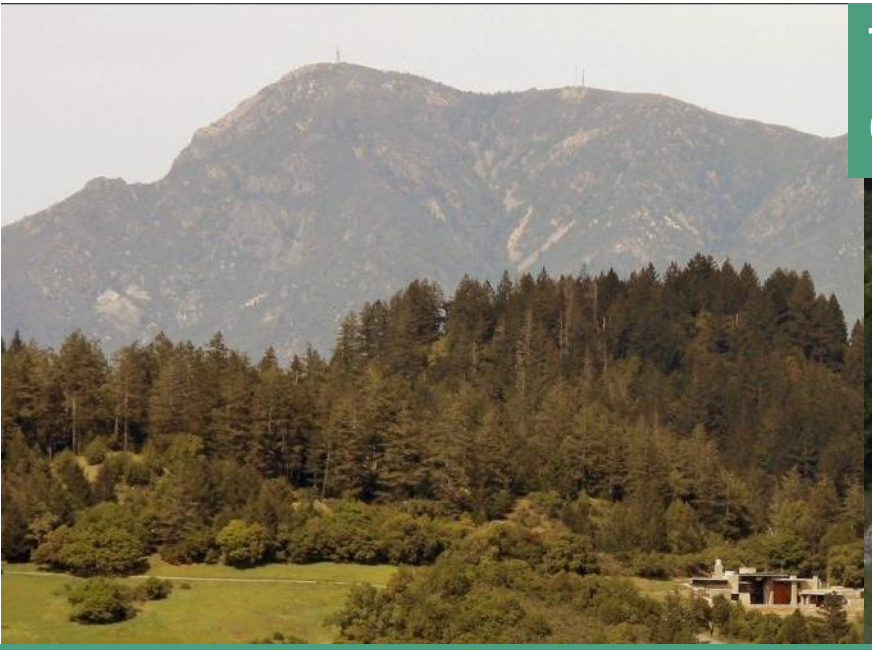
Pepperwood
PRESERVE
Inspiring conservation through science

Considering Climate Adaptation in the Napa River Watershed

The North Bay Climate Ready Initiative

May 15, 2015

Pepperwood mission: to advance science-based conservation



3200-acre reserve in Mayacamas, partnered with CA Academy of Sciences

The new Dwight Center for Conservation Science

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TBC3

Terrestrial Biodiversity Climate Change Collaborative

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Berkeley
UNIVERSITY OF CALIFORNIA

An internationally-recognized climate science initiative

USGS science for a changing world

CA.GOV

The California ENERGY COMMISSION

GORDON AND BETTY MOORE FOUNDATION

BAY AREA | OPEN SPACE COUNCIL

Creekside Center for Earth Observation

Point Blue Conservation Science

the question

how will a shifting climate effect the lives and landscapes of Northern California?

take home message

our region is becoming more arid

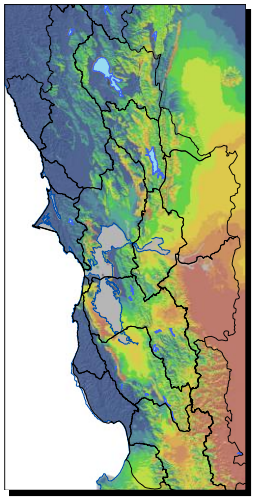
the challenge

so how can we make our watersheds more resilient?

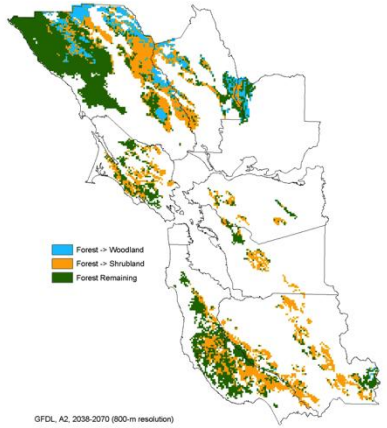
TBC3 has built a climate adaptation knowledge base for application to regional conservation

Climate + Topography

Watershed Hydrology + Topo-climate



Vegetation Cover + Fire Risks



Species Distributions

generating an ensemble of projections-NOT predictions

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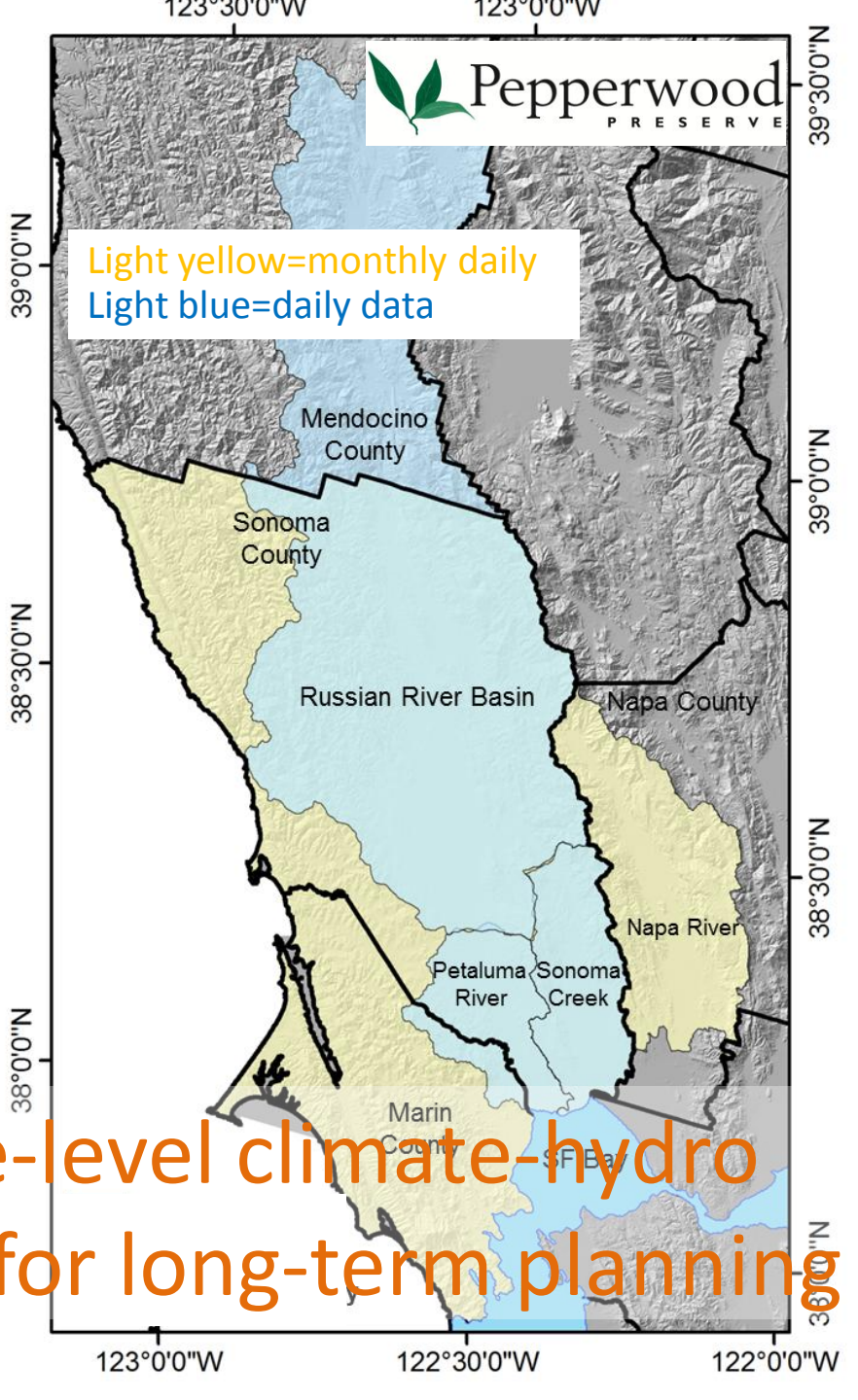
North Bay Climate Ready

