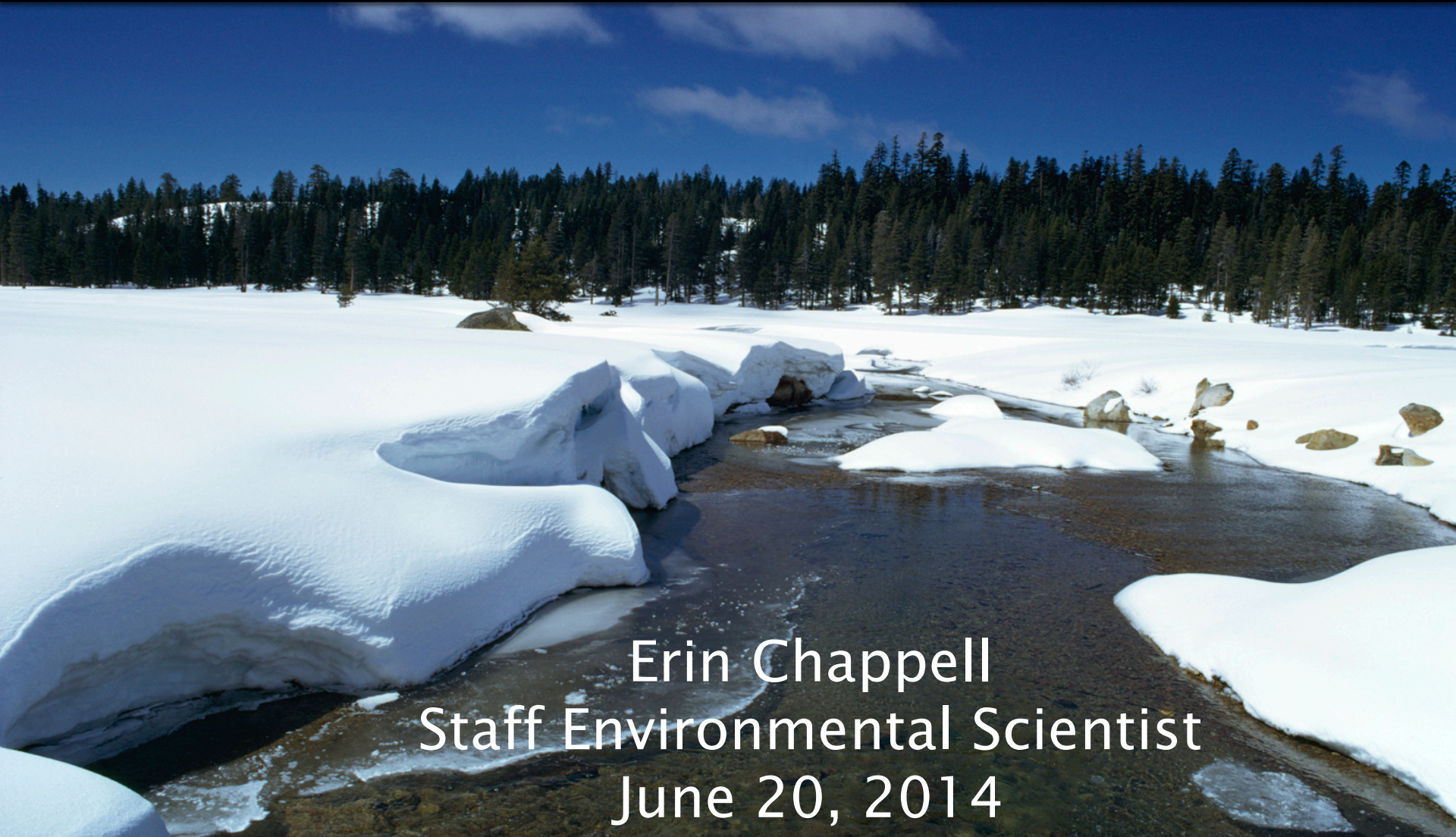




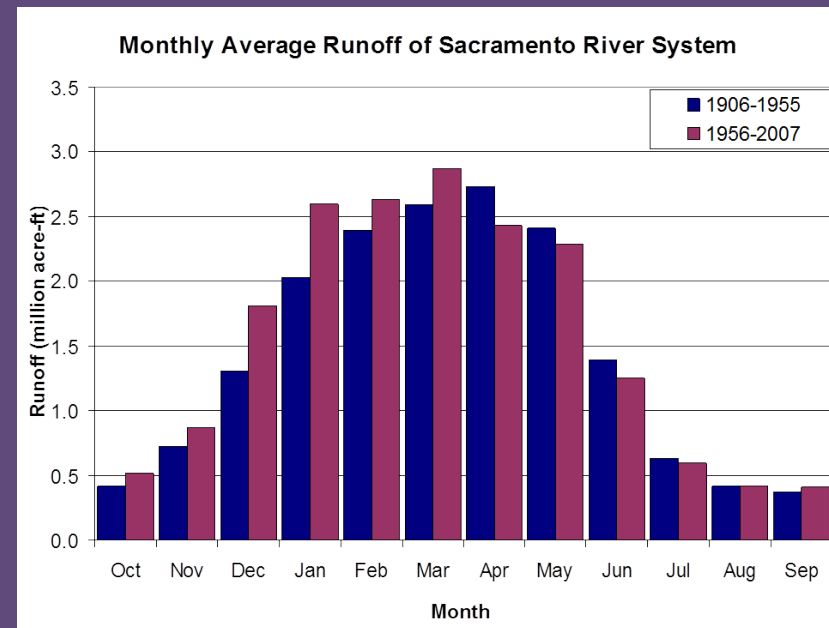
# Climate Change Impacts ~Bay-Delta Region~



Erin Chappell  
Staff Environmental Scientist  
June 20, 2014

# In the Past 100 years...

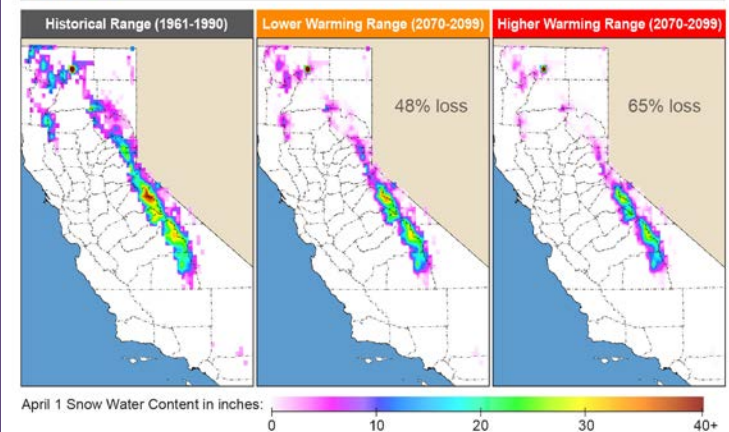
- ❖ 1°F rise in average temperatures
- ❖ 10% overall loss of snowpack in the Sierra Nevada
- ❖ Changes in runoff timing
- ❖ An average sea level rise of 7" along the California coast



# In the Next 40 years...

- ❖ 1 – 3.6°F temperature rise
- ❖ 25 - 40 % reduction in snowpack
- ❖ Sea level rise: 5-24”
- ❖ Less summer/fall runoff
- ❖ More intense wet and dry periods

Figure 3-22 Historical and projected California snowpack



Historical and projected April 1 Snow Water content for the Sierra for lower and higher warming scenarios depicting the effect of human generated greenhouse gases and aerosols on climate. By the end of this century, the Sierra snowpack is projected to experience a 48 to 65 percent loss from its average at the end of the previous century (Pierce and Cayan, 2013).



**“...depending on the vulnerability of human and natural communities and their abilities to respond to these growing risks through adaptive changes, the San Francisco Bay Area could experience either significant impacts or maintain its resilience in the face of a rapidly changing environment.”**

*- Ekstrom & Moser*

*CEC-500-2012-071*

# Bay Area Climate Change Projections

## ❖ Temperature

- 2050 ↑ 2.7°F; 2100 ↑ 3.6-10.8°F
- Longer period of heat extremes (June-Sept)

## ❖ Precipitation

- Annual total relatively unchanged
- Increase in frequency & intensity of extreme storms

