



Russian River Watershed Resilience Pilot

Watershed Network – Meeting 2

May 6, 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 & Introduction – Grant Davis
 - Project Review – Chris Delaney
 - Schedule
 - Study Area
 - Summary of Feedback, Vision and Desired Outcomes– Laura Harnish
 - Framing of Vulnerability and Risk Assessment – Armin Munévar
 - Overall Approach
 - Historical Weather-Related Hazards – Vijay Kesavan
 - Overview of Indicators and Metrics – Tapash Das
 - Network Review of Deliverables
 - Closing & Next Steps
-

Welcome

Grant Davis, General Manager, Sonoma Water



Meeting Objectives

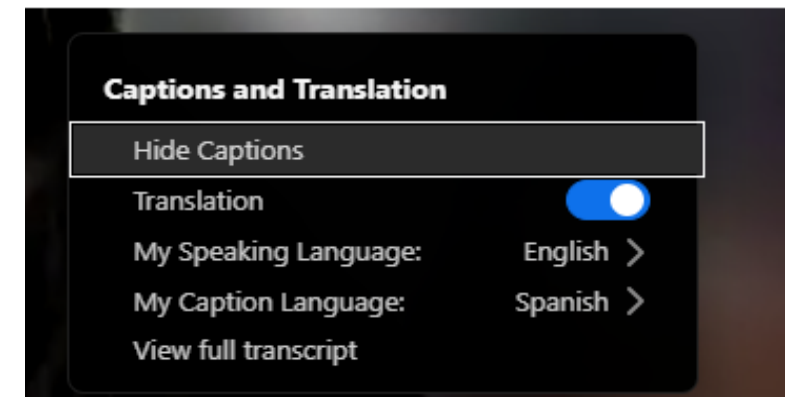
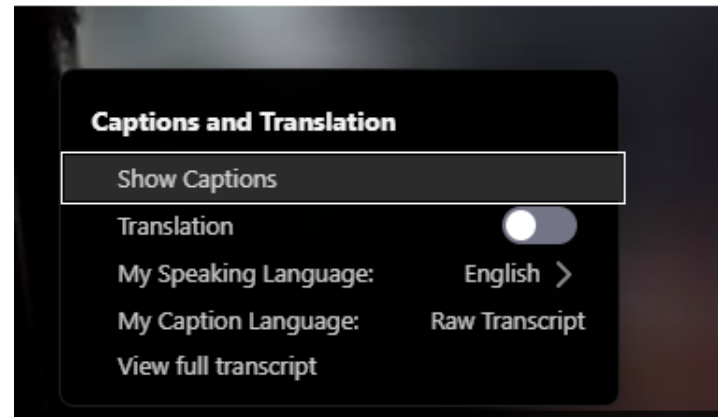
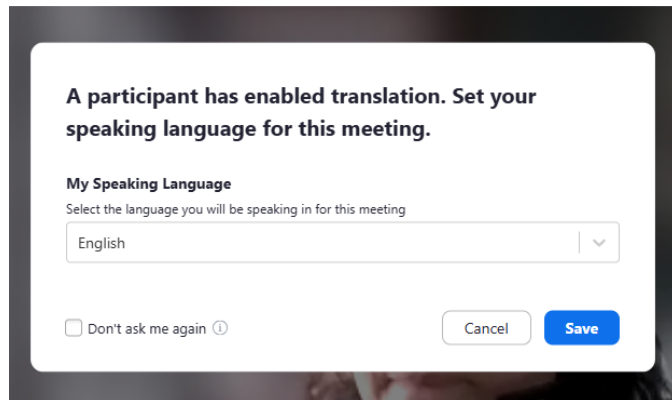
- 1. Review Project Vision and Discuss Desired Outcomes**
- 2. Develop a shared understanding of:**
 - Overall approach to the risk and vulnerability assessment**
 - Historical hazards**
 - Indicators and metrics and how they will be used**

