Climate Change Adaptation in SLO County

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National Center for Conservation Science and Policy

Photo by J. Zimmerlin

Local Government Commission

National Center for Conservation Science & Policy

ClimateWise Process

Funded by the KRESGE FOUNDATION

WHAT IT DOES

- Provides up-to-date scientific information
- Provides regionally-specific projections
- Works across disciplines to develop co-beneficial recommendations
- Creates new lines of communication

WHAT IT DOESN'T DO

- Instill our own values or recommendations
- Take a political stance
- Create a full adaptation plan for the County
- Implement strategies or recommendations

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The *ClimateWise* Approach: A Framework for Integrating Human and Ecosystem Adaptation

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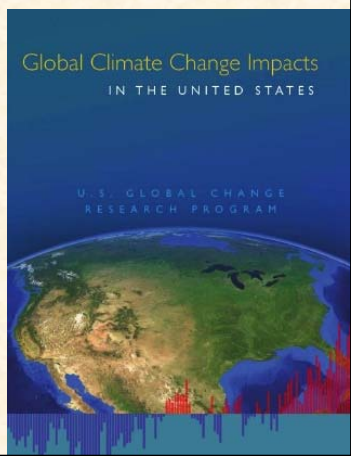
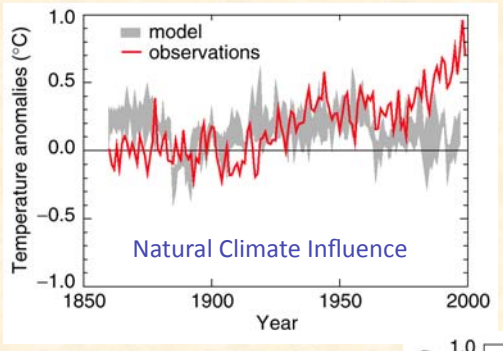
Primary findings of the latest U.S. government report on climate change impacts (released last summer)

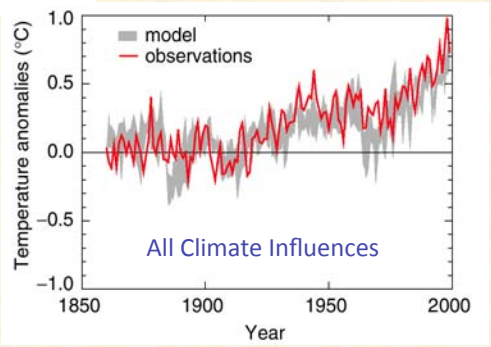
1. Global warming is unequivocal and primarily human-induced
2. Wide-spread climate-induced changes are already underway and expected to increase
3. Climate change WILL stress water resources worldwide
4. Crop and livestock production WILL be challenged
5. Thresholds WILL be crossed, leading to large changes in climate and ecosystems
6. Future climate change and its impacts depend on choices made today

Global Climate Change Impacts in the United States. 2009. T. R. Karl, J. M. Melillo, and T. C. Peterson, eds. Cambridge University Press.

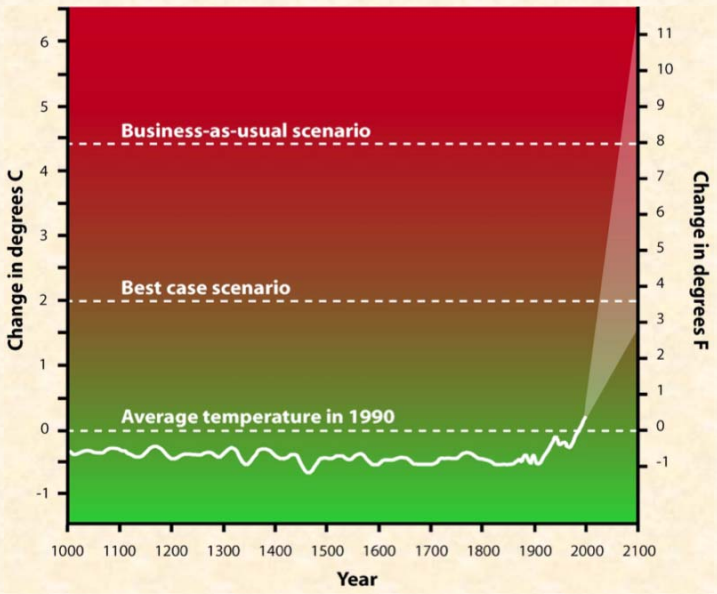




"Unequivocal" evidence: the climate is changing and it is human caused (IPCC 2007)