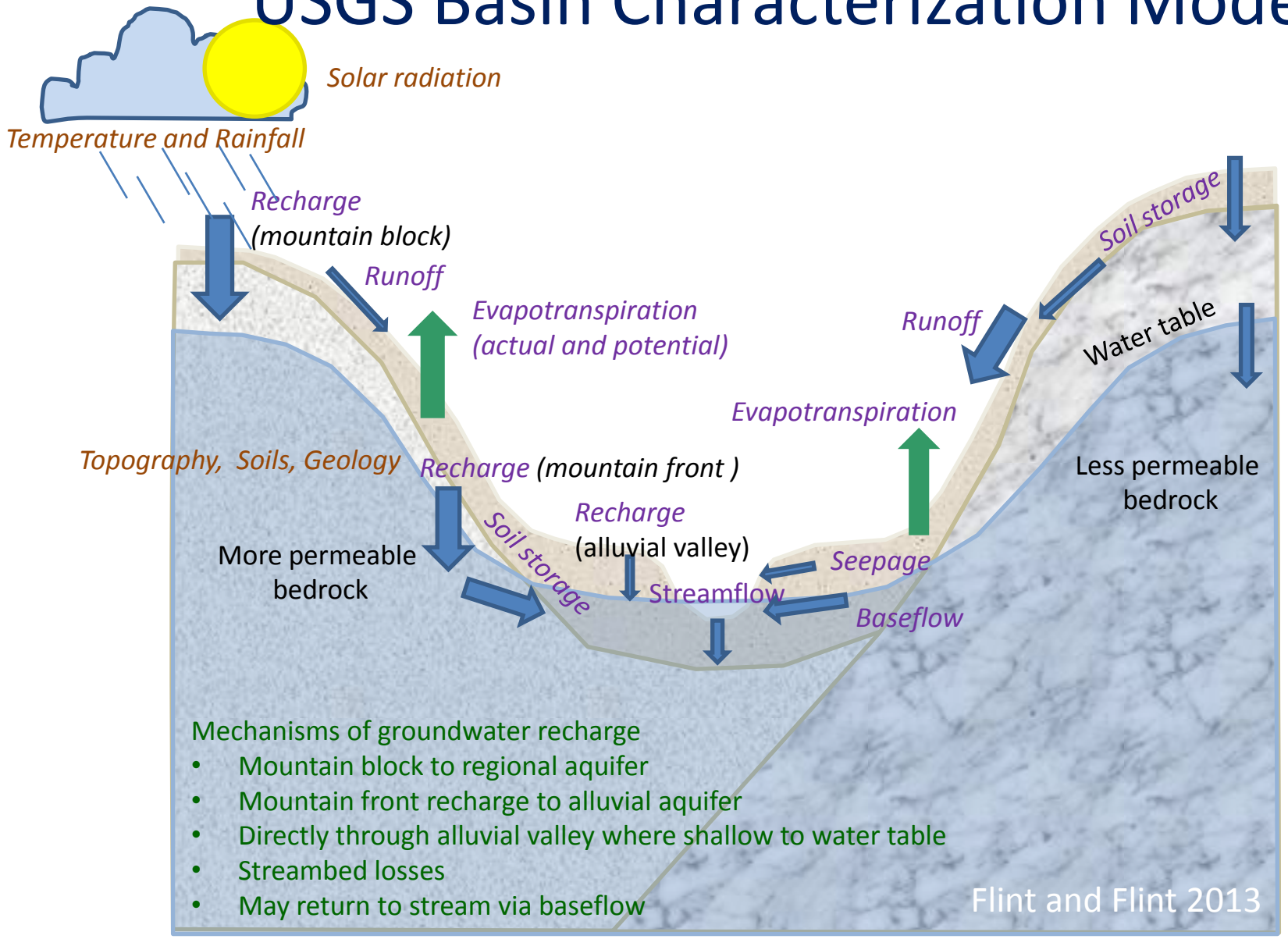
Marin, Sonoma County, Mendocino, Napa Counties

- (Not sea level rise!)
- Warmer temperatures
- Greater hydrologic variability
- Greater evapo-transpiration
- Increased water demand
- Variable runoff and recharge
- Shifts in natural vegetation types
- Increased wildfire risk



Translating landscape-level climate-hydro projections into inputs for long-term planning

