# Russian River Watershed Resilience Pilot

## Watershed Network – Meeting 3

## September 16, 2025

# News from around the Watershed

- While we wait for folks to join, please post any news from around the watershed in the chat

- News could include:
  - Achieving project milestone.
  - Citing of an interesting bird, mammal or amphibian.
  - Funding news
  - Celebration of a community member
  - Anything else you'd like to share.

# Today's Agenda

- Welcome & Introductions – Chris Delaney
- Watershed Perspectives – Network
- Climate and Hydrology Update – Tapash Das
- Indicators and Metrics Results – Armin Munévar, Tapash Das
- Initial Qualitative Vulnerability Assessment – Armin Munévar, Vijay Kesavan
- Watershed Network Input – Online and In-person
- Closing & Next Steps

# Welcome

## Chris Delaney, Project Manager, Sonoma Water

# Meeting Objectives

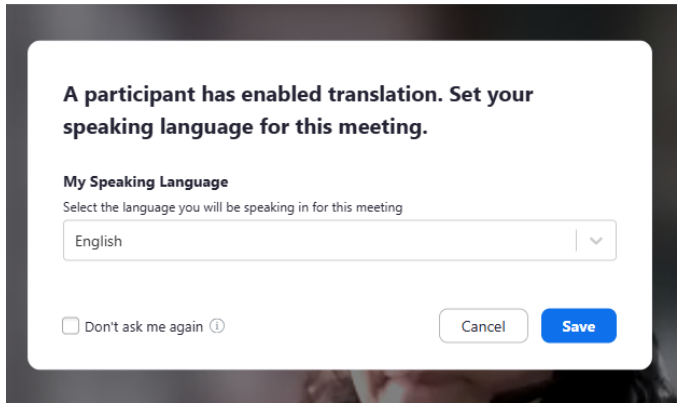
**1. Develop a shared understanding of:**

- ❑ **Updated Climate and Hydrology Efforts**
- ❑ **Revised Indicators and Metrics based on Network Input**
- ❑ **Draft Qualitative Vulnerability Assessment**

**2. Integrate Network Members observations of vulnerabilities across water resource sectors**

# Interpretation Captioning

- Elegir su idioma en la caja que parece después de unir la reunión. Haga clic “save”
- Select your speaking language on the dialog box that appears after you join, hit save

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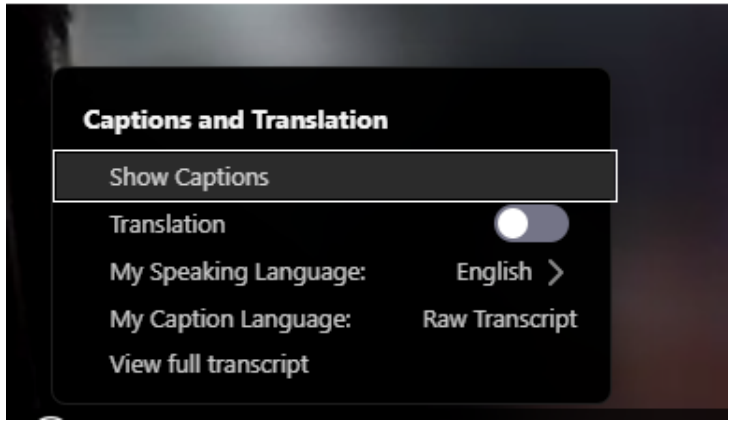


- En el menú que aparece, prenda traducción
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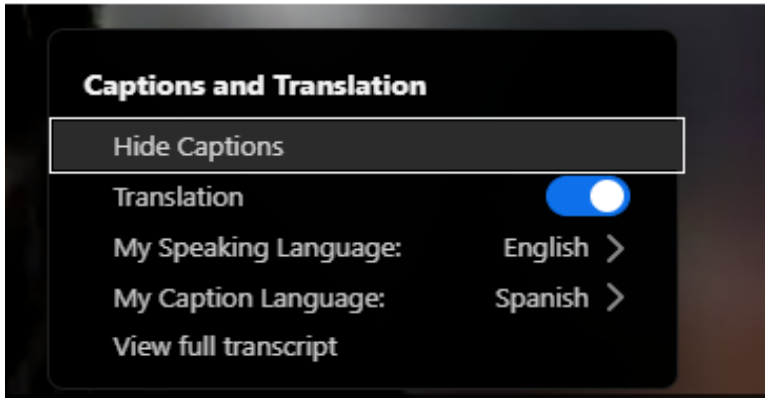
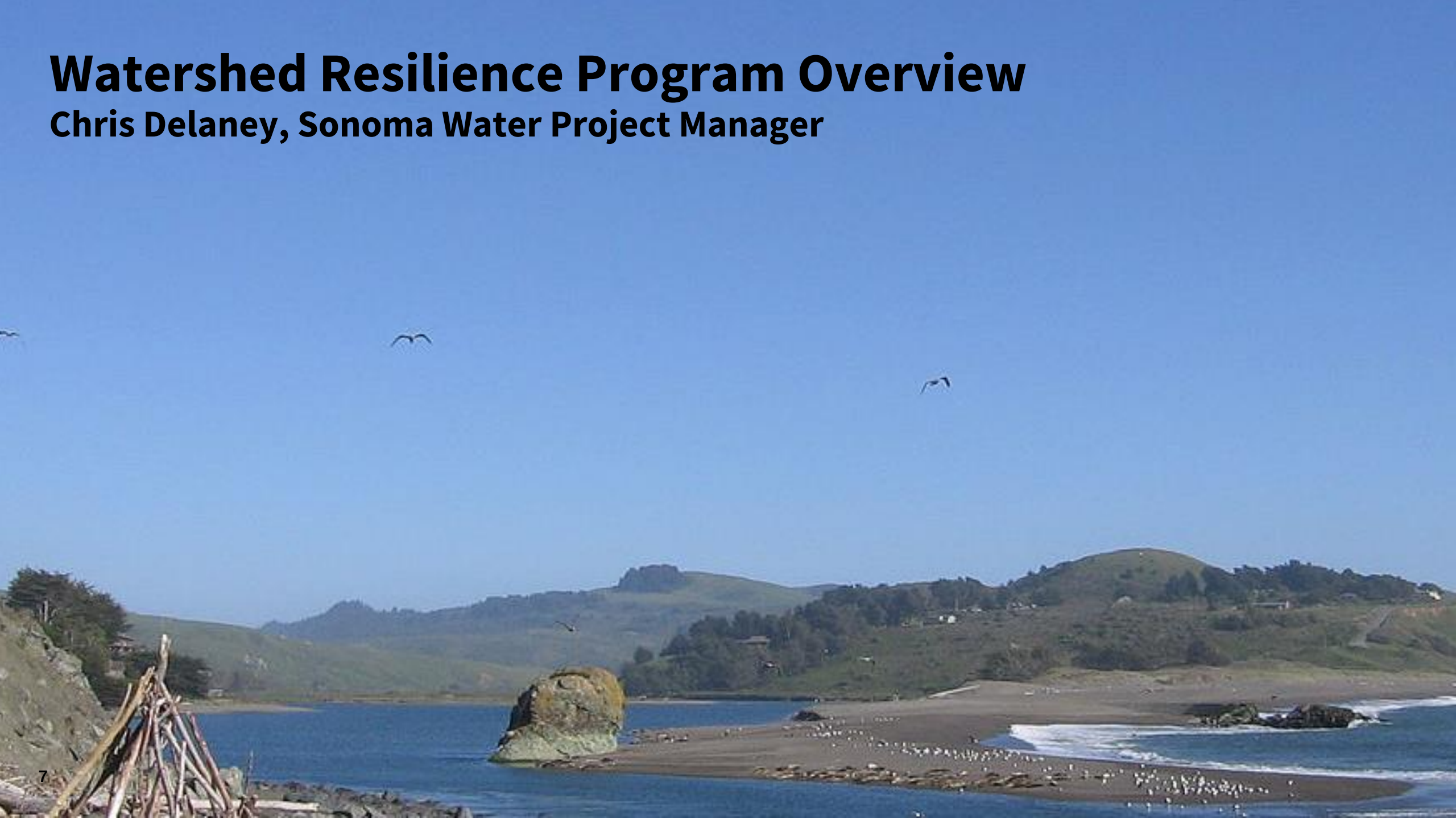