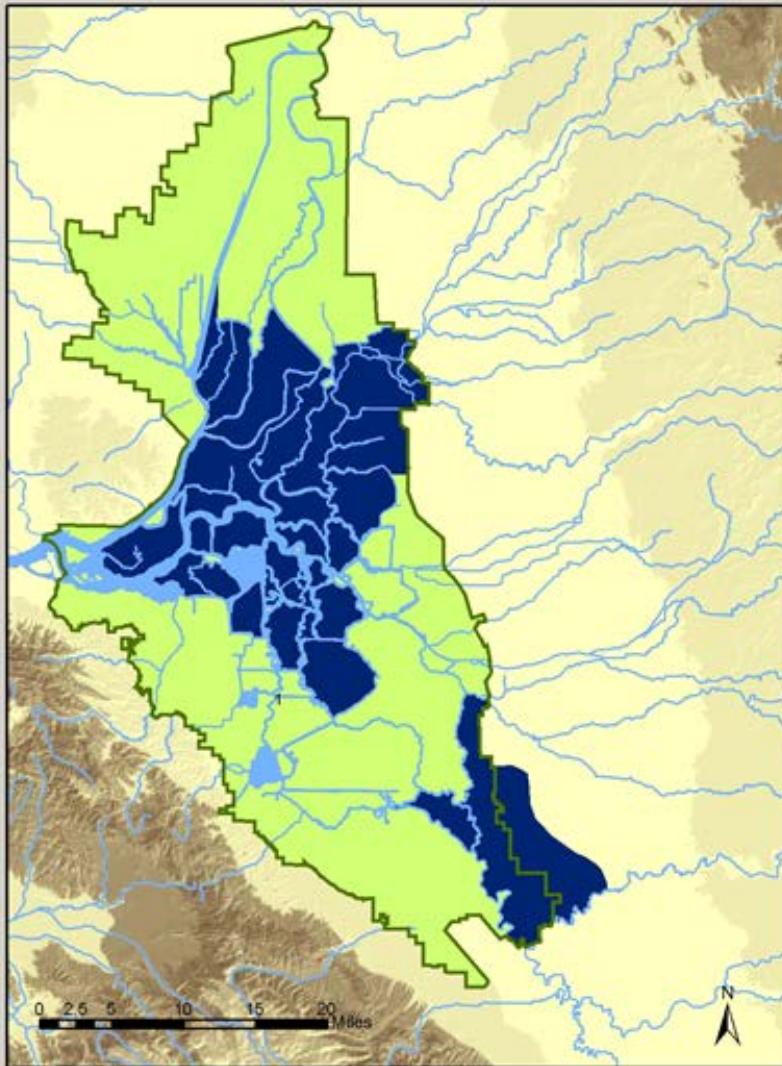
## ❖ Sea level rise

- 2050 5-24"; 2100 17-66"
- Increase in number & duration of extreme SL events

## ❖ Fire

- Increase in risk
- Longer fire season

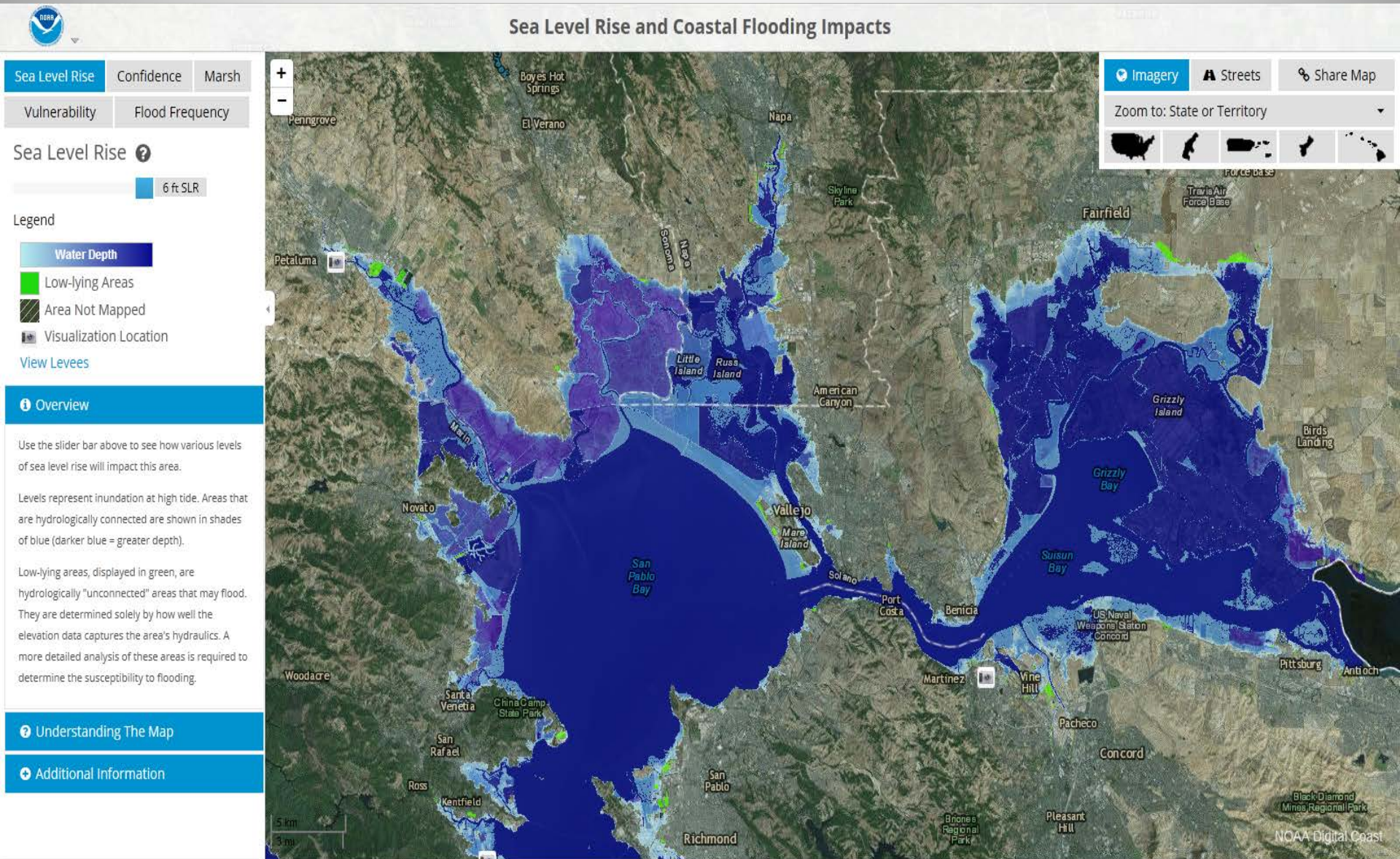
# Projected Sea Level Rise



Areas most at risk in the  
Delta with 2-foot sea  
level rise.