USGS Basin Characterization Model



Size of arrows reflect relative magnitude of water flow

USGS science for a changing world

Brown text is BCM input, Purple text is BCM output

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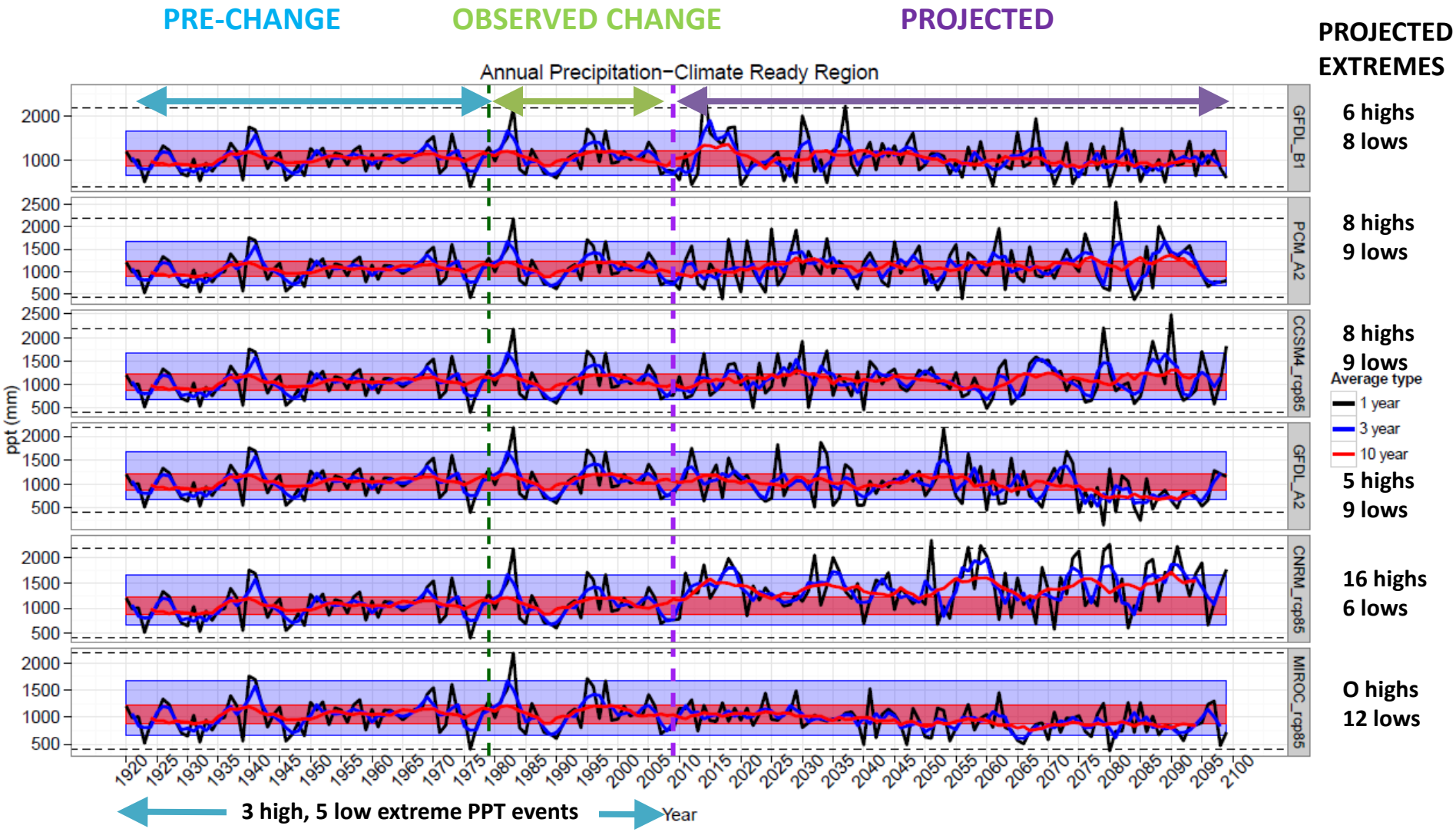
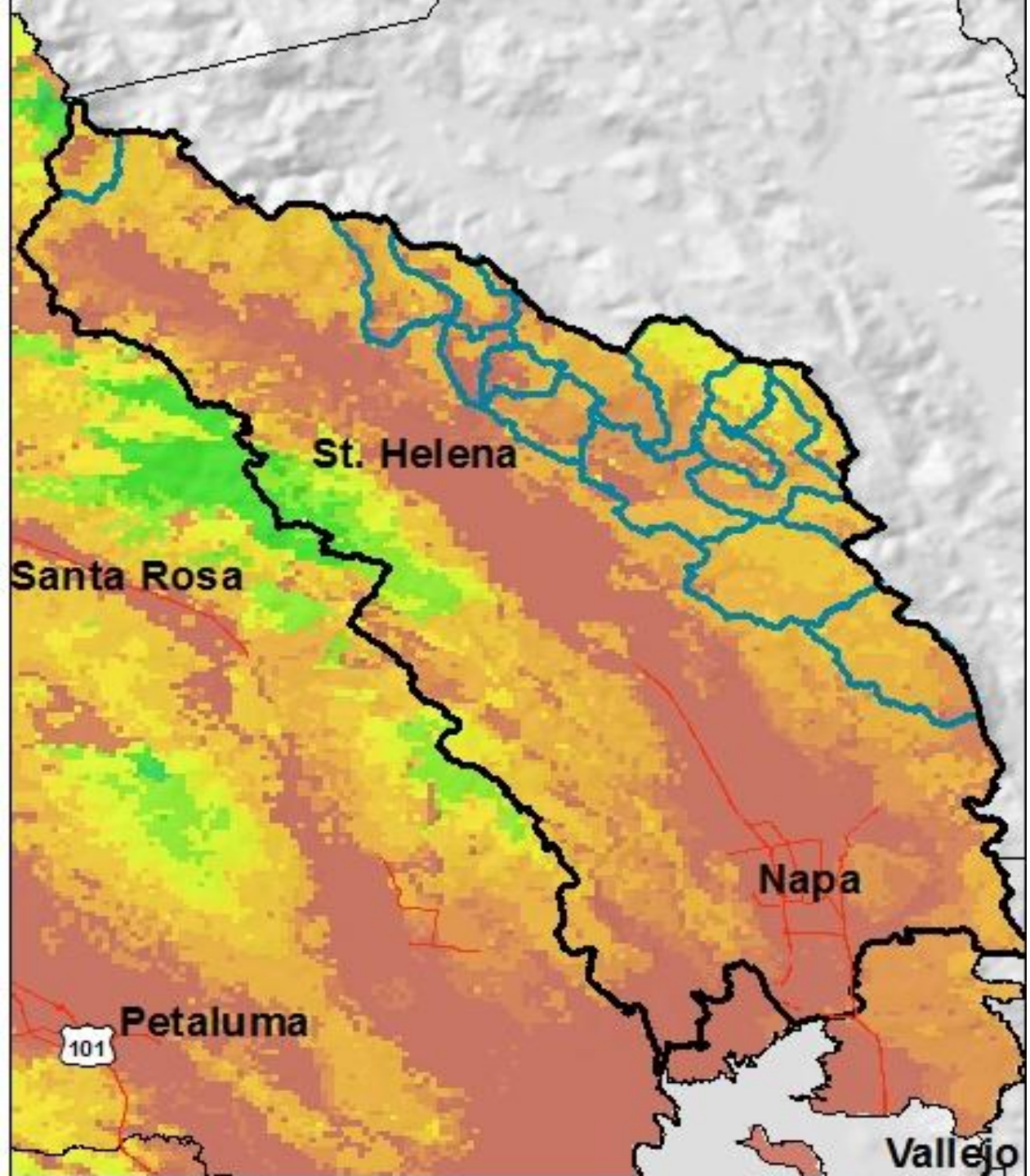
Annual Precipitation-North Bay Region



high and low extremes expected to approximately double frequencies in projections