# Watershed Resilience Program Overview

## Chris Delaney, Sonoma Water Project Manager

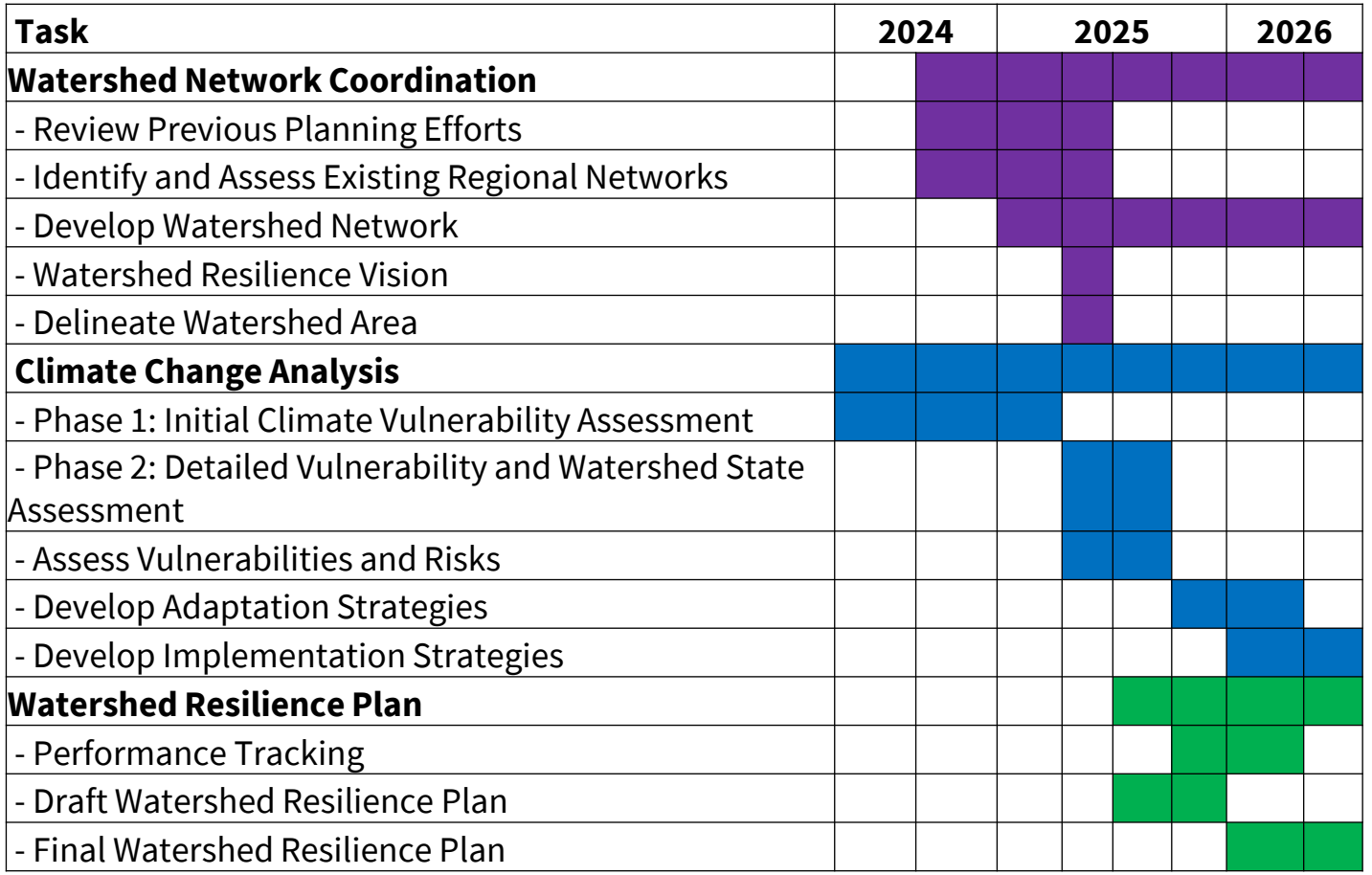


# Watershed Resilience Program

- Created Through the California Water Plan Update 2023
- Evolves the IRWM Program with a focus on:
  - Robust **Climate Change Analysis**
  - Integrating across water resource sectors as the **Watershed Scale**
  - **Equity** through collaboration, analysis, and investment
- Two-year pilot funding for watershed-specific plans

# Project Timeline and Key Milestones

- **Watershed Network Meetings:**
  - February - Completed
  - May- Completed
  - September, November 2025
  - January, March 2026
- **Draft Watershed Resilience Plan:**
  - Early 2026
- **Final Watershed Resilience Plan:**
  - April 2026

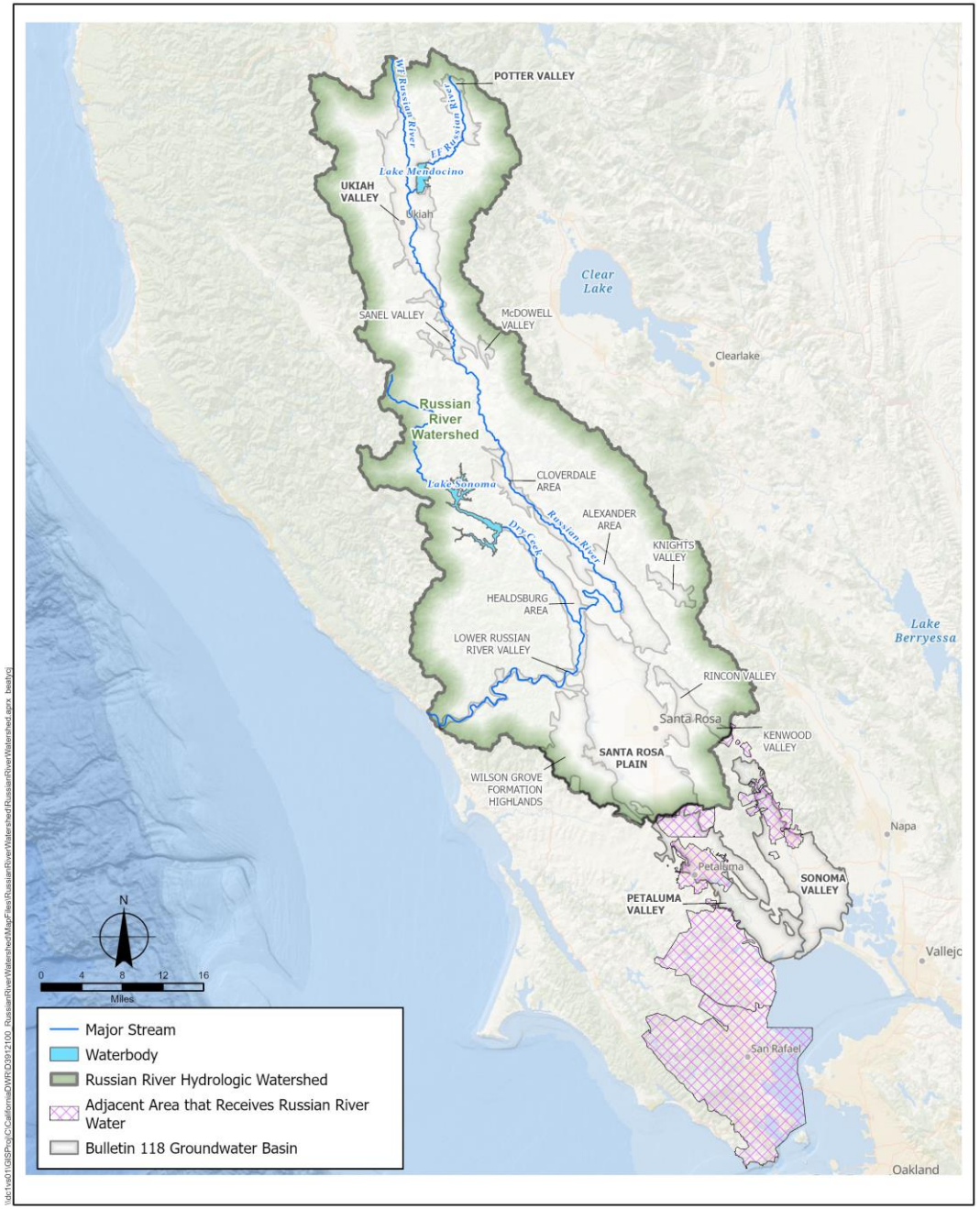


# Watershed Network Meetings and Topics

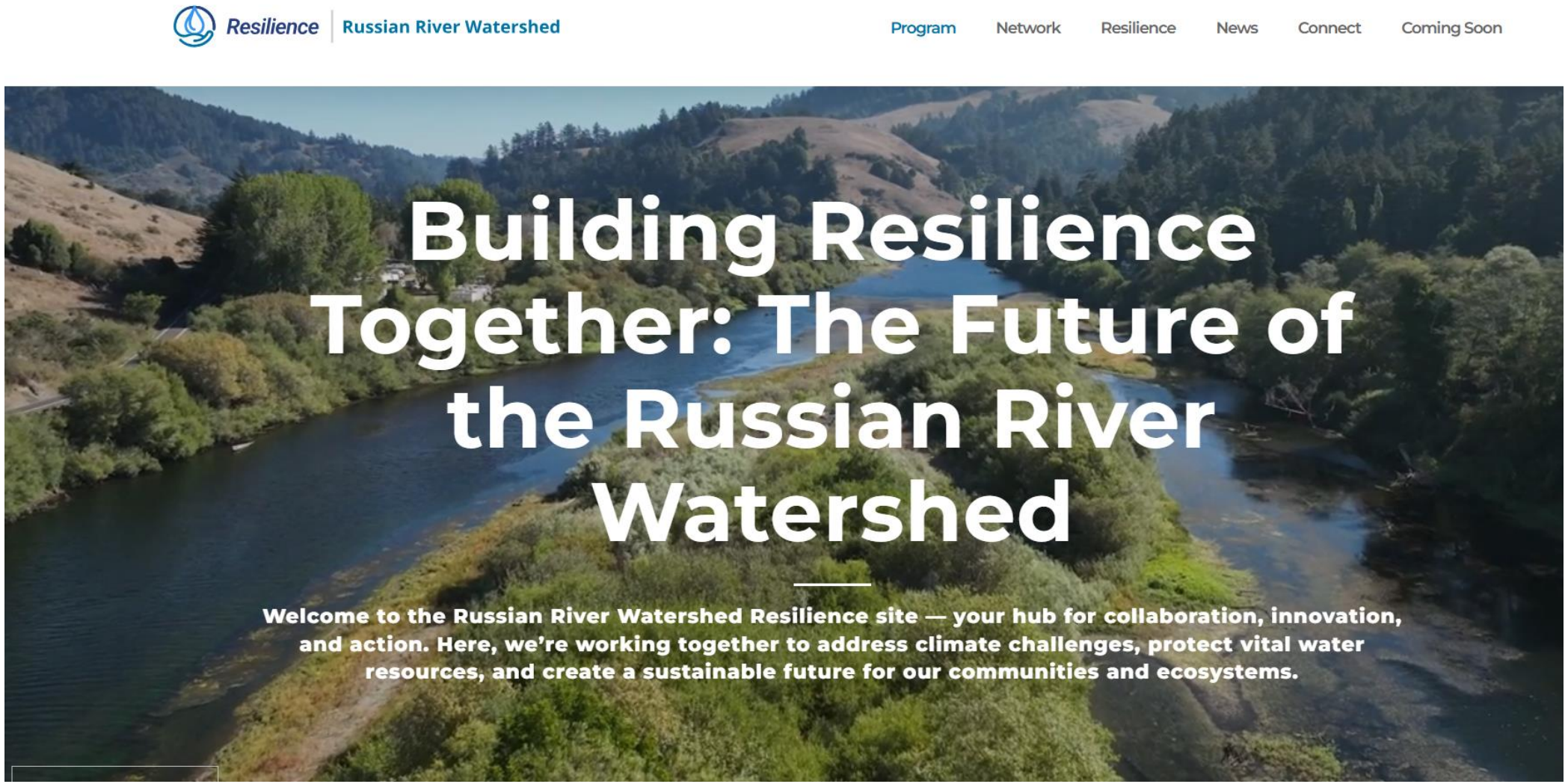
| Meeting | WRP Stage | Goals | Preparatory Work/Meeting Material |
|---|---|---|---|
| **#1 FEB 2025** | **1. Setting the Stage** | Introduce plan; review goals and vision; review/confirm watershed boundary; initiate goals and vision | Project fact sheet<br>GIS mapping of boundary<br>Draft Vision |
| **#2 MAY 6 2025** | **2. Explore Hazards**<br>**3. Assess Vulnerabilities and Risks** | Review hazards; identify and describe historical events and impacts; describe future hazards; gap analysis<br>Framing of vulnerability and risk assessment | Historical hazard summary<br>Projections of change<br>Gap analysis<br>Draft vulnerability metrics |
| **#3 SEPT 16 2025** | **3. Assess Vulnerabilities and risks** | Review of vulnerability and risk assessment<br>Integrate Network Members observations of vulnerabilities across water resource sectors | Draft vulnerability and risks assessment results |
| **#4 NOV 2025** | **3. Assess Vulnerabilities and risks**<br>**4. Develop Adaptation strategies** | Review refined vulnerability assessment<br>Identify adaptation strategies for consideration | Vulnerability and risk assessment results<br>Initial framing and identification of adaptation strategies |
| **#5 JAN 2026** | **4. Adaptation Strategies** | Review evaluation of adaptation strategies | Draft adaptation strategy list and evaluation |
| **#6 MARCH 2026** | **5. Implement & Monitor** | Identify possible implementation paths; recommendations for plan | Draft implementation paths for strategies<br>Draft recommendations for plan |

