

Climate Ready North Bay

Translating a landscape-level climate-hydrology database into inputs for long-term planning

For North Bay Watershed Association



North Bay Climate Adaptation Initiative
Sonoma Ecology Center





North Bay CLIMATE ADAPTATION INITIATIVE

RCPA

regional climate protection authority



SONOMA LAND TRUST

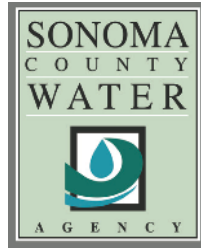


NORTH BAY
WATERSHED ASSOCIATION

center for
climate
protection



AUDUBON CANYON RANCH



SONOMA COUNTY
AGRICULTURAL PRESERVATION
AND OPEN SPACE DISTRICT



Coastal
Conservancy

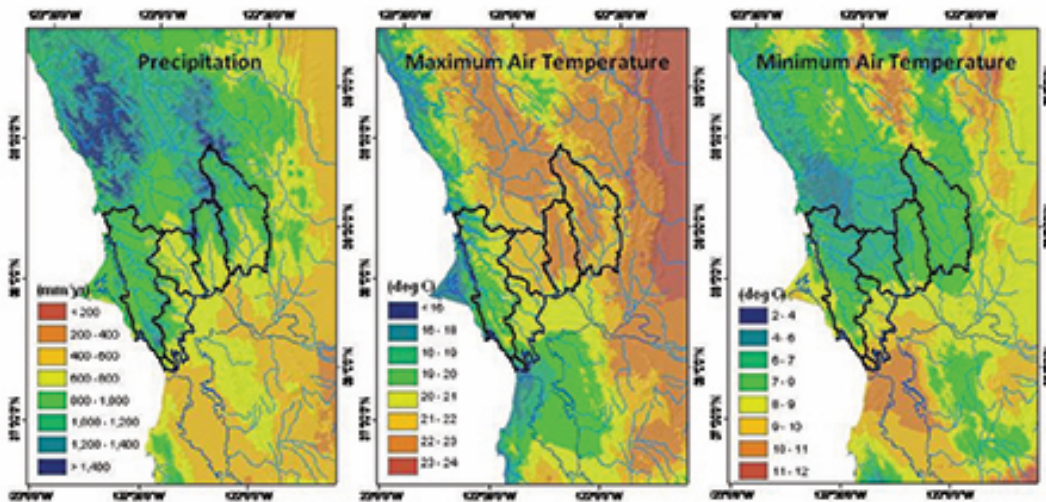


Creekside Center
for Earth Observation

Adapting to Climate Change State of the Science for North Bay Watersheds

A Guide for Managers

December 2010



Average annual temperatures and precipitation, 1971-2000

A report prepared for the North Bay Watershed Association
by the Dwight Center for Conservation Science at Pepperwood
in partnership with the US Geological Survey and
the Bay Area Open Space Council

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Ryan Branciforte, Bay Area Open Space Council

Project Context:
Making good on
NBWA's early
investment in climate
adaptation planning

Climate Ready data menu

Primary BCM outputs:

Temperature Rainfall Runoff Groundwater recharge
Evapotranspiration Soil moisture Climatic water deficit

Secondary variables:

Fire frequency (% annual likelihood of fire, or annual return interval)
Potential native vegetation transitions

Time scales: historical (1910-2010) and projected (2010-2100)

30-yr average, annual, or monthly/seasonal

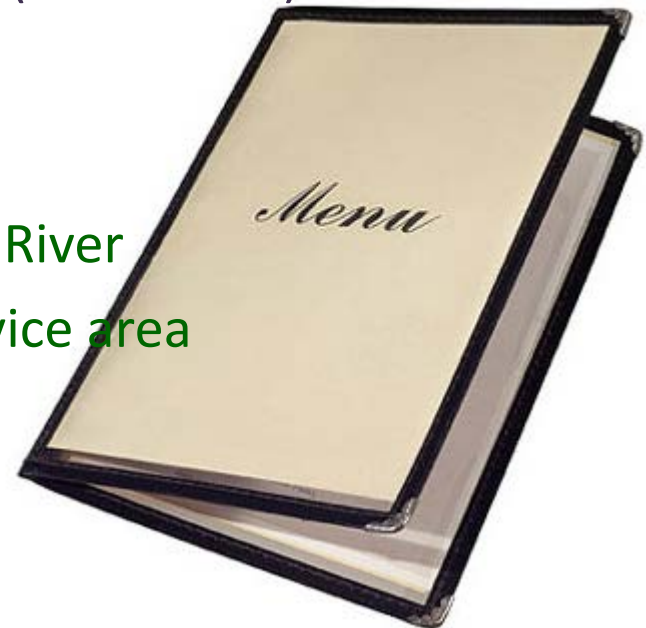
Spatial scales:

Regional: North Bay watersheds plus Russian River

Sub-regional: watershed, landscape unit, service area

County Large parcels

18 acre (270 m²) grid size



Not SLR

nbwatershed.org/climate-ready-north-bay

North Bay Watershed Association

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CLIMATE READY NORTH BAY

Climate Ready North Bay – Phase II

People working in North Bay watersheds are integrating climate change adaptation into their land, water, emergency, and watershed plans and policies. Climate Ready North Bay connects these people with the most up-to-date, actionable, customizable information to support their decisions and priorities.

Now, NBWA members and their watershed partners are familiar with carefully selected tools for answering questions about how climate and hydrology may be changing, and how to apply those answers to their work. Based on several interactive working sessions, these are the tools most useful to the NBWA community.

Background

NBWA funded this work through a grant to the North Bay Climate Adaption Initiative, represented by Sonoma Ecology Center. The project builds on NBWA's leadership in funding, in 2010, the first report written for resource managers based on USGS' BCM down-scaled climate projections for the North Bay, and on Climate Ready North Bay Phase 1, led by the Sonoma County Regional Climate Protection Authority and TBC3.

8 working sessions with 125 people

Tools for assessing climate hazards

Climate Ready North Bay, Phase 1. Reports and accompanying slideshows with results of customized analyses based on climate-related watershed management questions from North Bay users. North-Bay-wide products document broad trends, and there are also products specific to Marin County, Sonoma County plus Russian River, and Napa River watershed.

Conservation Lands Network Explorer. Create, view, and download maps of your hand-drawn area within the Bay Area, with 270m x 270m resolution, of 30-year averages of all BCM variables. Choose from 4 climate futures and 5 time periods. Tool also maps vegetation, protected land status, and conservation value.

Vegetation change. Bar plots from UC Berkeley Ackerly lab, showing changes in vegetation types with varying climate futures, 4-square diagrams for winning and losing vegetation types, and short reports by plant ecologists, available for each North Bay Landscape Unit of the Conservation Lands Network. [Detailed bar plots for each Bay Area county](#) are also available.

The Climate Commons. A searchable library of climate adaptation resources, including all of the above and more. See especially the [articles introducing concepts](#), and a [tabular comparison of tools](#).

SF Bay Area Watershed Analyst. Pick a subwatershed in the Bay Area, see graphs, tables, seasonal water balance diagram. Choose any of 14 futures to graph. Download many types of graphs, and data, for that subwatershed. Monthly data can be aggregated as you wish.