Napa Valley Current Runoff

1981-2010

7.8 inches runoff/yr

inches/year

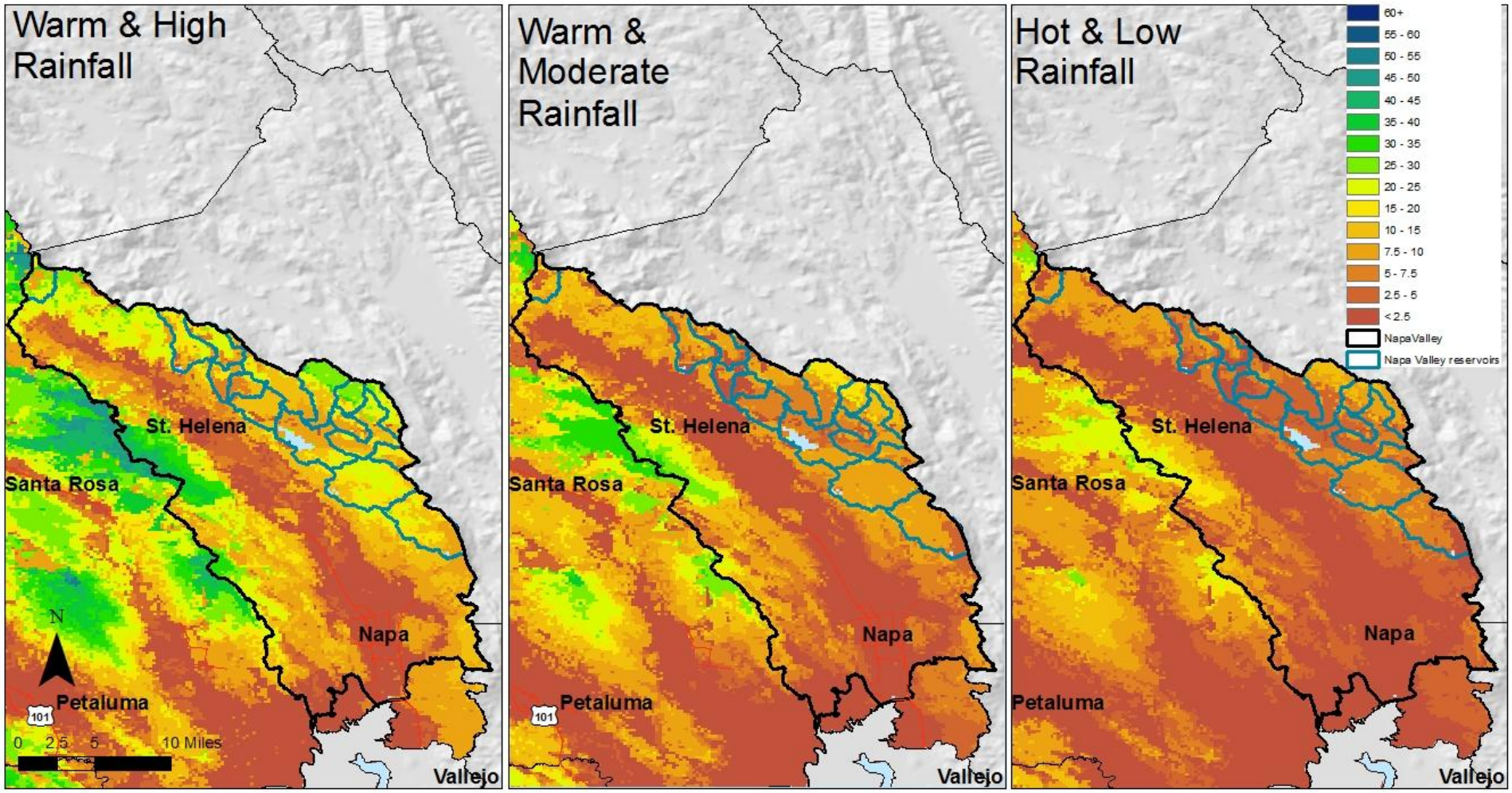
- 60+
- 55 - 60
- 50 - 55
- 45 - 50
- 40 - 45
- 35 - 40
- 30 - 35
- 25 - 30
- 20 - 25
- 15 - 20
- 10 - 15
- 7.5 - 10
- 5 - 7.5
- 2.5 - 5
- < 2.5
- Napa Valley
- Napa Valley reservoirs drainages

Reservoir drainages in blue outline

18-acre pixels monthly time steps

Projected Runoff, 2040-2069

long term water supply trends (30 y averages)



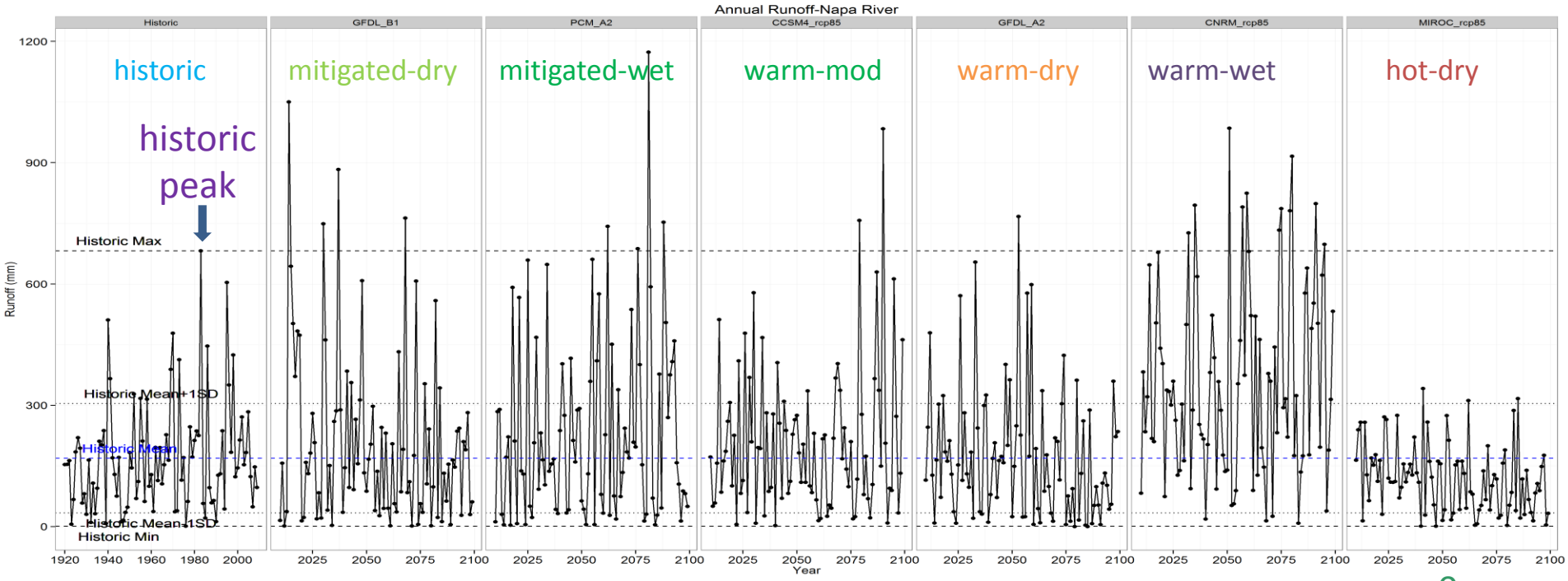
13 in/y average
67% greater than current