# Study Area Description

- Boundary
  - Russian River Hydrologic Watershed (HUC 8)
  - Adjacent Areas that Receive Russian River water
- Hydrological Features
  - Lake Mendocino and Lake Sonoma
  - Groundwater basins in RR Watershed, Sonoma Valley groundwater basin, Petaluma Valley groundwater basin
  - Russian River Estuary, Laguna de Santa Rosa
- “Plus” Areas
  - Adjacent areas that receive Russian River water
  - Limited evaluation of water supply (surface water and groundwater) only



# Russian River Watershed Resilience Website




https://russianriverwatershedresilience.org/ **Bookmark, register, engage … track progress of the Plan!**

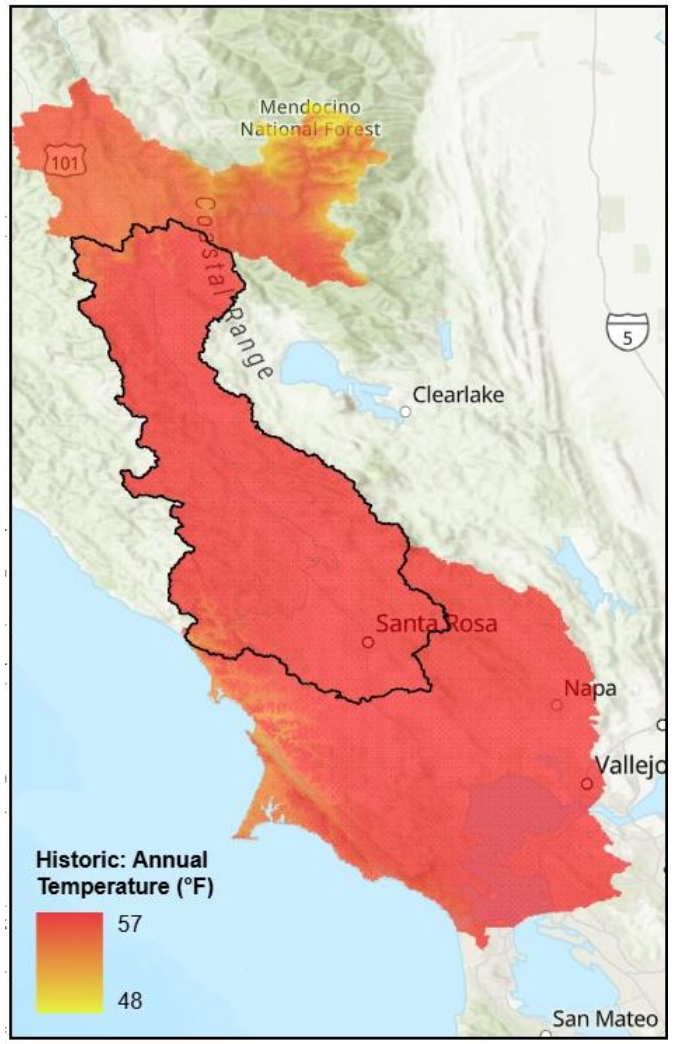
# Watershed Perspectives …

# Climate and Hydrology Update

Tapash Das

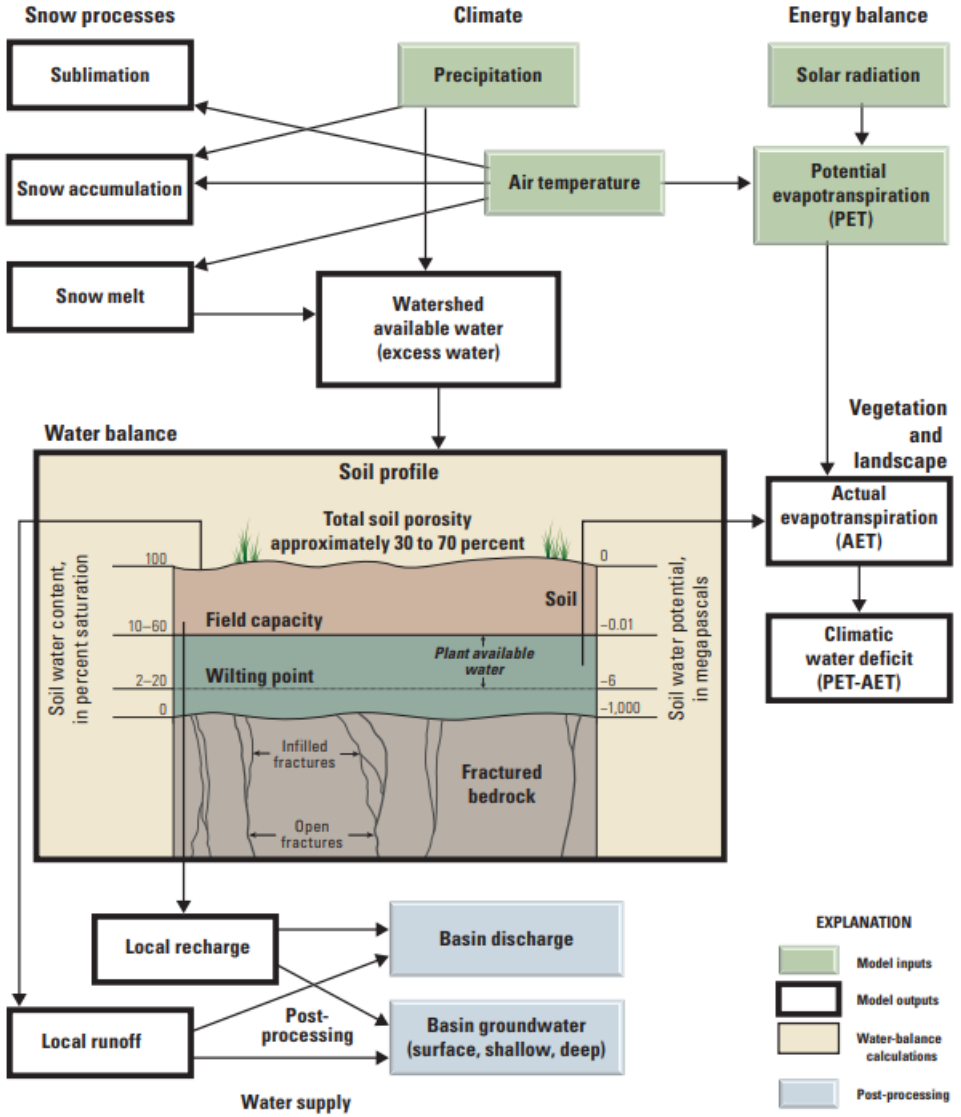
# Climate Model Datasets

- The climate model projections have been downscaled from 15 CMIP6 GCMs using the LOCA2-Hybrid approach by Scripps Institution of Oceanography.
- 3 km spatial resolution with daily outputs over the period 1950 to 2100 with coverage across California.
- Same datasets are being used to inform the California Fifth Climate Change Assessment.
- 3 km datasets were further downscaled to 270 m spatial resolution.



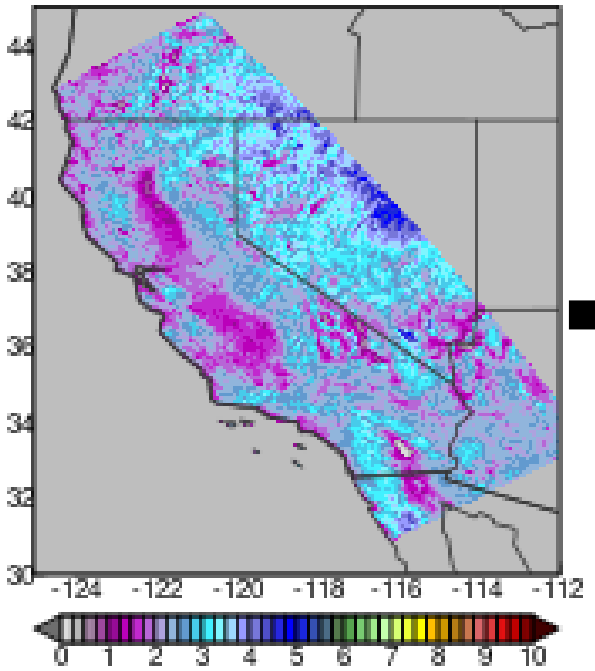
# Basin Characterization Model (BCM)

- Hydrologic Model developed by USGS.
- Gridded model with 270-m resolution.
- Simulates historical and future climate unimpaired streamflows and various hydrological fluxes.
- Uses PRISM climate inputs for historical and LOCA2-Hybrid for future climate.
- Used in many in various Russian River water supply planning studies.

