

STATE  
OF THE  
PARKS®

January 2018

MUIR WOODS NATIONAL MONUMENT

A Resource Assessment



National Parks Conservation Association®  
Protecting Our National Parks for Future Generations®

# STATE ♦ OF THE ♦ PARKS®

Center for State of the Parks®

More than a century ago, Congress established Yellowstone as the world's first national park. That single act was the beginning of a remarkable and ongoing effort to protect this nation's natural, historical, and cultural heritage.

Today, Americans are learning that national park designation alone cannot provide full resource protection. Many parks are compromised by development of adjacent lands, air and water pollution, invasive plants and animals, and rapid increases in motorized recreation. Park officials often lack adequate information on the status of and trends in conditions of critical resources.

The National Parks Conservation Association initiated the State of the Parks program in 2000 to assess the condition of natural and cultural resources in the parks, and determine how well equipped the National Park Service is to protect the parks—its stewardship capacity. The goal is to provide information that will help policymakers, the public, and the National Park Service improve conditions in national parks, celebrate successes as models for other parks, and ensure a lasting legacy for future generations.

For more information about the methodology and research used in preparing this report and to learn more about the Center for State of the Parks, visit [www.npca.org/stateoftheparks](http://www.npca.org/stateoftheparks) or contact: NPCA, Center for State of the Parks, P.O. Box 737, Fort Collins, CO 80522; phone: 970.493.2545; email: [stateoftheparks@npca.org](mailto:stateoftheparks@npca.org).

Since 1919, the National Parks Conservation Association has been the leading voice of the American people in protecting and enhancing our National Park System. NPCA, its members, and partners work together to protect the park system and preserve our nation's natural, historical, and cultural heritage for generations to come.

\* More than 325,000 members

\* Twenty-three regional and field offices

\* More than 120,000 activists

A special note of appreciation goes to those whose generous grants and donations made this report possible: G.D.S. Legacy Foundation, Ray Bingham, Ben and Ruth Hammett, Lee and Marty Talbot, and anonymous donors.

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Cover photo: Coast redwoods tower over visitors along Muir Woods' Main Trail. Photo courtesy of Ernesto Gonzalez Roda.



## INTRODUCTION



DARWIN ATKESON

*"This is the best tree-lovers monument that could possibly be found in all the forests of the world."*

—John Muir on Muir Woods National Monument, February 6, 1908

Perhaps what makes Muir Woods National Monument such a special place is not just the height, age, or rarity of its remarkable coast redwood (*Sequoia sempervirens*) trees, but also the proximity of the woods to the diverse and

large human populations of California's San Francisco Bay Area, and the opportunities the park offers them. Located within Marin County, approximately 15 miles north of San Francisco, Muir Woods provides a space of quiet respite away from the hustle and bustle of modern urban life. Some who visit the park, including schoolchildren, are experiencing a national park, natural area, or outdoor place of solitude and reflection for the first time in their lives.

Sunlight breaks through the dense canopy of Muir Woods' coast redwood forest to shine on the park's Main Trail.



CRAIG STOCKS

Visitors crane their necks to take in the dizzying heights of the park's coast redwood trees.

## MUIR WOODS NATIONAL MONUMENT AT A GLANCE

- **Inspiring natural resources:** Muir Woods' abundant natural resources include an intact old-growth coast redwood forest, Redwood Creek, wildlife, and habitat that supports several federally listed species—northern spotted owl, coho salmon, steelhead, and California bottlebrush grass.
- **Historic cultural resources:** Muir Woods National Monument is home to historic resources dating to the early 1900s; a museum collection and archives that contain correspondences between John Muir, William Kent, and Theodore Roosevelt; a cultural landscape that is listed in the National Register of Historic Places; and a rich human history that begins with the use of the area by the Huimen Coast Miwok and continues to the growth of the American conservation movement and beyond.
- **Recreational activities:** The park offers visitors several hiking trails, interpretive programs throughout the year, quiet areas, the chance to view spawning native salmon, and excellent bird-watching opportunities, among many other recreational activities. The park is also home to the oldest cross-country running trail in the United States, the Dipsea Trail, which is listed in the National Register of Historic Places.

Coast redwoods, the world's tallest organisms, once grew in moist temperate areas throughout the world, but now they can be found only within a narrow stretch of the Pacific Coast of North America. These behemoths, reaching upwards of 370 feet, require special environmental conditions, which limit where they can grow, and logging has reduced the number of coast redwood trees in these areas. Muir Woods protects the towering coast redwoods within a portion of the Redwood Creek watershed, which stretches from the summit of Mount Tamalpais to the Big Lagoon, where the creek empties into the Pacific Ocean.

President Theodore Roosevelt formally recognized the special qualities of the area when he established Muir Woods National Monument on January 9, 1908, using the Antiquities Act. Passed in 1906, the legislation grants the president the authority to set aside public lands or to accept private lands for the purpose of conserving the resources they contain. Originally consisting of 298 acres, Muir Woods was the 10th national monument to be established and the first national monument created near a major metropolitan area. The land was donated to the federal government by William and Elizabeth Kent, who had purchased land on the Marin Peninsula primarily to protect the remaining coast redwood trees from logging and to prevent the damming of Redwood Creek, which would have flooded the valley. William Kent was the park's first volunteer, and the culture of conservation and citizen stewardship originating with the Kents and continuing through today is at the heart of the park's story.