6.9 in/y average
11% less than current

4.3 in/y average
44% less than current

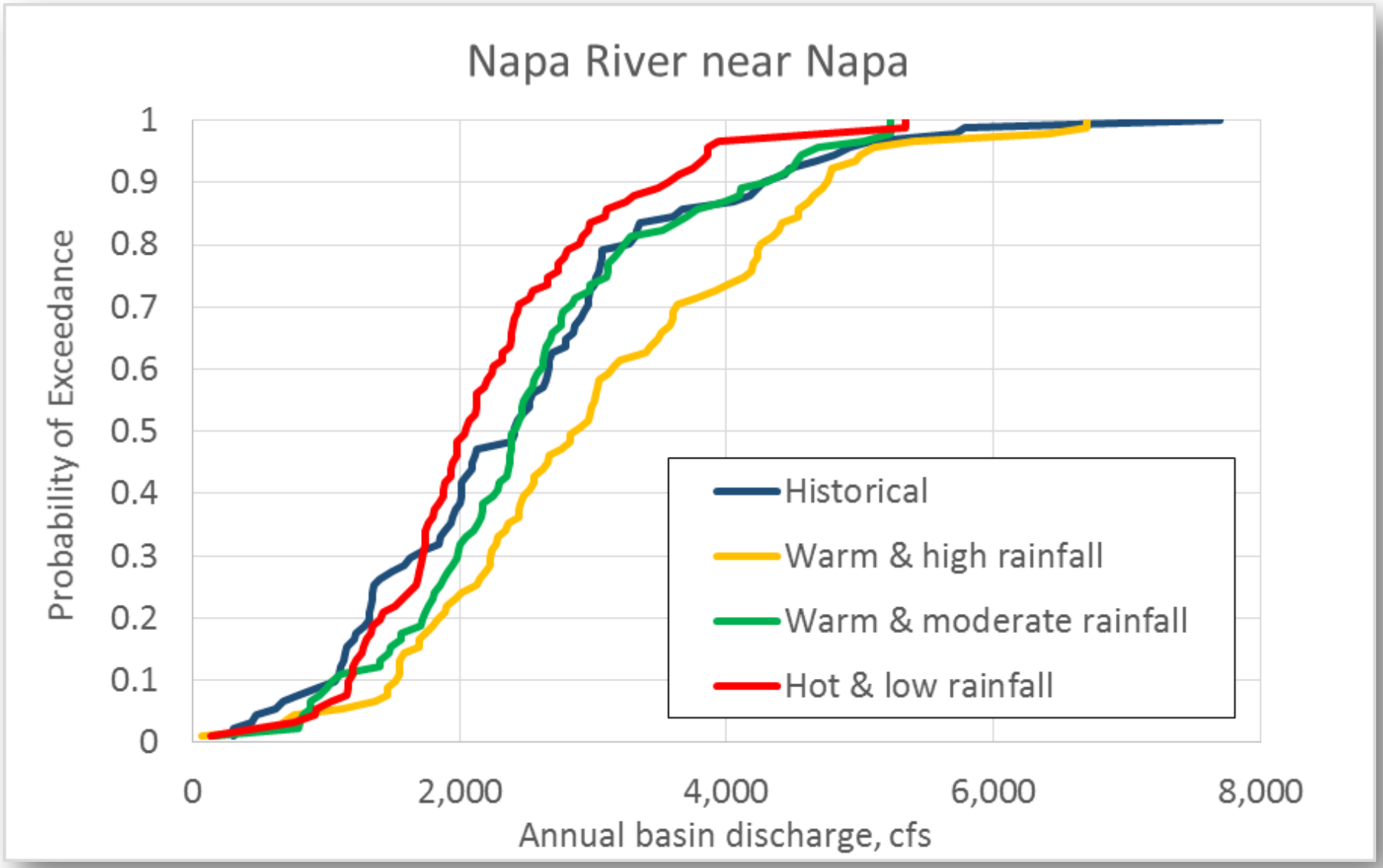
Napa River Valley Runoff

historic plus 6 models annual values

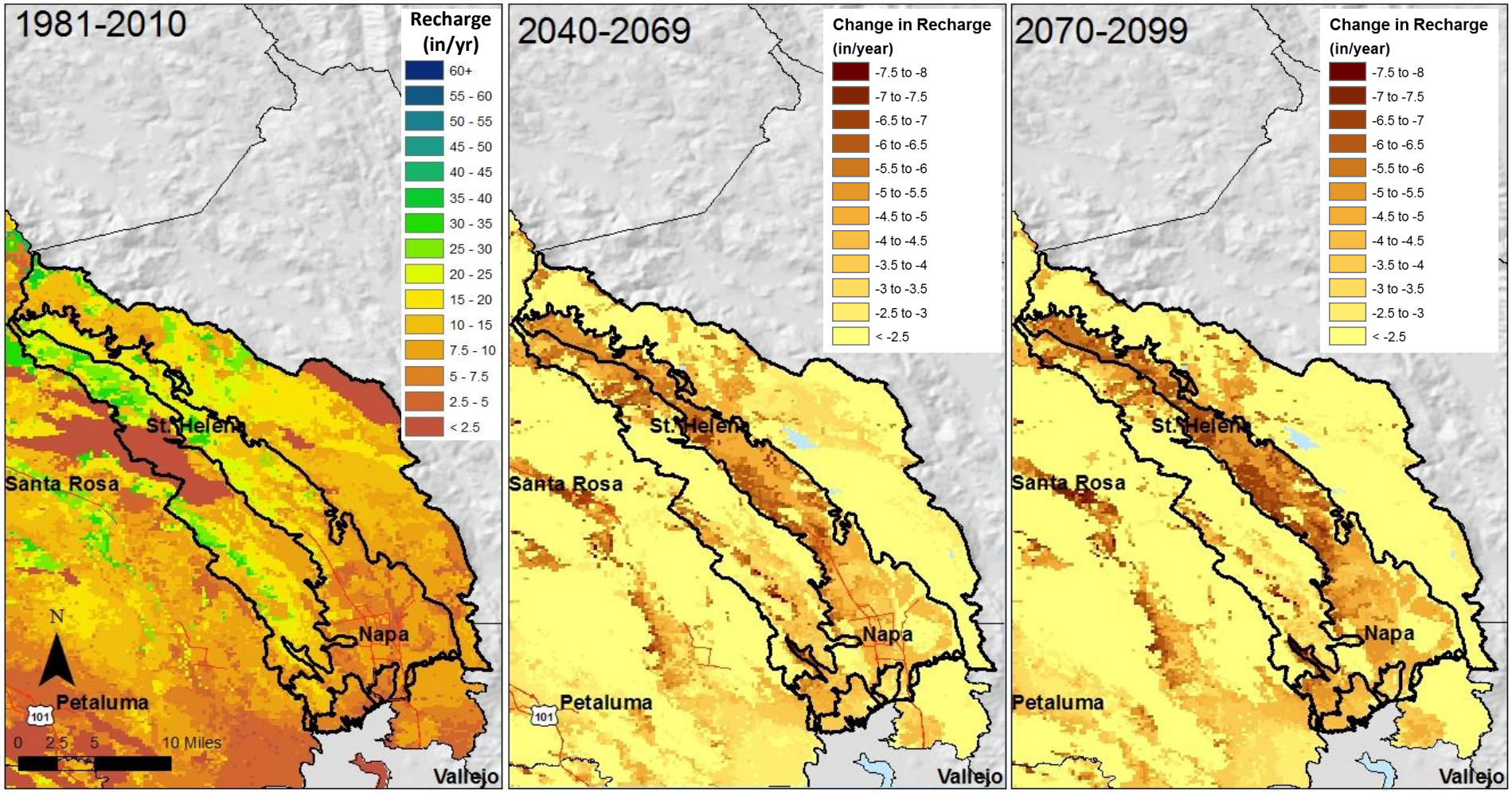


we can look at potential patterns of inter-annual variability

Runoff can be translated to annual or monthly in-river flows at a gage



Projected Change in Recharge, Hot and Low Rainfall



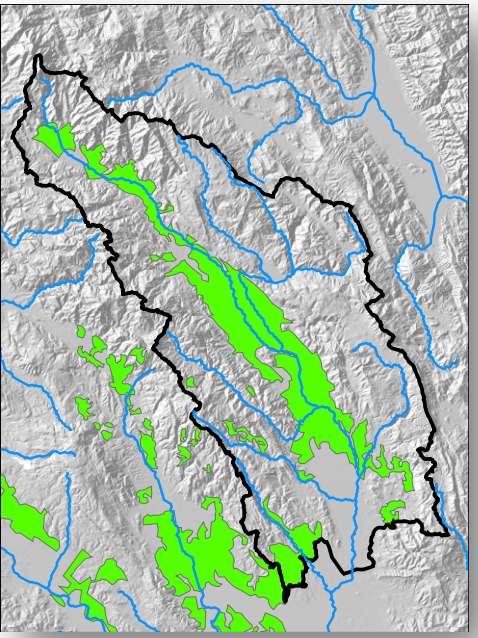