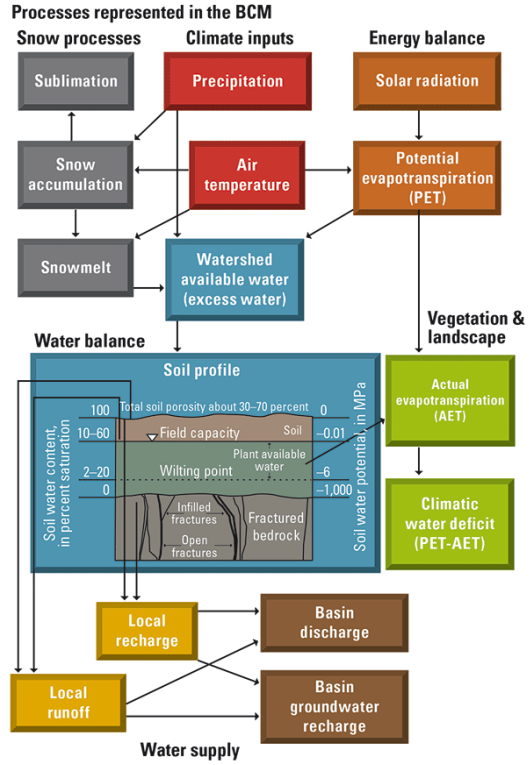



Source: https://pubs.usgs.gov/tm/06/h01/tm6h1.pdf

# Climate/Hydrological Metrics Development

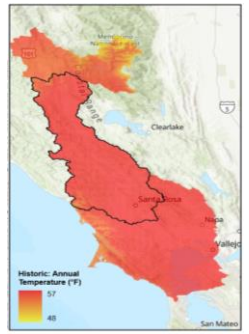



GCM ensemble bias reduction: 41 representative projections across 15 GCMs and 3 SSP scenarios

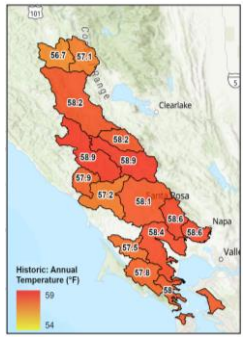



**Basin Characterization Model (BCM)**

**Climate Metrics (e.g., Temperature)**

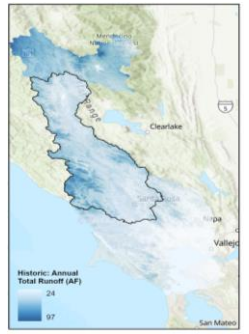


270m Grid scale



HUC-10 scale

**Hydrological Metrics (e.g., Runoff)**



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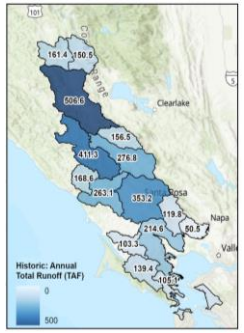


HUC-10 scale

# Communicating trends and change in climate and hydrology?

**Periods & Scenarios**

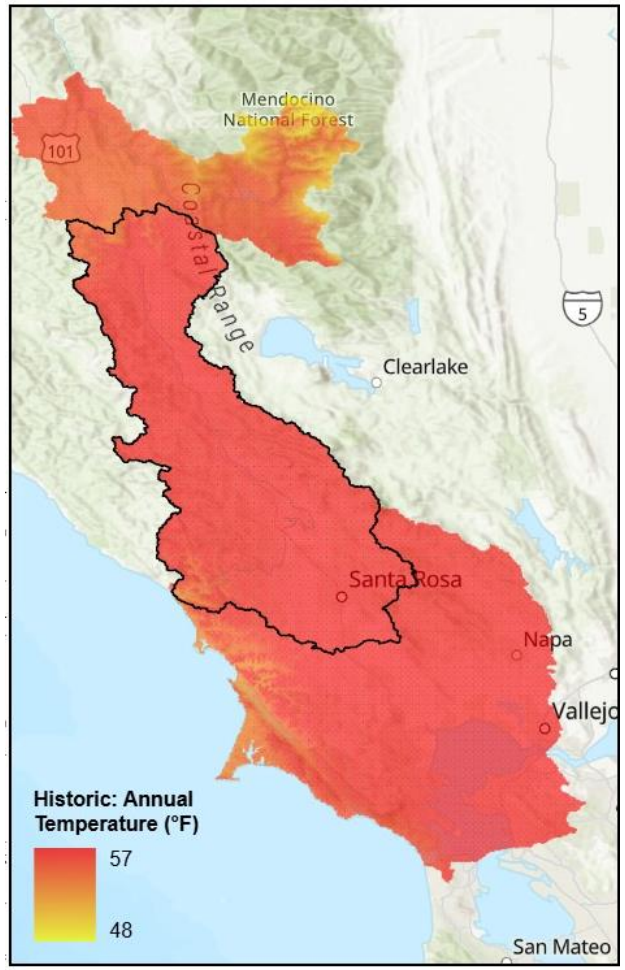
- Periods of Analysis
  - Historical: 1981-2010
  - Future
    - Mid: 2041-2070 (2055)
    - Late: 2071-2100 (2085)
- Climate Scenarios
  - Analysis of full GCM ensemble and three climate change scenarios for modeling

**Variables**

- Temperature
  - Change in annual and seasonal temperature
  - Extreme heat days (Tmax > 95 °F)
- Precipitation
  - Change in annual and seasonal precipitation
  - Changes in wet-dry transitions (duration/frequency)
  - Extreme precipitation (1% annual exceedance probability)
- Hydrology
  - Annual and season runoff volumes
  - High and low flow extremes (distribution)
  - Streamflow timing
  - Wet-dry transition changes based on natural flow
  - Drought severity and duration
  - Climate water deficit
- Landscape
  - Soil moisture
  - Anticipated vegetation changes
  - Wildfire probability and burn area

