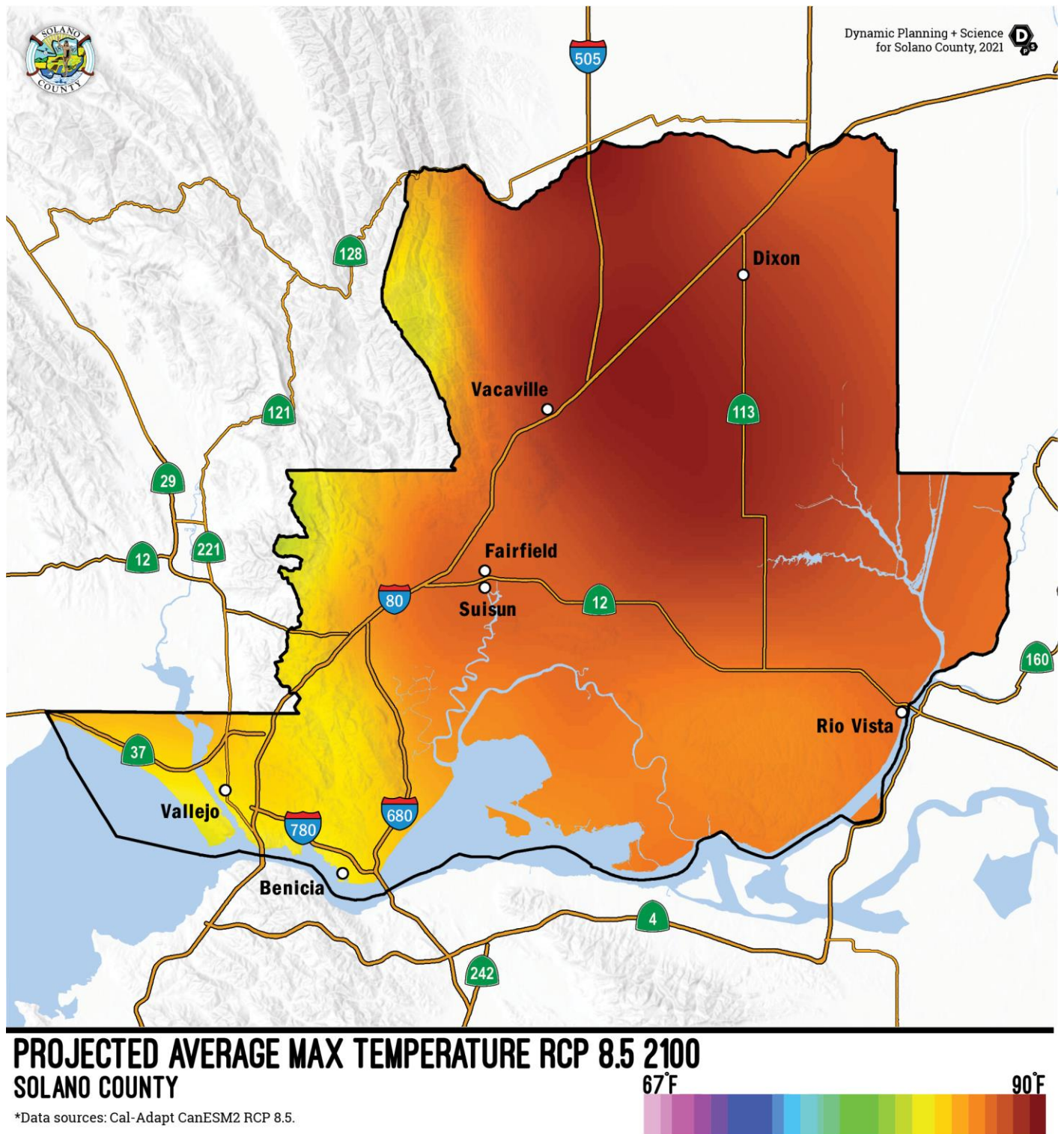


Figure 4-68: Projected Average Max Temperature RCP 8.5 2100





# SOLANO COUNTY AVERAGE ANNUAL MAXIMUM TEMPERATURE

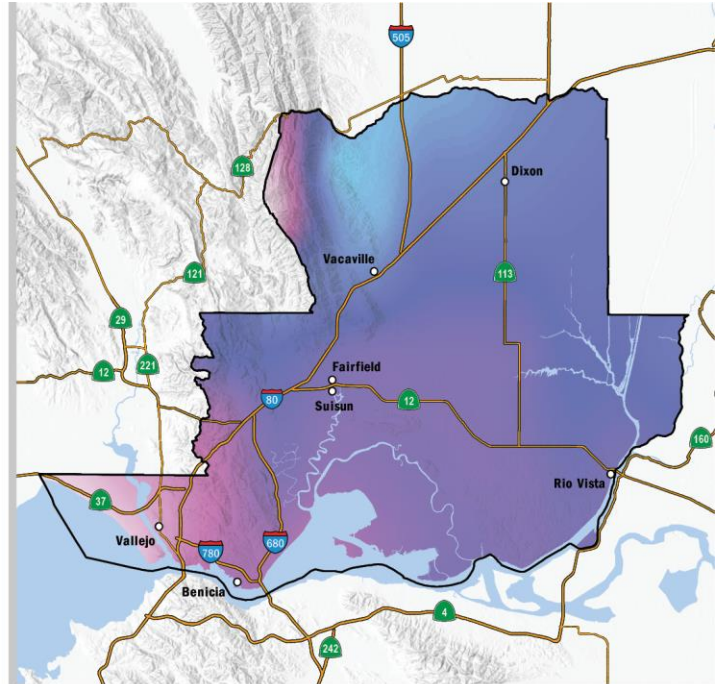
COMPARISON OF CURRENT OBSERVED TO RCP 4.5 AND RCP 8.5 SCENARIOS



\*Data sources: Cal-Adapt CanESM2 RCP 4.5 & 8.5, PRISM 30-YR Norms Annual Max Temp



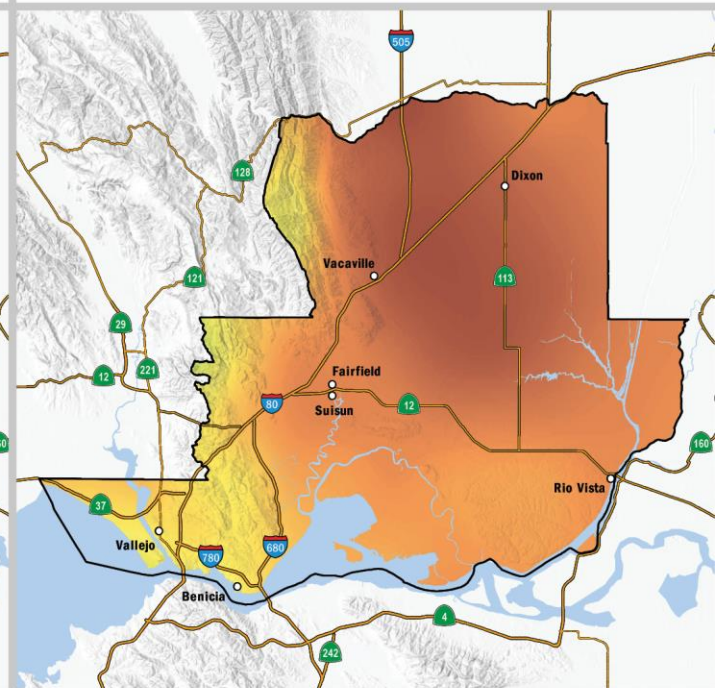
Dynamic Planning + Science  
for Solano County, 2021



**CURRENT 30-YR NORMAL**



**RCP 4.5 YEAR 2100**



**RCP 8.5 YEAR 2100**

Figure 4-69: Annual Average Maximum Temperature





#### **4.5.7.6 Warning Time**

As this section has described, many existing hazards could be intensified as a result of climate change, decreasing warning times and exacerbating impacts. Warning times are discussed under the various other hazards. Other climate change impacts are more long-term. Scientists have a high confidence in predicting the rise in global temperatures and have reached a consensus on the future impacts of climate change and the time frame in which they will occur.

##### **Sea-Level Rise**

Sea-level rise will occur slowly over time and increase impacts of other hazards profiled in the MJHMP, such as shoreline erosion and the potential impact of tsunamis.

#### **4.5.7.7 Secondary Hazards**

Secondary hazards of climate change include flood, extreme weather, drought, wildfire, sea-level rise, extreme heat, and heavy rain events. Climate change will increase the frequency at which extreme weather events occur. Secondary hazards of climate change that will have the greatest impact on Solano County include flood, drought, and extreme weather. Many of these impacts are discussed in other hazard profiles.

##### **Sea-Level Rise**

Sea-level rise is projected for the shoreline of Solano County as a secondary hazard associated with climate change. See Section 4.5.7.5 for sea-level rise projections for the Solano County shoreline.

#### **4.5.7.8 Vulnerability Assessment**

This section outlines vulnerabilities of Solano County to impacts from climate change and focuses on sea-level rise in particular, as many of the other impacts are secondary as outlined in other hazard profiles within this document. Sea-level rise also has delineated hazard boundaries and quantifiable exposure and damage estimations. This Vulnerability Assessment summarizes property, critical facilities, and population, including vulnerable populations in a more general context, within known hazard areas.

##### **Appendix C: Supplemental Climate Vulnerability Assessment**

Appendix C includes a more detailed, supplemental assessment of climate vulnerability for all climate-related problem statements identified for hazards profiled in this MJHMP. The County assessed both the impact of climate change to the area of concern and the county's capacity to adapt to the predicted future impact. Other jurisdictions completed this exercise and included results as appendices to jurisdictional annexes.

The impact and adaptive capacity ranking combine to give the climate change vulnerability score. The scoring is then used to prioritize mitigation actions based on vulnerability to climate change. This assessment is completed as a part of the overall MJHMP; jurisdictions may want to complete a more detailed Climate Vulnerability Assessment as part of in-depth climate adaptation planning,



#### 4.5.7.8.1 Population

Solano County's projected climate change exposures have the potential to leave sensitive populations in the county, as the County has a significant number of elderly (29%), residents with diverse racial and ethnic backgrounds (30%), and poor (8%). (American Community Survey, 2018)

Higher frequency of extreme heat conditions can cause serious public health impacts, increasing the risk of conditions directly related to heat, such as heat stroke and dehydration. Older adults, particularly seniors, are more likely to experience respiratory or cardiovascular health complications than younger individuals. Approximately 44,832 residents of the county are elderly. These populations are more likely to live alone with limited mobility. (*Id*)

Solano County's large agricultural workforce base is also susceptible to high heat. Heat stress can seriously affect those working outside by reducing overall productivity and, in extreme exposures, could lead to illness, disability, or death.

Renters are also more vulnerable, as they are less likely to reinforce buildings and buy insurance because the decision to make major home improvements typically lies with the property owner. Additionally, disaster recovery services target homeowners; renters may not receive as much outreach.

The Solano County Climate Change and Health Profile Report describes regional populations especially vulnerable to climate change. These populations include the very young and the very old, individuals with chronic medical conditions or psychiatric illness, as well as people taking multiple medications, people who are carless or lack access to public transit, people who are isolated socially, and people living in institutions. It also emphasizes the fact that climate change can magnify existing health disparities. Disadvantaged communities, such as those with low social support, poverty, low education, racially segregated, or those experiencing income inequality, are more likely to face disproportionate climate-related health burdens. (Maizlish, 2017)

#### Sea-Level Rise

As sea levels rise, the area and the number of people at risk because of flooding will also rise. Factors that increase vulnerability to the adverse impacts of flood events associated with sea-level rise include access to preparedness information, transportation, healthcare, and insurance. Key demographics associated with these vulnerabilities include income, race, linguistic isolation (i.e., non-English speaking), educational attainment, and residential tenure. (R. Dean Hardy, Mathew E. Hauer, 2018, p. 13) Language ability is an important factor in assessing vulnerability as emergency response crews may be unable to communicate with non-English speakers. The estimated population exposed to sea-level rise is summarized in Figure 4-70 and Table 4-65.

Sea-level rise may significantly impact vulnerable communities. Approximately 38% of those vulnerable to a 100-year flood with a 55-inch sea-level rise in Solano County earn less than \$30,000. (Solano County Sea Level Rise Strategic Program, 2011, p. 3.8)



Table 4-65: Population Exposure to Sea-Level Rise (Unincorporated County)

Total Population	
Unincorporated County	19,665

Sea Level Rise (Feet)	Population Count	% of Total
Low Rise (0.3m)	2,027	10.31%
Intermediate-Low Rise (0.5m)	2,531	12.87%
Intermediate Rise (1.0m)	2,666	13.55%
Intermediate-High Rise (1.5m)	2,798	14.23%
High Rise (2.0m)	2,993	15.22%
Extreme Rise (2.5m)	3,118	15.86%

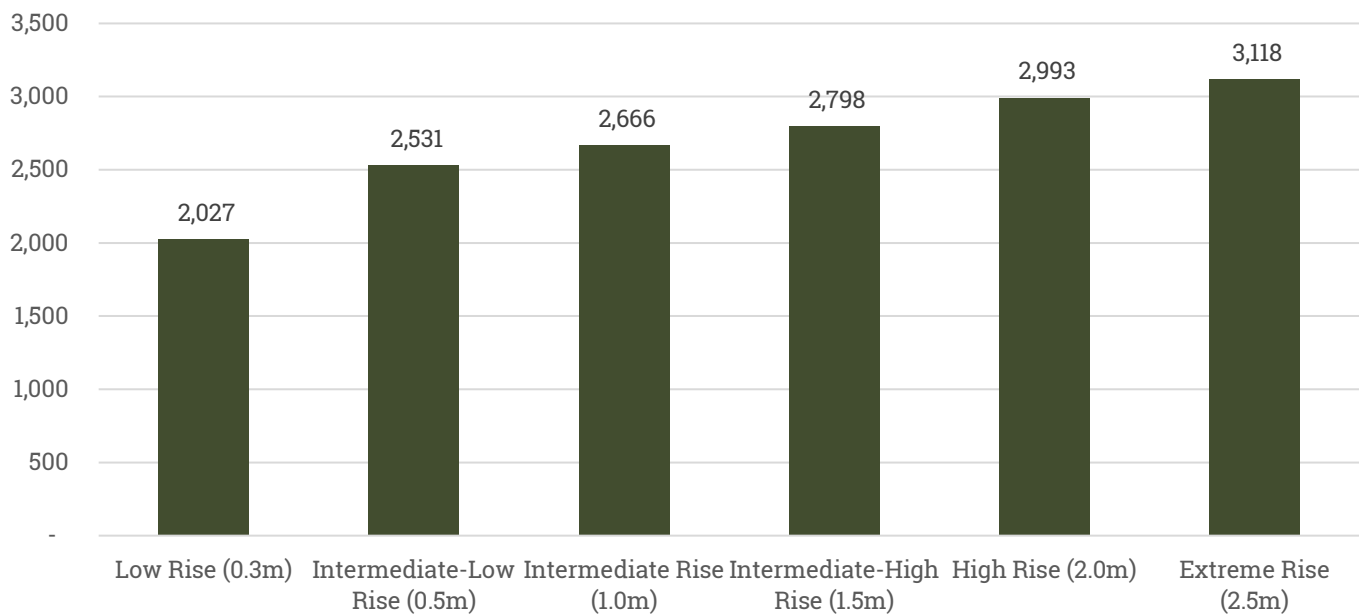


Figure 4-70: Population Exposure to Sea-Level Rise (Unincorporated County)

#### 4.5.7.8.2 Property

Climate change could significantly impact the agricultural and wine industries, which are large drivers of the county's economy. Specifically, the agricultural industry, which was recorded at \$371,715,000 in 2020, could be especially impacted as climate variability interferes with crop production. (Solano County Agricultural Department, 2020) Increases in temperature and changes in precipitation and soil moisture could impact the growth of wine grapes by causing late or irregular blooming and affecting yields.

The increased likelihood of extreme floods could lead to the destruction of crops, erosion of topsoil, and deposits of debris and sediment on croplands. Conversely, as average temperatures increase with climate change, agricultural demand for water could intensify under extreme heat conditions, under which water evaporates faster and plants need more water moving through their circulatory systems to stay cool. More



specifically, attempts to maintain wine grape productivity and quality in the face of warming may be associated with increased water use for irrigation, a change to different varieties of grapes, and to cool grapes through misting or sprinkling. As noted earlier, increased average temperatures and changes in timing and amounts of precipitation could affect local aquifer recharge for groundwater supplies in the future, which could in turn affect water supplies for agricultural uses.

### Sea-Level Rise

The Solano County shoreline is vulnerable to sea-level rise. Approximately 10 percent of the general population would be at risk of exposure to low rise (0.3m) while almost 16 percent would be exposed to extreme rise (2.5m). See Table 4-65. Approximately two percent of the parcel count would also be exposed. See Figure 4-71 for a property, parcel, and critical infrastructure exposure summary.

Table 4-66: Property Values Exposed to Sea-level Rise

	Total Parcels		Total Market Value (\$)	Total Content Value (\$)	Total Value (\$)	
Unincorporated County	6,668		\$3,186,640,275	\$2,078,097,240	\$5,264,737,515	

Sea Level Rise	Parcel Count	% of Total	Market Value Exposure (\$)	Content Value Exposure (\$)	Total Exposure (\$)	% of Total
Low Rise	44	0.7%	\$17,686,109	\$10,553,359	\$28,239,468	0.5%
Intermediate-Low Rise	60	0.9%	\$23,473,487	\$14,037,765	\$37,511,252	0.7%
Intermediate Rise	63	0.9%	\$23,982,853	\$14,406,631	\$38,389,484	0.7%
Intermediate-High Rise	76	1.1%	\$28,356,083	\$16,678,187	\$45,034,270	0.9%
High Rise	89	1.3%	\$33,329,557	\$20,260,286	\$53,589,843	1.0%
Extreme Rise	115	1.7%	\$39,825,844	\$23,575,022	\$63,400,866	1.2%

### 4.5.7.8.3 Critical Facilities

Some critical infrastructure (e.g., roads, hospitals, schools, and emergency facilities) are at increased risk of flooding in the county. For example, the Hazardous Waste Facility adjacent to the City of Vallejo could become vulnerable to intermediate and low levels of sea-level rise. Adjacent areas associated with lower income housing is vulnerable to any compromised facilities due to sea level rise such as the Hazardous Waste Facility. Sections of Interstate 80 could also be completely obstructed, such as the Carquinez Bridge.

### Sea-Level Rise

Critical facilities are summarized in the snapshot of sea-level rise in Figure 4-71. Table 4-67 and Table 4-68 summarize critical infrastructure exposed to sea-level rise in Solano County.





## SEA LEVEL RISE EXPOSURE

SOLANO COUNTY

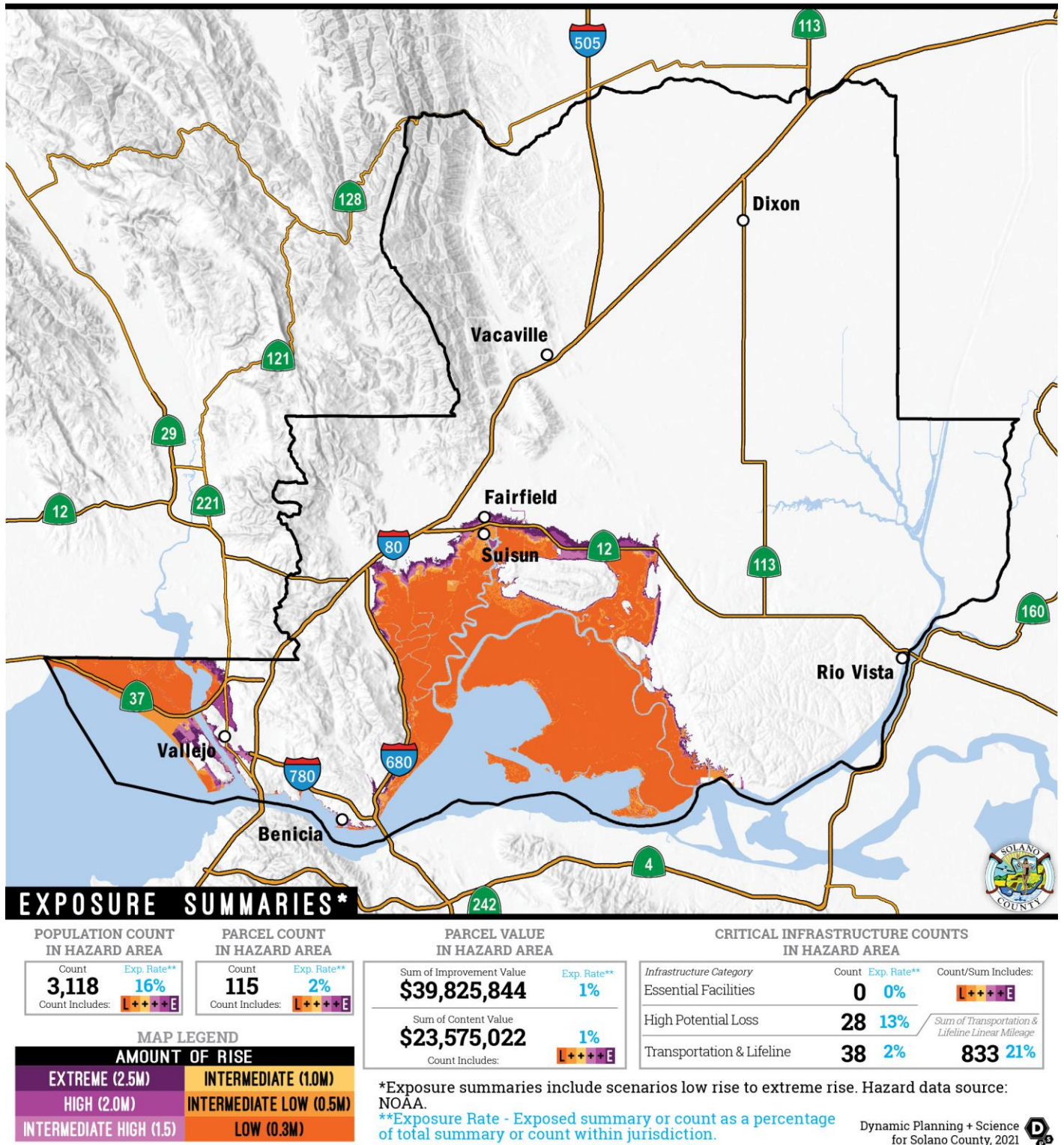


Figure 4-71: Sea-Level Rise Vulnerability and Exposure Snapshot





Table 4-67: Critical Infrastructure Points in Sea-Level Rise Regions (Unincorporated County)

Critical Infrastructure - Sea Level Rise

Infrastructure Type	Low Rise	Intermediate-Low Rise	Intermediate Rise	Intermediate-High Rise	High Rise	Extreme Rise
<b>Essential Facility</b>	-	-	-	-	-	-
EOC	-	-	-	-	-	-
Law Enforcement	-	-	-	-	-	-
Fire Station	-	-	-	-	-	-
Emergency Services	-	-	-	-	-	-
Hospital	-	-	-	-	-	-
<b>High Potential Loss</b>	3	3	4	8	24	28
Dam	-	-	-	-	-	-
Historic Building	-	-	-	-	-	-
Library	-	-	-	-	-	-
School	-	-	-	-	-	-
Historic Site	-	-	-	-	-	-
Community Center	-	-	-	-	-	-
Jurisdiction Real Property Asset*	-	-	-	-	-	-
Park	2	2	2	2	2	2
Wastewater Treatment Facility	-	-	-	-	-	-
Emergency Shelter	-	-	-	-	-	-
Administrative	-	-	-	-	-	-
Child Care Facility	-	-	-	-	-	-
Healthcare Facility	-	-	-	-	-	-
Senior Center	-	-	-	-	-	-
County Real Property Asset*	1	1	2	6	22	26
Early Learning	-	-	-	-	-	-
<b>Transportation and Lifeline</b>	20	29	30	30	36	38
Airport	-	-	-	-	-	-
Bridge	-	3	4	4	6	7
Power Plant	-	-	-	-	-	-
Substation	-	-	-	-	-	-
Bus Facility	-	-	-	-	-	-
NG Station	3	3	3	3	3	4
Bus Stop	-	-	-	-	-	-
Railway Bridge	-	-	-	-	-	-
Cell Tower	-	-	-	-	3	3
Breakout Tank	-	-	-	-	-	-
Oil Facility	-	-	-	-	-	-
Transmission Line Tower	17	23	23	23	24	24
Wind Turbine	-	-	-	-	-	-
Ferry	-	-	-	-	-	-
Amtrak Station	-	-	-	-	-	-
Train Station	-	-	-	-	-	-
<b>Hazmat</b>	11	12	12	13	13	14
Hazmat	11	12	12	13	13	14
Hazardous Waste facility	-	-	-	-	-	-
<b>Grand Total</b>	<b>34</b>	<b>44</b>	<b>46</b>	<b>51</b>	<b>73</b>	<b>80</b>



### Critical Infrastructure - Sea Level Rise

Infrastructure Type	Low Rise	Intermediate-Low Rise	Intermediate Rise	Intermediate-High Rise	High Rise	Extreme Rise
---------------------	----------	-----------------------	-------------------	------------------------	-----------	--------------

*\*Note: Real Property Assets are digitized insurance rolls for demonstrating value and ownership and may have overlapping points with other categories such as fire stations and law enforcement.*

*-Sea Level Rise Risk is cumulative*

Table 4-68: Miles of Critical Infrastructure (Linear) in Sea-Level Rise Regions (Unincorporated County)

### Lifelines (miles) - Sea Level Rise

Infrastructure Type (Linear)	Low Rise	Intermediate-Low Rise	Intermediate Rise	Intermediate-High Rise	High Rise	Extreme Rise
Bus Route	-	-	-	-	-	-
Levee (FEMA)	302.8	353.6	380.2	398.3	400.9	401.3
Levee Flood Wall	-	-	-	-	-	-
Levee Cross Section	-	-	-	-	-	-
NG Pipeline	19.3	19.7	19.8	20.7	21.6	23.5
Railroad	2.4	5.4	8.1	12.6	14.9	15.1
Street	200.3	251.5	284.4	317.1	334.6	348.4
4WD trail	-	-	-	-	-	-
Alley	-	-	-	-	-	-
Cul-de-sac	-	-	-	0.0	0.1	0.1
Driveway	13.8	17.8	19.7	21.5	22.6	23.2
Ferry	-	-	-	-	-	-
Interstate	2.7	3.0	3.6	8.4	14.3	16.2
Local road	158.1	199.0	224.7	240.6	245.5	248.8
Local road, major	25.5	31.5	36.1	43.2	47.4	52.3
Primary highway	-	-	-	-	-	-
Ramp	0.0	0.0	0.0	0.1	0.1	0.2
Service road	-	-	-	-	-	-
State/county highway	0.1	0.2	0.3	3.3	4.7	7.6
Traffic circle	-	-	-	-	-	-
Walkway	-	-	-	-	-	-
Transmission Line	29.4	33.4	34.0	35.7	36.6	37.2
<b>Grand Total</b>	<b>554.2</b>	<b>663.6</b>	<b>726.5</b>	<b>784.3</b>	<b>808.7</b>	<b>825.5</b>



#### **4.5.7.9 Future Trends in Development**

Solano County is committed to continuing efforts to address and reduce existing climate-related risks and future impacts on a holistic and programmatic level. With several ordinances and programs that cover a range of climate exposures and related impacts, the county is well equipped to handle current issues of extreme heat events and water supply, but could still likely face increasing challenges as projected changes occur.

The county has practices and organizations in place that help address future issues of sustainability and climate adaptation and works with several committees to reduce its emissions. For instance, it is working with the Agricultural Water Conservation Committee of the Solano Water Advisory Commission to produce fewer water-related GHG emissions. Solano County is finding ways to change behaviors and practices now. The County also adopted the Green Building Standards Code, which exemplifies the actionable steps being taken in order to set a precedent for reduced energy use, building with more sustainable materials, and employing better water conservation tactics. Likewise, the County recently developed a Climate Action Plan. The intent of the plan is to protect the county from any current and projected hazardous conditions associated with climate change. The focus of the plan is on the wellbeing of the county; this also includes maintaining a healthy economy which is both diverse and strong. The plan describes the potential climate change effects in Solano County and includes a GHG inventory and GHG reduction targets, as well as GHG emission reduction measures and actions. (Solano County Climate Action Plan, 2011)

The County also joined Marin Clean Energy (MCE), which allows users to purchase more renewable energy options as part of a progressive assembly bill called Community Choice Aggregation. Beginning in February of 2019, all homes and businesses in unincorporated Solano, as well as the Cities of Benicia and Vallejo, began receiving the power agency's default service, which runs on approximately 60 percent renewable energy. (Marin Clean Energy, 2020) These efforts, however, need to be expanded and applied on a much larger scale, along with mitigation actions identified in this HMP, to address future changes attributed to climate change.

#### **4.5.7.10 Climate Change Hazard Problem Statements**

As part of the mitigation action identification process, the Planning Committee for the county and for each jurisdiction identified issues and weaknesses, also called problem statements, for their respective facilities. Identification was based on the risk assessment and vulnerability analysis utilizing the RAMP mapping tool and climate change data. Climate change hazard problem statements for all participating jurisdictions are listed in Table 4-69; problem statements for all other participating jurisdictions are accessed in Volume 2 of this plan.

Identifying these common issues and weaknesses assists the Planning Committee in understanding the realm of resources needed for mitigation. The goal is to have at least one mitigation action for every problem statement. See Table 5-6 for a full list of mitigation actions and corresponding problem statements that they



address. Each problem statement is coded with a problem number for cross-referencing between Table 4-69 and Table 5-6.

Table 4-69: Climate Change Problem Statements

Problem No.	Hazard Type	Area of Concern	Mitigation Alternatives	Primary Agency	Problem Description	Related MA
ps-CC-SC-174	Climate Change	Impact	PRV - Prevention , PPRO - Property Protection , SP - Structural Projects	Solano County	Climate Change/ Sea Level Rise predicted to increase flooding, inundate some critical infrastructure including bridges, hazmat storage areas, and a police station.	ma-FL-SC-19, ma-FL-SC-21, ma-FL-SC-24
ps-CC-SC-175	Climate Change	Impact	NRP - Natural Resource Protection , SP - Structural Projects	Solano County	Droughts are likely to become more frequent and persistent.	ma-DR-SC-162, ma-DR-SC-163
ps-CC-SC-176	Climate Change	Impact	PRV - Prevention , PPRO - Property Protection , NRP - Natural Resource Protection	Solano County	Intense rainfall events, periodically ones with larger than historical runoff, will continue to affect Solano County	ma-FL-SC-25, ma-FL-SC-26, ma-FL-SC-173, ma-FL-SC-174
ps-CC-SC-177	Climate Change	Impact	PRV - Prevention , PPRO - Property Protection	Solano County	Wildfires will continue, with projections for a longer wildfire season, increased frequency, and expansion of the area susceptible to fire	ma-WF-SC-34, ma-WF-SC-37, ma-WF-SC-40
ps-CC-SC-178	Climate Change	Victim	PRV - Prevention , PE&A - Public Education & Awareness	Solano County	Climate change is expected to lead to increases in the frequency, intensity, and duration of extreme heat events and heat waves in Solano County which are likely to increase the risk of mortality and morbidity due to heat-related illness and exacerbation of existing chronic health conditions	ma-EW-SC-170, ma-EW-SC-171



## Section 5. Mitigation Strategy

The mitigation strategy is the guidebook to future hazard mitigation administration for the county and all other participating jurisdictions, capturing the key outcomes of the MJHMP planning process. The mitigation strategy is intended to reduce vulnerabilities outlined in the previous section with a prescription of policies and physical projects. These mitigation actions should be compatible with existing planning mechanisms and should outline specific roles and resources for implementation success. The Planning Committee conducted the hazard mitigation planning process through typical problem-solving, as did the Steering Committees for each participating jurisdiction. Those steps included:

- Estimate the impacts (see Vulnerability Assessments);
- Describe the problem (see Problem Statements);
- Assess what resources exist to lessen impacts and problem (see Capability Assessments);
- Develop Goals and Objectives to address the problems (see Goals and Objectives); and
- Determine what can be done and develop actions that are appropriate for the community (see Mitigation Action Matrix).

### 5.1 Mitigation Alternatives

During Planning Committee Meeting #3 on February 17, 2021, the MJHMP Planning Committee developed and reviewed mitigation actions with a wide range of alternatives using FEMA's six broad categories of mitigation alternatives described below. The MJHMP Planning Committee considered many mitigation alternatives for implementation under each mitigation category, both county-wide and for individual participating jurisdictions. The Planning Committee chose the most efficient and cost effective alternatives based on assessed vulnerability and risk, the capabilities assessment, and group consensus to address identified hazard problems.

Solano County and participating jurisdictions also met several times before and after the large group meeting to review specific hazard-related problem statements and develop mitigation actions. (Cal-Adapt, 2021) These meetings relied on the following framework to explore mitigation actions.





## PREVENTION (PRV)

Preventative activities keep hazard problems from getting worse and typically are administered through government programs or regulations addressing building and land development. Preventative actions are particularly effective in reducing a community's future vulnerability in areas where development has not occurred, or capital improvements have not yet been substantial. Examples of preventative activities include:

- |                                  |                           |                                     |                                    |
|----------------------------------|---------------------------|-------------------------------------|------------------------------------|
| ▪ Planning and zoning ordinances | ▪ Open space preservation | ▪ Stormwater management regulations | ▪ Capital improvements programming |
| ▪ Building codes                 | ▪ Floodplain regulations  | ▪ Drainage system maintenance       | ▪ Riverine or fault zone setbacks  |

---

## LOCAL PRV ALTERNATIVES

---

1. Establish ingress/ egress standards for future development.
2. Enhance the county's GIS database and capabilities related to hazards information.
3. Maintain detention basins.
4. Conduct detailed studies and mapping of floodplains for the Sacramento River and its tributaries, targeting problematic floodplains.
5. Update and distribute wildfire risk mapping for Solano County.
6. Restrict new development in dam inundation zones.
7. Amend or revise water conservation regulations for landscape design for commercial and residential development with the goal of limiting outdoor watering.



## PROPERTY PROTECTION (PPRO)

Property protection measures involve the modification of existing buildings and structures to help them better withstand the forces of a hazard, or removal of the structures from hazardous locations. Examples include:

- Building elevation
- Retrofitting (e.g., seismic design techniques, etc.)
- Insurance
- Critical facilities protection
- Safe rooms, shutters, shatter resistant glass

## LOCAL PPRO ALTERNATIVES

1. Continue to work with the Solano County Fire Departments to conduct mitigation projects with homeowners. Provide homeowners easily accessible resources for mitigating the risk of wildfire around their homes.
2. Implement additional fuel reduction projects.
3. Remove existing structures from flood areas whenever, and to the greatest extent, possible. Relocate farm work centers from flood risk areas.
4. Encourage privately owned critical facilities (e.g., churches, hotels, other gathering facilities) to evaluate the ability of the buildings to withstand earthquakes and to address any deficiencies identified.
5. Identify and harden critical lifeline systems (i.e., critical public services such as utilities and roads) to meet "Seismic Design Guidelines and Standards for Lifelines" or equivalent standards, such as American Lifelines Alliance (ALA) guidance.
6. Consider participation in the Community Rating System or other ways to increase participation in the NFIP.
7. Review construction plans for all bridges to determine their susceptibility to collapse and retrofit problem bridges.
8. Use flexible piping when extending water, sewer, or natural gas service.
9. Strengthen and retrofit non-reinforced masonry buildings and non-ductile concrete facilities that are particularly vulnerable to ground shaking.
10. Install shutoff valves and emergency connector hoses where water mains cross fault lines.
11. Continue to incentivize drought-tolerant landscape design.



## PUBLIC EDUCATION AND AWARENESS (PE&A)

Public education and awareness activities advise students, staff, parents, nearby residents, and elected officials about hazards, hazardous areas, and mitigation techniques they can use to protect themselves and their property. Measures to educate and inform the public include:

- |  |                                       |                           |  |
|--|---------------------------------------|---------------------------|--|
| ▪ Outreach projects, including neighborhood and community outreach | ▪ Speaker series/demonstration events | ▪ Real estate disclosures | ▪ School children educational programs |
|  | ▪ Hazard mapping                      | ▪ Materials library       | ▪ Hazard expositions                   |

## LOCAL PE&A ALTERNATIVES

1. Continue to work with the Solano County Fire Departments to educate homeowners on reducing the risk of wildfire on their property, including understanding their wildfire risk and free site visits.
2. Distribute public education materials relating to natural hazards, as well as emergency notifications in both English and Spanish.
3. Partner with local water agencies such as the Solano County Water Agency, the Solano Irrigation District, the Suisun City Water Department, etc., in their public education and conservation campaigns in both English and Spanish.
4. Encourage businesses to build financial reserves as part of economic development.
5. Improve information on floodplain management, earthquake preparedness, wildfire mitigation and preparedness, and other hazards on participating jurisdictions' websites.
6. Distribute National Flood Insurance Program and floodplain development information in county libraries for access by the public.
7. Focus a public education program around neighborhoods with egress/ingress issues and narrow roads.
8. Improve interactive hazard mapping resources available to the public.
9. Develop a public information campaign on 72-hour kits.
10. Develop a "Natural Hazard Awareness Week" campaign and conduct corresponding outreach to the community and all interested parties.
11. Conduct outreach to builders, architects, engineers, and inspectors about building susceptibility to earthquakes and proper design and building requirements.
12. Educate the public on the importance of drought-tolerant landscaping, low flow indoor fixtures, and other water savings techniques to better withstand periods of drought.
13. Partner with local programs such as the Solano County Water Agency School Water Education Program.
14. Offer agricultural disaster training and networking opportunities for farmers and agricultural regulatory agencies.



## NATURAL RESOURCE PROTECTION (NRP)

Natural resource protection activities reduce the impact of natural hazards by preserving or restoring natural areas and their protective functions. Such areas include floodplains, wetlands, steep slopes, and sand dunes. Parks, recreation, or conservation agencies and organizations often implement these protective measures. Examples include:

- Floodplain protection
- Vegetation management (e.g., fire resistant landscaping, fuel breaks, etc.)
- Wetland and habitat preservation and restoration
- Watershed management
- Erosion and sediment control

## LOCAL NRP ALTERNATIVES

1. Protect and restore wetlands, riparian areas, and natural buffers to sea level rise. In particular, continue to implement restoration of Solano County rivers.
2. Continue to implement the Solano County Water Agency Stormwater Pollution Prevention Plan.
3. Complete vegetation management projects as prescribed in local Community Wildfire Protection Plans.
4. Encourage and incentivize drought-tolerant landscape design.
5. Establish a priority list of slope failure locations and implement slope stabilization projects in the highest risk areas.



## EMERGENCY SERVICES (ES)

Although not typically considered a mitigation technique, emergency service measures do minimize the impact of a hazard event on people and property. These commonly are actions taken immediately prior to, during, or in response to a hazard event. Examples include:

- Warning systems
- Construction of evacuation routes
- Sandbag staging for flood protection
- Installing temporary shutters on buildings for wind protection

## LOCAL ES ALTERNATIVES

1. Install back up power generators for fire stations, pump houses, emergency shelters, and cooling centers.
2. Develop a website for vulnerable populations to register information such as where the individual in question lives, medications, restrictions, etc. Map registrants or tie information to the Nixle alert system.
3. Focus capital improvements on evacuation or emergency access routes needing attention.
4. Increase the capacity of existing hospitals through retrofits or upgrades, such as isolation wings.
5. Construct or improve egress for wildfire emergencies in wildland-urban interface (WUI) areas.





## STRUCTURAL PROJECTS (SP)

Structural mitigation projects are intended to lessen the impact of a hazard by modifying the environment and natural progression of the hazard event through construction. They are usually designed by engineers and managed or maintained by public works staff. Examples include:

- Stormwater diversions/ detention and retention infrastructure
- Utility Upgrades
- Seismic Retrofits

## LOCAL SP ALTERNATIVES

1. Continue to work with the Solano Resource Conservation District to maintain projects such as Centennial Park and the Solano County Delta Restoration Work.
2. Continue to work with the Napa Solano Audubon Society on projects such as clean water, habitat restoration, and watershed enhancement.
3. Improve water supply and delivery systems to be more resilient during times of drought.
4. Construct and develop alternative water supplies to augment single sources of water delivery.
5. Construct rainwater catchment systems to recharge groundwater in government rights-of-way.
6. Install water monitoring devices and drought-tolerant landscaping on government-owned facilities.
7. Improve stormwater drainage capacity; construct or improve stormwater basins county-wide to accomplish 100-year protection.
8. Construct, install, and maintain warning gauges on local dams as the opportunity or need arises.
9. Create an inventory and establish a priority list for culvert replacement that takes into account fish passage, flood depth reduction, and future losses avoided.
10. Retrofit critical care facilities with enhanced HVAC and isolation areas.



## 5.2 Identifying the Problem

As part of the mitigation action identification process, the MJHMP Planning Committee identified the areas of concern and potential impacts of each of the identified hazards on the community. Developing these “problem statements” for areas of concern, which describe the nature of the consequences or effects of a hazard occurrence on the community and its assets, ensures the identified mitigation actions are tailored to the specific problems created by various hazard scenarios and are specific to each participating jurisdiction. Each jurisdiction’s problem statements are available as part of the Mitigation Action Support Tool (MAST), available for participating jurisdictions on [mitigatehazards.com](http://mitigatehazards.com), and summarized for individual participating jurisdictions in Volume 2 of this plan.

See Section 5.6 for county-wide mitigation actions and Volume 2 for mitigation actions for each participating jurisdiction.

## 5.3 Identifying Benefits

Mitigation actions have a wide range of community benefits for increasing hazard resilience. The benefits are framed by the goals of the plan in Section 5.5. Benefits generated from the mitigation action projects can generally be categorized as governmental benefits and public benefits.

Governmental benefits have an indirect public benefit, as they are aimed at protecting community lifelines such as:

- critical infrastructure such as drinking water, wastewater, heating and cooling infrastructure;
- vulnerable population centers such as schools, childcare facilities, hospitals, residential care facilities, or other emergency or community services; or
- lifelines such as streets, transmission lines, pipelines for natural gas or water infrastructure, or levees.

Other benefits are aimed directly at the public through community benefits such as lower insurance costs through completion of large-scale mitigation activities; or cost-sharing for projects on private property; homeowner, business owner, and renters.

Benefits are largely shaped by identifying the problem (Section 5.2), defining the goals of the hazard mitigation plan (Section 5.5), and then by structuring the best mitigation action plan (Section 5.6) to address the problems and underlying goals, as illustrated in Figure 5-1.

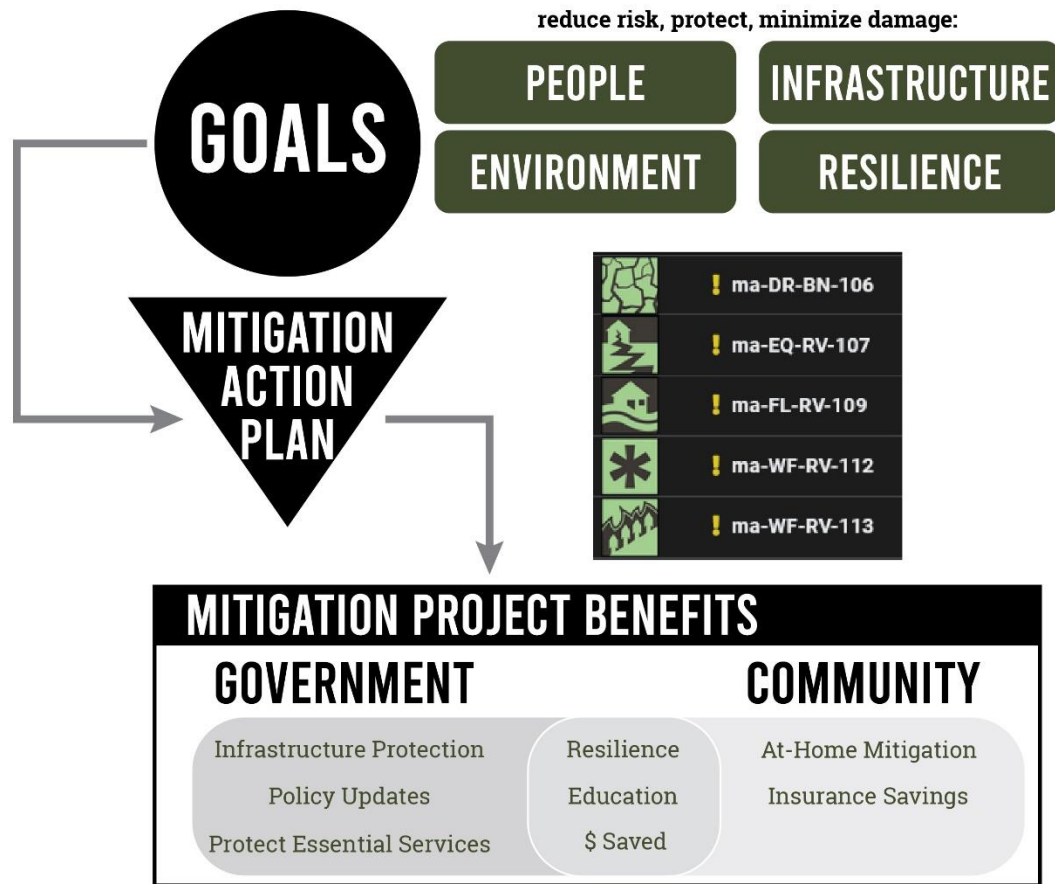


Figure 5-1: Process to Mitigation Project Benefits

## 5.4 Capabilities and Adaptive Capacity Assessment

This section examines Solano County’s planning and regulatory, administrative, technical, financial, educational, and outreach capabilities to augment known issues and weaknesses from identified natural hazards. Volume 2 of this HMP includes a capabilities assessment for each participating jurisdiction as part of their annexes.

Capabilities assessments in this Volume 1 and in Volume 2 include considerations of a community’s adaptive capacity for climate change, as outlined in Cal OES’ 2020 California Adaptation Planning Guide. Adaptive capacity is a community or region’s existing ability to moderate climate change impacts. Assessing adaptive capacity includes analysis of policies, plans, programs, funding, and staffing capacity. (Cal. Adaptation Planning Guide, 2020, p. 94)

The tables in this section explore various local planning mechanisms, administrative capacity, financial capabilities, and education and outreach initiatives. For more information on the regulatory environment surrounding each hazard, see hazard-specific sections of Section 4.5. The columns in each table represent address the following questions:



- Is the existing planning or regulatory mechanism used currently? (Column 1, Status)
- Has the HMP been integrated into the planning mechanism currently so that the named mechanism is currently used in HMP planning? (Column 2, Current Mitigation Use)
- Is there a future opportunity to expand, improve upon, and incorporate this 2020 HMP Update into the planning or regulatory mechanism? (Column 3, Future Opportunity)

The capabilities assessment is easily-digestible and based on color coding to indicate which policies and plans are adequate, need improvement, or for which the HMP could be integrated. Each table includes a legend that explains how each one of these questions are being answered according to the color indicated: green, yellow, or orange.

### 5.4.1 Planning and Regulatory Mitigation Capabilities

The information in Table 5-1 is used to align mitigation actions with the existing planning and regulatory capabilities of the county. Planning and regulatory tools typically used by local jurisdictions to implement hazard mitigation activities are building codes, zoning regulations, floodplain management policies, and other municipal planning documents.

Table 5-1: Solano County Planning and Regulatory Mitigation Capabilities

CAPABILITY ASSESSMENT LEGEND		
Status	Current Mitigation Use	Future Opportunity
Currently in use or present.	Used widely for mitigation.	Opportunity to expand and integrate.
(Sort of) Seldomly used or limited presence.	Limited use in mitigation planning.	Limited opportunity to expand and integrate.
(No) Not present or available.	Not used in mitigation planning.	No opportunity to expand or integrate.

Resource	HMP Integration			Notes / Additional Detail
	Status	Current Mitigation Use	Future Opportunity	
Planning and Regulatory Capabilities				
Construction and Future Development Regulations				
Building Codes				2019 California Building Code
Building Code Effectiveness Grading Schedule (BCEGS) Rating	N/A	N/A	N/A	
Public Protection (ISO Class)	N/A	N/A	N/A	
Hazard Related Development Standards				California Building Code Section 1505 Amended -Roofing (6.3-19); Permits (12.2-41); Duties and responsibilities of the floodplain administrator (12.2-43); Floodways (12.2-54); Separate Map Sheets or Documents (26-103.13)



Resource	HMP Integration			Notes / Additional Detail
	Status	Current Mitigation Use	Future Opportunity	
Planning and Regulatory Capabilities				
Hazard-Specific Ordinance				Flood Damage Prevention (Chpt. 12.2); California Fire Code -Section 110.4 added - hazard abatement (6.3-24); Fire Protection District- Clearance or Order to Clear Land of Flammable Material (12.5-20)
Zoning Ordinance				
Growth Management Ordinance			N/A	
Hazard Reduction Programs (Annually Conducted)				
Capital Improvements Program (CIP) or Plan				
Erosion/Sediment Control Program				Reassessments recommended after 2020 LNU Lightning Fires
Hazard-Related Public Outreach Program				See Education & Outreach Capabilities for more specifics.
Stormwater Management Program (Annual Inspections)				
Seismic Safety Program (Non-structural Inspections)				
Earthquake Modernization Program (Building Safety Inspections)				
Hazard Plans				
General Plan Safety Element				2008 General Plan
Noteworthy Area/ Specific Plan with Hazard Focus				
Community Wildfire Protection Plan (CWPP)				
Wildfire Vulnerability Assessment				
Urban or Integrated Regional Water Management Plan				2015 Solano County Water Agency Urban Water Management Plan
Floodplain Management Plan				This document is the County's Floodplain Mgmt Plan
Stormwater Management Plan				2017 SWCA Water Management Plan
Ground Water Management Plan(s)				Solano Groundwater Sustainability Plan (forthcoming, 2021)
Open Space and Land Management Plan(s)				
Emergency Operations Plan				2017 Solano County Emergency Operations Plan
Climate Action Plan, Vulnerability Ass'mt, or Adaptation Plan				2011 County of Solano Climate Action Plan & Sea Level Rise Strategic Plan
Sustainable Community Plan (SB 375)				ABAG Plan Bay Area 2040 (2017)
Local Delta/ Wetlands Program(s)				Suisun Marsh Local Protection Program; White Slough Specific Plan





Resource	HMP Integration			Notes / Additional Detail
	Status	Current Mitigation Use	Future Opportunity	
Planning and Regulatory Capabilities				
Downtown Plan with hazard focus	N/A	N/A	N/A	
Community Health Assessment(s)				2016 Solano County Community Health Assessment
National Flood Protection Program (NFIP)				
Floodplain Management Regulations				Chpt. 12.2 Flood Damage Prevention
Flood Insurance Education and Technical Assist.				
Flood Hazard Mapping / Re-Mapping				2013 Flood Insurance Study
Community Rating System (CRS)				Class 7



## 5.4.2 Administrative and Technical Capabilities

Table 5-2 shows the administrative and technical capabilities of Solano County.

Table 5-2: Solano County Administrative and Technical Capabilities

CAPABILITY ASSESSMENT LEGEND				
Status	Current Mitigation Use			Future Opportunity
Currently in use or present.	Used widely for mitigation.			Opportunity to expand and integrate.
(Sort of) Seldomly used or limited presence.	Limited use in mitigation planning.			Limited opportunity to expand and integrate.
(No) Not present or available.	Not used in mitigation planning.			No opportunity to expand or integrate.