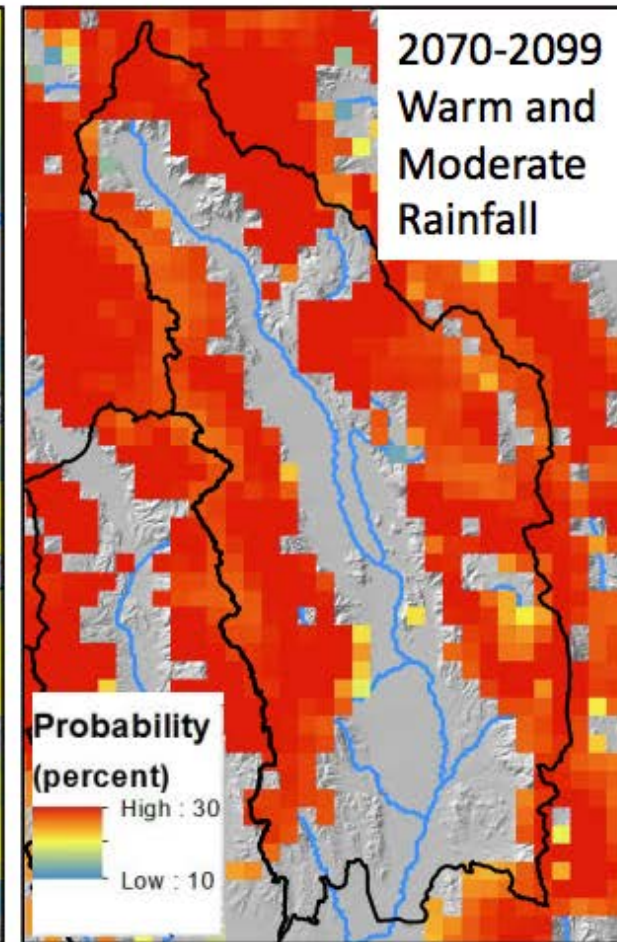
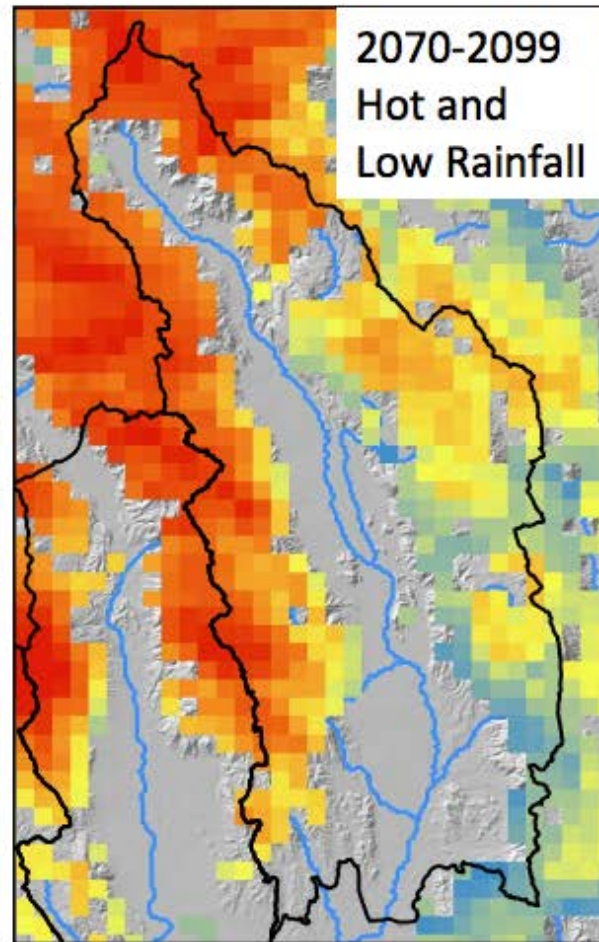
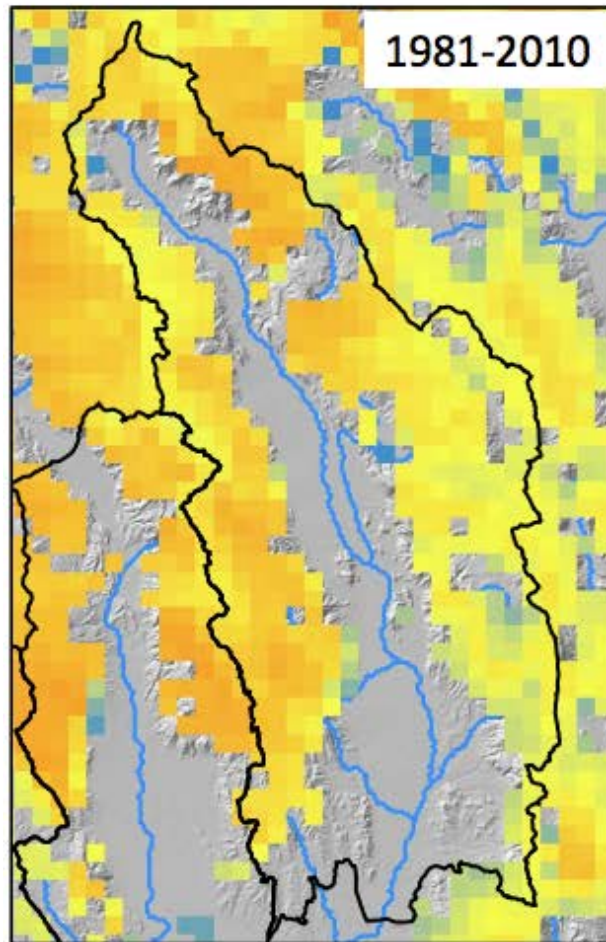
30-year climate and hydrology data for California. From the USGS Basin Characterization Model, maps of 30-year averages for all BCM variables for 18 climate futures for all of California (270m x 270m resolution) available as GIS downloads.

CalWeedMapper. Interactive mapping and reports for download, for invasive plant trends based on climate suitability and proximity to infestations. Results based on expert opinion, mapped observations, and limited climate suitability data. Choose Advanced mode, map an area of interest, and download the Regional Management Opportunities report.

Cal-Adapt beta. An easy tool for projecting the frequency and timing of future extreme heat days.