# Historical Climatological Analysis (1981-2010)

## Mean Annual Temperature

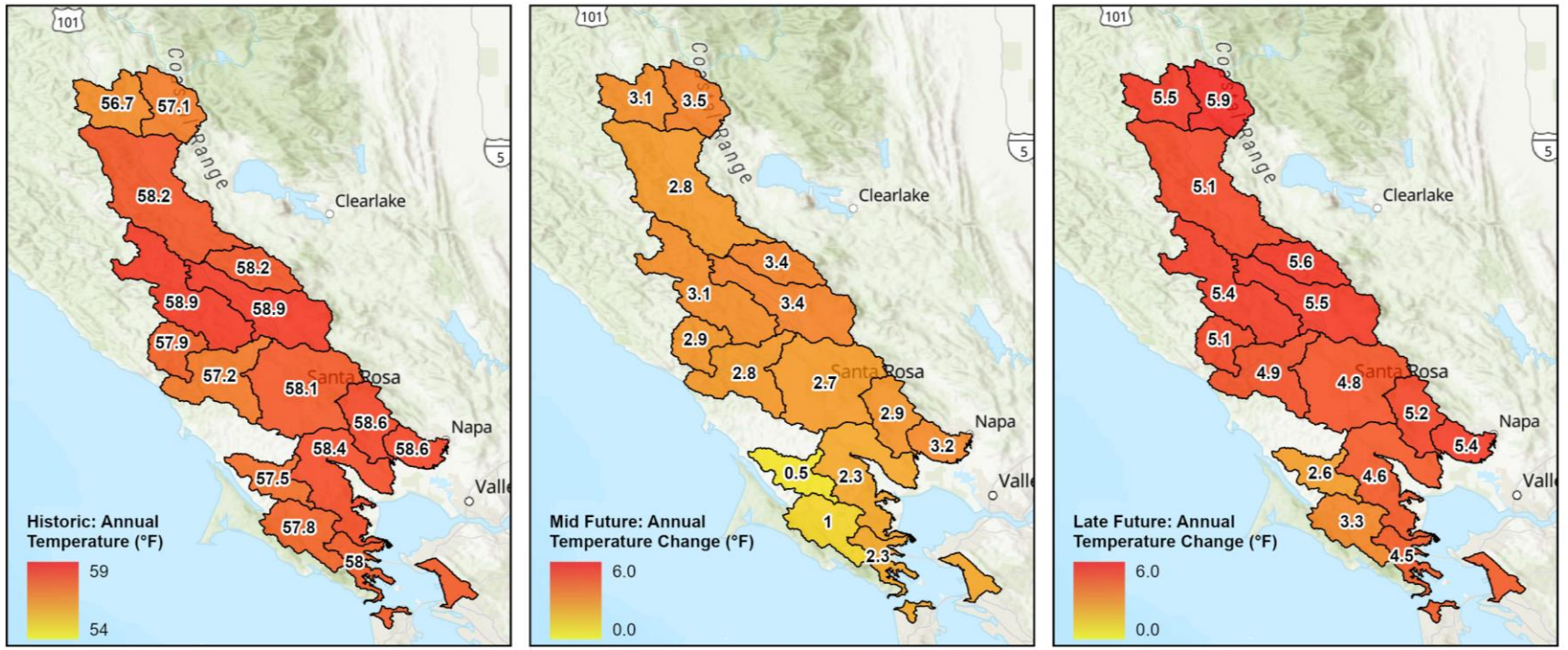



## Mean Annual Precipitation


## Mean Annual Runoff

# Projected Changes in Climatic Metrics: Annual Temperature

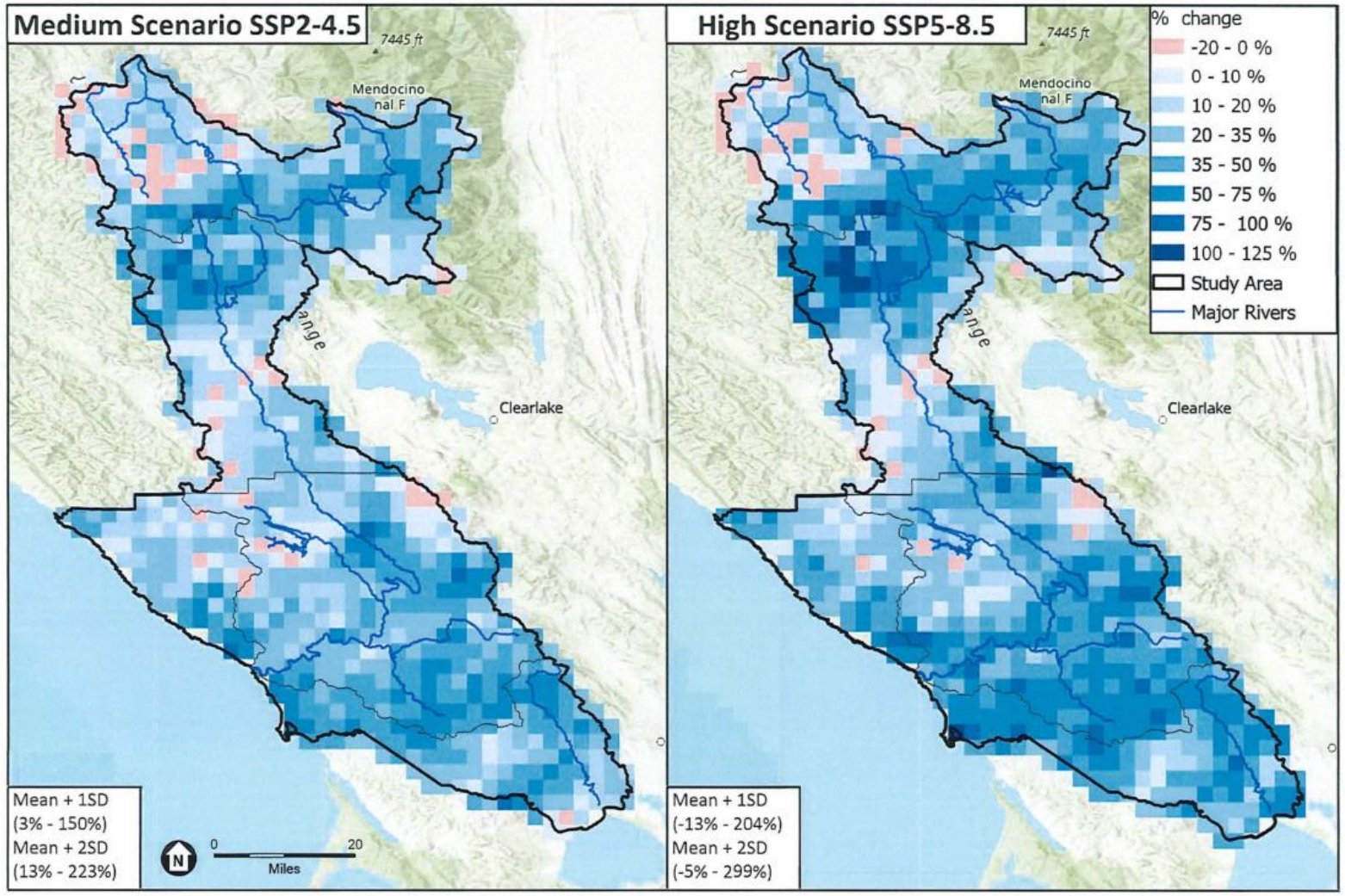
- Temperature increase is consistent across the future periods.
- Coastal influence shows less increase as compared to inland regions.
- Temperature is projected to rise by 3 °F during mid-future and nearly 6 °F by late future.
- Projected increase varies across various climate projections




Example – Work on other climatological and hydrological metrics in progress

# Projected Changes in 100-year Precipitation

Extreme precipitation in the Russian River basin is projected to increase, with studies indicating both greater intensity and frequency of atmospheric rivers




SOURCE: ESA, 2024

NOTE: Percent change is relative to the historic period (1950-2015)

Sonoma Water Future Rainfall

**Figure 7**

Model Mean % Change in 100-year rainfall
Late Century (2085)


Questions?
Hay algunas preguntas?

# Indicators and Metrics Results

Armin Munévar, Tapash Das

# Why do we need Indicators and Metrics?

- **Indicators** – The observable aspects of our water resource sectors in the watershed that inform us about their existing condition, the projected condition, and how they respond to adaptation.  Informs our decision making.
  - What makes a good indicator?
    - Easy to measure,  readily available data.
  - **Examples:**
  - Water Supply Reliability
  - Natural/Ecological Flows
  - Population Exposure to 100-yr Flood Event
  - Water Quality Impairments
- **Metrics-** The quantitative measurement of the indicator.
  - **Examples:**
  - Change in Monthly and Annual Flow Distribution
  - Change in Distribution of Hydrological Conditions for Minimum Flows
  - Change in Population at Risk in 100-yr Floodplain
  - Change in Water Temperature and Dissolved Oxygen

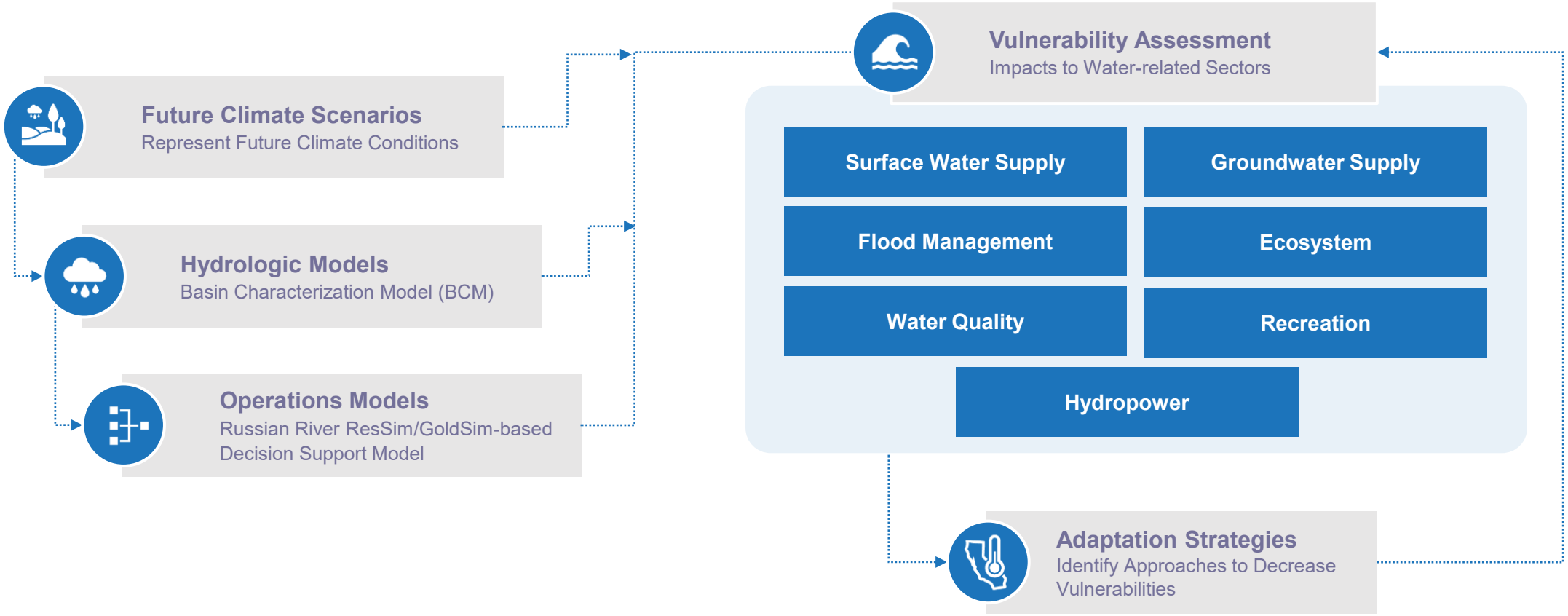
# Indicators and Metrics – Watershed Network Members Feedback

- **Strengthen integration across sectors**, especially where hydrology, water quality, and ecosystem health intersect.
- **Include historical and legacy impacts** (e.g., gravel mining, channelization, dam construction) in vulnerability assessments to better inform baseline conditions and adaptation planning.
- **Ensure tribal representation and input**, including traditional ecological knowledge, culturally relevant indicators, and consultation on beneficial uses and land management practices.
- **Refine equity metrics** to better capture the experiences of vulnerable and frontline communities, particularly where existing tools may overlook tribal and rural populations.
- **Expand focus beyond vulnerability** to include indicators of watershed health and resilience, supporting long-term ecological and community goals.