Resource	HMP Integration			Notes / Additional Detail
	Status	Current Mitigation Use	Future Opportunity	
Administrative and Technical				
Community Planning and Development Services				
Community Planner				
Civil Engineer				Jason Riley, Civil Engineer
Building Code Official				Saeed Irvani, Building Official
Floodplain Administrator				John Millea, Floodplain Manager
Fire Marshall	N/A	N/A	N/A	
Dedicated Public Outreach Personnel				
GIS Specialist and Capability				Stuart Bruce, Senior GIS Analyst
Emergency Manager				Don Ryan
Grant Manager, Writer, or Specialist				Various departmental responsibilities
Other				
Warning Systems/Services				
General				Alert Solano; County would like to pursue sirens as well
Flood				Emergency Alert: Flood Risk: California Department of Water Resources Flood Risk Notification Program Flood Control: Solano County Water Agency
Wildfire				
Geological Hazards				ShakeAlert.org (nation-wide)



## 5.4.3 Financial Capabilities

Table 5-3 identifies the financial tools or resources that Solano County has used to fund mitigation activities.

Table 5-3: Solano County Fiscal Capabilities Summary

CAPABILITY ASSESSMENT LEGEND		
Status	Current Mitigation Use	Future Opportunity
Currently in use or present.	Used widely for mitigation.	Opportunity to expand and integrate.
(Sort of) Seldomly used or limited presence.	Limited use in mitigation planning.	Limited opportunity to expand and integrate.
(No) Not present or available.	Not used in mitigation planning.	No opportunity to expand or integrate.

Resource	HMP Integration			Notes / Additional Detail
	Status	Current Mitigation Use	Future Opportunity	
Fiscal Capabilities				
Financial Resources for Hazard Mitigation				
Levy for Specific Purposes with Voter Approval				Fire Districts as example
Utilities Fees	N/A	N/A	N/A	
Benefit assessments	N/A	N/A	N/A	
System Development Fee	N/A	N/A	N/A	
Various Bonds to Incur Debt				
Withheld Spending in Hazard-Prone Areas				
Stormwater Service Fees				
Capital Improvement Project Funding				



## 5.4.4 Education and Outreach

Table 5-4 lists the local citizen groups that communicate hazard risks.

Table 5-4: Solano County Education/ Outreach Capabilities Summary

CAPABILITY ASSESSMENT LEGEND		
Status	Current Mitigation Use	Future Opportunity
Currently in use or present.	Used widely for mitigation.	Opportunity to expand and integrate.
(Sort of) Seldomly used or limited presence.	Limited use in mitigation planning.	Limited opportunity to expand and integrate.
(No) Not present or available.	Not used in mitigation planning.	No opportunity to expand or integrate.

Resource	HMP Integration			Notes / Additional Detail
	Status	Current Mitigation Use	Future Opportunity	
Education / Outreach Capabilities				
Education/Outreach Resources				
Website Dedicated to Hazard Topics				Get Ready Solano
Dedicated Social Media				
Hazard Info. Avail. at Library/ Planning Desk				
Annual Public Safety Events				Not in 2020 or likely for 2021
Ability to Field Public Tech. Assistance Requests				
Public Safety Newsletters or Printed Outreach				
Fire Safe Councils				
Resource Conservation Districts			N/A	Solano Resource Conservation District
Other				



## 5.4.5 Capability and Adaptive Capacity Opportunities

The above assessment offers ample opportunity for Solano County to consider strengthening its capabilities and adaptive capacity. The reflections in this section are meant as an example, not an exhaustive list of next steps to increase capacity. Prioritized opportunities to increase capacity in the county are shown as mitigation actions in Section 5.6.2.

The Capability Assessment identifies an opportunity to explore revisions to the County Code to incorporate lessons learned from recent wildfires and floods; there is an opportunity for the County to consider weed abatement, siting, access routes, defensible space and fuel breaks, and a variety of other topics. Some guidance documents are also aging, including the specific plan for White Slough.

Related to adaptive capacity, Solano County's climate action plan and sea-level rise strategic plan are now a decade old. There is an opportunity to update these plans and look more in-depth at prioritized climate vulnerabilities and adaptation strategies.

The following federal and state funding opportunities are provided as opportunities to leverage to increase county and jurisdictional capacity.

## 5.4.6 Federal and State Funding Opportunities

Table 5-5 is a list of available funding sources from state and federal agencies. This includes the FEMA Hazard Mitigation Assistance grant program, which is described in more detail in Section 6.3.5. This list serves as a resource and is not exclusive.

Table 5-5: Federal and State Funding Opportunities

Agency / Grant Name	Potential Programs/Grants
<b>FEMA Hazard Mitigation Assistance Grants</b>	See Section 6 for FEMA/ HMA grant details. For more information on current grants visit <a href="https://www.fema.gov/hazard-mitigation-assistance">https://www.fema.gov/hazard-mitigation-assistance</a> <ul style="list-style-type: none"><li>▪ Hazard Mitigation Grant Program (HMGP): <a href="https://www.fema.gov/hazard-mitigation-grant-program">https://www.fema.gov/hazard-mitigation-grant-program</a></li><li>▪ Building Resilient Infrastructure and Communities (BRIC): <a href="https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities">https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities</a></li><li>▪ Flood Mitigation Assistance Grant Program (FMA): <a href="https://www.fema.gov/flood-mitigation-assistance-grant-program">https://www.fema.gov/flood-mitigation-assistance-grant-program</a></li></ul>
<b>Other FEMA Grant Programs</b>	Including: <ul style="list-style-type: none"><li>▪ Assistance to Firefighters Grant Program. Assistance to Firefighters Grants, Fire Prevention &amp; Safety, and Staffing for Adequate Fire and Emergency Response. <a href="https://www.fema.gov/welcome-assistance-firefighters-grant-program">https://www.fema.gov/welcome-assistance-firefighters-grant-program</a></li></ul>





Agency / Grant Name	Potential Programs/Grants
	<ul style="list-style-type: none"> <li>▪ Emergency Management Performance Grants (EMPG). Good for Equipment, Back Up Generators, Etc. <a href="https://www.fema.gov/emergency-management-performance-grant-program">https://www.fema.gov/emergency-management-performance-grant-program</a></li> <li>▪ Regional Catastrophic Preparedness Grant Program (RCPGP). Housing and Logistics and Supply Chain Management, encouraging innovative regional solutions to issues related to catastrophic incidents, and building on existing regional efforts. <a href="https://www.fema.gov/regional-catastrophic-preparedness-grant-program">https://www.fema.gov/regional-catastrophic-preparedness-grant-program</a></li> </ul>
U.S. Dept. of Energy / Energy Efficiency and Conservation Block Grant Program	<p><i>Provides funding for weatherization of structures and development of building codes and ordinances to ensure energy efficiency and restoration of older homes.</i></p> <p><a href="https://www.energy.gov/eere/wipo/energy-efficiency-and-conservation-block-grant-program">https://www.energy.gov/eere/wipo/energy-efficiency-and-conservation-block-grant-program</a></p>
State and County Community Development Dept. Block Grants (CDBG)	<p>Through California Dept. of Housing and Community Development (HCD) programs include:</p> <ul style="list-style-type: none"> <li>▪ Community Development (CD)</li> <li>▪ Economic Development (ED)</li> <li>▪ Disaster Recovery Initiative (DRI)</li> <li>▪ Neighborhood Stabilization Program (NSP)</li> <li>▪ <a href="https://www.hcd.ca.gov/grants-funding/active-funding/cdbg.shtml">https://www.hcd.ca.gov/grants-funding/active-funding/cdbg.shtml</a></li> </ul>
Cal OES  Proposition 1B Grants Programs	<p>The Highway Safety, Traffic Reduction, Air Quality and Port Security Bond Act of 2006, approved by the voters as Proposition 1B at the November 7, 2006 general election, authorizes the issuance of \$19,925,000,000 in general obligation bonds for specified purposes, including grants for transit system safety, security, and disaster response projects.</p> <p><a href="http://www.caloes.ca.gov/cal-oes-divisions/grants-management/homeland-security-prop-1b-grant-programs/proposition-1b-grant">http://www.caloes.ca.gov/cal-oes-divisions/grants-management/homeland-security-prop-1b-grant-programs/proposition-1b-grant</a></p>
California Proposition 1: the Water Bond (AB 1471)	<p>Authorize \$7.545 billion in general obligation bonds for state water supply infrastructure projects, such as public water system improvements, surface and groundwater storage, drinking water protection, water recycling and advanced water treatment technology, water supply management and conveyance, wastewater treatment, drought relief, emergency water supplies, and ecosystem and watershed protection and restoration.</p> <p>The State Water Resources Control Board (State Water Board) will administer Proposition 1 funds for five programs. The estimated implementation schedule for each is outlined in five categories:</p> <ul style="list-style-type: none"> <li>▪ Small Community Wastewater</li> <li>▪ Water Recycling</li> <li>▪ Drinking Water</li> <li>▪ Stormwater</li> </ul>



Agency / Grant Name	Potential Programs/Grants
	<ul style="list-style-type: none"><li>Groundwater Sustainability</li></ul> <p><a href="http://www.waterboards.ca.gov/water_issues/programs/grants_loans/proposition1.shtml">http://www.waterboards.ca.gov/water_issues/programs/grants_loans/proposition1.shtml</a></p>
Assistance to Firefighters Grant Program (AFG); Fire Prevention and Safety (FP&S)	<p>The primary goal of the FP&amp;S Grants is to enhance the safety of the public and firefighters with respect to fire and fire-related hazards. The Grant Programs Directorate administers the FP&amp;S Grants as part of the AFG Program. FP&amp;S Grants are offered to support projects in two activity areas:</p> <p>1) Fire Prevention and Safety (FP&amp;S) Activity: Activities designed to reach high-risk target groups and mitigate the incidence of death and injuries caused by fire and fire-related hazards.</p> <p>2) Research and Development (R&amp;D) Activity: To learn more about how to prepare to apply for a project under this activity, please see the FP&amp;S Research and Development Grant Application Get Ready Guide.</p> <p><a href="https://www.fema.gov/fire-prevention-safety-grants">https://www.fema.gov/fire-prevention-safety-grants</a></p>
California Housing and Community Development (HCD) Emergency Solutions Grant (ESG) Program	<p><i>To fund projects that serve homeless individuals and families with supportive services, emergency shelter/transitional housing, assisting persons at risk of becoming homeless with homelessness prevention assistance, and providing permanent housing to the homeless population. The Homeless Emergency Assistance and Rapid Transition to Housing (HEARTH) Act of 2009 places new emphasis on assisting people to quickly regain stability in permanent housing after experiencing a housing crisis or homelessness.</i></p> <p><a href="http://www.hcd.ca.gov/fa/esg/index.html">http://www.hcd.ca.gov/fa/esg/index.html</a></p>
CalTrans Division of Local Assistance / Safe Routes to School Program	<p>California Dept. of Transportation. Federal funding administered via Caltrans. Local 10% match is the minimum requirement.</p> <p><a href="http://www.dot.ca.gov/hq/LocalPrograms/saferoutes/saferoutes.htm">http://www.dot.ca.gov/hq/LocalPrograms/saferoutes/saferoutes.htm</a></p> <p>Active transportation grant program. Creating mobility and connectivity. Prioritize projects, and preparation of PED for active transportation projects.</p>
Property Assessed Clean Energy (PACE) Programs	<p>PACE financing allows property owners to fund energy efficiency, water efficiency, and renewable energy projects with little or no up-front costs. With PACE, residential and commercial property owners living within a participating district can finance up to 100% of their project and pay it back over time as a voluntary property tax assessment through their existing property tax bill.</p>



Agency / Grant Name	Potential Programs/Grants
<b>HazMat Emergency Preparedness Grant</b>	<p>The purpose of this grant program is to increase effectiveness in safely and efficiently handling hazardous materials accidents and incidents; enhance implementation of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA); and encourage a comprehensive approach to emergency training and planning by incorporating the unique challenges of responses to transportation situations.</p> <p><a href="http://www.caloes.ca.gov/cal-oes-divisions/fire-rescue/hazardous-materials/hazmat-emergency-preparedness-grant">http://www.caloes.ca.gov/cal-oes-divisions/fire-rescue/hazardous-materials/hazmat-emergency-preparedness-grant</a></p>
<b>CERT Program Manager Course</b>	<p>The purpose of this Community Emergency Response Team (CERT) Program Manager course is to prepare CERT Program Managers for the tasks required to establish and sustain an active local CERT program.</p> <p><a href="http://www.californiavolunteers.org/index.php/CERT/PM/">http://www.californiavolunteers.org/index.php/CERT/PM/</a></p>
<b>California Residential Mitigation Program</b>	<p>The California Residential Mitigation Program (CRMP) was established to carry out mitigation programs to assist California homeowners who wish to seismically retrofit their houses.</p> <p><a href="http://www.californioresidentialmitigationprogram.com/">http://www.californioresidentialmitigationprogram.com/</a></p>
<b>Earthquake Brace + Bolt (EBB)</b>	<p>EBB, part of the California Residential Mitigation Program, was developed to help homeowners lessen the potential for damage to their houses during an earthquake by offering eligible homeowners up to a \$3,000 incentive to seismically retrofit their homes.</p> <p><a href="https://www.earthquakebracebolt.com/">https://www.earthquakebracebolt.com/</a></p>
<b>California Air Resources Board Air Pollution Incentives, Grants and Credit Programs</b>	<p>These programs have hundreds of millions of dollars in grants available over the next several years to reduce emissions from on- and off-road vehicles and equipment.</p> <p><a href="https://www.arb.ca.gov/ba/fininfo.htm">https://www.arb.ca.gov/ba/fininfo.htm</a></p>
<b>California Department of Water Resources Grants and Loans</b>	<p>Agency offers a variety of grants and loans related to integrated regional water management, flood mitigation, water conservation and efficiency, environmental restoration, groundwater, water quality, and water supply.</p> <p><a href="https://water.ca.gov/Work-With-Us/Grants-And-Loans">https://water.ca.gov/Work-With-Us/Grants-And-Loans</a></p>
<b>US Bureau of Reclamation WaterSMART Grants</b>	<p>Annual funding available for:</p> <ul style="list-style-type: none"> <li>▪ Water Reclamation and Reuse</li> <li>▪ Drought Resiliency Project</li> <li>▪ Water and Energy Efficiency Grant</li> </ul> <p><a href="https://www.usbr.gov/watersmart/">https://www.usbr.gov/watersmart/</a></p>



## 5.5 Mitigation Goals

Hazard mitigation plans must identify goals for reducing long-term vulnerabilities to identified hazards (44 C.F.R. § 201.6(c)(3)(i)). The HMPC established a set of goals for this plan, based on review of Solano County's previous goals, goals from other jurisdictions' hazard mitigation plans, and from the California Hazard Mitigation Plan. The HMPC also considered the preliminary risk assessment and public outreach results. The HMPC ultimately determined to adopt similar goals to the California Hazard Mitigation Plan.

Goals discussed in this section describe what future actions should occur to continue mitigating hazards. The goals form the basis for the development of the Mitigation Action Strategy and specific mitigation projects. The process consists of 1) setting goals, 2) considering mitigation alternatives, 3) identifying strategies or "actions", and 4) developing a prioritized action plan resulting in a mitigation strategy.

The goals and mitigation actions in this plan all support each other. Actions were prioritized based on their ability to achieve multiple goals. A mitigation strategy is considered effective based on how well the goals of the strategy are achieved. The abbreviations reflected in parenthesis below are used to match mitigation actions with each goal in Table 5-6.

The following are the goals for this plan:

**Goal 1: Significantly reduce risk of injuries and loss of life during disaster events. ("People")**

**Goal 2: Minimize damage to critical infrastructure and property and minimize interruption of essential services and activities. ("Infrastructure")**

**Goal 3: Protect the environment. ("Environment")**

**Goal 4: Promote community resilience through integration of hazard mitigation with public policy and standard business practices. ("Resilience")**

## 5.6 County-Wide Mitigation Actions

Mitigation actions were developed based upon planning committee priorities, risk assessment results, and mitigation alternatives. Most importantly, the newly-developed mitigation actions acknowledge updated risk assessment information outlined in Section 4.

Mitigation actions are available to jurisdictions on MAST, linked through [mitigatehazards.com](http://mitigatehazards.com); the format allows for regular updating and easy sorting by jurisdiction and hazard. Figure 5-2 illustrates the mitigation actions entered through MAST.

Table 5-6 establishes mitigation actions for the county. Each participating jurisdiction developed mitigation actions specifically tailored to their vulnerabilities and capabilities. Those mitigation actions are available

as part of the planning process library, which is summarized in Section 3, STEP 3: Develop a Mitigation Strategy, are available on the Mitigation Action Application, and available for each individual participating jurisdiction in Volume 2 of this plan.

Some mitigation actions support ongoing activities of participating jurisdictions, while other actions are intended to be completed when funding is available. All mitigation actions will be reviewed annually.

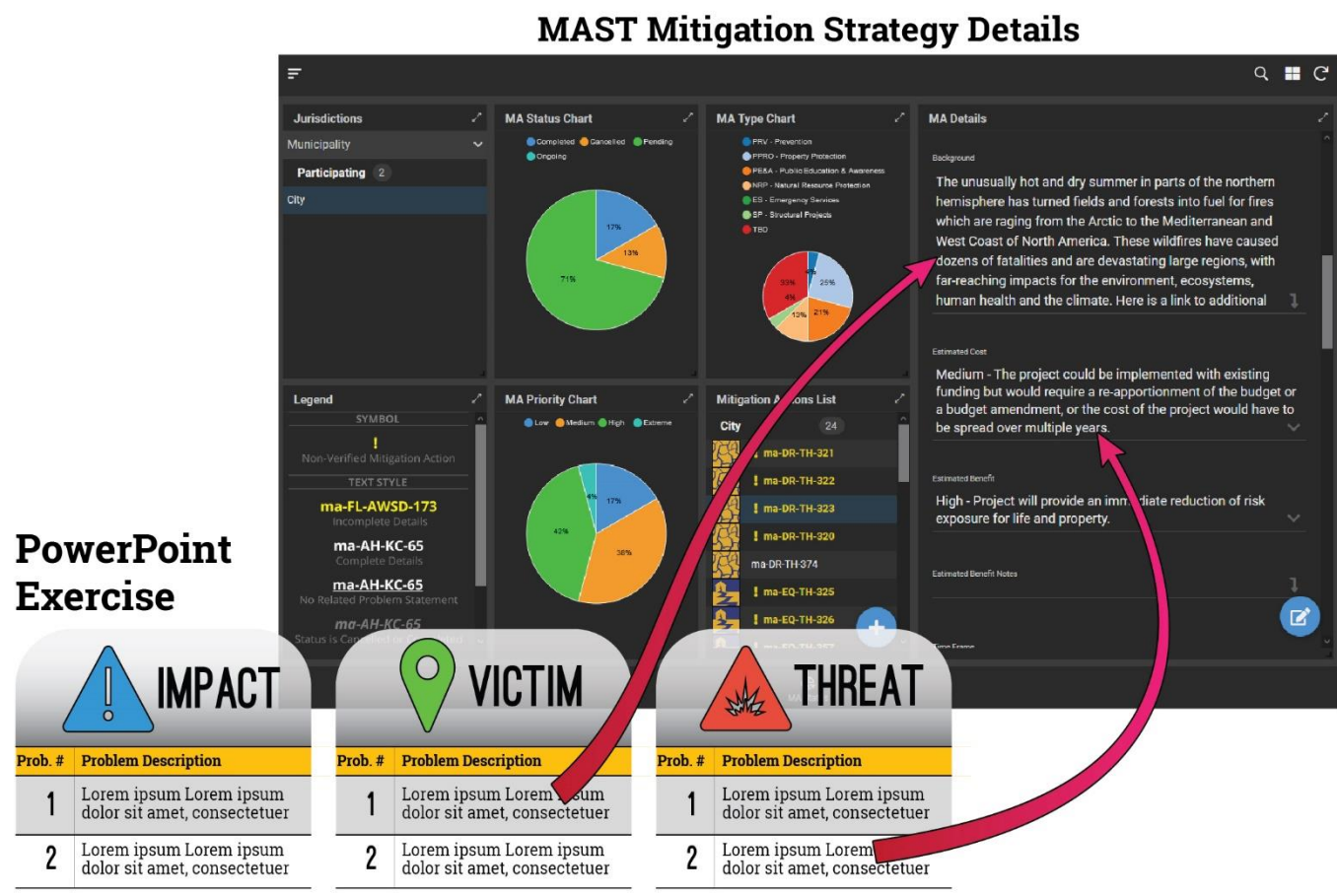


Figure 5-2: Mitigation Action Application

5.6.1 Prioritization of Mitigation Actions

Implementing the identified mitigation can be overwhelming for any local jurisdiction or district, especially with limited staffing and fiscal resources; prioritizing the identified mitigation actions can help greatly with this. To ensure this MJHMP realistically reflects available resources, mitigation actions are prioritized by considering the cost/benefit review, public input, and MJHMP Planning Committee agreement.





### 5.6.1.1 Cost/Benefit Review

The action plan must be prioritized according to a cost/benefit analysis of the proposed projects and their associated costs (44 C.F.R. §201.6(c)(3)(iii)). The benefits of proposed projects were weighed against estimated costs as part of the project prioritization process. This review does not meet FEMA Hazard Mitigation Grant Program (HMGP) and Building Resilient Infrastructure and Communities (BRIC) grant program requirements. A less formal, less costly approach was used because some projects may not be implemented for up to 10 years, and associated costs and benefits could change dramatically in that time. Parameters were established for assigning subjective ratings (high, medium, and low) to the costs and benefits of these projects. Cost ratings were defined as follows:

- **High**—Existing funding will not cover the cost of the project; implementation would require new revenue through an alternative source (for example, bonds, grants, and fee increases).
- **Medium**—The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
- **Low**—The project could be funded under the existing budget. The project is part of or can be part of an ongoing existing program.

Benefit ratings were defined as follows:

- **High**—Project will provide an immediate reduction of risk exposure for life and property.
- **Medium**—Project will have a long-term impact on the reduction of risk exposure for life and property, or will not provide an immediate reduction in the risk exposure for property.
- **Low**—Long-term benefits of the project are difficult to quantify in the short term.

Using this approach, projects with positive benefit versus cost ratios (such as high over high, high over medium, medium over low, etc.) are considered cost-beneficial and are prioritized accordingly. For many of the strategies identified in this action plan, the partners may seek financial assistance under the HMGP or BRIC programs, both of which require detailed cost/benefit analyses. These analyses will be performed on projects at the time of application using the FEMA cost/benefit model. For projects not seeking financial assistance from grant programs that require detailed analysis, the partners reserve the right to define "benefits" according to parameters that meet the goals and objectives of this HMP.



### 5.6.1.2 Public Input

An eight-question community survey was distributed by Solano County via a number of online platforms, including Facebook posts by participating jurisdictions and a notification across the SolanoAlert system. A total of 1,842 survey responses were collected in English and an additional eight responses were collected in Spanish. The results of the survey were used to ensure that the priorities of the county and participating jurisdictions match those of the residents and community members.

Specific question responses heavily influenced the prioritization of mitigation actions, including the following summarized questions and responses:

- **Property at risk?** 73.1% of participants believe their property is at risk from a natural hazard disaster.
- **Hazards experienced?** Respondents have experienced the following hazards:
  - Pandemic (55.4%)
  - Wildfire (44.1%)
  - Earthquake (51%)
  - Drought (38.4%)
  - Only 7.8% of respondents had not experienced a natural hazard.
- **Consider risk of hazards with home purchase?** 57.6% of participants considered the risk of naturally occurring hazards when choosing their home.
- **Informed about hazard risks?** 47.6% of respondents felt they were well-informed about the dangers of natural hazards, while 38.4% felt somewhat informed and 13.9% felt uninformed.
- **What incentives would encourage home protection from hazards?** Top three responses:
  - Rebate programs or reimbursement of upfront costs (69.6%)
  - Insurance premium discounts (64.4%)
  - Building permit fee waivers (47.4%)
- **Top mitigation projects for local governments to focus on?** Top responses:
  - Work on improving damage resistance of utilities (79%)
  - Ensure emergency shelters, the Emergency Operations Center, and communication towers have backup power generators (62.6%)
  - Retrofit and strengthen essential facilities (60.5%)
  - Replant vegetation after wildfires to prevent landslides and flooding (60.1%)
  - Replace inadequate or vulnerable bridges and roadways (58.7%)
  - Inform property owners of ways they can mitigate damage to their properties (56.9%)

As a result of the public survey, jurisdictions adjusted many of the priorities of various mitigation actions. Some were moved from medium to high priority based on community feedback, or vice versa. Several jurisdictions added public outreach and education to their mitigation actions in response to survey emphasis on the same. Spanish-speaking outreach appears to be important moving forward from survey results as well. The survey results also included a higher-than-anticipated response rate for air quality concerns and extended power outages, both of which may be emphasized to a higher degree in the MJHMP.



The complete survey results summary can be found in Appendix B.

## 5.6.2 Mitigation Action Plan

Table 5-6 lists each mitigation action for Solano County. Each participating jurisdiction developed unique mitigation actions as well, targeted at their own unique priorities and vulnerabilities; these are available on MAST (for participating jurisdictions only) and in Volume 2 of this MJHMP. Each mitigation action identifies the overall mitigation goal being addressed, responsible party, time frame, potential funding source, implementation steps and resources needed to implement these priority mitigation actions. As a living document, hazard problem statements and mitigation activities will be updated by participating jurisdictions through MAST.

The detail provided in MAST and captured in Table 5-6 meets the regulatory requirements of FEMA and DMA 2000.

The actions detailed in Table 5-6 and MAST contain both new action items developed for this plan update, as well as old actions that were yet to be completed from the 2014 plan. The action numbers indicate whether the action is new or from the 2014 plan. A sample of the action number nomenclature is presented in Figure 5-3.

Section 2, What's New, illustrates progress towards new and previous mitigation actions and indicates how many actions have been completed, deleted, or are ongoing or pending.

*Important to note: The Planning Committee realizes that new needs and priorities may arise as a result of a disaster or other circumstances and reserves the right to support new actions and edit existing actions as necessary as long as they conform to the overall goals of the plan.*

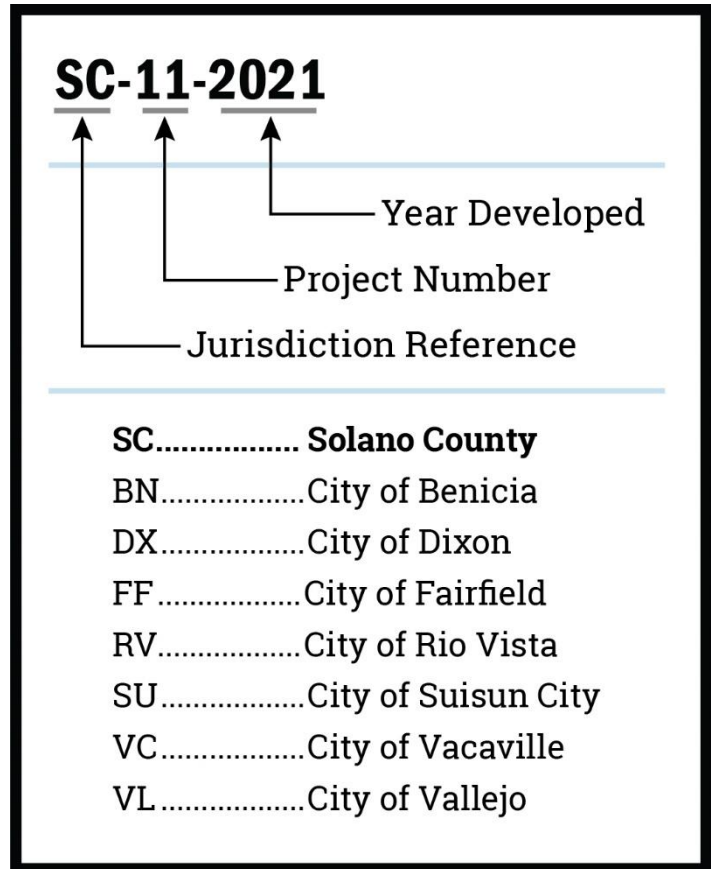


Figure 5-3: Mitigation Action Number Key

Table 5-6: County Wide Mitigation Action Tracker

Mitigation No.	Hazard Type	Mitigation Type	Status	Year	Primary Agency	Title/Description	Responsible Party	Estimated Cost	Estimated Benefit	Time Frame	HMA Activity Type	Potential Grant Source	Priority	Related Goal(s)	Related Problem Statements
ma-AH-SC-4	All Hazard	ES - Emergency Services	Ongoing	2014	Solano County	Ensure Hospital Disaster Preparedness Plan is updated	DRM, OES	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	Medium - Project will have a long-term impact on the reduction of risk exposure for life and property, or project will not provide an immediate reduction in the risk exposure for property.	3-5 Years	Planning	HMGP / BRIC	Medium	Goal 1: People , Goal 4: Resilience	ps-EQ-SC-125
ma-AH-SC-5	All Hazard	PE&A - Public Education & Awareness	Ongoing	2014	Solano County	Develop a multi-hazard community outreach plan that specifically includes outreach on hazard preparedness and mitigation to youth.	OES, Local Fire Districts, Public Information Officer	Low - The project could be funded under the existing budget. The project is part of or can be part of an ongoing existing program.	Medium - Project will have a long-term impact on the reduction of risk exposure for life and property, or project will not provide an immediate reduction in the risk exposure for property.	1-3 Years	5%	HMGP / BRIC	Medium	Goal 1: People , Goal 4: Resilience	ps-FL-SC-116, ps-SF-SC-133
ma-AH-SC-7	All Hazard	ES - Emergency Services	Ongoing	2014	Solano County	Sponsor the formation and training of Community Emergency Response Teams (CERTs)	OES, Local Fire Districts	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	Medium - Project will have a long-term impact on the reduction of risk exposure for life and property, or project will not provide an immediate reduction in the risk exposure for property.	1-3 Years	Project	HMGP / BRIC	Medium	Goal 1: People , Goal 4: Resilience	ps-SF-SC-133, ps-EQ-SC-125
ma-AH-SC-8	All Hazard	ES - Emergency Services	Ongoing	2014	Solano County	Expand or participate in expanding traditional disaster exercises and drills involving County emergency personnel.	OES	Low - The project could be funded under the existing budget. The project is part of or can be part of an ongoing existing program.	Medium - Project will have a long-term impact on the reduction of risk exposure for life and property, or project will not provide an immediate reduction in the risk exposure for property.	1-3 Years	Project	HMGP / BRIC	Medium	Goal 4: Resilience	ps-FL-SC-116
ma-AH-SC-9	All Hazard	PE&A - Public Education & Awareness	Ongoing	2014	Solano County	Convene Hazard Mitigation Group to work together to ensure County resiliency	OES, Public Information Officer	Low - The project could be funded under the existing budget. The project is part of or can be part of an ongoing existing program.	Medium - Project will have a long-term impact on the reduction of risk exposure for life and property, or project will not provide an immediate reduction in the risk exposure for property.	1-3 Years	Project	HMGP / BRIC	Medium	Goal 4: Resilience	ps-SF-SC-133
ma-AH-SC-10	All Hazard	PE&A - Public Education & Awareness	Ongoing	2014	Solano County	Update GIS Database/Mapping on infrastructure and systems	OES, DRM Public Works, Assessor, Local Fire Districts, Sheriff's Office	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	Ongoing	Planning	HMGP / BRIC	Medium	Goal 2: Infrastructure , Goal 4: Resilience	ps-FL-SC-118

Mitigation No.	Hazard Type	Mitigation Type	Status	Year	Primary Agency	Title/Description	Responsible Party	Estimated Cost	Estimated Benefit	Time Frame	HMA Activity Type	Potential Grant Source	Priority	Related Goal(s)	Related Problem Statements
ma-AH-SC-11	All Hazard	PE&A - Public Education & Awareness	Pending	2014	Solano County	Add Sirens to Community Warning System	OES, Information Technology, Public Information Officer	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	1-3 Years	Project	HMGP / BRIC	High	Goal 1: People	ps-EQ-SC-125, ps-WF-SC-109
ma-AH-SC-12	All Hazard	PRV - Prevention	Ongoing	2014	Solano County	Develop Farm and Animal Emergency Preparedness and Response Plans	OES, Agricultural Commissioner, Solano Farm Bureau, Agricultural Industry	Low - The project could be funded under the existing budget. The project is part of or can be part of an ongoing existing program.	Medium - Project will have a long-term impact on the reduction of risk exposure for life and property, or project will not provide an immediate reduction in the risk exposure for property.	5-10 Years	Planning	HMGP / BRIC	Medium	Goal 3: Environment , Goal 4: Resilience	ps-WF-SC-109
ma-AH-SC-14	All Hazard	ES - Emergency Services	Pending	2014	Solano County	Conduct Additional Evacuation and Emergency Planning for Solano County	DRM Building & Safety, Local Fire Districts	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	1-3 Years	Planning	HMGP / BRIC	Extreme	Goal 1: People	ps-EQ-SC-125, ps-SF-SC-134, ps-EQ-SC-123, ps-EQ-SC-124, ps-FL-SC-116, ps-WF-SC-104, ps-WF-SC-107
ma-DR-SC-162	Drought	PRV - Prevention , NRP - Natural Resource Protection	Pending	2021	Solano County	Replace irrigated landscaping with drought resistant vegetation and increase use of recycled water for irrigation in County-owned facilities	Department of Resource Management/ Pub Works; Solano County Water Agency	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	1-3 Years	Project	HMGP / BRIC	Medium	Goal 2: Infrastructure , Goal 3: Environment	ps-DR-SC-126, ps-CC-SC-175
ma-DR-SC-163	Drought	PRV - Prevention	Pending	2021	Solano County	Update County's land use code to include incentives for new development to implement drought tolerant landscaping that requires less water.	Department of Resource Management	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	1-3 Years	Planning	HMGP / BRIC	High	Goal 3: Environment	ps-DR-SC-127, ps-CC-SC-175
ma-DR-SC-201	Drought	PRV - Prevention	Pending	2021	Solano County	Develop countywide drought and water shortage contingency plan focused on small water systems and individual domestic wells.	Resource Mgmt; coordinate with SCWA	High - Existing funding will not cover the cost of the project; implementation would require new revenue through an alternative source (for example, bonds, grants, and fee increases).	High - Project will provide an immediate reduction of risk exposure for life and property.	3-5 Years	Planning	HMGP / BRIC	High	Goal 4: Resilience	ps-DR-SC-179



Mitigation No.	Hazard Type	Mitigation Type	Status	Year	Primary Agency	Title/Description	Responsible Party	Estimated Cost	Estimated Benefit	Time Frame	HMA Activity Type	Potential Grant Source	Priority	Related Goal(s)	Related Problem Statements
ma-DR-SC-202	Drought	PRV - Prevention	Pending	2021	Solano County	Strengthen review of groundwater supplies in development review standards.	Resource Mgmt, Planning Dept.	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	3-5 Years	Planning	HMGP / BRIC	High	Goal 4: Resilience	ps-DR-SC-179
ma-EQ-SC-16	Earthquake	ES - Emergency Services	Ongoing	2014	Solano County	Evaluate critical heath facilities	Hospitals are primary, DHS, PH, EMS, General Services	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	Medium - Project will have a long-term impact on the reduction of risk exposure for life and property, or project will not provide an immediate reduction in the risk exposure for property.	3-5 Years	Planning	HMGP / BRIC	Medium	Goal 1: People , Goal 2: Infrastructure	ps-EQ-SC-125
ma-EQ-SC-17	Earthquake	SP - Structural Projects	Ongoing	2014	Solano County	Conduct storage tank evaluations	SID Administration, Engineering, Water and Power Operations, Joint Power Authorities and/or special Improvement Districts	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	Medium - Project will have a long-term impact on the reduction of risk exposure for life and property, or project will not provide an immediate reduction in the risk exposure for property.	3-5 Years	Project	HMGP / BRIC	Medium	Goal 2: Infrastructure	ps-EQ-SC-124
ma-EQ-SC-164	Earthquake	PRV - Prevention	Pending	2021	Solano County	Draft Natural Gas Shut-Off Valve Ordinance	Community Development	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	1-3 Years	Planning	HMGP / BRIC	High	Goal 2: Infrastructure	ps-EQ-SC-119
ma-EQ-SC-165	Earthquake	PRV - Prevention , SP - Structural Projects	Pending	2021	Solano County	Inspect buildings and install seismic shut-off valves on gas fixtures on County-owned critical facilities and lines which currently lack them.	Public Works/ Facilities Maintenance	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	1-3 Years	Project	HMGP / BRIC	High	Goal 2: Infrastructure	ps-EQ-SC-120

Mitigation No.	Hazard Type	Mitigation Type	Status	Year	Primary Agency	Title/Description	Responsible Party	Estimated Cost	Estimated Benefit	Time Frame	HMA Activity Type	Potential Grant Source	Priority	Related Goal(s)	Related Problem Statements
ma-EQ-SC-166	Earthquake	SP - Structural Projects	Pending	2021	Solano County	Retrofit county-owned historic buildings, and ensure newer building codes are implemented and reinforced throughout the county.	Public Works/ Comm Dev	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	Ongoing	Planning	HMGP / BRIC	High	Goal 2: Infrastructure	ps-EQ-SC-121, ps-EQ-SC-122
ma-EQ-SC-167	Earthquake	PRV - Prevention , SP - Structural Projects	Pending	2021	Solano County	Inspect and conduct appropriate retrofits to the 28 County bridges within the 6.8 Concord Green Valley EQ scenario.	Department of Resource Management/ Public Works	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	3-5 Years	Project	HMGP / BRIC	High	Goal 2: Infrastructure	ps-EQ-SC-123
ma-EQ-SC-168	Earthquake	SP - Structural Projects	Pending	2021	Solano County	Conduct annual inspections for weak levees and maintain or improve existing levees in critical condition.	Public Works	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	Annually	N/A	Internal Funding	High	Goal 1: People , Goal 2: Infrastructure	ps-EQ-SC-124
ma-EQ-SC-169	Earthquake	PRV - Prevention , PE&A - Public Education & Awareness	Pending	2021	Solano County	Conduct public education campaign on earthquake preparedness and seismic housing retrofits.	County PIO	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	Annually	5%	HMGP / BRIC	High	Goal 1: People , Goal 4: Resilience	ps-EQ-SC-125
ma-EW-SC-170	Extreme Weather	ES - Emergency Services	Pending	2021	Solano County	Acquire back up generator for Senior Center to ensure ability to provide cooling center.	OES	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	1-3 Years	Project	HMGP / BRIC	High	Goal 1: People , Goal 4: Resilience	ps-EW-SC-129, ps-CC-SC-178

Mitigation No.	Hazard Type	Mitigation Type	Status	Year	Primary Agency	Title/Description	Responsible Party	Estimated Cost	Estimated Benefit	Time Frame	HMA Activity Type	Potential Grant Source	Priority	Related Goal(s)	Related Problem Statements
ma-EW-SC-171	Extreme Weather	PE&A - Public Education & Awareness	Pending	2021	Solano County	Conduct a public education campaign to increase awareness of the negative effects of extreme heat; include information on steps that households can take to mitigate these effects such as the location of emergency cooling centers.	County PIO	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	Annually	5%	HMGP / BRIC	High	Goal 1: People , Goal 4: Resilience	ps-EW-SC-129, ps-CC-SC-178
ma-EW-SC-172	Extreme Weather	PRV - Prevention , NRP - Natural Resource Protection	Pending	2021	Solano County	Replace dying or dead evergreen vegetation on City properties and in rights-of-way with wind resistant vegetation and implement annual tree trimming program.	Department of Resource Management/ Public Works	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	Annually	Project	HMGP / BRIC	High	Goal 2: Infrastructure , Goal 3: Environment	ps-EW-SC-131
ma-FL-SC-19	Flood	SP - Structural Projects	Ongoing	2014	Solano County	Elevate Buildings in the Repetitive Loss Areas	Department of Resource Management	High - Existing funding will not cover the cost of the project; implementation would require new revenue through an alternative source (for example, bonds, grants, and fee increases).	High - Project will provide an immediate reduction of risk exposure for life and property.	Ongoing	Project	HMGP / BRIC , FMA	High	Goal 2: Infrastructure	ps-EW-SC-128, ps-FL-SC-116, ps-CC-SC-174
ma-FL-SC-20	Flood	PPRO - Property Protection	Ongoing	2014	Solano County	Coordinate the Grants for Building Elevation Between the County and SCWA	DRM, OES, SCWA	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	Medium - Project will have a long-term impact on the reduction of risk exposure for life and property, or project will not provide an immediate reduction in the risk exposure for property.	Ongoing	Project	HMGP / BRIC , FMA	Medium	Goal 2: Infrastructure	ps-EW-SC-128
ma-FL-SC-21	Flood	SP - Structural Projects	Ongoing	2014	Solano County	Construct priority detention basin projects and/or other flood improvements. Identify priority projects subject to future sea-level rise impacts.	In partnership with SCWA	High - Existing funding will not cover the cost of the project; implementation would require new revenue through an alternative source (for example, bonds, grants, and fee increases).	High - Project will provide an immediate reduction of risk exposure for life and property.	5-10 Years	Project	HMGP / BRIC	Medium	Goal 4: Resilience	ps-FL-SC-112, ps-FL-SC-116, ps-CC-SC-174
ma-FL-SC-24	Flood	PE&A - Public Education & Awareness	Ongoing	2014	Solano County	Initiate an annual notification of flood risk to the owners of all buildings in special flood hazard areas	DRM, OES, Public Information Officer	Low - The project could be funded under the existing budget. The project is part of or can be part of an ongoing existing program.	Medium - Project will have a long-term impact on the reduction of risk exposure for life and property, or project will not provide an immediate reduction in the risk exposure for property.	1-3 Years	5%	HMGP / BRIC , FMA	Medium	Goal 4: Resilience	ps-FL-SC-116, ps-CC-SC-174

Mitigation No.	Hazard Type	Mitigation Type	Status	Year	Primary Agency	Title/Description	Responsible Party	Estimated Cost	Estimated Benefit	Time Frame	HMA Activity Type	Potential Grant Source	Priority	Related Goal(s)	Related Problem Statements
ma-FL-SC-25	Flood	SP - Structural Projects	Ongoing	2014	Solano County	Widen channels for the Ulatis Flood Control Project	SCWA	High - Existing funding will not cover the cost of the project; implementation would require new revenue through an alternative source (for example, bonds, grants, and fee increases).	Medium - Project will have a long-term impact on the reduction of risk exposure for life and property, or project will not provide an immediate reduction in the risk exposure for property.	3-5 Years	Project	HMGP / BRIC , FMA	Medium	Goal 1: People , Goal 4: Resilience	ps-FL-SC-113, ps-CC-SC-176
ma-FL-SC-26	Flood	SP - Structural Projects	Ongoing	2014	Solano County	Conduct outlet improvements for Green Valley Flood Control Project	SCWA	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	3-5 Years	Project	HMGP / BRIC	High	Goal 2: Infrastructure , Goal 4: Resilience	ps-FL-SC-115, ps-CC-SC-176
ma-FL-SC-28	Flood	PRV - Prevention	Ongoing	2014	Solano County	Maintain flood channel maintenance records.	DRM, SCWA, Reclamation and Conservation Districts	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	1-3 Years	Planning	HMGP / BRIC	High	Goal 2: Infrastructure , Goal 4: Resilience	ps-FL-SC-118
ma-FL-SC-29	Flood	SP - Structural Projects	Ongoing	2014	Solano County	Remove sediment in reservoirs	SCWA, SID	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	5-10 Years	Project	HMGP / BRIC	Medium	Goal 1: People , Goal 2: Infrastructure , Goal 4: Resilience	ps-EW-SC-128
ma-FL-SC-32	Flood	NRP - Natural Resource Protection	Ongoing	2014	Solano County	Expand protected private and public open space in the County.	DRM Planning, Board of Supervisors, SCWA, Resource Conservation Districts, Other Conservation Organizations	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	1-3 Years	Planning	HMGP / BRIC	High	Goal 3: Environment , Goal 4: Resilience	ps-FL-SC-116

Mitigation No.	Hazard Type	Mitigation Type	Status	Year	Primary Agency	Title/Description	Responsible Party	Estimated Cost	Estimated Benefit	Time Frame	HMA Activity Type	Potential Grant Source	Priority	Related Goal(s)	Related Problem Statements
ma-FL-SC-173	Flood	PRV - Prevention , PPRO - Property Protection , NRP - Natural Resource Protection	Pending	2021	Solano County	Maintain clear passage for water flow in the portion of Suisun Creek west of Fairfield by removing debris twice a year at minimum.	Department of Resource Management	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	Ongoing	Project	HMGP / BRIC	High	Goal 2: Infrastructure , Goal 4: Resilience	ps-FL-SC-117, ps-WF-SC-114, ps-CC-SC-176
ma-FL-SC-174	Flood	PRV - Prevention	Pending	2021	Solano County	Inventory drainages requiring routine debris management; develop debris management schedule and maintain database for this purpose	Dept. of Resource Management	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	Ongoing	Planning	HMGP / BRIC	High	Goal 2: Infrastructure , Goal 4: Resilience	ps-FL-SC-118, ps-WF-SC-114, ps-CC-SC-176
ma-SF-SC-175	Slope Failure	SP - Structural Projects	Pending	2021	Solano County	Conduct appropriate retrofits for County bridges in high landslide areas and reinforce hazardous slopes	Dept. of Resource Management	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	1-3 Years	Project	HMGP / BRIC	High	Goal 2: Infrastructure	ps-SF-SC-132
ma-SF-SC-176	Slope Failure	SP - Structural Projects	Pending	2021	Solano County	Assess 2 child-care facilities in high landslide risk areas; assist property owners in appropriate modifications including slope reinforcements	Dept. of Resource Mgmt	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	1-3 Years	Project	HMGP / BRIC	High	Goal 1: People , Goal 2: Infrastructure	ps-SF-SC-134
ma-SF-SC-177	Slope Failure	PRV - Prevention	Pending	2021	Solano County	Assess steep slope damages from the 2020 LNU lightning complex fire, including new areas susceptible to slope failure.	OES; Resource Mgmt	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	1-3 Years	Planning	HMGP / BRIC	High	Goal 1: People , Goal 4: Resilience	ps-SF-SC-135



Mitigation No.	Hazard Type	Mitigation Type	Status	Year	Primary Agency	Title/Description	Responsible Party	Estimated Cost	Estimated Benefit	Time Frame	HMA Activity Type	Potential Grant Source	Priority	Related Goal(s)	Related Problem Statements
ma-WF-SC-34	Wildfire	PRV - Prevention	Ongoing	2014	Solano County	Conduct annual Defensible Space Inspection Program in the Unincorporated County and enforce Code violations.	Local Fire Districts	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	1-3 Years	Planning	HMGP / BRIC	Extreme	Goal 1: People , Goal 4: Resilience	ps-EW-SC-130, ps-WF-SC-110, ps-WF-SC-111, ps-WF-SC-106, ps-CC-SC-177
ma-WF-SC-36	Wildfire	ES - Emergency Services	Ongoing	2014	Solano County	Maintain and improve, where needed, wildfire emergency access	Local Fire Districts, DRM Public Works	High - Existing funding will not cover the cost of the project; implementation would require new revenue through an alternative source (for example, bonds, grants, and fee increases).	High - Project will provide an immediate reduction of risk exposure for life and property.	1-3 Years	Project	HMGP / BRIC	Extreme	Goal 1: People	ps-WF-SC-104, ps-WF-SC-107, ps-WF-SC-108, ps-WF-SC-108, ps-WF-SC-109
ma-WF-SC-37	Wildfire	PRV - Prevention	Pending	2014	Solano County	Develop Community Wildfire Prevention Plan (CWPP) for particularly high threat neighborhoods and communities; support ongoing community efforts to do the same.	Local Fire Districts	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	5-10 Years	Planning	HMGP / BRIC	High	Goal 4: Resilience	ps-EW-SC-130, ps-WF-SC-108, ps-WF-SC-105, ps-WF-SC-109, ps-CC-SC-177
ma-WF-SC-38	Wildfire	NRP - Natural Resource Protection	Pending	2014	Solano County	Establish a County Chipper Program	DRM, Local Fire Districts	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	3-5 Years	Project	HMGP / BRIC	High	Goal 4: Resilience	ps-WF-SC-105, ps-WF-SC-109
ma-WF-SC-40	Wildfire	ES - Emergency Services	Ongoing	2014	Solano County	Develop Spatial Data for Wildfire Emergencies	OES, DRM	Medium - The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.	High - Project will provide an immediate reduction of risk exposure for life and property.	1-3 Years	Planning	HMGP / BRIC	High	Goal 2: Infrastructure , Goal 4: Resilience	ps-WF-SC-108, ps-CC-SC-177

Mitigation No.	Hazard Type	Mitigation Type	Status	Year	Primary Agency	Title/Description	Responsible Party	Estimated Cost	Estimated Benefit	Time Frame	HMA Activity Type	Potential Grant Source	Priority	Related Goal(s)	Related Problem Statements
ma-WF-SC-178	Wildfire	PRV - Prevention , PE&A - Public Education & Awareness , ES - Emergency Services	Pending	2021	Solano County	Establish egress routes from Travis Air Force Base; potential routes include Walters Road to Highway 12	Solano County	Low - The project could be funded under the existing budget. The project is part of or can be part of an ongoing existing program.	High - Project will provide an immediate reduction of risk exposure for life and property.	1-3 Years	Planning	HMGP / BRIC	High	Goal 1: People , Goal 2: Infrastructure	ps-WF-SC-108

***Note: As a living document, project descriptions and actions in the tables above will be modified to reflect current conditions over time in MAST.***



INTENTIONAL BLANK PAGE



## Section 6. Plan Implementation and Maintenance

It is important that this plan becomes a tool for all participating jurisdictions to ensure reductions in possible damage from a natural hazard event. This section discusses adopting, implementing, monitoring, evaluating, and updating the MJHMP, which should help ensure that it remains relevant. This section also describes the incorporation of the MJHMP into existing planning mechanisms, and how the jurisdictions will continue to engage the public.

### 6.1 Plan Adoption

To comply with DMA 2000, the Solano County Board of Supervisors has officially adopted the Solano County Multi-Jurisdiction Hazard Mitigation Plan. The adoption of the MJHMP recognizes Solano County's commitment to reducing the impacts of natural hazards within the county. A copy of the MJHMP adoption resolution is included immediately following the Executive Summary.

### 6.2 Plan Implementation

Over time, implementation strategies for mitigation actions will become more detailed. MAST will be extremely useful for participating jurisdictions to plan for updates to this MJHMP and to update individual mitigation actions as implemented or revised. In conjunction with the progress report processes, implementation strategy worksheets will be extremely useful as a plan of record tool for updates. Each implementation strategy worksheet provides individual steps and resources need to complete each priority mitigation action. The following are considerations for developing future implementation strategies:

- **Use processes that already exist.** Take advantage of the tools and procedures identified in the capability assessment in Section 5.4. Using planning mechanisms already in place and familiar to participating jurisdictions will give the planning implementation phase a strong initial boost.
- **Updated work plans, policies, or procedure.** Incorporating hazard mitigation concepts and activities can help integrate the MJHMP into daily operations. These changes can include how major development projects and subdivision reviews are addressed in hazard-prone areas or ensure that hazard mitigation concerns are considered in the approval of major capital improvement projects.
- **Job descriptions.** Working with department or agency heads to revise job descriptions of government staff to include mitigation-related duties, including designating a "mitigation lead" within a department, can further institutionalize hazard mitigation with little financial expenditure or programmatic overhaul.