11 in/y average for valley

29% reduction
to 7.5 in/y average for valley

27% reduction
to 7.8 in/y average for valley

Low rainfall scenario results in losses of 2.5 inches of groundwater recharge per unit area annually

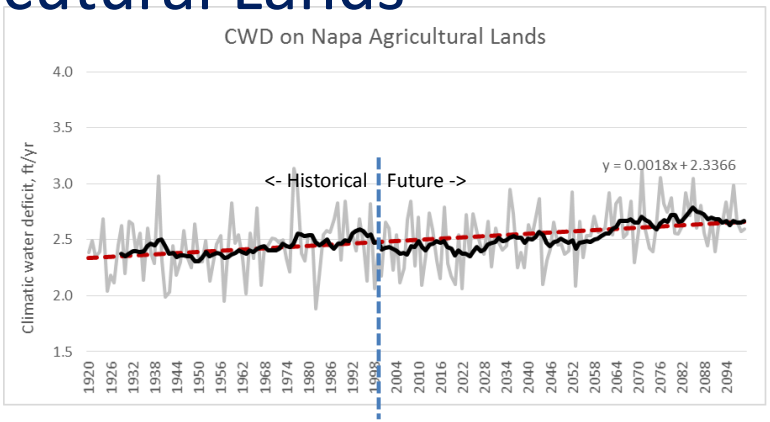
Climatic Water Deficit (indicator of irrigation demand on Agricutural Lands



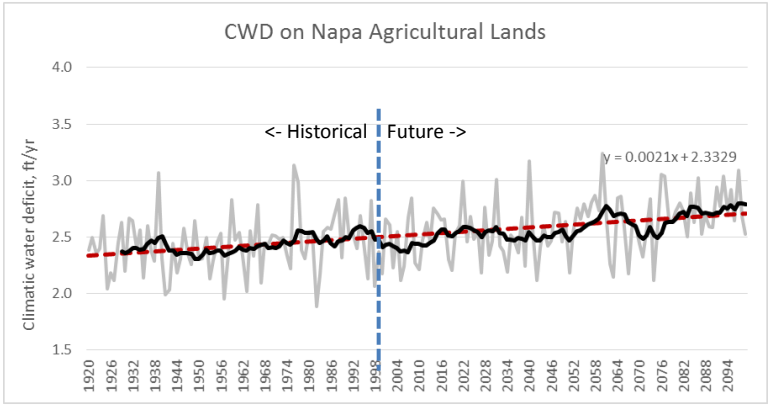
Water deficits increase in all scenarios