Change in Projected Probability of Burning One or More Times

Climate Ready North Bay Phase 1



Probability of fire doubles
in some locations

Urban and agricultural areas masked out

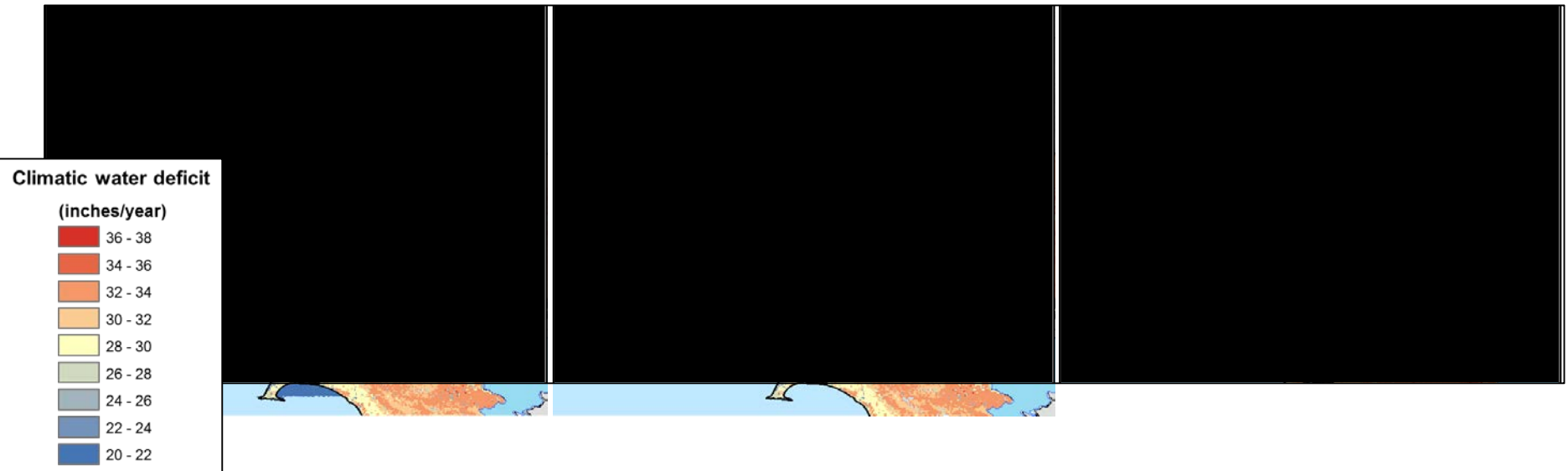
		Current	Hot, Low Rainfall	Moderate Rainfall
Variable	Units	1971-2000	2070-2099	2070-2099
Probability of burning 1 or more times	Percent	21%	22%	29%
	SD	2%	5%	3%