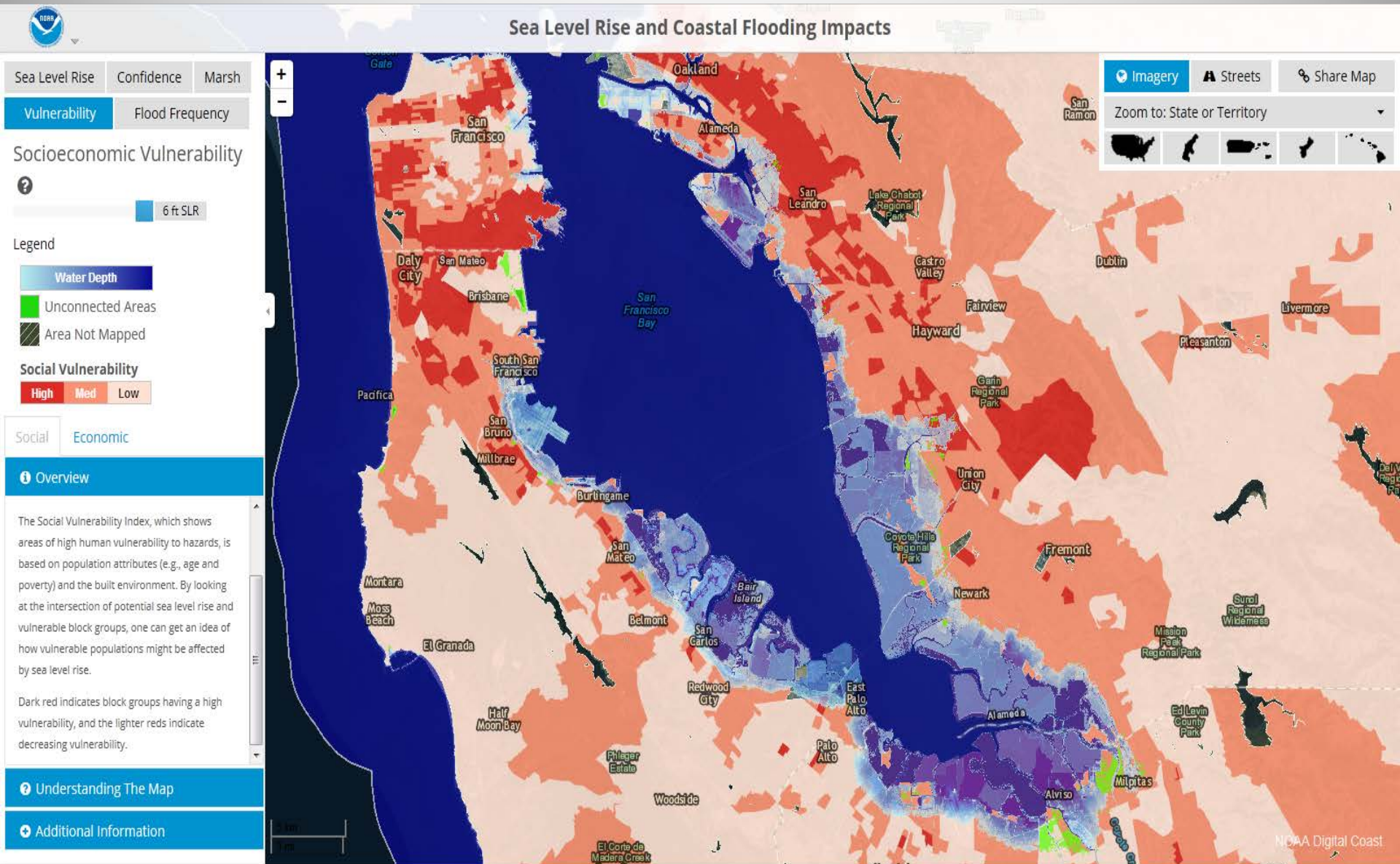


# Projected Sea Level Rise – North Bay





# Projected Sea Level Rise – South Bay





# Regional Sector Impacts

## Water Supply

### Marin

- ❖ Annual local rainfall

### San Francisco/East Bay

- ❖ Timing and quantity of Sierra Nevada snowmelt

### Other Areas

- ❖ Changes in Delta and local groundwater supplies

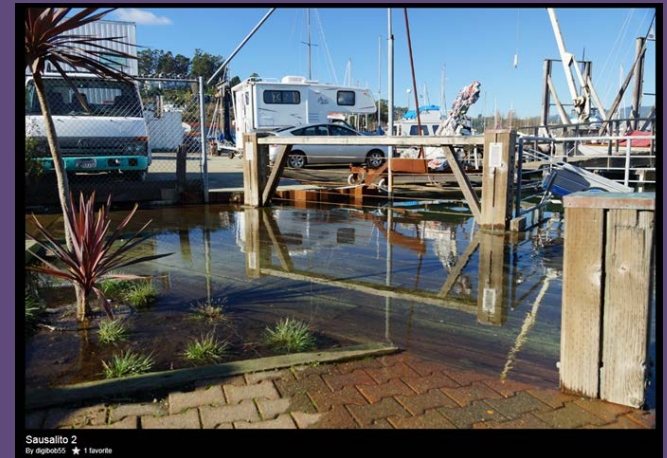


# Regional Sector Impacts

## Infrastructure & Development

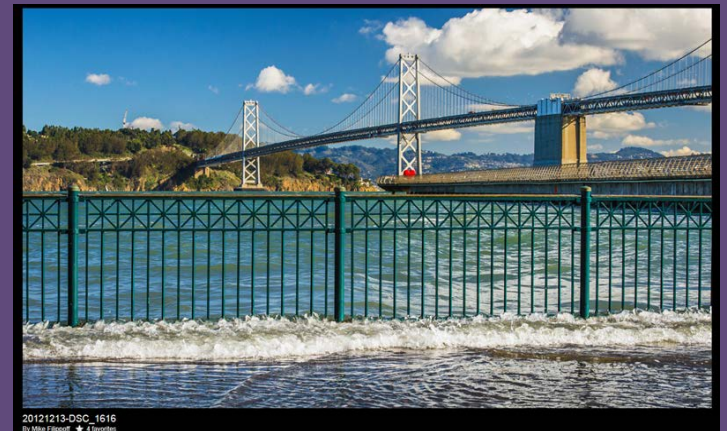
### Infrastructure

- ❖ Impairment and damage
- ❖ More frequent inoperability
- ❖ San Mateo & Alameda particularly vulnerable



### Development – w/ 55” SLR

- ❖ 270,000 people
- ❖ \$62 billion in assets
- ❖ 333 sq. miles of shoreline





# Regional Sector Impacts

## Agriculture

### General Impacts

- ❖ Increase in water demand
- ❖ Increase in pests/disease
- ❖ Shifts in crop type



### North Bay

- ❖ Suboptimal conditions for high quality wine grapes
- ❖ Potential increase in forage production but shorter growing season & decrease in reliability