# Modifications in Response to Feedback

| Category | Metrics (& New Metrics) | Proposed Modifications |
|---|---|---|
| **Surface Water Supply** | • Flows (mainstem + key tributaries)<br>• Delivery % demand<br>• Reservoir storage & FIRO ops | • Define representative tributaries for subwatersheds<br>• Reclassify river and tributary flows as PR/PE<br>• Add env. flow reliability & water use metric |
| **Groundwater Supply** | • GW levels & storage<br>• GSP criteria<br>• GW quality (EC, nitrate) | • Include recharge proxy (floodplain acres) |
| **Flood Management** | • Flood stage frequency<br>• Pop/assets in floodplain<br>• FIRO metrics | • Add beneficial inundation regime<br>• Leverage LiDAR-based channel capacity<br>• Include historic baseline |
| **Ecosystem** | • Functional flows<br>• Temp/DO<br>• Salmonid flow targets & habitat connectivity<br>• Add watershed health metrics | • Review California Environmental Flows Framework (CEFF) metrics<br>• Add riparian & connectivity metrics |
| **Water Quality** | • Temp, DO, biostimulatory<br>• Drinking water violations | • Add metric to measure exceeding standards |
| **Recreation** | • Lake levels for boating/fishing<br>• River flows for access<br>• Cyanotoxins | • Include fishing in metric for river flows<br>• Add metric for # of access points for safe swimming and boating |
| **Hydropower** | • Monthly MWh at Coyote Valley & Warm Springs Dams | • Note FIRO co-benefits |

# Russian River WRP Technical Approach Workflow



# Analytical Tools & Key Quantitative Metrics

| | Sectors | BCM | GSFLOW | HEC-ResSim, GoldSim DSM | HEC-HMS, HEC-RAS | HEC-ResSim WQ, QCM, Suitable Habitat Acre-day Model | Key Metrics Example |
|---|---|---|---|---|---|---|---|
| 1 | **Surface Water Supply** | ◆ | | ◆ | | | Reservoir storage and frequency; delivery as percentage of demand |
| 2 | **Groundwater Supply** | | ◆ | | | | Groundwater elevation and storage |
| 3 | **Flood Management** | ◆ | | ◆ | ◆ | | Flow and Stage Frequency for Russian River and Tributaries; Reservoir flood releases |
| 4 | **Ecosystem** | ◆ | | | | ◆ | Instream flows to support threatened and endangered fish, River temperature, estuary water levels and habitat |
| 5 | **Water Quality** | | | | | ◆ | River temperature, Populations Affected by Drinking Water System Violations |
| 6 | **Recreation** | ◆ | | ◆ | | | Reservoir storage levels, River flows suitable for river recreational access and boating |
| 7 | **Hydropower** | | | ◆ | | | Power generation from reservoir operations |

# Initial Qualitative Vulnerability Assessment

Armin Munévar, Vijay Kesavan

# Vulnerability Assessment - Process

1. Set the Stage
2. Explore Hazards
3. Assess Vulnerability
4. Develop Adaptation Strategies
5. Implement & Monitor

1. Systematically identify & evaluate the vulnerabilities of watershed resources to climate hazards.
2. Highlight critical vulnerabilities for additional focus.
3. Inform development of targeted adaptation strategies for long-term resilience.

**Exposure**: How are system components exposed to climate hazards?

**Sensitivity**: How large are the changes on the system due to hazard exposure?

*(expected magnitude of change)*

**Adaptive Capacity**: How well is the system able to adapt to the potential impacts?

*(Inherent capacity to adapt & respond)*

**Vulnerability Rating**: Which vulnerabilities pose the greatest risk?

*(combination of sensitivity & adaptive capacity)*

# Vulnerability Assessment – Exposure Analysis

1. Set the Stage
2. Explore Hazards
3. Assess Vulnerability
4. Develop Adaptation Strategies
5. Implement & Monitor

1. Systematically identify & evaluate the vulnerabilities of watershed resources to climate hazards.
2. Highlight critical vulnerabilities for additional focus.
3. Inform development of targeted adaptation strategies for long-term resilience.

- Surface Water Supply
- Groundwater Supply
- Flood Management
- Ecosystem
- Water Quality
- Recreation
- Hydropower
- Community & Equity

**Exposure**: How are system components exposed to climate hazards?

- Rising temperature & Extreme Heat
- Intense & Frequent Droughts
- Intense Precipitation & Flooding
- Intense & Frequent Wildfires
- Sea-level rise

# Vulnerability Assessment – Qualitative Analysis

Vulnerability assessment relies on an **initial qualitative analysis** for efficient planning

## Qualitative Analysis

- Efficiently identify vulnerabilities using prior studies, historical data, expert judgment, & local knowledge.
- Facilitate broader understanding & engagement by network.
- Highlights areas where deeper analysis is most needed.

Where we are today…

## Quantitative Analysis

- Focus on most critical vulnerabilities
- Use analytical tools such as models for further assessment
- Useful for quantifying current vulnerability, mapping, and assessing performance of future strategies

… and upcoming

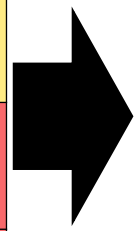
# Sensitivity and Adaptive Capacity

| Score | Sensitivity Rating |
|---|---|
| 1 | Low Sensitivity |
| 2 | Moderate-Low Sensitivity |
| 3 | Moderate Sensitivity |
| 4 | Moderate-High Sensitivity |
| 5 | High Sensitivity |

| Score | Adaptive Capacity Rating |
|---|---|
| 1 | High Capacity |
| 2 | Moderate-High Capacity |
| 3 | Moderate Capacity |
| 4 | Moderate-Low Capacity |
| 5 | Low Capacity |

# Vulnerability Rating

| Adaptive Capacity Rating | Sensitivity Rating | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| High (1) | 1 | 1 | 2 | 2 | 3 |
| Moderate-High (2) | 1 | 1 | 2 | 3 | 3 |
| Moderate (3) | 1 | 2 | 3 | 4 | 5 |
| Low-Moderate (4) | 1 | 2 | 4 | 5 | 5 |
| Low (5) | 1 | 2 | 5 | 5 | 5 |



| Score | Vulnerability Rating |
|---|---|
| 1 | Low Vulnerability |
| 2 | Moderate-Low Vulnerability |
| 3 | Moderate Vulnerability |
| 4 | Moderate-High Vulnerability |
| 5 | High Vulnerability |

# Upper Russian River – Qualitative Vulnerability Assessment

| System | System | Planning Area | System Component | Vulnerability Rating |
|---|---|---|---|---|
| Surface Water Supply | SW | Upper Russian River | Headwaters (Upper Russian River) | 4 |
| Surface Water Supply | SW | Upper Russian River | East Fork Russian River | 4 |
| Surface Water Supply | SW | Upper Russian River | Potter Valley Imports | 5 |
| Surface Water Supply | SW | Upper Russian River | West Fork Russian River | 5 |
| Surface Water Supply | SW | Upper Russian River | Lake Mendocino/Coyote Valley Dam | 4 |
| Surface Water Supply | SW | Upper Russian River | Main Stem Russian River (to Cloverdale) | 4 |
| Groundwater Supply | GW | Upper Russian River | Potter Valley Groundwater Basin | 4 |
| Groundwater Supply | GW | Upper Russian River | Ukiah Valley Groundwater Basin | 4 |
| Groundwater Supply | GW | Upper Russian River | Sanel Valley Groundwater Basin | 3 |
| Groundwater Supply | GW | Upper Russian River | McDowell Valley Groundwater Basin | 3 |
| Flood Management | FM | Upper Russian River | Coyote Valley Dam/Lake Mendocino | 4 |
| Flood Management | FM | Upper Russian River | Russian River Floodplain (Upper Russian River) | 4 |
| Flood Management | FM | Upper Russian River | Tributaries (Upper Russian River) | 4 |
| Water Quality | WQ | Upper Russian River | Ecological | 3 |
| Water Quality | WQ | Upper Russian River | Regulatory Standards | 3 |
| Water Quality | WQ | Upper Russian River | Drinking Water & Quality | 5 |
| Ecosystems | ES | Upper Russian River | Aquatic Ecosystems (Upper Russian River) | 4 |
| Ecosystems | ES | Upper Russian River | Riparian Systems (Upper Russian River) | 4 |
| Ecosystems | ES | Upper Russian River | Forests and Headwaters (Upper Russian River) | 4 |
| Hydropower | HP | Upper Russian River | Potter Valley Project | 3 |
| Hydropower | HP | Upper Russian River | Lake Mendocino Plant at Coyote Valley Dam | 3 |
| Recreation | RC | Upper Russian River | Lake Recreation & Tourism (Lake Mendocino) | 3 |
| Recreation | RC | Upper Russian River | River Recreation & Tourism | 3 |
| Community & Equity | CE | Upper Russian River | Ukiah, Redwood Valley, Hopland, and Rural Towns | 4 |

*Vulnerability Key:*
*1 = Low*
*2 = Low/Moderate*
*3 = Moderate*
*4 = Moderate/High*
*5 = High*

*System Key:*
*CE = Community & Equity*
*ES = Ecosystem*
*FM = Flood management*
*GW = Groundwater supply*
*HP = Hydropower*
*SW = Surface water supply*
*WQ = Water quality*
*RC = Recreation*

# Middle Russian River – Qualitative Vulnerability Assessment

| System | System | Planning Area | System Component | Vulnerability Rating |
|---|---|---|---|---|
| Surface Water Supply | SW | Middle Russian River | Headwaters (Middle Russian River) | 4 |
| Surface Water Supply | SW | Middle Russian River | Main Stem (Cloverdale to Dry Creek) | 4 |
| Surface Water Supply | SW | Middle Russian River | Lake Sonoma | 4 |
| Surface Water Supply | SW | Middle Russian River | Dry Creek | 4 |
| Surface Water Supply | SW | Middle Russian River | Alexander Valley | 4 |
| Groundwater Supply | GW | Middle Russian River | Alexander Valley Groundwater Basin (Cloverdale Area) | 3 |
| Groundwater Supply | GW | Middle Russian River | Alexander Valley Groundwater Basin (Alexander Area) | 3 |
| Groundwater Supply | GW | Middle Russian River | Healdsburg Area Groundwater Basin | 3 |
| Groundwater Supply | GW | Middle Russian River | Knights Valley Groundwater Basin | 3 |
| Flood Management | FM | Middle Russian River | Warm Springs Dam/Lake Sonoma | 4 |
| Flood Management | FM | Middle Russian River | Dry Creek | 2 |
| Flood Management | FM | Middle Russian River | Russian River Floodplain (Middle Russian River) | 4 |
| Water Quality | WQ | Middle Russian River | Ecological | 4 |
| Water Quality | WQ | Middle Russian River | Regulatory Standards | 4 |
| Water Quality | WQ | Middle Russian River | Drinking Water & Quality | 4 |
| Ecosystems | ES | Middle Russian River | Aquatic Ecosystems (Middle Russian River) | 4 |
| Ecosystems | ES | Middle Russian River | Riparian Systems (Middle Russian River) | 4 |
| Ecosystems | ES | Middle Russian River | Forests and Headwaters (Middle Russian River) | 4 |
| Ecosystems | ES | Middle Russian River | Dry Creek Restoration | 4 |
| Ecosystems | ES | Middle Russian River | Laguna de Santa Rosa | 4 |
| Hydropower | HP | Middle Russian River | Warm Springs Dam (Lake Sonoma) | 3 |
| Recreation | RC | Middle Russian River | Lake Recreation & Tourism (Lake Sonoma) | 3 |
| Recreation | RC | Middle Russian River | River Recreation & Tourism | 4 |
| Community & Equity | CE | Middle Russian River | Cloverdale, Healdsburg, Windsor, Geyserville, Vineyard/Farmworker Communities | 5 |