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

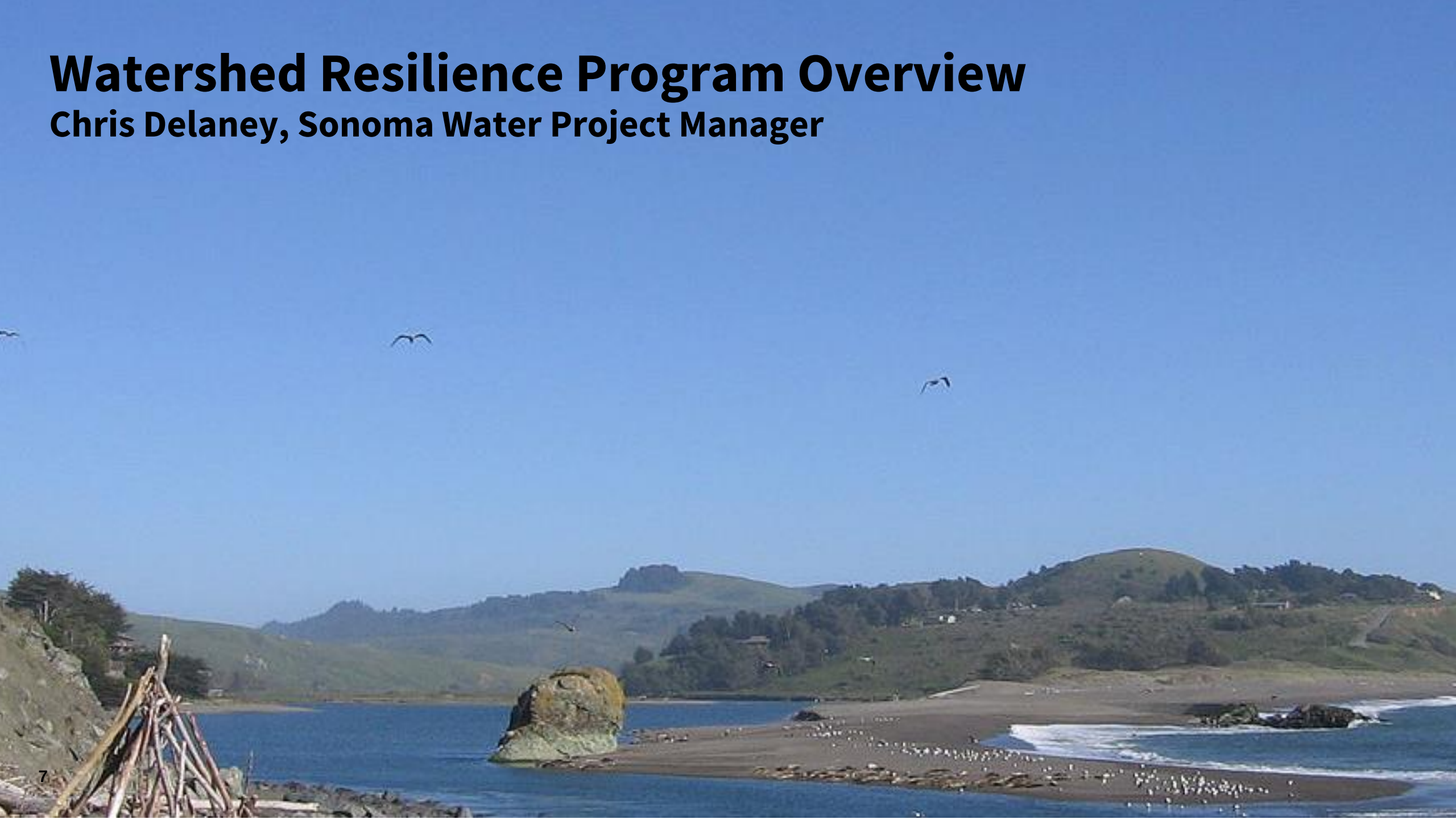
- Apague capciones por navegar al botón en la pantalla, elige “show captions”
- Now turn on captions by going to the CC button on the Zoom toolbar and choosing “show captions”

- En el menú que aparece, prenda traducción
- In the menu that appears, turn on translation
- Al lado do “my caption language”, abra el menú para elegir su idioma preferida
- Next to “My caption language”, open the menu to select your preferred language



Watershed Resilience Program Overview

Chris Delaney, Sonoma Water Project Manager



Project Timeline and Key Milestones

- **Watershed Network Meetings:**

- February - Completed
- May- Today
- September, November 2025
- January, March 2026

- **Draft Watershed Resilience Plan:**

- Early 2026

- **Final Watershed Resilience Plan:**

- April 2026

Task	2024	2025		2026	
Watershed Network Coordination					
- Review Previous Planning Efforts					
- Identify and Assess Existing Regional Networks					
- Develop Watershed Network					
- Watershed Resilience Vision					
- Delineate Watershed Area					
Climate Change Analysis					
- Phase 1: Initial Climate Vulnerability Assessment					
- Phase 2: Detailed Vulnerability and Watershed State Assessment					
- Assess Vulnerabilities and Risks					
- Develop Adaptation Strategies					
- Develop Implementation Strategies					
Watershed Resilience Plan					
- Performance Tracking					
- Draft Watershed Resilience Plan					
- Final Watershed Resilience Plan					

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 GIS mapping of boundary Draft Vision
2 MAY, 6 2025	2. Explore Hazards 3. Assess Vulnerabilities and Risks	Review hazards; identify and describe historical events and impacts; describe future hazards; gap analysis Framing of vulnerability and risk assessment	Historical hazard summary Projections of change Gap analysis Draft vulnerability metrics
3 SEPT 2025	3. Assess Vulnerabilities and risks	Review of vulnerability and risk assessment	Draft vulnerability and risks assessment results
4 NOV 2025	3. Assess Vulnerabilities and risks 4. Develop Adaptation strategies	Review refined vulnerability assessment Identify adaptation strategies for consideration	Vulnerability and risk assessment results 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 Draft recommendations for plan