water deficit = PET-AET

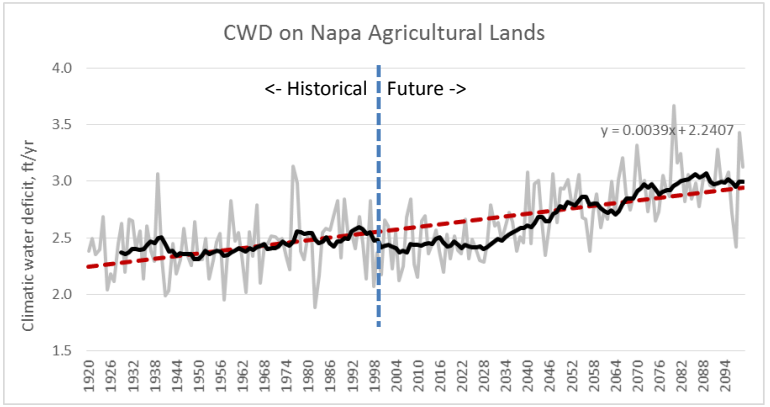
Warm & High Rainfall



Warm & Moderate Rainfall



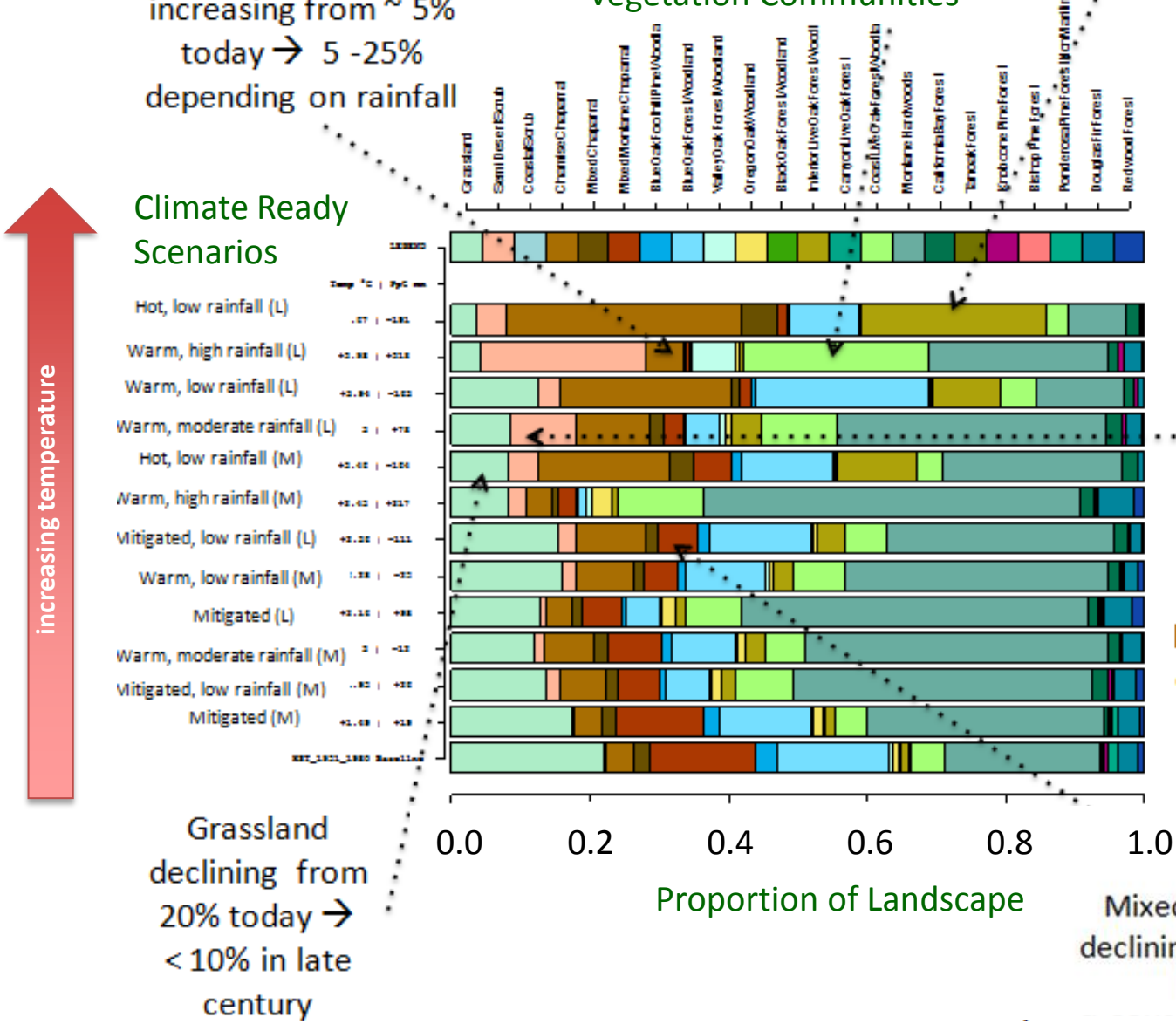
Hot & Low Rainfall



Napa County Vegetation Report Summary

Coast Live Oak and Interior Live Oak increasing from ~ 5% today → 5 - 25% late century, depending on rainfall

Conditions for Chemise Chaparral increasing from ~ 5% today → 5 -25% depending on rainfall