Over the years additional redwood stands and other parcels have been added to Muir Woods—128 acres in 1921, 53 acres in 1951, and 50 acres between 1960 and 1983, among other additions—bringing the park's size to its present 558 acres. In 1972 Muir Woods was incorporated into Golden Gate National Recreation Area; it and New York's Gateway

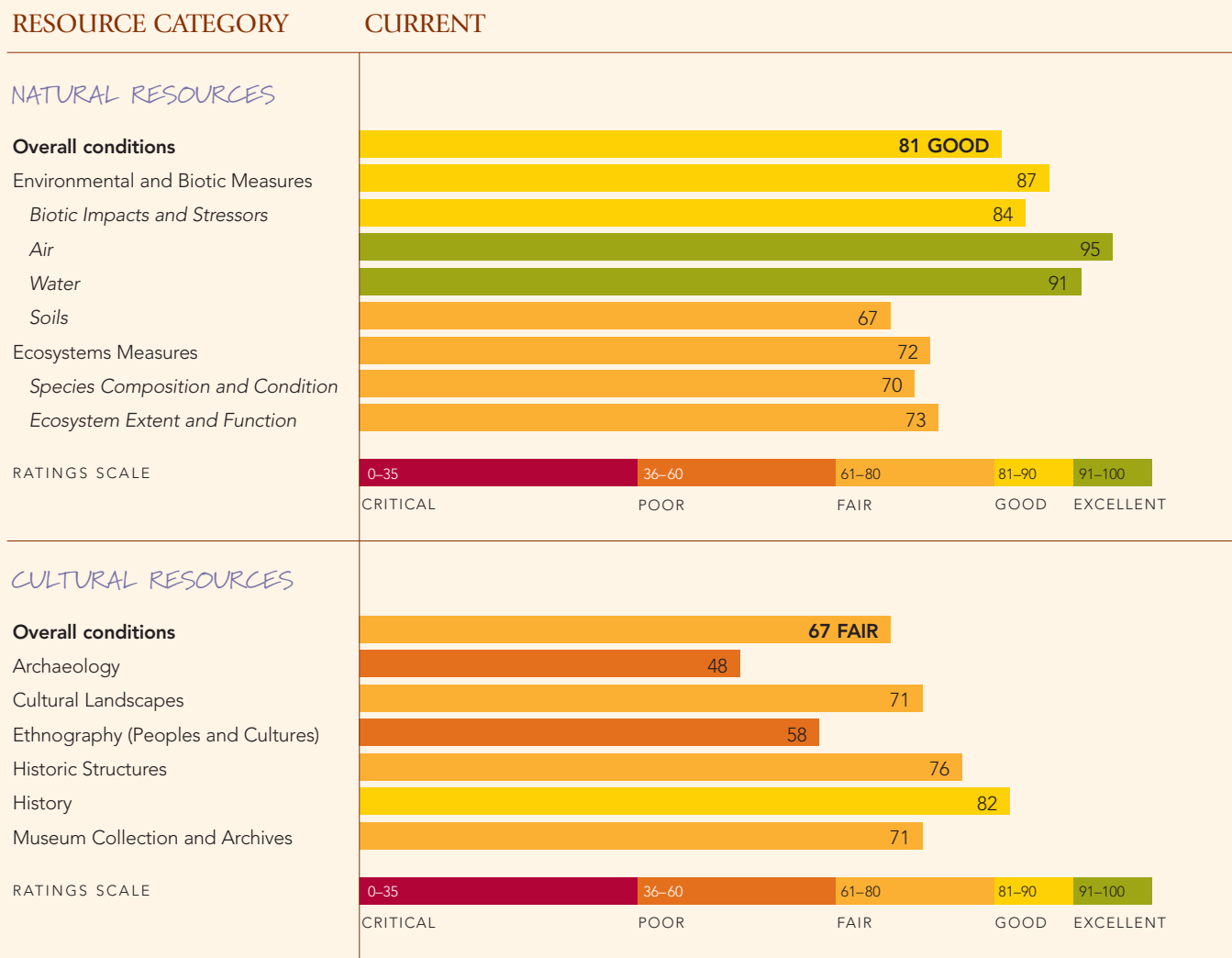


National Recreation Area were the first national recreation areas created near large urban populations. Muir Woods draws on natural and cultural resource staff from Golden Gate National Recreation Area as needed for specific projects, while interpretive and maintenance personnel staff the monument on a daily basis.

Muir Woods was first set aside to protect the primeval old-growth coast redwood forests. The focus on natural resource preservation has

expanded as the park has become a refuge for rare wildlife and plant species—northern spotted owl, coho salmon, steelhead, and California bottlebrush grass. In addition, park managers have expanded Muir Woods’ scope of interpretation and preservation to include the park’s significant cultural resources and to provide recreation opportunities that do not degrade resources.

Note: When interpreting the scores for resource conditions, recognize that critical information upon which the ratings are based is not always available. This limits data interpretation to some extent. For Muir Woods National Monument, 63 percent of the natural resources information was available, and 82 percent of the cultural resources information was available.



The findings in this report do not necessarily reflect past or current park management. Many factors that affect resource conditions are a result of both human and natural influences over long periods of times, in many cases pre-dating the park's creation. In addition, some park resources can be affected by factors that are outside the park and beyond the National Park Service's control. The intent of the Center for State of the Parks is not to evaluate National Park Service staff performance, but to document the present status of park resources and determine which actions can be taken to protect them in the future.