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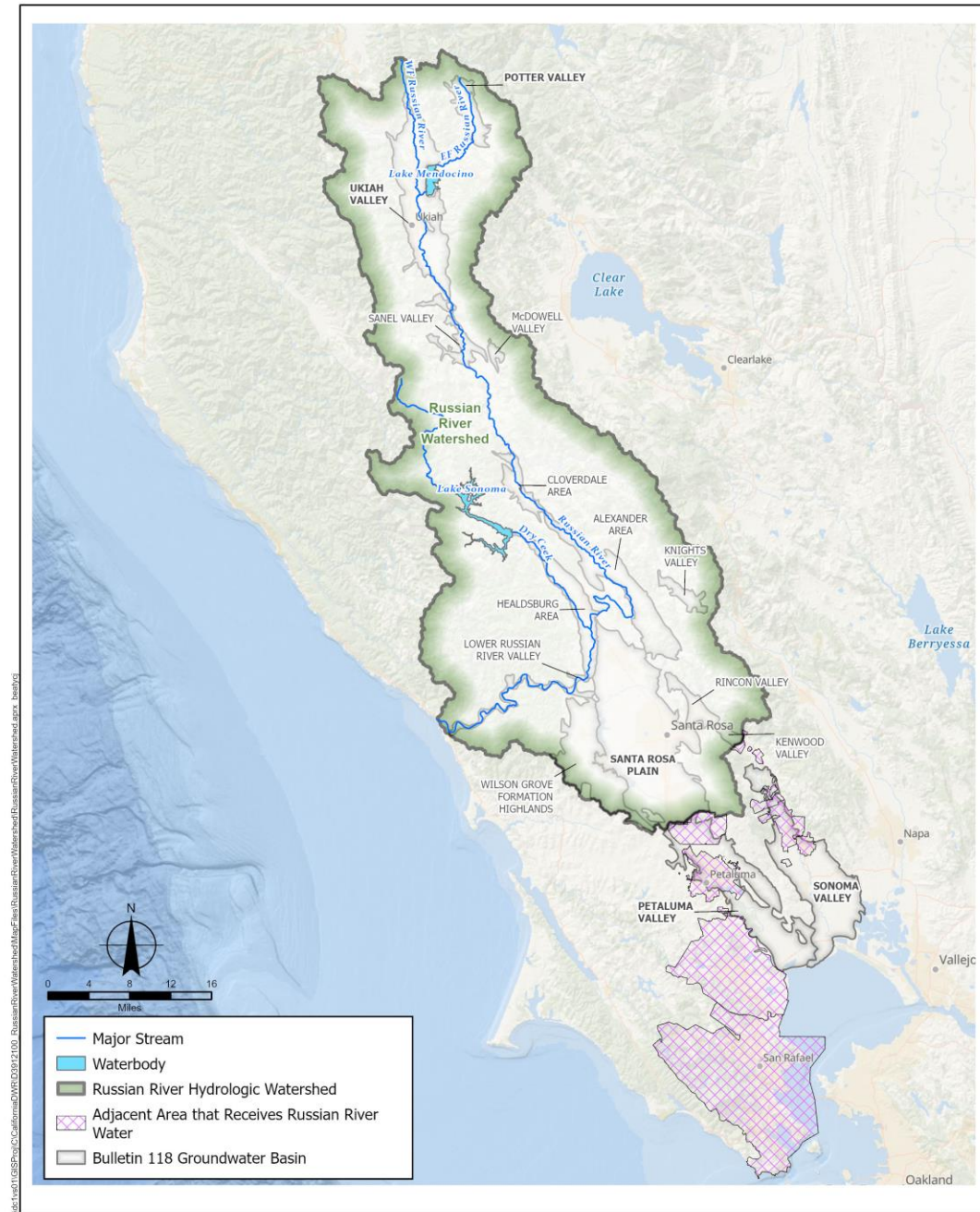
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Study Area Description

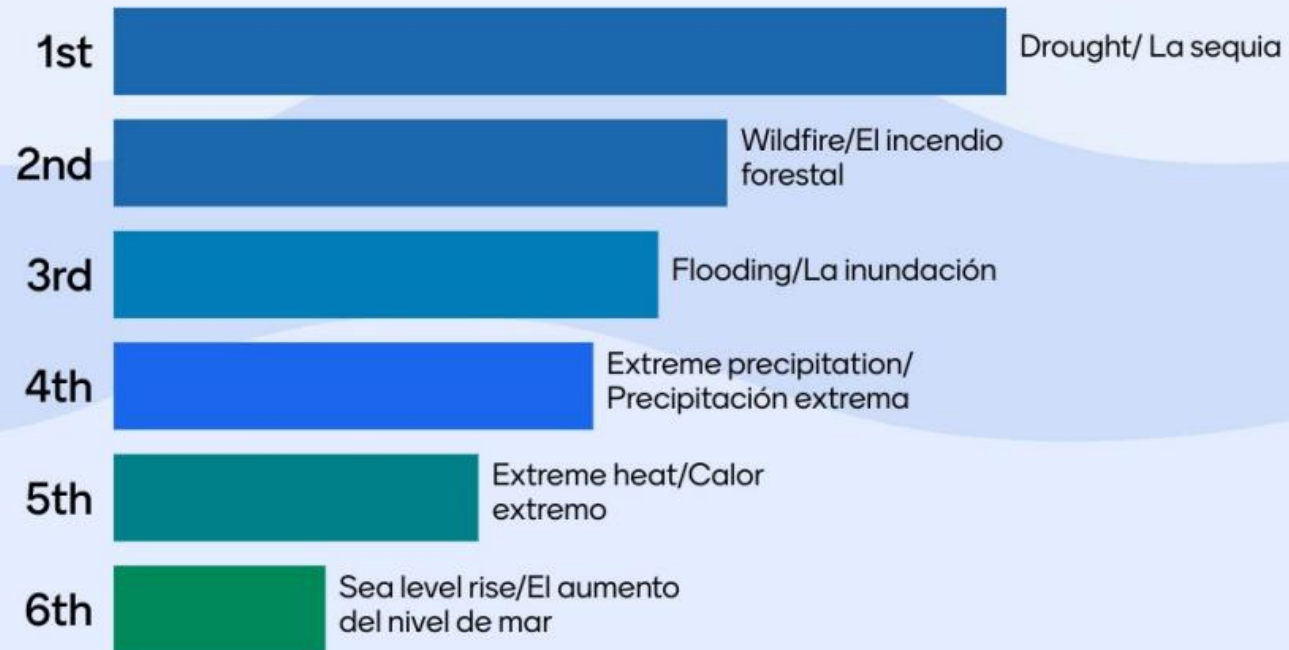
- Boundary
 - Russian River Hydrologic Watershed (HUC 8)
 - Adjacent Areas that Receive Russian River water
- Hydrological Features
 - Lake Mendocino and Lake Sonoma
 - Groundwater basins in RR Watershed, Sonoma Valley groundwater basin, Petaluma Valley groundwater basin
 - Russian River Estuary
- “Plus”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