# Regional Sector Impacts

## Ecosystems & Biodiversity

### Wetlands

- ❖ SB - limited landward migration
- ❖ NB - more migration potential



### Fisheries

- ❖ Threatens 82% of natives
- ❖ Benefits non-natives



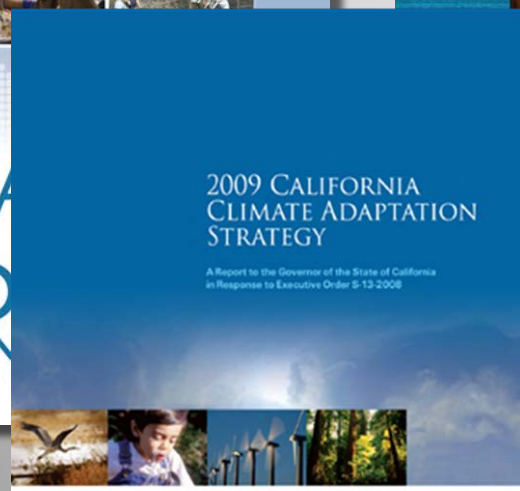
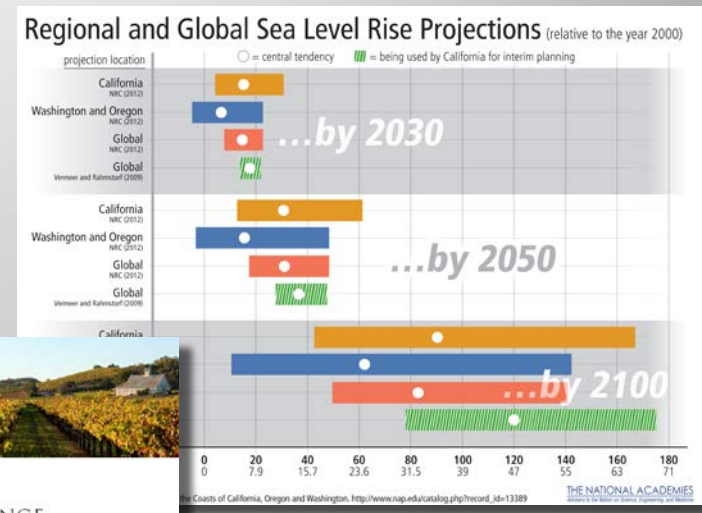
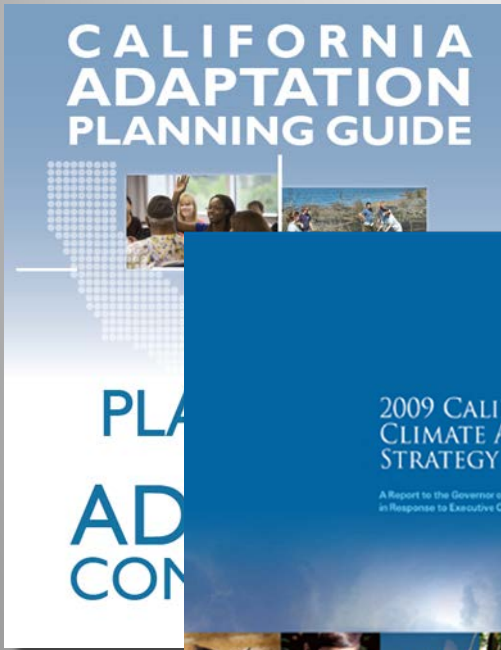
### Plant Communities

- ❖ Coastal shift
- ❖ Less diversity (endemics)