## RATINGS

Current overall conditions of the known **natural resources** at Muir Woods National Monument rated a “good” score of 81 out of a possible 100. Ratings were assigned through an evaluation of park research and monitoring data using NPCA’s Center for State of the Parks comprehensive assessment methodology (see “Appendix” on page 32). Factors that helped the park achieve this score include the health of its coast redwood trees, which comprise one of the few remnant groves in Marin County, the high-quality habitat the park provides for the federally listed endangered coho salmon and the threatened northern spotted owl and steelhead, and the park’s air and water quality. Challenges facing the park’s natural resources include a lack of funds to implement restoration projects; past human-caused alterations to the landscape that continue to negatively affect ecosystems; the adverse effects of the park’s fire-suppression policies; and damage from adjacent land uses (e.g., increased sedimentation in waterways and encroachment by invasive non-native plant species).

Overall conditions of the park’s known **cultural resources** rated 67 out of a possible 100, indicating “fair” conditions. The scores for cultural resources are based on the results of indicator questions that reflect the National Park Service’s own *Cultural Resource Management Guideline* and other policies related to cultural and historical resources. Factors influencing the overall score include a lack of important baseline inventories and reports, which was a major consideration in the “poor” score for archaeology; conversely, the park has been able to complete a historic resource study through the use of outside contractors, which bolstered the history program and helped it achieve a “good” score.



Muir Woods National Monument is a haven for a host of wildlife species, both large and small. Each year, ladybugs migrate en masse to the park to find relief from central California’s scorching summer temperatures in Muir Woods’ cool fog and breezes.

### Muir Woods National Monument

**Park location** Northern California, about 15 miles north of San Francisco

**Park size (acres)** 558

**Park establishment** 1908

**Recreational visits (2009)** 779,880

## KEY FINDINGS

- **Northern spotted owl population faces threats and is declining.** Habitat loss and the recent expansion of barred owls into northern spotted owl habitat continue to affect federally listed threatened northern spotted owls within and outside the park. Park staff plan to begin monitoring barred owl populations.
- **Sudden oak death threatens several tree species.** Sudden oak death is a major threat for the park's oak and tanoak trees, which provide habitat and food for a host of animal species, including species preyed upon by northern spotted owls. Staff distribute literature to visitors and have posted signs to educate them on ways they can avoid spreading this water-carried mold. The park installs boot-washing stations at special events and during certain volunteer projects to help prevent pathogen transportation.
- **Muir Woods provides habitat for rare coho salmon and steelhead.** The park is a sanctuary for the federally listed coho salmon and steelhead, species that require both healthy freshwater and marine habitats during their lives. These species have declined because of habitat degradation and destruction. Upon returning from the ocean to spawn and then perish, coho salmon and steelhead provide valuable nutrients for a host of species, including the towering coast redwoods, which absorb nutrients released from the fish as they decay. Survival of these fish species depends on landscape-level ecosystem health, and the Park Service is partnering with other federal, state, and local government agencies as well as nonprofit organizations and private landowners to improve habitat for the fish and other species. Riparian and stream restoration projects within Golden Gate National Recreation Area at the Banducci Flower Farm site and Big Lagoon are intended to benefit coho salmon and steelhead that spawn in Redwood Creek.
- **Cultural resource program needs additional staff.** There are no cultural resource staff permanently assigned to Muir Woods; instead, the monument relies on Golden Gate National Recreation Area staff who are shared among several park areas. While most cultural resource projects at Muir Woods do not require full-time staff, the park does need additional support. Park staff have requested funding for a cultural landscape specialist and an assistant archaeologist who would be stationed at Golden Gate National Recreation Area and would be assigned to Muir Woods on a part-time basis.
- **Park managers concerned about how climate change could affect coast redwoods, coho salmon, and steelhead.** The park's native species will have to adapt to the environmental ramifications that climate change will bring, and some species could be extirpated. Climate change could affect the formation and presence of fog along the Pacific Coast, which is of particular concern because coast redwoods rely on fog to provide the moisture that enables them to grow to such towering heights. How climate change will affect Pacific Coast fog is currently being studied by researchers from the University of California at Berkeley, among others.
- **Park staff fight non-native, invasive plant species.** Non-native plants can dramatically alter ecosystem structure and composition by outcompeting





KAREN BAAS

native plants, and they can reduce the availability of food for native wildlife. With the exception of panic veldtgrass, the most prolific invasive non-native plant species within Muir Woods National Monument are mainly located outside the redwood and Douglas-Fir forest and include forget-me-nots, thistles, bluegum eucalyptus, brooms, and cape-ivy. Park staff and volunteers keep an eye out for invasive species and often remove them by hand when they are spotted. They have been able to control forget-me-nots in some areas, but the plants are more difficult to remove from steep slopes. The park has also worked to eradicate cape-ivy and several other invasives. In recent years the park

secured funding to develop a long-term strategy for controlling invasive non-native plants and to support ongoing efforts to control panic veldtgrass.

- **Planning documents are needed.** Muir Woods National Monument is in need of several baseline resource reports, studies, and plans, including a cultural landscape report, archaeological overview and assessment, ethnographic overview and assessment, traditional use studies, collections management plan update, and historic structure report. These documents would ensure resources are identified and protected, help staff manage the park's natural and cultural resources, and could be used to enhance interpretation.