## **6.2.1 Steering Committee**

The Steering Committee oversaw the development of the plan and made recommendations on key elements of the plan, including the maintenance strategy. The Steering Committee recommended that an oversight committee referred to herein as the MJHMP Steering Committee, should have an active role in the plan maintenance strategy. Therefore, it is recommended that the MJHMP Steering Committee become involved in key elements of the plan maintenance strategy. The new MJHMP Steering Committee should strive to include representation from the participating jurisdictions, as well as other stakeholder groups and members of the public in the planning area. Keeping this new MJHMP Steering Committee intact will also jump-start future updates.

The new MJHMP Steering Committee will review annual progress reports from participating jurisdictions and develop a county-wide report to provide input to Solano County, including to the Board of Supervisors, on possible improvements or action steps to be considered at the next update. Completion of a progress report is the responsibility of each participating jurisdiction. It will be the MJHMP Steering Committee's role to review the individual progress reports and create a county-wide report that covers the unincorporated areas in an effort to identify revisions and issues needing to be addressed by future plans. These annual reports will also be released to the media and posted online for public review.

## **6.3 Monitoring, Evaluating, and Updating the MJHMP**

This section describes the schedule and process for monitoring, evaluating, and updating the MJHMP. The Mitigation Action Support Tool (MAST) has been developed as a primary jurisdictional resource for updating and monitoring mitigation actions. See subsection 6.3.2 below for more information on MAST.

### **6.3.1 Schedule**

Monitoring the progress of the mitigation actions will be ongoing throughout the five-year period between the adoption of the MJHMP and the next update effort. The newly-formed MJHMP Steering Committee will meet at least four times each year to monitor the implementation of mitigation actions and develop updates as necessary. The committee's meeting schedule will be posted online, and meetings will be open to the public.

The MJHMP will be updated every five years, as required by DMA 2000. The update process will begin at least one year prior to the expiration of the MJHMP. However, should a significant disaster occur within the county, the MJHMP Steering Committee will reconvene within 30 days of the disaster to review and update the MJHMP as appropriate. The Solano County Board of Supervisors will adopt written updates to the MJHMP as a DMA 2000 requirement.





### 6.3.2 Mitigation Action Support Tool (MAST) Updates

Hazard problem statements and mitigation activities will be updated through a web interface application developed specifically for Solano County and other participating jurisdictions, available on the project website ([mitigatehazards.com/solanohmp/](https://mitigatehazards.com/solanohmp/)), to ensure this MJHMP remains a living document.

MAST is a web-based interactive tool that enables multiple users to search, view, enter, and update mitigation actions, ideas or projects, and other information. MAST provides participating jurisdiction staff and plan reviewers (Cal OES and FEMA) access to valuable mitigation information that can be leveraged by future planning or other risk reduction efforts. Users can update the status of their mitigation projects throughout the planning lifecycle and this web-based tool will improve a participating jurisdiction's ability to apply for FEMA's Hazard Mitigation Assistance (HMA) grant programs, including the initial grant application processes through Cal OES.

### 6.3.3 Process

The MJHMP Steering Committee will coordinate with responsible agencies and organizations identified for each mitigation action. These responsible agencies and organizations will monitor and evaluate the progress made on the implementation of mitigation actions and report to the MJHMP Steering Committee on an annual basis. These responsible departments will assess the effectiveness of the mitigation actions and modify them as appropriate. MAST will assist mitigation project managers in reporting on the status and assessing the effectiveness of the mitigation actions. Most updates to the HMP will occur easily through MAST.

Information from the mitigation leads within responsible departments will be used to monitor mitigation actions and in the annual evaluation of the MJHMP. The following questions will be considered in evaluating MJHMP effectiveness:

- Has the nature or magnitude of hazards affecting the county and other jurisdictions changed?
- Are there new hazards that have the potential to impact the county and other jurisdictions?
- Do the identified goals and actions address current and expected conditions?
- Have mitigation actions been implemented or completed?
- Has the implementation of identified mitigation actions resulted in expected outcomes?
- Are current resources adequate to implement the MJHMP?
- Should additional local resources be committed to address identified hazards?

Future updates to the MJHMP will account for any new hazard vulnerabilities, special circumstances, or new information that becomes available. Issues that arise or updates made during monitoring and evaluating the MJHMP will be incorporated into the next update of the MJHMP in 2026. The questions identified above would remain valid during the preparation of the update.



## MAST Mitigation Strategy Details



Figure 6-1: Diagram of MAST Viewing Details

### 6.3.4 Continuing Public Involvement

During the five-year update cycle, county staff will involve the public through public workshops and quarterly Steering Committee meetings. Information on upcoming public events related to the MJHMP or solicitation for comments will be announced via newspapers, mailings, and on the county MJHMP website ([mitigatehazards.com/solanohmp/](http://mitigatehazards.com/solanohmp/)). An electronic copy of the current MJHMP document will be accessible through the county website, as well as at the County Courthouse in the City of Fairfield. The MJHMP Steering Committee will, as much as practicable, incorporate the following concepts into its public outreach strategy to ensure continued public involvement in the MJHMP planning process:

- Work with public service clubs (e.g., the Solano Sunset Rotary Club and the Solano County Library).
- Collaborate with faith-based organizations.
- Create story ideas for media outlets, such as newspapers, local radio, and TV.
- Distribute emails and postcards or mailers to county, city, and town residents about hazard mitigation updates.
- Post meeting announcements at city halls, community centers, coffee houses, grocery stores, etc.



- Educate and collaborate with insurance companies, landlords, and realtors.
- Participate in other existing local community meeting places (e.g., Benicia Farmers Market, Fairfield Farmers Market, and Vacaville Farmers Market).
- Distribute information through K-12 schools.
- Continue to use the county website as a distribution point for hazard mitigation information.

### 6.3.5 HMA Monitoring

FEMA's Hazard Mitigation Assistance (HMA) Program is the catalyst that drives increased understanding and supports proactive community action to reduce losses from natural hazards. To support this vision, FEMA funds three grant programs under HMA: Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA), and Building Resilient Infrastructure and Communities (BRIC).

- **HMGP** assists in implementing long-term hazard mitigation planning and projects following a Presidential major disaster declaration.
- **BRIC** provides funds for hazard mitigation planning and projects on an annual basis.
- **FMA** provides funds for planning and projects to reduce or eliminate risk of flood damage to buildings that are insured under the National Flood Insurance Program (NFIP) on an annual basis.

HMGP funding is generally 15 percent of the total amount of federal assistance provided to a state, territory, or federally-recognized tribe following a major disaster declaration. BRIC and FMA funding depends on the amount congress appropriates each year for those programs. HMGP supports cost-effective post-disaster projects and is the longest-running mitigation program among FEMA's three grant programs. A 2019 study by the National Institute of Building Sciences' (NIBS) Multihazard Mitigation Council has shown that every federal dollar spent on mitigation saves six dollars in response and recovery costs. (National Institute of Building Sciences, 2019, p. 116)

MAST will be extremely useful in applying for Cal OES funding. Plan maintenance will be primarily done through MAST. Figure 6-2 demonstrates how MAST information will translate into Cal OES NOIs and grant subapplication requests.

Following a disaster, Cal OES and local Solano County officials in a joint effort with FEMA will perform Preliminary Damage Assessments (PDA) of the areas that sustained damage. Cal OES submits, through the FEMA Regional Office, the information collected along with a damage estimate to request a declaration from the President. A Presidential Major Disaster Declaration provides for the availability of HMGP funds at the request of a state's governor in eligible communities within a state, tribe, or territory. Figure 6-3 depicts this.

Figure 6-3 also shows a timeline of how projects should be developed and administered by local government and FEMA under the HMGP. HMGP grant recipients have 36 months from the close of the application period to complete projects. For more information on HMGP project development process visit:

[fema.gov/hazard-mitigation-grant-program-guide-state/local-governments](https://fema.gov/hazard-mitigation-grant-program-guide-state/local-governments)



## MAST Mitigation Strategy Details

### Grant Application Information



Figure 6-2: MAST and Cal OES Grant Applications



Figure 6-3: HMGP Timeline



### 6.3.6 Incorporation into Other Planning Mechanisms

For the MJHMP to be successful, the recommendations and underlying principles of the HMP should be incorporated into community planning and development, such as capital improvement budgeting, building and zoning codes, general plans, and regional plans. Integration into a variety of departments at the county and participating jurisdiction level provides an opportunity to network, identify, and highlight mitigation activities and opportunities at all levels of government. It is also important to monitor funding opportunities that can be leveraged to implement the mitigation actions.

Each jurisdictional process for integration into other planning mechanisms will vary; the commitment to ongoing implementation meetings for the next five years will be essential to keeping this MJHMP relevant and at the forefront of planning processes. Some jurisdictions have ongoing updates that have already begun to incorporate data from the MJHMP.

Information from this MJHMP can be incorporated into the following. Note, this plan lists ongoing updates known at the time of this MJHMP. These are not meant to be exhaustive.

- **Solano County and Municipal General Plans:** The MJHMP will provide information that can be incorporated into the safety, land use, and conservation elements of general plans for municipalities and the county as they are updated. Many jurisdictions will update the safety element of the general plan to incorporate the MJHMP, in compliance with Assembly Bill 2140. Specific risk and vulnerability information from the Solano County MJHMP will assist in identifying areas where development may be at risk to potential hazards, which in turn can be incorporated into general plans. For example, jurisdictions may consider instituting a hazard overlay zone that requires additional scrutiny because of close proximity to certain hazards.
  - The City of Fairfield is currently updating its General Plan; coordination on incorporating data from this MJHMP is ongoing.
- **Building and Development Codes and Zoning Ordinances:** The MJHMP provides information to enable the county and municipalities to make decisions on appropriate building and development codes and ordinances. Appropriate building codes and ordinances can increase resilience against natural disasters. Some county and municipal mitigation actions directly recommend updates or new regulations as mitigation for hazard risks; those mitigation actions indicate priorities for regulatory updates in participating jurisdictions.
- **Community Wildfire Protection Plans (CWPP):** The MJHMP will provide information that can be incorporated into a CWPP or Strategic Fire Plan for areas within the county. Development of a county-wide or localized CWPP is a county mitigation action that may be implemented during this planning period.
- **Water and Flood Management Plans:** The MJHMP will provide information that can be included in updates of urban water management plans, the Solano Groundwater Sustainability Plan, the Lower Sacramento River/Delta North Regional Flood Management Plan, and other water or flood management plans. While the process for updating these types of plans will vary by jurisdiction,





the flood data developed for the MJHMP can be used in other mechanisms along with exposure and damage estimation information.

- The City of Suisun City is developing a Flood Resiliency Plan in collaboration with Sustainable Solano and the San Francisco Bay Conservation and Development Commission; coordination on incorporating data from this MJHMP is ongoing.
- The City of Benicia is currently updating its Urban Water Management Plan, which includes its Stormwater Management Plan; coordination on incorporating data from this MJHMP is ongoing.
- A county-wide collaborative of five groundwater sustainability agencies are jointly developing Solano County's Groundwater Sustainability Plan (GSP); participating jurisdictions will carry forward the MJHMP for consideration in this GSP.
- **Climate Action Plans:** The MJHMP includes detailed climate vulnerability information that can be a useful first step in developing or updating a climate action plan.
  - The City of Fairfield is currently developing a Climate Action Plan in conjunction with updating its General Plan; coordination on incorporating data from this MJHMP is ongoing.
- **Other Plans:** Participating jurisdictions are developing an array of plans that overlap with considerations from this MJHMP. The planning process for the development of the MJHMP identified several relevant ongoing planning processes and opportunities to integrate the MJHMP. Those ongoing planning processes include:
  - The City of Benicia and ongoing development of a Vegetation Management Plan and Parks and Trails Master Plan.

### 6.3.7 Planning Integration Processes

With adoption of this plan, Solano County and participating jurisdictions will be responsible for the plan implementation and maintenance. The County and the MJHMP Steering Committee will continue to:

- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to Solano County communities;
- Ensure hazard mitigation risk assessments and maps remain a consideration for safety decision-makers;
- Report on plan progress and recommended changes; and
- Inform and solicit input from the public.



## Section 7. Works Cited

- Ackerly. (2018). *San Francisco Bay Area Summary Report*. Retrieved 01 21, 2021, from <https://climateassessment.ca.gov/regions/>
- American Community Survey. (2018). *Explore Census Data*. Retrieved 01 25, 2021, from <https://data.census.gov/cedsci/>
- Bedsworth. (2018). *Statewide Summary Report: California's Fourth Climate Change Assessment*. Retrieved 01 21, 2021, from <https://www.climateassessment.ca.gov/state/>
- Blume, H. (2019, 12 06). PG&E reaches \$13.5-billion settlement with victims of devastating California wildfires. *LA Times*. Retrieved from <https://www.latimes.com/california/story/2019-12-06/pge-settlement-fire-northern-california>
- CAL FIRE. (2020). *LNU Lightning Complex (includes Hennessey, Gamble, 15-10, Spanish, Markley, 13-4, 11-16, Walbridge)*. Retrieved from <https://www.fire.ca.gov/incidents/2020/8/17/lnu-lightning-complex-includes-hennessey-gamble-15-10-spanish-markley-13-4-11-16-walbridge/>
- Cal OES. (2018). *State of California Hazard Mitigation Plan*. Retrieved from [https://www.caloes.ca.gov/HazardMitigationSite/Documents/002-2018%20SHMP\\_FINAL\\_ENTIRE%20PLAN.pdf#search=404](https://www.caloes.ca.gov/HazardMitigationSite/Documents/002-2018%20SHMP_FINAL_ENTIRE%20PLAN.pdf#search=404)
- Cal. Adaptation Planning Guide. (2020). *Cal OES*. Retrieved from <https://www.caloes.ca.gov/HazardMitigationSite/Documents/CA-Adaptation-Planning-Guide-FINAL-June-2020-Accessible.pdf>
- Cal. Dep't of Water Resources. (2015). *California's Most Significant Droughts: Comparing Historical and Recent Conditions*.
- Cal-Adapt. (2020). *Extended Drought Scenarios*. Retrieved from <https://cal-adapt.org/tools/extended-drought/>
- CalAdapt. (2021). *Extreme Heat*. ( Geospatial Innovation Facility at University of California, Berkeley) Retrieved from CalAdapt Tool: <https://cal-adapt.org/tools/extreme-heat/>
- Cal-Adapt. (2021). *Extreme Heat Days and Warm Nights*. Retrieved 03 10, 2021, from <https://cal-adapt.org/tools/extreme-heat/>
- Cal-Adapt. (2021). *Extreme Precipitation*. Retrieved 04 01, 2021, from <https://cal-adapt.org/tools/extreme-precipitation/#lat=38.2854&lng=-122.0000&boundary=counties&climatevar=Precipitation>
- Cal-Adapt. (2021). *Local Climate Change Snapshot for Solano County*. Retrieved 04 02, 2021, from <https://cal-adapt.org/tools/local-climate-change-snapshot/>



- Cal-Adapt. (2021). *Local Climate Change Snapshot for Solano County, California*. Retrieved 01 21, 2021, from <https://cal-adapt.org/tools/local-climate-change-snapshot/>
- California Department of Forestry and Fire Protection. (2005). *Fire Management Plan*. Retrieved 01 13, 2021, from <https://www.yumpu.com/en/document/view/17277043/sonoma-lake-napa-fire-plan-board-of-forestry-and-fire->
- California Department of Forestry and Fire Protection. (2013-2018). *California Cooperative Wildland Fire Management and Stafford Act Response Agreement*. Retrieved 08 29, 2021, from <https://gacc.nifc.gov/oscc/cwcg/docs/2013cfma/FinalCFMA2013-2018.pdf>
- California Department of Water Resources. (2015). *California's Most Significant Droughts*. Retrieved May 15, 2020, from [https://water.ca.gov/-/media/DWR-Website/Web-Pages/What-We-Do/Drought-Mitigation/Files/Publications-And-Reports/CalSigDroughts19\\_v9\\_ay11.pdf](https://water.ca.gov/-/media/DWR-Website/Web-Pages/What-We-Do/Drought-Mitigation/Files/Publications-And-Reports/CalSigDroughts19_v9_ay11.pdf)
- (2010). *California Drought Contingency Plan*. California Department of Water Resources. Retrieved 05 14, 2020, from [https://water.ca.gov/LegacyFiles/waterplan/docs/cwpu2013/Final/vol4/drought/01California\\_Drought\\_Contingency\\_Plan.pdf](https://water.ca.gov/LegacyFiles/waterplan/docs/cwpu2013/Final/vol4/drought/01California_Drought_Contingency_Plan.pdf)
- California Employment Development Department. (2019). *Agricultural Employment in California*. Retrieved 01 26, 2020, from Occupational Employment Statistics and Wages (OES) Employment and Wages: <https://www.labormarketinfo.edd.ca.gov/data/oes-employment-and-wages.html>
- California Fire. (2020). *Red Flag Warning & Fire Weather Watches*. Retrieved from <https://www.fire.ca.gov/programs/communications/red-flag-warnings-fire-weather-watches/>
- California Legislative Information. (n.d.). *Public Resources Code*. Retrieved 08 29, 2021, from [https://leginfo.ca.gov/faces/codes\\_displaySection.xhtml?lawCode=PRC&sectionNum=4102.&article=1.&highlight=true&keyword=%EF%82%A7%09State%20Responsibility%20Areas%20](https://leginfo.ca.gov/faces/codes_displaySection.xhtml?lawCode=PRC&sectionNum=4102.&article=1.&highlight=true&keyword=%EF%82%A7%09State%20Responsibility%20Areas%20)
- California Office of Emergency Services. (2018). *California State Hazard Mitigation Plan*. Retrieved from <https://www.caloes.ca.gov/cal-oes-divisions/hazard-mitigation/hazard-mitigation-planning/state-hazard-mitigation-plan>
- California Office of Environmental Health Hazard Assessment. (2019). *Heat Related Mortality and Morbidity*. Retrieved 04 02, 2021, from <https://oehha.ca.gov/epic/impacts-biological-systems/heat-related-mortality-and-morbidity>
- California Public Utilities Commission. (2020). Retrieved from <https://www.cpuc.ca.gov/deenergization/>
- California Seismic Safety Commission. (2002, July 11). *Improving Natural Gas Safety in Earthquakes*. Retrieved from [https://ssc.ca.gov/wp-content/uploads/sites/9/2020/08/cssc\\_2002-03\\_natural\\_gas\\_safety.pdf](https://ssc.ca.gov/wp-content/uploads/sites/9/2020/08/cssc_2002-03_natural_gas_safety.pdf)



- California's Fourth Climate Change Assessment. (2018). *Statewide Summary Report*. Retrieved from [https://www.energy.ca.gov/sites/default/files/2019-11/Statewide\\_Reports-SUM-CCCA4-2018-013\\_Statewide\\_Summary\\_Report\\_ADA.pdf](https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-013_Statewide_Summary_Report_ADA.pdf)
- Caltrans. (2021). *Long-Term Socio-Economic Forecasts by County*. Retrieved 01 25, 2021, from <https://dot.ca.gov/programs/transportation-planning/economics-data-management/transportation-economics/long-term-socio-economic-forecasts-by-county>
- CDC. (2013). *Climate Change and Extrememe Heat Events*. Center for Disease Control. Retrieved 04 01, 2021, from <https://www.cdc.gov/climateandhealth/pubs/ClimateChangeandExtremeHeatEvents.pdf>
- CDC. (2017). *About Extreme Heat*. Retrieved 04 01, 2021, from [https://www.cdc.gov/disasters/extremeheat/heat\\_guide.html](https://www.cdc.gov/disasters/extremeheat/heat_guide.html)
- CDC. (2020). *Mold After a Disaster*. Retrieved from Centers for Disease Control and Prevention: <https://www.cdc.gov/disasters/mold/index.html>
- CDC. (2021). *Extreme Heat*. Retrieved 04 01, 2021, from <https://www.cdc.gov/disasters/extremeheat/index.html>
- CDWR. (2021). *Urban Water Management Plans*. Retrieved from Colorado Dept. of Water Resources: <https://water.ca.gov/Programs/Water-Use-And-Efficiency/Urban-Water-Use-Efficiency/Urban-Water-Management-Plans>
- Center for Climate and Energy Solutions. (n.d.). *Wildfires and Climate Change*. Retrieved from <https://www.c2es.org/content/wildfires-and-climate-change/>
- CGS. (2020). *Rockfall*. Retrieved from Colorado Geological Survey: <https://coloradogeologicalsurvey.org/hazards/rockfall/>
- CGS. (2020). *Seismic Shaking Hazard Assessment*. Retrieved from <https://www.conservation.ca.gov/cgs/Pages/PSHA/shaking-assessment.aspx>
- City and County of San Francisco Hazard Mitigation Plan. (2014). *2014 Hazard Mitigation Plan*.
- Climate Central. (2013). *Lighning-Caused Wildfires*. Retrieved 09 30, 2020, from <https://www.climatecentral.org/gallery/graphics/lightning-caused-wildfires>
- County of Solano and Solano Economic Development Corporation. (2020). *Solano County 2019: Index of Economic and Community Progress*. Retrieved January Tuesday, 2021, from <https://www.solanocounty.com/civicax/filebank/blobdload.aspx?BlobID=32160>
- D. Branum, R. C. (2016). *Earthquake Shaking Potential for California*. CGS. Retrieved 04 07, 2020, from [https://ssc.ca.gov/forms\\_pubs/shaking\\_18x23.pdf](https://ssc.ca.gov/forms_pubs/shaking_18x23.pdf)



- Department of Environmental Conservation. (2020). *State of Vermont*. Retrieved from <https://dec.vermont.gov/waste-management/spills>
- Department of Water Resources. (2020). *California's Most Significant Droughts: Comparing Historical and Recent Conditions*. Retrieved from [https://water.ca.gov/-/media/DWR-Website/Web-Pages/What-We-Do/Drought-Mitigation/Files/Publications-And-Reports/a6022\\_CalSigDroughts19\\_v9\\_ay11.pdf](https://water.ca.gov/-/media/DWR-Website/Web-Pages/What-We-Do/Drought-Mitigation/Files/Publications-And-Reports/a6022_CalSigDroughts19_v9_ay11.pdf)
- DWR. (2021). *Countywide Drought and Water Shortage Contingency Plans*. Retrieved from California Division of Water Resources: <https://water.ca.gov/Programs/Water-Use-And-Efficiency/2018-Water-Conservation-Legislation/County-Drought-Planning>
- EPA. (2021). *Learn About Environmental Justice*. Retrieved 08 31, 2021, from <https://www.epa.gov/environmentaljustice/learn-about-environmental-justice>
- Federal Highway Administration. (2013). *A Guide for Maintaining Pedestrian Facilities for Enhanced Safety*. Retrieved 04 02, 2021, from [https://safety.fhwa.dot.gov/ped\\_bike/tools\\_solve/fhwasa13037/chap3.cfm](https://safety.fhwa.dot.gov/ped_bike/tools_solve/fhwasa13037/chap3.cfm)
- FEMA. (2020). *Data Feeds*. Retrieved from <https://www.fema.gov/data-sets>
- FEMA. (2020, 07 31). *Types of Floods and Floodplains*. Retrieved May 15, 2020, from <https://training.fema.gov/hiedu/docs/fmc/chapter%20%20-%20types%20of%20floods%20and%20floodplains.pdf>
- FEMA. (2020). *Wildland urban interface (WUI)*. Retrieved from <https://www.usfa.fema.gov/wui/>
- Food and Agriculture Organization of the United Nations. (2014). *Direct and Indirect Effects of Sea-Level Rise*. Retrieved from [http://www.fao.org/nr/climpag/pub/eire0047\\_en.asp](http://www.fao.org/nr/climpag/pub/eire0047_en.asp)
- Geology.com. (2020). *Tsunami Geology - What Causes a Tsunami*. Retrieved from <https://geology.com/articles/tsunami-geology.shtml>
- Governor's Office of Planning and Research. (2017). *State of California General Plan Guidelines*. Retrieved 08 29, 2021, from [https://opr.ca.gov/docs/OPR\\_COMPLETE\\_7.31.17.pdf](https://opr.ca.gov/docs/OPR_COMPLETE_7.31.17.pdf)
- Grantham, T. (2018). *North Coast Summary Report, California's Fourth Climate Change Assessment*. University of California, Berkley. Retrieved 07 30, 2020, from [https://www.energy.ca.gov/sites/default/files/2019-11/Reg\\_Report-SUM-CCCA4-2018-001\\_NorthCoast\\_ADA.pdf](https://www.energy.ca.gov/sites/default/files/2019-11/Reg_Report-SUM-CCCA4-2018-001_NorthCoast_ADA.pdf)
- Grantham, Theodore; University of California, Berkeley. (2018). *California's Fourth Climate Change Assessment*. Retrieved from [https://www.energy.ca.gov/sites/default/files/2019-11/Reg\\_Report-SUM-CCCA4-2018-001\\_NorthCoast\\_ADA.pdf](https://www.energy.ca.gov/sites/default/files/2019-11/Reg_Report-SUM-CCCA4-2018-001_NorthCoast_ADA.pdf)





- Harvard School of Public Health. (2021, Aug. 13). Press Release: Wildfire smoke may have contributed to thousands of extra COVID-19 cases and deaths in western U.S. in 2020. Retrieved from <https://www.hsph.harvard.edu/news/press-releases/wildfire-smoke-may-have-contributed-to-thousands-of-extra-covid-19-cases-and-deaths-in-western-u-s-in-2020/>
- Krause, E., & Reeves, R. (2017, Sept. 18). *Hurricanes hit the poor the hardest*. Retrieved Jan. 30, 2020, from Brookings Institute: <https://www.brookings.edu/blog/social-mobility-memos/2017/09/18/hurricanes-hit-the-poor-the-hardest/>
- Leah Fisher, Sonya Ziaja. (2018). *California's Fourth Climate Change Assessment*. Retrieved 08 29, 2021, from [https://www.energy.ca.gov/sites/default/files/2019-11/Statewide\\_Reports-SUM-CCCA4-2018-013\\_Statewide\\_Summary\\_Report\\_ADA.pdf](https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-013_Statewide_Summary_Report_ADA.pdf)
- Levin, Phil; Davies, Ian. (2019, Nov. 6). *Racial and Ethnic Minorities are More Vulnerable to Wildfires*. Retrieved Jan. 30, 2020, from The Conversation: <http://theconversation.com/racial-and-ethnic-minorities-are-more-vulnerable-to-wildfires-106290>
- Lutz, H. (2018, February 21). *Napa grapegrowers brace for extended frost season, with little rain*. Retrieved from Napa Valley Register: [https://napavalleyregister.com/news/local/napa-grapegrowers-brace-for-extended-frost-season-with-little-rain/article\\_74a4eca7-b723-5ebd-abdf-61a2ba7e4958.html](https://napavalleyregister.com/news/local/napa-grapegrowers-brace-for-extended-frost-season-with-little-rain/article_74a4eca7-b723-5ebd-abdf-61a2ba7e4958.html)
- Maizlish. (2017). *Climate Change and Health Profile Report Solano County*. Retrieved 01 25, 2021, from [https://www.cdph.ca.gov/Programs/OHE/CDPH%20Document%20Library/CHPRs/CHPR095Solano\\_County2-23-17.pdf](https://www.cdph.ca.gov/Programs/OHE/CDPH%20Document%20Library/CHPRs/CHPR095Solano_County2-23-17.pdf)
- Makwana, N. (2019). *Disaster and its impact on mental health: A narrative review*. Retrieved 08 31, 2021, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6857396/>
- Manconi, A. e. (2016). *Real-time detection, location, and characterization of Rockslides using broadband regional seismic networks*. Retrieved from <https://agupubs.onlinelibrary.wiley.com/doi/pdf/10.1002/2016GL069572>
- Marin Clean Energy. (2020). *MCE Community Choice Energy*. Retrieved 01 26, 2021, from <https://www.mcecleanenergy.org/>
- Murphy, M. (2006, December 2006). *Vaca Flood Woes Top Story of '06*. Retrieved from The Reporter: <https://www.thereporter.com/2006/12/31/vaca-flood-woes-top-story-of-06/>
- National Center for Disaster Preparedness. (2020). *Vulnerable Populations*. Retrieved 01 24, 2020, from <https://ncdp.columbia.edu/research/vulnerable-populations/>
- National Institute of Building Sciences. (2017). *Publications*. Retrieved from [https://www.fema.gov/media-library-data/1516812817859-9f866330bd6a1a93f54cdc61088f310a/MS2\\_2017InterimReport.pdf](https://www.fema.gov/media-library-data/1516812817859-9f866330bd6a1a93f54cdc61088f310a/MS2_2017InterimReport.pdf)



- National Institute of Building Sciences. (2019). *Natural Hazard Mitigation Saves*. Retrieved 02 04, 2021, from <https://www.nibs.org/page/mitigationsaves>
- National Institute of Water and Atmospheric Research. (2016). *Drought*. Retrieved from <https://niwa.co.nz/education-and-training/schools/students/drought>
- National Oceanic and Atmospheric Administration . (2020). *What are El Niño and La Niña?* Retrieved from National Ocean Service: <https://oceanservice.noaa.gov/facts/ninonina.html>
- National Oceanic and Atmospheric Administration. (2018). *Tsunamis*. Retrieved from <https://www.noaa.gov/education/resource-collections/ocean-coasts/tsunamis>
- National Oceanic and Atmospheric Administration. (n.d.). *Is Sea Level Rising*. Retrieved from <https://oceanservice.noaa.gov/facts/sealevel.html>
- National Park Service. (2018). *Wildfire Causes and Evaluations*. Retrieved from <https://www.nps.gov/articles/wildfire-causes-and-evaluation.htm#:~:text=Humans%20and%20Wildfire,and%20intentional%20acts%20of%20arson.>
- National Research Council. (2012). *Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future*. Retrieved from <https://www.nap.edu/catalog/13389/sea-level-rise-for-the-coasts-of-california-oregon-and-washington>
- National Weather Service. (n.d.). *Red Flag Warning*. Retrieved August 2020, from <https://www.weather.gov/mqt/redflagtips#:~:text=A%20Red%20Flag%20Warning%20means,increased%20risk%20of%20fire%20danger.&text=%2DExtinguish%20all%20outdoor%20fires%20properly,is%20cold%20to%20the%20touch.>
- National Wildfire Coordinating Group. (n.d.). *Wildland Urban Interface*. Retrieved June 4, 2020, from <https://www.nwccg.gov/term/glossary/wildland-urban-interface-wui>
- NOAA. (2017). *Global and Regional Sea Level Rise Scenarios for the United States*. Silver Spring, Maryland. Retrieved 07 27, 2020, from [https://tidesandcurrents.noaa.gov/publications/techrpt83\\_Global\\_and\\_Regional\\_SLR\\_Scenarios\\_for\\_the\\_US\\_final.pdf](https://tidesandcurrents.noaa.gov/publications/techrpt83_Global_and_Regional_SLR_Scenarios_for_the_US_final.pdf)
- NOAA. (2018). *Ask the scientist: How can the weather spark and spread wildfires?* Retrieved from <https://www.noaa.gov/stories/ask-scientist-how-can-weather-spark-and-spread-wildfires>
- NOAA. (2020). *Storm Events Database*. Retrieved Jan. 30, 2020, from National Centers for Environmental Information: <https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=5486532>
- Office of Environmental Health Hazard Assessment. (2021). *CalEnviroScreen 4.0*. Retrieved 08 31, 2021, from <https://oehha.ca.gov/calenviroscreen/report/draft-calenviroscreen-40>



- Office of the State Fire Marshal. (2021). *Fire Hazard Severity Zones*. Retrieved 08 29, 2021, from <https://osfm.fire.ca.gov/divisions/wildfire-planning-engineering/wildfire-prevention-engineering/fire-hazard-severity-zones/>
- OPR Planning and Investing for a Resilient California. (n.d.). A Guidebook for State Agencies. 19. Retrieved from [https://opr.ca.gov/docs/20180313-Building\\_a\\_Resilient\\_CA.pdf](https://opr.ca.gov/docs/20180313-Building_a_Resilient_CA.pdf)
- Pacific Northwest Seismic Network. (n.d.). *Ground Motion*. Retrieved May 15, 2020, from <https://pnsn.org/outreach/earthquakehazards/ground-motion>
- R. Dean Hardy, Mathew E. Hauer. (2018). *Social vulnerability projections improve sea-level rise risk assessments*. Retrieved 08 29, 2021, from <https://mathewhauer.github.io/papers/2018-AppliedGeographerHardyHauer.pdf>
- Ready.gov. (2021). *Extreme Heat*. Retrieved 04 01, 2021, from <https://www.ready.gov/heat#:~:text=Extreme%20heat%20is%20a%20period,which%20can%20lead%20to%20death.>
- San Francisco Estuary Institute Aquatic Science Center. (2012). *Sacramento-San Joaquin Delta Historical Ecology Investigation: Exploring Pattern and Process*. Retrieved 02 26, 2021, from [https://www.waterboards.ca.gov/waterrights/water\\_issues/programs/bay\\_delta/california\\_waterfix/exhibits/docs/swrcb\\_100.pdf](https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/swrcb_100.pdf)
- Seismic Safety Commission. (2009). *The Field Act and its Relative Effectiveness in*. Retrieved from [ssc.ca.gov: https://ssc.ca.gov/forms\\_pubs/cssc\\_09-02\\_the\\_field\\_act\\_report\\_appendices.pdf](https://ssc.ca.gov/forms_pubs/cssc_09-02_the_field_act_report_appendices.pdf)
- Shahir Masri et al. (2021). *Disproportionate Impacts of Wildfires among Elderly and Low-Income Communities in California from 2000–2020*. Retrieved 08 31, 2021, from <https://www.mdpi.com/1660-4601/18/8/3921>
- Sherwin, B. (2019). *After the Storm: The Importance of Acknowledging Environmental Justice in Sustainable Development and Disaster Preparedness*. Retrieved 08 31, 2021, from <https://delpf.law.duke.edu/article/after-the-storm-sherwin-vol29-iss2/>
- Solano County 2017-2020 Comprehensive Economic Development Strategy. (2017). *Comprehensive Economic Development Strategy*. Retrieved 01 05, 2021, from <https://drive.google.com/file/d/0Bz0KtN0Uw9zcanglNEJzRU9PbUE/view>
- Solano County. (2018, October 2). *Solano County Component of the Suisun Marsh Local Protection Program (Draft)*. Retrieved from <https://www.solanocounty.com/civicax/filebank/blobdload.aspx?blobid=29446>
- Solano County. (2020). *2020 LNU Lightning Complex Fire*. Retrieved 01 14, 2021, from [https://www.solanocounty.com/depts/rm/2020\\_lnu\\_lightning\\_complex\\_fire/default.asp](https://www.solanocounty.com/depts/rm/2020_lnu_lightning_complex_fire/default.asp)



- Solano County. (2020). *After Action Report & Improvement Plan*.
- Solano County Agricultural Department. (2020). *2020 Crop and Livestock Report*.
- Solano County Climate Action Plan. (2011). *County of Solano Climate Action Plan*. Retrieved 01 26, 2021, from <https://www.solanocounty.com/civicax/filebank/blobdload.aspx?BlobID=10080#:~:text=The%20Climate%20Action%20Plan%20is,win%20conditions%20along%20the%20way>.
- Solano County General Plan. (2008). *General Plan*. Retrieved January Monday, 2021, from [https://www.solanocounty.com/depts/rm/planning/general\\_plan.asp](https://www.solanocounty.com/depts/rm/planning/general_plan.asp)
- Solano County Sea Level Rise Strategic Program. (2011). *County of Solano Sea Level Rise Strategic Program*. Retrieved 01 25, 2021, from <https://www.solanocounty.com/civicax/filebank/blobdload.aspx?BlobID=11108>
- Solano HMP. (2014). Retrieved from <https://www.solanocounty.com/civica/filebank/blobdload.asp?BlobID=20107>
- Solano LAFCO MSR. (2020). *Solano County Reclamation/ Levee Districts Municipal Service Revise*. Fairfield, CA: Prepared by Milani & Associates, Craft Consulting Group, and MMS Designs.
- Syphard, J. K. (2019). *Twenty-first century California, USA, wildfires: fuel-dominated vs. wind-dominated fires*. Retrieved from Twenty-first century California, USA, wildfires: fuel-dominated vs. wind-dominated fires
- The National Severe Storms Laboratory. (2020, 07 31). *SEVERE WEATHER 101*. Retrieved May 17, 2020, from <https://www.nssl.noaa.gov/education/svrwx101/floods/types/>
- Thompson, A. (2014, Nov. 13). Lightning May Increase with Global Warming. *Scientific American*. Retrieved 09 30, 2020, from <https://www.scientificamerican.com/article/lightning-may-increase-with-global-warming/>
- U.S. Department of Health & Human Services. (2016). *Public Health Emergency*. Retrieved from <https://www.phe.gov/Preparedness/planning/abc/Pages/afn-guidance.aspx>
- U.S. Dep't of Ag. (2017). *Hired Farm Labor, Workers and Payroll*. Retrieved 01 26, 2020, from USDA National Agricultural Statistics Service: [https://www.nass.usda.gov/Quick\\_Stats/CDQT/chapter/2/table/7/state/CA/county/055/year/2017](https://www.nass.usda.gov/Quick_Stats/CDQT/chapter/2/table/7/state/CA/county/055/year/2017)
- United States Census Bureau. (2019). *Income and Poverty in the United States: 2017*. Retrieved from [https://www.census.gov/library/publications/2020/demo/p60-270.html#:~:text=Median%20household%20income%20was%20%2468%2C703,and%20Table%20A%2D1\).](https://www.census.gov/library/publications/2020/demo/p60-270.html#:~:text=Median%20household%20income%20was%20%2468%2C703,and%20Table%20A%2D1).)



- United States Department of Agriculture. (2021, 8 13). *Emergency Disaster Designation and Declaration Process*. Retrieved from USDA Farm Service Agency: [https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/FactSheets/emergency\\_disaster\\_designation\\_declaration\\_process-factsheet.pdf](https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/FactSheets/emergency_disaster_designation_declaration_process-factsheet.pdf)
- United States Department of Agriculture. (n.d.). *Alluvial Fan Process Group*. Retrieved from <https://www.fs.usda.gov/>
- United States Department of Agriculture. (n.d.). *Fire Effects on the Environment*. Retrieved from <https://www.fs.usda.gov/pnw/page/fire-effects-environment>
- United States Environmental Protection Agency. (2016). *Climate Impacts on Agriculture and Food Supply*. Retrieved from [https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-agriculture-and-food-supply\\_.html](https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-agriculture-and-food-supply_.html)
- United States Environmental Protection Agency. (2021). *Climate Change Indicators*. Retrieved 08 29, 2021, from <https://www.epa.gov/climate-indicators/weather-climate>
- United States Forest Service. (n.d.). *Prescribed Fire*. Retrieved May 15, 2020, from <https://www.fs.usda.gov/managing-land/prescribed-fire>
- United States Geological Survey. (2004). *Landslide Types and Processes*. Retrieved from <https://pubs.usgs.gov/fs/2004/3072/fs-2004-3072.html>
- United States Geological Survey. (2004). *Landslide Types and Processes*. Retrieved from <https://pubs.usgs.gov/fs/2004/3072/fs-2004-3072.html>
- United States Geological Survey. (2005). *NOAA-USGS Debris-Flow Warning System-Final Report*. Retrieved from <https://pubs.usgs.gov/circ/2005/1283/pdf/Circular1283.pdf>
- United States Geological Survey. (n.d.). *Landslide Hazards*. Retrieved from <https://www.usgs.gov/natural-hazards/landslide-hazards>
- United States Geological Survey. (n.d.). *The Modified Mercalli Intensity Scale*. Retrieved May 15, 2020, from [https://www.usgs.gov/natural-hazards/earthquake-hazards/science/modified-mercalli-intensity-scale?qt-science\\_center\\_objects=0#qt-science\\_center\\_objects](https://www.usgs.gov/natural-hazards/earthquake-hazards/science/modified-mercalli-intensity-scale?qt-science_center_objects=0#qt-science_center_objects)
- United States Geological Survey. (n.d.). *The Pacific Coastal Fog Project*. Retrieved June 16, 2020, from [https://www.usgs.gov/centers/wgsc/science/pacific-coastal-fog-project?qt-science\\_center\\_objects=0#qt-science\\_center\\_objects](https://www.usgs.gov/centers/wgsc/science/pacific-coastal-fog-project?qt-science_center_objects=0#qt-science_center_objects)
- United States Geological Survey. (n.d.). *The Science of Earthquakes*. Retrieved May 15, 2020, from USGS Science for a Changing World: [https://www.usgs.gov/natural-hazards/earthquake-hazards/science/science-earthquakes?qt-science\\_center\\_objects=0#qt-science\\_center\\_objects](https://www.usgs.gov/natural-hazards/earthquake-hazards/science/science-earthquakes?qt-science_center_objects=0#qt-science_center_objects)





- United States Geological Survey. (n.d.). *The Science of Earthquakes*. Retrieved May 15, 2020, from USGS Science for a Changing World: [https://www.usgs.gov/natural-hazards/earthquake-hazards/science/science-earthquakes?qt-science\\_center\\_objects=0#qt-science\\_center\\_objects](https://www.usgs.gov/natural-hazards/earthquake-hazards/science/science-earthquakes?qt-science_center_objects=0#qt-science_center_objects)
- United States Geological Survey. (n.d.). *What Are the Long Term Effects of Climate Change*. Retrieved from [https://www.usgs.gov/faqs/what-are-long-term-effects-climate-change-1?qt-news\\_science\\_products=0#qt-news\\_science\\_products](https://www.usgs.gov/faqs/what-are-long-term-effects-climate-change-1?qt-news_science_products=0#qt-news_science_products)
- United States Geological Survey. (n.d.). *What is liquefaction?* Retrieved May 15, 2020, from USGS Science for a Changing World: [https://www.usgs.gov/faqs/what-liquefaction?qt-news\\_science\\_products=0#qt-news\\_science\\_products](https://www.usgs.gov/faqs/what-liquefaction?qt-news_science_products=0#qt-news_science_products)
- University of California, Davis Center for Watershed Sciences. (2020). *Projects and Research Programs*. Retrieved from <https://watershed.ucdavis.edu/>
- US Department of Energy. (2019). *Extreme Weather and Climate Vulnerabilities of the Electric Grid*. Retrieved 04 02, 2021, from <https://www.energy.gov/sites/prod/files/2019/09/f67/Oak%20Ridge%20National%20Laboratory%20EIS%20Response.pdf>
- US EPA. (2020). *Green Infrastructure*. Retrieved from <https://www.epa.gov/green-infrastructure/manage-flood-risk>
- USGS. (2014). *M6.0 South Napa, California Earthquake – August 24, 2014*. Retrieved 01 12, 2021, from [https://www.usgs.gov/natural-hazards/earthquake-hazards/science/m60-south-napa-california-earthquake-august-24-2014?qt-science\\_center\\_objects=0#qt-science\\_center\\_objects](https://www.usgs.gov/natural-hazards/earthquake-hazards/science/m60-south-napa-california-earthquake-august-24-2014?qt-science_center_objects=0#qt-science_center_objects)
- USGS. (2016). *Effects of Urban Development on Floods*. Retrieved from US Geological Survey Science for a Changing World: <https://pubs.usgs.gov/fs/fs07603/>
- USGS. (2020). *2018 United States (Lower 48) Seismic Hazard Long-term Model*. Retrieved from [https://www.usgs.gov/natural-hazards/earthquake-hazards/science/2018-united-states-lower-48-seismic-hazard-long-term?qt-science\\_center\\_objects=0#qt-science\\_center\\_objects](https://www.usgs.gov/natural-hazards/earthquake-hazards/science/2018-united-states-lower-48-seismic-hazard-long-term?qt-science_center_objects=0#qt-science_center_objects)
- USGS. (2020). *Does human activity cause landslides?* Retrieved from [https://www.usgs.gov/faqs/do-human-activities-cause-landslides?qt-news\\_science\\_products=0#qt-news\\_science\\_products](https://www.usgs.gov/faqs/do-human-activities-cause-landslides?qt-news_science_products=0#qt-news_science_products)
- USGS. (2020). *Increases in Wildfire-Caused Erosion Could Impact Water Supply and Quality in the West*. Retrieved from <https://www.usgs.gov/news/increases-wildfire-caused-erosion-could-impact-water-supply-and-quality-west-2>
- USGS. (n.d.). *Earthquake Hazards 201 - Technical Q&A*. Retrieved May 15, 2020, from USGS Science for a Changing World: <https://137.227.224.120/hazards/learn/technical.php#accel>



- Watershed Emergency Response Team. (2020). *LNU Lightening Complex Hennessey Fire*. Retrieved 03 26, 2021
- Western Regional Climate Center. (2020). *Climate of California*. Retrieved from [https://wrcc.dri.edu/Climate/narrative\\_ca.php](https://wrcc.dri.edu/Climate/narrative_ca.php)
- Western Regional Climate Center. (2020). *Climate of California*. Retrieved from [https://wrcc.dri.edu/Climate/narrative\\_ca.php](https://wrcc.dri.edu/Climate/narrative_ca.php)
- Wiebold, B. (2007). *Flood Effects on Grain Crops*. Retrieved from University of Missouri Extension: <https://extension.missouri.edu/publications/agw1014>
- Yana S. Valachovic et al. (2011). Sudden Oak Death-caused Changes to Surface Fuel Loading and Potential Fire Behavior in Douglas-fir-tanoak Forests. *Forest Ecology and Management*, 1973-1986.



## **Appendix A. Analysis Methodology**

# **SOLANO COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN**



A vulnerability assessment was conducted using Geographic Information Systems (GIS) for each of the priority hazards identified by the Planning Committee. Several sources of data are necessary to conduct a vulnerability analysis. This appendix presents an outline of the data inputs, processing steps, and outputs used to create the vulnerability analysis results presented in the Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). The analysis methodology is presented first, followed by an overview of the analysis data.

## A.1. Natural Hazard Exposure

The natural hazard exposure analysis (see C. Natural Hazard Exposure in Figure 7-4) is an inventory of population, parcels, critical facilities, and other assets within each natural hazard area. As shown in Figure 7-1, the presence of a structure inside a natural hazard area (the flood zone in this example) qualifies that structure as exposed to the natural hazard.



Figure 7-1: Hazard Exposure

The total counts of parcels, people, facilities, and assets and the sum of values within the planning area which could be exposed to a hazard event are referred to as the “exposure” in this plan. A natural hazards overlay was developed to reflect the combination of many known natural hazard spatial footprints. The spatial overlay method enables summarization of building values, parcel counts, population exposure, and critical facility exposure within a hazard’s geographic extents (see C. Natural Hazard Exposure in Figure 7-4). The input data is used to evaluate exposure for wildfire, flood, areas protected by levee, dam inundation, earthquake, liquefaction, faults of required investigation, landslide, sea-level rise, and tsunami run-up.

### A.1.1. Damage Estimation with Hazus

FEMA’s Hazus software was implemented to conduct a detailed loss estimation for flood, earthquake, and dam inundation. Hazus is a nationally applicable standardized methodology that contains models for estimating potential losses from earthquakes, floods, and hurricanes. Hazus uses GIS technology to estimate physical, economic, and social impacts of disasters. For purposes of this planning effort, Hazus was used to generate damage estimations due to possible earthquakes and flooding. The estimated damage and losses



provided by the Hazus Software provide the ability to understand possible widescale damage to buildings and facilities.

In the hypothetical geography shown in Figure 7-3, even though both structures are exposed to flooding, it is expected that the structure with a first floor height below the depth of flooding will receive significantly more damage than the structure with a first floor height above the expected water depth. Note that not all building data contains first floor height, and first floor height is an example of the type of field utilized by Hazus in calculating damage estimates.

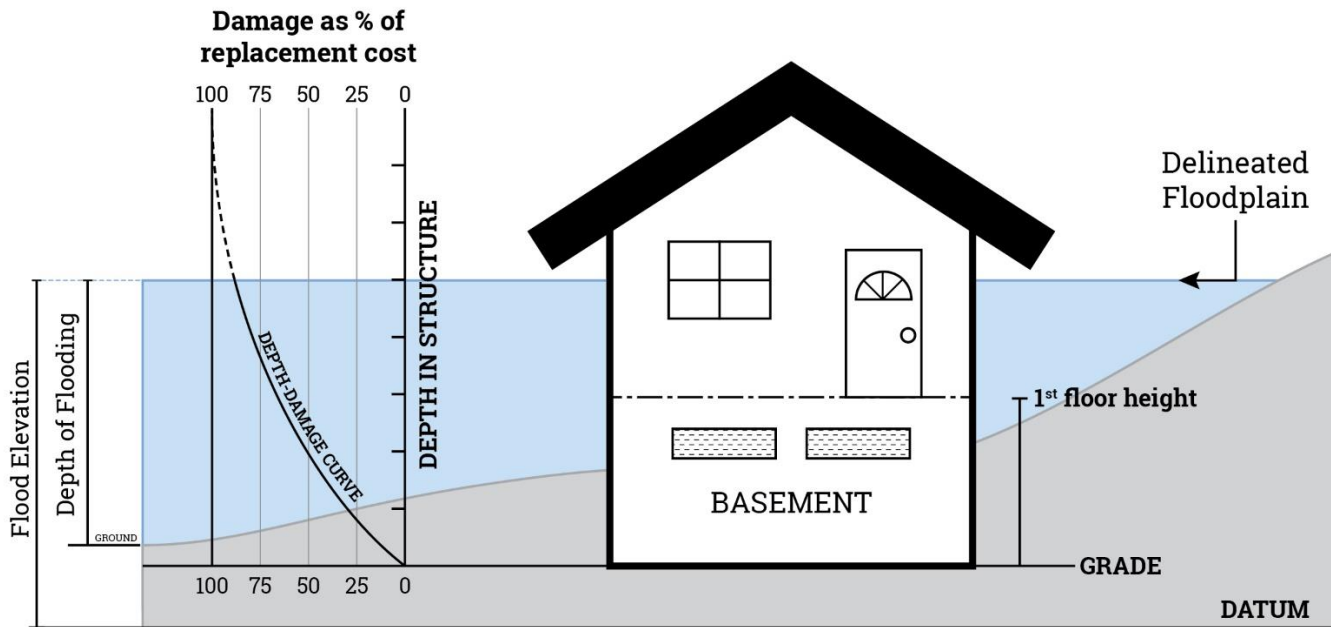


Figure 7-2: Flood Depth and Damage Curves

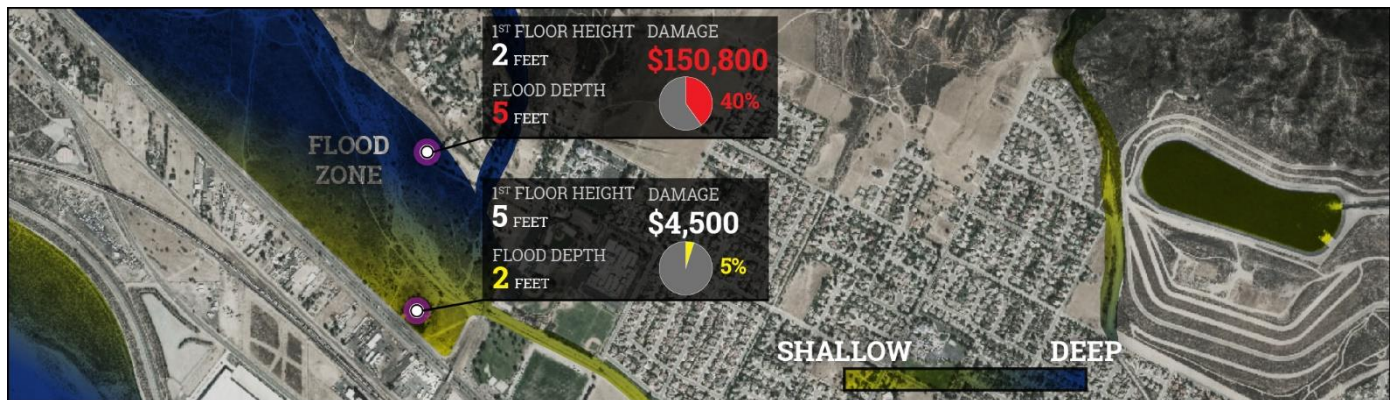


Figure 7-3: Hazus Damage Estimations



Damage estimations are shown for improved jurisdictional real property assets for flood and earthquake for all jurisdictions in Section A.2.4. Unincorporated insured assets received from a county-provided list are shown in Section A.2.5; improved parcels were filtered out of this longer dataset for Hazus estimated damage results as shown in Section A.2.4 (which includes improved assets for all jurisdictions with some measure of damage estimated for each hazard). Jurisdictions may access other, non-incorporated insured asset rolls through [mitigatehazards.com/solanoHMP](https://mitigatehazards.com/solanoHMP).