Average Global Temperature



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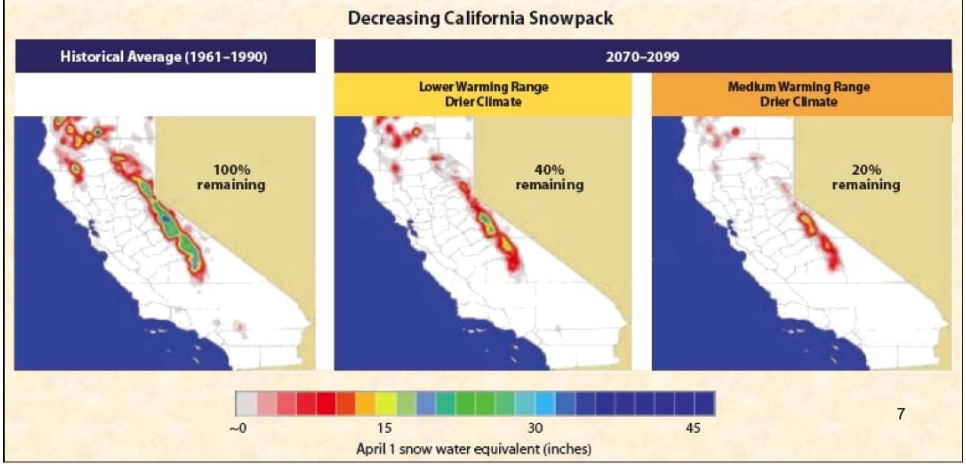
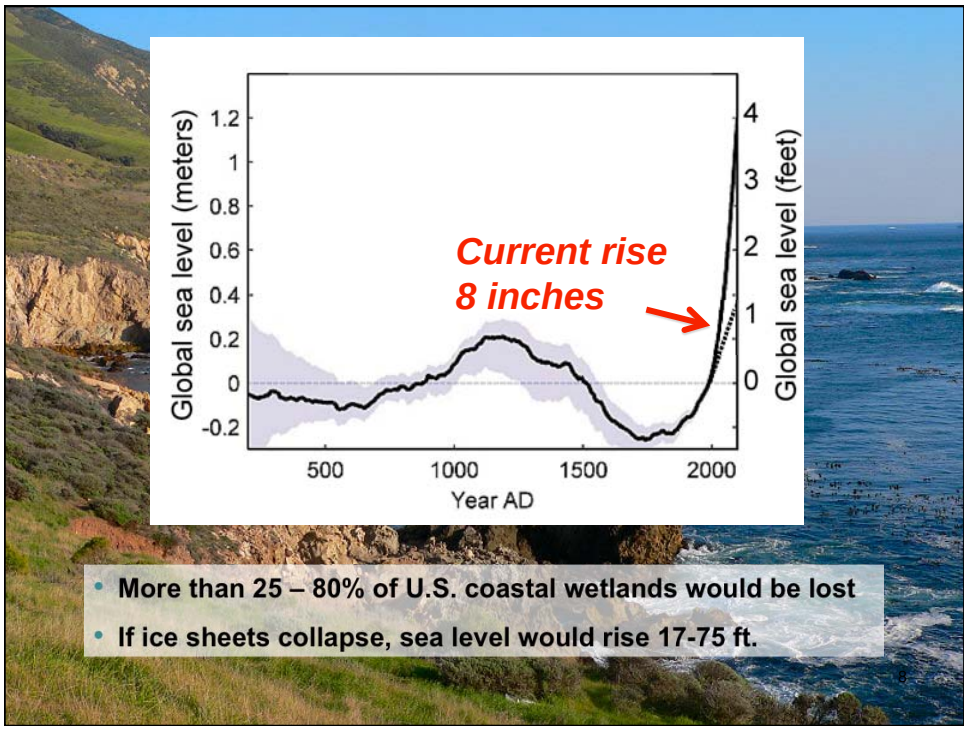
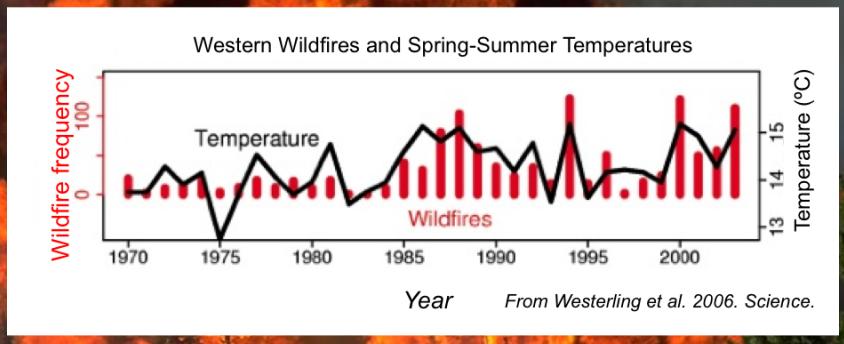
Climate Change Impacts

- 3-11˚ F increase by 2099
- Higher drought stress in summer
- Increase in severe storms
- Snowfall shifting to rainfall
- Declining snowpack





Increasing risk of wildfire

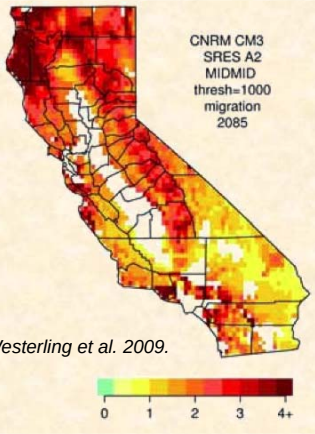


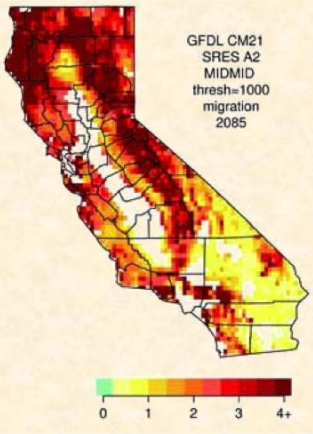
From Westerling et al. 2006. Science.

6-fold increase in area burned since 1986

Statewide averages - A2 Scenario

2005-2035 107% – 141% of historical fire
2035-2064 117% – 170%
2070-2099 157% – 269%





From Westerling et al. 2009.

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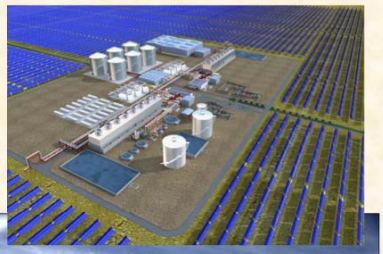
Human response to climate change



