North Bay Climate Ready
applied science for land and water
adaptation planning

Sonoma County Climate Adaptation Forum
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Lisa Micheli, PhD
Pepperwood’s Dwight Center for Conservation Science

Lorrie Flint, PhD
US Geological Survey
Pepperwood Foundation

mission
to advance science-based conservation throughout our region and beyond

The new Dwight Center for Conservation Science

3200-acre reserve in Sonoma, originally gifted to CA Academy of Sciences
North Bay Climate Ready

a high-resolution regional natural resource vulnerability assessment via CA Coastal Conservancy Funding

Clients: Sonoma County-Water Agency, Open Space District, Regional Parks, nine cities

Mendocino Co-water and flood district

Napa Valley: Napa County-Planning, Public Works and Flood Control

Marin: Marin Municipal Water District
weather stations can already detect a warming trend in our local climate, especially in “minimum temperatures”

between 1911 and 2000, 1.0 degree F increase in summer temps and a 1.7 degree F increase in winter temps (averaged over 30 year periods)
average temperatures are projected to rise 3-6 degrees F by the close of this century.

impacts on precipitation are uncertain, but rainfall patterns are likely to be more variable.
North Bay Climate Ready will assess how these impacts will play out across the North Bay landscape.
“downscaling” from Global Circulation Models (GCMs) to high resolution climate-hydro futures

GCM output

275 km grid cells 12-km grid cells

Downscaled to 270m grid cells

high-resolution data on watershed soils, geology and topography allow us to downscale to 18 acre “pixels” via the BCM
we run the model for multiple (six) “scenarios” to compare high and low rainfall outcomes
BCM estimates “unimpaired” stream-flow based on modeled recharge and runoff.
Modeled change in summer maximum air temperature

Observed 1981-2010

A2 GFDL 2040-2069

A2 GFDL 2070-2099

30 degrees C = 86 degrees F

July tmax (°C)

- 16 - 20
- 20.1 - 25
- 25.1 - 30
- 30.1 - 35
- 35.1 - 38

Dry Climate Scenario (GFDL-A2)

35 degrees C = 95 degrees F
Modeled change in precipitation

Dry Climate Scenario (GFDL-A2)

250 mm = 10 inches
Change in groundwater recharge

Dry Climate Scenario (GFDL-A2)

250 mm = 10 inches
**Climatic Water Deficit**

Annual evaporative demand that exceeds available water

**Potential – Actual Evapotranspiration**

- Correlates to
  - vegetation distribution
  - wildfire occurrence and intensity
- Describes the water supply needed to fulfill agricultural demand
- Increases with warming due to the increase in evapotranspiration
- Indicator of “landscape drought”

we are pioneering measures of drought stress now applied across the state and beyond
Modeled change in climatic water deficit

Historic (1981-2010)
Mean Climatic Water Deficit

Future (2040-2069)
MIROC_esm_RCP85
Mean Climatic Water Deficit

Change in CWD
Future - Current

250 mm = 10 inches

CWD

500 700 800 900 1050

mm water/year

Delta CWD
High : 230.293
Low : 35.1233

Dry Climate Scenario (MIROC-85)
Lake Mendocino 2014
this year’s rainfall is approximately 60% of normal, our reservoir is presently only 80% full and is projected to at 50% by May
soil moisture deficits control how much reservoirs fill in response to rain

Pepperwood Preserve Grassland Soil Moisture Monitoring

(Normal year plant water use of soil water)

(headwaters of Mark West Creek)

Data US Geological Survey
Water supply
2013-14 compared to 1951-1980 average

Landscape drought
Soils water deficits as of January 2014

Quantifying water supply reductions
Mapping landscape drought stress
we can estimate increased irrigation demand due to higher temps
we can estimate impacts on the future of our forests
we can estimate how climate may impact fire regimes
we can estimate shifts in crop suitability

Mean Grape Ripening Date
Group 5 1250 DD (Pinot Noir, Chardonnay)

1971-2000

2000-2009

Source: Flint and Flint in prep.
we can evaluate the climate adaptation value of wildlife corridors.

Pepperwood

Inspiring conservation through science
but we need to monitor in real-time in order to evaluate and refine model “hypotheses”

green = low deficits, red = high deficits
resilience is all about our quality of life
Thank you!

Lisa Micheli, PhD

lmicheli@pepperwoodpreserve.org

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