Hazus is a FEMA product with highly detailed documentation provided on the analysis steps and algorithms performed against the input data and associated scenarios in the process of obtaining loss estimates. The explanation in this appendix section is simplified. Refer to the full documentation and technical manuals from FEMA for greater explanation on Hazus specifics.

## **A.1.2. Distinguishing Results – Natural Hazard Exposure Analysis vs Hazus Results**

Table and chart references throughout the hazard mitigation plan are explicitly called out for Hazus results as “Damage Estimates”. There are expected differences in the results between estimations of Natural Hazard overlays and detailed Hazus results. Snapshot tables and Natural Hazard Exposure sections do not contain Hazus estimates.

## **A.2. Analysis Data**

### **A.2.1. Assets, Value, and Population**

#### **A.2.1.1. Parcels**

County-provided parcel geometry was joined with County Assessor data. Centroids were created to represent parcels at a single location. Fields required by Hazus that were not present in the parcel data provided were given default values based on the mapped use-codes of each parcel. Earthquake building design level attribution was based on year built (where the default was 1972) and building code adaptation chronology. Improved parcels were chosen for the parcels dataset by a query of improvement value presence, building area, and use-code descriptors. Where building area values were present, a replacement cost of \$250 per square foot was used in place of assessed values.

#### **A.2.1.2. Asset Insurance Schedules**

County and jurisdictional insurance schedules were used in developing Real Property Asset data with valuations and structural data for analyses. These assets were utilized in Hazus damage estimate analysis as well as vulnerability exposure analysis. The tabular data were geocoded and quality checked for building placement. This data is presented in the exposure analysis as “Real Property Assets” and in Hazus results



as government and emergency occupancy categories. There is some overlap with Real Property Asset data and the other critical infrastructure classifications..

### **A.2.1.3. Population**

Population estimates were derived from 2014-2018 five-year U.S. Census Bureau American Community Survey (ACS) numbers as applied to Census block groups and Census Place geographies, then processed through GIS modeling in order to break down the proportional population for smaller units of area in relation to natural hazards.

### **A.2.1.4. Critical Infrastructure**

Critical facilities and transportation/lifeline typically include hospitals, fire stations, police stations, storage of critical records, and similar facilities. These data came from a collection of sources, including but not limited to: county GIS, county and local jurisdiction insurance data, CDSS, CEC, FCC, Hazus, USACE, NBI, FEMA, and NPS. All data sources have a level of accuracy acceptable for planning purposes.

Table 7-7 is a complete list of Critical Infrastructure data used in the analysis.

### **A.2.1.5. Hazus Inputs**

Hazus data inputs include hazard scenario data and detailed building data. The GIS team conducted a Level 2 analysis utilizing user-defined buildings with refined building characteristic parameters as inputs for the damage estimation calculations (see A.2.1.1 and A.2.1.2). Both county-wide building data and real property assets were used as inputs in this level 2 analysis. The customized user defined building dataset allows for more accurate results for damage estimation based upon detailed building characteristics.

***Note: FEMA's Hazus software utilizes different user defined building information inputs to develop loss estimates depending on the hazard module. The Hazus flood and earthquake modules use fragility curves based upon the user's definition of building characteristics, including but not limited to:***

- Area
- Year Built
- Construction Type
- Number of Stories
- First Floor Height
- EQ Design Level
- Occupancy Type (Residential, Government, etc.)
- Building Values

***Defaults were used for missing fields and values based on use-code and other available information for that input.***



## A.2.2. Natural Hazard Data

### A.2.2.1. Earthquake Shaking

The CGS two percent chance – 50-year probability map was used as a qualitative guide in selecting an earthquake epicenter-based shakemap scenario for analyses. The M6.8 Concord Green Valley and M7.1 Hayward Rodgers Creek earthquake scenarios and shakemaps were used in this plan's analyses.

#### Earthquake Scenario MMI Shaking Intensity

M6.8 Concord Green Valley & M7.1 Hayward Rodgers Creek EQ Scenarios

Intensity	MMI	Description/Damage
I-Not felt	0-1	Not felt except by a very few under especially favorable conditions.
II-Weak	1-2	Felt only by a few persons at rest, especially on upper floors of buildings.
III-Weak	2-3	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 similar to the passing of a truck. Duration estimated.
IV-Light	3-4	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	4-5	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI-Strong	5-6	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII-Very strong	6-7	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	7-8	Damage slight in specially designed 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	8-9	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X-Extreme	9-10	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Source: USGS Scenario MMI Grid



### A.2.2.2. Liquefaction

USGS earthquake caused liquefaction susceptibility by type and age of quaternary deposits.

#### Liquefaction Susceptibility

Hazard	Native Class	Description
Very Low	VL	Very Low susceptibility to liquefaction delineated by type and age of Quaternary deposits. Not Shown
Low	L	Low susceptibility to liquefaction delineated by type and age of Quaternary deposits.
Medium	M	Medium susceptibility to liquefaction delineated by type and age of Quaternary deposits.
High	H	High susceptibility to liquefaction delineated by type and age of Quaternary deposits.
Very High	VH	Very High susceptibility to liquefaction delineated by type and age of Quaternary deposits.

Source: USGS Liquefaction Susceptibility

### A.2.2.3. Fault Zones Requiring Investigation

Quaternary faults (USGS) and associated zones requiring investigation as provided by CGS.

#### Quaternary Faults and Zones of Required Investigation

Hazard	Native Class	Description
Zone of Investigation	Area of Required Investigation	Site-specific investigations are required for certain developments within the zones depicted on these areas and, if the potential for the hazard is found to exist, plans to mitigate the hazard must be provided prior to a lead agency issuing a permit for construction.

Source: CGS

### A.2.2.4. Dam Inundation Zones

Dam inundation zone GIS data were provided by Cal OES and DWR. These represent the estimated flood extent in the event of dam failure for individual dams.

#### Dam Inundation Area

Hazard	Description
Inundation Area	CalOES dam inundation maps show the maximum extent of damage of a flood wave emanating from a dam failure. Dam Inundation maps for the State of California are required by California Government Code Section 8589.5(b). DWR Dam Breach Inundation studies included for those with Downstream Hazard ratings of Extremely High.

Source: Cal OES, DWR





### A.2.2.5. Flood Zones

The input parameters for Hazus analysis of Flood exposure included depth grids created with the FEMA Flood Zone data mentioned in section A.2.2.5. 100-YR and 500-YR were scenarios used to analyze the exposure to inputs as depicted in Figure 7-4. 100-YR Coastal and FEMA areas protected by levee were analyzed in the exposure analysis with limited findings of exposure. NLD Areas Behind Levee were analyzed in the exposure analysis supplementally.

#### FEMA Flood Hazard

Hazard	Flood Zone	Description
100-YR Flood [SFHA]	Subtype: Floodway	A "Regulatory Floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. Communities must regulate development in these floodways to ensure that there are no increases in upstream flood elevations.
	SFHA outside Floodway	The land area covered by the floodwaters of the base flood is the Special Flood Hazard Area (SFHA) on NFIP maps. The SFHA is the area where the National Flood Insurance Program's (NFIP's) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies.
100-YR Coastal [SFHA]	Coastal SFHA	Zone VE, also known as a Coastal High Hazard Area, is considered one of the areas of highest risk depicted on FIRMs. Zone VE is designated where wave hazards are expected to be particularly strong and have the potential to cause dramatic structural damage. <a href="https://www.fema.gov/coastal-flood-risk-study-process">https://www.fema.gov/coastal-flood-risk-study-process</a>
500-YR Flood [non-SFHA]	Subtypes: 0.2% Annual Chance, Protected by Levee	Moderate risk areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by a levee. No BFEs or base flood depths are shown within these zones.
Protected by Levee [non-SFHA]	Protected by Levee	Areas protected from the 1-percent-annual-chance flood by a levee. No BFEs or base flood depths are shown within these zones.

Source: FEMA MSC DFIRM

### A.2.2.6. Area Behind Levee

An Area Behind Levee is an area of a floodplain from which water is excluded by the levee system. National Levee Database (USACE). Differs from FEMA protected by levee areas.



## Area Protected by Levee

Hazard	Native Class	Description
Area Behind Levee	Areas Defined in NLD	Area of a floodplain from which water is excluded by the levee system. National Levee Database (USACE)

*Source: National Levee Database - United States Army Corps of Engineers*

### A.2.2.7. Landslide Susceptibility

GIS layer with geographic boundaries defining the likelihood of deep-seated landslides. Underlying geology and slope angle are used in the creation of this layer by the California Geological Society. Low, Medium, and High landslide classes were chosen as summary classes for this plan.

## Landslide Susceptibility

Hazard	Description	
Low	1-5	These classes express the generalization that on very low slopes, landslide susceptibility is low even in weak materials, and that landslide susceptibility increases with slope and in weaker rocks.
Medium	6-7	Very high landslide susceptibility, classes VIII, IX, and X, includes moderate and steep slopes in hard rocks and weak rocks.
High	8-10	Very high landslide susceptibility, classes VIII, IX, and X, includes very steep slopes in hard rocks and moderate to very steep slopes in weak rocks.

*Source: CGS Susceptibility to Deep-Seated Landslides in California*



### A.2.2.8. Sea-Level Rise

GIS layer composite from NOAA sea-level rise data. Zero to 10 feet of rise were classified based on Global Mean Sea Level (GMSL) Scenarios where low rise is zero to one feet, intermediate-low is two feet, intermediate is three feet, intermediate-high is four to five feet, high is six to seven feet, and extreme is greater than or equal to eight feet.

#### Sea Level Rise

Hazard	Native Class	Description
Low	0 - 1'	Sea level rise from 0 to 1 foot above Mean Higher High Water (MHHW) [98% probability by year 2100]
Intermediate Low	1 - 2'	Sea level rise from 1 foot to 2 feet above MHHW [73% probability by year 2100]
Intermediate	2 - 3'	Sea level rise from 2 feet to 3 feet above MHHW [3% probability by year 2100]
Intermediate High	3 - 5'	Sea level rise from 3 feet to 5 feet above MHHW [0.5% probability by year 2100]
High	5 - 7'	Sea level rise from 5 feet to 7 feet above MHHW [0.1% probability by year 2100]
Extreme	> 7'	Sea level rise greater than or equal to 8 feet above MHHW [0.05% probability by year 2100]

*Source: National Oceanic and Atmospheric Administration Office for Coastal Management Sea Level Rise Data: 1-10 ft Sea Level Rise Inundation Extent*

*Note: These data depict the potential inundation of coastal areas resulting from a projected 1 to 10 feet rise in sea level above current Mean Higher High Water (MHHW) conditions.*



### A.2.2.9. Tsunami Run-up

GIS layer obtained from CGS / Cal OES MOST Model that outlines 10-foot tsunami run-up inundation area.

#### Tsunami Run-up

Hazard	Native Class	Description
Tsunami Run-up	Maximum Wave Elevation	A consortium of tsunami modelers, geologic hazard mapping specialists, and emergency planning scientists is producing maximum tsunami inundation maps for California, covering most residentially and transient populated areas along the state's coastline. The new tsunami inundation maps will be an upgrade over the existing maps for the state, improving on the resolution, accuracy, and coverage of the maximum anticipated tsunami inundation line. Thirty-three separate map areas covering nearly one-half of California's coastline were selected for tsunami modeling using the MOST (Method of Splitting Tsunami) model. Based on a preliminary evaluation of over fifty local and distant tsunami source scenarios, those with the maximum expected hazard for a particular area were input to MOST. The MOST model was run with a near-shore bathymetric grid resolution varying from three arc-seconds (90m) and one arc-seconds (30m), depending on availability. Maximum tsunami "flow depth" and inundation layers were created by combining all modeled scenarios for each area.

Source: Cal OES / CGS

*Note: Coordinated by Cal OES, these official maps are developed for all populated areas at risk to tsunamis in California and represent a combination of the maximum considered tsunamis for each area.*



### A.2.2.10. Wildfire Hazard Severity

A proprietary Dynamic Planning + Science composite GIS layer derived from wildland urban interfaces, California Public Utilities Commission fire threat areas, and Fire Hazard Severity Zones. See Table 7-1.

Table 7-1: Wildfire Hazard Severity Classification

Hazard	Native Class	Description
Moderate	Tier 1	HHZs are zones in direct proximity to communities, roads, and utility lines, and are a direct threat to public safety.
	1	WUI is the potential treatment zone in which projects could be conducted to reduce wildland fire threats to people.
	1 / Moderate	See Cal Fire FHSZ (State Responsibility Area [SRA] & Local Responsibility Area [LRA])
High	Tier 2	Tier 2 fire-threat areas depict areas where there is an elevated risk (including likelihood and potential impacts on people and property) from utility associated wildfires.
	High	See Cal Fire FHSZ (State Responsibility Area [SRA] & Local Responsibility Area [LRA])
Very High	Tier 3	Tier 3 fire-threat areas depict areas where there is an extreme risk (including likelihood and potential impacts on people and property) from utility associated wildfires.
	Very High	Classification of a zone as moderate, high or very high fire hazard is based on a combination of how a fire will behave and the probability of flames and embers threatening buildings. Each area of the map gets a score for flame length, embers, and the likelihood of the area burning. Scores are then averaged over the zone areas. Final zone class (moderate, high and very high) is based on the averaged scores for the zone.

Source: Moderate - Cal Fire Tree Mortality, WUI, FHSZ; High - CPUC Utility Threat, Cal Fire FHSZ; Very High - High - CPUC Utility Threat, Cal Fire FHSZ (SRA & LRA)





### A.2.3. Methodology Overview

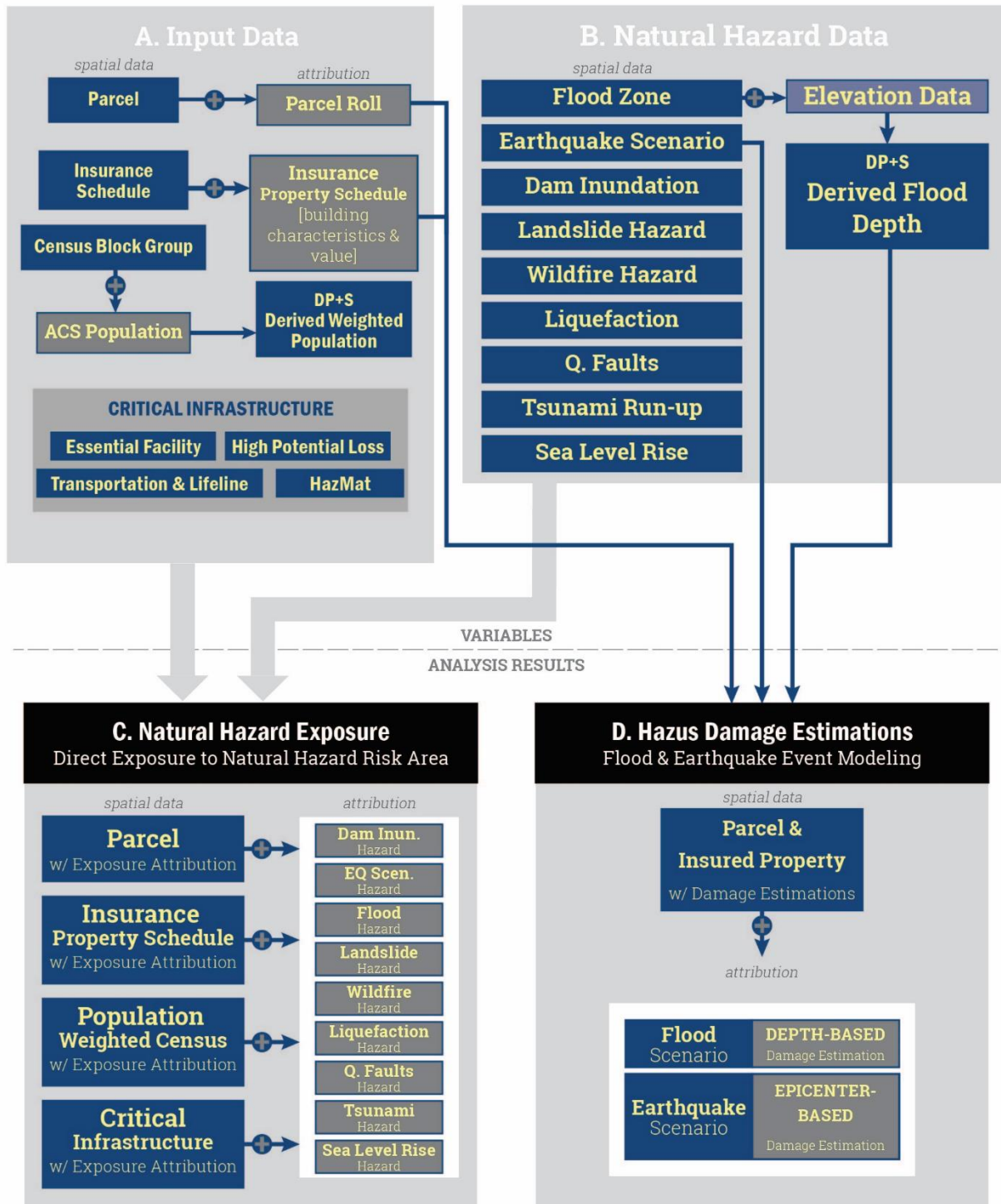


Figure 7-4: Data Analysis Methodology



## A.2.4. Real Property Damage Estimations

The following tables provide detailed real property asset damage estimations for a 100-YR and 500-YR flood events (Table 7-2 and Table 7-3) and for both the M6.8 Concord Green Valley Earthquake Scenario (Table 7-4 and the M7.1 Hayward Rodger's Creek Earthquake Scenario (Table 7-5).

Note that these damage estimation tables only show improved assets with some measure of damage estimated for each hazard. Section A.2.5 shows all unincorporated insured assets received from a county-provided list; improved parcels were filtered out of this longer data set for Hazus estimated damage results as shown herein for all jurisdictions. Jurisdictions may access the insured asset rolls through [mitigatehazards.com/solanoHMP](https://mitigatehazards.com/solanoHMP) as well.

Table 7-2: 100-YR Flood Damage Estimations for Improved Assets

Building/Site Name	# Bldg.	Value		Damage Pct.		Estimated Losses (USD)			
		Structure	Content	Structure	Content	Structure	Content	Total	Loss Pct. of Value
<b>Benicia</b>	<b>7</b>	<b>\$5,440,508</b>	<b>\$3,804,627</b>	<b>11%</b>	<b>66%</b>	<b>\$811,226</b>	<b>\$2,312,079</b>	<b>\$3,123,306</b>	<b>34%</b>
Blower Building	1	\$753,535	\$1,041,426	5%	35%	\$41,309	\$360,956	\$402,265	22%
Chem. Storage Facility (Odor Scrubber)	1	\$197,728	\$383,133	6%	40%	\$11,982	\$154,194	\$166,176	29%
Disinfection Station (Chem Storage Area)	1	\$168,793	\$193,888	14%	82%	\$23,511	\$159,681	\$183,192	51%
Emerg. Gen. Bldg. (Natural Gas)	1	\$34,963	\$495,751	10%	66%	\$3,635	\$328,152	\$331,787	63%
Equip. Bldg. (Secondary Area)	1	\$1,467,285	\$1,674,174	13%	78%	\$196,588	\$1,298,870	\$1,495,458	48%
Industrial Monitoring Station	1	\$147,091	\$16,254	9%	63%	\$13,683	\$10,225	\$23,908	15%
Ship Service Facility	1	\$2,671,113	\$1	19%	100%	\$520,518	\$1	\$520,519	19%
<b>Dixon</b>	<b>4</b>	<b>\$903,600</b>	<b>\$1,473,200</b>	<b>0%</b>	<b>0%</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>0%</b>
Wastewater Treatment Plant	4	\$903,600	\$1,473,200	0%	0%	\$0	\$0	\$0	0%
<b>Fairfield</b>	<b>4</b>	<b>\$12,902,000</b>	<b>\$933,132</b>	<b>1%</b>	<b>3%</b>	<b>\$588</b>	<b>\$90</b>	<b>\$679</b>	<b>0%</b>
Octo Inn Park	1	\$404,000	\$9,800	0%	0%	\$0	\$0	\$0	0%
Paradise Valley Golf Course	2	\$52,000	\$1,332	1%	7%	\$588	\$90	\$679	1%
Training Facility	1	\$12,446,000	\$922,000	0%	0%	\$0	\$0	\$0	0%
<b>Rio Vista</b>	<b>2</b>	<b>\$449,400</b>	<b>\$164,600</b>	<b>5%</b>	<b>30%</b>	<b>\$22,470</b>	<b>\$49,380</b>	<b>\$71,850</b>	<b>12%</b>
Corporation Yard	2	\$449,400	\$164,600	5%	30%	\$22,470	\$49,380	\$71,850	12%
<b>Suisun City</b>	<b>15</b>	<b>\$5,433,262</b>	<b>\$137,328</b>	<b>11%</b>	<b>66%</b>	<b>\$700,001</b>	<b>\$105,524</b>	<b>\$805,525</b>	<b>14%</b>
4-Plex	13	\$5,329,794	\$137,326	13%	76%	\$699,632	\$105,524	\$805,156	15%
Park Restroom	1	\$66,212	\$1	0%	0%	\$0	\$0	\$0	0%
Restroom Bldg	1	\$37,256	\$1	1%	6%	\$369	\$0	\$369	1%
<b>Unincorporated County</b>	<b>6</b>	<b>\$53,401,751</b>	<b>\$53,401,751</b>	<b>1%</b>	<b>4%</b>	<b>\$53,252</b>	<b>\$319,509</b>	<b>\$372,761</b>	<b>0%</b>
2009 H&Ss New Lab	1	\$7,556,000	\$7,556,000	0%	0%	\$0	\$0	\$0	0%
Courts	1	\$805,000	\$805,000	0%	0%	\$0	\$0	\$0	0%



Building/Site Name	# Bldg.	Value		Damage Pct.		Estimated Losses (USD)			
		Structure	Content	Structure	Content	Structure	Content	Total	Loss Pct. of Value
Health & Social Services Headquarters Bldg.	1	\$30,045,000	\$30,045,000	0%	0%	\$0	\$0	\$0	0%
Health & Social Services Health Facility	1	\$13,498,000	\$13,498,000	0%	0%	\$0	\$0	\$0	0%
Nut Tree Nut Tree Airport	1	\$1	\$1	0%	0%	\$0	\$0	\$0	0%
Veteran's Memorial Building	1	\$1,497,750	\$1,497,750	4%	21%	\$53,252	\$319,509	\$372,761	12%
<b>Vacaville</b>	<b>1</b>	<b>\$80,000</b>	<b>\$1</b>	<b>3%</b>	<b>16%</b>	<b>\$2,164</b>	<b>\$0</b>	<b>\$2,164</b>	<b>3%</b>
Pena Adobe	1	\$80,000	\$1	3%	16%	\$2,164	\$0	\$2,164	3%
<b>Vallejo</b>	<b>7</b>	<b>\$5,026,610</b>	<b>\$875,173</b>	<b>4%</b>	<b>12%</b>	<b>\$187,673</b>	<b>\$173,670</b>	<b>\$361,343</b>	<b>6%</b>
Fire Station 23	2	\$1,357,507	\$339,994	8%	12%	\$107,441	\$39,638	\$147,079	9%
Mare Island	1	\$1,214,392	\$290,743	7%	46%	\$80,232	\$132,381	\$212,613	14%
Marina Properties	4	\$2,454,711	\$244,436	1%	4%	\$0	\$1,651	\$1,651	0%
<b>Grand Total</b>	<b>46</b>	<b>\$83,637,131</b>	<b>\$60,789,812</b>	<b>6%</b>	<b>36%</b>	<b>\$1,777,374</b>	<b>\$2,960,253</b>	<b>\$4,737,626</b>	<b>3%</b>

Table 7-3: 500-YR Flood Damage Estimations for Improved Assets

Building/Site Name	# Bldg.	Value		Damage Pct.		Estimated Losses (USD)			
		Structure	Content	Structure	Content	Structure	Content	Total	Loss Pct. of Value
<b>Benicia</b>	<b>1</b>	<b>\$153,657</b>	<b>\$1</b>	<b>0%</b>	<b>0%</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>0%</b>
Grand Stand	1	\$153,657	\$1	0%	0%	\$0	\$0	\$0	0%
<b>Fairfield</b>	<b>6</b>	<b>\$2,735,000</b>	<b>\$150,909</b>	<b>1%</b>	<b>5%</b>	<b>\$12,178</b>	<b>\$15,134</b>	<b>\$27,312</b>	<b>1%</b>
Community Resources Apartments	1	\$1,133,000	\$1	0%	0%	\$0	\$0	\$0	0%
Heather House	4	\$1,356,000	\$99,957	0%	0%	\$0	\$0	\$0	0%
Laurel Creek Park	1	\$246,000	\$50,951	5%	30%	\$12,178	\$15,134	\$27,312	9%
<b>Suisun City</b>	<b>1</b>	<b>\$16,691</b>	<b>\$1</b>	<b>0%</b>	<b>0%</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>0%</b>
Bus Shelter	1	\$16,691	\$1	0%	0%	\$0	\$0	\$0	0%
<b>Unincorporated County</b>	<b>15</b>	<b>\$121,786,251</b>	<b>\$122,918,126</b>	<b>4%</b>	<b>24%</b>	<b>\$2,035,426</b>	<b>\$12,058,289</b>	<b>\$14,093,715</b>	<b>6%</b>
Ag Office Space	1	\$517,750	\$517,750	13%	77%	\$68,927	\$397,712	\$466,640	45%
Ag Office Space/Warehouse (Bldg A)	1	\$1,526,750	\$1,526,750	13%	76%	\$202,193	\$1,163,232	\$1,365,425	45%
Bay Area Community Services (Bacs)	1	\$1,791,000	\$1,791,000	2%	11%	\$34,140	\$204,842	\$238,983	7%



Building/Site Name	# Bldg.	Value		Damage Pct.		Estimated Losses (USD)			
		Structure	Content	Structure	Content	Structure	Content	Total	Loss Pct. of Value
Facilities Warehouse (Shared With Sheriff)	1	\$1,340,000	\$1,340,000	0%	0%	\$0	\$0	\$0	0%
Fleet Operations- Light Equipment Shop	1	\$878,500	\$878,500	0%	0%	\$0	\$0	\$0	0%
Gen Serv Surplus (Bldg B)	1	\$2,000,000	\$2,000,000	13%	75%	\$261,253	\$1,491,276	\$1,752,529	44%
Hall Of Justice	1	\$27,787,000	\$27,787,000	4%	22%	\$1,005,825	\$6,034,953	\$7,040,778	13%
Jail	1	\$54,594,750	\$54,594,750	0%	0%	\$0	\$0	\$0	0%
Law And Justice	1	\$8,479,000	\$8,479,000	0%	0%	\$0	\$0	\$0	0%
Probation Building	1	\$10,951,750	\$10,951,750	1%	5%	\$83,704	\$502,222	\$585,926	3%
Sheriff/Coroner	1	\$1,638,750	\$2,458,125	0%	0%	\$0	\$0	\$0	0%
Sheriff's Office	1	\$625,000	\$937,500	0%	0%	\$0	\$0	\$0	0%
Weights & Measures	1	\$429,250	\$429,250	13%	77%	\$57,442	\$332,398	\$389,840	45%
William J. Carroll Govt. Center Site	2	\$9,226,751	\$9,226,751	2%	10%	\$321,942	\$1,931,652	\$2,253,594	12%
<b>Vacaville</b>	<b>14</b>	<b>\$5,444,000</b>	<b>\$627,744</b>	<b>3%</b>	<b>12%</b>	<b>\$19,496</b>	<b>\$20,286</b>	<b>\$39,782</b>	<b>1%</b>
Al Patch Park	1	\$250,000	\$16,800	0%	0%	\$0	\$0	\$0	0%
Arlington Park	4	\$368,000	\$89,440	3%	15%	\$10,811	\$19,574	\$30,385	7%
Gentry Meadowlands	2	\$176,000	\$49,416	0%	0%	\$0	\$0	\$0	0%
Keating Park	2	\$375,000	\$136,099	0%	0%	\$0	\$0	\$0	0%
Leisure Town Lift Station	1	\$323,000	\$28,588	0%	0%	\$0	\$0	\$0	0%
Transit Plaza	2	\$205,000	\$2,143	15%	54%	\$8,685	\$713	\$9,397	5%
Vacaville Fire Station 75	1	\$3,640,000	\$229,500	0%	0%	\$0	\$0	\$0	0%
Water Treatment Plant	1	\$107,000	\$75,758	0%	0%	\$0	\$0	\$0	0%
<b>Vallejo</b>	<b>1</b>	<b>\$1,439,433</b>	<b>\$12,048</b>	<b>5%</b>	<b>28%</b>	<b>\$67,209</b>	<b>\$3,375</b>	<b>\$70,585</b>	<b>5%</b>
Community Center	1	\$1,439,433	\$12,048	5%	28%	\$67,209	\$3,375	\$70,585	5%
<b>Grand Total</b>	<b>38</b>	<b>\$131,575,032</b>	<b>\$123,708,829</b>	<b>3%</b>	<b>16%</b>	<b>\$2,134,310</b>	<b>\$12,097,084</b>	<b>\$14,231,395</b>	<b>6%</b>



Table 7-4. EQ M6.8 Concord Green Valley Damage Estimations for Improved Assets

Building/ Site Name	# Bldg.	Site Value			Probability Damage Exceeds			Economic Loss	Loss Pct.
		Structure	Content	Total	Slight	Moderate	Extensive		
<b>Benicia</b>	<b>74</b>	<b>\$73,452,515</b>	<b>\$19,977,929</b>	<b>\$93,430,444</b>	<b>48%</b>	<b>25%</b>	<b>9%</b>	<b>\$17,344,529</b>	<b>19%</b>
Barn	1	\$52,488	\$1	\$52,489	45%	14%	2%	\$4,997	10%
Blower Building	1	\$753,535	\$1,041,426	\$1,794,961	30%	9%	1%	\$46,681	3%
Camel Barn	1	\$1,143,507	\$1	\$1,143,508	54%	37%	12%	\$245,820	21%
Camel Barn - Office	1	\$603,137	\$1	\$603,138	54%	37%	12%	\$129,656	21%
Caretaker House	1	\$311,070	\$1	\$311,071	45%	14%	2%	\$29,614	10%
Chem. Storage Facility (Odor Scrubber)	1	\$197,728	\$383,133	\$580,861	62%	30%	5%	\$33,604	6%
Chemical Building	1	\$2,883,103	\$562,213	\$3,445,316	46%	19%	3%	\$324,868	9%
Chlorine Room	1	\$395,443	\$1	\$395,444	73%	57%	20%	\$131,034	33%
City Hall	1	\$6,423,835	\$2,008,928	\$8,432,763	72%	58%	27%	\$2,317,206	27%
Civic Center Park - Restroom	1	\$85,585	\$1	\$85,586	61%	29%	4%	\$14,132	17%
Commandants Hse	1	\$2,418,037	\$1	\$2,418,038	95%	91%	71%	\$1,749,643	72%
Community Center And Portables	1	\$853,630	\$1	\$853,631	43%	6%	0%	\$52,660	6%
Concession	2	\$444,537	\$2	\$444,539	27%	8%	1%	\$24,757	6%
Convention Center	1	\$6,301,089	\$406,054	\$6,707,143	86%	76%	46%	\$3,281,859	49%
Digester 1 And 2 Equipment Building	1	\$289,358	\$514,328	\$803,686	62%	46%	17%	\$78,008	10%
Digester 3	1	\$1,738,559	\$1	\$1,738,560	62%	30%	5%	\$295,468	17%
Digester 3 Equipment Building	1	\$311,061	\$431,897	\$742,958	30%	9%	1%	\$19,270	3%
Digesters 1	1	\$1,335,868	\$1	\$1,335,869	98%	95%	76%	\$1,015,968	76%
Disinfection Station (Chem Storage Area)	1	\$168,793	\$193,888	\$362,681	62%	30%	5%	\$28,686	8%
Dwelling	1	\$325,362	\$1	\$325,363	36%	10%	1%	\$22,486	7%
Emerg. Gen. Bldg. (Natural Gas)	1	\$34,963	\$495,751	\$530,714	37%	5%	0%	\$1,790	0%
Equip. Bldg. (Secondary Area)	1	\$1,467,285	\$1,674,174	\$3,141,459	30%	9%	1%	\$90,898	3%
Filter Control Room And Gallery	1	\$1,746,764	\$1	\$1,746,765	46%	19%	3%	\$196,825	11%
Fire Station	1	\$3,904,970	\$286,078	\$4,191,048	33%	5%	0%	\$184,978	4%
Fire Station #12	1	\$993,098	\$1,432,535	\$2,425,633	27%	8%	1%	\$53,508	2%
Flash Mix Room	1	\$438,788	\$1	\$438,789	46%	19%	3%	\$49,443	11%
Grand Stand	1	\$153,657	\$1	\$153,658	32%	3%	0%	\$6,486	4%
Hockey Rink	1	\$53,190	\$1	\$53,191	64%	40%	10%	\$12,052	23%
Industrial Monitoring Station	1	\$147,091	\$16,254	\$163,345	30%	9%	1%	\$9,112	6%
Library	1	\$8,111,579	\$3,924,567	\$12,036,146	35%	11%	1%	\$582,736	5%
Museum	2	\$1,694,909	\$2	\$1,694,911	82%	73%	49%	\$637,209	38%
Operation Building	1	\$2,302,808	\$224,074	\$2,526,882	30%	9%	1%	\$142,659	6%





Building/ Site Name	# Bldg.	Site Value			Probability Damage Exceeds			Economic Loss	Loss Pct.
		Structure	Content	Total	Slight	Moderate	Extensive		
Operations Building	1	\$4,980,954	\$1	\$4,980,955	73%	57%	20%	\$1,650,489	33%
Pier/Restroom	1	\$181,242	\$1	\$181,243	43%	6%	0%	\$11,181	6%
Plant Headworks (Rake System Included)	1	\$277,302	\$983,376	\$1,260,678	98%	95%	76%	\$210,896	17%
Police Station	1	\$1,604,174	\$331,347	\$1,935,521	63%	45%	17%	\$427,384	22%
Pool Dressing / Shower Building	1	\$551,009	\$114,747	\$665,756	59%	42%	15%	\$136,479	20%
Portable Office	2	\$360,391	\$77,597	\$437,988	25%	6%	0%	\$18,261	4%
Recreation Center	1	\$1,304,698	\$97,307	\$1,402,005	33%	5%	0%	\$61,804	4%
Restroom	6	\$758,036	\$6	\$758,042	37%	18%	5%	\$88,692	12%
Restroom - Playground Area	1	\$65,558	\$1	\$65,559	40%	5%	0%	\$3,755	6%
Restroom / Canteen - Softball Fields	1	\$65,558	\$1	\$65,559	33%	11%	1%	\$4,575	7%
Restroom/Canteen	1	\$1	\$1	\$2	34%	4%	0%	\$0	2%
Restroom/Canteen - Little League Fields	1	\$181,242	\$1	\$181,243	40%	5%	0%	\$10,380	6%
Scheduled Mobile & Contractors Equipment	1	\$1	\$1,191,000	\$1,191,001	67%	43%	12%	\$0	0%
School - Gymnasium	1	\$4,538,935	\$206,669	\$4,745,604	59%	42%	15%	\$1,124,249	24%
School - Storage - Wood Framed	2	\$29,623	\$15,755	\$45,378	38%	8%	1%	\$2,142	5%
Service Station	1	\$396,487	\$1	\$396,488	64%	49%	21%	\$117,939	30%
Sewer Lift Station	1	\$20,715	\$1	\$20,716	41%	25%	7%	\$2,973	14%
Ship Service Facility	1	\$2,671,113	\$1	\$2,671,114	84%	56%	14%	\$834,856	31%
Shop Building	2	\$1,117,556	\$363,577	\$1,481,133	53%	22%	3%	\$207,940	14%
Solar Inverter	1	\$318,673	\$1	\$318,674	27%	6%	0%	\$14,649	5%
Solar Panel Farm	1	\$2,144,108	\$1	\$2,144,109	27%	6%	0%	\$98,565	5%
Solid Dewatering Building	1	\$509,993	\$2,589,051	\$3,099,044	30%	9%	1%	\$31,594	1%
Southern Pacific Depot	1	\$742,082	\$1	\$742,083	33%	7%	0%	\$40,058	5%
Storage	2	\$171,244	\$2	\$171,246	33%	8%	1%	\$10,619	6%
Storage Garage	1	\$38,583	\$1	\$38,584	54%	10%	0%	\$3,388	9%
Thickener Building	1	\$229,075	\$412,158	\$641,233	30%	9%	1%	\$14,191	2%
Utility Bldg.	2	\$407,671	\$2	\$407,673	44%	15%	2%	\$40,733	10%
Utility Bldg. - South Hampton Park	1	\$34,596	\$1	\$34,597	43%	13%	2%	\$3,074	9%
Youth Center	1	\$1,290,107	\$1	\$1,290,108	59%	42%	15%	\$319,547	25%
Misc	1	\$376,961	\$1	\$376,962	46%	17%	2%	\$40,003	11%
<b>Dixon</b>	<b>48</b>	<b>\$23,946,000</b>	<b>\$5,521,810</b>	<b>\$29,467,810</b>	<b>12%</b>	<b>3%</b>	<b>0%</b>	<b>\$385,649</b>	<b>1%</b>
Annex Building	1	\$443,700	\$87,700	\$531,400	12%	2%	0%	\$8,408	2%
City Hall	1	\$555,600	\$1	\$555,601	11%	2%	0%	\$9,234	2%
Family Services	1	\$1,152,200	\$1	\$1,152,201	12%	2%	0%	\$21,834	2%



Building/ Site Name	# Bldg.	Site Value			Probability Damage Exceeds			Economic Loss	Loss Pct.
		Structure	Content	Total	Slight	Moderate	Extensive		
Fire Station #1	6	\$5,993,300	\$492,102	\$6,485,402	16%	4%	0%	\$73,761	1%
Hall Park	3	\$383,000	\$50,200	\$433,200	8%	1%	0%	\$3,905	1%
Modular Building	2	\$732,000	\$28,401	\$760,401	10%	1%	0%	\$11,161	1%
Police Station	1	\$4,087,800	\$786,200	\$4,874,000	8%	1%	0%	\$38,793	1%
Pool Complex	4	\$1,398,500	\$52,602	\$1,451,102	6%	1%	0%	\$14,932	1%
Public Works Yard	4	\$1,088,800	\$396,800	\$1,485,600	20%	7%	1%	\$69,963	5%
Pump Station	1	\$1,157,500	\$1	\$1,157,501	25%	7%	1%	\$55,456	5%
Restroom Building	2	\$357,900	\$2	\$357,902	8%	1%	0%	\$3,756	1%
School Lift/Pump Station	3	\$2,900	\$109,800	\$112,700	20%	5%	0%	\$85	0%
Senior/Multi-Use Center	1	\$1,547,300	\$117,700	\$1,665,000	8%	0%	0%	\$13,848	1%
Storage/Concession Bldg	1	\$41,900	\$5,100	\$47,000	14%	6%	1%	\$1,551	3%
Train Station	1	\$481,300	\$20,000	\$501,300	9%	0%	0%	\$4,847	1%
Wastewater Treatment Plant	6	\$1,576,500	\$1,860,500	\$3,437,000	10%	2%	0%	\$21,522	1%
Water Storage /Pumping Site - Fitzgerald	4	\$633,200	\$341,200	\$974,400	10%	2%	0%	\$6,273	1%
Water Well/Pumping Site- Valley Glen	1	\$569,400	\$182,100	\$751,500	7%	1%	0%	\$6,110	1%
Water Well/Storage - Parklane	1	\$683,900	\$410,800	\$1,094,700	7%	1%	0%	\$6,928	1%
Water Well/Storage - Watson Ranch	2	\$852,900	\$554,000	\$1,406,900	7%	1%	0%	\$9,561	1%
White House & Garage	2	\$206,400	\$26,600	\$233,000	12%	2%	0%	\$3,721	2%
<b>Fairfield</b>	<b>90</b>	<b>\$234,692,052</b>	<b>\$29,566,829</b>	<b>\$264,258,881</b>	<b>31%</b>	<b>10%</b>	<b>2%</b>	<b>\$23,661,568</b>	<b>9%</b>
Allan Witt Park	13	\$13,400,000	\$690,945	\$14,090,945	30%	8%	1%	\$965,807	7%
Anna Kyle Modular	1	\$101,000	\$30,434	\$131,434	25%	2%	0%	\$3,229	2%
B. Gale Wilson Neighborhood Center	1	\$288,000	\$52,708	\$340,708	35%	4%	0%	\$13,827	4%
Center For Creative Arts	1	\$11,125,000	\$620,000	\$11,745,000	22%	6%	0%	\$464,914	4%
Civic Center	6	\$38,906,000	\$18,309,644	\$57,215,644	47%	31%	11%	\$10,940,991	19%
Community Resources Apartments	1	\$1,133,000	\$1	\$1,133,001	55%	19%	1%	\$134,442	12%
Cordelia Community Park	2	\$156,000	\$2,392	\$158,392	42%	8%	0%	\$10,639	7%
Corporation Yard	3	\$874,000	\$165,000	\$1,039,000	36%	8%	1%	\$63,149	6%
Dunnell Property	2	\$933,000	\$25,001	\$958,001	29%	5%	0%	\$43,538	5%
Fairfield/Cordelia Library	1	\$16,236,000	\$204,200	\$16,440,200	54%	24%	3%	\$2,275,638	14%
Fairfield/Vacaville Train Station	1	\$405,000	\$1	\$405,001	5%	1%	0%	\$2,766	1%
Ff Police Department	1	\$1,516,000	\$318,000	\$1,834,000	43%	27%	8%	\$236,041	13%
Fire Station	3	\$4,518,000	\$658,226	\$5,176,226	42%	22%	5%	\$625,625	12%
Fire Station #35	1	\$6,434,500	\$482,805	\$6,917,305	41%	12%	1%	\$518,428	7%
Fire Station #37	1	\$13,943,400	\$1,207,990	\$15,151,390	22%	6%	0%	\$586,738	4%



Building/ Site Name	# Bldg.	Site Value			Probability Damage Exceeds			Economic Loss	Loss Pct.
		Structure	Content	Total	Slight	Moderate	Extensive		
Fire Station #39	1	\$3,014,400	\$497,814	\$3,512,214	19%	1%	0%	\$70,507	2%
Fire Station #40	1	\$3,527,500	\$347,829	\$3,875,329	31%	3%	0%	\$141,382	4%
Fire Station #41	1	\$4,934,250	\$492,805	\$5,427,055	22%	2%	0%	\$144,327	3%
Gary Falati Park	1	\$1	\$1	\$2	18%	3%	0%	\$0	1%
Heather House	4	\$1,356,000	\$99,957	\$1,455,957	29%	4%	0%	\$52,898	4%
Housing Division Office	1	\$649,000	\$201,400	\$850,400	25%	12%	2%	\$44,268	5%
Laurel Creek Park	3	\$724,000	\$80,049	\$804,049	18%	3%	0%	\$20,224	3%
Lee Bell Park	1	\$36,000	\$3,896	\$39,896	22%	6%	0%	\$1,515	4%
Mankas Neighborhood Center	1	\$288,000	\$52,708	\$340,708	31%	3%	0%	\$11,543	3%
Non-Profit	2	\$460,000	\$35,789	\$495,789	30%	5%	0%	\$26,669	5%
North Bay Regional Water Treatment Plant	9	\$50,485,000	\$514,285	\$50,999,285	13%	3%	0%	\$1,011,841	2%
Octo Inn Park	1	\$404,000	\$9,800	\$413,800	26%	7%	1%	\$20,341	5%
Paradise Valley Golf Course	5	\$5,123,000	\$346,786	\$5,469,786	24%	2%	0%	\$150,448	3%
Rancho Solano Golf Course	6	\$6,304,000	\$546,483	\$6,850,483	31%	7%	1%	\$367,339	5%
Rockville Hills Park	1	\$42,000	\$709	\$42,709	53%	23%	3%	\$5,668	13%
Rolling Hills Pump Station	2	\$1,371,000	\$163,156	\$1,534,156	34%	20%	5%	\$153,333	10%
Senior Center	2	\$6,270,000	\$609,319	\$6,879,319	26%	3%	0%	\$216,165	3%
Television Equipment	1	\$1	\$500,000	\$500,001	90%	73%	34%	\$0	0%
Temp Operation Center	1	\$368,000	\$22,973	\$390,973	31%	8%	1%	\$21,443	5%
Training Facility	1	\$12,446,000	\$922,000	\$13,368,000	30%	4%	0%	\$535,302	4%
Transportation Center	2	\$14,429,000	\$893,494	\$15,322,494	48%	21%	3%	\$2,233,350	15%
Waterman Water Treatment Plant	5	\$12,492,000	\$458,229	\$12,950,229	45%	17%	2%	\$1,547,231	12%
Rio Vista	35	\$20,214,100	\$5,801,309	\$26,015,409	11%	2%	0%	\$439,225	2%
Airport	7	\$6,395,200	\$130,206	\$6,525,406	19%	5%	0%	\$218,140	3%
Beach Wastewater Treatment Plant	4	\$436,700	\$380,401	\$817,101	9%	2%	0%	\$5,926	1%
Bruning Park	3	\$437,200	\$103,600	\$540,800	5%	1%	0%	\$2,990	1%
City Hall	1	\$2,213,300	\$399,100	\$2,612,400	11%	4%	1%	\$57,679	2%
Commercial Rental Building	1	\$420,100	\$1	\$420,101	6%	0%	0%	\$2,752	1%
Corporation Yard	4	\$535,400	\$238,800	\$774,200	10%	2%	0%	\$12,471	2%
Egbert Park	1	\$154,900	\$12,500	\$167,400	19%	4%	0%	\$5,175	3%
Library	1	\$954,500	\$730,500	\$1,685,000	5%	1%	0%	\$6,529	0%
Northwest Wastewater Treatment Plant	8	\$5,272,700	\$2,486,401	\$7,759,101	10%	2%	0%	\$95,728	1%
Police Station	1	\$1,001,900	\$437,600	\$1,439,500	5%	0%	0%	\$6,072	0%
Senior Center	1	\$1,576,200	\$128,200	\$1,704,400	10%	1%	0%	\$19,419	1%



Building/ Site Name	# Bldg.	Site Value			Probability Damage Exceeds			Economic Loss	Loss Pct.
		Structure	Content	Total	Slight	Moderate	Extensive		
Storage Rental Building	1	\$563,000	\$39,100	\$602,100	6%	0%	0%	\$3,603	1%
Water Treatment Plant / Well #10	2	\$253,000	\$714,900	\$967,900	8%	1%	0%	\$2,742	0%
<b>Suisun City</b>	<b>34</b>	<b>\$22,547,883</b>	<b>\$6,210,939</b>	<b>\$28,758,822</b>	<b>27%</b>	<b>12%</b>	<b>2%</b>	<b>\$2,006,614</b>	<b>7%</b>
4-Plex	13	\$5,329,794	\$137,326	\$5,467,120	25%	12%	2%	\$361,680	7%
Announcers Booth	1	\$20,140	\$2,892	\$23,032	18%	8%	1%	\$898	4%
Bus Shelter	1	\$16,691	\$1	\$16,692	21%	3%	0%	\$522	3%
City Hall	1	\$2,192,078	\$1,286,557	\$3,478,635	28%	6%	0%	\$106,820	3%
Community Center	1	\$5,297,891	\$1	\$5,297,892	50%	27%	6%	\$820,908	15%
Concession Std	1	\$241,016	\$14,454	\$255,470	18%	8%	1%	\$10,747	4%
Corp Yrd/Mn Bld	1	\$282,100	\$550,763	\$832,863	18%	8%	1%	\$12,579	2%
Fire House New	1	\$644,090	\$625,934	\$1,270,024	20%	9%	1%	\$33,061	3%
Harbor Theatre	1	\$2,990,659	\$964,196	\$3,954,855	25%	12%	2%	\$202,946	5%
Lawler House	1	\$858,202	\$8,673	\$866,875	25%	12%	2%	\$58,238	7%
Park Restroom	1	\$66,212	\$1	\$66,213	25%	12%	2%	\$4,493	7%
Police Bldg	1	\$1,580,614	\$2,006,452	\$3,587,066	28%	6%	0%	\$77,023	2%
Restroom Bldg	1	\$37,256	\$1	\$37,257	26%	12%	2%	\$2,661	7%
Scheduled Mobile & Contractors Equipment	1	\$1	\$363,595	\$363,596	46%	24%	5%	\$0	0%
Snr Citizen Cnt	1	\$908,101	\$140,222	\$1,048,323	23%	10%	2%	\$53,533	5%
Storage	1	\$134,091	\$80,952	\$215,043	15%	3%	0%	\$3,384	2%
Train Station	1	\$315,587	\$28,914	\$344,501	25%	12%	2%	\$21,416	6%
Vacant Commercial Building - 701	2	\$394,279	\$2	\$394,281	25%	12%	2%	\$26,756	7%
Vacant Commercial Building - 711	1	\$112,651	\$1	\$112,652	25%	12%	2%	\$7,644	7%
Vacant Commercial Building - 713	1	\$112,651	\$1	\$112,652	55%	32%	7%	\$20,132	18%
Misc	1	\$1,013,779	\$1	\$1,013,780	55%	32%	7%	\$181,172	18%
<b>Unincorporated County</b>	<b>81</b>	<b>\$587,282,015</b>	<b>\$589,069,265</b>	<b>\$1,176,351,280</b>	<b>29%</b>	<b>8%</b>	<b>2%</b>	<b>\$26,171,059</b>	<b>2%</b>
2009 H&Ss New Lab	1	\$7,556,000	\$7,556,000	\$15,112,000	35%	5%	0%	\$394,348	3%
Ag Office Space	1	\$517,750	\$517,750	\$1,035,500	55%	11%	0%	\$46,468	4%
Ag Office Space/Warehouse (Bldg A)	1	\$1,526,750	\$1,526,750	\$3,053,500	50%	11%	1%	\$128,537	4%
Ag/Uc-Coop/District Attorney	1	\$3,870,000	\$3,870,000	\$7,740,000	55%	19%	1%	\$459,214	6%
Animal Shelter - New Bldg	1	\$3,094,500	\$3,094,500	\$6,189,000	8%	0%	0%	\$29,676	0%
Animal Shelter - Shelter Building	1	\$3,074,500	\$3,074,500	\$6,149,000	19%	2%	0%	\$74,956	1%
Assessor/Recorders - (Old Office)	1	\$2,125,000	\$2,125,000	\$4,250,000	55%	19%	1%	\$252,153	6%
Bay Area Community Services (Bacs)	1	\$1,791,000	\$1,791,000	\$3,582,000	55%	19%	1%	\$212,520	6%
Cement Hill Communication Site	1	\$306,250	\$306,250	\$612,500	19%	1%	0%	\$6,881	1%