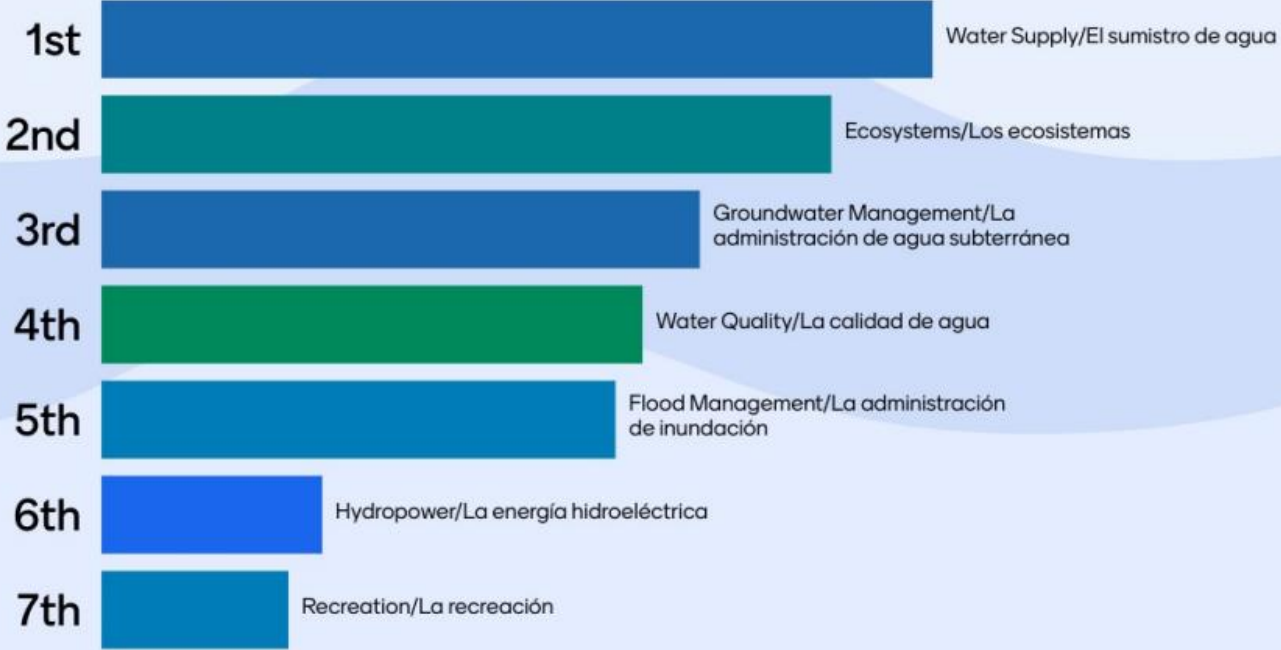
Feedback Review, Vision and Outcomes

Laura Harnish, Jacobs

Rank the climate change impact that concerns you the most for the Russian River watershed. 1 being most concerning and 5 being least.



Which water sectors do you feel are most vulnerable to changes in climate. 1 being the most vulnerable and 5 being the least.



Vision Statement: Interactive Poll

<https://www.menti.com/al1uaqscjffo>

Working together across water resource sectors, Tribal governments, communities and resource agencies to actively steward the resources of the Russian River watershed to be increasingly resilient to the impacts of climate change.



Revised Vision Statement

DRAFT Vision Statement

Actively steward the resources of the Russian River watershed to be increasingly climate resilient by working together across water resource sectors in collaboration with local and Tribal communities.

Cuidar activamente los recursos de la cuenca del río Russian para que sean cada vez más resilientes al clima, trabajando juntos entre los sectores de recursos hídricos en colaboración con las comunidades locales y tribales.


Poll #1: What are your Desired Outcomes

**How will you know that this watershed network and the WRP itself were a success – Desired Outcomes?
Please rank in order of importance:**

- **Substantial Funding for Adaptation Strategies has been secured**
 - **Implementation of Adaptation Strategies is underway**
 - **Relationships developed through this network still exist and have been expanded to address ongoing watershed issues**
 - **The WRP is a living document, continuously updated to reflect changing conditions and inform management decisions**
 - **All communities in the watershed including tribal communities feel that their knowledge, interest and concerns are reflected in the WRP**
 - **Risks to Vulnerable communities have been identified and reduced**
 - **Other (please specify)**
-



Questions?
Hay algunas preguntas?