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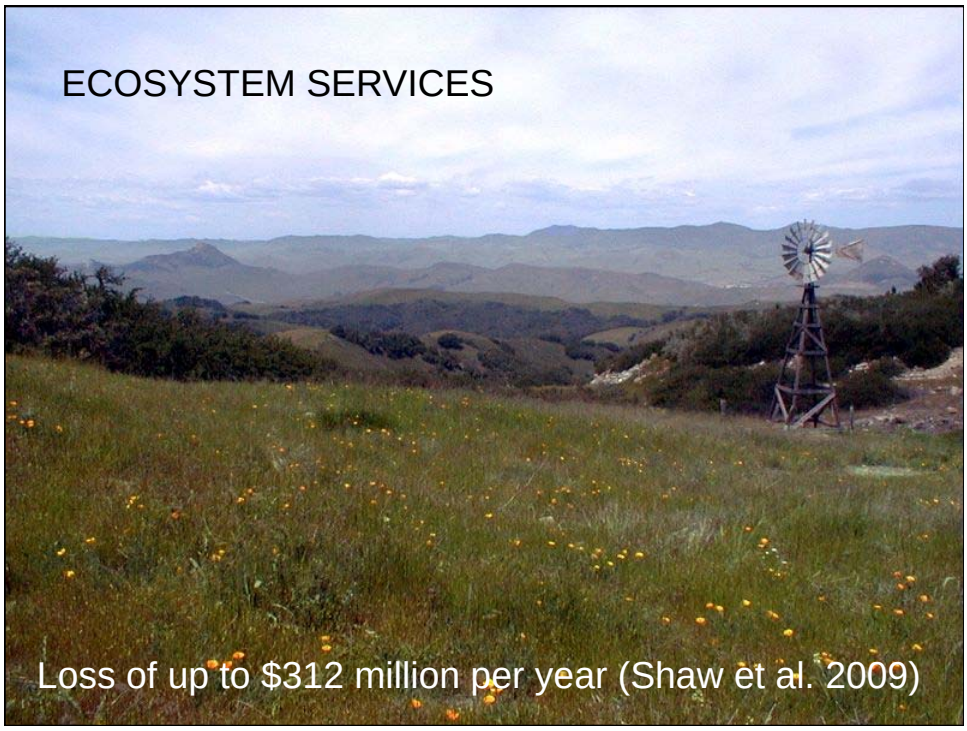
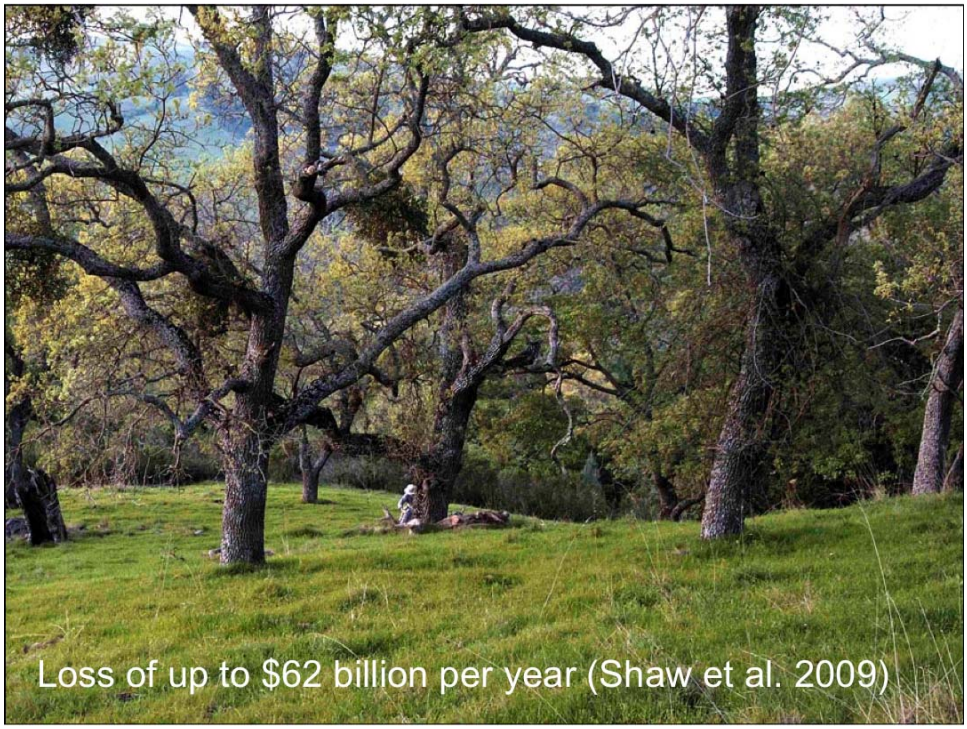
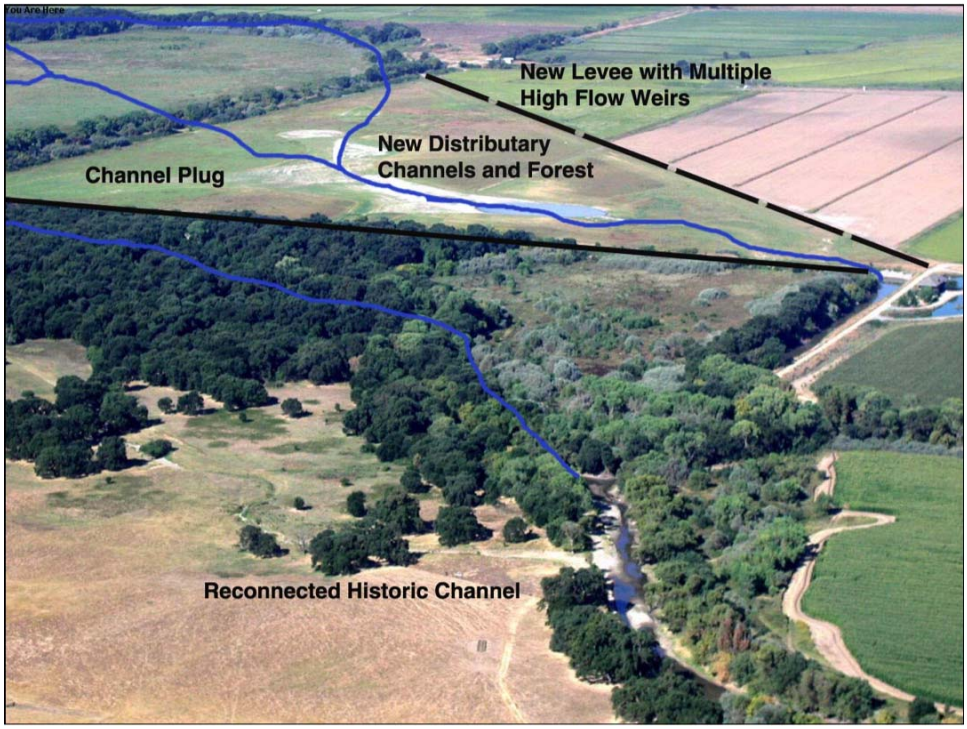
ECOSYSTEM SERVICES



Loss of up to $312 million per year (Shaw et al. 2009)


Loss of up to $62 billion per year (Shaw et al. 2009)


New Levee with Multiple
High Flow Weirs
New Distributary
Channels and Forest
Channel Plug
Reconnected Historic Channel

Adaptation Strategies

Strategy	Benefits	Co-benefits/conflicts
1. Restore floodplains	Reduces flood incidence, increases late summer flow	Increases aquatic systems resilience to climate change Moderately inexpensive

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2. Build new dams	Increases water storage capacity, provides flood control	Decreases aquatic systems resilience Expensive
3. Reintroduce beavers	Increases late summer flow, increases water storage, reduces flood incidence	Increases biological diversity Permeable to fish movement Inexpensive