*Vulnerability Key:*
*1 = Low*
*2 = Low/Moderate*
*3 = Moderate*
*4 = Moderate/High*
*5 = High*

*System Key:*
*CE = Community & Equity*
*ES = Ecosystem*
*FM = Flood management*
*GW = Groundwater supply*
*HP = Hydropower*
*SW = Surface water supply*
*WQ = Water quality*
*RC = Recreation*

# Lower Russian River – Qualitative Vulnerability Assessment

| System | System | Planning Area | System Component | Vulnerability Rating |
|---|---|---|---|---|
| Surface Water Supply | SW | Lower Russian River | Main Stem Russian River (Dry Creek Confluence to Jenner) | 4 |
| Surface Water Supply | SW | Lower Russian River | Windsor Wells | 3 |
| Surface Water Supply | SW | Lower Russian River | Russian River Diversion Facilities | 4 |
| Groundwater Supply | GW | Lower Russian River | Lower Russian River Valley Groundwater Basin | 3 |
| Groundwater Supply | GW | Lower Russian River | Santa Rosa Plain Groundwater Basin | 4 |
| Groundwater Supply | GW | Lower Russian River | Rincon Valley Groundwater Basin | 3 |
| Groundwater Supply | GW | Lower Russian River | Kenwood Valley Groundwater Basn | 3 |
| Flood Management | FM | Lower Russian River | Central Sonoma Watershed Project | 5 |
| Flood Management | FM | Lower Russian River | Tributaries (Lower Russian River) | 4 |
| Flood Management | FM | Lower Russian River | Laguna de Santa Rosa | 4 |
| Flood Management | FM | Lower Russian River | Russian River Floodplain (Lower Russian River) | 5 |
| Flood Management | FM | Lower Russian River | Russian River Estuary | 4 |
| Water Quality | WQ | Lower Russian River | Ecological | 3 |
| Water Quality | WQ | Lower Russian River | Regulatory Standards | 5 |
| Water Quality | WQ | Lower Russian River | Drinking Water & Quality | 3 |
| Ecosystems | ES | Lower Russian River | Aquatic Ecosystems (Lower Russian River) | 4 |
| Ecosystems | ES | Lower Russian River | Riparian Systems (Lower Russian River) | 4 |
| Ecosystems | ES | Lower Russian River | Russian River Estuary | 5 |
| Ecosystems | ES | Lower Russian River | Forests and Headwaters (Lower Russian River) | 4 |
| Recreation | RC | Lower Russian River | River Recreation & Tourism | 4 |
| Community & Equity | CE | Lower Russian River | Guerneville, Monte Rio, Forestville, Renter Communities, Mobile Homes | 5 |

*Vulnerability Key:*
*1 = Low*
*2 = Low/Moderate*
*3 = Moderate*
*4 = Moderate/High*
*5 = High*

*System Key:*
*CE = Community & Equity*
*ES = Ecosystem*
*FM = Flood management*
*GW = Groundwater supply*
*HP = Hydropower*
*SW = Surface water supply*
*WQ = Water quality*
*RC = Recreation*

# Sonoma Water Transmission System and Adjacent Areas – Qualitative Vulnerability Assessment

| System | System | Planning Area | System Component | Vulnerability Rating |
|---|---|---|---|---|
| Surface Water Supply | SW | Sonoma Water Transmission System | Transmission System | 4 |
| Surface Water Supply | SW | Sonoma Water Transmission System | Retail Customer Systems | 4 |
| Surface Water Supply | SW | Sonoma Water Transmission System | Marin Water System | 4 |
| Surface Water Supply | SW | Sonoma Water Transmission System | Lake Stafford | 4 |
| Groundwater Supply | GW | Adjacent Areas | Sonoma Valley Groundwater Basin | 4 |
| Groundwater Supply | GW | Adjacent Areas | Petaluma Valley Groundwater Basin | 4 |

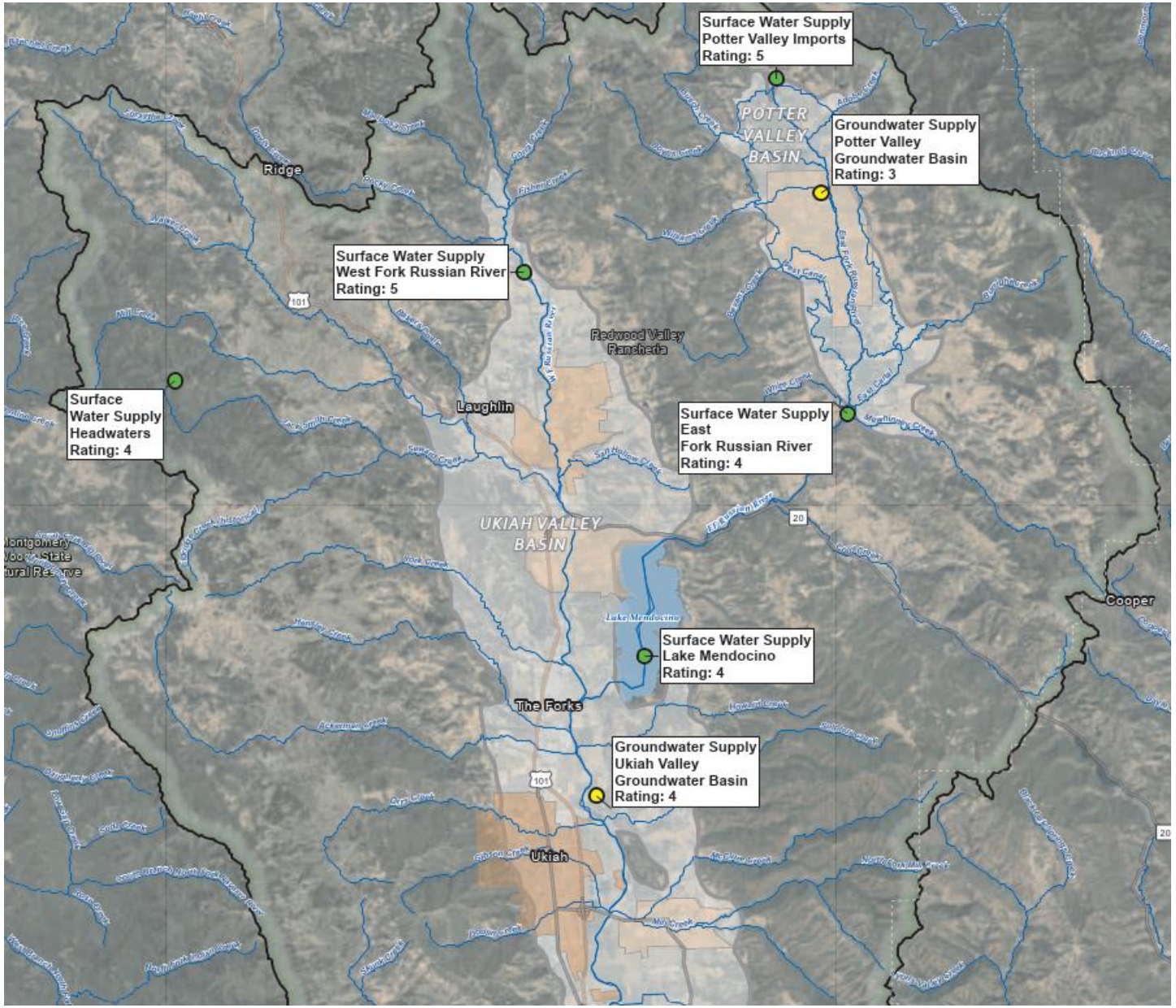
*Vulnerability Key:*
*1 = Low*
*2 = Low/Moderate*
*3 = Moderate*
*4 = Moderate/High*
*5 = High*

*System Key:*
*CE = Community & Equity*
*ES = Ecosystem*
*FM = Flood management*
*GW = Groundwater supply*
*HP = Hydropower*
*SW = Surface water supply*
*WQ = Water quality*
*RC = Recreation*

# Visualizing Vulnerabilities

- Qualitative vulnerabilities have been mapped to help visualize
- Ratings and descriptions are DRAFT and further analysis for most will be conducted quantitatively
- Provided on maps to guide receiving your input on further vulnerability identification