Framing Vulnerability and Risk Assessments

Major Steps in Watershed Resilience Pilot



1. Set the Stage



2. Explore Hazards



3. Assess Vulnerabilities & Risks



4. Develop Adaptation Strategies



5. Implement & Monitor



Hydroclimate Stressors Being Considered in Vulnerability & Risk Assessment



Temperature

- Increases up to 2.7 – 3.3°F by mid-century
- Increased frequency of temperature extremes (days > 35°C or 95°F)



Sea Level Rise

- MSL increases by 0.7 to 1.3 ft (0.2 to 0.4 m) by mid-century
- Storm surge will cause additional increases



Precipitation

- Extreme precipitation increases (ARs) by 11%
- Increased winter, decreased summer precipitation (more variability)



Drought

- Increasing intensity of drought conditions
- Increasing frequency and duration of dry weather conditions



Wildfire

- More frequent and intense wildfires due to warmer temperatures and drier conditions
- Increase in probability of wildfires by 15-33%



River Flooding

- Potential increase in AR-driven floods on Russian River
- Flooding will become more extreme in the future





Historical Hazards



Historical Hazards Analysis

Purpose:

- Document significant past weather events – extreme heat and precipitation, flooding, drought and wildfire, and their impacts in the watershed
- Provide an understanding based on historical trends analysis, of key watershed vulnerabilities



Common Impacts Reported – Survey Feedback

Event(s)	Reported Impacts
2021–2022 Drought, Walbridge, Kincade, Glass Fires	Major habitat and water quality damage, salmonid breeding disruption
1983 Flood	Water quality impacts from simultaneous formaldehyde spill, shutdown of water supplies
Tubbs, Kincade Fires, WY21 Drought, Atmospheric Rivers	Destroyed infrastructure, increased erosion, severe fire weather, rebuilding challenges
2017 Fire	Contaminant transport via subwatersheds, ecosystem impacts
2017 Redwood Complex Fire, 2021–2022 Drought	Massive acreage burned, home loss, long-term mold, floodplain management issues
Flooding since 1986, fires, drought	Disrupted travel, evacuations, mental health challenges, increased resource mismanagement, wildlife disruptions, agricultural changes, community fire safety efforts
2012–2016 Megadrought, 1986/1995 Floods, 2020–2021 Wildfires, 2023–2024 Floods	Water shortages, farm losses, groundwater depletion, salmonid stress, regulatory changes, habitat damage, increased 2025 wildfire risk, sea level rise impacts
2019 Flood, 2017–2020 Fires, 2014 Cyanobacteria	Business closures, pet deaths from toxic algae, river operation curtailments
2005 Flood, Multiple Droughts/Fires	Treatment plant impacts, need for water supply development, infrastructure damage, water quality issues
2017 Sonoma Complex, 2019 Kincaid Fire	Major community, infrastructure, and natural resource impacts

Common Impacts Reported – Survey Feedback

Droughts (2012–2016, 2021–2022)

- Water shortages for communities and agriculture; small farmers lost land.
- Increased groundwater pumping led to long-term depletion.
- Stress on endangered salmon, steelhead, and aquatic ecosystems.
- Triggered new water regulations and conservation efforts.



Wildfires

- Major fires (Tubbs, Kincade, Walbridge, Glass, Redwood Complex) destroyed homes, forests, and infrastructure.
- Increased erosion, runoff, and water quality issues.
- Community trauma, evacuations, and loss of insurance.
- Boosted local fire safety and vegetation management efforts.



Common Impacts Reported – Survey Feedback

Floods (1983, 1986, 1995, 2005, 2019, 2023–2024)

- Damaged infrastructure, homes, and water systems.
- Road closures, school and business disruptions, long-term mold.
- Channelization and development reduced floodplain capacity, worsening impacts and erosion.



Common Impacts Reported – Survey Feedback

- Loss of life and homes
- Mental health challenges and heightened community stress
- Evacuations, school/business closures, trauma, and loss of insurance
- Disrupted travel and damaged roads/bridges
- Water supply interruptions and need for new infrastructure (e.g., water storage, drip irrigation)
- Water quality issues (e.g., contamination, toxic algae)
- Vegetation changes increasing future wildfire risk
- Channelization and floodplain loss reducing ecosystem resilience
- Agricultural losses, forced sale of farms/ranches

Overview of Climate Hazards

Atmospheric Rivers and Flooding

- Vast majority of floods caused by atmospheric rivers
- Severe flood impacts in lower Russian River watershed
- Extensive economic damage and repeated evacuations (2023, 2019, 1997, and 1986)



Wildfires

- Redwood Complex and Walbridge fires have significantly impacted sub-watersheds including Mark West, Mill, and Grape Creek
- Severe post-fire impact include debris flows, toxic runoff, and water quality degradation



Extreme Temperatures

- Temperatures above 108°F in inland areas, reducing grape yields and triggering harmful algal blooms
- Spring 2008 frost forced vineyard owners to divert large volumes of river water for frost protection causing river flows to plummet and resulting in fish kills



Drought

- Record-low precipitation and reservoir storage (e.g., 2012–2015, 2020–2022)
- Disconnected streams, reduced flows, and elevated water temperatures have caused significant stress for salmon and steelhead in tributaries like Dutch Bill Creek



Major Historical Weather-Related Hazards

1976-
1977



Drought

The driest single year in California's measured hydrologic record occurred in 1977. Severe impacts to reservoirs and groundwater supplies; agricultural losses; increased reliance on emergency water sources.

1986



Flood (February)

Record-breaking atmospheric river event caused Russian River to crest at 49.5 feet, the highest recorded level.

2008



Frost (Spring)

2008 frost season was the worst in over 30 years, with freezing temperatures. Widespread use of water for frost protection in vineyards, led to drops in river flow. Combination of drought and frost led to fish stranding and death of juvenile coho and steelhead trout.

2013-
2016



Drought

Driest four-year period on record for the watershed, with the two warmest years in state history.

2017



Tubbs Fire

Fast-moving wildfire burned through urban-wildland interface areas in Sonoma County. Burned over 36,807 acres; destroyed more than 5,600 structures and killed dozens of residents.

2018



Mendocino Complex Fire (Ranch and River Fires)

Burned 459,123 acres, 280 structures and 1 fatality. Smoke impacts, evacuations, and air quality crisis region-wide.