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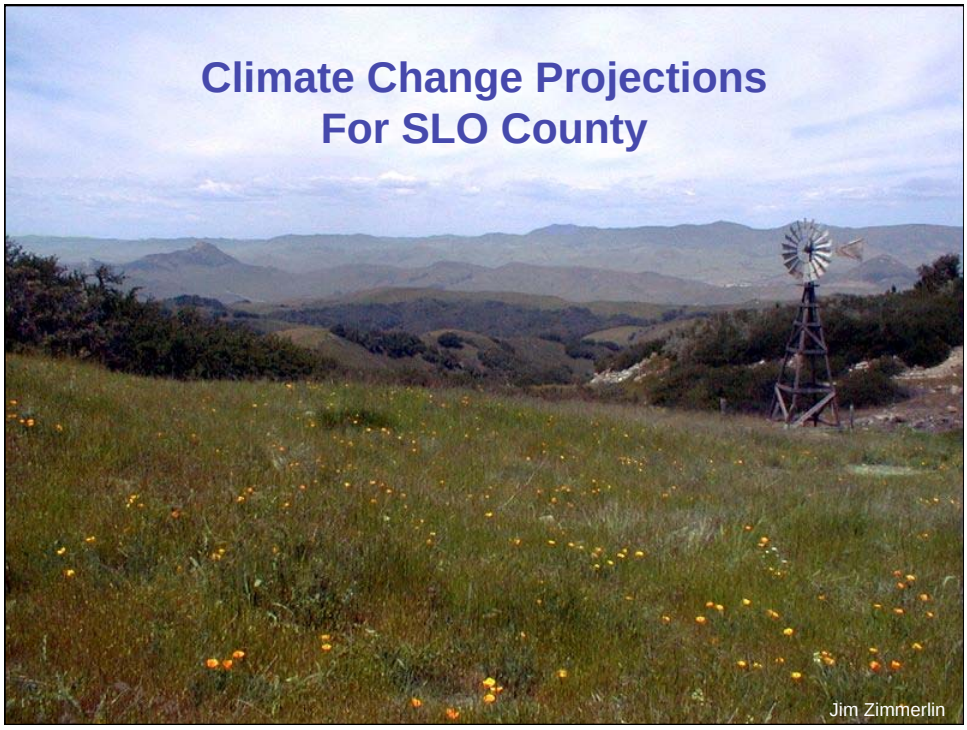
Climate Change Projections For SLO County



Jim Zimmerlin

Climate Change Projections

- 3 global climate models
  - Temperature
  - Precipitation
- Model output downscaled to 8km x 8km resolution
- Downscaled output used to run vegetation model (MC1) with fire module
- CEC reports and other relevant studies also reviewed

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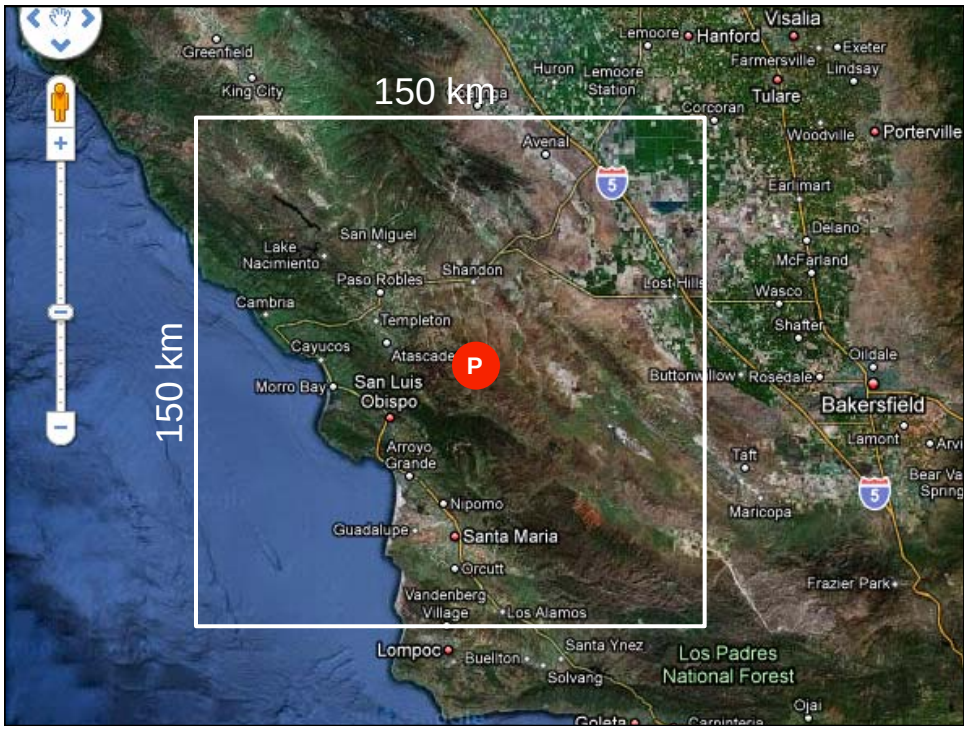
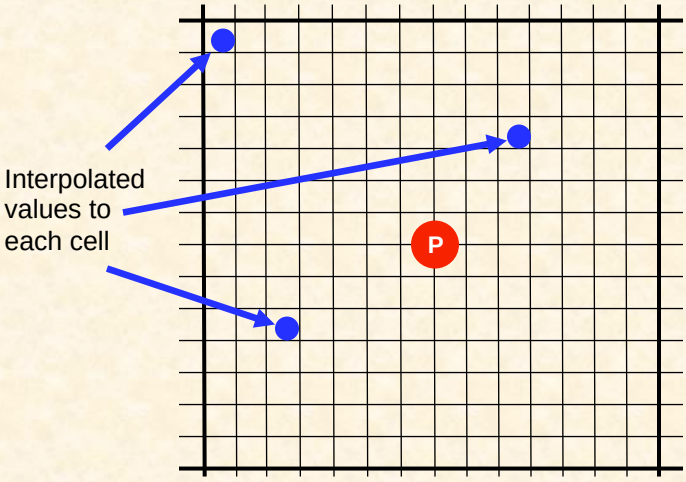


