



# Vegetation Communities at John Muir National Historic Site

The Question: *What vegetation types are present on Mt. Wanda? How much area does each vegetation type cover on Mt. Wanda? What is the status of sensitive vegetation types?*

Taking a close look at the forest or open meadows reveals that there are often subtle differences in plant species across a wide landscape. Unique microclimates, exposure to the sun, soil types, moisture availability, and a variety of other factors influence the types of plant species present in any given location. Changes in any of these factors will cause changes to the vegetation community which in turn also affect the different animal species inhabiting them such as birds and butterflies. Identifying and monitoring long-term changes in the type and extent of vegetation communities provide insight into other large-scale changes such as the spread of invasive plant species, disease, or climate change.

In addition, throughout California, there has been recent concern about the lack of regeneration in oak species. In some cases, this could be due to acorns not germinating and other cases show high rates of mammal herbivory on seedlings. As mature trees die off, there is the possibility that the oak dominated vegetation communities will decline. While the exact cause of this widespread phenomenon remains unknown, another critical threat to some oak species is Sudden Oak Death (SOD), caused by the pathogen *Phytophthora ramorum*. The disease has appeared in a few trees in eastern Contra Costa County but has not yet spread to Mt. Wanda. *Phytophthora ramorum* does not attack all oaks. Of the species occurring on Mt. Wanda only blue oaks and Coast live oaks are susceptible. Bay trees are not killed by the pathogen but are believed to be an important vector for spreading the spores.

The Project: *Conduct surveys on vegetation communities and oak regeneration at John Muir National Historic Site.*

A project was started in 2004 by the San Francisco Bay Area Inventory and Monitoring Program to classify the vegetation communities present on Mount Wanda based on the National Vegetation Classification System (NVCS). The NVCS is a standard hierarchical classification system of vegetation based on the types and abundance of plant species present. The most specific descriptive categories are alliance and association. This project builds upon a 2002 study to evaluate regeneration of four oak species and presence of Sudden Oak Death (SOD).

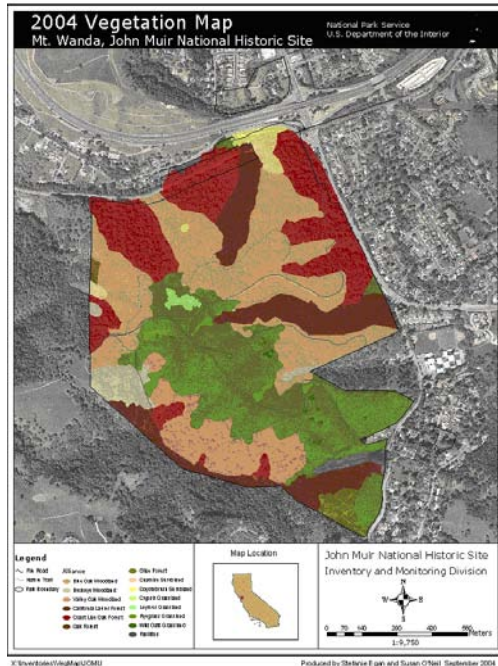
Survey Method for vegetation communities: In 2004, the vegetation on Mt. Wanda was delineated using the California Native Plant Society rapid assessment protocol at 45 locations during the growing season. The data were used to classify vegetation to the alliance level of the NVCS. Recent color and black/white aerial photographs were used along with Geographic Information Systems (GIS) and GPS units in the field to determine the boundaries of each vegetation type. Due to the small size of Mt. Wanda, all polygons were checked in the field for accuracy of the vegetation type and



The 13 vegetation associations on Mt. Wanda represent four vegetation classes: (from upper left to lower right) forest, shrubland, woodland, and grassland.

boundaries (a polygon is a mapping software unit that describes a geographic feature, consisting of a defined boundary and a point inside the boundary for identification).

Survey Method for oak regeneration study: In 2002, 26 50-meter transects were randomly established through oak-dominated habitats. The size and age class of all oak species with at least a portion of their canopy falling within 1-m on each side of a transect were recorded. Susceptible oak species and non-oak species were checked for symptoms of *Phytophthora ramorum* infection. Typical symptoms include bleeding cankers on the trunk and dying branches.



**A total of 13 native and non-native vegetation association types were categorized and mapped on Mt. Wanda.**

within the transects, which may indicate a lack of seed germination or higher rate of herbivory than for other species. California bays represented the greatest number of seedlings of any species which is remarkable given that they are only found in moist areas of Mt. Wanda. The large number of bay seedlings and saplings may indicate a future shift to a bay dominant system in the valleys and riparian zones where the current canopy cover is approximately 50% Coast live oak and 50% Bay trees.

There were no signs of Sudden Oak Death documented during the study on oaks or bay trees on Mt. Wanda.

## Additional Resources

San Francisco Bay Area Inventory and Monitoring Program: <http://www1.nature.nps.gov/im/units/sfan/index.htm>

USGS-NPS Vegetation Mapping Program: <http://biology.usgs.gov/npsveg>

California Native Plant Society Vegetation Program: <http://www.cnps.org/programs/vegetation/index.htm>

California Oak Mortality Task Force: <http://nature.berkeley.edu/comtf>

## For More Information

Marcus Koenen, Inventory and Monitoring Coordinator, National Park Service, San Francisco Bay Area Network, Fort Cronkhite Bldg. 1063, Sausalito, CA 94965. [Marcus\\_Koenen@nps.gov](mailto:Marcus_Koenen@nps.gov).

*The Results: A total of 13 native and non-native vegetation association types were categorized and mapped on Mt. Wanda. For all of the locations surveyed, all oaks had only mature trees and seedlings present with no saplings. This indicates a lack of recruitment from seedlings to the next stage of development.*

The 13 vegetation associations on Mt. Wanda represent four vegetation classes: forest, woodland, shrubland and grassland. The most dominant (largest area) on Mt. Wanda are native Blue oak woodland (26 acres), native Coast live oak forest (20 acres), native California Bay forest (13 acres) and non-native Wild oat grassland (28 acres). Vegetation associations on Mt. Wanda are unique and classification cannot be completed until further work is done in the East Bay hills and the classifications are officially accepted.

Surveys along transects documented four native oak species on Mt. Wanda: Coast live oak (*Quercus agrifolia*), Black oak (*Quercus kelloggii*), Blue oak (*Quercus douglasii*), and Valley oak (*Quercus lobata*). No saplings of any oak species were detected within 1-m on each side of the 26 transects in oak woodlands and forests. Blue oaks were the majority of trees detected in the study. Blue oaks were also the only species that had more adults than seedlings