2019



Flood (February)

Russian River crested at 45.38 feet; widespread evacuations.

2020



LNU Lightning Complex (Walbridge and Meyers) Fires

Burned over 363,220 acres across multiple counties, including Sonoma County. Destroyed over 1,491 structures; extensive damage to hillsides and watersheds affecting Lake Sonoma.

2020-
2022



Drought

Driest three-year period on record for California; record low reservoir levels in Sonoma County; severe water restrictions and 17% reduction in water use. Emergency drought regulations enacted, including curtailments of water diversions and modified reservoir releases to protect water supply for health, safety, and endangered fish species.

Geographic Distribution of Impacts



Watershed-wide: Drought impacts are far-reaching – especially significant in Lake Mendocino, Lake Sonoma, Alexander Valley, Dry Creek Valley, Ukiah Valley, and areas dependent on shallow wells.

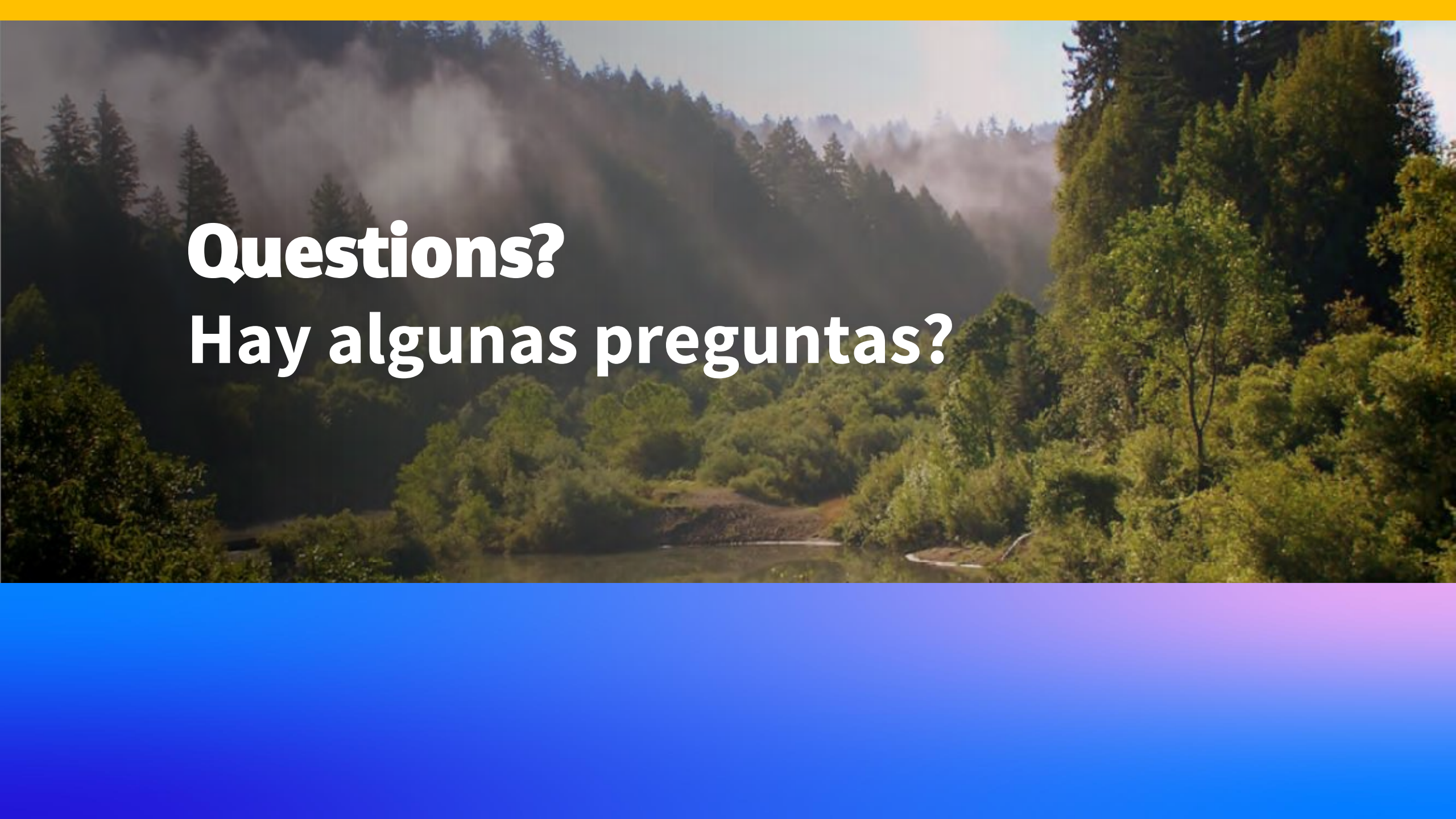
Upper & Middle Watershed:

- Drought and wildfire risks present; some flooding in agricultural valleys - Cloverdale, Healdsburg, Alexander Valley, Dry Creek Valley
- Spring 2008 Frost impacted primarily upper and middle watershed

Lower Watershed:

- Frequent and severe flooding: Guerneville, Monte Rio, Rio Nido, Forestville, Duncans Mills, Mirabel Park
- High wildfire risk in forested areas - Guerneville, Monte Rio, Forestville, Mark West Springs, Wikiup, Fountaingrove





Questions?
Hay algunas preguntas?

