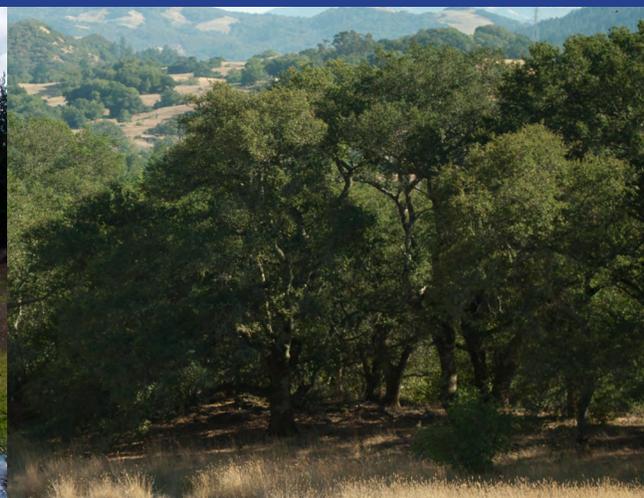


# Healthy Forests in a Changing Climate

*for people who steward forestland*



*Inside Learn About:*

**Climate Implications on Forests**

**What to Expect for the Future**

**How You Can Help**



# Healthy Forests in a Changing Climate

for people who steward forest lands

## Forests define our home

Chances are that if you live in rural parts of the North Bay you live in or not far from a forest, whether a rolling oak woodland, a conifer canyon featuring Douglas fir and redwood, or a diverse mix of hardwoods typical of Coast Range mountains.

Our forests provide shelter from wind and sun and serve as homes for wildlife. They provide wood and timber, serve a vital role in cleaning our air and water, and protect our landscape from erosion. Forests help reduce the impacts of climate change through absorption and storage of carbon dioxide, taking it out of the atmosphere where it otherwise creates the “greenhouse gas effect” causing climate change. But our forests are also at risk from the North Bay’s changing climate.

*This fact sheet provides tools to help you protect and manage our forests in the face of a changing climate.*

## Weather determines where plants can grow

Imagine a future without the iconic redwood tree. Multiple climate projections agree that sometime in the next century our weather is likely to be closer to Santa Barbara County’s than the relatively cooler conditions we experience today.<sup>1</sup> That means plants like redwoods (*Sequoia sempervirens*) that need extremely cool and moist conditions may struggle to survive in the North Bay by this century’s end.

*Plant ecologists estimate that over time, our region may lose woody forest vegetation as our landscape adapts to higher temperatures and more variable rainfall.<sup>2</sup>*

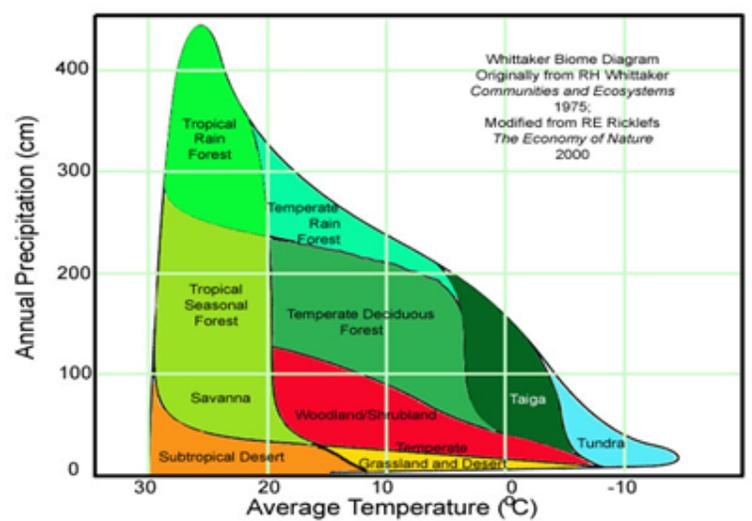
This means we may start to see our forests transition from tree cover to chaparral shrub cover, especially in the wake of potentially more frequent forest die-off events due to fire or disease.

## Forests for the future

Efforts to foster forest adaptation are important to protect both ecosystem values (such as wildlife habitat, watersheds and streams) and human ecosystem services (clean air, water, and soils, property values, safety, recreation, and wood products).

California Department of Forestry and Fire Protection, 2012

## Climate drives plant distributions



This figure shows how vegetation communities around the world are adapted to specific combinations of temperature and rainfall

1 Micheli, L et al., 2012. Downscaling Future Climate Projections to the Watershed Scale. *San Francisco Estuary and Watershed Science*, 10(4), jmie\_sfews\_11170.