Building/ Site Name	# Bldg.	Site Value			Probability Damage Exceeds			Economic Loss	Loss Pct
		Structure	Content	Total	Slight	Moderate	Extensive		
Chevron/Carl's Junior	1	\$1	\$1	\$2	26%	2%	0%	\$0	2%
Child Start	1	\$606,250	\$606,250	\$1,212,500	25%	6%	0%	\$26,414	2%
Claybank Detention Facility	1	\$22,813,750	\$22,813,750	\$45,627,500	17%	2%	0%	\$510,115	1%
Cogeneration Plant	1	\$2,954,250	\$2,954,250	\$5,908,500	25%	3%	0%	\$101,154	2%
Communications & Grounds/Facilities Operations/Sheriff	1	\$1,822,500	\$1,822,500	\$3,645,000	25%	3%	0%	\$62,402	2%
Corp Yard -Fleet Heavy Equipment Shop	1	\$1,224,000	\$1,224,000	\$2,448,000	31%	8%	1%	\$70,270	3%
Corp Yard -Transportation Paint Shop	1	\$1,891,500	\$1,891,500	\$3,783,000	34%	8%	0%	\$110,709	3%
Corp Yard -Transportation Survey, Soils Lab, Mx	1	\$480,000	\$480,000	\$960,000	31%	8%	1%	\$27,557	3%
County Communication Transmitter Building	1	\$125,000	\$125,000	\$250,000	37%	10%	1%	\$9,008	4%
County Events Center (Old Library)	1	\$2,741,000	\$2,741,000	\$5,482,000	74%	41%	7%	\$619,329	11%
Courts	1	\$805,000	\$805,000	\$1,610,000	33%	4%	0%	\$36,016	2%
Facilities Warehouse (Shared With Sheriff)	2	\$2,265,000	\$2,265,000	\$4,530,000	26%	3%	0%	\$78,812	2%
Fairfield Government Center	1	\$70,529,250	\$70,529,250	\$141,058,500	25%	3%	0%	\$2,414,922	2%
Fairfield Government Center Garage	1	\$89,803,750	\$89,803,750	\$179,607,500	25%	3%	0%	\$3,074,881	2%
Fairfield Library	1	\$8,921,000	\$8,921,000	\$17,842,000	25%	3%	0%	\$306,882	2%
Fairfield Post Office	1	\$3,528,250	\$3,528,250	\$7,056,500	25%	3%	0%	\$121,372	2%
Fairgrounds Facilities	1	\$43,803,750	\$43,803,750	\$87,607,500	46%	13%	1%	\$3,922,188	4%
Family Justice Center	1	\$2,345,750	\$2,345,750	\$4,691,500	25%	3%	0%	\$80,694	2%
Fleet Operations- Light Equipment Shop	1	\$878,500	\$878,500	\$1,757,000	31%	8%	1%	\$50,997	3%
Fuller Bldg: Mx Equipment & Evidence Storage	1	\$750,000	\$750,000	\$1,500,000	21%	3%	0%	\$22,650	2%
Gen Serv Surplus (Bldg B)	1	\$2,000,000	\$2,000,000	\$4,000,000	50%	11%	1%	\$168,380	4%
Hall Of Justice	1	\$27,787,000	\$27,787,000	\$55,574,000	25%	3%	0%	\$951,427	2%
Hall Of Justice/Law Library	1	\$712,500	\$712,500	\$1,425,000	42%	14%	2%	\$65,051	5%
Health & Social Services Headquarters Bldg.	1	\$30,045,000	\$30,045,000	\$60,090,000	35%	5%	0%	\$1,568,049	3%
Health & Social Services Health Facility	1	\$13,498,000	\$13,498,000	\$26,996,000	35%	5%	0%	\$704,461	3%
Jail	1	\$54,594,750	\$54,594,750	\$109,189,500	25%	3%	0%	\$1,869,324	2%
Justice Building	1	\$17,619,750	\$17,619,750	\$35,239,500	40%	10%	0%	\$1,265,979	4%
Juvenile Hall	1	\$14,353,000	\$14,353,000	\$28,706,000	29%	4%	0%	\$584,024	2%
Law And Justice	1	\$8,479,000	\$8,479,000	\$16,958,000	25%	3%	0%	\$290,321	2%
Library	1	\$2,287,250	\$2,287,250	\$4,574,500	25%	3%	0%	\$78,681	2%
Maintenance	1	\$818,250	\$818,250	\$1,636,500	21%	3%	0%	\$24,711	2%
Marriott Hotel Site	1	\$1	\$1	\$2	26%	2%	0%	\$0	2%
New Foundations (Probation)	1	\$2,177,750	\$2,177,750	\$4,355,500	29%	4%	0%	\$88,613	2%





Building/ Site Name	# Bldg.	Site Value			Probability Damage Exceeds			Economic Loss	Loss Pct.
		Structure	Content	Total	Slight	Moderate	Extensive		
New H&Ss Building	1	\$15,366,500	\$15,366,500	\$30,733,000	19%	2%	0%	\$384,777	1%
New Veteran's Memorial Building	1	\$1,870,500	\$1,870,500	\$3,741,000	8%	1%	0%	\$17,452	0%
Nut Tree Nut Tree Airport	9	\$9	\$9	\$18	16%	2%	0%	\$0	1%
Nut Tree Nut Tree Airport - Northeast Hangars	1	\$1	\$1	\$2	16%	2%	0%	\$0	1%
Nut Tree Nut Tree Airport - Southeast Hangars	2	\$2	\$2	\$4	16%	2%	0%	\$0	1%
Nut Tree Nut Tree Airport Administration Bldg	1	\$1,907,500	\$1,907,500	\$3,815,000	13%	1%	0%	\$31,149	1%
Office Of Emergency Services	1	\$1,310,750	\$1,966,125	\$3,276,875	93%	84%	54%	\$776,161	24%
Office Space: Hertz	1	\$2,618,750	\$2,618,750	\$5,237,500	13%	1%	0%	\$42,764	1%
Portable Building	1	\$540,000	\$540,000	\$1,080,000	21%	2%	0%	\$13,797	1%
Probation - Challenge Building	1	\$1,980,500	\$1,980,500	\$3,961,000	29%	4%	0%	\$80,587	2%
Probation - Juvenile Detention Facility	1	\$13,195,000	\$13,195,000	\$26,390,000	29%	4%	0%	\$536,905	2%
Probation Building	1	\$10,951,750	\$10,951,750	\$21,903,500	25%	3%	0%	\$374,988	2%
Shed (For Groundskeeping)	1	\$180,000	\$180,000	\$360,000	32%	3%	0%	\$7,618	2%
Sheriff/Coroner	1	\$1,638,750	\$2,458,125	\$4,096,875	93%	84%	54%	\$970,386	24%
Sheriff's Office	1	\$625,000	\$937,500	\$1,562,500	53%	22%	3%	\$81,581	5%
Social Services Building	1	\$15,166,500	\$15,166,500	\$30,333,000	21%	4%	0%	\$530,979	2%
Stanton Correctional Facility	1	\$31,950,000	\$31,950,000	\$63,900,000	7%	0%	0%	\$268,700	0%
Training: Classrooms	1	\$2,485,000	\$2,485,000	\$4,970,000	8%	0%	0%	\$23,831	0%
Training: Shop Bays	1	\$7,350,000	\$7,350,000	\$14,700,000	8%	0%	0%	\$70,487	0%
Transportation	1	\$925,000	\$925,000	\$1,850,000	9%	0%	0%	\$9,232	0%
Veteran's Memorial Building	5	\$8,019,250	\$8,019,250	\$16,038,500	42%	16%	2%	\$908,615	6%
Warehouse-Food & Drygoods	1	\$3,022,750	\$3,022,750	\$6,045,500	7%	0%	0%	\$25,421	0%
Weights & Measures	1	\$429,250	\$429,250	\$858,500	56%	18%	2%	\$49,480	6%
William J. Carroll Govt. Center Site	2	\$9,226,751	\$9,226,751	\$18,453,502	11%	1%	0%	\$56,006	0%
<b>Vacaville</b>	<b>117</b>	<b>\$118,265,001</b>	<b>\$15,679,949</b>	<b>\$133,944,950</b>	<b>17%</b>	<b>4%</b>	<b>0%</b>	<b>\$3,424,308</b>	<b>3%</b>
Al Patch Park	2	\$253,000	\$18,800	\$271,800	15%	2%	0%	\$5,466	2%
Andrew Park	1	\$139,000	\$2,655	\$141,655	13%	3%	0%	\$3,071	2%
Arlington Park	4	\$368,000	\$89,440	\$457,440	15%	1%	0%	\$6,956	2%
Art League Studio/Gallery	1	\$353,000	\$96,382	\$449,382	20%	4%	0%	\$11,910	3%
Buck/Eldridge Office Complex	5	\$3,163,000	\$620,563	\$3,783,563	19%	1%	0%	\$72,713	2%
Centennial Park	1	\$149,000	\$3,267	\$152,267	12%	3%	0%	\$2,981	2%
City Hall Complex	4	\$15,161,000	\$2,568,372	\$17,729,372	15%	3%	0%	\$334,555	2%
Cooper School Park	1	\$189,000	\$64,221	\$253,221	14%	1%	0%	\$3,100	1%
Corporation Yard	16	\$5,371,000	\$1,239,801	\$6,610,801	20%	4%	0%	\$335,948	5%



Building/ Site Name	# Bldg.	Site Value			Probability Damage Exceeds			Economic Loss	Loss Pct.
		Structure	Content	Total	Slight	Moderate	Extensive		
Easterly Wastewater Treatment	20	\$24,054,000	\$3,825,133	\$27,879,133	18%	7%	1%	\$920,128	3%
Easterly Wastewater Treatment Plant	1	\$3,765,000	\$1	\$3,765,001	17%	3%	0%	\$105,608	3%
Fire Station No. 4	2	\$940,000	\$252,500	\$1,192,500	26%	7%	1%	\$20,730	2%
Fire Station No. 71	2	\$1,833,000	\$320,880	\$2,153,880	18%	1%	0%	\$41,102	2%
Fire Station No. 72	1	\$790,000	\$229,500	\$1,019,500	15%	1%	0%	\$13,817	1%
Fire Station No. 73	2	\$844,000	\$740,000	\$1,584,000	23%	6%	0%	\$14,775	1%
Gentry Meadowlands	2	\$176,000	\$49,416	\$225,416	14%	1%	0%	\$2,927	1%
Harbison Event Center	4	\$2,034,000	\$4	\$2,034,004	19%	4%	0%	\$50,152	2%
Horse Creek Lift Station	1	\$313,000	\$122,112	\$435,112	11%	2%	0%	\$5,947	1%
Keating Park	6	\$876,000	\$195,929	\$1,071,929	16%	2%	0%	\$18,829	2%
Lagoon Valley Park	3	\$237,000	\$64,018	\$301,018	20%	1%	0%	\$5,671	2%
Leisure Town Lift Station	1	\$323,000	\$28,588	\$351,588	11%	2%	0%	\$5,743	2%
Nelson Park	1	\$122,000	\$2,859	\$124,859	15%	1%	0%	\$2,168	2%
Old City Hall	1	\$635,000	\$153,865	\$788,865	38%	13%	1%	\$52,019	7%
Pena Adobe	6	\$477,000	\$56,053	\$533,053	16%	2%	0%	\$10,778	2%
Police Department Headquarters	1	\$14,827,000	\$1,435,118	\$16,262,118	13%	3%	0%	\$327,528	2%
Senior Center	1	\$4,546,000	\$138,856	\$4,684,856	13%	3%	0%	\$100,421	2%
Sport Center	2	\$2,816,000	\$123,541	\$2,939,541	15%	2%	0%	\$62,189	2%
Three Oak Community Center	5	\$4,893,000	\$107,411	\$5,000,411	14%	3%	0%	\$113,270	2%
Transit Plaza	2	\$205,000	\$2,143	\$207,143	13%	3%	0%	\$4,528	2%
Transmitter Property - Leased	1	\$1	\$662,594	\$662,595	20%	3%	0%	\$0	0%
Trower Center	2	\$408,000	\$35,601	\$443,601	16%	1%	0%	\$7,585	2%
Ulati Cultural Center	2	\$8,010,000	\$642,006	\$8,652,006	13%	1%	0%	\$132,886	2%
Vaca Boys And Girls Center	3	\$1,129,000	\$192,867	\$1,321,867	16%	1%	0%	\$21,349	2%
Vaca Valley Lift Station	1	\$318,000	\$28,588	\$346,588	11%	2%	0%	\$5,565	2%
Vacaville Fire Station 75	1	\$3,640,000	\$229,500	\$3,869,500	4%	0%	0%	\$18,236	0%
Vacaville Museum	1	\$2,348,000	\$1	\$2,348,001	13%	3%	0%	\$51,867	2%
Vacaville Transportation Center	2	\$384,000	\$2,101	\$386,101	21%	4%	0%	\$13,075	3%
Water Treatment Plant	4	\$12,167,000	\$912,263	\$13,079,263	23%	10%	2%	\$518,476	4%
Wykoff Reservoir	1	\$9,000	\$423,000	\$432,000	15%	4%	0%	\$238	0%
Vallejo	129	\$300,302,350	\$36,211,422	\$336,513,772	29%	10%	2%	\$28,383,986	8%
Apn-0056-194-150	1	\$124,136	\$1	\$124,137	20%	3%	0%	\$3,686	3%
Bi-Bett Resident House	1	\$450,083	\$1	\$450,084	20%	4%	0%	\$15,240	3%
Bi-Bett Shelter	1	\$491,565	\$1	\$491,566	19%	1%	0%	\$11,291	2%



Building/ Site Name	# Bldg.	Site Value			Probability Damage Exceeds			Economic Loss	Loss Pct.
		Structure	Content	Total	Slight	Moderate	Extensive		
Bi-Bett/Louisiana House	1	\$418,971	\$1	\$418,972	23%	5%	0%	\$16,139	4%
Blue Rock Springs Golf Course/Vallejo Golf Club, I	18	\$5,524,636	\$1,372,454	\$6,897,090	34%	8%	1%	\$274,962	4%
City Hall	1	\$25,732,460	\$2,754,877	\$28,487,337	42%	15%	2%	\$2,376,650	8%
Community Center	1	\$1,439,433	\$12,048	\$1,451,481	40%	10%	0%	\$103,423	7%
Corporation Yard Storage	1	\$950,980	\$388,828	\$1,339,808	40%	10%	0%	\$68,328	5%
Corporation Yard/Police Station	7	\$15,595,243	\$2,748,842	\$18,344,085	32%	15%	4%	\$2,722,063	15%
Cunningham	3	\$1,132,465	\$217,530	\$1,349,995	33%	14%	3%	\$46,250	3%
Dos Reis Water Facilities	5	\$4,918,757	\$123,243	\$5,042,000	24%	9%	1%	\$169,736	3%
Ferry Building	1	\$3,258,428	\$21,323	\$3,279,751	15%	3%	0%	\$85,012	3%
Fire Prevention	3	\$981,057	\$103,317	\$1,084,374	42%	23%	5%	\$144,394	13%
Fire Station 21	1	\$3,490,729	\$898,531	\$4,389,260	35%	8%	0%	\$208,955	5%
Fire Station 22	2	\$1,098,243	\$275,985	\$1,374,228	32%	12%	2%	\$28,697	2%
Fire Station 23	2	\$1,357,507	\$339,994	\$1,697,501	37%	14%	2%	\$73,577	4%
Fire Station 24	1	\$1,650,993	\$366,180	\$2,017,173	43%	12%	1%	\$135,431	7%
Fire Station 25	1	\$1,031,871	\$224,334	\$1,256,205	28%	7%	1%	\$52,213	4%
Fire Station 26	1	\$1,238,244	\$297,324	\$1,535,568	33%	7%	0%	\$67,261	4%
Fire Station 27	1	\$2,270,115	\$523,774	\$2,793,889	55%	24%	3%	\$314,366	11%
Fire Station 28	1	\$4,438,598	\$827,450	\$5,266,048	14%	3%	0%	\$102,709	2%
Flemming Hill Water Treatment	11	\$69,677,686	\$5,895,422	\$75,573,108	23%	8%	1%	\$3,494,741	5%
Florence Douglas Center	1	\$2,380,043	\$205,569	\$2,585,612	19%	2%	0%	\$59,596	2%
Georgia Water Facility	5	\$3,607,918	\$81,499	\$3,689,417	24%	8%	1%	\$113,314	3%
J F Kennedy Library	1	\$25,833,050	\$1,857,635	\$27,690,685	60%	41%	13%	\$6,058,625	22%
Kaiser	2	\$1,144,911	\$177,893	\$1,322,804	15%	2%	0%	\$23,999	2%
Mare Island	8	\$18,192,029	\$3,701,659	\$21,893,688	38%	16%	2%	\$1,477,954	7%
Marina Properties	10	\$5,013,128	\$8,172,713	\$13,185,841	28%	10%	2%	\$331,365	3%
Native Son	1	\$693,790	\$1	\$693,791	32%	9%	1%	\$43,910	6%
North Vallejo Community Center	1	\$1,036,019	\$28,985	\$1,065,004	21%	5%	0%	\$39,907	4%
Office Building	1	\$686,531	\$12,613	\$699,144	25%	6%	0%	\$29,912	4%
Pennsylvania House	2	\$1,269,357	\$69,515	\$1,338,872	20%	4%	0%	\$42,980	3%
Police Sub Station	1	\$629,493	\$69,301	\$698,794	23%	5%	0%	\$24,248	3%
Police Traffic Division	1	\$680,308	\$114,690	\$794,998	27%	6%	1%	\$32,145	4%
Satellite Cm Office	1	\$356,892	\$1	\$356,893	31%	8%	1%	\$20,243	6%
Sludge Dewatering Facilities	6	\$4,815,051	\$788,600	\$5,603,651	23%	8%	1%	\$167,140	3%
South Vallejo Community Center	1	\$2,696,344	\$19,601	\$2,715,945	14%	3%	0%	\$65,198	2%



Building/ Site Name	# Bldg.	Site Value			Probability Damage Exceeds			Economic Loss	Loss Pct.
		Structure	Content	Total	Slight	Moderate	Extensive		
Swanzy	8	\$23,307,827	\$220,058	\$23,527,885	27%	10%	2%	\$3,511,364	15%
Transit Center	4	\$8,118,072	\$1,437,567	\$9,555,639	34%	13%	2%	\$659,982	7%
Travis Afb Water Treatment Plant	8	\$14,014,769	\$764,978	\$14,779,747	20%	5%	0%	\$829,246	6%
Vallejo Naval Museum	1	\$9,062,828	\$1,097,083	\$10,159,911	71%	54%	22%	\$2,958,107	29%
Vallejo Transit Center	1	\$29,491,790	\$1	\$29,491,791	27%	6%	0%	\$1,379,626	5%
<b>Grand Total</b>	<b>608</b>	<b>\$1,380,701,916</b>	<b>\$708,039,452</b>	<b>\$2,088,741,368</b>	<b>27%</b>	<b>9%</b>	<b>2%</b>	<b>\$101,816,937</b>	<b>5%</b>

Table 7-5: EQ M7.1 Hayward Rodger's Creek Flood Damage Estimations for Improved Assets

Building/ Site Name	# Bldg.	Site Value			Probability Damage Exceeds			Economic Loss	Loss Pct.
		Structure	Content	Total	Slight	Moderate	Extensive		
<b>Benicia</b>	<b>74</b>	<b>\$73,452,515</b>	<b>\$19,977,929</b>	<b>\$93,430,444</b>	<b>18%</b>	<b>6%</b>	<b>1%</b>	<b>\$3,933,703</b>	<b>4%</b>
Barn	1	\$52,488	\$1	\$52,489	14%	2%	0%	\$1,134	2%
Blower Building	1	\$753,535	\$1,041,426	\$1,794,961	11%	2%	0%	\$13,760	1%
Camel Barn	1	\$1,143,507	\$1	\$1,143,508	16%	8%	1%	\$49,651	4%
Camel Barn - Office	1	\$603,137	\$1	\$603,138	16%	8%	1%	\$26,188	4%
Caretaker House	1	\$311,070	\$1	\$311,071	14%	2%	0%	\$6,722	2%
Chem. Storage Facility (Odor Scrubber)	1	\$197,728	\$383,133	\$580,861	34%	11%	1%	\$13,995	2%
Chemical Building	1	\$2,883,103	\$562,213	\$3,445,316	9%	2%	0%	\$41,603	1%
Chlorine Room	1	\$395,443	\$1	\$395,444	22%	10%	1%	\$21,749	5%
City Hall	1	\$6,423,835	\$2,008,928	\$8,432,763	37%	23%	6%	\$846,148	10%
Civic Center Park - Restroom	1	\$85,585	\$1	\$85,586	34%	11%	1%	\$6,058	7%
Commandants Hse	1	\$2,418,037	\$1	\$2,418,038	24%	13%	3%	\$183,843	8%
Community Center And Portables	1	\$853,630	\$1	\$853,631	14%	1%	0%	\$14,059	2%



Building/ Site Name	# Bldg.	Site Value			Probability Damage Exceeds			Economic Loss	Loss Pct.
		Structure	Content	Total	Slight	Moderate	Extensive		
Concession	2	\$444,537	\$2	\$444,539	10%	2%	0%	\$6,737	2%
Convention Center	1	\$6,301,089	\$406,054	\$6,707,143	24%	13%	3%	\$479,072	7%
Digester 1 And 2 Equipment Building	1	\$289,358	\$514,328	\$803,686	21%	11%	2%	\$17,483	2%
Digester 3	1	\$1,738,559	\$1	\$1,738,560	34%	11%	1%	\$123,055	7%
Digester 3 Equipment Building	1	\$311,061	\$431,897	\$742,958	11%	2%	0%	\$5,680	1%
Digesters 1	1	\$1,335,868	\$1	\$1,335,869	53%	34%	10%	\$261,135	20%
Disinfection Station (Chem Storage Area)	1	\$168,793	\$193,888	\$362,681	34%	11%	1%	\$11,947	3%
Dwelling	1	\$325,362	\$1	\$325,363	18%	3%	0%	\$9,390	3%
Emerg. Gen. Bldg. (Natural Gas)	1	\$34,963	\$495,751	\$530,714	14%	1%	0%	\$576	0%
Equip. Bldg. (Secondary Area)	1	\$1,467,285	\$1,674,174	\$3,141,459	11%	2%	0%	\$26,793	1%
Filter Control Room And Gallery	1	\$1,746,764	\$1	\$1,746,765	9%	2%	0%	\$25,206	1%
Fire Station	1	\$3,904,970	\$286,078	\$4,191,048	13%	1%	0%	\$61,269	1%
Fire Station #12	1	\$993,098	\$1,432,535	\$2,425,633	9%	2%	0%	\$14,251	1%
Flash Mix Room	1	\$438,788	\$1	\$438,789	9%	2%	0%	\$6,332	1%
Grand Stand	1	\$153,657	\$1	\$153,658	14%	1%	0%	\$2,531	2%
Hockey Rink	1	\$53,190	\$1	\$53,191	30%	13%	2%	\$4,117	8%
Industrial Monitoring Station	1	\$147,091	\$16,254	\$163,345	11%	2%	0%	\$2,686	2%
Library	1	\$8,111,579	\$3,924,567	\$12,036,146	13%	3%	0%	\$180,239	1%
Misc	1	\$376,961	\$1	\$376,962	26%	7%	1%	\$18,841	5%
Museum	2	\$1,694,909	\$2	\$1,694,911	28%	16%	4%	\$172,938	10%
Operation Building	1	\$2,302,808	\$224,074	\$2,526,882	11%	2%	0%	\$42,049	2%
Operations Building	1	\$4,980,954	\$1	\$4,980,955	22%	10%	1%	\$273,952	5%
Pier/Restroom	1	\$181,242	\$1	\$181,243	10%	0%	0%	\$2,151	1%
Plant Headworks (Rake System Included)	1	\$277,302	\$983,376	\$1,260,678	53%	34%	10%	\$54,207	4%
Police Station	1	\$1,604,174	\$331,347	\$1,935,521	25%	13%	3%	\$119,367	6%
Pool Dressing / Shower Building	1	\$551,009	\$114,747	\$665,756	21%	11%	2%	\$33,292	5%
Portable Office	2	\$360,391	\$77,597	\$437,988	8%	1%	0%	\$5,147	1%
Recreation Center	1	\$1,304,698	\$97,307	\$1,402,005	13%	1%	0%	\$20,471	1%
Restroom	6	\$758,036	\$6	\$758,042	17%	6%	1%	\$32,783	4%
Restroom - Playground Area	1	\$65,558	\$1	\$65,559	11%	0%	0%	\$782	1%
Restroom / Canteen - Softball Fields	1	\$65,558	\$1	\$65,559	8%	2%	0%	\$848	1%
Restroom/Canteen	1	\$1	\$1	\$2	11%	1%	0%	\$0	1%
Restroom/Canteen - Little League Fields	1	\$181,242	\$1	\$181,243	11%	0%	0%	\$2,162	1%
Scheduled Mobile & Contractors Equipment	1	\$1	\$1,191,000	\$1,191,001	35%	17%	3%	\$0	0%





Building/ Site Name	# Bldg.	Site Value			Probability Damage Exceeds			Economic Loss	Loss Pct.
		Structure	Content	Total	Slight	Moderate	Extensive		
School - Gymnasium	1	\$4,538,935	\$206,669	\$4,745,604	21%	11%	2%	\$274,242	6%
School - Storage - Wood Framed	2	\$29,623	\$15,755	\$45,378	16%	2%	0%	\$757	2%
Service Station	1	\$396,487	\$1	\$396,488	24%	13%	3%	\$30,058	8%
Sewer Lift Station	1	\$20,715	\$1	\$20,716	19%	9%	2%	\$1,096	5%
Ship Service Facility	1	\$2,671,113	\$1	\$2,671,114	39%	11%	1%	\$196,914	7%
Shop Building	2	\$1,117,556	\$363,577	\$1,481,133	22%	5%	0%	\$55,772	4%
Solar Inverter	1	\$318,673	\$1	\$318,674	5%	1%	0%	\$1,973	1%
Solar Panel Farm	1	\$2,144,108	\$1	\$2,144,109	5%	1%	0%	\$13,272	1%
Solid Dewatering Building	1	\$509,993	\$2,589,051	\$3,099,044	11%	2%	0%	\$9,312	0%
Southern Pacific Depot	1	\$742,082	\$1	\$742,083	15%	2%	0%	\$15,970	2%
Storage	2	\$171,244	\$2	\$171,246	12%	2%	0%	\$3,515	2%
Storage Garage	1	\$38,583	\$1	\$38,584	11%	0%	0%	\$469	1%
Thickener Building	1	\$229,075	\$412,158	\$641,233	11%	2%	0%	\$4,183	1%
Utility Bldg.	2	\$407,671	\$2	\$407,673	11%	2%	0%	\$5,066	1%
Utility Bldg. - South Hampton Park	1	\$34,596	\$1	\$34,597	14%	2%	0%	\$756	2%
Youth Center	1	\$1,290,107	\$1	\$1,290,108	21%	11%	2%	\$77,948	6%
<b>Dixon</b>	<b>48</b>	<b>\$23,946,000</b>	<b>\$5,521,810</b>	<b>\$29,467,810</b>	<b>4%</b>	<b>1%</b>	<b>0%</b>	<b>\$116,756</b>	<b>0%</b>
Annex Building	1	\$443,700	\$87,700	\$531,400	5%	1%	0%	\$2,853	1%
City Hall	1	\$555,600	\$1	\$555,601	3%	0%	0%	\$2,000	0%
Family Services	1	\$1,152,200	\$1	\$1,152,201	5%	1%	0%	\$7,409	1%
Fire Station #1	6	\$5,993,300	\$492,102	\$6,485,402	6%	1%	0%	\$20,372	0%
Hall Park	3	\$383,000	\$50,200	\$433,200	2%	0%	0%	\$1,086	0%
Modular Building	2	\$732,000	\$28,401	\$760,401	3%	0%	0%	\$2,516	0%
Police Station	1	\$4,087,800	\$786,200	\$4,874,000	2%	0%	0%	\$10,547	0%
Pool Complex	4	\$1,398,500	\$52,602	\$1,451,102	2%	0%	0%	\$3,816	0%
Public Works Yard	4	\$1,088,800	\$396,800	\$1,485,600	8%	2%	0%	\$24,037	2%
Pump Station	1	\$1,157,500	\$1	\$1,157,501	11%	2%	0%	\$20,187	2%
Restroom Building	2	\$357,900	\$2	\$357,902	2%	0%	0%	\$1,033	0%
School Lift/Pump Station	3	\$2,900	\$109,800	\$112,700	8%	1%	0%	\$28	0%
Senior/Multi-Use Center	1	\$1,547,300	\$117,700	\$1,665,000	2%	0%	0%	\$3,992	0%
Storage/Concession Bldg	1	\$41,900	\$5,100	\$47,000	6%	2%	0%	\$600	1%
Train Station	1	\$481,300	\$20,000	\$501,300	3%	0%	0%	\$1,324	0%
Wastewater Treatment Plant	6	\$1,576,500	\$1,860,500	\$3,437,000	3%	0%	0%	\$6,077	0%
Water Storage /Pumping Site - Fitzgerald	4	\$633,200	\$341,200	\$974,400	4%	1%	0%	\$1,673	0%



Building/ Site Name	# Bldg.	Site Value			Probability Damage Exceeds			Economic Loss	Loss Pct.
		Structure	Content	Total	Slight	Moderate	Extensive		
Water Well/Pumping Site- Valley Glen	1	\$569,400	\$182,100	\$751,500	2%	0%	0%	\$1,611	0%
Water Well/Storage - Parklane	1	\$683,900	\$410,800	\$1,094,700	2%	0%	0%	\$1,853	0%
Water Well/Storage - Watson Ranch	2	\$852,900	\$554,000	\$1,406,900	2%	0%	0%	\$2,415	0%
White House & Garage	2	\$206,400	\$26,600	\$233,000	5%	1%	0%	\$1,327	1%
<b>Fairfield</b>	<b>90</b>	<b>\$234,692,052</b>	<b>\$29,566,829</b>	<b>\$264,258,881</b>	<b>8%</b>	<b>2%</b>	<b>0%</b>	<b>\$4,631,417</b>	<b>2%</b>
Allan Witt Park	13	\$13,400,000	\$690,945	\$14,090,945	6%	1%	0%	\$150,433	1%
Anna Kyle Modular	1	\$101,000	\$30,434	\$131,434	7%	0%	0%	\$791	1%
B. Gale Wilson Neighborhood Center	1	\$288,000	\$52,708	\$340,708	6%	0%	0%	\$1,970	1%
Center For Creative Arts	1	\$11,125,000	\$620,000	\$11,745,000	6%	1%	0%	\$96,565	1%
Civic Center	6	\$38,906,000	\$18,309,644	\$57,215,644	14%	7%	1%	\$2,269,087	4%
Community Resources Apartments	1	\$1,133,000	\$1	\$1,133,001	12%	1%	0%	\$17,686	2%
Cordelia Community Park	2	\$156,000	\$2,392	\$158,392	2%	0%	0%	\$426	0%
Corporation Yard	3	\$874,000	\$165,000	\$1,039,000	10%	1%	0%	\$14,394	1%
Dunnell Property	2	\$933,000	\$25,001	\$958,001	9%	1%	0%	\$10,725	1%
Fairfield/Cordelia Library	1	\$16,236,000	\$204,200	\$16,440,200	8%	1%	0%	\$207,171	1%
Fairfield/Vacaville Train Station	1	\$405,000	\$1	\$405,001	1%	0%	0%	\$292	0%
Ff Police Department	1	\$1,516,000	\$318,000	\$1,834,000	12%	5%	1%	\$47,542	3%
Fire Station	3	\$4,518,000	\$658,226	\$5,176,226	11%	4%	1%	\$124,344	2%
Fire Station #35	1	\$6,434,500	\$482,805	\$6,917,305	2%	0%	0%	\$15,893	0%
Fire Station #37	1	\$13,943,400	\$1,207,990	\$15,151,390	6%	1%	0%	\$127,303	1%
Fire Station #39	1	\$3,014,400	\$497,814	\$3,512,214	5%	0%	0%	\$15,313	0%
Fire Station #40	1	\$3,527,500	\$347,829	\$3,875,329	6%	0%	0%	\$21,906	1%
Fire Station #41	1	\$4,934,250	\$492,805	\$5,427,055	6%	0%	0%	\$35,872	1%
Gary Falati Park	1	\$1	\$1	\$2	5%	0%	0%	\$0	0%
Heather House	4	\$1,356,000	\$99,957	\$1,455,957	8%	1%	0%	\$12,756	1%
Housing Division Office	1	\$649,000	\$201,400	\$850,400	8%	3%	0%	\$12,130	1%
Laurel Creek Park	3	\$724,000	\$80,049	\$804,049	5%	0%	0%	\$4,341	1%
Lee Bell Park	1	\$36,000	\$3,896	\$39,896	6%	1%	0%	\$312	1%
Mankas Neighborhood Center	1	\$288,000	\$52,708	\$340,708	6%	0%	0%	\$1,863	1%
Non-Profit	2	\$460,000	\$35,789	\$495,789	9%	1%	0%	\$7,304	1%
North Bay Regional Water Treatment Plant	9	\$50,485,000	\$514,285	\$50,999,285	3%	1%	0%	\$228,675	0%
Octo Inn Park	1	\$404,000	\$9,800	\$413,800	5%	1%	0%	\$2,727	1%
Paradise Valley Golf Course	5	\$5,123,000	\$346,786	\$5,469,786	6%	0%	0%	\$34,116	1%
Rancho Solano Golf Course	6	\$6,304,000	\$546,483	\$6,850,483	5%	1%	0%	\$34,277	1%



Building/ Site Name	# Bldg.	Site Value			Probability Damage Exceeds			Economic Loss	Loss Pct.
		Structure	Content	Total	Slight	Moderate	Extensive		
Rockville Hills Park	1	\$42,000	\$709	\$42,709	5%	1%	0%	\$341	1%
Rolling Hills Pump Station	2	\$1,371,000	\$163,156	\$1,534,156	12%	5%	1%	\$40,472	3%
Senior Center	2	\$6,270,000	\$609,319	\$6,879,319	7%	0%	0%	\$51,327	1%
Television Equipment	1	\$1	\$500,000	\$500,001	28%	13%	2%	\$0	0%
Temp Operation Center	1	\$368,000	\$22,973	\$390,973	9%	1%	0%	\$4,795	1%
Training Facility	1	\$12,446,000	\$922,000	\$13,368,000	10%	1%	0%	\$144,498	1%
Transportation Center	2	\$14,429,000	\$893,494	\$15,322,494	15%	4%	0%	\$531,584	3%
Waterman Water Treatment Plant	5	\$12,492,000	\$458,229	\$12,950,229	14%	3%	0%	\$362,184	3%
<b>Rio Vista</b>	<b>35</b>	<b>\$20,214,100</b>	<b>\$5,801,309</b>	<b>\$26,015,409</b>	<b>5%</b>	<b>1%</b>	<b>0%</b>	<b>\$202,630</b>	<b>1%</b>
Airport	7	\$6,395,200	\$130,206	\$6,525,406	8%	1%	0%	\$78,341	1%
Beach Wastewater Treatment Plant	4	\$436,700	\$380,401	\$817,101	4%	1%	0%	\$2,218	0%
Bruning Park	3	\$437,200	\$103,600	\$540,800	4%	0%	0%	\$2,365	0%
City Hall	1	\$2,213,300	\$399,100	\$2,612,400	9%	4%	0%	\$48,626	2%
Commercial Rental Building	1	\$420,100	\$1	\$420,101	5%	0%	0%	\$2,206	1%
Corporation Yard	4	\$535,400	\$238,800	\$774,200	5%	1%	0%	\$6,696	1%
Egbert Park	1	\$154,900	\$12,500	\$167,400	10%	2%	0%	\$2,560	2%
Library	1	\$954,500	\$730,500	\$1,685,000	4%	1%	0%	\$5,164	0%
Northwest Wastewater Treatment Plant	8	\$5,272,700	\$2,486,401	\$7,759,101	4%	1%	0%	\$32,737	0%
Police Station	1	\$1,001,900	\$437,600	\$1,439,500	2%	0%	0%	\$2,635	0%
Senior Center	1	\$1,576,200	\$128,200	\$1,704,400	8%	1%	0%	\$15,557	1%
Storage Rental Building	1	\$563,000	\$39,100	\$602,100	3%	0%	0%	\$1,582	0%
Water Treatment Plant / Well #10	2	\$253,000	\$714,900	\$967,900	4%	1%	0%	\$1,943	0%
<b>Suisun City</b>	<b>34</b>	<b>\$22,547,883</b>	<b>\$6,210,939</b>	<b>\$28,758,822</b>	<b>12%</b>	<b>4%</b>	<b>1%</b>	<b>\$747,539</b>	<b>3%</b>
4-Plex	13	\$5,329,794	\$137,326	\$5,467,120	11%	4%	0%	\$136,549	2%
Announcers Booth	1	\$20,140	\$2,892	\$23,032	6%	2%	0%	\$245	1%
Bus Shelter	1	\$16,691	\$1	\$16,692	11%	1%	0%	\$233	1%
City Hall	1	\$2,192,078	\$1,286,557	\$3,478,635	11%	2%	0%	\$35,994	1%
Community Center	1	\$5,297,891	\$1	\$5,297,892	23%	10%	1%	\$304,841	6%
Concession Std	1	\$241,016	\$14,454	\$255,470	6%	2%	0%	\$2,928	1%
Corp Yrd/Mn Bld	1	\$282,100	\$550,763	\$832,863	6%	2%	0%	\$3,428	0%
Fire House New	1	\$644,090	\$625,934	\$1,270,024	8%	3%	0%	\$11,098	1%
Harbor Theatre	1	\$2,990,659	\$964,196	\$3,954,855	11%	4%	0%	\$76,621	2%
Lawler House	1	\$858,202	\$8,673	\$866,875	11%	4%	0%	\$21,987	3%
Misc	1	\$1,013,779	\$1	\$1,013,780	29%	13%	2%	\$78,284	8%



Building/ Site Name	# Bldg.	Site Value			Probability Damage Exceeds			Economic Loss	Loss Pct.
		Structure	Content	Total	Slight	Moderate	Extensive		
Park Restroom	1	\$66,212	\$1	\$66,213	11%	4%	0%	\$1,696	3%
Police Bldg	1	\$1,580,614	\$2,006,452	\$3,587,066	11%	2%	0%	\$25,954	1%
Restroom Bldg	1	\$37,256	\$1	\$37,257	11%	4%	0%	\$954	3%
Scheduled Mobile & Contractors Equipment	1	\$1	\$363,595	\$363,596	22%	9%	1%	\$0	0%
Snr Citizen Cnt	1	\$908,101	\$140,222	\$1,048,323	8%	3%	0%	\$16,273	2%
Storage	1	\$134,091	\$80,952	\$215,043	4%	1%	0%	\$683	0%
Train Station	1	\$315,587	\$28,914	\$344,501	11%	4%	0%	\$8,085	2%
Vacant Commercial Building - 701	2	\$394,279	\$2	\$394,281	11%	4%	0%	\$10,101	3%
Vacant Commercial Building - 711	1	\$112,651	\$1	\$112,652	11%	4%	0%	\$2,886	3%
Vacant Commercial Building - 713	1	\$112,651	\$1	\$112,652	29%	13%	2%	\$8,699	8%
<b>Unincorporated County</b>	<b>81</b>	<b>\$587,282,015</b>	<b>\$589,069,265</b>	<b>\$1,176,351,280</b>	<b>9%</b>	<b>1%</b>	<b>0%</b>	<b>\$6,934,903</b>	<b>1%</b>
2009 H&Ss New Lab	1	\$7,556,000	\$7,556,000	\$15,112,000	7%	0%	0%	\$67,022	0%
Ag Office Space	1	\$517,750	\$517,750	\$1,035,500	9%	0%	0%	\$5,348	1%
Ag Office Space/Warehouse (Bldg A)	1	\$1,526,750	\$1,526,750	\$3,053,500	8%	1%	0%	\$14,901	0%
Ag/Uc-Coop/District Attorney	1	\$3,870,000	\$3,870,000	\$7,740,000	12%	1%	0%	\$60,411	1%
Animal Shelter - New Bldg	1	\$3,094,500	\$3,094,500	\$6,189,000	1%	0%	0%	\$3,125	0%
Animal Shelter - Shelter Building	1	\$3,074,500	\$3,074,500	\$6,149,000	4%	0%	0%	\$15,649	0%
Assessor/Recorders - (Old Office)	1	\$2,125,000	\$2,125,000	\$4,250,000	12%	1%	0%	\$33,171	1%
Bay Area Community Services (Bacs)	1	\$1,791,000	\$1,791,000	\$3,582,000	12%	1%	0%	\$27,958	1%
Cement Hill Communication Site	1	\$306,250	\$306,250	\$612,500	3%	0%	0%	\$1,139	0%
Chevron/Carl's Junior	1	\$1	\$1	\$2	15%	1%	0%	\$0	1%
Child Start	1	\$606,250	\$606,250	\$1,212,500	20%	4%	0%	\$20,285	2%
Claybank Detention Facility	1	\$22,813,750	\$22,813,750	\$45,627,500	4%	0%	0%	\$116,122	0%
Cogeneration Plant	1	\$2,954,250	\$2,954,250	\$5,908,500	7%	0%	0%	\$22,925	0%
Communications & Grounds/Facilities	1	\$1,822,500	\$1,822,500	\$3,645,000	7%	0%	0%	\$14,143	0%
Operations/Sheriff	1	\$1,224,000	\$1,224,000	\$2,448,000	10%	2%	0%	\$18,470	1%
Corp Yard -Fleet Heavy Equipment Shop	1	\$1,891,500	\$1,891,500	\$3,783,000	11%	1%	0%	\$27,275	1%
Corp Yard -Transportation Paint Shop	1	\$480,000	\$480,000	\$960,000	10%	2%	0%	\$7,243	1%
Corp Yard -Transportation Survey, Soils Lab, Mx	1	\$125,000	\$125,000	\$250,000	6%	1%	0%	\$1,134	0%
County Communication Transmitter Building	1	\$2,741,000	\$2,741,000	\$5,482,000	21%	3%	0%	\$86,424	2%
County Events Center (Old Library)	1	\$805,000	\$805,000	\$1,610,000	11%	0%	0%	\$9,877	1%
Courts	2	\$2,265,000	\$2,265,000	\$4,530,000	7%	0%	0%	\$18,011	0%
Facilities Warehouse (Shared With Sheriff)	1	\$70,529,250	\$70,529,250	\$141,058,500	7%	0%	0%	\$547,307	0%
Fairfield Government Center	1								



Building/ Site Name	# Bldg.	Site Value			Probability Damage Exceeds			Economic Loss	Loss Pct.
		Structure	Content	Total	Slight	Moderate	Extensive		
Fairfield Government Center Garage	1	\$89,803,750	\$89,803,750	\$179,607,500	7%	0%	0%	\$696,877	0%
Fairfield Library	1	\$8,921,000	\$8,921,000	\$17,842,000	7%	0%	0%	\$72,795	0%
Fairfield Post Office	1	\$3,528,250	\$3,528,250	\$7,056,500	7%	0%	0%	\$27,379	0%
Fairgrounds Facilities	1	\$43,803,750	\$43,803,750	\$87,607,500	21%	3%	0%	\$1,346,965	2%
Family Justice Center	1	\$2,345,750	\$2,345,750	\$4,691,500	7%	0%	0%	\$18,203	0%
Fleet Operations- Light Equipment Shop	1	\$878,500	\$878,500	\$1,757,000	11%	2%	0%	\$14,038	1%
Fuller Bldg: Mx Equipment & Evidence Storage	1	\$750,000	\$750,000	\$1,500,000	6%	0%	0%	\$5,468	0%
Gen Serv Surplus (Bldg B)	1	\$2,000,000	\$2,000,000	\$4,000,000	8%	1%	0%	\$19,520	0%
Hall Of Justice	1	\$27,787,000	\$27,787,000	\$55,574,000	7%	0%	0%	\$215,627	0%
Hall Of Justice/Law Library	1	\$712,500	\$712,500	\$1,425,000	18%	4%	0%	\$21,824	2%
Health & Social Services Headquarters Bldg.	1	\$30,045,000	\$30,045,000	\$60,090,000	7%	0%	0%	\$266,499	0%
Health & Social Services Health Facility	1	\$13,498,000	\$13,498,000	\$26,996,000	7%	0%	0%	\$119,727	0%
Jail	1	\$54,594,750	\$54,594,750	\$109,189,500	7%	0%	0%	\$423,655	0%
Justice Building	1	\$17,619,750	\$17,619,750	\$35,239,500	29%	6%	0%	\$823,547	2%
Juvenile Hall	1	\$14,353,000	\$14,353,000	\$28,706,000	7%	0%	0%	\$117,120	0%
Law And Justice	1	\$8,479,000	\$8,479,000	\$16,958,000	7%	0%	0%	\$65,797	0%
Library	1	\$2,287,250	\$2,287,250	\$4,574,500	7%	0%	0%	\$17,749	0%
Maintenance	1	\$818,250	\$818,250	\$1,636,500	6%	0%	0%	\$5,965	0%
Marriott Hotel Site	1	\$1	\$1	\$2	15%	1%	0%	\$0	1%
New Foundations (Probation)	1	\$2,177,750	\$2,177,750	\$4,355,500	7%	0%	0%	\$17,770	0%
New H&Ss Building	1	\$15,366,500	\$15,366,500	\$30,733,000	15%	1%	0%	\$287,661	1%
New Veteran's Memorial Building	1	\$1,870,500	\$1,870,500	\$3,741,000	2%	0%	0%	\$4,826	0%
Nut Tree Nut Tree Airport	9	\$9	\$9	\$18	4%	0%	0%	\$0	0%
Nut Tree Nut Tree Airport - Northeast Hangars	1	\$1	\$1	\$2	5%	0%	0%	\$0	0%
Nut Tree Nut Tree Airport - Southeast Hangars	2	\$2	\$2	\$4	5%	0%	0%	\$0	0%
Nut Tree Nut Tree Airport Administration Bldg	1	\$1,907,500	\$1,907,500	\$3,815,000	4%	0%	0%	\$8,813	0%
Office Of Emergency Services	1	\$1,310,750	\$1,966,125	\$3,276,875	31%	17%	3%	\$123,525	4%
Office Space: Hertz	1	\$2,618,750	\$2,618,750	\$5,237,500	4%	0%	0%	\$12,099	0%
Portable Building	1	\$540,000	\$540,000	\$1,080,000	5%	0%	0%	\$2,911	0%
Probation - Challenge Building	1	\$1,980,500	\$1,980,500	\$3,961,000	7%	0%	0%	\$16,993	0%
Probation - Juvenile Detention Facility	1	\$13,195,000	\$13,195,000	\$26,390,000	7%	0%	0%	\$107,671	0%
Probation Building	1	\$10,951,750	\$10,951,750	\$21,903,500	7%	0%	0%	\$84,986	0%
Shed (For Groundskeeping)	1	\$180,000	\$180,000	\$360,000	8%	0%	0%	\$1,631	0%
Sheriff/Coroner	1	\$1,638,750	\$2,458,125	\$4,096,875	31%	17%	3%	\$154,436	4%





Building/ Site Name	# Bldg.	Site Value			Probability Damage Exceeds			Economic Loss	Loss Pct.
		Structure	Content	Total	Slight	Moderate	Extensive		
Sheriff's Office	1	\$625,000	\$937,500	\$1,562,500	22%	6%	0%	\$25,125	2%
Social Services Building	1	\$15,166,500	\$15,166,500	\$30,333,000	17%	3%	0%	\$398,727	1%
Stanton Correctional Facility	1	\$31,950,000	\$31,950,000	\$63,900,000	1%	0%	0%	\$32,270	0%
Training: Classrooms	1	\$2,485,000	\$2,485,000	\$4,970,000	1%	0%	0%	\$2,510	0%
Training: Shop Bays	1	\$7,350,000	\$7,350,000	\$14,700,000	1%	0%	0%	\$7,424	0%
Transportation	1	\$925,000	\$925,000	\$1,850,000	1%	0%	0%	\$925	0%
Veteran's Memorial Building	5	\$8,019,250	\$8,019,250	\$16,038,500	18%	3%	0%	\$233,586	1%
Warehouse-Food & Drygoods	1	\$3,022,750	\$3,022,750	\$6,045,500	1%	0%	0%	\$3,053	0%
Weights & Measures	1	\$429,250	\$429,250	\$858,500	10%	1%	0%	\$5,821	1%
William J. Carroll Govt. Center Site	2	\$9,226,751	\$9,226,751	\$18,453,502	2%	0%	0%	\$5,444	0%
<b>Vacaville</b>	<b>117</b>	<b>\$118,265,001</b>	<b>\$15,679,949</b>	<b>\$133,944,950</b>	<b>6%</b>	<b>1%</b>	<b>0%</b>	<b>\$966,449</b>	<b>1%</b>
Al Patch Park	2	\$253,000	\$18,800	\$271,800	3%	0%	0%	\$1,045	0%
Andrew Park	1	\$139,000	\$2,655	\$141,655	4%	1%	0%	\$812	1%
Arlington Park	4	\$368,000	\$89,440	\$457,440	4%	0%	0%	\$1,565	0%
Art League Studio/Gallery	1	\$353,000	\$96,382	\$449,382	8%	1%	0%	\$4,120	1%
Buck/Eldridge Office Complex	5	\$3,163,000	\$620,563	\$3,783,563	4%	0%	0%	\$13,560	0%
Centennial Park	1	\$149,000	\$3,267	\$152,267	3%	0%	0%	\$568	0%
City Hall Complex	4	\$15,161,000	\$2,568,372	\$17,729,372	5%	1%	0%	\$91,038	1%
Cooper School Park	1	\$189,000	\$64,221	\$253,221	4%	0%	0%	\$915	0%
Corporation Yard	16	\$5,371,000	\$1,239,801	\$6,610,801	8%	1%	0%	\$122,148	2%
Easterly Wastewater Treatment	20	\$24,054,000	\$3,825,133	\$27,879,133	7%	2%	0%	\$294,226	1%
Easterly Wastewater Treatment Plant	1	\$3,765,000	\$1	\$3,765,001	5%	1%	0%	\$24,472	1%
Fire Station No. 4	2	\$940,000	\$252,500	\$1,192,500	8%	1%	0%	\$4,726	0%
Fire Station No. 71	2	\$1,833,000	\$320,880	\$2,153,880	4%	0%	0%	\$7,554	0%
Fire Station No. 72	1	\$790,000	\$229,500	\$1,019,500	5%	0%	0%	\$4,029	0%
Fire Station No. 73	2	\$844,000	\$740,000	\$1,584,000	7%	1%	0%	\$3,062	0%
Gentry Meadowlands	2	\$176,000	\$49,416	\$225,416	5%	0%	0%	\$887	0%
Harbison Event Center	4	\$2,034,000	\$4	\$2,034,004	7%	1%	0%	\$15,963	1%
Horse Creek Lift Station	1	\$313,000	\$122,112	\$435,112	4%	1%	0%	\$1,587	0%
Keating Park	6	\$876,000	\$195,929	\$1,071,929	4%	0%	0%	\$3,782	0%
Lagoon Valley Park	3	\$237,000	\$64,018	\$301,018	4%	0%	0%	\$971	0%
Leisure Town Lift Station	1	\$323,000	\$28,588	\$351,588	3%	0%	0%	\$1,554	0%
Nelson Park	1	\$122,000	\$2,859	\$124,859	5%	0%	0%	\$622	0%
Old City Hall	1	\$635,000	\$153,865	\$788,865	17%	4%	0%	\$18,840	2%