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



Climate Metrics – How we communicate trends and change in climate

- Three periods of analysis
 - Historical: 1981-2010 or 1991-2020
 - Future (early): 2026-2055
 - Future (late): 2056-2085
- Climate scenarios:
 - Ensemble range and 3 ensemble-informed scenarios
- Temperature
 - Change in annual and seasonal temperature
 - Extreme heat days ($T_{max} > 95F$ and $T_{max} > T_{98th}$)
- Precipitation
 - Change in annual and seasonal precipitation
 - Changes in wet-dry transitions (duration and frequency change)
 - Extreme precipitation 1% annual exceedance probability
- Sea Level
 - Projections consistent with latest CA Coastal Commission 2024 sea level rise guidance

Hydrological and Landscape Metrics – How we communicate trends and change in hydrology and landscape

- 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
 - Evaporative demand (PET)
- Landscape
 - Soil moisture
 - Anticipated vegetation changes
 - Wildfire probability and burn area

Vulnerability Indicators and Metrics – **Surface Water Supply**

- **Indicators:**

- Monthly and Annual Flow
- Water Supply Reliability
- Reservoir Condition

- **Sample Metrics:**

- Change in monthly and annual flow distribution
- Change in natural flow on Russian River tributaries
- Water delivery reliability
- Change in reservoir storage and frequency





Vulnerability Indicators and Metrics – Groundwater Supply

- **Indicators:**

- Groundwater Level Trends
- Total Volume of in Storage
- Groundwater Quality Trends

- **Sample Metrics:**

- Change in groundwater elevation
- Change in groundwater storage
- Change in Frequency of Exceeding GSP or Historical Reference Thresholds
- Change in Groundwater Quality





Vulnerability Indicators and Metrics – Flood Management

- **Indicators:**

- Flood Stage
- Population Exposure to Flood Events
- Asset Exposure to Flood Events
- Reservoir Condition

- **Sample Metrics:**

- Change in flow for Russian River tributaries
- Change in flow in Santa Rosa Creek
- Change in population at risk in 100-yr and 500-yr floodplain
- Change in value of assets Impacted in 100- and 500-yr Floodplain
- Change in maximum pool and uncontrolled spill frequency for Lake Mendocino and Lake Sonoma



Vulnerability Indicators and Metrics – Ecosystem

- **Indicators:**

- Natural/Ecological Flows
- Wildfire Threat
- Water Quality Impairments

- **Sample Metrics:**

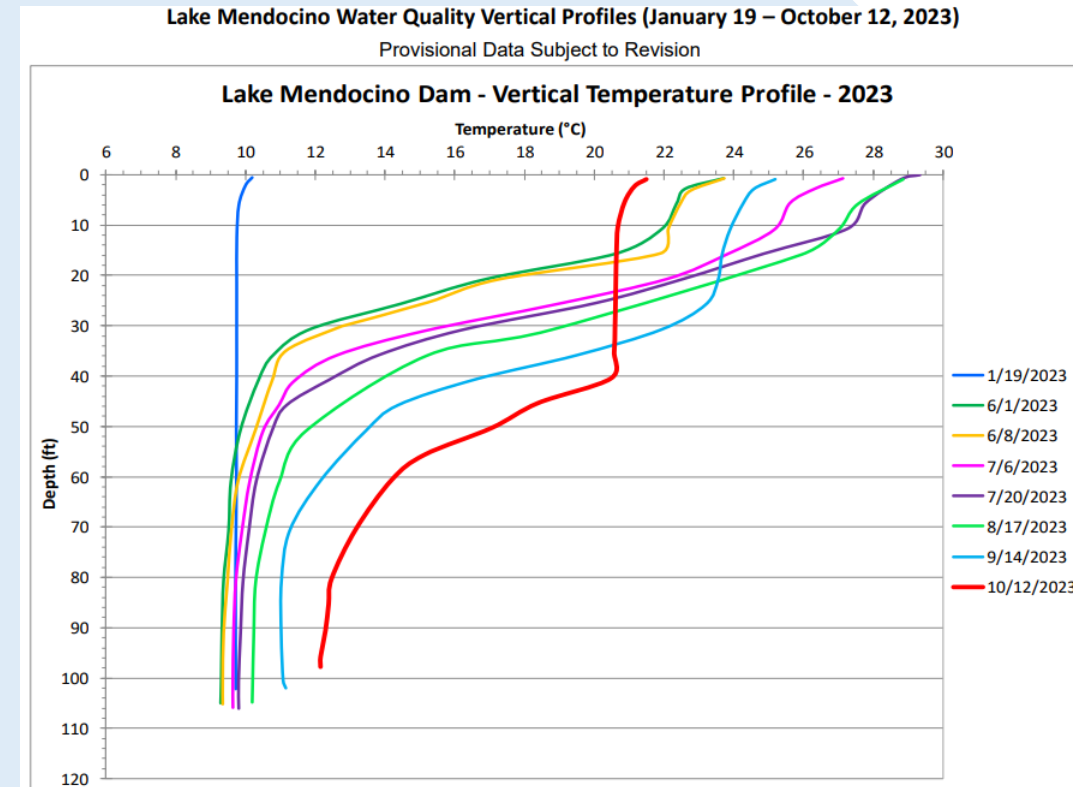
- Change in hydrological flow regimes for Russian R and tributaries
- Change in wildfire burn probability and burn area
- Change in stream water quality
- Change in estimated habitat
- Change in floodplain inundation regime





Vulnerability Indicators and Metrics – Water Quality

- **Indicators:**
 - Water Quality Impairments
- **Sample Metrics:**
 - Change in natural receiving water temperature
 - Change in dissolved oxygen
 - Change in concentration of chemical constituents
 - Change in conditions leading to algal blooms