2 Cornwell, W et al., 2012. Climate Change Impacts on California Vegetation: Physiology, Life History, and Ecosystem Change. California Energy Commission, CEC-500-2012-023.

# Why Should We Care?

*Because a drier, warmer climate increases fire risks.*

A changing climate is expected to bring more frequent extreme weather conditions, subjecting forests to increased stress due to drought, disease, invasive species, and insect pests. These stressors are likely to make forests more vulnerable to catastrophic fire.<sup>3</sup>

Periodic fires are natural processes important to the health and renewal of forests, but we need to balance the natural resource benefits of episodic fire with the need to manage threats to homes and built infrastructure. This is particularly true for properties located at the wildland-urban interface where residential development mingles with wildland areas.<sup>4</sup>

Historically our region experienced frequent mild to moderate fires, particularly in light of what we know about the indigenous use of fire as a forest thinning and grassland management tool.<sup>5</sup> Today urban-wildland interface zones are now particularly susceptible to more intense wildfires in part because since the 1950s, our fire prevention efforts have in many cases allowed large amounts of dead and downed wood, potential fuel for wildfires, to accumulate in our forests.

Given that today fires burn more intensely than ever before, the potential loss of life and property damage is very high if steps are not taken to create “fire safe” zones around homes, especially since access by fire departments is often difficult in rural areas. The Oakland Hills (1991) and Santa Rosa (2008) fires are examples of catastrophic fires at an urban-wildland interface.

*As of 2005, 70% of the area of Sonoma County is considered a high hazard zone for wildland fire, and 18% is classified as a wildland-urban fire threat zone.<sup>6</sup>*



Many forests in the North Bay border residential or agricultural properties that are not actively managed. Whether or not you consider our forest lands an aesthetic or commercial asset, they provide a remarkable range of benefits to people and wildlife that face an uncertain future as our climate changes and fire risks potentially increase.

If the projected shift from forests to oak woodlands or scrub and chaparral dominated vegetation community occurs in our region,<sup>7</sup> the need for adaptive strategies to preserve ecosystem services provided by forestlands and to help the forestlands persist through floods and droughts are management challenges we will face on our properties.

<sup>3</sup> Westerling, A and Bryant, B, 2008. Climate Change and Wildfire in California. *Climatic Change* (2008) 87 (Suppl 1): s231-s249.

<sup>4</sup> California Department of Forestry and Fire Protection 2009. *Homeowner's Checklist: How To Make Your Home Fire Safe*. Sacramento, California: [http://www.fire.ca.gov/communications/downloads/fact\\_sheets/Checklist.pdf](http://www.fire.ca.gov/communications/downloads/fact_sheets/Checklist.pdf).

<sup>5</sup> Anderson, M, 2006. *Tending the Wild*. UC Press, Berkeley, CA. 255pp.

<sup>6</sup> Sonoma County Permit and Resource Management Department 2011 Update. *Sonoma County Hazard Mitigation Plan*. Santa Rosa, California: Sonoma County PRMD. [http://www.sonoma-county.org/prmd/docs/hmp\\_2011/figures/8\\_8.pdf](http://www.sonoma-county.org/prmd/docs/hmp_2011/figures/8_8.pdf).

<sup>7</sup> <http://rcci.savetheredwoods.org/science/index.shtml>.

# What Can We Do To Help Our Forests Adapt?

*Like many activities that aim to adapt to projected conditions of a changing climate, many of the recommendations below are best management practices that you may already be applying to your property. The recommendations below address how to keep your forest healthy and how to minimize the potential damage due to wildfire.*

## Support forest health

- ***Keep an eye on your forest.*** Look out for pest insects and disease, invasive species, and dying trees. If you have questions, contact University of California Cooperative Extension Master Gardeners or a private arborist.<sup>8</sup>
- ***Be choosy when replanting.*** When you plant new trees or other plants, choose species that will be able to adapt to predicted future arid climate conditions (see *Learn More*).
- ***Look for North Bay natives.*** When planting native species on your property, purchase plants and tree starts from nurseries that collect, propagate, and disseminate tree species better adapted to the North Bay climate and changing environmental conditions<sup>9</sup> (see *Learn More*).
- ***Work to eradicate non-native pest insects, diseases, and invasive weeds on your property.*** Educate yourself on what to look for and how to avoid moving insects, diseases, and invasive species from infected areas to uninfected areas. The following websites are good places to start: [www.suddenoakdeath.org](http://www.suddenoakdeath.org) and [www.caforestpestcouncil.org](http://www.caforestpestcouncil.org).<sup>10</sup>
- ***Leverage your resources.*** Seek projects and apply practices that support multiple resource objectives such as planting projects designed to improve forest health, reduce fuel loads, and reduce erosion. For example, you can use the woody materials collected from forest thinning and exotic species removal to create erosion control structures in gullies to reduce head-cut erosion, filter out sediment, and disperse the erosional force of the water.<sup>11</sup>

### Our forests need your help



An oak woodland at Pepperwood Preserve, Santa Rosa, CA

<sup>8</sup> UC Cooperative Extension Master Gardeners, [www.ucanr.org/sites/scmg](http://www.ucanr.org/sites/scmg).