The Main Trail provides access to the park for a host of visitors of all abilities.

## RESOURCE MANAGEMENT HIGHLIGHTS

- **Restoration efforts outside Muir Woods' boundaries benefit resources within the park.** Resource managers recognize that productive populations of fish and wildlife require healthy ecosystems regardless of park boundaries. As such, the park is involved with restoration efforts downstream on Redwood Creek at the Banducci Flower Farm site, which is managed by Golden Gate National Recreation Area, and at Big Lagoon, which is outside the monument at Muir Beach, to improve ecosystem health and salmonid habitat. Cooperation between the National Park Service; federal, state, and local agencies; nonprofit organizations; and private landowners is paramount to the success of these projects.
- **Shuttle system has helped to alleviate crowded parking lots.** Buses transport visitors from parking lots and public transportation stops in Sausalito and Marin City to and from the park, and an electronic sign on Highway 101 notifies visitors when parking lots in the monument are full. The park-and-ride shuttle service was introduced in 2005. The program has been extremely popular, partly because the park has a limited number of parking spaces, and they fill quickly on most days. The shuttles have reduced vehicle traffic to Muir Woods, thereby easing congestion, reducing illegal parking along roadways, and reducing air pollution. The shuttle runs on weekends and holidays every 20 minutes from early May through September.
- **Trails Forever program helps maintain park trails.** The Golden Gate National Parks Conservancy, a nonprofit organization that supports research, interpretation, and conservation programs at Golden Gate National Recreation Area, launched the Trails Forever initiative in 2003 to renovate and expand trails throughout the national recreation area. The goal of this initiative is to build a world-class trail system while protecting natural resources. Some of Muir Woods' trails, including the Hillside Trail that parallels the Main Trail through the park, have been the focus of restoration work done through the program.
- **Park recognized in the National Register of Historic Places.** In January 2008, Muir Woods was listed as a historic district in the National Register of Historic Places, the official list of historic places worthy of preservation. This listing allows the park to apply for additional preservation funding and ensures that an appropriate level of review and adequate mitigation is achieved for projects with the potential to harm park resources.
- **Park is working to preserve soundscape and improve visitor experience.** The National Park Service has recognized that the natural sounds that visitors hear while in national parks can be as important to their experience as landscapes, wildlife, and cultural resources. At Muir Woods, staff are attempting to provide quiet areas for visitors by designating times and places for silence and managing vehicle noise within the park. For example, the park has placed signage at the entrance of Cathedral Grove, a collection of some of the park's oldest and tallest trees,

reminding visitors that they are entering a quiet zone and to please turn off any cell phones while in the grove.

- **Ongoing infrastructure changes aimed at conserving park resources.** The National Park Service is working to better protect Muir Woods' cultural and natural resources while also improving visitor experience. Recent projects to this end include realigning roads and parking areas, implementing a public shuttle system to bring visitors to the monument, removing inappropriately placed structures (e.g., a restroom within an old-growth redwood grove), deconstructing revetments from streams to restore natural flow and movement, and renovating and replacing boardwalks to reduce their width and keep visitors closer to the creek. Future projects could include providing additional offsite parking, formulating a plan for the meadow and the remaining buildings at the park's entrance, decreasing the footprint of entrance structures in order to reduce their impact on the landscape, and collaborating with Mt. Tamalpais State Park on the possibility of using less sensitive state park land for the Redwood Creek nursery, volunteer staging area, and maintenance facilities. The National Park Service has returned historic buildings to serve more historic uses such as administration and staff housing, while moving away from more modern concession uses.



This interpretive display shows native plants grown by the Redwood Creek Nursery that are being replanted within the park as well as information on habitat restoration at Muir Woods.



## THE MUIR WOODS NATIONAL MONUMENT ASSESSMENT



CRAIG STOCKS

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Muir Woods National Monument

Visitors cross one of the four wooden bridges that traverse Redwood Creek along the Main Trail. From the bridges they might see aquatic wildlife such as steelhead and coho salmon.

### NATURAL RESOURCES—PARK PRESERVES INCREASINGLY RARE HABITATS, PLANTS, AND WILDLIFE

The assessment rated the overall condition of natural resources at Muir Woods National Monument a score of 81 out of 100, which ranks park resources in “good” condition. Prominent factors that helped the park achieve this positive rating include the health

of its remnant coast redwood forest ecosystem, the aquatic habitats that support rare fish species, and the overall “excellent” air and water quality.

### PARK HABITATS—REMNANT COAST REDWOOD FORESTS PROTECTED

Muir Woods National Monument was established in 1908 to protect some of the area’s last remaining old-growth coast redwood trees,

which were part of a forest that had never been logged because of their inaccessibility. Today, 85 percent of the park is comprised of old-growth coast redwood and Douglas-fir (*Pseudotsuga menziesii*) forests. Native hardwood forest, riparian forest/scrubland, coastal scrub/chaparral, grassland, and non-native evergreen forest account for the majority of Muir Woods' remaining acreage. While the forests of coast redwood and Douglas-fir are either healthy or are recovering from past disturbances, other habitats have been more significantly altered and are not recovering on their own. Fire suppression, invasive non-native plants, and past land use practices have significantly affected ecosystem health and altered species composition within these habitats.