Vulnerability Indicators and Metrics – Tribal Beneficial Uses and Recreation

- **Indicators:**

- Tribal beneficial uses
- Recreational Uses

- **Sample Metrics:**

- Changes in water levels to Lake Mendocino benefiting recreational opportunities
- Changes in water surface elevations at which recreation sites in Lake Mendocino/ Lake Sonoma become Inundated
- Changes in flows suitable for River recreational access and boating
- Cyanotoxins conditions





Vulnerability Indicators and Metrics – Hydropower

- **Indicators:**
 - Hydropower Generation
- **Sample Metrics:**
 - Change in power production Coyote Valley Dam
 - Change in power production at Warm Springs Dam





Vulnerability Indicators and Metrics – Equity

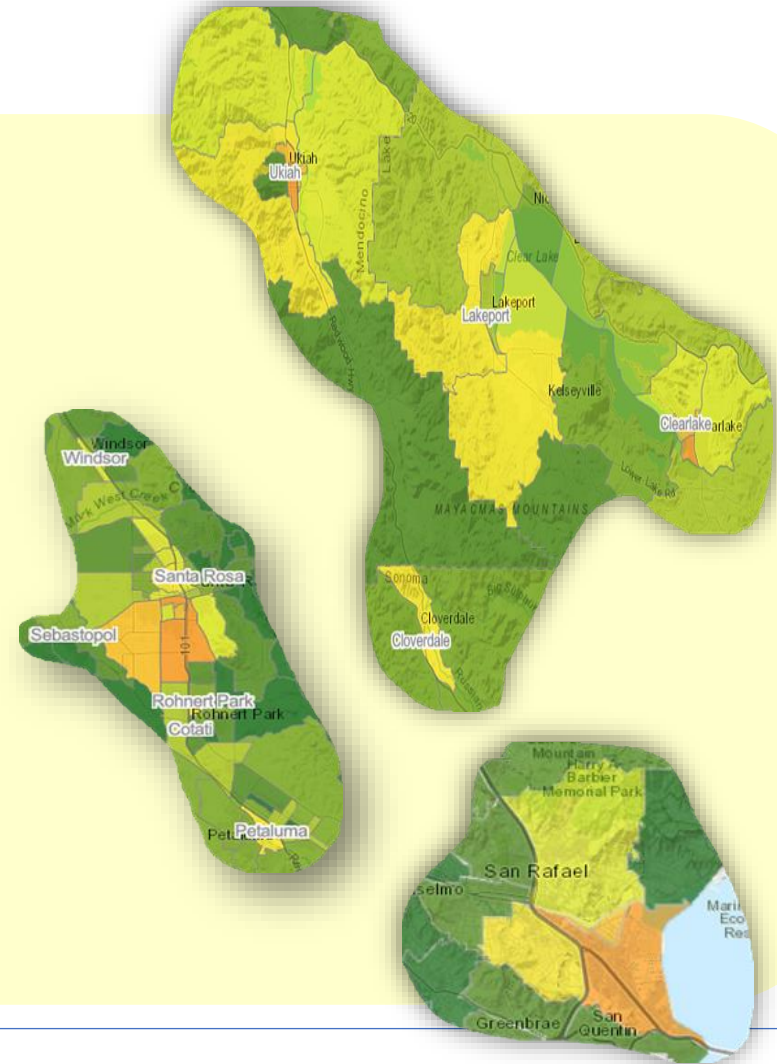
- **Indicators**

- Population Exposure to Risks

- **Sample Metrics:**

- **Change in population exposure to risks**

- Surface Water Supply
- Flood risk
- Extreme heat
- Wildfires
- Groundwater Supply



Poll #2: What additional indicators or metrics would be useful in describing vulnerability?



Questions?
Hay algunas preguntas?

Watershed Network Review of Draft Work Products

Armin Munevar, Jacobs



Project Website

- Website
 - Russian River Watershed Resilience website in development and will be used to share draft work products, data, and resilience plan
- Contents
 - 1. Watershed Resilience Program and Pilot Overview**
 - 2. Watershed Overview**
 - 3. Watershed Network**
 4. Climate Change in the Watershed
 5. Water Sector Vulnerabilities & Risks
 6. Adaptation Strategies
 7. Watershed Resilience Plan
 8. Resources
 9. Data
 - 10. Contact**

Upcoming Work Products Available for your Review

- Draft Gap Analysis
- Draft Historical Hazards
- Draft Indicators and Metrics



Science Engagement

- Science Advisory
 - Provide input on approach for science used to develop watershed resilience plan
 - Specifically in three areas: climate, vulnerabilities, and science-based adaptation strategies
- Science Group
 - Small group selected for expertise
 - Inclusive of academic, agency, tribal, and NGO members
 - Two meetings to provide input:
 - Climate and vulnerability (June/July)
 - Adaptation strategies (September/October)



Upcoming Network Engagement

Poll #3: What additional Network Engagement are you interested in?

- Field Trips hosted by Network Members to observe areas of risk or potential adaptation project sites
- Presentations by Network Members on climate risks and solutions outside of Network Meetings
- Use Network Meeting time to split into smaller Zoom groups for targeted discussion
 - By Sector
 - By location
 - By hazard
- Create opportunities outside of Network Meeting time to have targeted group discussions
 - By Sector
 - By location
 - By Hazard
- Other

Poll #4: Would you attend a webinar for a deep dive on Indicators and Metrics in June?

- Yes
- No



Closing - Thank You

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