Refining the scale of global models



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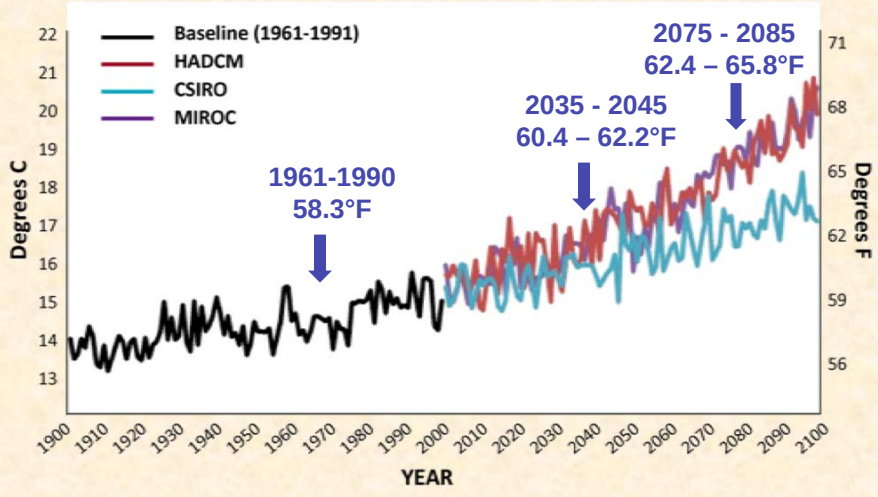
Annual Average Temperature for SLO County



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Average Temperature for the County

2035-2045

Season	Historic	CSIRO	HADCM	MIROC
Spring	55.5° F	+2.1° F	+3.9° F	+3.5° F
Summer	69.9° F	+1.8° F	+4.2° F	+4.7° F
Fall	60.3° F	+2.8° F	+3.7° F	+3.9° F
Winter	47.3° F	+1.7° F	+2.8° F	+3.6° F

2075-2085

Season	Historic	CSIRO	HADCM	MIROC
Spring	55.5° F	+3.6° F	+7.6° F	+6.6° F
Summer	69.9° F	+4.3° F	+8.8° F	+8.9° F
Fall	60.3° F	+5.0° F	+7.9° F	+7.5° F
Winter	47.3° F	+3.4° F	+5.9° F	+7.0° F

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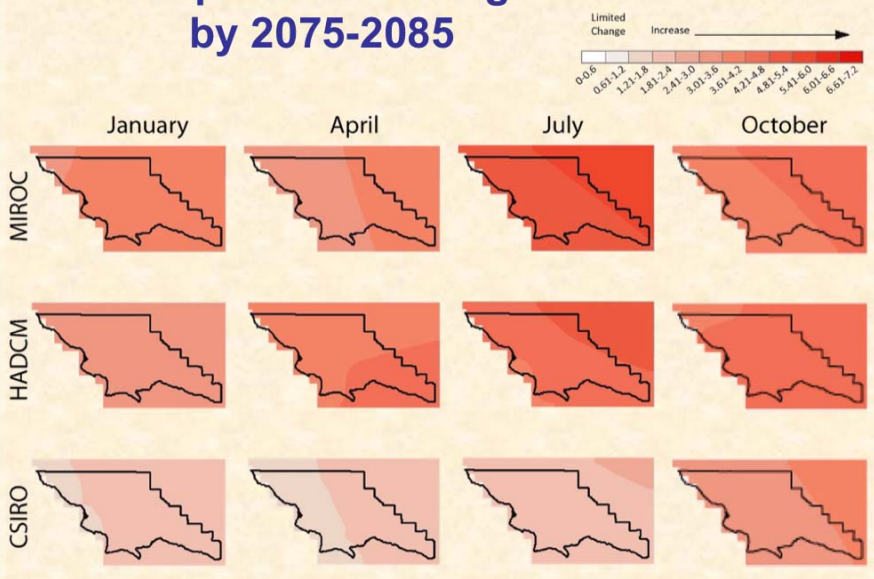
Temperature Change by 2075-2085



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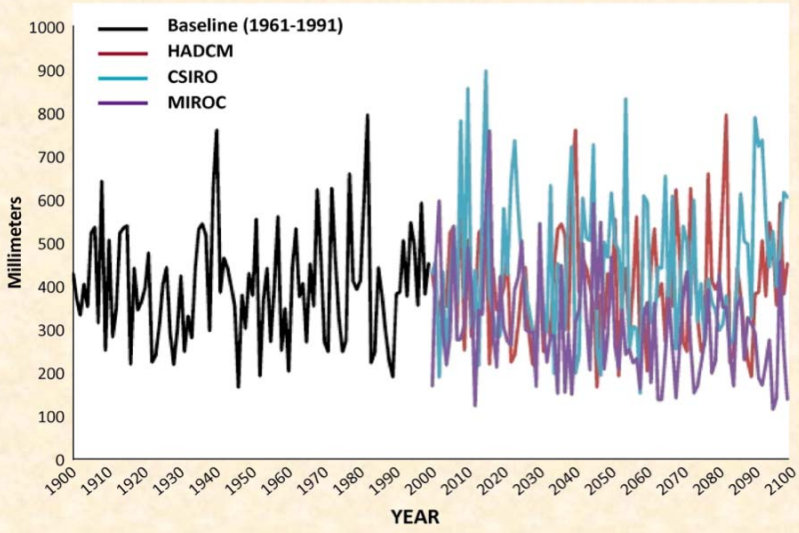
Annual Average Precipitation



Annual Average Precipitation

	Historic	MIROC	HADCM	CSIRO
Historic	396 mm			
2035-2045		↓289	↑493	↑435
2075-2085		↓276	↑418	↓332