Projected Climatic Water Deficit 2040-2069

Warm & High Rainfall

Warm & Moderate Rainfall

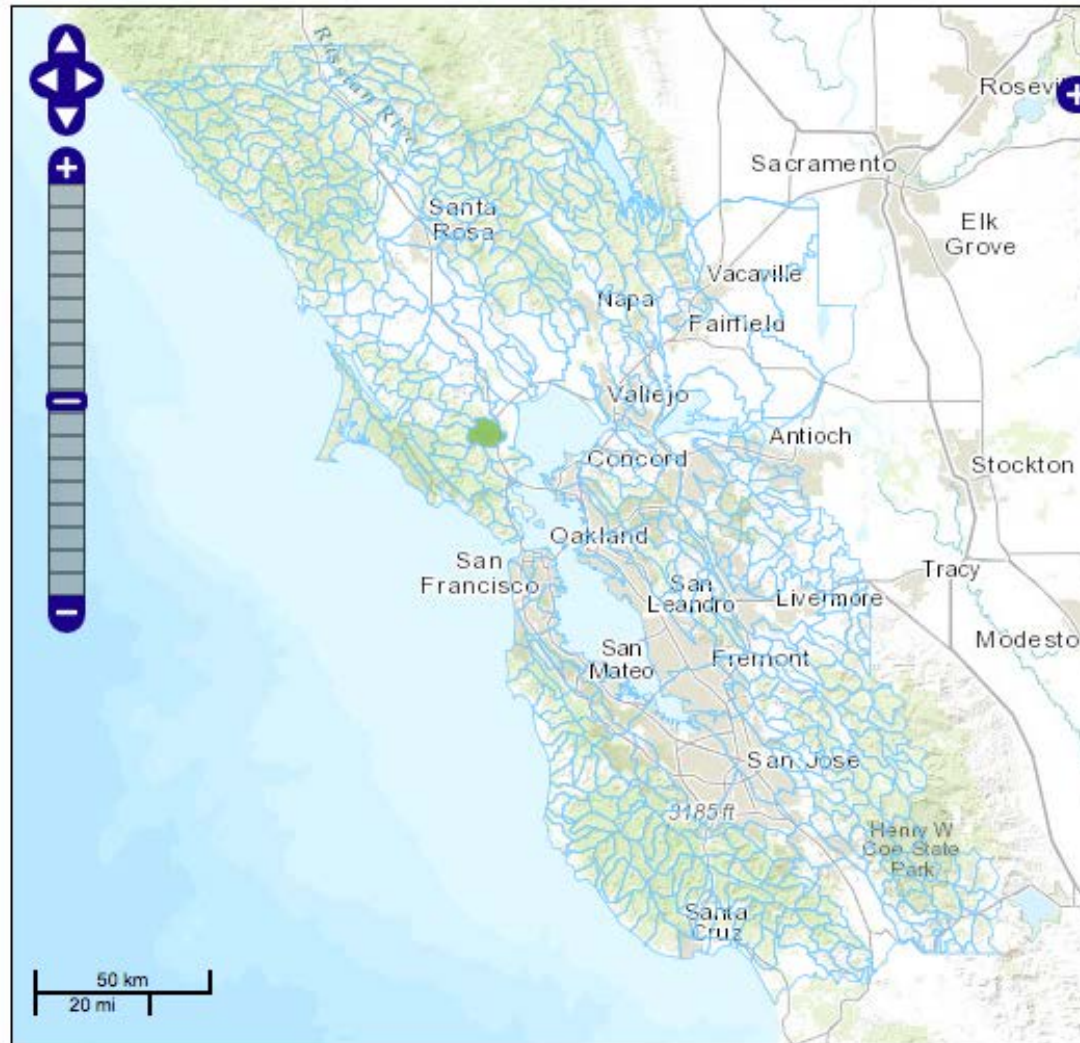
Hot & Low Rainfall



- CWD increases by mid-century for all scenarios
- CWD correlates with irrigation demand, landscape stress, vegetation patterns

San
Francisco
Bay Area

Climate-Smart Watershed Analyst



undefined



Pepperwood
PRESERVE

[Recenter Map](#)



Watershed: **Miller Creek (HUC 2206200002)**

10732 acres, 4343 hectares

[help](#)

Data Variable:

Future Scenario:

Historic Average Over:

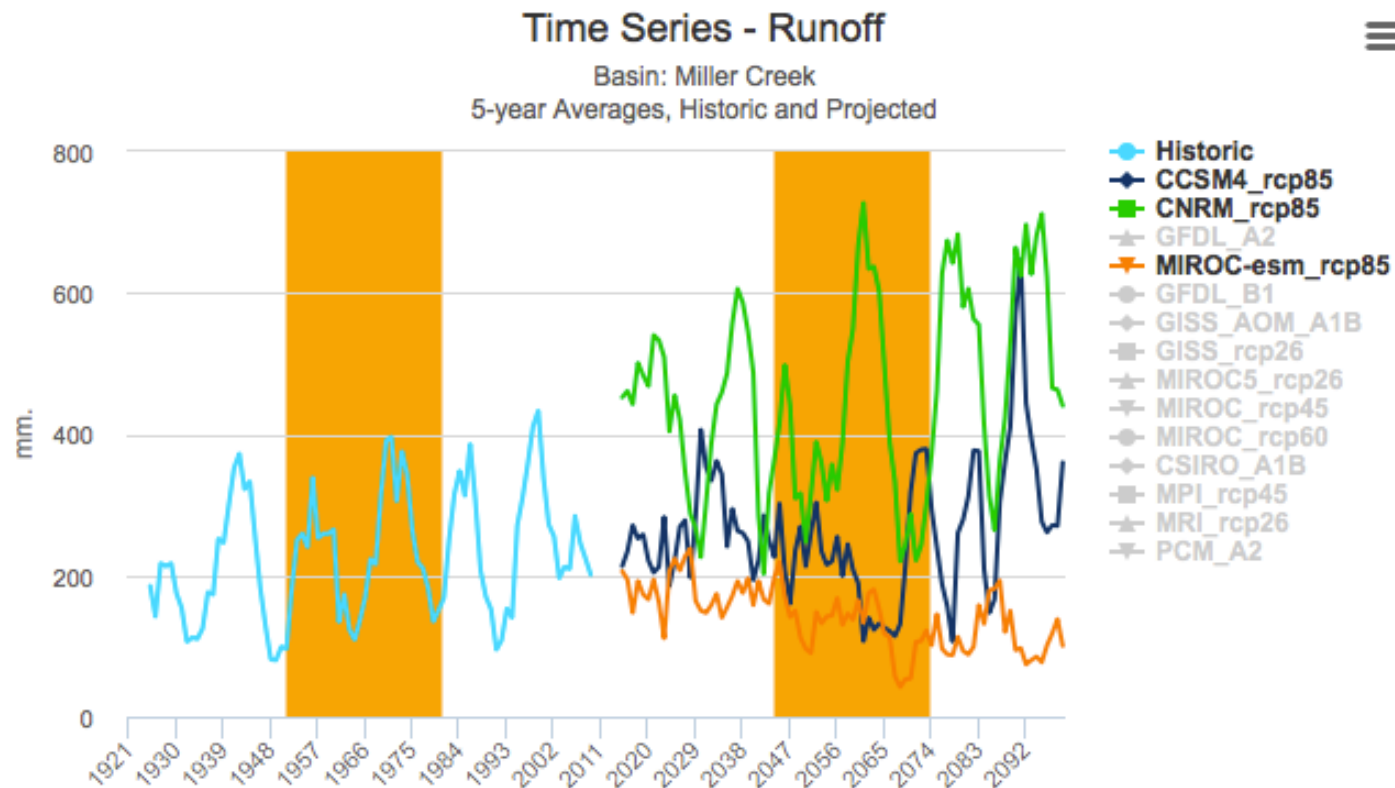
Projected Average Over:

Year Range:

Year Range:

Time Series

Smooth over: years
Data Variable selected at top



Highcharts.com

SF Bay Watershed Analyst

Number of Extreme Heat Days

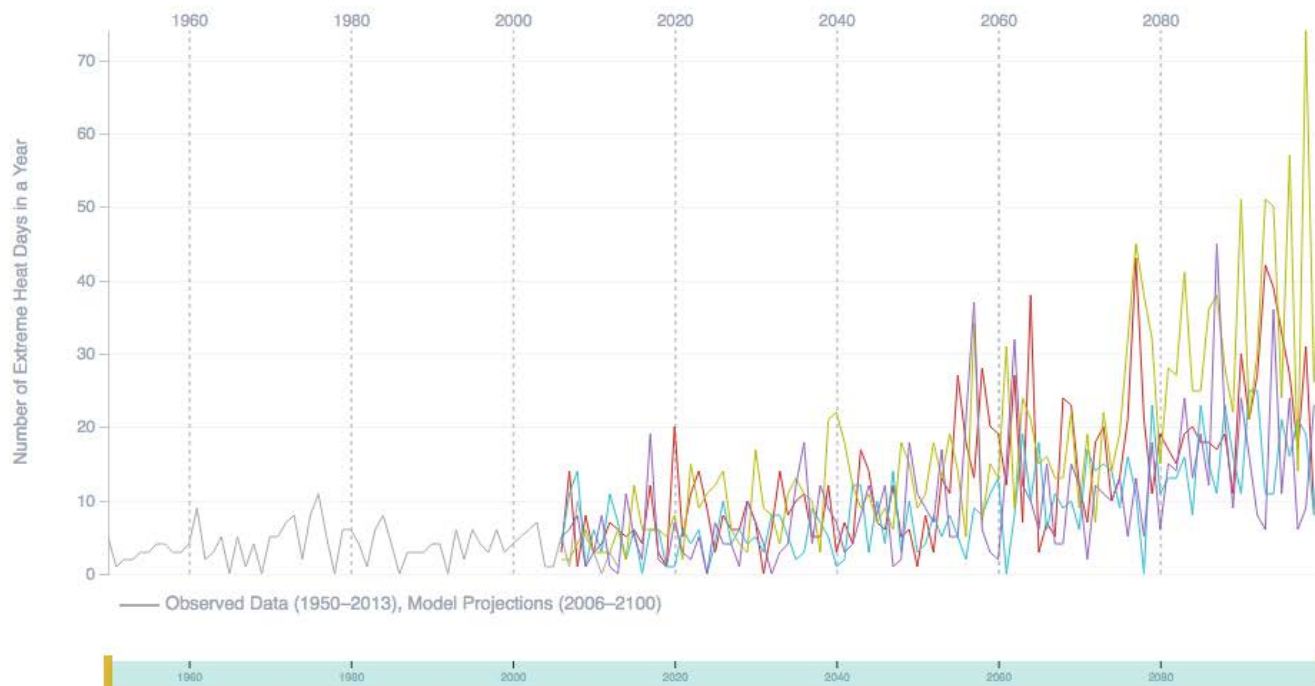
AREA NEAR NOVATO, CA, USA

Emissions continue to rise strongly through 2050 and plateau around 2100 (RCP 8.5)