Historically, coast redwood forests occupied approximately 2 million acres along a narrow strip of the California and Oregon coast. Logging has reduced the old-growth redwood forests to less than 4 percent of this range, and just 18 percent of the remaining old-growth forests are permanently protected within national and state parks and forest reserves. Extensive logging throughout the Marin Headlands during the 19th and early 20th centuries isolated the coast redwood trees on the lands that would later be protected within Muir Woods National Monument, creating an island of protected habitat. Despite their isolation, park staff consider the remaining coast redwood and Douglas-fir forests within Muir Woods to be healthy. They support myriad birds and mammals, including several federally listed species, and provide important nesting habitat for the federally listed threatened northern spotted owl (*Strix occidentalis caurina*).

Although the lands adjacent to Muir Woods National Monument lack old-growth forests of coast redwood and Douglas-fir, most acres are publicly owned and managed by various state and federal agencies. This public ownership protects them from development, maintains intact habitat for wildlife, and helps maintain

## FIRE SUPPRESSION AFFECTS ECOSYSTEM HEALTH

Fire-suppression policies at Muir Woods have disrupted the cycle of natural fires. This has allowed for the entrenchment of flammable non-native plants and has increased fuel loads, which could result in a catastrophic fire. In addition, second-growth species have grown more crowded, and ecosystems have changed (grasslands have become shrublands and shrublands have become coast redwood and Douglas-fir forest). However, there is no documented evidence that fire suppression has led to major structural or compositional changes within the original coast redwood and Douglas-fir forest, though fire suppression has reduced the number of fire scars on trees, which provide important wildlife habitat for bats and northern spotted owls, among others. Park staff are considering options for returning fire to Muir Woods; some limited prescribed burns have already been introduced into certain areas. Staff must balance the benefits of prescribed burns to certain species versus the negative effects these burns will have on other species. The park is working on a five-year plan to guide prescribed burns.

The charred bark of these coast redwoods serves as a reminder that fire is a natural element of the coast redwood ecosystem. Low intensity fires do not kill the trees because of their thick bark, but they do prevent the buildup of forest debris that can lead to higher intensity fires that can kill trees.



KIRKE WRENCH

## STAFF WORK TO PROTECT RARE PLANT SPECIES

One of the park's native species, California bottlebrush grass (*Elymus californicus*), is a federal species of concern, which is a term that identifies a species as declining or in need of conservation, though it has not been officially listed as threatened or endangered. It grows in coniferous forests and riparian woodlands, and staff have fenced off portions of the park to protect the plants from trampling, to prevent soil from being compacted, and to safeguard the shallow root systems of coast redwoods.



The California bottlebrush in the foreground is a federal species of concern that park managers are working to protect.

ecosystem functions. In areas where land adjacent to the park has been developed, such as the Muir Woods Park neighborhood, Green Gulch Farm, and the village of Muir Beach, park wildlife have been negatively affected (e.g., northern spotted owls face reduced habitat, and invasive non-native species have established themselves).

Channel alterations and other major changes (e.g., the construction of levees and parking lots, destructive recreational use, and dredging) over the last century at Big Lagoon (where Redwood Creek enters the Pacific Ocean at Muir Beach) have eliminated important rearing habitat for anadromous salmonids (species that are born in freshwater streams, mature in marine environments, and then return to their places of birth to reproduce and perish). Historically, Big Lagoon contained 13 acres of wetlands, 12 acres of open water, and 5 acres of dunes. Today, Big Lagoon has just 1.7 acres of open water during the wettest time of the year, and it has lost most of its marshland. In an attempt to help restore connectivity and improve habitat, especially for coho salmon and steelhead, the National Park Service worked with five local and state agencies (California Department of Fish and Game, California Department of Parks and Recreation, Marin County, Marin Municipal Water District, Muir Beach Community Services District), as well as the Golden Gate National Parks Conservancy and private landowners, to develop a landscape-level plan for restoring and managing the Redwood Creek watershed.

The lower Redwood Creek restoration project at Muir Beach began in fall 2009 and seeks to restore the natural function of the creek and connection with the floodplain, recreate wetland habitat, realign the parking lot without decreasing existing capacity, restore dune habitat, control invasive non-native plant species, and expand the tidal lagoon and backwater habitat at Muir Beach—both critical for the survival of adult and juvenile fish. Any changes at Big Lagoon that favor salmon may



JULIE SMITH

negatively affect the area's suitability for the California red-legged frog (*Rana draytonii*), a species that was federally listed as threatened in 1996 and has disappeared from approximately 70 percent of its historic range due to habitat alterations and development. California red-legged frogs have been documented within Big Lagoon as recently as 2003; they are not currently found within Muir Woods National Monument. To mitigate potential negative effects on suitable red-legged frog habitat, the lower Redwood Creek restoration project included creation of a half-acre pond for the species. When this area becomes vegetated the Park Service plans on working with the U.S. Fish and Wildlife Service to relocate California red-legged frogs to this pond. The first phase of the lower Redwood Creek restoration project was made possible by funding from the National Park Service Recreation Fee Program,

California Department of Fish and Game, U.S. Fish and Wildlife Service, and Golden Gate National Parks Conservancy members. The Park Service and the Golden Gate National Parks Conservancy are also partnering with the Marin County Department of Public Works and the neighboring San Francisco Zen Center for this project.