**Sample Climate Vulnerabilities for Surface and Groundwater Supply (Upper Russian River)**

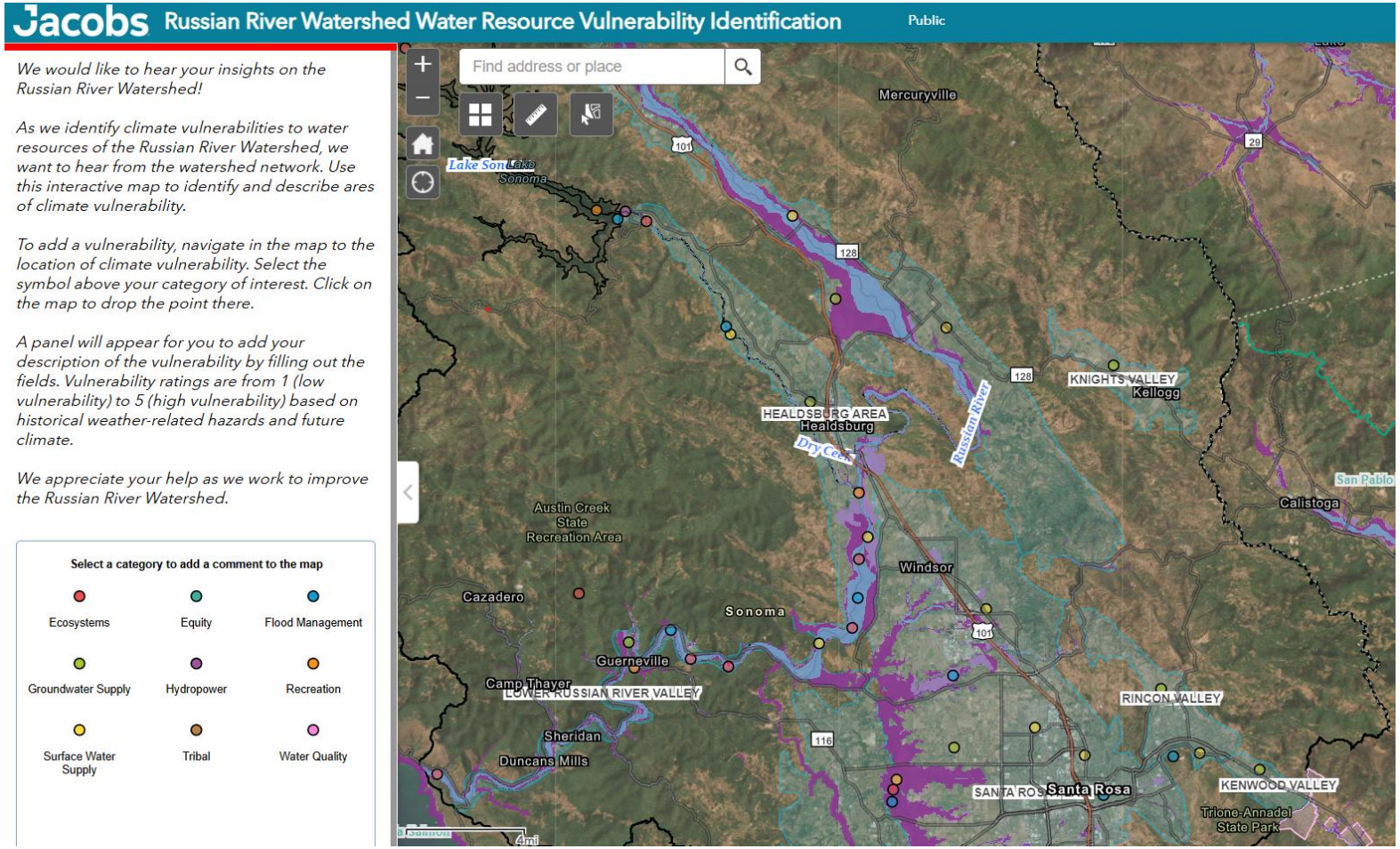



Questions?
Hay algunas preguntas?

# Network Members Input

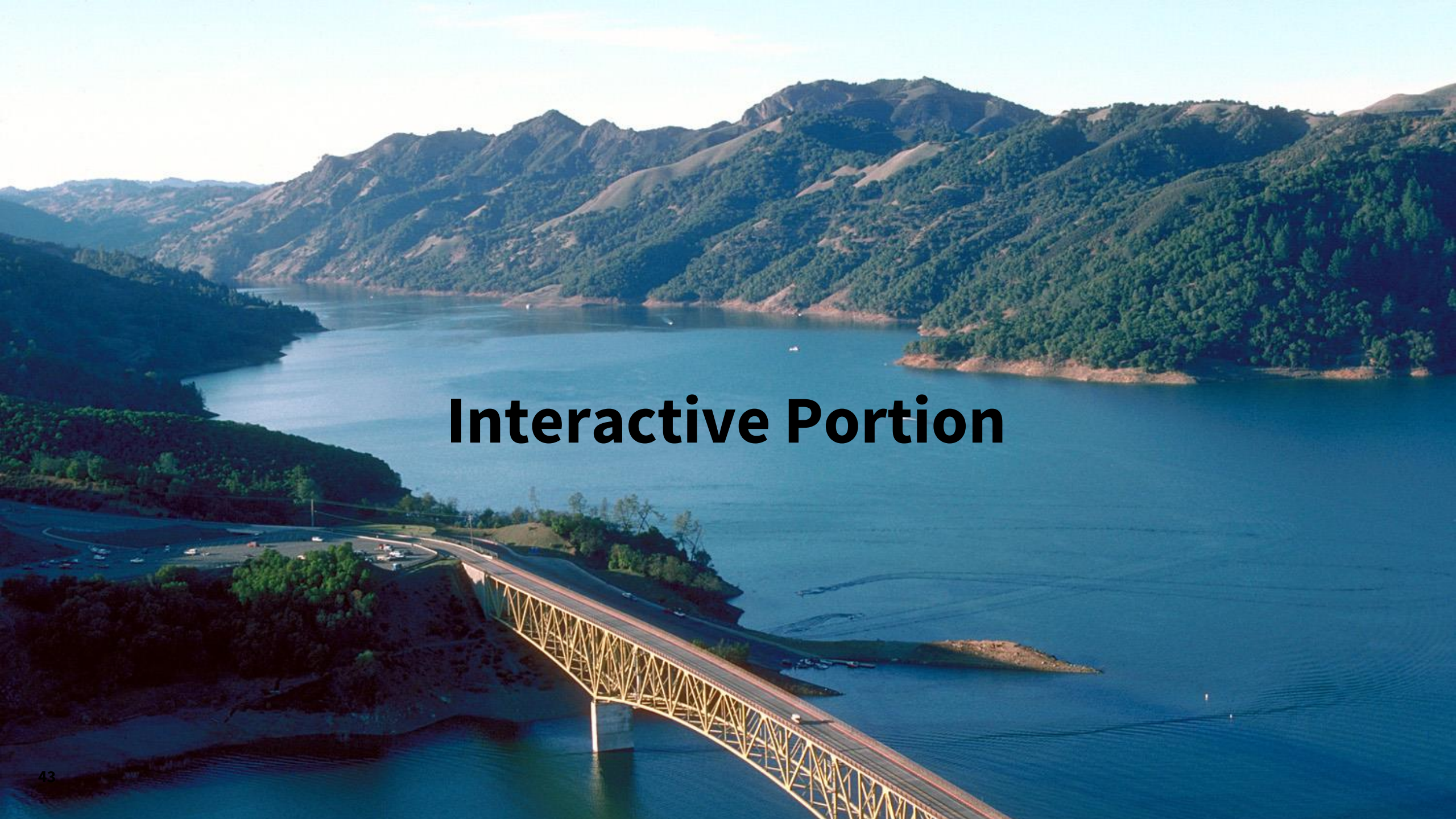
# Network Members Input on Vulnerabilities

- In Person and On-Line Options to Provide Input






https://jacobs.maps.arcgis.com/apps/webappviewer/index.html?id=dc8305faa60a4a90a51124e5a7473a1c



# Interactive Portion

# Activity Instructions – 1 hour 4:00-5:00

- Activity Instructions
  - **Online**
    - Go to link for Vulnerability Mapper (link in chat and website)
    - Navigate to the right side –  Turn on Layers that interest you
    - Navigate to the left side of the screen
    - Select a resource category and rating, drag and drop your cursor
    - You will be able to edit your own pin, but not delete it
    - **Laura and Vijay** are available for questions, if you have any trouble, please add items to the chat and we will add them to the map for you.
  - **In Person**
    - Stations broken up by groupings of resource categories **–**
      - Groundwater, Surface Water, Hydropower – Table 1
      - Water Quality, Ecosystems, Recreation, Flood Management – Table 2
    - **Tapash, Armin, Steve, Jay and Chris raise your hands –** these folks are available to answer questions
    - Take the sticky notes, assign a resource category and rating, describe the item

# Climate Vulnerability Mapping

## Identify Places and System Components that you have observed or are concerned are vulnerable to Climate

- Resource Categories
  - Ecosystems
  - Equity
  - Flood Management
  - Groundwater Supply
  - Hydropower
  - Recreation
  - Surface Water Supply
  - Tribal
  - Water Quality
- Climate Vulnerability Ratings – designation and description
  - 1 - Low
  - 2 - Moderate-Low
  - 3 - Moderate
  - 4 – Moderate High
  - 5 – High

# Example – Housing Services

- Winter Emergency Shelter in Guerneville
  - Guerneville, CA 95446
- Pick a Resource Category (only select one)
  - Equity
- Select a climate vulnerability rating
  - 1
  - 2
  - 3
  - 4
  - **5 - High Vulnerability**

# Example – Critical Fish Habitat

- Spawning Grounds for Coho Salmon and Steelhead
  - Various tributaries Green Valley, Dutch Bill, Mill, Willow, Mark West creeks
- Pick a Resource Category (only select one)
  - Ecosystems
- Select a climate vulnerability rating
  - 1
  - 2
  - 3
  - 4 –Moderate-High Vulnerability
  - 5

# Example – Park Facility

- Riverfront Regional Park
- Pick a Resource Category (only select one)
  - Recreation
- Select a climate vulnerability rating
  - 1
  - 2-Moderate-Low
  - 3
  - 4
  - 5

# Activity Takeaways

- What did you notice?
- What became clearer?
- What questions did it generate for you?

# Mapping Exercise will remain open

- This mapping exercise will remain open for two weeks until September 30th. Please continue to add items.
- Accessible at project website:
  - https://russianriverwatershedresilience.org (Resilience page)

# Closing - Thank You

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