Extreme Heat Threshold: 96.37°F

Download Data

Save Chart



Average number of days with high above 96.37°F in 1961–1990

4.3

Average number of days with high above 96.37°F in 2070–2099

20

RCP 4.5

Emissions peak around 2040, then decline

RCP 8.5

Emissions continue to rise strongly through 2050 and plateau around 2100

Additional resources

For further exploration , please see:

- [NBCAI's fact sheets](#) on climate adaptation in the North Bay
- [A Roadmap for Climate Resilience in Sonoma County](#)
- [Climate Readiness Institute](#) - bay area scale, excellent newsletter
- [Bay Area Ecosystem Climate Change Collaborative](#) – excellent newsletter
- [TBC3](#) – climate, hydrology, vegetation, and fog research
- [California Landscape Conservation Collaborative](#)

Two surveys, another planned

What People Are Saying

Two project surveys indicate that the NBWA community is finding the Climate Ready North Bay Phase 1 products somewhat more relevant to their needs than the interactive Conservation Lands Network Explorer or the SF Bay Area Watershed Analyst. Many respondents are interested in watching a webinar on the tools and applications. A third survey in 2017 will keep tracking whether and how the NBWA community has found these tools useful.

More!

Webinar

*Workshop of
local case
studies*

*Tools demo for:
roads, wastewater,
ag orgs, city
planners*

*New names
for NBWA*

Common needs requiring focused analysis

Riverine flooding: “what to do about the 100-year flood?”

Riverine flooding combined with sea level rise

Designing, maintaining, repairing infrastructure with future conditions in mind

Where will salmonids not survive?

Toxic algae, disease vectors

Run surface water-groundwater models with future precip and ET conditions

Estimate benefits of taking action on e.g. stormwater



North Bay
CLIMATE
ADAPTATION
INITIATIVE

Future-Proofing

A Roadmap for Climate Resilience in Sonoma County

*You've heard the saying 'It takes a village to raise a child.'
Well, it takes a village with a plan to respond to climate change!*

Justin Witt, Brelje & Race, Sonoma County Climate Adaptation Forum, April, 2015

Sonoma County is a leader in reducing emissions to slow down climate change. However, even with these measures, serious climate hazards cannot be avoided. Climate resilience or climate readiness means we are prepared to deal with the hazards of climate change, we are reducing our vulnerabilities to the hazards, and we are set up to maintain or even improve our quality of life despite climate stresses.

We're all in it together. It will take action by all kinds of people in Sonoma County to achieve climate resilience. Climate resilience can improve nearly all aspects of life in Sonoma County, including general quality of life, social equity, ecological functions, water supply, wildlife and open space protection, economic stability, and safety.



Climate Smart North Bay fact sheet 5. Find more fact sheets and the full Roadmap document at northbayclimate.org.



9 CLIMATE RESILIENCE GOALS

1. Promote healthy, safe communities
2. Protect water resources
3. Promote a sustainable, climate-resilient economy
4. Mainstream the use of climate projections
5. Manage buffer zones
6. Promote ag preparedness and food security
7. Protect infrastructure
8. Increase emergency preparedness and prevention
9. Monitor climate and its effects

A Climate-Resilient Vision for Sonoma County

- 1 Vulnerable communities' resilience
- 2 Connect community

- 3 Use less water

- 4 Use less water

- 5 Manage water as one

- 6 Diversify agriculture

- 7 Seize opportunities

- 8 Build resilient supply chain

- 10 Make room for water

- 9 Quantify benefits

- 11 Align plans with hazards

- 12 Farm carbon, water & diverse crops

- 14 Position your business

- 13 Subsidize local food

- 15 Reduce forest flammability

- 16 Prepare yourself

- 17 Invest in radical collaboration

- 18 Reality check

- 19 Align investments with values

- 20 Measure resilience

6 CLIMATE HAZARDS ADDRESSED

COMMUNITY RESOURCES AFFECTED

People and social systems
Built systems
Natural and working lands

TOP 20 ACTIONS

These are the highest priority actions from a longer list in the complete Roadmap document, distilled from over 125 raw actions from dozens of contributors and vetted by NBCAI and other experts.