Efforts to restore natural flows and improve summer and winter habitat for juvenile coho salmon and steelhead at the Banducci Flower Farm site began in 2003. The restoration projects to date have included removing 20th-century levees to reconnect the river channel with portions of its floodplain, creating additional floodplain, installing log jams to provide complex habitat, and planting native riparian vegetation. Despite this progress, further restoration work is needed. Plans have been developed to further improve the functionality

Residential development adjacent to the park poses challenges as well as opportunities (such as partners for restoration projects), for resource managers.



A father and son plant a coffeeberry bush, a fast-growing evergreen shrub that is native to California, as part of a habitat restoration project at Muir Woods.

of the floodplain, remove additional levees, and improve the habitat of a small tributary. However, the park has not been able to secure the funding to implement these projects. The next phases at the Banducci Flower Farm site aim to create summer rearing and winter habitat for salmonids, restore flooding and floodplain function, create seasonal wetlands and California red-legged frog habitat, and improve songbird nesting habitat.

#### LAND USE HISTORY—EXTENSIVE ALTERATIONS WITHIN AND NEAR THE PARK AFFECT RESOURCES

The first humans known to inhabit the present-day Marin Headlands of California were the Huimen Coast Miwok, who were active in the area thousands of years before the arrival of the first European explorers in the late 16th century. The Huimen Coast Miwok interacted with their surrounding environment, shaping it to suit their needs. For example, studies have found that the natural fire frequency in the region was approximately 135 to 350 years; the Huimen Coast Miwok reduced this interval to 20 to 80 years. The Huimen Coast Miwok used fire to drive game animals toward hunters and to manage vegetation to improve grazing for deer species and encourage the growth of certain plant species. Fire, both natural and human-caused, has shaped the distribution and species composition of the area's native plant communities, and regular fires may have controlled some pests and diseases.

The Spanish brought cattle ranching and increased grazing to the Marin Headlands in the mid-1700s. By the mid-1800s, American settlers began intensive dairy and logging operations within the headlands. While coast redwood forests in much of the region were logged intensively, the forests on land that would become Muir Woods National Monument were spared because the area was difficult to access.

Historic grazing and logging on adjacent lands, and more recent road construction and residential building in the headlands have exacerbated soil erosion, leading to an increase in landslides and gulying that has worsened sedimentation within Redwood Creek and its tributaries. Today, landslides and slope failure are common on the Camino Del Canyon Road in the park's Camp Monte Vista tract. In 2007, the Marin Municipal Water District completed several successful improvement projects on roads and trails on the slopes upstream of



Muir Woods to help improve slope stability and reduce sedimentation.

The Civilian Conservation Corps worked in the park during the 1930s, completing projects that were intended to improve the park for visitors by controlling flooding, reducing stream-bank erosion, and providing a more aesthetically pleasing environment. Unfortunately, some of these projects disrupted natural processes and degraded ecosystem health. For example, the removal of woody debris and the construction of bank revetments or rock walls along 3,541 feet of Redwood Creek prevented the formation of natural pools and undercut banks, which degraded or eliminated the complex habitat that spawning and juvenile coho salmon and steelhead require. Floods were curtailed, and when they were, bare mineral soils were no longer exposed, diminishing the opportunity for coast redwood seeds to sprout into seedlings. Woody debris on the valley floor can function as nurse logs that allow coast redwoods to sprout and grow. As late as the 1970s, no nurse logs were present in the forests along Redwood Creek. As recently as the early 1990s, woody debris was removed from Redwood Creek to prevent logjams that might increase flooding. Today, the National Park Service's policy is to refrain from maintaining revetments built in the 1930s, some of which are failing, allowing the creek to return to its natural flows. The practice of removing woody debris has stopped as National Park Service policy has shifted toward encouraging natural processes without interference. There are now between 20 and 30 nurse logs along Redwood Creek.

During the early and mid-1900s, recreational pressure on native ecosystems increased as more people visited the monument. Over time, the valley floor became denuded as visitors traveled off-trail and picked native vegetation. For example, some early visitors collected ferns and rhododendrons for their own personal landscapes; this practice has been prohibited since the 1920s. Park staff have made extensive efforts

to restore vegetation to the valley floor by replanting native plant species and by building wooden fences to discourage off-trail travel in order to reduce trampling and soil compaction. Restoration efforts along Redwood Creek have been successful; areas that had been completely devoid of vegetation along the creek have recovered to the point that it is not possible to discern restoration plantings from natural vegetation.

The park moved away from actively replanting coast redwood trees in favor of natural regeneration in the 1970s after questions arose about the effectiveness of previous regeneration efforts. Natural coast redwood regeneration at Muir Woods is aided by the reestablishment of natural water flows and by limiting off-trail travel by visitors.

Between 1999 and 2003, park staff removed segments of the paved Main Trail (which runs from the park entrance along Redwood Creek for 1.6 miles) and replaced it with narrower wooden raised boardwalks. This effort has helped to begin the process of soil recovery and restoring natural hydrological processes after years of compaction and denudation. Erosion from hillside hiking trails continues to be an issue for park managers; certain trails receive restoration attention from the Golden Gate National Parks Conservancy's Trails Forever program, but the remaining trails get only maintenance work. The Redwood Creek Trail along the valley floor is a priority for the limited staff maintenance time.