<sup>9</sup> "How can sudden oak death and related diseases be prevented," [http://ucanr.edu/News/Sudden\\_Oak\\_Death/?uid=450&ds=191](http://ucanr.edu/News/Sudden_Oak_Death/?uid=450&ds=191).

<sup>10</sup> Landis, B, 2011. How CNPS Developed a Policy on Native Plants and Fire Safety. *Fremontia*, 8.

<sup>11</sup> For example see Wildlands Restoration at OAEC (2000-2009): <http://www.oaec.org/wildlands-biodiversity/wildlands-restoration-oaec>.

# How Can We Protect Our Communities From Wildfire?

- *Remove fuel loads from forests located near residences.* Be aware of fuel loads caused by dead and dying trees. Reduce hazardous fuel loads resulting from excessive tree deaths or invasive species from forests located near homes and other infrastructure.<sup>12</sup> Reduce fire hazard and restore fire-resilient conditions by thinning, removing live or dead vegetation that allows a fire to climb up from the landscape or forest floor into the tree canopy, and retain healthy native trees such as conifers and oaks. *However, do consider keeping standing dead trees or snags outside the fire safe zone as they can provide valuable wildlife habitat.*

Follow defensible space guidelines to reduce fuel loads, but not clear all vegetation, within 100' of your home.<sup>13</sup>

- *Avoid new construction in highest fire hazard areas* and consider projections of future climate when planning future land uses. See the NBCAI Fact Sheet on *Climate Change in the North Bay*.<sup>14</sup>
- *Make structures more fire resistant* by using ignition-resistant construction materials, starting with a Class A roof, if not already present.
- *Make a fire emergency plan* and make sure your family and neighbors are familiar with it. Consider creating a plan that is coordinated with your neighbors.<sup>15</sup>

*We face a wide range of potential scenarios, from floods to droughts, that may result from climate change. In order for our communities and forests to be resilient in the face of climate threats, we need to take climate into account in planning for the long-term management of our forest resources.*

## Learn more

What not to plant in high fire risk zones

Read a list of plant species that are either flammable, invasive, or both and should not be used in areas of high fire danger from the California Native Plant Society [here](#).

Invasive weeds that increase fire risks

View a table of non-native, invasive plants associated with change in fire regime or fuel conditions in California from the California Native Plant Society [here](#).

How to find native plants

Access a list of nurseries that carry native plants from the "Sonoma County Gardener's Resource Guide" at [http://sonomacountynurseries.com/?page\\_id=12](http://sonomacountynurseries.com/?page_id=12).

## Defensible space guidelines



From the California Department of Forestry and Fire Protection

The North Bay Climate Smart fact sheet series is a project of the North Bay Climate Adaptation Initiative (NBCAI). NBCAI is a coalition of natural resource managers, policy makers and scientists working to identify and promote effective climate adaptation strategies that sustain the ecological and human communities of the North Bay watersheds. This document is also available at [www.northbayclimate.org](http://www.northbayclimate.org).

<sup>12</sup> California Department of Forestry and Fire Protection 2012. Climate Adaptation: [http://calfire.ca.gov/resource\\_mgt/climate-change-climate\\_change\\_adaptation.php](http://calfire.ca.gov/resource_mgt/climate-change-climate_change_adaptation.php).

<sup>13</sup> Access Defensible Space Guidelines at: California Department of Forestry and Fire Protection 2012. Checklist: [www.fire.ca.gov/communications/downloads/fact\\_sheets/Checklist.pdf](http://www.fire.ca.gov/communications/downloads/fact_sheets/Checklist.pdf).

<sup>14</sup> Micheli, L. 2013. Climate Change in the North Bay. *Climate Smart North Bay*, Pepperwood Preserve, Santa Rosa, CA. Available at: [www.northbayclimate.org](http://www.northbayclimate.org).

<sup>15</sup> [http://www.fire.ca.gov/fire\\_protection/fire\\_protection\\_be\\_prepared.php](http://www.fire.ca.gov/fire_protection/fire_protection_be_prepared.php), [http://osfm.fire.ca.gov/fireplan/fireplanning\\_planning\\_mappingtool.php](http://osfm.fire.ca.gov/fireplan/fireplanning_planning_mappingtool.php).