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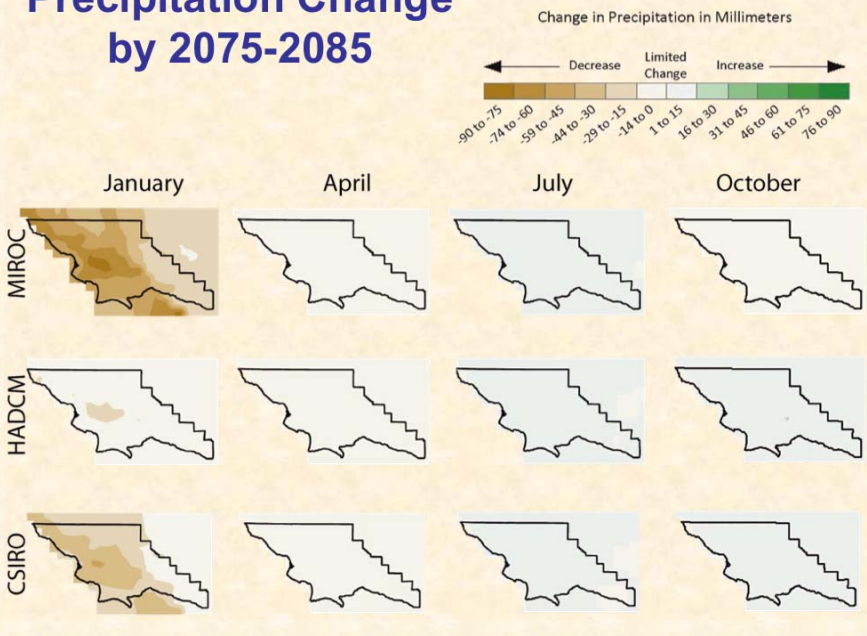
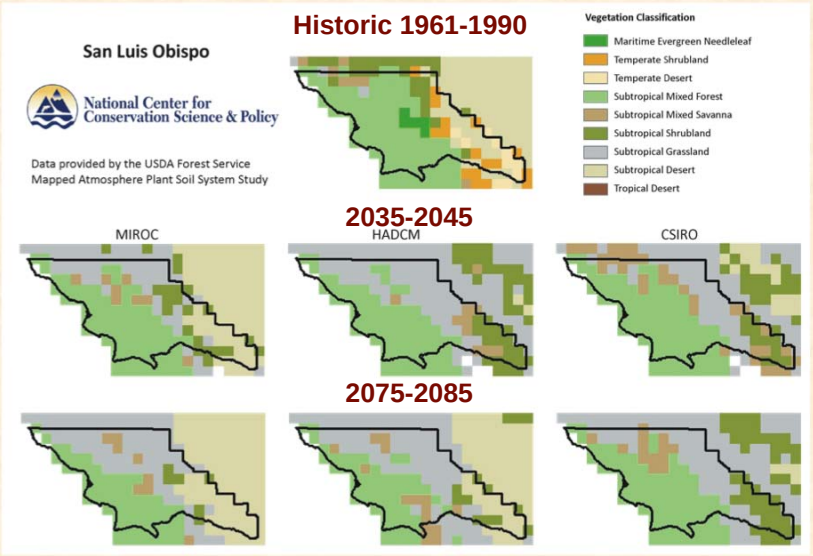
Precipitation Change by 2075-2085



Vegetation Projected with MC1



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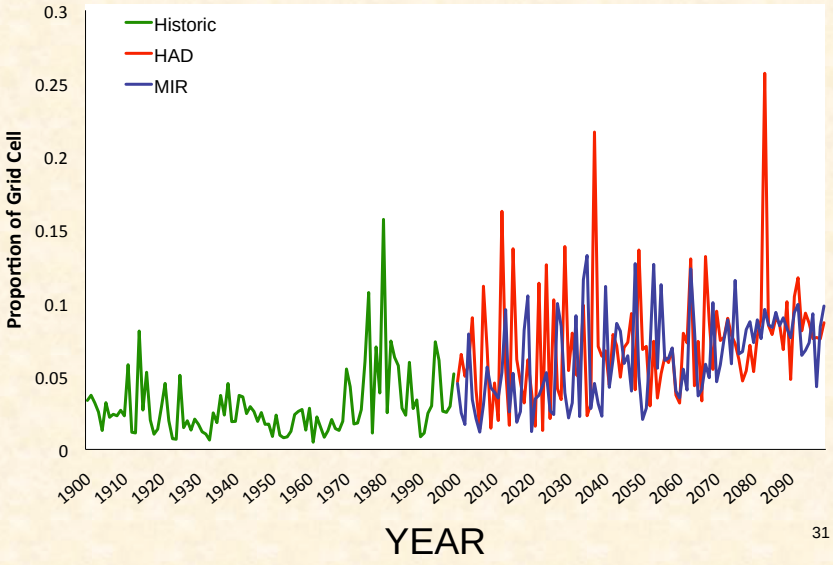
Projected Proportion Burned



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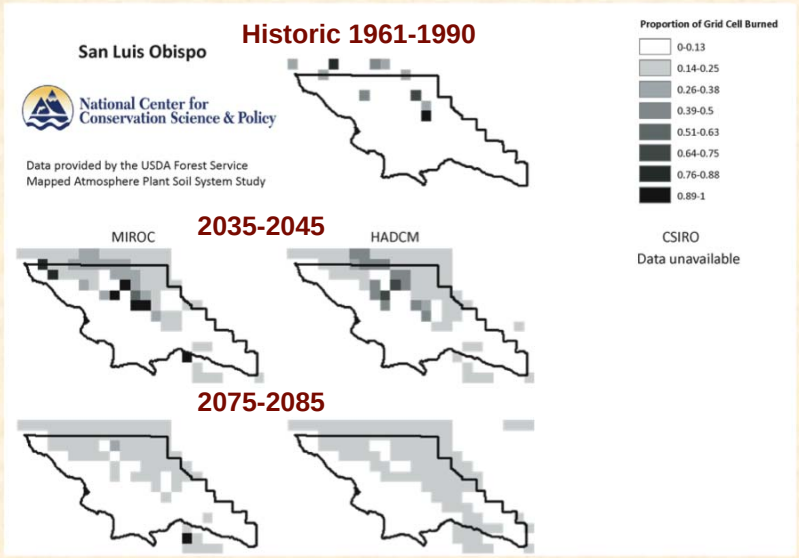

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Additional studies of climate change in SLO County

- 14 - 58% decline in forage production statewide, with steep declines in northeastern parts of SLO County (Shaw et al. 2009)