Building/ Site Name	# Bldg.	Site Value			Probability Damage Exceeds			Economic Loss	Loss Pct.
		Structure	Content	Total	Slight	Moderate	Extensive		
Pena Adobe	6	\$477,000	\$56,053	\$533,053	5%	0%	0%	\$2,783	1%
Police Department Headquarters	1	\$14,827,000	\$1,435,118	\$16,262,118	4%	1%	0%	\$86,590	1%
Senior Center	1	\$4,546,000	\$138,856	\$4,684,856	4%	1%	0%	\$26,549	1%
Sport Center	2	\$2,816,000	\$123,541	\$2,939,541	5%	0%	0%	\$16,444	1%
Three Oak Community Center	5	\$4,893,000	\$107,411	\$5,000,411	3%	0%	0%	\$21,468	0%
Transit Plaza	2	\$205,000	\$2,143	\$207,143	4%	1%	0%	\$1,197	1%
Transmitter Property - Leased	1	\$1	\$662,594	\$662,595	4%	0%	0%	\$0	0%
Trower Center	2	\$408,000	\$35,601	\$443,601	3%	0%	0%	\$1,506	0%
Ulati Cultural Center	2	\$8,010,000	\$642,006	\$8,652,006	4%	0%	0%	\$38,448	0%
Vaca Boys And Girls Center	3	\$1,129,000	\$192,867	\$1,321,867	4%	0%	0%	\$4,539	0%
Vaca Valley Lift Station	1	\$318,000	\$28,588	\$346,588	3%	0%	0%	\$1,472	0%
Vacaville Fire Station 75	1	\$3,640,000	\$229,500	\$3,869,500	1%	0%	0%	\$2,184	0%
Vacaville Museum	1	\$2,348,000	\$1	\$2,348,001	4%	1%	0%	\$13,712	1%
Vacaville Transportation Center	2	\$384,000	\$2,101	\$386,101	6%	1%	0%	\$3,195	1%
Water Treatment Plant	4	\$12,167,000	\$912,263	\$13,079,263	9%	3%	0%	\$128,274	1%
Wykoff Reservoir	1	\$9,000	\$423,000	\$432,000	3%	0%	0%	\$43	0%
<b>Vallejo</b>	<b>129</b>	<b>\$300,302,350</b>	<b>\$36,211,422</b>	<b>\$336,513,772</b>	<b>22%</b>	<b>8%</b>	<b>1%</b>	<b>\$28,203,576</b>	<b>8%</b>
Apn-0056-194-150	1	\$124,136	\$1	\$124,137	18%	2%	0%	\$3,115	3%
Bi-Bett Resident House	1	\$450,083	\$1	\$450,084	20%	4%	0%	\$14,943	3%
Bi-Bett Shelter	1	\$491,565	\$1	\$491,566	20%	1%	0%	\$11,847	2%
Bi-Bett/Louisiana House	1	\$418,971	\$1	\$418,972	20%	4%	0%	\$13,910	3%
Blue Rock Springs Golf Course/Vallejo Golf Club	18	\$5,524,636	\$1,372,454	\$6,897,090	14%	2%	0%	\$91,779	1%
City Hall	1	\$25,732,460	\$2,754,877	\$28,487,337	38%	13%	1%	\$2,076,352	7%
Community Center	1	\$1,439,433	\$12,048	\$1,451,481	29%	6%	0%	\$67,279	5%
Corporation Yard Storage	1	\$950,980	\$388,828	\$1,339,808	29%	6%	0%	\$44,449	3%
Corporation Yard/Police Station	7	\$15,595,243	\$2,748,842	\$18,344,085	26%	12%	3%	\$2,221,910	12%
Cunningham	3	\$1,132,465	\$217,530	\$1,349,995	19%	7%	1%	\$19,977	1%
Dos Reis Water Facilities	5	\$4,918,757	\$123,243	\$5,042,000	18%	6%	1%	\$109,112	2%
Ferry Building	1	\$3,258,428	\$21,323	\$3,279,751	13%	3%	0%	\$70,708	2%
Fire Prevention	3	\$981,057	\$103,317	\$1,084,374	37%	20%	4%	\$120,615	11%
Fire Station 21	1	\$3,490,729	\$898,531	\$4,389,260	29%	6%	0%	\$161,935	4%
Fire Station 22	2	\$1,098,243	\$275,985	\$1,374,228	28%	10%	2%	\$21,910	2%
Fire Station 23	2	\$1,357,507	\$339,994	\$1,697,501	34%	12%	2%	\$62,812	4%
Fire Station 24	1	\$1,650,993	\$366,180	\$2,017,173	27%	5%	0%	\$68,500	3%



Building/ Site Name	# Bldg.	Site Value			Probability Damage Exceeds			Economic Loss	Loss Pct.
		Structure	Content	Total	Slight	Moderate	Extensive		
Fire Station 25	1	\$1,031,871	\$224,334	\$1,256,205	19%	4%	0%	\$32,267	3%
Fire Station 26	1	\$1,238,244	\$297,324	\$1,535,568	20%	3%	0%	\$36,404	2%
Fire Station 27	1	\$2,270,115	\$523,774	\$2,793,889	33%	10%	1%	\$151,371	5%
Fire Station 28	1	\$4,438,598	\$827,450	\$5,266,048	16%	4%	0%	\$121,573	2%
Flemming Hill Water Treatment	11	\$69,677,686	\$5,895,422	\$75,573,108	15%	5%	1%	\$2,210,099	3%
Florence Douglas Center	1	\$2,380,043	\$205,569	\$2,585,612	15%	1%	0%	\$44,554	2%
Georgia Water Facility	5	\$3,607,918	\$81,499	\$3,689,417	19%	6%	1%	\$84,207	2%
J F Kennedy Library	1	\$25,833,050	\$1,857,635	\$27,690,685	60%	41%	13%	\$6,064,825	22%
Kaiser	2	\$1,144,911	\$177,893	\$1,322,804	15%	2%	0%	\$23,502	2%
Mare Island	8	\$18,192,029	\$3,701,659	\$21,893,688	44%	19%	3%	\$1,885,531	9%
Marina Properties	10	\$5,013,128	\$8,172,713	\$13,185,841	29%	11%	2%	\$363,681	3%
Native Son	1	\$693,790	\$1	\$693,791	33%	10%	1%	\$45,388	7%
North Vallejo Community Center	1	\$1,036,019	\$28,985	\$1,065,004	12%	3%	0%	\$21,653	2%
Office Building	1	\$686,531	\$12,613	\$699,144	20%	4%	0%	\$22,971	3%
Pennsylvania House	2	\$1,269,357	\$69,515	\$1,338,872	20%	4%	0%	\$42,143	3%
Police Sub Station	1	\$629,493	\$69,301	\$698,794	23%	5%	0%	\$25,180	4%
Police Traffic Division	1	\$680,308	\$114,690	\$794,998	19%	4%	0%	\$21,049	3%
Satellite Cm Office	1	\$356,892	\$1	\$356,893	17%	3%	0%	\$10,043	3%
Sludge Dewatering Facilities	6	\$4,815,051	\$788,600	\$5,603,651	17%	5%	1%	\$102,632	2%
South Vallejo Community Center	1	\$2,696,344	\$19,601	\$2,715,945	13%	3%	0%	\$60,290	2%
Swanzy	8	\$23,307,827	\$220,058	\$23,527,885	23%	10%	2%	\$6,089,900	26%
Transit Center	4	\$8,118,072	\$1,437,567	\$9,555,639	31%	11%	1%	\$601,327	6%
Travis Afb Water Treatment Plant	8	\$14,014,769	\$764,978	\$14,779,747	6%	1%	0%	\$239,464	2%
Vallejo Naval Museum	1	\$9,062,828	\$1,097,083	\$10,159,911	78%	63%	30%	\$3,583,986	35%
Vallejo Transit Center	1	\$29,491,790	\$1	\$29,491,791	23%	5%	0%	\$1,138,383	4%
<b>Grand Total</b>	<b>608</b>	<b>\$1,380,701,916</b>	<b>\$708,039,452</b>	<b>\$2,088,741,368</b>	<b>12%</b>	<b>3%</b>	<b>1%</b>	<b>\$45,736,972</b>	<b>2%</b>



## A.2.5. Insured Assets Roll

Table 7-6: Unincorporated County Insured Asset Roll

Building/ Site Name	# Bldg.	Site Value		
		Structure	Content	Total
<b>Solano County</b>	<b>172</b>	<b>\$593,737,350</b>	<b>\$595,524,600</b>	<b>\$1,189,261,950</b>
2009 H&SS New Lab	1	\$7,556,000	\$7,556,000	\$15,112,000
Ag Office Space	1	\$517,750	\$517,750	\$1,035,500
Ag Office Space/Warehouse (Bldg A)	1	\$1,526,750	\$1,526,750	\$3,053,500
Ag/UC-Coop/District Attorney	1	\$3,870,000	\$3,870,000	\$7,740,000
Alley/walkway between Steffan St. and Benicia Road	1	\$1	\$1	\$2
Animal Shelter - New Bldg	1	\$3,094,500	\$3,094,500	\$6,189,000
Animal Shelter - Shelter Building	1	\$3,074,500	\$3,074,500	\$6,149,000
Annex Lawn (Annex bldg demoed on 09/2009)	1	\$1	\$1	\$2
Assessor/Recorders - (Old Office)	1	\$2,125,000	\$2,125,000	\$4,250,000
Assessor/Recorders - Parking Lot	1	\$1	\$1	\$2
Bay Area Community Services (BACS)	1	\$1,791,000	\$1,791,000	\$3,582,000
Cement Hill Communication Site	1	\$306,250	\$306,250	\$612,500
Chevron/Carl's Junior	1	\$1	\$1	\$2
Child Start	1	\$606,250	\$606,250	\$1,212,500
Claybank Detention Facility	1	\$22,813,750	\$22,813,750	\$45,627,500
Cogeneration Plant	1	\$2,954,250	\$2,954,250	\$5,908,500
Communications & Grounds/Facilities Operations/Sheriff	1	\$1,822,500	\$1,822,500	\$3,645,000
Corp Yard - Owned by Public Works	1	\$1,376,250	\$1,376,250	\$2,752,500
Corp Yard - parking	1	\$1	\$1	\$2
Corp Yard -Fleet Heavy Equipment Shop	1	\$1,224,000	\$1,224,000	\$2,448,000
Corp Yard -Transportation Paint Shop	1	\$1,891,500	\$1,891,500	\$3,783,000
Corp Yard -Transportation Survey, Soils Lab, Mx	1	\$480,000	\$480,000	\$960,000
County Campus Parking Lot	1	\$1	\$1	\$2
County Communication Transmitter Building	1	\$125,000	\$125,000	\$250,000
County Events Center (Old Library)	1	\$2,741,000	\$2,741,000	\$5,482,000
Courts	1	\$805,000	\$805,000	\$1,610,000
Dirt Lot	1	\$1	\$1	\$2
Dixon Corporation Yard - Transportation	1	\$201,750	\$201,750	\$403,500
Dixon Corporation Yard - Transportation - Vacant Lot	1	\$1	\$1	\$2
Facilities Warehouse (shared with Sheriff)	2	\$2,265,000	\$2,265,000	\$4,530,000
Fairfield Government Center	1	\$70,529,250	\$70,529,250	\$141,058,500
Fairfield Government Center Garage	1	\$89,803,750	\$89,803,750	\$179,607,500
Fairfield Library	1	\$8,921,000	\$8,921,000	\$17,842,000
Fairfield Post Office	1	\$3,528,250	\$3,528,250	\$7,056,500
Fairfield Post Office (Parking Lot)	1	\$1	\$1	\$2
Fairgrounds Facilities	1	\$43,803,750	\$43,803,750	\$87,607,500
Family Justice Center	1	\$2,345,750	\$2,345,750	\$4,691,500
Fleet Operations- Light Equipment Shop	1	\$878,500	\$878,500	\$1,757,000
Fouts Springs Youth Facility	1	\$1	\$1	\$2
Fueling System	1	\$305,750	\$305,750	\$611,500
Fuller Bldg: Mx Equipment & Evidence Storage	1	\$750,000	\$750,000	\$1,500,000
Gale Wilson - Donation	1	\$1	\$1	\$2
Gale Wilson - Donation Parcel # was 0048-090-320	1	\$1	\$1	\$2
Gen Serv Surplus (Bldg B)	1	\$2,000,000	\$2,000,000	\$4,000,000
Hall of Justice	1	\$27,787,000	\$27,787,000	\$55,574,000
Hall of Justice/Law Library	1	\$712,500	\$712,500	\$1,425,000
Health & Social Services Headquarters Bldg.	1	\$30,045,000	\$30,045,000	\$60,090,000



Building/ Site Name	# Bldg.	Site Value		
		Structure	Content	Total
Health & Social Services Health Facility	1	\$13,498,000	\$13,498,000	\$26,996,000
Jail	1	\$54,594,750	\$54,594,750	\$109,189,500
Justice Building	1	\$17,619,750	\$17,619,750	\$35,239,500
Juvenile Hall	1	\$14,353,000	\$14,353,000	\$28,706,000
Kalis Property Vacant	1	\$1	\$1	\$2
Law and Justice	1	\$8,479,000	\$8,479,000	\$16,958,000
Library	1	\$2,287,250	\$2,287,250	\$4,574,500
Maintenance	1	\$818,250	\$818,250	\$1,636,500
Marriott Hotel Site	1	\$1	\$1	\$2
New Foundations (Probation)	1	\$2,177,750	\$2,177,750	\$4,355,500
New H&SS Building	1	\$15,366,500	\$15,366,500	\$30,733,000
New Veteran's Memorial Building	1	\$1,870,500	\$1,870,500	\$3,741,000
Nut Tree Airport RPZ Land - Buzz Oates Purchase - 40.95 ac	6	\$6	\$6	\$12
Nut Tree Nut Tree Airport	9	\$9	\$9	\$18
Nut Tree Nut Tree Airport - entrance road	1	\$1	\$1	\$2
Nut Tree Nut Tree Airport - middle of runway	1	\$1	\$1	\$2
Nut Tree Nut Tree Airport - northeast hangars	1	\$1	\$1	\$2
Nut Tree Nut Tree Airport - northern portion of runway	1	\$1	\$1	\$2
Nut Tree Nut Tree Airport - north runway expansion (vacant)	1	\$1	\$1	\$2
Nut Tree Nut Tree Airport - south end of runway	1	\$1	\$1	\$2
Nut Tree Nut Tree Airport - southeast hangars	2	\$2	\$2	\$4
Nut Tree Nut Tree Airport - southern portion of runway	1	\$1	\$1	\$2
Nut Tree Nut Tree Airport Administration bldg	1	\$1,907,500	\$1,907,500	\$3,815,000
Nut Tree Nut Tree Airport RPZ - end of runway	1	\$1	\$1	\$2
Nut Tree Nut Tree Airport RPZ - northwest side of runway	1	\$1	\$1	\$2
Nut Tree Nut Tree Airport Vacant Lot - No Fly Zone	9	\$9	\$9	\$18
Office of Emergency Services	1	\$1,310,750	\$1,966,125	\$3,276,875
Office Space: Hertz	1	\$2,618,750	\$2,618,750	\$5,237,500
Old Animal Care Building site - demo'd 4/11, was 1127sf	1	\$1	\$1	\$2
Parcel acquired from Kirkpatrick	1	\$1	\$1	\$2
Parking Lot (South County Master Plan)	2	\$2	\$2	\$4
Parking lot in rear of H&SS Admin. 275 Beck	1	\$1	\$1	\$2
PG&E Tower Right of Way	1	\$1	\$1	\$2
Portable Building	1	\$540,000	\$540,000	\$1,080,000
Probation - Challenge Building	1	\$1,980,500	\$1,980,500	\$3,961,000
Probation - Juvenile Detention Facility	1	\$13,195,000	\$13,195,000	\$26,390,000
Probation Building	1	\$10,951,750	\$10,951,750	\$21,903,500
Probation Parking Lot	1	\$1	\$1	\$2
Proposed Exchg Property for Fouts Springs Ppty	4	\$4	\$4	\$8
Putah Creek	1	\$1	\$1	\$2
Putah Creek bank of trees next to bridge, 505	3	\$3	\$3	\$6
Rio Vista Corporation Yard - Transportation	1	\$597,000	\$597,000	\$1,194,000
Roadway	1	\$1	\$1	\$2
Shed (for Groundskeeping)	1	\$180,000	\$180,000	\$360,000
Sheriff/Coroner	1	\$1,638,750	\$2,458,125	\$4,096,875
Sheriff's Office	1	\$625,000	\$937,500	\$1,562,500
Social Services Building	1	\$15,166,500	\$15,166,500	\$30,333,000
Stanton Correctional Facility	1	\$31,950,000	\$31,950,000	\$63,900,000
Stevenson Bridge Area (for Putah Creek)	1	\$1	\$1	\$2
Strip along Highway	1	\$1	\$1	\$2
Training: Classrooms	1	\$2,485,000	\$2,485,000	\$4,970,000
Training: Shop Bays	1	\$7,350,000	\$7,350,000	\$14,700,000





Building/ Site Name	# Bldg.	Site Value		
		Structure	Content	Total
Transportation	1	\$925,000	\$925,000	\$1,850,000
Vacant land	3	\$3	\$3	\$6
Vacant Land - Strip next to sidewalk	1	\$1	\$1	\$2
Vacant land along Napa River adjacent to Vjo. River Park	1	\$1	\$1	\$2
Vacant Land Remnant	4	\$4	\$4	\$8
Vacant Land Site for Fire Station	2	\$2	\$2	\$4
Vacant Lot left after construction of Weyland Canal	1	\$1	\$1	\$2
Vacant Lot Remnant	3	\$3	\$3	\$6
Vacant Lot Remnant adjacent to The Reporter	1	\$1	\$1	\$2
Vacant Parcel at Beck Campus (from Stephen Power)	1	\$1	\$1	\$2
Vacant parcel from City of VV	1	\$1	\$1	\$2
Vacant parcel from City of VV - exchanged for 600 Merchant	1	\$1	\$1	\$2
Vacant parcel next to Pierce Lane	1	\$1	\$1	\$2
Vacaville Corporation Yard	1	\$72,000	\$72,000	\$144,000
Veteran's Memorial Building	5	\$8,019,250	\$8,019,250	\$16,038,500
Veteran's Memorial Building parking lot	1	\$3,902,500	\$3,902,500	\$7,805,000
Warehouse-Food & Drygoods	1	\$3,022,750	\$3,022,750	\$6,045,500
Weights & Measures	1	\$429,250	\$429,250	\$858,500
Wilcox Ranch	12	\$12	\$12	\$24
William J. Carroll Govt. Center Site	2	\$9,226,751	\$9,226,751	\$18,453,502
<b>Grand Total</b>	<b>172</b>	<b>\$593,737,350</b>	<b>\$595,524,600</b>	<b>\$1,189,261,950</b>

## A.2.6. Data Dictionary

Table 7-7: Critical Facility Data Dictionary

Dataset	Data Steward	Notes
Jurisdictions	County	Feature Server - QA With stakeholders
Aerial Imagery	USDA	NAIP to be used unless a better local dataset is available
County Boundary	Census	Utilized Census Boundary - Close match to county provided but with less introduced error in population analysis
Standard Elevation Model	NED	1/3 arc second NED
High Resolution Elevation Model	NED, NOAA	Will need most accurate available for depth grid creation
GNIS	USGS	Place names and landmarks
Stream	Esri, NHD, County	Also check <a href="https://geohub-doitgis.opendata.arcgis.com/datasets/waterlines/data">https://geohub-doitgis.opendata.arcgis.com/datasets/waterlines/data</a> and <a href="https://geohub-doitgis.opendata.arcgis.com/datasets/water-lin">https://geohub-doitgis.opendata.arcgis.com/datasets/water-lin</a>
Water	Esri, NHD, County	Also check <a href="https://geohub-doitgis.opendata.arcgis.com/datasets/water-ply/data">https://geohub-doitgis.opendata.arcgis.com/datasets/water-ply/data</a>
Building Outlines	County	County Open Data sourced
Parcel Geometry	County	From County Open data 2020 parcel dataset - most complete



Dataset	Data Steward	Notes
Address Points	County	These are from Solano Open Data and are simple parcel polygon centroids
Parcel Roll	County	<b>REQUESTED THROUGH OES:</b> Parcels_Public_View Feature Service has most attributes but needs further investigation Tax_Parcels FS Layer empty but shows useful fields for Hazus. Attributes needed: APN, Improvement Value, Land Value, Total Assessed Value, Market Value, Number of stories, First floor height, Structure Floor Area (in square feet), Use Code (and lookup table if needed: residential, industrial, commercial, education, etc), Year Built, Construction Type (wood frame, masonry, etc), Foundation Type (slab on grade, stemwall, etc), Address, EQ Design Level
Emergency Operations Center	County	Found within Feature Server (CountyBuildings)
Emergency Services	County	Need to reconcile, From Hazus dataset
Fire Station	County	From Jake's GDB Provided from data request
Hospital	County	From Jake's GDB Provided from data request
Police Station	County	From Jake's GDB Provided from data request
Administrative	County	From Jake's GDB Provided from data request
Cell Tower	County	From Jake's GDB Provided from data request
Child Care Facility	County	From Jake's GDB Provided from data request
Community Center	County	From Jake's GDB Provided from data request
<b>County/Municipality Insured Assets</b>	County	<b>REQUESTED THROUGH OES:</b> Insurance property schedule with appraisal values, building characteristics, and location required. Usual information includes: Location, Address, City, State, ZIP Code, Sq Feet, Year Built, Stories, Const Desc, Const Code, Total Real Property, Total Personal Property, Total Rent, Total Values, Excluded Real Value, Excluded Contents Value, Latitude, Longitude
Dam	USACE NID, DWR	Only NID at this point, may need to follow up with DWR data
Detention Center	County	Found within Feature Server (CountyBuildings)
Early Learning	County	From Jake's GDB Provided from data request
Emergency Shelter	County	Found within Feature Server (CountyBuildings)
Fairground	County	None Found on County Feature Server
Foster Family Agency	CDSS	3rd party source data can be supplemented by local data per availability.
Healthcare Facility	County	From Jake's GDB Provided from data request
Historic Building	NPS	3rd party source data can be supplemented by local data per availability.
Historic Site	NPS, County	3rd party source data can be supplemented by local data per availability. See CAHLandmarks
Library	County	From Jake's GDB Provided from data request



Dataset	Data Steward	Notes
Park	County	Converted to centroid from polygon that was provided in Jake's GIS GDB data request
Power Plant	CEC	CEC 2020 Power Plant opened Data
Residential Child Care	CDSS	3rd party source data can be supplemented by local data per availability.
Residential Elder Care Facility	CDSS	3rd party source data can be supplemented by local data per availability.
School	County	From County Open Data
Senior Center	County	From Jake's GDB Provided from data request
Wastewater Treatment Facility	Hazus	Local jurisdiction preferred over Hazus - None found on County Feature Server
Airport	Hazus	County dataset had smaller airports (private?)
Amtrak Station	County	From Jake's GDB Provided from data request
Bridge	NBI	National bridge inventory more inclusive than various county layers
Breakout Tank	County	From Jake's GDB Provided from data request
Bus Stop	County	From Jake's GDB Provided from data request
Bus Facility	Hazus	Supplemental to county provided data
Bus Route	County	From Jake's GDB Provided from data request
Ferry	County	From Jake's GDB Provided from data request
Levee	FEMA	None Found on County Feature Server
Levee Flood Wall	USACE NLD	NLD WFS
Levee XS	USACE NLD	May be deprecated by NLD WFS
NG Pipeline	CEC, County	CEC Open Data more inclusive than county provided
NG Station	CEC	CEC Open Data
Oil Facility	Hazus	Hazus data repository
Railroad	ESRI	From ESRI streetmap
Railway Bridge	Hazus	Hazus data repository
Street	County	From Jake's GDB Provided from data request
Substation	CEC	3rd party source data can be supplemented by local data per availability. - None Found on County Feature Server
Train Station	County	From Jake's GDB Provided from data request
Transmission Line	CEC, County	CEC or County Feature Server (PowerLinesPGE)
Transmission Line Tower	CEC	3rd party source data can be supplemented by local data per availability. None found on County Feature Server
Wind Turbine	County	From Jake's GDB Provided from data request
Hazmat	County	From Jake's GDB Provided from data request
Hazardous Waste Facility	County	From Jake's GDB Provided from data request



Dataset	Data Steward	Notes
Census Block Group	US Census Bureau	Processed by DPS to include demographics report values as provided by Census ACS
Dam Inundation	Cal OES, DWR	Consolidated from DWR and Cal OES data. 3rd party source data can be supplemented by local data per availability. - None found on County Feature Server
Shake Potential	USGS, CISON	Currently outside of GDB
EQ Scenarios 1-X	USGS, CISON	Chosen qualitatively from shake potential map
Flood Hazard	FEMA	FEMA DFIRM NFHL
Sea Level Rise	NOAA	NOAA Office for Coastal Management Sea Level Rise Data: 1-10 ft Sea Level Rise Inundation Extent
Landslide Susceptibility	CGS	CGS Landslide susceptibility for deep bedded landslides
Tsunami Runup	CGS, Cal OES	CGS data from MOST Model - 10' inundation
Wildfire Hazard Severity Zone	Cal Fir, CPUC	Composite fire layer developed by DPS
EQ Fault Zones	CGS	CGS, USGS Fault zones
Fire Perimeter Calfire	NIFC	Statewide for burn perimeters 2000-2019 (Geomac Archive)
Fire Regime MFRI	USGS	<a href="https://www.landfire.gov/NationalProductDescriptions13.php">https://www.landfire.gov/NationalProductDescriptions13.php</a>
Expansive Soils	USGS	Are layers from 2013 plan acceptable?
Qfaults	USGS	CGS zones of required investigation
Repetitive Loss Areas	FEMA	FEMA Sourced, need county support for data request
Best Available Mapping (Flood)	USACE	Best Available Mapping (BAM), USACE



INTENTIONAL BLANK PAGE



## **Appendix B. Process Documentation**

# **SOLANO COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN**



INTENTIONAL BLANK PAGE



# Appendix B

---

## Table of Contents

**Planning Committee Meeting Documentation.....B1**

**Public Notice & Press Release Documentation ..... B2**

**Survey & Results Documentation..... B3**

**Mitigation Strategy Prioritization Process Documentation..... B4**

**Website Documentation ..... B5**



**PAGE INTENTIONALLY LEFT BLANK**



# Planning Committee Meeting Documentation

---

## Appendix B.1





**PAGE INTENTIONALLY LEFT BLANK**



## Torie Jarvis

---

**From:** Torie Jarvis  
**Sent:** Friday, November 20, 2020 5:15 PM  
**Cc:** Don Ryan; Rains, Robyn L.  
**Subject:** Solano Hazard Mitigation Plan, first meeting SAVE-THE-DATE!  
**Attachments:** Solano MJHMP Meeting #1.ics; Solano MJHMP Meeting #1 Agenda.pdf

Hello Solano County, Cities, and stakeholders,

We hope you can all save the date for the first meeting of the Planning Committee to update the County's Multi-Jurisdictional Hazard Mitigation Plan! The purpose of the Solano MJHMP is to reduce property losses and avoid injury and/or casualties resulting from natural disasters. Hazard mitigation is the use of sustained, long-term actions to reduce loss of life, personal injury, and property damage that can result from a disaster.

**Wednesday, December 16, 2020**  
**2 – 4 PM via Zoom.**

A calendar event and *draft* agenda are attached.

You've been invited to this meeting as County and City staff and important stakeholders to add your valuable perspective to the analysis of natural hazard impacts in Solano County. This Planning Team will meet 3-4 times over the coming months, through April 2021. During this initial meeting, you will learn about FEMA's hazard mitigation program, prevalent hazards throughout the County, and mitigation techniques to reduce damage and injury in the event of a wildfire, flood, earthquake, and other natural hazards.

Please let us know if you would like to update the contact person for your jurisdiction or add to the contact list with other local agencies, nonprofits, or others you think may be interested.

We look forward to hearing from you.

Cheers,

Torie Jarvis



**Torie Jarvis**  
970-323-4330  
torie@dynamicplanning.co



Planning Manager

[www.dynamicplanning.co](http://www.dynamicplanning.co)



## Solano County Multi-Jurisdiction Hazard Mitigation Plan 2021 Update Planning Committee Meeting #1

**Wed., Dec. 16, 2020**  
2 PM – 4 PM

**Via Zoom Conference call**

<https://us02web.zoom.us/j/84844687973?pwd=NlF4aFE2RmxReDljQ0d6WDZJRVRqZz09>

**Passcode:** Solano2021

By phone: 669 900 6833 Meeting ID: 848 4468 7973

### Agenda

- **Welcome and Introductions**
- **Background**
- **Mitigation Planning Defined**
- **Planning Process Review**
  - Project Schedule
  - Website Review
- **FEMA Hazard Mitigation Assistance**
- **2012 Mitigation Plan Review**
  - Recent Success Stories
- **What Has Changed?**
- **Outreach**
- **Next Steps**

Project Website: [mitigatehazards.com](https://mitigatehazards.com)

Project Webpage: [mitigatehazards.com/SolanoHMP](https://mitigatehazards.com/SolanoHMP)

Website Password: **Solano2021**

Polling Website for Smartphone: [pollev.com/dynamicplanning](https://pollev.com/dynamicplanning)

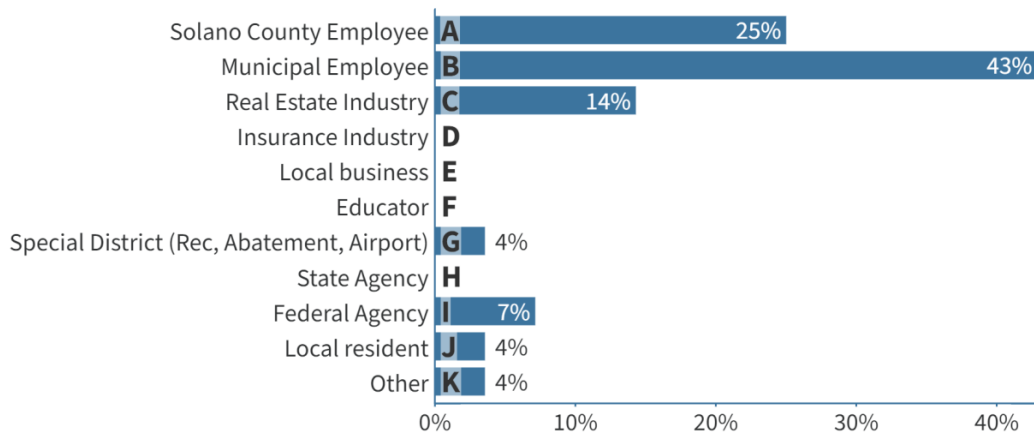


# Solano County Meeting #1: Solano County

## Poll Results Report

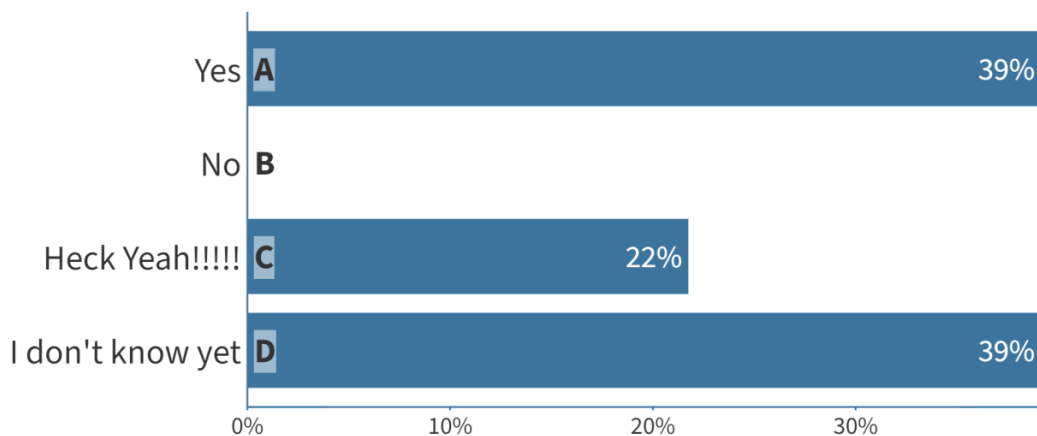
Respond at [PollEv.com/dynamicplanning](https://PollEv.com/dynamicplanning)  
Text **DYNAMICPLANNING** to **22333** once to join, then **A, B, C, D, E...**

### What agency do you associate your attendance with?



Respond at [PollEv.com/dynamicplanning](https://PollEv.com/dynamicplanning)  
Text **DYNAMICPLANNING** to **22333** once to join, then **A, B, C, or D**

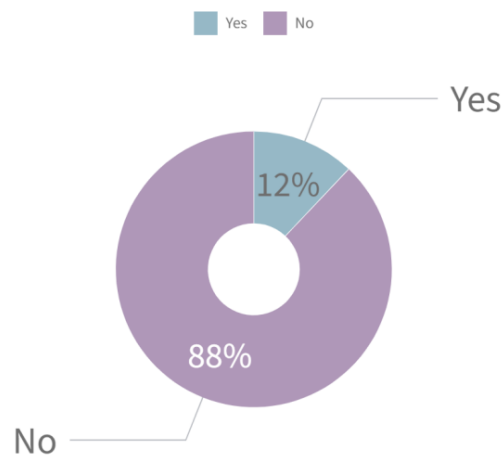
### Are you excited to be involved in this HMP Update Process?





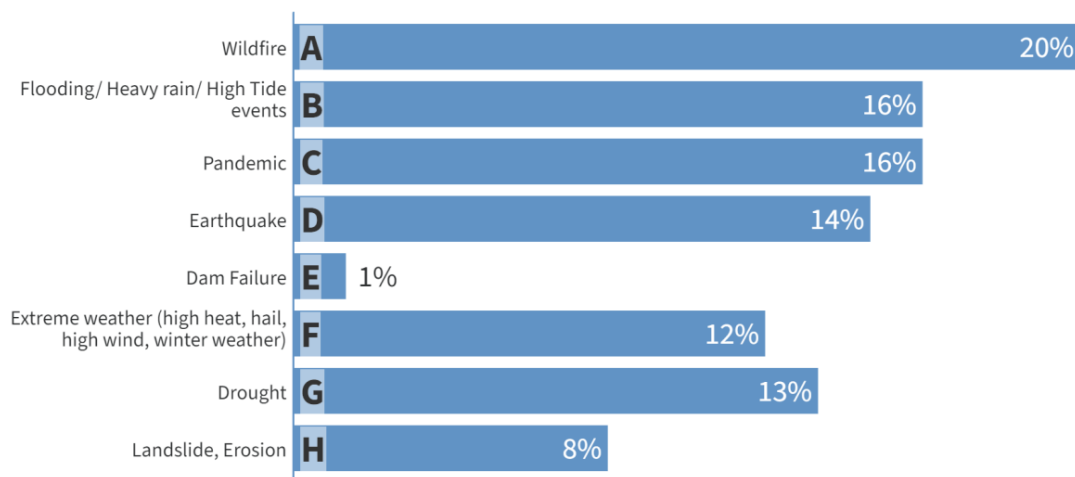
Respond at [PollEv.com/dynamicplanning](https://poll.evo.com/dynamicplanning)  
Text **DYNAMICPLANNING** to **22333** once to join, then **A or B**

## Were you involved in the last County or relevant City HMP effort?



Respond at [PollEv.com/dynamicplanning](https://poll.evo.com/dynamicplanning)  
Text **DYNAMICPLANNING** to **22333** once to join, then **A, B, C, D, E...**

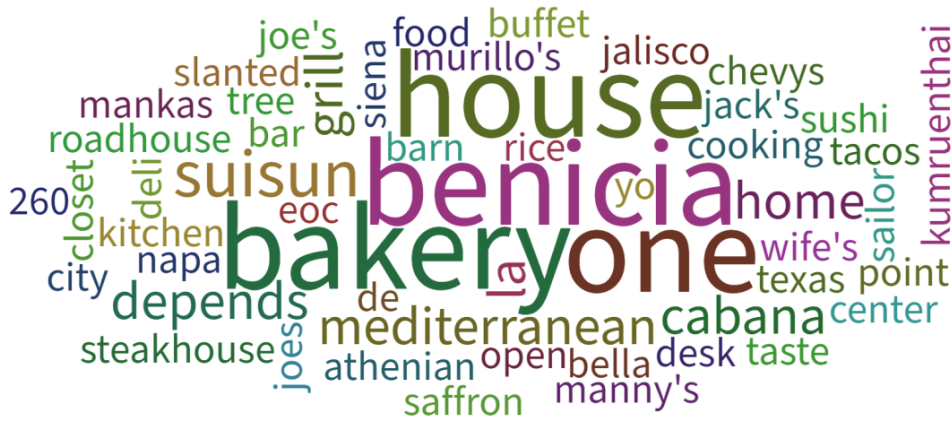
## What hazard events have you personally experienced in Solano?





Text **DYNAMICPLANNING** to **22333** once to join, then text your message

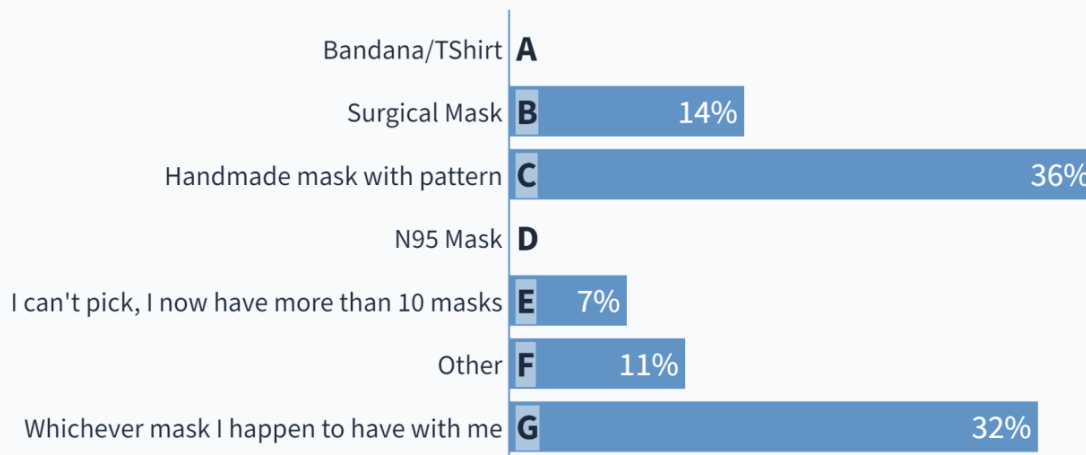
## Best Place for Lunch in the County?



Respond at [PollEv.com/dynamicplanning](https://www.poll-ev.com/dynamicplanning)

Text **DYNAMICPLANNING** to **22333** once to join, then **A, B, C, D, E...**

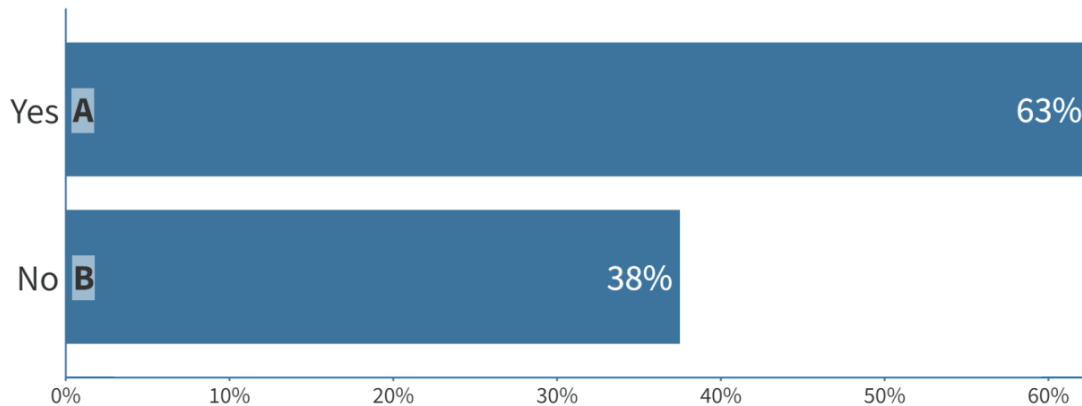
**Choose your favorite COVID19 face covering:**





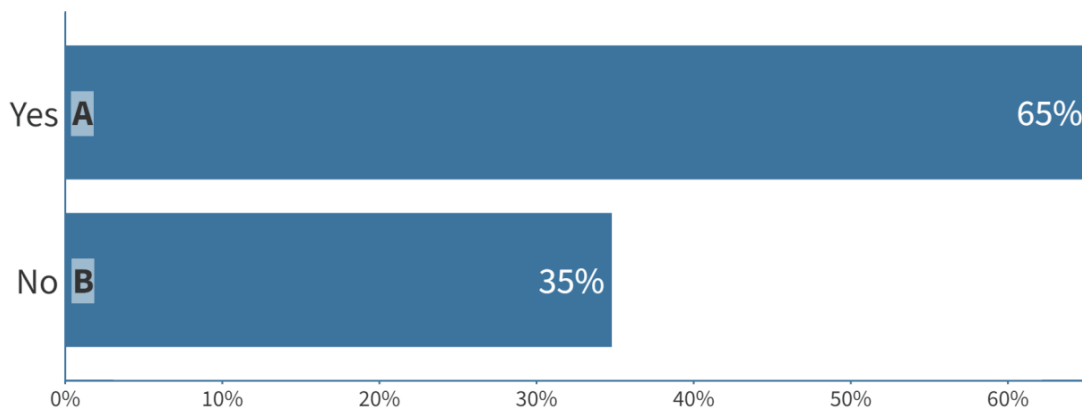
Respond at [PollEv.com/dynamicplanning](https://poll-ev.com/dynamicplanning)  
Text **DYNAMICPLANNING** to **22333** once to join, then **A or B**

### Did you know that the County has a recently expired Hazard Mitigation Plan?



Respond at [PollEv.com/dynamicplanning](https://poll-ev.com/dynamicplanning)  
Text **DYNAMICPLANNING** to **22333** once to join, then **A or B**

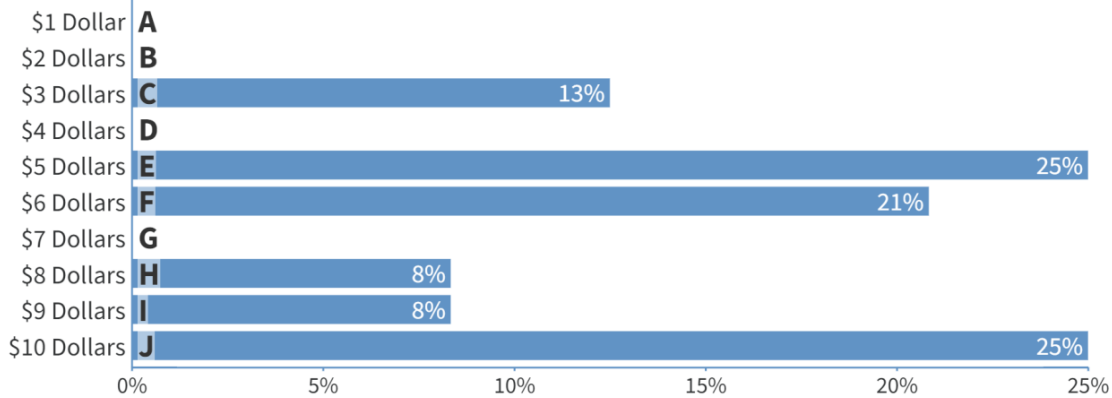
### Did you know that FEMA funds mitigation projects before a disaster strikes?





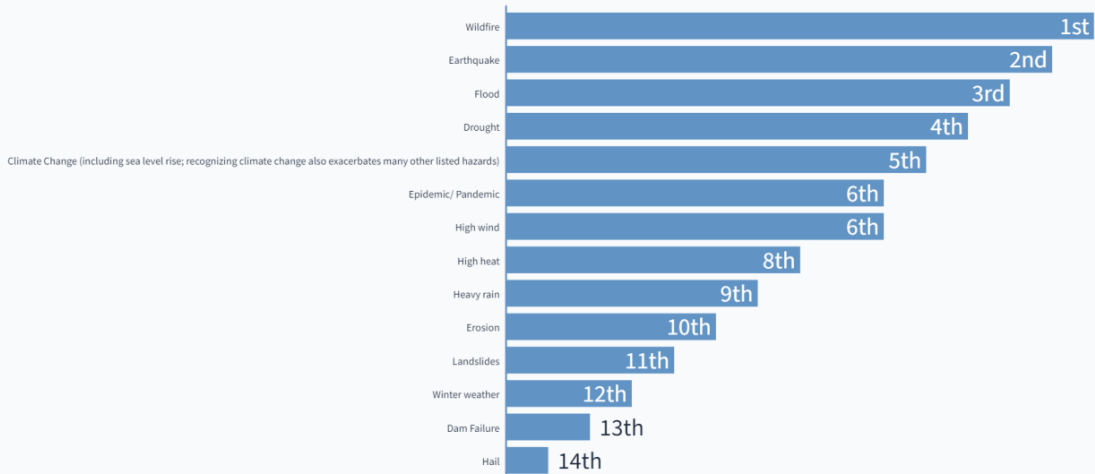
Respond at [PollEv.com/dynamicplanning](https://poll.ev.com/dynamicplanning)  
Text **DYNAMICPLANNING** to **22333** once to join, then **A, B, C, D, E...**

## For every mitigation dollar spent how much commonly saved in disaster damage avoidance?



Respond at [PollEv.com/dynamicplanning](https://poll.ev.com/dynamicplanning)

## Rank the hazard priority for the County by dragging up and down.





Respond at [PollEv.com/dynamicplanning](https://poll-ev.com/dynamicplanning)  
Text **DYNAMICPLANNING** to **22333** once to join, then text your message

**When thinking about WILDFIRE RISK, what areas of the County comes to mind? You may write in more than one.**

"Grasslands" 5 days ago

"Napa, Solano, Sonoma" 5 days ago

"Putah Creek, Lake Berryessa, Putah Diversion Dam, Putah South Canal" 5 days ago

"Shasta Trinity" 5 days ago

"allendale" 5 days ago

"Suisun Valley" 5 days ago

"all of it." 5 days ago

"Gibson Canyon" 5 days ago

"Blue Ridge" 5 days ago

"Pleasants Valley" 5 days ago

"Green Valley" 5 days ago

"Vacaville Country Properties" 5 days ago

"Open space" 5 days ago

"blue ridge" 5 days ago

"Gordon Valley" 5 days ago

"Pleasants Valley" 5 days ago

"Lagoon Valley" 5 days ago

"English Hills" 5 days ago

"Shasta" 5 days ago

**"Green Valley, Rural Fairfield, Rural Vacaville"** 5 days ago

"Rancho Solano, Green Valley Highlands, Twin Sisters, Rural Vacaville" 5 days ago

Respond at [PollEv.com/dynamicplanning](https://poll-ev.com/dynamicplanning)

**Click at the temperature you would consider "extreme heat" in the County.**

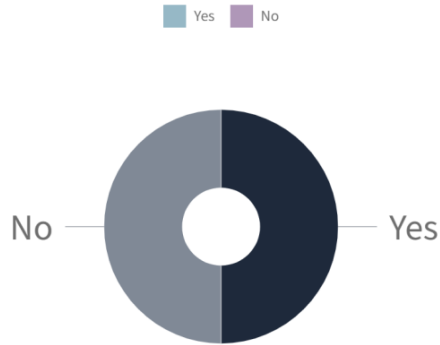
60 70 80 90 100

15 20 25 30 35 40



Respond at [PollEv.com/dynamicplanning](https://poll.evo.com/dynamicplanning)  
Text **DYNAMICPLANNING** to **22333** once to join, then **A or B**

## Have you ever been involved in applying for or administering a grant under FEMA's Hazard Mitigation Assistance program?







## Torie Jarvis

---

**From:** Torie Jarvis  
**Sent:** Wednesday, December 2, 2020 1:48 PM  
**To:** Don Ryan  
**Subject:** First HMP Meeting  
**Attachments:** Solano MJHMP Meeting #1.ics; Solano MJHMP Meeting #1 Agenda.pdf; Solano NGO Agency Contacts.pdf

Hello County and City staff,

Thank you for participating in the first combined Solano Multi-Jurisdiction Hazard Mitigation Plan (MJHMP), an update of existing HMPs combined into one MJHMP.

We are looking forward to our first meeting of the Planning Committee for the MJHMP Update. This email is a reminder about the upcoming meeting, as we've been adding to our list of City contacts for each jurisdiction.

**If you are a participating jurisdiction lead listed below and haven't send Dynamic Planning your contact list, please do so ASAP. We have not heard back from Vallejo, Fairfield, Vacaville, Suisun City, or Dixon.** You should have a minimum of five contacts for each City, and should include the PIO.

**The first meeting is Wednesday, December 16<sup>th</sup> from 2-4 PM via zoom.** More information is below and a meeting invite and draft agenda are attached. Please RSVP so we can track attendance per FEMA requirements.

We are also looking for additional members of the Planning Committee from your jurisdiction—CERT leaders, school district facilities/ operations, other volunteer agencies in your district. Interested realtors and insurance agents are helpful and always difficult to track down, if you know of any. Their expertise and perspective on hazard impacts is always helpful. Please send any additional contacts to me: [torie@dynamicplanning.co](mailto:torie@dynamicplanning.co). A current list of NGOs and agencies we've contacted to date is attached.

Cheers,

Torie



**Torie Jarvis**  
970-323-4330  
[torie@dynamicplanning.co](mailto:torie@dynamicplanning.co)



Planning Manager

[www.dynamicplanning.co](http://www.dynamicplanning.co)



## SOLANO MULTI-JURISDICTION HAZARD MITIGATION PLAN UPDATE

You are cordially invited to attend the first Planning Committee meeting in the process to update the Mendocino Multi-Jurisdiction Hazard Mitigation Plan (MJHMP)!

You have been identified as a member of the planning team for your jurisdiction-- and your jurisdiction is participating in the MJHMP (called a Participating Jurisdiction or PJ) by the PJ lead listed at the end of this email. Therefore you're a member of the MJHMP Planning Committee!

### Planning Committee Meeting #1

Wed. Dec. 16, 2020

2 PM to 4 PM

Via Zoom conference call:

<https://us02web.zoom.us/j/84844687973?pwd=NlF4aFE2RmxReDIjQ0d6WDZJRVRgZz09>

Call-in option: 669 900 6833

Meeting ID: 848 4468 7973



While we greatly prefer to meet face-to-face, due to coronavirus, this meeting will be held via Zoom. We will hope subsequent meetings can be in-person. We are pleased to begin the process to update the Solano Multi-Jurisdiction Hazard Mitigation Plan (MJHMP). The purpose of the Solano MJHMP is to reduce property losses and avoid injury and/or casualties resulting from natural disasters. Hazard mitigation is the use of sustained, long-term actions to reduce loss of life, personal injury, and property damage that can result from a disaster.

December 2020

16



The Plan is multi-jurisdictional in that 8 different Solano County jurisdictions are participating (the County, and Cities of Benicia, Dixon, Fairfield, Rio Vista, Suisun City, Vacaville, and Vallejo). Your jurisdiction's active participation in the



update process, as demonstrated by your attendance at this meeting, helps us fulfill one of FEMA's prerequisites for Plan approval.

This is the first in a series of 3-4 meetings over the course of four months to review and develop information for the updated MJHMP. During the series of meetings, you will learn about FEMA's hazard mitigation program, prevalent hazards throughout the County, and mitigation techniques to reduce damage and injury in the event of a wildfire, flood, earthquake, and other natural hazards.

At this first meeting, you will meet our Plan update consultants, Dynamic Planning + Science (DP+S). We will review project scope and schedule, an internal project management protocol, and Cal OES/FEMA plan review requirements. Meeting participants will discuss required multi-jurisdictional planning processes and documentation of such and begin planning a public outreach strategy. Consultants will review the existing MJHMP and demonstrate new Plan development resources and tools available to participating jurisdictions.