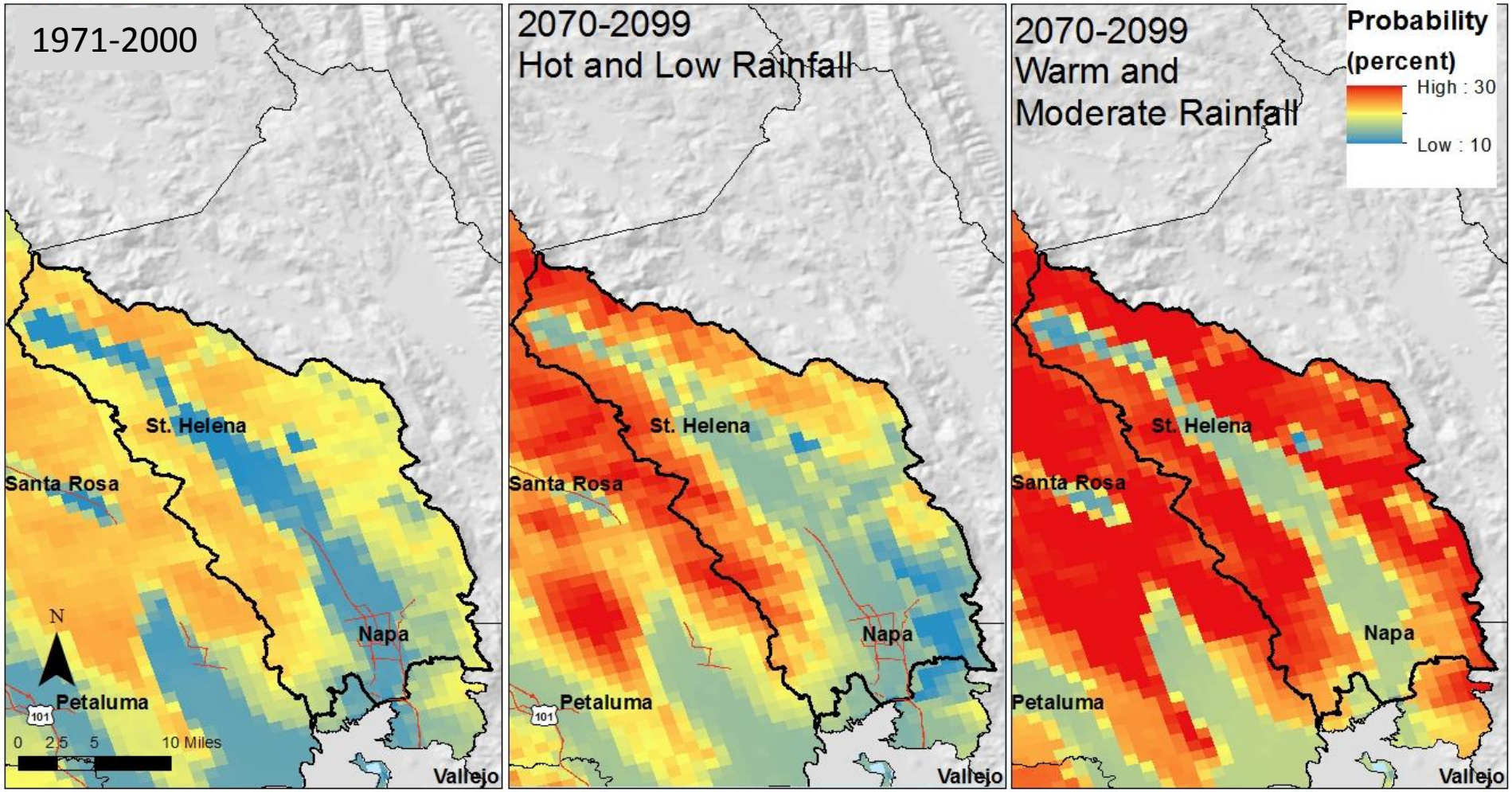
increasing temperature

Semi-desert Scrub emerges and becomes common

Grassland declining from 20% today → < 10% in late century

Mixed Montane Chaparral declining from ~10% → < 5% by mid century

Change in Projected Probability of Burning One or More Times



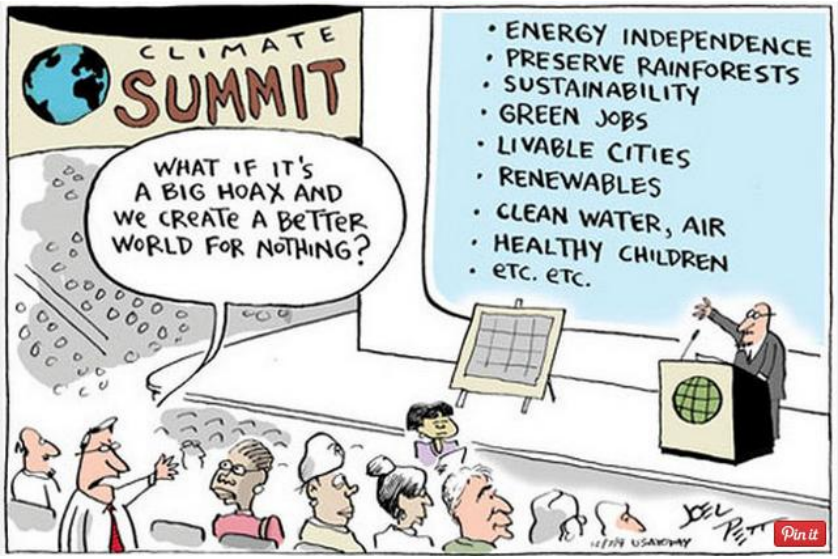
Probability of a fire in a 30y period doubles
in some locations

		Current	Hot, Low Rainfall	Moderate Rainfall
Variable	Units	1971-2000	2070-2099	2070-2099
Probability of burning 1	Percent	18%	19%	25%
or more times	SD	4%	5%	6%


what kind of long-term plans can use this data?
human health
energy demand
watershed plans
surface water supply
hazard mitigation
sustainable groundwater management
agricultural sustainability
fire protection
ecological restoration
The future of Northern CA
is going to be more arid
photo D.D. Ackerly

Win-win strategies for climate adaptation

Mitigate greenhouse gas emissions.
Protect key watershed functional areas: floodplains, recharge areas, wetlands.
Recycle and conserve water.
Increase soil moisture holding capacity.
Get serious about fuels management.
Identify native species that are likely to be climate “winners”- id and protect seed sources
Keep the landscape connected-riparian and terrestrial habitat corridors.
Prepare for more frequent extreme events.
Invest in preparedness-its cheaper than emergency response!



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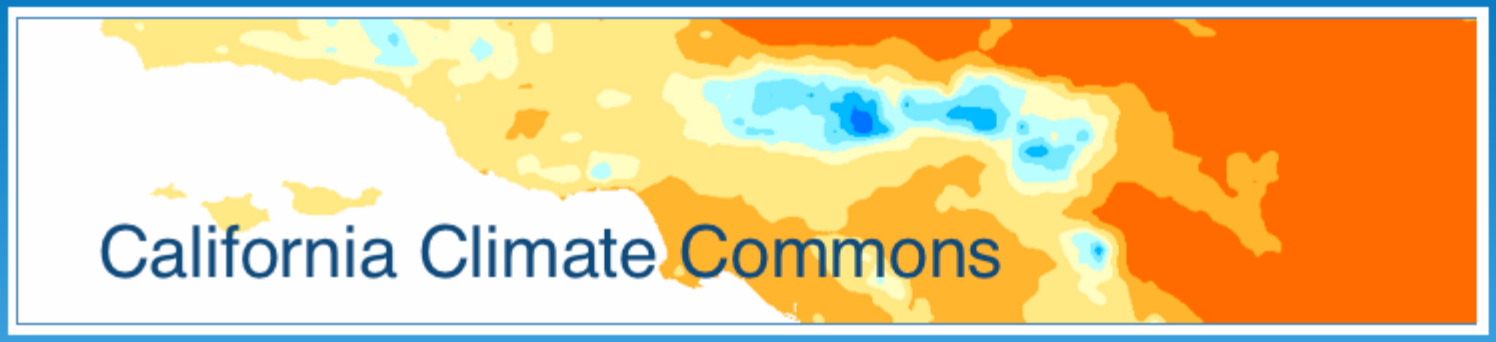

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to learn more about the watershed model….

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Dataset

California Basin Characterization Model (BCM) downscaled climate and hydrology

Data Variables in this Dataset

- Actual evapotranspiration - Potential evapotranspiration calculated when soil water co wilting point
- Climatic Water Deficit - Potential minus Actual Evapotranspiration
- Excess water - Water remaining above evapotranspiration
- Maximum monthly temperature -
- Minimum monthly temperature -
- Potential Evapotranspiration - Water that could evaporate or transpire from plants if a

climate.calcommons.org
will host Climate Ready North Bay “Climate Smart Exchange”