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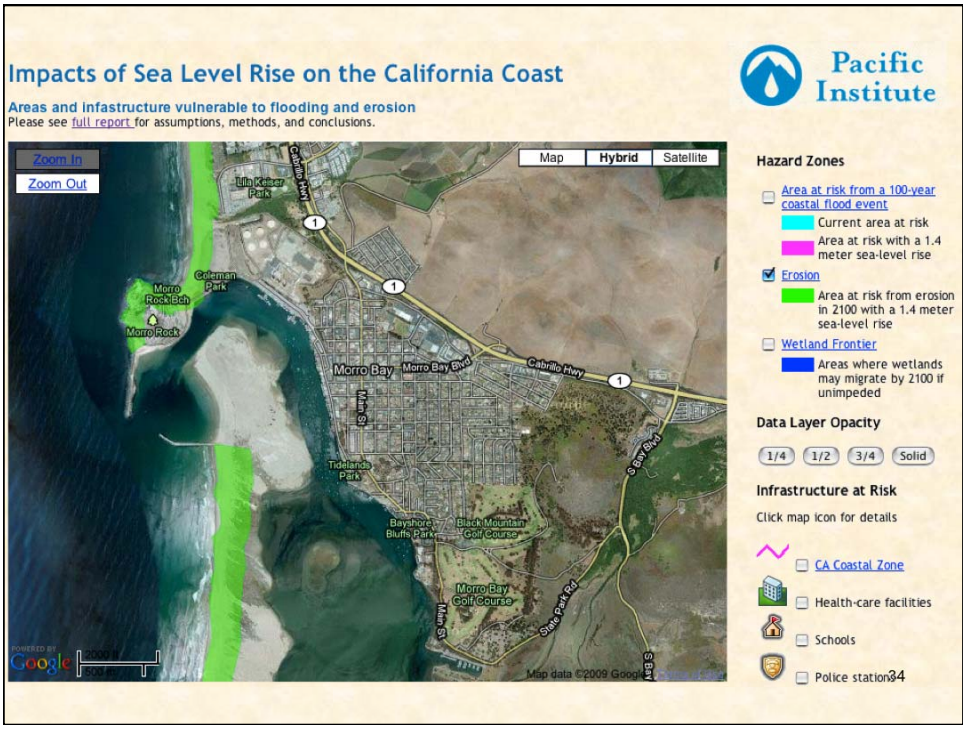

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Impacts of Sea Level Rise on the California Coast
Areas and infastructure vulnerable to flooding and erosion
Please see full report for assumptions, methods, and conclusions.
Pacific Institute
Zoom In
Zoom Out
Map
Hybrid
Satellite
Hazard Zones
Area at risk from a 100-year coastal flood event
Current area at risk
Area at risk with a 1.4 meter sea-level rise
Erosion
Area at risk from erosion in 2100 with a 1.4 meter sea-level rise
Wetland Frontier
Areas where wetlands may migrate by 2100 if unimpeded
Data Layer Opacity
1/4
1/2
3/4
Solid
Infrastructure at Risk
Click map icon for details
CA Coastal Zone
Health-care facilities
Schools
Police stations
Pismo Beach
Grover Beach
Oceano
El Camino Real
Cabrillo Hwy
Pismo Coast Shopping Plaza Shopping Center
Pismo Lake Ecological Reserve
Le Sage Riviera Golf Course
Grover Heights Park
Ramona Garden Park
Grover City Plaza Shopping Center
Chumash Park Site
Price Canyon Rd
Dolliver St
James Way
Pacific Blvd
S 4th St
N 4th St
Mentone Drainage Basin Park
2000 ft
500 m
Google
Map data ©2009 Google
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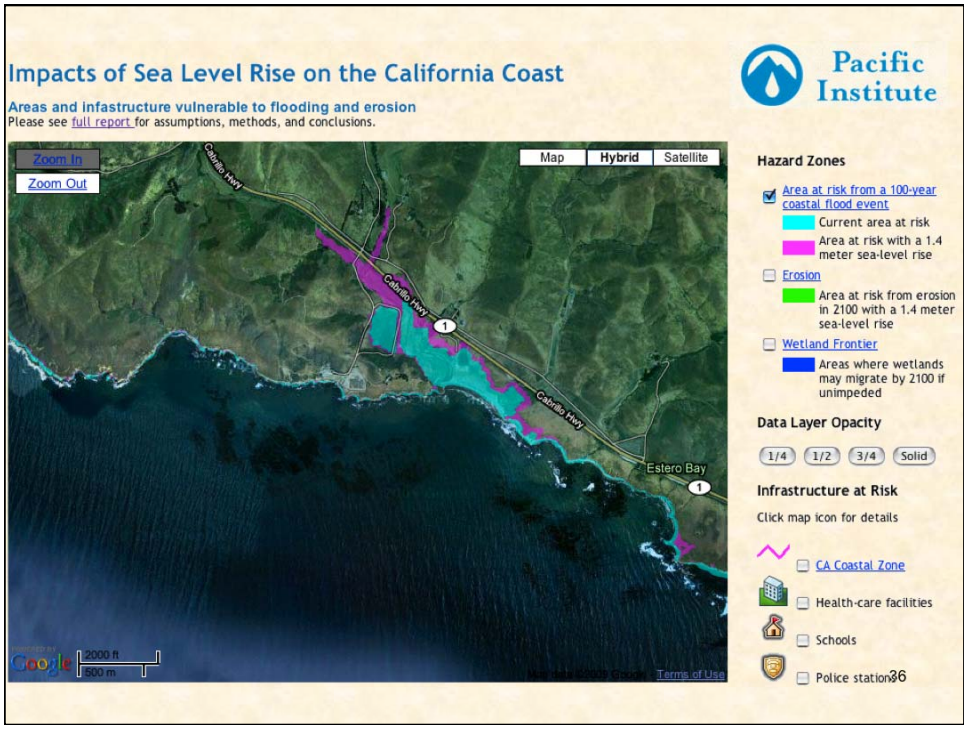
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Estero Bay
2000 ft
500 m
Google
Terms of Use
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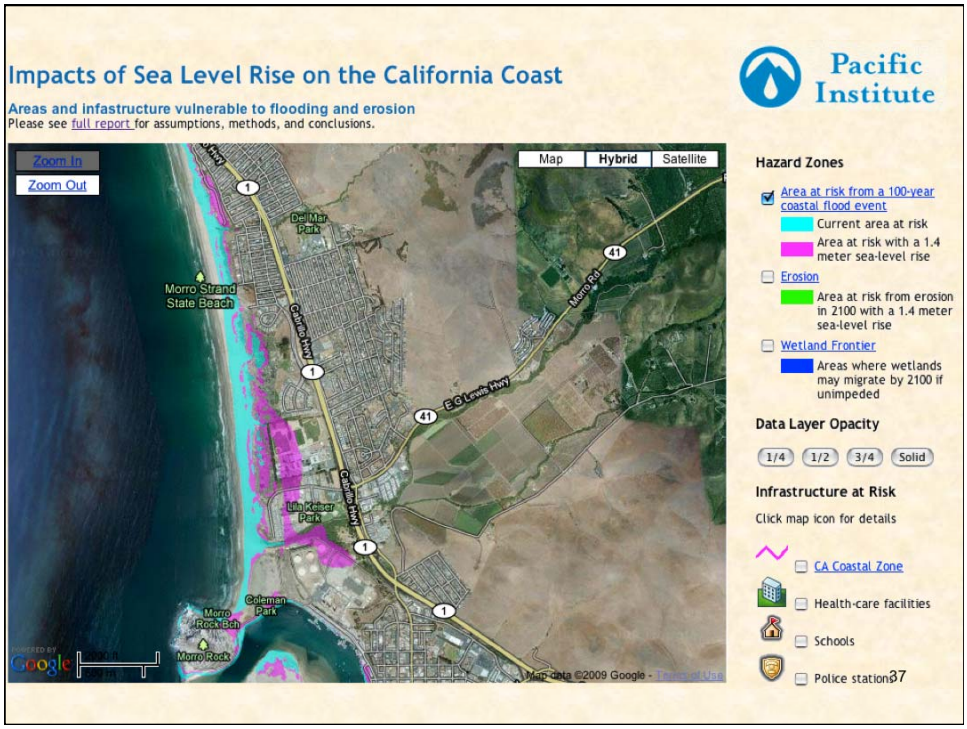
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Lila Keiser Park
Coleman Park
Morro Rock Beh
Morro Rock
Google
2000 ft
500 m
Map data ©2009 Google - Terms of Use
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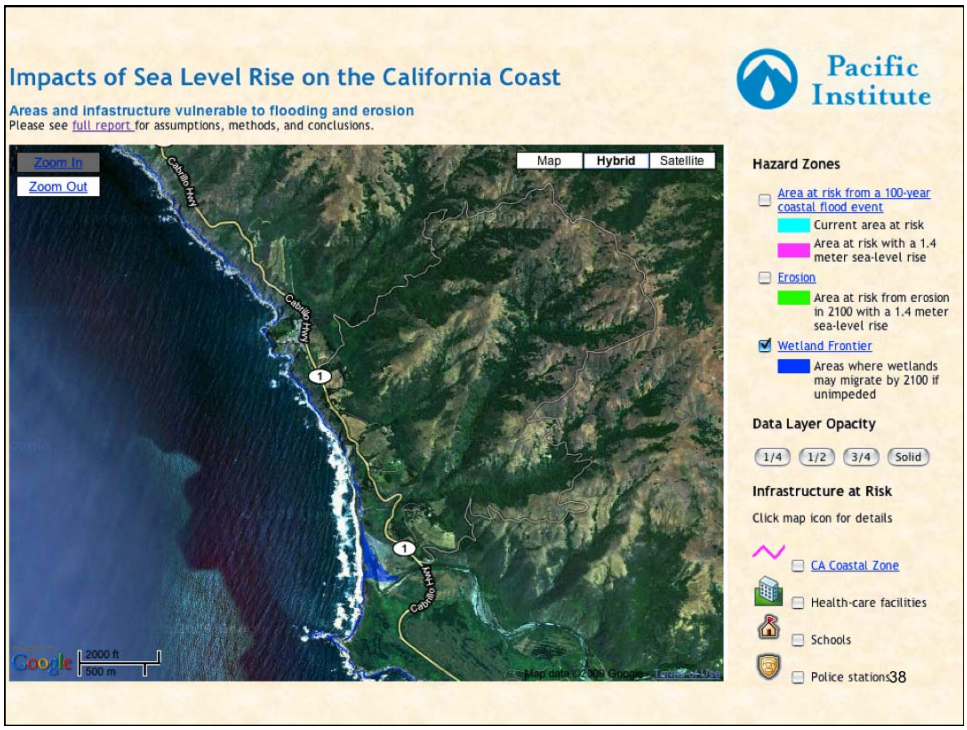
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Results of the Natural Systems Workshop