**Participating Jurisdiction Leads (PJ Leads):**

- **Solano County:** Don Ryan, OES Manager
- **City of Benicia:** Josh Chadwick, Fire Chief
- **City of Dixon:** Todd McNeal, Fire Chief
- **City of Fairfield:** John Sturdee, Fire Battalion Chief
- **City of Rio Vista:** Jeffrey Armstrong, Fire Chief
- **City of Suisun City:** Justin Vincent, Fire Chief
- **City of Vacaville:** Tim Burke, Assistant Public Works Director/ City Engineer
- **City of Vallejo:** Byron Berhel, Fire Battalion Chief

Please let us know if you need additional information and how we can be of assistance. We appreciate your time and consideration as always. Looking forward to seeing you at the end of the month.



### *Draft Agenda*

- Welcome and Introductions
- Background
- Mitigation Planning Defined
- Planning Process Review
  - Project Schedule
  - Website Review
- FEMA Hazard Mitigation Assistance
- 2012 Mitigation Plan Review
  - Recent Success Stories
- What Has Changed?
- Outreach
- Next Steps

### **MITIGATE HAZARDS**







## **Solano County Multi-Jurisdiction Hazard Mitigation Plan 2021 Update JURISDICTIONAL LEAD MEETING**

**Wed., Dec. 16, 2020**  
1 PM – 1:45 PM

**Via Zoom Conference call**

<https://us02web.zoom.us/j/83973703130?pwd=UUc2OFNmNTI3S2FURGg5ajJQYWp0UT09>

**Passcode:** Solano2021

By phone: 669 900 6833    Meeting ID: 839 7370 3130

### **Agenda**

for pre-meeting with jurisdictional leads

- Intros
- Expectations, your role as PJ Lead
- Overview of 5 exercises to complete
  1. Develop Planning Team
  2. Risk Prioritization
  3. Characterize Areas of Concern
  4. Capabilities Assessment
  5. Mitigation Actions
- Outreach and your role as liaison



---

**Torie Jarvis**

**From:** Torie Jarvis  
**Sent:** Tuesday, January 5, 2021 2:43 PM  
**Cc:** Don Ryan  
**Subject:** Solano Hazard Mitigation Planning Committee Meetings-- Save the Dates!  
**Attachments:** Solano Hazard Mitigation Planning Committee Mtg #2.ics; Solano Hazard Mitigation Planning Committee Mtg #3.ics

Hello Solano Hazard Mitigation Planning Committee,

Thank you all for a great first meeting back on December 16<sup>th</sup>, and Happy New Year!

Please save the dates for the second and the last HMPC meetings, where we'll take a deeper dive into hazard vulnerabilities in Solano County. Meeting information is attached and below. Agendas and other meeting info is available at [mitigatehazards.com/solanohmp/meetings](https://mitigatehazards.com/solanohmp/meetings) (password Solano2021).

Later this week we expect to have the Public Survey on Hazards ready for you all to share within your networks! Please stay tuned and help us get the word out.

Cheers,

Torie

[View this email in your browser](#)

SOLANO COUNTY  
MULTI-JURISDICTION HAZARD MITIGATION PLAN



## Save the Dates!

# Solano Hazard Mitigation Planning Committee (HMPC) Coming Up!

**HMPC Meeting #2: Wed. Jan. 27th, 2-4 PM**



### **HMPC Mtg #3: Wed. Feb. 17, 2-4 PM**

**More information below!**



*Above photo of Lake Berryessa during LNU Lightning Complex 2020 by AFP, Josh Edison*

## **HMPC Meeting #2: Assessing Vulnerabilities**

**Wed. Jan. 27, 2-4 PM via Zoom**

<https://us02web.zoom.us/j/82378724699?pwd=UENDVVJLcWY0bFJlVWlxa2NVdUtlIdz09>

Meeting ID: 823 7872 4699

Passcode: Solano2021

Call In: 669 900 6833



**Meeting description:** At HMPC Meeting #2 we will take a deeper dive into hazard vulnerabilities in Solano County. We will review past events, spur conversation about specific concerns, and explore the new hazard mapping for Solano County— the Risk Assessment Mapping Platform— through interactive polling.

## HMPC Meeting #3: Mitigating Hazards

**Wed. Jan. 27, 2-4 PM via Zoom**

<https://us02web.zoom.us/j/83026512010?pwd=elZPbHdIR3lDTnBNMDQwbk1DZHMvZz09>

Meeting ID: 830 2651 2010

Passcode: Solano2021

Call In: 253 215 8782

**Meeting description:** At HMPC Meeting #3 we will review what we've learned about Solano County's hazard vulnerabilities and learn how to mitigate those vulnerabilities. Mitigating hazards looks at a range of projects and planning activities that can reduce or eliminate hazard vulnerabilities in communities. We'll take a deeper dive into what that looking like in Solano County

Thank you to those of you who attending the first HMPC meeting on December 16th! The meeting recording, results from the polling, and meeting materials are available at

[mitigatehazards.com/solanohmp/meetings](https://mitigatehazards.com/solanohmp/meetings) (password Solano2021)

Click here to visit project page!



**Torie Jarvis**  
970-323-4330  
torie@dynamicplanning.co



Planning Manager

[www.dynamicplanning.co](http://www.dynamicplanning.co)





## Torie Jarvis

---

**From:** Torie Jarvis  
**Sent:** Monday, January 25, 2021 6:51 PM  
**Cc:** Don Ryan  
**Subject:** Solano Mtg #2 THIS WEDNESDAY!  
**Attachments:** Solano Hazard Mitigation Planning Committee Mtg #2.ics

Hello Solano County Hazard Mitigation Planning Committee,

We're looking forward to our second meeting of the Planning Committee for updating the County's Hazard Mitigation Plan (HMP) and developing the County's first combined Multi-Jurisdictional HMP for the County and all cities in the county . .

Our second meeting is this **Wednesday, Jan. 27, from 2-4 PM via Zoom**. Agenda and other meeting info is available at [mitigatehazards.com/solanohmp/meetings](https://mitigatehazards.com/solanohmp/meetings) (password Solano2021). Meeting info:

Meeting link: <https://us02web.zoom.us/j/82378724699?pwd=UENDVVJLcWY0bFJlVWlxa2NVdUtldz09>  
Meeting ID: 823 7872 4699  
Passcode: Solano2021  
Call In: 669 900 6833

At this meeting, we will take a deeper dive into hazard vulnerabilities in Solano County. We will review past events, spur conversation about specific concerns, and explore the new hazard mapping for Solano County— the Risk Assessment Mapping Platform. We also will solicit input on ranking priority hazards in Solano County through interactive polling.

Thank you!

Torie and the DP+S Team (consultant team working on the HMP)



**Torie Jarvis**  
970-323-4330  
[torie@dynamicplanning.co](mailto:torie@dynamicplanning.co)



Planning Manager

[www.dynamicplanning.co](http://www.dynamicplanning.co)

**Background on the HMP Development:** The term *Hazard Mitigation* describes actions that communities can take to help reduce or eliminate long-term risks caused by natural disasters. Natural Hazards in any jurisdiction can include flooding, wildfire, landslides, earthquake, and drought. During the planning process, prioritization will be given to the hazards within the jurisdiction that are most likely to occur. Hazard mitigation planning and projects can create safer jurisdictions by reducing loss of life and property damage associated with future disasters. Each dollar spent on mitigation can save the jurisdiction four to seven dollars! See [mitigatehazards.com/](https://mitigatehazards.com/) for more information.

You've been identified as a key stakeholder in the Planning Committee because of your local knowledge and experience from your role as a regional agency, neighboring jurisdiction, business owner, or resident of the County.





## Solano County Multi-Jurisdiction Hazard Mitigation Plan 2021 Update

### Hazard Mitigation Planning Committee (HMPC)

#### Meeting #2

Wednesday, Jan. 27, 2020  
2-4 PM

Via Zoom Conference call  
[Use this link](#)  
Password: Solano2021  
Call-in option: 669 900 6833  
Meeting ID: 823 7872 4699  
[Zoom User Guide](#)

#### Agenda

- **Welcome and Introductions**
- **Meeting #1 Brief Recap**
- **Risk Assessment/ Community Vulnerability Review**
  - Review Risk Assessment Mapping Platform (RAMP)
- **Risk Matrix Group Exercise**
- **Hazard Problem Statement Exercise Review**
- **Review Outreach Materials**
  - Survey
  - Web content
- **Next Steps**
  - Jurisdictional Exercises (capabilities assessment, success stories, risk matrix, and problem statements)

Project Website: [mitigatehazards.com](http://mitigatehazards.com)

Project Webpage: <http://mitigatehazards.com/solanohmp/>

Website Username/Password: **Solano2021**

Polling Website for Smartphone: [www.pollev.com/dynamicplanning](http://www.pollev.com/dynamicplanning)



## **Solano County Meeting #2: Solano County Poll Results Report**

# **SOLANO COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN**

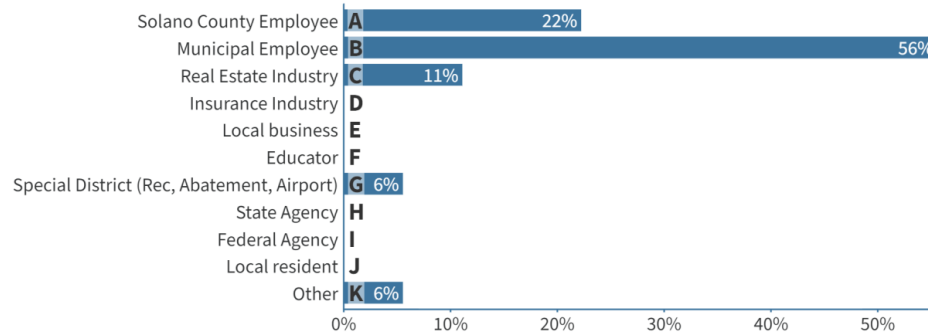
*HMPC Mtg #2 Report 1*



Respond at [PollEv.com/dynamicplanning](https://poll-ev.com/dynamicplanning)

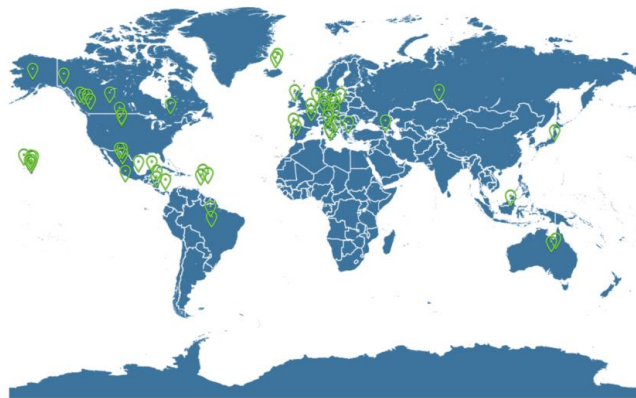
Text **DYNAMICPLANNING** to **22333** once to join, then **A, B, C, D, E...**

### What agency do you associate your attendance with?



Respond at [PollEv.com/dynamicplanning](https://poll-ev.com/dynamicplanning)

### Click on your top 3 favorite places you've traveled.





Respond at [PollEv.com/dynamicplanning](https://poll-ev.com/dynamicplanning)

Click on the mitigation actions (as opposed to problems in need of mitigation).



Respond at [PollEv.com/dynamicplanning](https://poll-ev.com/dynamicplanning)

### RA Exercise for WILDFIRE

		IMPACT			
		Minor	Limited	Critical	Catastrophic
PROBABILITY	Highly Likely	Medium	High	Extreme	Extreme
	Likely	Medium	High	High	Extreme
	Possible	Low	Medium	High	High
	Unlikely	Low	Low	Medium	Medium



Respond at [PollEv.com/dynamicplanning](https://poll-ev.com/dynamicplanning)

### RA Exercise for EARTHQUAKE

		IMPACT			
		Minor	Limited	Critical	Catastrophic
PROBABILITY	Highly Likely	Medium	High	Extreme	Extreme
	Likely	Medium	High	High	Extreme
	Possible	Low	Medium	High	High
	Unlikely	Low	Low	Medium	Medium

Respond at [PollEv.com/dynamicplanning](https://poll-ev.com/dynamicplanning)

### RA Exercise for FLOOD

		IMPACT			
		Minor	Limited	Critical	Catastrophic
PROBABILITY	Highly Likely	Medium	High	Extreme	Extreme
	Likely	Medium	High	High	Extreme
	Possible	Low	Medium	High	High
	Unlikely	Low	Low	Medium	Medium





Respond at [PollEv.com/dynamicplanning](https://www.poll-ev.com/dynamicplanning)

### RA Exercise for DROUGHT

		IMPACT			
		Minor	Limited	Critical	Catastrophic
PROBABILITY	Highly Likely	Medium	High	Extreme	Extreme
	Likely	Medium	High	High	Extreme
	Possible	Low	Medium	High	High
	Unlikely	Low	Low	Medium	Medium

Respond at [PollEv.com/dynamicplanning](https://www.poll-ev.com/dynamicplanning)

### RA Exercise for CLIMATE CHANGE

		IMPACT			
		Minor	Limited	Critical	Catastrophic
PROBABILITY	Highly Likely	Medium	High	Extreme	Extreme
	Likely	Medium	High	High	Extreme
	Possible	Low	Medium	High	High
	Unlikely	Low	Low	Medium	Medium



Respond at [PollEv.com/dynamicplanning](https://poll-ev.com/dynamicplanning)

### RA Exercise for EPIDEMIC / PANDEMIC

		IMPACT			
		Minor	Limited	Critical	Catastrophic
PROBABILITY	Highly Likely	Medium	High	Extreme	Extreme
	Likely	Medium	High	High	Extreme
	Possible	Low	Medium	High	High
	Unlikely	Low	Low	Medium	Medium

Respond at [PollEv.com/dynamicplanning](https://poll-ev.com/dynamicplanning)

### RA Exercise for EXTREME WEATHER

		IMPACT			
		Minor	Limited	Critical	Catastrophic
PROBABILITY	Highly Likely	Medium	High	Extreme	Extreme
	Likely	Medium	High	High	Extreme
	Possible	Low	Medium	High	High
	Unlikely	Low	Low	Medium	Medium



Respond at [PollEv.com/dynamicplanning](https://www.poll-ev.com/dynamicplanning)

### RA Exercise for SLOPE FAILURE (Landslide)

		IMPACT			
		Minor	Limited	Critical	Catastrophic
PROBABILITY	Highly Likely	Medium	High	Extreme	Extreme
	Likely	Medium	High	High	Extreme
	Possible	Low	Medium	High	High
	Unlikely	Low	Low	Medium	Medium

Respond at [PollEv.com/dynamicplanning](https://www.poll-ev.com/dynamicplanning)

### RA Exercise for SOIL HAZARDS (erosion, shrink/swell)

		IMPACT			
		Minor	Limited	Critical	Catastrophic
PROBABILITY	Highly Likely	Medium	High	Extreme	Extreme
	Likely	Medium	High	High	Extreme
	Possible	Low	Medium	High	High
	Unlikely	Low	Low	Medium	Medium



Respond at [PollEv.com/dynamicplanning](https://poll-ev.com/dynamicplanning)

### RA Exercise for DAM FAILURE

		IMPACT			
		Minor	Limited	Critical	Catastrophic
PROBABILITY	Highly Likely	Medium	High	Extreme	Extreme
	Likely	Medium	High	High	Extreme
	Possible	Low	Medium	High	High
	Unlikely	Low	Low	Medium	Medium



## Torie Jarvis

---

**From:** Torie Jarvis  
**Sent:** Tuesday, January 12, 2021 9:21 PM  
**To:** Don Ryan  
**Subject:** SURVEY RELEASE and Mtg Dates  
**Attachments:** Solano Hazard Mitigation Planning Committee Mtg #2.ics; Solano Hazard Mitigation Planning Committee Mtg #3.ics; PR\_Survey\_Information.jpg

Hello Solano Hazard Mitigation Planning Committee,

Two announcements for you all this evening:

1. We are excited to share with you the **PUBLIC SURVEY** for the Solano County Multi-Jurisdiction Hazard Mitigation Plan. Note, anyone who participates in the survey and chooses to share contact info is automatically entered to win a \$150 Stihl voucher. The survey will be open through the end of February.
  - a. **Please share** survey information in your networks, websites, social media feeds, etc. Please share your outreach with me/DP+S so we can document outreach in the Plan update.
  - b. Please take the survey, especially stakeholders who are not city or county employees.
  - c. A survey graphic is attached for promotion.
  - d. The survey is available at [mitigatehazards.com/solanohip/get-involved](https://mitigatehazards.com/solanohip/get-involved).
2. **Save the dates** for the final two meetings of the Solano Hazard Mitigation Planning Committee to review and discuss county-wide hazard vulnerabilities. Meeting #2 is scheduled for Wed. Jan. 27 from 2-4 PM and Meeting #3 is scheduled for Wed. Feb. 17 from 2-4 PM. More information is found on the calendar invites (attached) and at [mitigatehazards.com/solanohip/solano-meetings/](https://mitigatehazards.com/solanohip/solano-meetings/) (password: Solano2021). We are resending this save-the-date as we received several bounce backs to the one sent last week (likely because of the HTML included).
  - a. We are also outreaching separately with City and County leads to coordinate meetings on City and County infrastructure vulnerability the first two weeks of February. Please help us stay on track to have the administrative draft HMP by the end of February and get these meetings scheduled.

Thanks, all!

Torie



**Torie Jarvis**  
970-323-4330  
torie@dynamicplanning.co



Planning Manager

[www.dynamicplanning.co](http://www.dynamicplanning.co)





## Torie Jarvis

---

**From:** Torie Jarvis  
**Sent:** Friday, February 12, 2021 2:58 PM  
**To:** Don Ryan  
**Subject:** Reminder: third Hazard Mitigation Planning Committee meeting  
**Attachments:** Solano County Meeting #3 Agenda.pdf; Solano Hazard Mitigation Planning Committee Mtg #3.ics

Hello Solano Hazard Mitigation Planning Committee,

It's hard to believe it's been a month since our last meeting of the HMPC.

**A reminder: Our third and final HMPC Meeting is next Wednesday, Feb. 17<sup>th</sup>, from 2-4 PM.** Meeting info and agenda attached. Meeting information also available on [mitigatehazards.com/solanohmp/solano-meetings/](http://mitigatehazards.com/solanohmp/solano-meetings/).

At this meeting, we'll revisit the overall goals of the County's Hazard Mitigation Plan, provide updates on all the work that's occurred since the last meeting and turn towards the **mitigation strategy** in the Plan.

Please continue sharing the Public Hazard Mitigation Survey in your networks!  
<http://mitigatehazards.com/solanohmp/get-involved/>. Reach out if you need more materials for sharing.

We're looking forward to seeing you all on Wednesday,

Torie



**Torie Jarvis**  
970-323-4330  
torie@dynamicplanning.co



Planning Manager

[www.dynamicplanning.co](http://www.dynamicplanning.co)



## **Solano County Multi-Jurisdiction Hazard Mitigation Plan 2021 Update**

### **Hazard Mitigation Planning Committee**

### **Meeting #3**

**Wednesday, Feb. 17, 2021**  
**2 -4 PM**

**Via Zoom Conference call**  
[Use this link](#)  
Password: Solano2021  
Call-in option: 669 900 6833  
Meeting ID: 830 2651 2010  
[Zoom User Guide](#)

#### **Agenda**

- **Welcome and Introductions**
- **Meeting #2 and Jurisdictional Exercises, Brief Recap**
- **Crafting a Multi-Jurisdictional Plan: Where we are headed**
- **Mitigation Action Strategy**
  - **Explore the Mitigation Action Support Tool**
- **Setting Plan Goals**
- **Developing a Nexus to HMA Funding**
- **Maintaining Your Plan: the Next 5 Years**
- **Next Steps**

**Project Webpage:** [mitigatehazards.com/solanohmp/](https://mitigatehazards.com/solanohmp/)

**Meeting Resources:** [mitigatehazards.com/solanohmp/solano-meetings/](https://mitigatehazards.com/solanohmp/solano-meetings/)

**Website Username/Password:** Solano2021

**Polling Website for Smartphone:** [pollev.com/dynamicplanning](https://pollev.com/dynamicplanning)



## Torie Jarvis

**From:** Torie Jarvis  
**Sent:** Monday, May 3, 2021 10:25 AM  
**To:** Robert.Newman@cityofvallejo.net; byron.berhel@cityofvallejo.net; Christinia.ratcliffe@cityofvallejo.net; Margaret.Kavanaugh-Lynch@cityofvallejo.net; Melissa.cansdale@cityofvallejo.net; snuno@gvrd.org; armond.sarkis@cityofvallejo.net; benjamin.smith@cityofvallejo.net; cathy.carpenter@cityofvallejo.net; addison.leblanc@cityofvallejo.net  
**Cc:** Daniel Spivak; Ethan E. Mobley  
**Subject:** FOR REVIEW: Admin draft of Solano Hazard Mitigation Plan and Vallejo Annex  
**Attachments:** City of Vallejo Annex Review.ics  
  
**Importance:** High

Dear Vallejo Hazard Mitigation Planning Committee,

We are exciting to present the long-awaited administrative draft of the Solano County Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). **We are requesting your review and input on this draft before Friday, June 4<sup>th</sup>.**

Links to collaborative PDFs for Volume 1 (which serves as umbrella document and unincorporated County HMP) and each municipal annex are available at [mitigatehazards.com/solanohmp/admindraft/](https://mitigatehazards.com/solanohmp/admindraft/) (password: Solano2021). Vallejo's annex is available [directly via this link](#).

Collaborative PDFs allow commenters to see each other's comments and respond to one another, so we recommend using this feature. You can also provide comments via email or online form. Note: each participating jurisdiction is invited to provide comment on Volume 1 of this MJHMP, the umbrella document and unincorporated County-wide document.

These drafts are only available to participating jurisdictions at this time. We will move to public review in June; you are further able to offer edits during public review.

We have several **tips for this administrative review** included at the bottom of the [admin draft webpage](#). Importantly, we encourage everyone to take a look at the **mitigation strategy at the end of the annex** as this is the first time you'll see this new information. At our upcoming meeting, we'll review an alternate method for editing mitigation actions through MAST, the mitigation action support tool that is now live on [mitigatehazards](https://mitigatehazards.com) with the password Solano2021.

Any yellow highlighting you see in any document in a placeholder that will be updated before moving to public draft.

We will talk to you this Wed. at 1 PM (invite attached) to review this administrative draft along two other topics: the process for QAQC'ing data in the risk assessment mapping platform and an introduction to the new climate vulnerability appendices in development. We'll send out scheduling in a second email.

Let us know if you have questions about this process, and thank you for your time!



**Torie Jarvis**  
(she, her, hers)  
970-323-4330  
torie@dynamicplanning.co



Planning Manager

[www.dynamicplanning.co](http://www.dynamicplanning.co)



## Torie Jarvis

---

**From:** Torie Jarvis  
**Sent:** Wednesday, March 31, 2021 4:37 PM  
**Subject:** Solano HMP Update

Hello to jurisdictions participating in the Solano County Multi-Jurisdictional Hazard Mitigation Plan (MJHMP),

We are putting the finishing touches on the draft mitigation strategy, umbrella plan, and jurisdictional annexes. **We expect to have administrative drafts of Volume 1 (the County and umbrella plan) and jurisdictional annexes in the next two weeks** (except special districts). Public review follows admin review, and then review by Cal OES and FEMA. We are entering the home stretch!

We plan to schedule a jurisdictional call in April to 1) introduce a process for QAQC'ing your jurisdictional data in RAMP; 2) review the admin draft, and 3) discuss some new climate vulnerability assessment materials we'll be producing as appendices to Vol 1 and annexes. Your jurisdictional contact will reach out shortly to schedule this call, which can be with the jurisdictional lead or the full jurisdictional planning team.

The County has been hard at work getting word out about the **public Hazard Mitigation survey**--- and the County now has received well over 1,800 survey responses, 9 in Spanish ([view here](#) and see below survey tally)! We will close the survey at the end of this week and provide a survey summary for you all.

Lastly, the County is bringing on Vallejo Flood and Wastewater District and in discussions with Solano County Water Agency to become participating jurisdictions in the MJHMP. These special districts would participate in "catch up" planning committee meetings and go through hazard prioritization and vulnerability discussions similar to all other planning jurisdictions. Their annexes can be submitted for approval by FEMA at a later date as well.

Let us know if you have any questions, and we'll be in touch shortly re: admin draft HMP and scheduling a follow up meeting,

Thank you!

Torie



*Tell us what you think...*

English

**Community Survey**

Survey results:

Total Surveys

**1,837**

Spanish

**Encuesta Próximamente**

Survey results:

Encuestas Totales

**9**



**Torie Jarvis**  
(she, her, hers)  
970-323-4330  
torie@dynamicplanning.co  
Planning Manager

[www.dynamicplanning.co](http://www.dynamicplanning.co)





Community Group or Local Agency	Date of outreach	Result of outreach (if not on Planning Committee)	CRS Points
Greenbelt Alliance, Terri Shore	11/20/2020	Greenbelt Alliance confirmed unable to attend Planning Committee, held call to share research and outreach efforts on 4/13/2021	2
Solano County Black Chamber of Commerce (please AT solanoblackchamber.org)	11/20/2020	No response	1
Solano Hispanic Chamber of Commerce ( <a href="mailto:info@solanoehc.com">info AT solanoehc.com</a> )	11/20/2020	Attended all Planning Committee meetings, provided input on Spanish Survey	1
Solano Economic Development Corporation (sandy AT solanoedc.org; robert AT solanoedc.org)	11/20/2020	No response/ did not participate	1
Solano County Water Agency (rsanford AT scwa2.com; aflorendo AT scwa2.com; <a href="mailto:JBarich@scwa2.com">JBarich AT scwa2.com</a> )	11/20/2020	Provided data, background info for County flooding 3/16/2021, and became a participating jurisdiction	2
Vallejo Flood and Wastewater District	2/10/2021	Provided data, background info for Vallejo flooding 3/21/2021, and became a participating jurisdiction	2
Sustainable Solano (Jonathan Erwin, Elena Karoulina)	2/25/2021	Exchanged data about flood resiliency plan and HMP in a call on 3/2/2021, further coordination and added to Planning Committee	2

**In addition to other listed community groups who ended up participating on the Planning Committee.**

*Other Jurisdictions Contacted*



## Torie Jarvis

---

**From:** Torie Jarvis  
**Sent:** Friday, November 20, 2020 2:46 PM  
**To:** sandy@solanoedc.org; robert@solanoedc.org  
**Subject:** Mitigating hazards in Solano County

Dear Robert and Sandy,

We are currently kicking off an update to the County's Hazard Mitigation Plan, and would welcome your participation in the Planning Committee that will meet 3-4 times throughout the update process (between December and April). It's important to have the economic development perspective to understand economic impacts of hazard events in our analyses. It looks like Sandy was part of the team who assisted in the last Hazard Mitigation Plan update in 2015.

For now, we'll keep Sandy on the contact list from the previous update. Please let us know if there is better contact information for you all. We hope to "see" you at our first Planning Committee meeting: **Wed. Dec. 16 from 2-4 PM (held virtually).**

Thank you!

Torie



**Torie Jarvis**  
970-323-4330  
torie@dynamicplanning.co



Planning Manager

[www.dynamicplanning.co](http://www.dynamicplanning.co)



## Torie Jarvis

---

**From:** Torie Jarvis  
**Sent:** Friday, November 20, 2020 2:36 PM  
**To:** 'tshore@greenbelt.org'  
**Subject:** Another HMP in Solano County

Hi Teri,

We really appreciate your attendance with the City of Napa Hazard Mitigation Plan. We're also consultants working on the Solano County Multi-Jurisdiction Hazard Mitigation Plan that includes all the municipalities in Solano County.

It looks like you all have a staff person, Kevin Riley, working directly in Solano. Do you think he would be able/ interested in participating in our process? Would you mind connecting us if so? I'm not seeing a contact for him on your website.

Thanks so much!

Torie



**Torie Jarvis**  
970-323-4330  
torie@dynamicplanning.co



Planning Manager

[www.dynamicplanning.co](http://www.dynamicplanning.co)



## Torie Jarvis

---

**From:** Paris Badat <pbadat@greenbelt.org>  
**Sent:** Tuesday, February 23, 2021 1:18 PM  
**To:** Torie Jarvis  
**Cc:** Teri Shore  
**Subject:** Intro and Meeting Request

Hi Torie,

I hope you are having a good week! My name is Paris Badat and I manage corporate relationships for [Greenbelt Alliance](#). I know that you engaged with our Director of Advocacy Teri Shore on public participation in the update of the City of Napa's Hazard Mitigation Plan.

I am reaching out because we are at an exciting moment here at Greenbelt Alliance, we recently launched our new [strategic plan](#) and are looking to connect with other organizations around the region to share our vision and deepen collaborations. Our new body of work builds on our amazing decades-long legacy, but at the same time represents a significant evolution for the organization - leveraging our expertise in land-use policy advocacy and regional collaboration to realize a climate-resilient Bay Area.

Like Dynamic Planning, we are focused on the connection between land-use decisions and climate risks, and how to reduce the risks to our communities through policies, programs, and actions. We are developing original research and policy recommendations to increase resilience to multiple climate hazards in cities and counties across the Bay Area. We'd love to find some time to chat about what we are working on, learn about the projects you are prioritizing, and understand how we can support one another's efforts.

Please let me know if you are available for a thirty-minute meeting with our program team in the coming weeks. Thank you and I look forward to hearing from you.

Cheers,

Paris Badat  
Corporate and Foundation Relations Manager  
(415) 543-6771 X 315  
[Greenbelt Alliance](#)  
312 Sutter Street, Suite 402 | San Francisco, CA 94108

We're adapting to a changing climate. Get our new [Strategic Plan](#) to find out how.  
[Greenbelt.org](#) | [Facebook](#) | [Instagram](#) | [Twitter](#)



## Torie Jarvis

**Subject:** Dynamic Planning / Greenbelt Alliance

**Start:** Tue 4/13/2021 12:00 PM  
**End:** Tue 4/13/2021 12:30 PM

**Recurrence:** (none)

**Meeting Status:** Accepted

**Organizer:** pbadat@greenbelt.org

**You have been invited to the following event.**

### Dynamic Planning / Greenbelt Alliance

**When** Tue Apr 13, 2021 11am – 11:30am Pacific Time - Los Angeles

**Calendar** torie@dynamicplanning.co

**Who**

- pbadat@greenbelt.org - organizer
- ethan@dynamicplanning.co
- torie@dynamicplanning.co
- tshore@greenbelt.org
- abrownstevens@greenbelt.org

#### [more details »](#)

Greenbelt Alliance is inviting you to a scheduled Zoom meeting.

Topic: Dynamic Planning Meeting

Time: Apr 13, 2021 11:00 AM Pacific Time (US and Canada)

Join Zoom Meeting

<https://us02web.zoom.us/j/4155436771?pwd=MFZiMjFBZmV2V3BuZjIjNeXAwQzNrdz09>

Meeting ID: 415 543 6771

Passcode: 312

One tap mobile

+16699006833,,4155436771#,,, \*312# US (San Jose)

+13462487799,,4155436771#,,, \*312# US (Houston)

Dial by your location

+1 669 900 6833 US (San Jose)

+1 346 248 7799 US (Houston)

+1 253 215 8782 US (Tacoma)

+1 929 436 2866 US (New York)

+1 301 715 8592 US (Washington DC)

+1 312 626 6799 US (Chicago)

Meeting ID: 415 543 6771

Passcode: 312

Find your local number: <https://us02web.zoom.us/u/kbtIkLg7dn>

Going (torie@dynamicplanning.co)? [Yes](#) - [Maybe](#) - [No](#) [more options »](#)



## Torie Jarvis

---

**From:** Torie Jarvis  
**Sent:** Friday, November 20, 2020 2:43 PM  
**To:** info@solanohcc.com  
**Subject:** Solano Co Hazard Mitigation Plan

Hello to the Solano Hispanic Chamber of Commerce,

We are currently kicking off an update to the County's Hazard Mitigation Plan, and would welcome your participation in the Planning Committee that will meet 3-4 times throughout the update process (between December and April). It's important to have the perspective of Hispanic-owned businesses in Solano County to understand how your group is affected by a slate of hazards we'll be analyzing.

We're planning to add the Solano HCCC to our email list for meetings. Please let us know if there is better contact information for you all. We hope to "see" you at our first Planning Committee meeting: **Wed. Dec. 16 from 2-4 PM (held virtually).**

Thank you!

Torie



**Torie Jarvis**  
970-323-4330  
torie@dynamicplanning.co



Planning Manager

[www.dynamicplanning.co](http://www.dynamicplanning.co)





## Torie Jarvis

---

**From:** Jeff Barich <JBarich@scwa2.com>  
**Sent:** Tuesday, March 9, 2021 1:59 PM  
**To:** Torie Jarvis  
**Cc:** Ethan E. Mobley; Roland Sanford; Alex Rabidoux  
**Subject:** RE: Solano Hazard Mitigation Plan

Torie –

I am available the following times:

- Wednesday the 10<sup>th</sup> after 2pm
- Thursday the 11<sup>th</sup> after 2pm
- Monday the 15<sup>th</sup> after 2pm
- Tuesday the 16<sup>th</sup> after 12pm
- Wednesday the 17<sup>th</sup> after 1pm

I will let Roland reply himself, and I added my supervisor Alex Rabidoux in case he is interested in joining the conversation.

Jeffrey M. Barich, P.E.  
Senior Water Resources Engineer  
Solano County Water Agency  
810 Vaca Valley Parkway, Suite 203  
Vacaville, CA 95688  
[JBarich@scwa2.com](mailto:JBarich@scwa2.com)  
Office: (707) 455-1109  
Cell: (707) 724-3587

---

**From:** Torie Jarvis <torie@dynamicplanning.co>  
**Sent:** Tuesday, March 9, 2021 12:24 PM  
**To:** Roland Sanford <rsanford@scwa2.com>; Jeff Barich <JBarich@scwa2.com>  
**Cc:** Ethan E. Mobley <ethan@dynamicplanning.co>  
**Subject:** Solano Hazard Mitigation Plan

Hi Roland and Jeff,

We are working on crafting the County's first multi-jurisdictional hazard mitigation plan (MJHMP). I believe my colleague, Ty Johnson, reached out to Roland to ask some questions about county efforts to mitigate flood. We were wondering specifically about a home-raising program the SCWA had and may have reinvigorated. It would be great to set up a call to have some discussion about flood impacts and mitigation needed in the County.

In addition, we are currently discussing adding the Vallejo Sanitation and Wastewater District to the County's MJHMP as a late addition. They would otherwise need to update their HMP next year including identifying funding sources for such. We wanted to check in with SCWA and see if you all might be interested in the same add-on option, and happy to discuss what this would look like.

Would you have some time to get on the phone this week or next week?

- Wed. 10:30-12 or after 2 PM



## Torie Jarvis

---

**Subject:** Solano Hazard Mitigation Plan call with SWCA  
**Location:** <https://us02web.zoom.us/j/89476592658>  
  
**Start:** Tue 3/16/2021 1:00 PM  
**End:** Tue 3/16/2021 2:00 PM  
  
**Recurrence:** (none)  
  
**Meeting Status:** Meeting organizer  
  
**Organizer:** Torie Jarvis  
**Required Attendees:** Ethan E. Mobley; Roland Sanford; Alex Rabidoux; Jeff Barich  
**Optional Attendees:** Don Ryan; Brian Greer

DP+S is inviting you to a scheduled Zoom meeting.

Join Zoom Meeting  
<https://us02web.zoom.us/j/89476592658>

Meeting ID: 894 7659 2658  
One tap mobile  
+12532158782,,89476592658# US (Tacoma)  
+13462487799,,89476592658# US (Houston)

Dial by your location  
+1 253 215 8782 US (Tacoma)  
+1 346 248 7799 US (Houston)  
+1 669 900 6833 US (San Jose)  
+1 301 715 8592 US (Washington DC)  
+1 312 626 6799 US (Chicago)  
+1 646 558 8656 US (New York)  
Meeting ID: 894 7659 2658  
Find your local number: <https://us02web.zoom.us/j/89476592658>



## Torie Jarvis

---

**From:** Torie Jarvis  
**Sent:** Friday, November 20, 2020 2:39 PM  
**To:** [elease@solanoblackchamber.org](mailto:elease@solanoblackchamber.org)  
**Subject:** Solano Hazard Mitigation Plan

Hello to the Solano County Black Chamber of Commerce,

We are currently kicking off an update to the County's Hazard Mitigation Plan, and would welcome your participation in the Planning Committee that will meet 3-4 times throughout the update process (between December and April). It's important to have the perspective of small businesses and the experience of people of color in Solano County to understand how small businesses are affected by a slate of hazards we'll be analyzing.

We're planning to add you to our email list for meetings. Please let us know if there is better contact information for you all—this is the only contact email we're finding currently. Also, we hope to "see" you at our first Planning Committee meeting: **Wed. Dec. 16 from 2-4 PM (held virtually).**

Thank you!

Torie



**Torie Jarvis**  
970-323-4330  
[torie@dynamicplanning.co](mailto:torie@dynamicplanning.co)



Planning Manager

[www.dynamicplanning.co](http://www.dynamicplanning.co)



## Torie Jarvis

---

**From:** Jonathan Erwin <jonathan@sustainablesolano.org>  
**Sent:** Thursday, February 25, 2021 8:43 PM  
**To:** Torie Jarvis  
**Cc:** elena@sustainablesolano.org; Alma Hernandez  
**Subject:** Re: Flood/ hazard mitigation  
**Attachments:** Flood Resiliency Plan.pdf

Hello Torie,

Great to connect! - Thank you Alma for bringing people and projects together!

Please find the document I shared attached.

We would love to hop on a call next week if you are available. Let me know if there are some dates/times that work best for you and we can coordinate on our end.

Have a great weekend in the meantime!

Best,  
Jonathan

On Thu, Feb 25, 2021 at 6:58 PM Torie Jarvis <[torie@dynamicplanning.co](mailto:torie@dynamicplanning.co)> wrote:

Hi Elena and Jonathan,

Your project sounds great and so connected to the hazard mitigation plan update. I'm glad we're able to connect (thanks Alma!).

I just wanted to say hello for now and touch base on how we might coordinate to make sure we're incorporating your work into our mitigation strategy. It would be great to explicitly cite to the Flood Resiliency Plan and make sure we're calling for implementing the Plan even if you aren't sure of the actions you're looking at yet.

Would you want to hop on a call soon to discuss?

I have all sorts of thoughts, like how we might utilize our Risk Assessment Mapping Platform or other products – especially while the County is paying for this!



## Torie Jarvis

---

**From:** Jonathan Erwin <jonathan@sustainablesolano.org>  
**Sent:** Monday, March 1, 2021 12:50 PM  
**To:** Torie Jarvis  
**Cc:** Elena Karoulina  
**Subject:** Re: Flood/ hazard mitigation

Hello Torie,

Great to connect last week and thank you for sharing your presentation with us! I look forward to connecting tomorrow. I just sent a cal invite with call information, but also see it below.

Related, you mentioned a public survey that is open for comment in the presentation. We would love to include a shout-out to it in our newsletter going out tomorrow. It includes around 4500 residents and stakeholders across the county. Do you mind writing a short paragraph blurb about it and we would be happy to include it.

Thank you!

Jonathan

Call Info:

SuSol Team is inviting you to a scheduled Zoom meeting.

Topic: SuSol Team's Personal Meeting Room

Join Zoom Meeting

<https://zoom.us/j/6613021598>

Meeting ID: 661 302 1598

One tap mobile

+16699006833,,6613021598# US (San Jose)

+12532158782,,6613021598# US (Tacoma)

Dial by your location

+1 669 900 6833 US (San Jose)

+1 253 215 8782 US (Tacoma)

+1 346 248 7799 US (Houston)

+1 312 626 6799 US (Chicago)

+1 929 205 6099 US (New York)

+1 301 715 8592 US (Washington DC)

Meeting ID: 661 302 1598

Find your local number: <https://zoom.us/u/adcMWqudR4>

On Fri, Feb 26, 2021 at 4:44 PM Torie Jarvis <[torie@dynamicplanning.co](mailto:torie@dynamicplanning.co)> wrote:

Hi Elena and Jonathan.



## Torie Jarvis

---

**Subject:** Hazard Mitigation Plan discussion  
**Location:** <https://us02web.zoom.us/j/86970056049>  
**Start:** Fri 3/12/2021 9:00 AM  
**End:** Fri 3/12/2021 10:00 AM  
**Recurrence:** (none)  
**Meeting Status:** Meeting organizer  
**Organizer:** Torie Jarvis  
**Required Attendees:** Keith Sorsdal; Ethan E. Mobley; Brian Greer

DP+S is inviting you to a scheduled Zoom meeting.

Note time corrected to 8 AM PST, not 7!

Join Zoom Meeting  
<https://us02web.zoom.us/j/86970056049>

Meeting ID: 869 7005 6049  
One tap mobile  
+12532158782,,86970056049# US (Tacoma)  
+13462487799,,86970056049# US (Houston)

Dial by your location  
+1 253 215 8782 US (Tacoma)  
+1 346 248 7799 US (Houston)  
+1 669 900 6833 US (San Jose)  
+1 301 715 8592 US (Washington DC)  
+1 312 626 6799 US (Chicago)  
+1 646 558 8656 US (New York)

Meeting ID: 869 7005 6049  
Find your local number: <https://us02web.zoom.us/u/k63cskqE>





# Public Notice & Press Release Documentation

---

## Appendix B.2




**PAGE INTENTIONALLY LEFT BLANK**



member.everbridge.net/453003085614570/notif/2f111khdh

Sign In Sign Up Notifications Overview FAQs

Language: Select Language   
Powered by Google Translate

## Notifications

General

[« Back](#) | [OES Survey](#)

2021-03-08 15:00:58 EST

Solano County needs your help in improving our Hazard Mitigation Plan. Go to <http://mitigatehazards.com/solanoohmp/get-involved/> to complete the survey.

***Alert Solano Survey Notice***




Facebook

https://www.facebook.com/122459117856418/pho 80%

facebook

Log In

TAKE THE SURVEY AND ENTER TO



WIN

a \$150 voucher toward **STIHL** product

MITIGATE HAZARDS


WWW.MITIGATEHAZARDS.COM

Help the County become more informed about local hazards and take a survey!!!  
Be entered to win a hazard mitigation home use item!


grand prize

\$150 voucher toward **STIHL** product

SURVEY LINK



<http://mitigatehazards.com/solanohmp/get-involved>

 Benicia Fire Department  
January 21 · 🌐

Want your voice heard regarding hazards in our County? Click here to access the survey:  
[www.mitigatehazards.com/solanohmp/get-involved](http://www.mitigatehazards.com/solanohmp/get-involved)

The City of Benicia is updating its Hazard Mitigation Plan in conjunction with all other cities in Solano County. Please take the survey to inform the County about hazards that you would like to see addressed.

4 3 Shares

Like Comment Share

See more of Benicia Fire Department on Facebook

Log In or Create New Account

Benicia Fire Dept Survey FB post



## Torie Jarvis

**From:** Della Olm <DOlm@ci.benicia.ca.us>  
**Sent:** Thursday, January 21, 2021 3:15 PM  
**To:** Torie Jarvis  
**Subject:** FW: The latest news from City of Benicia

Hi Torie,

Please see the newsletter below. 😊

### Della Olm

Management Analyst  
Benicia Fire Department  
707-746-4272 (Office)  
707-771-4229 (Cell)

---

**From:** Erik Upson, Interim City Manager <edev@cityofbenicia.ccsend.com> **On Behalf Of** Erik Upson, Interim City Manager  
**Sent:** Monday, January 18, 2021 9:02 AM  
**To:** GRP-EVERYONE <GRP-EVERYONE@ci.benicia.ca.us>  
**Subject:** The latest news from City of Benicia



## City of Benicia This Week

read it - watch it - like it - share it

**In this edition:** Holiday Closure, COVID Vaccine Update, Park Improvement, Eastern Gateway Workshop This Week, Take the Survey and Enter to Win, Thanks to Public Works Crew

[View as Webpage](#)



### Message from the Interim City Manager

January 18, 2021



Hello Everyone,

Continuing my focus on volunteerism, today I focus on a very special group looking out for our seniors, the Carquinez Village.

Benicia is an amazing community, and it has an especially vibrant senior population. In fact, while the median age in California is 36.5 and in Solano County it's 36.9, in Benicia it's 43.0...and rising. I first became aware of this unique phenomena in conversations with Terry Scott of our Arts & Culture Commission several years ago, and it helped me realize the importance of addressing the impact of this on our community in regards to providing public safety.

In my travels and in the great fortune I've had in being embraced by my wife's culture through her amazing Filipino family, I've seen how families and cultures can embrace, nurture and thus extend the quality of life for their elders. What if we, as a community, could do the same? That is just what Carquinez Village is about. [Carquinez Village](#) is a nonprofit founded in 2017. It doesn't have a physical space because it's really more about helping seniors age in place with peace of mind as part of a 'vibrant community of older adults'. The volunteers are mostly seniors themselves. They have 100 members and 50 direct service volunteers. In their first pre-Pandemic years their primary service was transportation. Now they have pivoted and their primary service has become 'friendly contacts'. I can only imagine how wonderful and important that service is to seniors largely cut-off from any social contacts, even if via Zoom. They also do errands, grocery shopping, garden chores, and even provide technical assistance (you can imagine how important that is for seniors right now!).

During the Pandemic they have been working closely with other nonprofits to deliver food to seniors in need. They have expanded the number of programs they offer via Zoom, in an effort to support one of their key goals in keeping seniors mentally active and engaged.

They do still provide transportation for doctor visits and, critically, *will be assisting seniors in getting to their vaccination appointments!* Details on the vaccine rollout are shared in an article below.

Since being introduced to Susan Neuhaus and Judie Donaldson, I've been increasingly impressed with the work of Carquinez Village and the important role it can play in making our community a better place and addressing a critical link in the support network for our seniors. Let's help grow this organization.

If you are interested in being a part of this amazing community, donating or becoming a volunteer, please reach out them at [carquinezvillage.org](http://carquinezvillage.org), on [Facebook](#), or by calling 707.297.2472.

Thank you for your interest in the **City of Benicia This Week!**

**Erik Upson**

Interim City Manager

[CityofBeniciaThisWeek@ci.benicia.ca.us](mailto:CityofBeniciaThisWeek@ci.benicia.ca.us)

## City News





## Holiday Closure

Benicia City Offices and Benicia Community Center will be closed on **Monday, January 18**, in observance of Martin Luther King Jr. Day.



Requests for emergency water and sewer service may be made at the [Benicia Police Department](#) at 200 East L Street or by calling 707.745.3411.

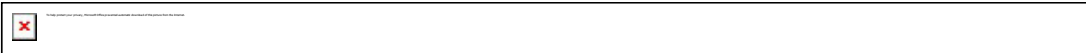
## COVID Vaccine Update

While the pandemic continues and many parts of our nation are severely impacted, our biggest hope is that the current surge will soon begin to subside and that, as more of the population receives their vaccines, we will see significant improvements.

The COVID-19 vaccination is one of the most important tools to end the pandemic. Distribution of the COVID-19 vaccine in California began on December 14, 2020 with the launch of the "[Vaccinate ALL 58](#)" vaccine distribution campaign. The State is prioritizing vaccines for equitable distribution. Specifically, Californians will be prioritized as shown in the chart below

Last week, the [Governor announced](#) that California is prioritizing individuals 65 and over to receive the vaccine to increase the pace of COVID-19 vaccine distribution to those at greatest risk. A new system is expected to launch this week to notify people who are eligible to receive a vaccine.

More information on Solano County's rollout of the COVID-19 vaccine is available at [https://www.solanocounty.com/depts/ph/coronavirus\\_links/covid\\_19\\_vaccines.asp](https://www.solanocounty.com/depts/ph/coronavirus_links/covid_19_vaccines.asp). Scroll down to find phone numbers for your health care provider. While supplies are limited, you may be able to schedule an appointment for your vaccine by calling this number, if you meet the current criteria.



## Park Improvement

Willow Glen Park at West 7th and K Street has received a recent improvement. The City contracted to remove and replace a 40-year-old asphalt walkway with a 220 feet concrete walkway. This will allow for better access to the playground and restroom and improve the aesthetics of the park. The new pathway should be completed and available for access beginning the week of January 25.



The project was funded by impact fees generated by nearby in-fill development.

Information about all of Benicia's great parks is available here: <https://www.ci.benicia.ca.us/parks>.



## Eastern Gateway Workshop This Week



The City of Benicia is hosting an interactive remote workshop for the [Eastern Gateway Study](#). The workshop

will be on **Thursday, January 21**, 6 - 8 p.m., via Zoom. At this workshop you will learn about recent progress made on the project and provide feedback on important aspects of the new zoning changes such as allowable uses, building and site design.

Through the Eastern Gateway Study, the City will update the zoning regulations to encourage mixed use development around the intersection of Military East and East Fifth Street. An overarching goal of the study is to facilitate the construction of new housing.

Meeting materials, including an agenda, the Draft Vision and Zoning District Approach document, and two videos explaining these materials can now be found on left side of the project webpage, [www.ci.benicia.ca.us/easterngateway](http://www.ci.benicia.ca.us/easterngateway). To get the most out of the workshop, staff recommends reading the Vision and Zoning District Approach document or watching the two videos prior to the workshop.

[Click here](#) for a link to the virtual workshop and instructions on how to join the meeting. To ensure that we have sufficient staff and zoom capacity for everyone to participate in the workshop, we are asking that you RSVP before the event. You can RSVP by calling or emailing Danielle Crider at 707.746.4324 or [dcriders@ci.benicia.ca.us](mailto:dcriders@ci.benicia.ca.us). However, everyone is welcome to attend, regardless of whether you RSVP for the event.

We look forward to seeing you over Zoom on January 21! In the meantime, if you have questions, please contact Danielle Crider using the information above.

## Take the Survey and Enter to Win

The Solano Hazard Mitigation Planning Committee needs your help in creating the County's Hazard Mitigation Plan. The purpose of a hazard mitigation plan is to reduce or eliminate long-term risk to people and their property from hazards.



Solano County is developing its first multi-jurisdictional hazard mitigation plan, pulling together and updating existing plans for the County and for the Cities of Vallejo, Fairfield, Vacaville, Suisun City, Benicia, Dixon, and Rio Vista. This update will strive to make the County, its residents, and visitors less vulnerable to future hazard events.

They need your input! Take the survey at [mitigatehazards.com/solanohtml/get-involved](https://mitigatehazards.com/solanohtml/get-involved). If you provide your contact information, you will be entered to win a \$150 Stihl Power Tool gift certificate!

## Thanks to Public Works Crew



On December 25, while many residents were enjoying a socially distanced Christmas Day, Public Works staff conducted an emergency shutdown of the Water Treatment Plant due to a leak in the City's 36-inch Raw Water Treatment Line. This shutdown was undetectable by customers thanks to the rapid, professional actions of City operations and field crews. While



the leak was being repaired, Benicia customers immediately began using treated water sourced from Lake Herman.

Last week, the Interim City Manager stopped by the Public Works Corporation Yard to thank staff who sacrificed holiday time with their families to ensure Benicia residents had safe, uninterrupted water service.



## Save the Date

- **Jan 18** - City Offices closed for Martin Luther King Jr Holiday.
- **Jan 19** - **City Council meeting**, 7 p.m. via livestream. Watch live at <https://www.ci.benicia.ca.us/agendas>. See the [Full Agenda](#) for more information.
- **Jan 22** - City Offices closed for [Alternate Friday](#).