Muir Woods National Monument has had little development, road construction (aside from the facilities near the park entrance), or habitat alteration within park boundaries during the last several decades. As described above, certain areas that were disturbed historically have also had time to recover, either naturally or with the assistance of park staff. While the park was being protected from development within its borders, adjacent development continued throughout the 20th century. For example, more than 100 homes

At one time an East Coast species, barred owls have expanded their range and now compete with the federally listed northern spotted owls in Muir Woods for territory and prey. The barred owls' impact on its smaller relative is now being studied as resource managers struggle to protect the threatened northern spotted owl.



were built along Panoramic Ridge above Muir Woods by the early 1950s. In the Camp Monte Vista tract, trees and understory species were cleared for residential development, and non-native landscape plants such as invasive eucalyptus and acacia were introduced. This tract was purchased by the Park Service in 1983 and is currently in need of restoration work. Development in the upper Redwood Creek watershed has also affected the park. Specifically, upstream roads and trails have decreased soil stability, increasing erosion and the amount of sediment entering the creek in the runoff.

**WILDLIFE—PARK WILDLIFE INCLUDES SEVERAL FEDERALLY LISTED SPECIES** Twenty-seven mammal, 12 reptile, five amphibian, and four native fish species live within Muir Woods National Monument. An additional nine mammal species are thought to occur within the park but their presence is uncon-

firmed. Overall Muir Woods' mammals have not been well studied.

The park provides excellent habitat for bats. Tall, old-growth coast redwood and Douglas-fir trees provide crevices and cavities that the bats use for roosting. A 2004 survey found ten bat species foraging and/or roosting within the park. Of these species, four are federal species of concern: Townsend's big-eared bat (*Corynorhinus townsendii*), fringed myotis (*Myotis thysanodes*), long-legged myotis (*Myotis volans*), and Yuma myotis (*Myotis yumanensis*). One species, the western red bat (*Lasiurus blossevillii*), is on the U.S. Forest Service's sensitive species list. Sensitive species are not listed or proposed to be listed under the Endangered Species Act, but the National Forest Service focuses on conservation of the species and its habitat on National Forest System lands.

Two of the park's most important fish species are anadromous salmonids—steelhead (*Oncorhynchus mykiss*) and coho salmon (*O.*

*kisutch*). Anadromous fish serve as the backbone of the coast redwood and Douglas-fir ecosystem as their decaying bodies provide nutrients that allow a wide range of species to grow, including the trees themselves. Steelhead were federally listed as threatened in 1997. Coho salmon were federally listed as threatened in 1996 and were reclassified as endangered in 2005.

The section of Redwood Creek within Muir Woods National Monument is a particularly good spawning area, but habitat for juvenile salmon is very limited due to a loss of pools that resulted from previous creek alterations. Coho salmon populations can be greatly affected by floods, droughts, and other unpredictable events, which can jeopardize the survival of an entire year's spawning population. In fact, there has been recent evidence that weather conditions are affecting runs of coho salmon. In 2006, researchers counted lower numbers of juvenile coho per pool than average. During 2007–2008, no returning adult coho were observed in Redwood Creek, for the first time since records have been kept. Because the decline in coho is widespread, the cause is thought to be poor ocean conditions brought on by weather conditions, warmer ocean temperature, and lack of nutrients during 2006.

Muir Woods' bird species were surveyed between 1997 and 1999, including extensive efforts to document the presence of the federally listed threatened marbled murrelet (*Brachyramphus marmoratus*), which requires mature, tall trees. Thus far, this bird has not been found in the park. According to National Park Service data, Muir Woods National Monument has 59 confirmed bird species, although this might be an underrepresentation; the park's 1999 resource management plan identifies at least 69 bird species present at the park. The only federally listed bird species is the northern spotted owl, which is known to reside and breed within park boundaries. Cooper's hawk (*Accipiter cooperii*) and sharp-shinned hawk (*Accipiter striatus*) are two state-listed

species of concern found within Muir Woods. Other bird species of concern at Muir Woods due to their rarity or declining status include Pacific-slope flycatcher (*Empidonax difficilis*), Allen's hummingbird (*Selasphorus sasin*), chestnut-backed chickadee (*Parus rufescens*), and hermit thrush (*Catharus guttatus*).

The northern spotted owl was federally listed as threatened in 1990. Owl habitat within Muir Woods is high quality, although the birds still face threats. Nearby residential and commercial development destroys habitat; the owls are particularly susceptible to West Nile virus; sudden oak death may affect both nesting habitat and prey species abundance; and barred owls have been suspected of displacing northern spotted owls in Marin County. The 2008 U.S. Fish and Wildlife Service's final recovery plan for northern spotted owls identifies barred owls as the primary threat to northern spotted owl recovery. Barred owls were once found solely in the eastern United States, but they have been expanding their range over the last century and are now found in the Pacific Northwest and California. Barred owls compete with the northern spotted owl for food and breeding habitat, and they are genetically similar enough to mate with northern spotted owls, creating hybrids. In 2007, the first breeding pair of barred owls was discovered in the park; the pair was observed again in 2008. Anecdotal evidence suggests that breeding barred owls in Muir Woods have displaced breeding northern spotted owls; the park plans to monitor barred owl habitat use and movement.

## NON-NATIVE PLANTS AND TREE DISEASES THREATEN FORESTS

The National Park Service Species Database (NPSpecies)—the Park Service’s database for plant and animal species within Park Service units—lists 263 vascular plant species within Muir Woods National Monument, although 108 of them are non-native species.