Results of the Natural Systems Workshop

1 Issue: Unsustainable ground water withdrawal reduces the resilience of riparian and aquatic species to climate change.

Results of the Natural Systems Workshop

1 Issue: Unsustainable ground water withdrawal reduces the resilience of riparian and aquatic species to climate change.

Recommendations:

- Monitor and regulate ground water withdrawal
- Incentives for conservation
- Consider new types of crops that use less water

Results of the Natural Systems Workshop

2 Issue: Species will need connected habitat to shift their ranges as the climate changes.

Results of the Natural Systems Workshop

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Recommendations:

- Develop regional plans for habitat connectivity
- Develop incentives for private land owners to provide habitat in crucial areas
- Retain ranches and large tracts of land

Results of the Natural Systems Workshop

3 Issue: Sedimentation from land use is already problematic and likely to get worse.

Results of the Natural Systems Workshop

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Recommendations:

- Encourage/educate changes to land use
- Restore wetlands and riparian zones to filter sedimentation
- Prescribed burning to retain healthy uplands

Results of the Natural Systems Workshop

4 Issue: Loss of wetlands, riparian areas, and floodplains has reduced aquatic and riparian species resilience to climate change.

Results of the Natural Systems Workshop

4 Issue: Loss of wetlands, riparian areas, and floodplains has reduced aquatic and riparian species resilience to climate change.

Recommendations:

- Restore/create wetlands, riparian zones, and floodplains
- Protect remaining ones from cattle, development

Results of the Natural Systems Workshop

5 Issue: Sea level rise threatens coastal wetlands and intertidal zones.

Results of the Natural Systems Workshop

5 Issue: Sea level rise threatens coastal wetlands and intertidal zones.

Recommendations:

- Do not armor the coast
- Rolling easements
- Relocation of key developments

Results of the Natural Systems Workshop

6 Issue: Loss of oak woodlands will be exacerbated by climate change.

Results of the Natural Systems Workshop

6 Issue: Loss of oak woodlands will be exacerbated by climate change.

Recommendations:

- Restore oak woodlands by protecting seedlings from cattle
- Incentives for oak woodlands on private land
- Develop more drought resistant oak

Results of the Natural Systems Workshop

7 Issue: Most productive habitat for T&E species often found on private land – unprotected.

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Recommendations:

- Rework “Critical habitat” designations
- Include future habitat and movement corridors as well as current strongholds.

Results of the Natural Systems Workshop

8 Issue: Land use planning is currently based on historical conditions without a regional or long-term perspective.

Results of the Natural Systems Workshop

8 Issue: Land use planning is currently based on historical conditions without a regional or long-term perspective.

Recommendations:

- Watershed scale useful for planning efforts
- All landowners/stakeholders at the table
- Future conditions different from current