# Mitigation & Adaptation Efforts Statewide



**CALIFORNIA CLIMATE CHANGE PORTAL**

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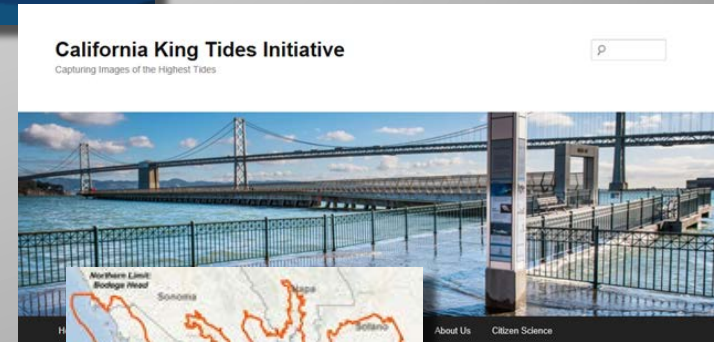
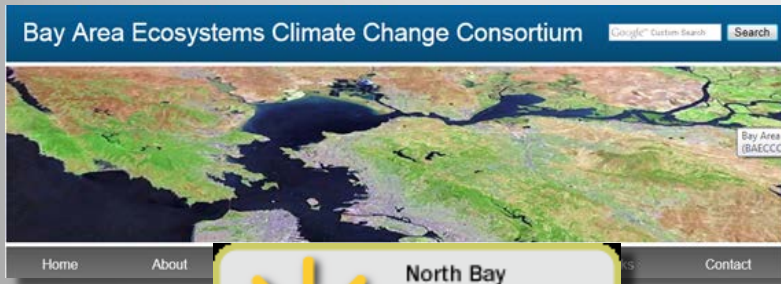
HOME STATE LOCAL INDIVIDUALS BUSINESS SCIENCE

**Climate Action Team Working Groups**

- Agriculture
- Biodiversity
- Coastal and Ocean Climate Adaptation Team (CO-CAT)
- Interagency Forestry Working Group (IFWG)
- Land Use and Infrastructure Working Group (ICLU-In)
- Public Health Working Group
- Research Working Group
- State Government
- Water Energy Climate Action Team Working Group (WET-CAT)



# Mitigation & Adaptation Efforts Bay Area





# Mitigation & Adaptation Efforts Delta



DELTA STEWARDSHIP COUNCIL

The Delta Stewardship Council was created in legislation to achieve the state mandated coequal goals for the Delta. "Coequal goals" means the two goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem. The coequal goals are achieved in a manner that protects and enhances the unique cultural, recreational, natural resources, and agricultural values of the Delta as an evolving place." (CA Water Code §85054)



## Twitchell Island Carbon Sequestration Wetlands



SACRAMENTO-SAN JOAQUIN  
DELTA CONSERVANCY

**BDCP**  
BAY DELTA CONSERVATION PLAN

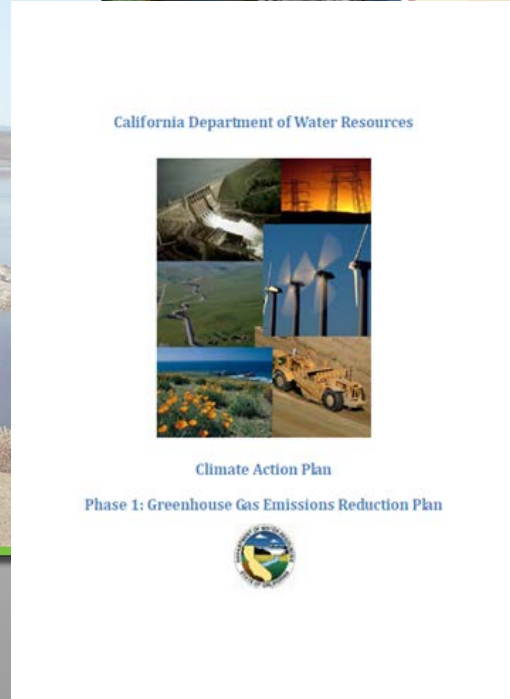
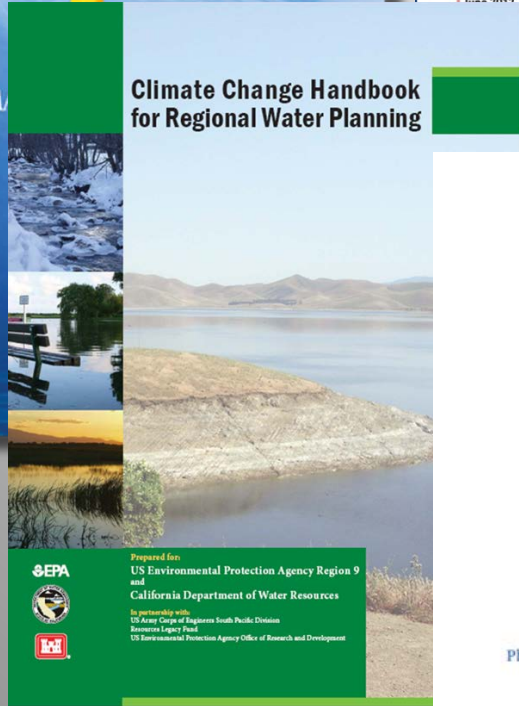
A Collaborative Approach to Restore the Sacramento-San Joaquin Delta's Ecosystem and Protect California's Water Supplies