### Modified service due to COVID-19

City Hall is open from 9 a.m. to 4 p.m. If you require entrance to City Hall offices outside of these hours, please make arrangements with staff from the department that you will be visiting.

All visitors shall be required to enter City Hall from East L street through the door located on the left (East) side of the building closest to the Post Office. Please check in with the staff person at the designated Welcome Window.

You will be required to wear a face covering over both your nose and mouth for the duration of your visit to City Hall. Please maintain 6 feet of social distancing between other visitors and staff. Do not visit City Hall if you are experiencing symptoms of COVID-19. Appointments can always be rescheduled.

[Contact Us](#)

City of Benicia This Week is published each Monday morning. Previous editions are available [here](#). We also communicate on [Nextdoor.com](#) and [AlertSolano.com](#). Sign up now!



Join our mailing list!

City of Benicia This Week is published each Monday morning. Previous editions are available [here](#). We also communicate on [Nextdoor.com](#) and [AlertSolano.com](#). Sign up now!

City of Benicia | 707.746.4200 | 250 East L Street, Benicia, CA | [edev@ci.benicia.ca.us](mailto:edev@ci.benicia.ca.us)

See what's happening on our other social sites:



City of Benicia | 250 East L Street, Benicia, CA 94510

[Unsubscribe GRP-EVERYONE@ci.benicia.ca.us](mailto:Unsubscribe GRP-EVERYONE@ci.benicia.ca.us)

[Update Profile](#) | [About our service provider](#)

Sent by cityofbeniciathisweek@ci.benicia.ca.us powered by



Try email marketing for free today!

***Benicia Newsletter re Survey 6***





Facebook

https://www.facebook.com/SolanoCountyWaterAger 80%

facebook Log In

**TAKE THE SURVEY AND ENTER TO**

**WIN**  
a \$150 voucher  
toward **STIHL** product

MITIGATE HAZARDS  
WWW.MITIGATEHAZARDS.COM

Help the County become more informed about local hazards and take a survey!!!  
Be entered to win a hazard mitigation home use item!

grand prize  
\$150 voucher toward  
**STIHL** product

**SURVEY LINK**

<http://mitigatehazards.com/solanohmp/get-involved>

**Solano County Water Agency**  
January 14 · 🌐

We are excited to share with you the PUBLIC SURVEY for the Solano County Multi-Jurisdiction Hazard Mitigation Plan. Note, anyone who participates in the survey and chooses to share contact info is automatically entered to win a \$150 Stihl voucher. The survey will be open through the end of February.

The survey is available at [mitigatehazards.com/solanohmp/get-involved](http://mitigatehazards.com/solanohmp/get-involved).

Like Comment Share

**See more of Solano County Water Agency on Facebook**

Log In or Create New Account

Solano Water Agency Survey FB Post





# Survey & Results Documentation

---

## Appendix B.3



**PAGE INTENTIONALLY LEFT BLANK**



# **Solano County 2021 Multi-Jurisdiction Hazard Mitigation Plan: Public Hazard Mitigation Survey Summary**



## Summary

An 8-question community survey was distributed by the County via a number of online platforms, including Facebook posts by participating jurisdictions and a notification across the SolanoAlert system. The results of the survey are used to ensure that the priorities of the County and participating jurisdictions match those of the residents/community members. The response rate for the survey has been remarkably successful, in large part due to comprehensive efforts at distributing the survey widely and ensuring its ease of access. The survey response rate by demographic is listed here:

### English Survey Responses

1,842

### Spanish Survey Responses

8

The survey respondents represent participating jurisdictions, the County, and other jurisdictions. The locales identified by survey respondents are shown in Figure 1. "Other" locales include, but are not limited to, Napa, Yolo, Sacramento, and Sonoma Counties and cities within those areas.

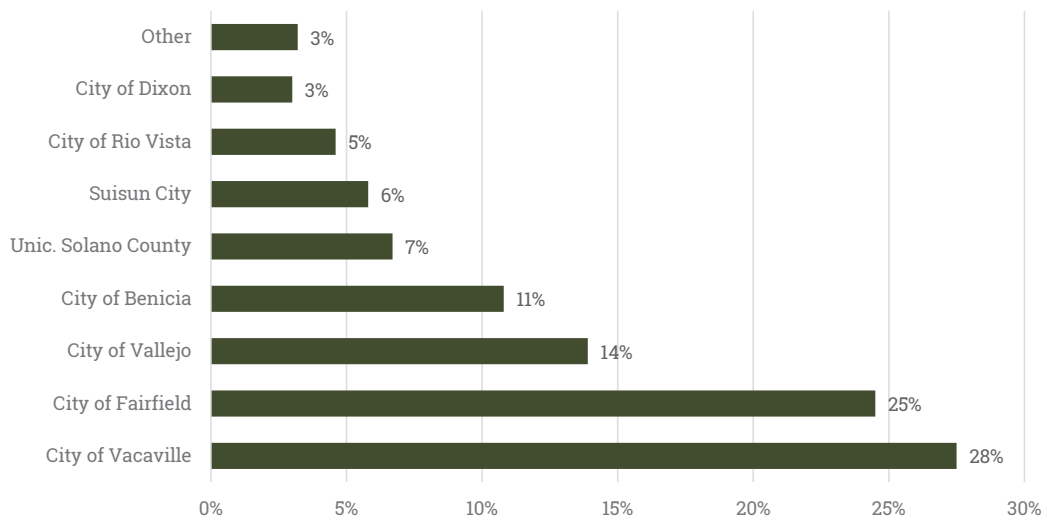


Figure 1: Where do Survey Respondents Live?



The following is a brief summary of responses:

- **Property at risk?** 73.1% of participants believe their property is at risk from a natural hazard disaster.
- **Hazards experienced?** Respondents have experienced the following hazards:
  - Earthquakes (51%)
  - Wildfire (44.1%)
  - Pandemic (55.4%)
  - Drought (38.4%)
  - Only 7.8% of respondents had not experienced a natural hazard.
- **Consider risk of hazards with home purchase?** 57.6% of participants considered the risk of naturally occurring hazards when choosing their home.
- **Informed about hazard risks?** 47.6% of respondents felt they were well-informed about the dangers of natural hazards, while 38.4% felt somewhat informed and 13.9% felt uninformed.
- **What incentives would encourage home protection from hazards?** Top three responses:
  - rebate programs or reimbursement of upfront costs (69.6%)
  - insurance premium discounts (64.4%)
  - building permit fee waivers (47.4%)
- **Top mitigation projects for local governments to focus on?** Top responses:
  - Work on improving damage resistance of utilities (79%)
  - Ensure emergency shelters, the Emergency Operations Center, and communication towns have backup power generators (62.6%)
  - Retrofit and strengthen essential facilities (60.5%)
  - Replant vegetation after wildfires to prevent landslides and flooding (60.1%)
  - Replace inadequate or vulnerable bridges and roadways (58.7%)
  - Inform property owners of ways they can mitigate damage to their properties (56.9%)



## Question-By-Question Summary

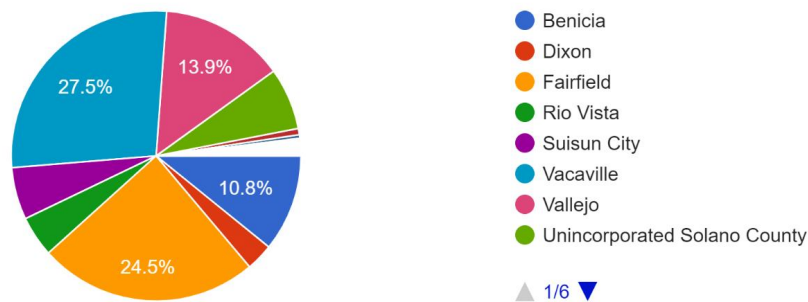
### Question 1: Where does the survey respondent live?

The below pie chart shows the breakdown of where respondents live. Solano County and municipal respondents include:

- City of Vacaville: 27.5%
- City of Fairfield: 24.5%
- City of Vallejo: 13.9%
- City of Benicia: 10.8%
- Unincorporated Solano County: 6.7%
- City of Suisun City: 5.8%
- City of Rio Vista: 4.6%
- City of Dixon: 3%

The remaining respondents represented a wide array of nearby municipalities and counties. These included: Napa County, the City of Davis, the City of American Canyon, the City of Winters, Yolo County, Sacramento County, Sonoma County, the unincorporated community of Yolano, the City of Paradise, Lake Berryessa, the City of Rancho Solano, the Solano County Water Agency, Green Valley Highlands, San Francisco, the City of Eureka, the City of Cordelia, the City of Carmichael, the city of Rodeo, Contra Costa County, Humboldt County, the City of Antioch.

I live in...  
1,842 responses



#### Spanish survey results:

The Majority of Spanish respondents came from the City of Fairfield (66.7%). The remaining respondents came from the City of Dixon (22.2%) and the City of Benicia (11.1%).



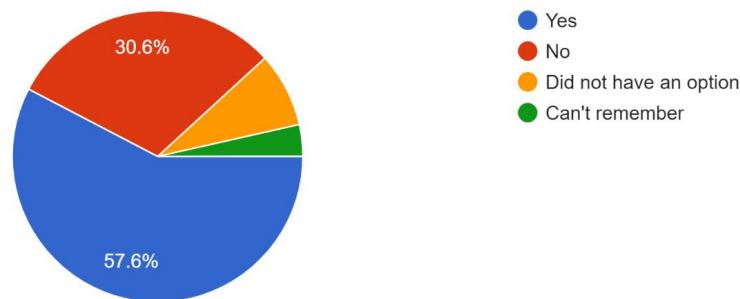


## Question 2: Did you consider the risks of naturally occurring hazards when you chose your home?

A majority of respondents ( 57.6%) did consider the risks of naturally occurring hazards when they chose their home. A smaller percentage (30.6%) did not consider the risks of naturally occurring hazards when choosing their home. And smaller proportions either could not remember (3.5%) or did not have an option (8.3%) of considering the risks of naturally occurring hazards when choosing their home.

Did you consider the risks of naturally occurring hazards when you chose your home?

1,841 responses



### Spanish survey results:

Of the four options, Spanish respondents responded with only two types of responses. A majority of respondents ( 66.7%) did *not* consider the risks of naturally occurring hazards when they chose their home. A smaller percentage (33.3%) did consider the risks of naturally occurring hazards when choosing their home.

**Observation:** The Spanish survey responses mark a reversal from the English-speaking surveys, where a vast majority did consider hazard risks, suggesting outreach or additional guidance in home purchasing for Spanish-speakers may be helpful.

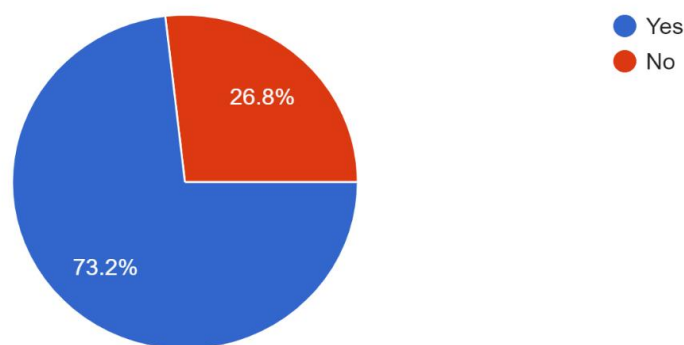


### Question 3: Do you believe your property is at risk from a natural disaster?

Most respondents answered yes to this question, 73.2%, and only 26.8% answered no.

Do you believe your property is at risk from a natural hazard disaster?

1,842 responses



#### Spanish survey results:

Most respondents answered yes to this question, 55.6% as opposed to only 44.4% who answered no.



## Question 4: Which of the following types of hazard events have you or someone in your household experienced at your current home?

The below list summarizes the top responses for the type of hazard events respondents or household members have experienced, along with the percentage of total respondents:

- Severe weather -summer (high heat, high wind) (59.6%)
- Pandemic (55.4%)
- Earthquake (51.1%)
- Wildfire (44.1%)
- Drought (Agricultural or domestic) (38.4%)
- Severe weather -winter (extremely low temperatures, hard freezes) (12.4%)
- Flooding (including from a river, local drainage & high groundwater levels) (11.3%)
- None of the above (7.7%)
- Geohazard (landslide, erosion, mudslide, soil expansion/collapse) (6.3%)
- Climate Change (sea level rise) (4.1%)
- Agricultural disaster (1.2%)
- Dam failure (1.2%)

Respondents also replied with their own unique natural hazard concerns regarding which hazards they had experienced at their current home. Some trends from these responses included: the reduced air quality from local wildfires, extended power outages, and biosolid waste hazards.

### Spanish survey results:

The below list includes the percentage of respondents who indicated that they have experienced the following hazards at their current home.

- Pandemic (77.8%)
- Severe weather -summer (high heat, high wind) (66.7%)
- Flooding (including from a river, local drainage & high groundwater levels) (44.4%)
- Wildfire (44.4%)
- Drought (Agricultural or domestic) (44.4%)
- Severe weather -winter (extremely low temperatures, hard freezes) (44.4%)
- Earthquake (11.1%)
- Dam failure (11.1%)
- Climate Change (sea level rise) (11.1%)
- None of the above (11.1%)

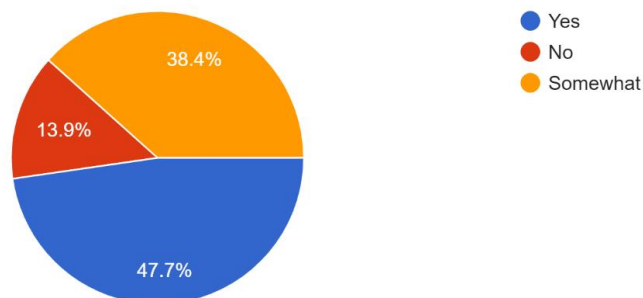
**Observation:** Survey results included a higher-than-anticipated response rate for air quality concerns and extended power outages, both of which may be emphasized to a higher degree in the MJHMP.



## Question 5: Do you think you are well informed about the dangers of natural hazards in this area?

The three options for answering this question were yes, no, and somewhat. Most respondents (47.7%) responded that they are well informed. About a third (38.4%) said no, they are not well informed, and 13.9% said they were somewhat well informed.

Do you think you are well informed about the dangers of natural hazards in this area?  
1,842 responses



### Spanish survey results:

Most Spanish speaking respondents answered no to this question (55.6%). A minority answered yes (44.4%), that they are well informed.



## Question 6: What actions have you taken for your home or property that increase personal safety or reduce risk and injury from potential disasters?

The list below reflects the percentage of respondents who have taken the following actions for their home or property that increase personal safety or reduce risk and injury from potential disasters.

- Purchased homeowners/renters insurance (86.7%)
- Installed low flow water devices for showers, faucets, and toilets (53.6%)
- Reduced vegetation around home for wildfire defense (48.4%)
- Installed drought tolerant plants or landscaping (47.5%)
- Installed alternate power supply; generators, battery/solar back up (25.6%)
- Installed fire resistant siding and roofing for wildfire defense (19.8%)
- Flood-proofing measures (elevating furnace, water heaters, electric panels) (14.8%)
- Asked landlord to conduct any of the above mitigation measures (4.8%)
- Installed basement flood proofing measures (sump pumps, waterproof paint/barriers) (3.4%)

Respondents also replied with their own unique answers. Some highlights include installing retention walls to prevent slope failure, purchasing earthquake insurance, and improving the drainage systems around their property.

### Spanish survey results:

The list below reflects the percentage of respondents to the Spanish survey who have taken the following actions for their home or property that increase personal safety or reduce risk and injury from potential disasters.

- Purchased homeowners/renters insurance (55.6%)
- Reduced vegetation around home for wildfire defense (22.2%)
- Installed alternate power supply; generators, battery/solar back up (22.2%)
- Installed drought tolerant plants or landscaping (22.2%)
- Flood-proofing measures (elevating furnace, water heaters, electric panels) (11.1%)
- Installed fire resistant siding and roofing for wildfire defense (11.1%)
- Other (11.1%)



## Question 7: Which of the following incentives would encourage you to protect your home to withstand the impacts of possible natural hazards?

The list below reflects the percentage of respondents who indicated that the following incentives would encourage them to protect their homes to withstand the impacts of possible natural hazards:

- Rebate programs or reimbursement of upfront costs (69.6%)
- Insurance premium discounts (64.4%)
- Building permit fee waiver (47.4%)
- Home improvement cost-share grants (43.3%)
- Labor assistance; for renters and homeowners (40%)
- Low interest home improvement loans (38.7%)
- Technical assistance: for renters and homeowners (35%)

Respondents also replied with their own unique answers for which incentives would encourage them to protect their home to withstand the impacts of possible natural hazards. Some noteworthy highlights include: better notification of natural hazard risks and more informational meetings or webinars, first time homeowners assistance, disability code assistance programs, and lower insurance costs.

### Spanish survey results:

The list below reflects the percentage of Spanish-speaking respondents who indicated that the following incentives would encourage them to protect their homes to withstand the impacts of possible natural hazards:

- Rebate programs or reimbursement of upfront costs (77.8%)
- Technical assistance: for renters and homeowners (66.7%)
- Low interest home improvement loans (55.6%)
- Insurance premium discounts (55.6%)
- Building permit fee waiver (55.6%)
- Home improvement cost-share grants (33.3%)
- Labor assistance; for renters and homeowners (33.3%)





## Question 8: Which of the following mitigation projects do you believe local government agencies should focus on to reduce disruptions of services and to strengthen the community?

The list below reflects the percentage of respondents who selected various mitigation actions on which local governments should focus to reduce disruptions of services and to strengthen the community.

- Work on improving the damage resistance of utilities (79.3%)
- Ensure that emergency shelters, the Emergency Operations Center and communications towers have backup power generators (62.6%)
- Retrofit and strengthen essential facilities such as police, fire, emergency medical services, hospitals, schools, etc. (60.5%)
- Replant vegetation after wildfires to prevent landslides and flooding (60%)
- Replace inadequate or vulnerable bridges and roadways (58.6%)
- Inform property owners of ways they can mitigate damage to their properties (56.9%)
- Retrofit or upgrade drainage systems (51%)
- Assist vulnerable property owners with securing funding to mitigate impacts to their property(s) (50.9%)
- Provide better information about hazard risk and high-hazard areas (49.5%)
- Strengthen codes, ordinances, and plans (33.3%)

Respondents also replied with their own unique answers for which mitigation projects local governments should prioritize. Highlights include:

- improve early warning systems,
- increase fire response capacity,
- reduce vegetative fuel,
- increase how well-informed residents are,
- increase pandemic resilience,
- replant with endemic plant species,
- provide more funding for earthquake retrofits,
- develop better communication tools, and
- develop community wildfire protection plans.

### Spanish survey results:

The list below reflects the percentage of Spanish speaking respondents who selected various mitigation actions on which local governments should focus.

- Retrofit and strengthen essential facilities such as police, fire, emergency medical services, hospitals, schools, etc. (88.9%)
- Retrofit or upgrade drainage systems (77.8%)
- Work on improving the damage resistance of utilities (77.8%)
- Strengthen codes, ordinances, and plans (77.8%)
- Provide better information about hazard risk and high-hazard areas (77.8%)
- Replant vegetation after wildfires to prevent landslides and flooding (77.8%)
- Replace inadequate or vulnerable bridges and roadways (66.7%)



- Inform property owners of ways they can mitigate damage to their properties (66.7%)
- Assist vulnerable property owners with securing funding to mitigate impacts to their property(s) (66.7%)
- Ensure that emergency shelters, the Emergency Operations Center and communications towers have backup power generators (55.6%)

## Additional Questions and Comments from Respondents

At the end of the survey, respondents were able to provide any additional questions or comments that they had regarding hazard mitigation and community protection against natural disasters. There were 334 different responses. These responses included compliments, questions, and comments indicating recommendations and challenges to mitigation. Below is a representative list of many comments, organized by theme. These themes include Wildfire, Climate Change, All Hazards, Flood, Earthquake, and Communication.

### Wildfire

- Fire departments need more staff, money, and resources to better protect communities.
- Would like more education about preventing loss of life & structures during wildfires; would like to see more emphasis on prevention of wildfires in our communities.
  - Including more natural fire prevention such as brush clearing and goats in Fairfield/Vacaville
- Better evacuation plans and exit roads and temporary housing options in the case of a wildfire evacuation.
- County grants to reopen fire station in Glen Cove.
- Have Caltrans set K rails or mitigate fire danger at toll plaza, the source of most fires in South Vallejo.
- Help reduce homelessness to help prevent the brush fires.
- Fighting a fire is extremely difficult when PG&E turns off power to our water pumps.
- Improve forest management, harden structures for fire, improve communications with the public, create evacuation plans, conduct county-wide drills for various disasters, and coordinate with Napa County on installing wildfire sensing technology.
- Hazard mitigation should also include code enforcement violations. Code violations that increase hazards should be identified and addressed. There should also be assistance to deal with these, like free fire debris removal, free green waste pickup.
- There is a potentially large volunteer community of hikers, campers, hunters, etc. that would help with fire prevention efforts in parks and recreation areas of the county.
- Limit PG&E rolling blackouts during fire season. Form community groups to assist with welfare checks on elderly, handicapped and homeless. The emergency services are stretched too thin to expect them to check on needy folks.
- My biggest concern after the 2020 wildfires is another fire season. Here during Fairfield's dry season, we are a tinderbox waiting for a spark. Last fall all it took was a gender reveal party (it was a boy) to set the town ablaze for a month.
- Audit PG&E look at power lines in the country where fire danger is more prevalent.



### Climate Change

- I have zero info from the city or county about any mitigation efforts re: climate change, nor expected impacts to Solano County. Especially after last summer, we need a lot more info about fire dangers to the county.
- Climate change legislation to protect from wildfires.
- Sea rise concerns due to global warming are a future concern in Suisun City. Why is my home in a AE flood zone and a couple of homes in my neighborhood have received exemptions from maintaining flood insurance.
- Drought due to climate change is a bigger long term threat than flooding. Do not ignore it.
- The weather each year is getting more & more unpredictable & we need to plan accordingly. Failing to prepare is preparing to fail.
- Provide reports on sea level rise and climate change.

### All Hazards

- We are on 3 fault lines with gas lines all over Cordelia. We all need to be prepared in case of earthquake, flooding, and fires.
- Solano needs a master list of emergency resources categorized by type of help needed: housing, emergency grants, emergency water, sewer, and power; where to go for food and other essentials.
- Don't wait for the emergency.
- Bring back CERT team program, have a country awareness day that's like a street fair with some vendors to promote emergency preparation mitigation and education. We are due for a big earthquake in California; you just really never know when!

### Flood

- Cut and clean away vegetation and debris from Sweeney Creek. This creek is a known problem and floods too often causing extensive damage to property and homes. Find a solution please.
- I don't think people appreciate how much flood risk they have. More education would be good!
- In the Fairfield area, improvements to storm drainage should be made to eliminate flooding of I-80 during heavy rain events. This involves improvements in the County and Fairfield.
- Very concerned about flooding on I-80 and the potential for gridlock.
- Canals / drainage streams should be cleared of weeds each spring after the rains. They are choked with weeds. Water backs up and has nowhere to go. Animals live in the weeds. I would rather have a raccoon or possum in my yard than a flooded house.

### Earthquake

- In our area there is earthquake risk and flood risk, but many of my neighbors have no idea where local faults are, nor are they aware of flood risk from the slough. We need more community education to spread the word.
- I'm worried about maintaining order and the supply chain of critical supplies post-earthquake.



- Based on homeowners and earthquake insurance policy rates in this area (i.e. low rates), I feel fortunate to live in an area that is not as subject to natural disasters as other cities in our region.
- I'm involved in earthquake early warning and I can't afford earthquake insurance. Would be nice if it were affordable.

#### **Communication**

- Better communication during disasters. The communication to evacuate during the last wildfire was quick (via text) but I was not told I could go home until a friend told me that VVPD posted it via social media (which I didn't have)/ no text.
- City should have emergency sirens to warn people to evacuate. Police unable to hit all the neighborhoods to warn sleeping people of approaching fires.
- During the LNU complex fire here in Vacaville, communications with OES, fire, sheriffs and law enforcement were poor at best. There has to be a better system to communicate immediate risk and need for evacuation.
- Encourage and provide advice for local neighborhoods to support one another during one of these events. As an example, during the LNU fire complex last year, many neighbors stayed home and defended neighbor's houses. Like Neighborhood watch concept.
- In our area there is earthquake risk and flood risk, but many of my neighbors have no idea where local faults are, nor are they aware of flood risk from the slough. We need more community education to spread the word.
- Improve education on single source of most updated information in a disaster. Too much social media and apps to sift through - use the text notifications more and communicate what site to go to.
- More public awareness of possible types of emergencies, what are the plans during an emergency, notification types, do we have a by area evacuation plan. Maybe quarterly zoom classes on emergency preparedness and evacuations.
- Clearly define and communicate evacuation locations.
- Communication is good but needs to be reliably updated on a timely basis.
- We need a better, more effective emergency alert system.
- Better ways to communicate info to Hispanic community.



# Mitigation Strategy Prioritization Process Documentation

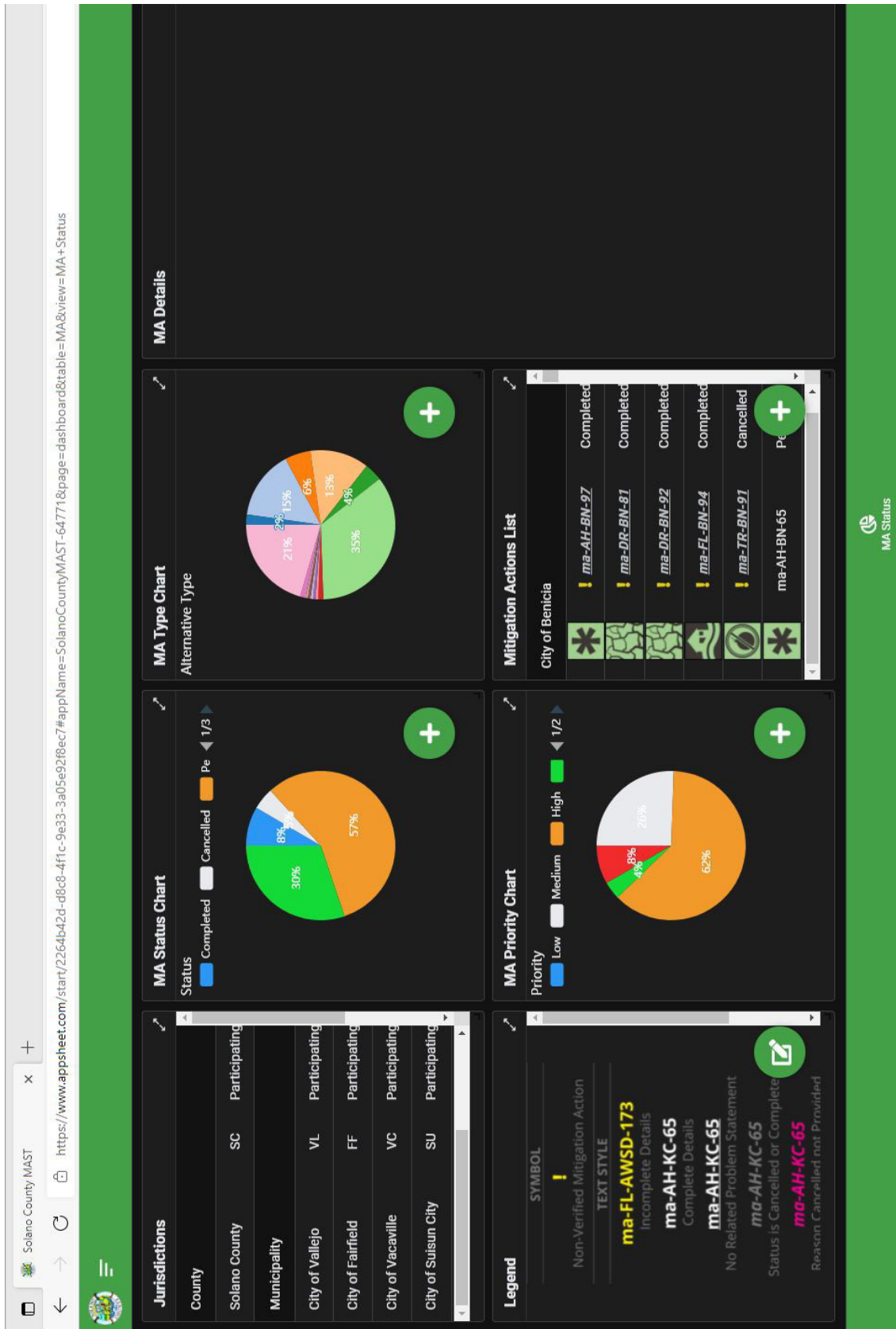
---

## Appendix B.4



**PAGE INTENTIONALLY LEFT BLANK**





MAST Priority Field



**PAGE INTENTIONALLY LEFT BLANK**



# Website Documentation

---

## Appendix B.5



**PAGE INTENTIONALLY LEFT BLANK**



PLANNING AND GRANTS

MITIGATION AT HOME

INVOLUCRATE

PROJECTS

SEARCH

Solano County MJHMP 2021

Executive Summary

Public Survey

Mitigation at Home

Stakeholders

ADMIN DRAFT "NEW"

Meetings

Document Upload

Planning Process Library

POC App

HAST App

RAMP App

Project Contacts

Solano County OES

DON RYAN

707-784-1616

DYNAMIC PLANNING + SCIENCE

ETHAN HOBLEY

910-323-4330

BRIAN GREER

910-253-0054

TORRE JARVIS

910-323-4330

Solano County Multi-Jurisdiction Hazard Mitigation Plan 2021 Update

# Executive Summary

The County of Solano, along with 7 other participating jurisdictions, will develop an update to the 2012 Solano County Multi-Jurisdiction Hazard Mitigation Plan to reduce losses resulting from natural disasters. Hazard mitigation is the use of sustained, long-term actions to reduce the loss of life, personal injury, and property damage that can result from a disaster.

Planning efforts could include capital projects and other pragmatic activities that can mitigate the impacts of hazards. The 2021 MJHMP Update will cover each of the major natural hazards that pose risks to County infrastructure and residents. Recognizing that successful mitigation planning efforts must be communicated and understood by the public, the County approach will include stakeholder participation and input with the use of cutting edge GIS technology to map and update the hazard information for each hazard profiled in the 2021 MJHMP.

## Mitigation Planning Benefits

- Identifying actions for risk reduction through collaboration with stakeholders and the public
- Focusing resources on the greatest risks and vulnerabilities
- Building partnerships by involving citizens, organizations, and businesses
- Increasing education and awareness of threats and hazards, as well as their risks
- Communicating priorities to State and Federal officials
- Aligning risk reduction with other community objectives

## Participating Jurisdictions

The 2021 MJHMP update will include, at a minimum, the jurisdictions listed below. It is understood that the County also encompasses areas of land controlled by Federal and State land management agencies, including the California Department of Forestry and Fire Protection, and the Bureau of Land Management. While other levels of government have jurisdiction in these parts of the County, the Hazard Mitigation Plan could also be used to document and coordinate mitigation efforts among Federal, State, and local jurisdictions. In addition, it will be important to invite organizations such as public and private utility companies to be stakeholders during the update process.

The following jurisdictions will meet FEMA guidelines and requirements as a formal participating agency:

- County of Solano
- City of Benicia
- City of Dixon
- City of Fairfield
- City of Rio Vista
- City of Suisun City
- City of Vacaville
- City of Vallejo

## Participating Jurisdictions Map



## Update Requirements & DMA 2000

A current and approved hazard mitigation plan is a prerequisite for jurisdictions wishing to pursue funding under the Hazard Mitigation Grant Program (HMGP) if a Federal disaster should occur. The Stafford Act constitutes the statutory authority for most Federal disaster response and recovery activities, especially as they pertain to FEMA and FEMA programs.

On October 30, 2000, the Robert T. Stafford Disaster Relief and Emergency Assistance Act was amended by Public Law 106-390 and is referred to as the Disaster Mitigation Act of 2000 (DMA 2000). As a DMA 2000 requirement, the Solano MJHMP must be updated every five (5) years to remain in compliance with regulations and Federal mitigation grant conditions. Federal regulations require hazard mitigation plans to include a plan for monitoring, evaluating, and updating the hazard mitigation plan. A current and approved hazard mitigation plan is a prerequisite for jurisdictions wishing to pursue funding under the Stafford Act.

## Project Funding Information

The County of Solano is using funding from the FEMA Hazard Mitigation Grant Program to complete the MJHMP update. The County has contracted with Dynamic Planning + Science to update the current Local Hazard Mitigation Plan. The consultant will provide process facilitation, stakeholder outreach, data collection and analysis, plan writing, and strategy development.

## Executive Summary



PLANNING  
AND GRANTS

MITIGATION  
AT HOME

INVOLUCRATE

PROJECTS

Solano County MJHMP 2021

Executive Summary

Public Survey

Mitigation at Home

Stakeholders

ADMIN DRAFT "NEW"

Meetings

Document Upload

Planning Process Library

POC App

MAST App

RAMP App

Project Contacts

Solano County OES

DON RYAN

707-784-1616

Dynamic Planning + Science

ETHAN MOBLEY

970-323-4331

BRIAN GREER

510-253-0054

TORIE JARVIS

970-323-4330

Solano County Multi-Jurisdiction Hazard Mitigation  
Plan 2021 Update

## Get Involved



The purpose of a hazard mitigation plan is to reduce or eliminate long-term risk to people and their property from hazards. Solano County is developing its first multi-jurisdictional hazard mitigation plan, pulling together and updating existing plans for the County and for the Cities of Vallejo, Fairfield, Vacaville, Suisun City, Benicia, Dixon, and Rio Vista. This update will strive to make the County, its residents, and visitors less vulnerable to future hazard events.

THANK YOU FOR PARTICIPATING IN THE SURVEY!

THE SURVEY CLOSED ON APRIL 5, 2021

### SURVEY RESULTS

Tell us what you think...

English

Survey CLOSED

Survey results:

Total Survey

1,84

Spanish

Encuesta CERRADA

Survey results:

Encuestas Totales

8

Thank you for weighing in on the hazard mitigation survey! We are integrating your input into the County's Hazard Mitigation Plan. The information you provide will help us identify and coordinate projects focused on reducing the risk of injury or damage to property from future hazard events (e.g. wildfires, floods, earthquakes).

If you shared your contact information, you're automatically entered to win a \$150 voucher towards STIHL products!



## Review the Hazard Mitigation Plan

You can review the hazard mitigation plan when it's open for public comment, estimated mid-May of 2021. Please visit the "Public Review HMP" option on the left, which will appear when public comment is open.

**Public Survey**





PLANNING  
AND GRANTS

MITIGATION  
AT HOME

INVOLUCRATE

PROJECTS



Solano County MJHMP 2021

Executive Summary

Public Survey

Mitigation at Home

Stakeholders

ADMIN DRAFT "NEW"

Meetings

Document Upload

Planning Process Library

POC App

MAST App

RAMP App

Project Contacts

Solano County OES

DON RYAN

707-784-1616

Dynamic Planning + Science

ETHAN MOBLEY

910-323-4331

BRIAN GREER

510-253-0054

TORIE JARVIS

910-323-4330

Solano County Multi-Jurisdiction Hazard Mitigation  
Plan 2021 Update

## Mitigation at Home



### Perform Mitigation Around Your Home!

Mitigation around your home can better prepare you and your family for an unexpected emergency or disaster incident, and help you recover more quickly. Here are some resources to get you started.

#### Assess Your Own Risk

Using Cal OES MyHazards, type in your address to assess your risk to natural hazards including earthquakes, flood, fire and tsunami. Learn what you should do to reduce injuries, protect your life and those of others, and reduce damage to your home and property.

Visit [Ready.gov](https://www.ready.gov) to learn about different hazards and how you can prepare your home or business for these events.

#### Home Mitigation Ideas

Now that you're familiar with the hazards that have the potential to affect your community, check out some of these mitigation techniques that can be performed around your home:

##### Wildfire Mitigation Ideas

- California Fire Safe Council: Information on grants/ funding programs and community events.
- CAL FIRE Why 100° Video from CAL Fire with defensible space guidelines for your home.
- CAL FIRE Ready for Wildfire: CAL Fire website for preparing your home for wildfire.
- CAL Fire Ready for Wildfire (Get Ready): CAL Fire tips on defensible space, hardening your home, and fire-resistant landscapes.
- CAL Fire Ready for Wildfire (Prevention): CAL Fire "One Less Spark" wildfire prevention tips for equipment use, debris burning, campfires and more.

##### Earthquake Mitigation Ideas

- FEMA Earthquake Home Hazard Hunt: FEMA recommendations for reducing earthquake hazards in your home.
- California Earthquake Brace and Bolt Program: California EBB provides \$3,000 grants to be used toward a code-compliant seismic retrofit for houses that qualify. Find out more about the program and if your house qualifies.

##### Flood Mitigation Ideas

- FEMA Flood Mitigation: Tips for preparing your home or workplace, collecting sources of information, developing an emergency communications plan and knowing what to do when a flood is approaching your home or business.
- California Flood Preparedness Tips: Tips on how to divert water away from your home during a flood including sandbag filling and placement.

##### Severe Weather Mitigation Ideas

- Severe Storm Mitigation: Tips to equip your home with the accessories it will need to survive a storm from the National Association of Home Builders.

##### Drought Mitigation Ideas

- Save Our Water: Tips and resources for water conservation in and around the home.

#### Reduce Personal Risk or Injury

##### → Create a Plan

Every household should have a disaster plan! Meet with your family members and discuss why you need to prepare for a disaster. Discuss and explain the dangers of the various hazards that may impact your home or your community.

##### → Build an Emergency Kit

An emergency kit is assembled so that in case of an emergency you are prepared ahead of time. It is possible that you will need to survive on your own after an emergency and this kit should have all the basic yet essential items you will need for at least 72 hours. Your kit should contain food and water, items in case there is a power shortage, and other items such as personal hygiene supplies and copies of important documents.

### Mitigation at Home



PLANNING  
AND GRANTS

MITIGATION  
AT HOME

INVOLUCRATE

PROJECTS



Solano County MJHMP 2021

Executive Summary

Public Survey

Mitigation at Home

Stakeholders

ADMIN DRAFT "NEW"

Meetings

Document Upload

Planning Process Library

POC App

MAST App

RAMP App

Project Contacts

Solano County OES

DON RYAN

707-784-1616

Dynamic Planning + Science

ETHAN MOBLEY

910-323-4331

BRIAN GREER

510-253-0054

TORIE JARVIS

910-323-4330

Solano County Multi-Jurisdiction Hazard Mitigation  
Plan 2021 Update



## Draft Documents

Solano County's draft HMP and annexes have been prepared for stakeholder review. Each document has been crafted based on the feedback provided in our stakeholder meetings and project correspondence. Now is your opportunity to review and provide additional edits/information to the 2021 HMP.

Click the links below to explore the draft docs and launch the review PDF for the Volume 1 HMP and each annex. Your feedback will automatically be sent to the project team for incorporation into the HMP.

The review PDF is a collaborative environment between all stakeholders – see below for more details on what to look for and how to comment.

If you need help navigating these products, please email [torie@dynamickplanning.co](mailto:torie@dynamickplanning.co).

### ADMINISTRATIVE DRAFT

Solano County

- Draft VOLUME 1 (5/3/2020)
- Climate Vulnerability Assessment (6/2/2020)

City of Benicia

- Draft Annex (5/3/2020)
- Draft Climate Vulnerability Assessment (6/2/2020)

City of Dixon

- Draft Annex (5/3/2020)
- Draft Climate Vulnerability Assessment (6/2/2020)

City of Fairfield

- Draft Annex (5/3/2020)
- Draft Climate Vulnerability Assessment (6/2/2020)

City of Rio Vista

- Draft Annex (5/3/2020)
- Draft Climate Vulnerability Assessment (6/2/2020)

City of Suisun City

- Draft Annex (5/3/2020)
- Draft Climate Vulnerability Assessment (6/2/2020)

City of Vacaville

- Draft Annex (5/3/2020)
- Draft Climate Vulnerability Assessment (6/2/2020)

City of Vallejo

- Draft Annex (5/3/2020)
- Draft Climate Vulnerability Assessment (6/2/2020)

### HOW TO COMMENT!



Option 1

Click the links below to comment on the Draft Annexes

Option 2

Submit a Comment Form.

Option 3

Email your comments!

### Help & How-To

Click the green bars below to get advice on specific portions of the drafts to review and 2) to review the steps to contribute to the review PDFs!

▼ Tips for Reviewing Volume 1 (Umbrella & Unincorporated County)

▼ Tips for Reviewing Annexes

▼ How to Comment in Review PDF

### Draft Documents



PLANNING  
AND GRANTS ▾

MITIGATION  
AT HOME

INVOLUCRATE ▾

PROJECTS ▾



Solano County MJHMP 2021

Executive Summary

Public Survey

Mitigation at Home

Stakeholders

**ADMIN DRAFT \*NEW\***

Meetings

Document Upload

Planning Process Library

POC App

MAST App

RAMP App

Project Contacts

Solano County OES

DON RYAN

707-784-1616

Dynamic Planning + Science

ETHAN MOBLEY

970-323-4331

BRIAN GREER

510-253-0054

TORIE JARVIS

970-323-4330

## ▲ Planning Committee Meeting #1 (Dec. 16)

### Planning Committee Meeting #1

Date: Wednesday, December 16, 2020

Time: 2 PM - 4 PM

Via Zoom conference call:

<https://us02web.zoom.us/j/84844687973?pwd=NlF4aFE2RmxReDljQod6WDZlRVRqZz09>

Web Passcode: Solano2021

Call-in option: 669 900 6833

Meeting ID: 848 4468 7973

[Zoom User Guide](#)

### Meeting #1 Materials

- [Agenda](#)
- [Meeting Recording](#)
- [Powerpoint slides](#)
- [Summary of PollEV Results](#)
- [Zoom User Guide](#)

## ▼ Planning Committee Meeting #2 (Jan. 27)

## ▼ Planning Committee Meeting #3 (Feb. 17)

## ▼ Participating Jurisdiction Meetings

### Meetings



PLANNING  
AND GRANTS ▾

MITIGATION  
AT HOME

INVOLUCRATE ▾

PROJECTS ▾



## Solano County MJHMP 2021

Executive Summary

Public Survey

Mitigation at Home

Stakeholders

*ADMIN DRAFT "NEW"*

Meetings

Document Upload

Planning Process Library

POC App

MAST App

RAMP App

Project Contacts

Solano County OES

DON RYAN

707-784-1616

Dynamic Planning + Science

ETHAN MOBLEY

970-323-4331

BRIAN GREER

510-253-0054

TORIE JARVIS

970-323-4330

### Planning Committee Meeting #1 (Dec. 16)

#### Planning Committee Meeting #1

Date: Wednesday, December 16, 2020

Time: 2 PM – 4 PM

Via Zoom conference call:

<https://us02web.zoom.us/j/84844687973?pwd=NlF4aFE2RmxReDljQOd6WDZJRVRqZz09>

Web Passcode: Solano2021

Call-in option: 669 900 6833

Meeting ID: 848 4468 7973

[Zoom User Guide](#)

#### Meeting #1 Materials

- [Agenda](#)
- [Meeting Recording](#)
- [Powerpoint slides](#)
- [Summary of PollEV Results](#)
- [Zoom User Guide](#)

### Planning Committee Meeting #2 (Jan. 27)

### Planning Committee Meeting #3 (Feb. 17)

### Participating Jurisdiction Meetings

#### Document Upload



PLANNING  
AND GRANTS ▾

MITIGATION  
AT HOME

INVOLUCRATE ▾

PROJECTS ▾



#### Solano County MJHMP 2021

[Executive Summary](#)

[Public Survey](#)

[Mitigation at Home](#)

[Stakeholders](#)

[ADMIN DRAFT "NEW"](#)

[Meetings](#)

[Document Upload](#)

[Planning Process Library](#)

[POC App](#)

[MAST App](#)

[RAMP App](#)

[Project Contacts](#)

[Solano County OES](#)

[DON RYAN](#)

[707-784-1616](#)

[Dynamic Planning + Science](#)

[ETHAN MOBLEY](#)

[970-323-4331](#)

[BRIAN GREER](#)

[510-253-0054](#)

[TORIE JARVIS](#)

[970-323-4330](#)

Solano County Multi-Jurisdiction Hazard Mitigation  
Plan 2021 Update:

## Planning Process Library



This library includes links to view map products or exercises completed by each jurisdiction to meet or exceed FEMA planning requirements outlined in 44 CFR § 201.6 - Local Mitigation Plans (44 CFR Part 201 - Mitigation Planning). Most importantly §201.6(c)(2)(iii) requires that in multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

Risk Assessment - explore or download each hazard exposure & damage estimation map

Hazard Prioritization - hazard prioritization risk matrices

Areas of Concern - identifies hazard problem statements

Capability Assessments - details specific technical, fiscal, and regulatory resources

If you need help navigating these mapping products, please email [brian@dynamicplanning.co](mailto:brian@dynamicplanning.co)

### ▼ Solano County

### ▲ Municipalities

#### Benicia

[Risk Assessment - View Maps / Download Maps](#)

[Hazard Prioritization - View Risk Matrix](#)

[Areas of Concern - View Problem Statements](#)

[Capability Assessments - View Capability Assessment](#)

#### Dixon

[Risk Assessment - View Maps / Download Maps](#)

[Hazard Prioritization - View Risk Matrix](#)

[Areas of Concern - View Problem Statements](#)

[Capability Assessments - View Capability Assessment](#)

#### Fairfield

[Risk Assessment - View Maps / Download Maps](#)

[Hazard Prioritization - View Risk Matrix](#)

[Areas of Concern - View Problem Statements](#)

[Capability Assessments - View Capability Assessment](#)

#### Rio Vista

[Risk Assessment - View Maps / Download Maps](#)

[Hazard Prioritization - View Risk Matrix](#)

[Areas of Concern - View Problem Statements](#)

[Capability Assessments - View Capability Assessment](#)

#### Suisun City

[Risk Assessment - View Maps / Download Maps](#)

[Hazard Prioritization - View Risk Matrix](#)

[Areas of Concern - View Problem Statements](#)

[Capability Assessments - View Capability Assessment](#)

#### Vacaville

[Risk Assessment - View Maps / Download Maps](#)

[Hazard Prioritization - View Risk Matrix](#)

[Areas of Concern - View Problem Statements](#)

[Capability Assessments - View Capability Assessment](#)

#### Vallejo

[Risk Assessment - View Maps / Download Maps](#)

[Hazard Prioritization - View Risk Matrix](#)

[Areas of Concern - View Problem Statements](#)

[Capability Assessments - View Capability Assessment](#)

### Planning Process Library



PLANNING  
AND GRANTS ▾

MITIGATION  
AT HOME

INVOLUCRATE ▾

PROJECTS ▾



#### Solano County MJHMP 2021

Executive Summary

Public Survey

Mitigation at Home

Stakeholders

ADMIN DRAFT \*NEW\*

Meetings

Document Upload

Planning Process Library

POC App

MAST App

RAMP App

#### Project Contacts

##### Solano County OES

DON RYAN

707-784-1616

Dynamic Planning + Science

ETHAN MOBLEY

970-323-4331

BRIAN GREER

510-253-0054

TORIE JARVIS

Solano County Multi-Jurisdiction Hazard Mitigation  
Plan 2021 Update

## Points of Contact



#### Point of Contact Database

Click the link below to launch the point of contact database for the 2021 Solano County HMP update. The app is searchable for specific names, jurisdictions, emails, etc.

LAUNCH POC APP

**POC App**





PLANNING  
AND GRANTS

MITIGATION  
AT HOME

INVOLUCRATE

PROJECTS



## Solano County MJHMP 2021

Executive Summary

Public Survey

Mitigation at Home

Stakeholders

**ADMIN DRAFT \*NEW\***

Meetings

Document Upload

Planning Process Library

POC App

MAST App

RAMP App

Project Contacts

### Solano County OES

DON RYAN

707-784-1616

Dynamic Planning + Science

ETHAN MOBLEY

970-323-4331

BRIAN GREER

510-253-0054

TORIE JARVIS

970-323-4330

Solano County Multi-Jurisdiction Hazard Mitigation  
Plan 2021 Update



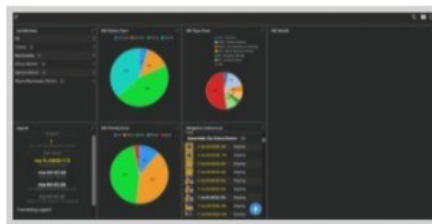
## Using the Mitigation Action Support Tool (MAST)

The links below allow you to access the Mitigation Action Support Tool "MAST". Each stakeholder will receive an invitation to a introduction and functionality review meeting. For additional help, please reach out to our team by emailing [torie@dynamicplanning.co](mailto:torie@dynamicplanning.co)

### Solano County MAST

Access the application by clicking the link below.

**LAUNCH MAST**



### About MAST

MAST enables exploration, editing, and ongoing updates to the mitigation strategy for the 2020 Mendocino HMP. MAST is an important step in creating a hazard mitigation plan that can be updated, revised, and inputted into grant requests into the future.

MAST enhances traditionally planning documents by allowing direct stakeholder inputs and updated by project participants—keeping this 2020 Mendocino HMP a truly living document.

This application is for the use of 2020 Mendocino HMP stakeholders only and may not be shared or demonstrated to users outside of the stakeholder group.

If you need additional help navigating these tools or have any questions regarding the planning process please email [torie@dynamicplanning.co](mailto:torie@dynamicplanning.co).

### MAST App



PLANNING  
AND GRANTS ▾

MITIGATION  
AT HOME

INVOLUCRATE ▾

PROJECTS ▾



## Solano County MJHMP 2021

Executive Summary

Public Survey

Mitigation at Home

Stakeholders

**ADMIN DRAFT \*NEW\***

Meetings

Document Upload

Planning Process Library

POC App

MAST App

RAMP App

Project Contacts

Solano County OES

DON RYAN

707-784-1616

Dynamic Planning + Science

ETHAN MOBLEY

970-323-4331

BRIAN GREER

510-253-0054

TORIE JARVIS

970-323-4330

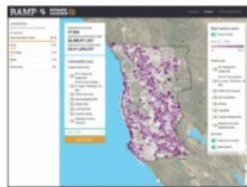
Solano County Multi-jurisdiction Hazard Mitigation  
Plan 2021 Update



## Risk Assessment Mapping Platform

Access the application with username and password  
both matching the project password.

**LAUNCH RAMP**



## RAMP Resources

The RAMP user guide details RAMP's user interface  
and how to use the mapping application.

**RAMP User Guide**

The hazards legend provides full details for each class  
of hazard portrayed in RAMP and provides data  
sources.

**Hazards Legend**

The GIS data dictionary itemizes the status of each GIS  
data layer that will be used in the project.

**GIS Data Dictionary**

If you need additional help navigating these mapping  
tools or have any questions regarding data sources,  
analysis methods, etc., please email  
[brian@dynamicplanning.co](mailto:brian@dynamicplanning.co).

## Critical Infrastructure Editor

Access the application with username and password  
provided.

This is a little different than RAMP! Log-in credentials:

Username: Dynamic\_GIS

Password: Dynamic@2021

Start Here:

**CI Editor Process**

Direct Link:

**CI Editor**

## Critical Infrastructure Editor Resources

Companion tables for each jurisdiction can be found  
below

**City of Benicia**

**City of Dixon**

**City of Fairfield**

**City of Rio Vista**

**Suisun City**

**City of Vacaville**

**City of Vallejo**

**RAMP App**

## **Appendix C. Climate Vulnerability Assessment (CVA)**

# **SOLANO COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN**



**PAGE INTENTIONALLY LEFT BLANK**