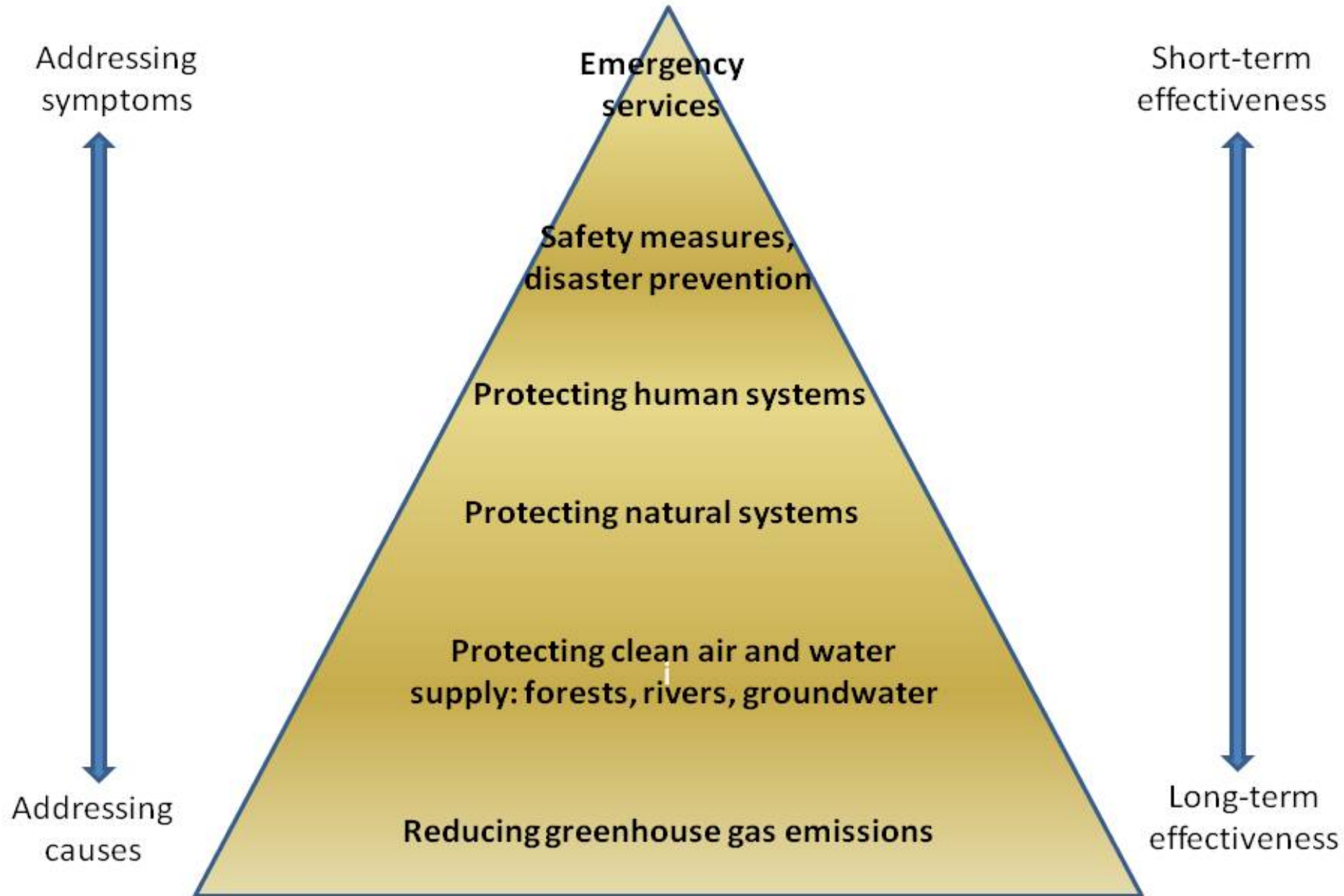
For the full list of actions, see the complete Roadmap at northbayclimate.org.

We must ALL participate for our community to be climate-resilient. Every person (and actor) has a part to play—school child, designer, official, tradesperson, farmer, retiree—to lead us to the resilient future we know is possible.

5 ACTORS



Building Blocks of Climate Response



Mitigation

Reduce
greenhouse gas
emissions,
sequester carbon

Adaptation

Protect
communities from
inevitable impacts
of climate change

WIN-WIN-WIN

- Water efficiency
- Energy efficiency
- Local food
- Natural water infrastructure
- Compact development
- Local renewable energy
- Distributed intelligent grid

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