2012 Strategic Plan

# Mitigation & Adaptation Efforts

## DWR





# Addressing Climate Change

## A Cross-sector Approach in the Bay-Delta Region

- ❖ Regional planning needs to include considerations of vulnerabilities to climate change and risks
- ❖ We must embrace an entirely new way of thinking about planning and management
- ❖ We need to focus on both mitigation & adaptation
- ❖ The decisions and investments we make *now* will play a large role in determining the region's resiliency in the face of a changing climate

## Climate Change



Climate change is having a profound impact on California water resources, as evidenced by changes in snowpack, sea level, and river flows. These changes are expected to continue in the future and more of our precipitation will likely fall as rain instead of snow. This potential change in weather patterns will exacerbate flood risks and add additional challenges for water supply reliability.

The mountain snowpack provides as much as a third of California's water supply by accumulating snow during our wet winters and releasing it slowly when we need it during our dry springs and summers. Warmer temperatures will cause what snow we do get to melt faster and earlier, making it more difficult to store and use. By 2050, scientists project a loss of at least 25 percent of the Sierra snowpack. This loss of snowpack means less water will be available for Californians to use.

Climate change is also expected to result in more variable weather patterns throughout California. More variability can lead to longer and more severe droughts. In addition, the sea level will continue to rise threatening the sustainability of the Sacramento-San Joaquin Delta, the heart of the California water supply system and the source of water for 25 million Californians and millions of acres of prime farmland.

The Department of Water Resources (DWR) is addressing these impacts through mitigation and adaptation measures to ensure that Californians have an adequate water supply, reliable flood control, and healthy ecosystems now and in the future. Below are some of DWR's climate change activities.

- In May, 2012 DWR adopted phase 1 of its Climate Action Plan, a Department-wide [Greenhouse Gas Emissions Reduction Plan](#)
- In October, 2010 DWR adopted an [Environmental Stewardship Policy](#) which supports a "Total Resource Management" approach to planning activities and projects Department-wide
- DWR in cooperation with the U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, and Resources Legacy Fund completed the [Climate Change Handbook for Regional Water Planning](#) (2011)
- DWR released summaries of its climate change achievements as a [Poster](#) and [Brochure](#) (2010)
- DWR adopted its own [Sustainability Policy](#) to promote a departmental change in the way DWR does business (2009), and established clear and measurable [Goals](#) for sustainability implementation (2010). [Visit DWR's Sustainability Portal](#) and [Watch DWR's Sustainability Videos](#).
- In 2007, 2008, and 2009, DWR was a member of the California Climate Action Registry and made the list as a Climate Action Leader by reporting its GHG emissions and having the data verified through a third party audit. In 2010, DWR transitioned to [The Climate Registry](#), a North America-wide climate registry, and continued to provide third party verified GHG emissions inventory data.
- DWR adopted a [Climate Change Adaptation Strategy](#) (2008)

### Other Climate Change Activities

Adapting to the current and future effects of climate change is essential for DWR and California's water managers. DWR addresses climate change in its California Water Plan, which is updated every five years. The California Water Plan provides a framework for water managers, legislators, and the public to consider options and make decisions regarding California's water future. DWR continues to improve and expand the analysis of climate change in the California Water Plan. The [2009 California Water Plan Update](#) includes multiple scenarios of future climate conditions and stresses the inclusion of uncertainty, risk, and sustainability.

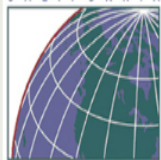
### [Climate Change Technical Advisory Group](#)

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- [Current Perspectives Blog Archive](#)



### The Climate Registry

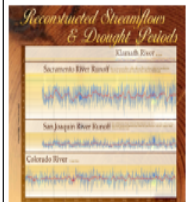
CALIFORNIA



Climate ACTION TEAM

### Featured Link

[Paleoclimate \(Tree-Ring\) Study Released](#)



New Hydroclimate Reconstructions have been released, using updated tree-ring chronologies for these California river basins: Klamath, San Joaquin and Sacramento. The report, prepared by the University of Arizona, allows assessment of hydrologic variability over centuries to millennia, gives historic context for assessing recent droughts, and can be used in climate change research.

[Report](#)  
[Poster](#)  
[Data files](#)

# [www.water.ca.gov/climatechange](http://www.water.ca.gov/climatechange)