Many of the non-native species found within the park, including cape-ivy (*Delairea odorata*) and bluegum eucalyptus (*Eucalyptus globulus*), were planted as ornamental landscaping by previous residents in the Camp Monte Vista subdivision before it was purchased by the Park Service. Some of these species have spread beyond their original plantings. Soil disturbances within the park and on adjacent lands (e.g., logging, grazing, farming, and residential development), the large number of monument visitors, and the lack of regular fires have also allowed non-native plants to take hold within Muir Woods. Once introduced, these plants establish themselves and become entrenched, especially on the outskirts of the park near developed areas. Some invasive non-native plants (e.g., bull thistle [*Cirsium vulgare*] and yellow star-thistle [*Centaurea solstitialis*]) can be found in any disturbed area, while other species favor a certain habitat type. For example, French broom (*Genista monspessulana*) and Italian thistle (*Carduus pycnocephalus*) are found within Muir Woods’ grasslands, while English ivy (*Hedera helix*), panic veldtgrass (*Ehrharta erecta*), coastal burnweed (*Erechtites minima*), forget-me-not (*Myosotis latifolia*), and poison-hemlock (*Conium maculatum*) inhabit riparian habitats along Redwood Creek and its tributaries.

Although the coast redwood and Douglas-fir ecosystem is not as affected by non-native species as other areas, some species have become established within the forest understory. For example, panic veldtgrass tends to thrive in disturbed areas along trails and the riverbank. Control methods for

this species are still being developed and tested. Muir Woods National Monument is a pilot location for testing different control methods—hand removal, chemical treatment, mulching with rice straw, and the use of fire in winter. Park staff and volunteers have been able to control forget-me-not along the canyon floor, although it is more difficult to remove from the adjacent steep, inaccessible slopes. The park has also worked to eradicate cape-ivy, brooms, acacias, and other species.

Native hardwoods and coast redwood and Douglas-fir forest understory species at Muir Woods are threatened by sudden oak death (*Phytophthora ramorum*), an introduced water mold that thrives in cool, moist forest environments and is spread by spores that move through the air, on humans and animals, and via trees, brush, and leaves that are moved from one area to another. It can cause large cankers on the main stems of oak trees (*Quercus* spp.) and tanoak (*Lithocarpus densiflorus*), which often kill the hosts. Tanoak plays a major role in the coast redwood and Douglas-fir forest understory, as the acorns produced by these trees are a main source of food for several of the park’s birds and mammals, such as the dusky-footed woodrat (*Neotoma fuscipes*), a major prey species for northern spotted owls. A reduction in the amount of oaks in the park could result in a corresponding decrease in the diversity and abundance of wildlife. Although treating individual trees is prohibitively expensive, park managers are trying to stop the spread of the disease to other parts of the park, region, and state by educating visitors during interpretive programs and by distributing pamphlets that teach visitors about the disease and how to avoid spreading it. The park also installs boot-washing stations during periods when the pathogen is most active within the soil.



One element of the park's restoration effort at the Banducci Flower Farm site is to restore Redwood Creek to more closely resemble its natural meandering course.

#### WATER AND AIR QUALITY—LIMITED MONITORING REVEALS GOOD CONDITIONS

Redwood Creek is the predominant hydrologic feature of Muir Woods National Monument. Data on aquatic species richness indicate water quality within Redwood Creek and its tributaries is excellent. Water quality downstream of the park is affected by elevated levels of fecal coliform bacteria and nitrogen that are likely attributable to runoff from horse pastures, agricultural activities at Green Gulch Farm, and septic system leaks. The National Park Service is working to improve the creek's aquatic and riparian habitats and water quality downstream of Muir Woods at Big Lagoon and the Banducci Flower Farm to benefit anadromous fish species that travel through these reaches to spawning habitat within the park.

Air quality is not monitored within the park; the nearest National Park Service air-quality monitoring stations are located at Point Reyes

National Seashore (30 miles north of Muir Woods) and Pinnacles National Monument (140 miles south of the park). There are additional federal and state air-quality stations located throughout the region as well. According to a 2005 National Park Service study, monitoring stations located in Marin County show air-quality parameters to be within federal National Ambient Air Quality Standards determined by the U.S. Environmental Protection Agency.

#### SOUNDSCAPE—SOUNDS OF NATURE AND SILENCE ARE AN IMPORTANT RESOURCE

Muir Woods National Monument is located near the San Francisco Bay Area, a major urban center with approximately 6.8 million residents. The park provides visitors with a quiet place where they can escape the noise of cities and hear the sound of water running in a creek, the calls of songbirds, the rustle of wind blowing

through old-growth coast redwoods, or the silence and stillness of nature, especially when the fog rolls in off the bay. Sound levels and the types of noises that can be heard play a big role in visitors' perceptions of solitude and nature.

The level of human-caused noise within Muir Woods garnered attention around the time that the northern spotted owl was federally listed as threatened. In response to this listing, the Park Service sought to reduce the level of noise at Muir Woods during the owls' breeding season to reduce possible disturbances. Since then, considerable effort has gone into understanding how natural- and human-caused sounds affect wildlife and visitor experience. This work has led to efforts to improve visitor experience by limiting human-caused sounds. In a park that is so close to a major urban area, providing a quiet, natural place is increasingly valuable.

Muir Woods was selected to participate in a pilot project during the mid-2000s to develop

a sound-monitoring program. Baseline noise data were collected by volunteers and with remote recording devices installed in the Cathedral Grove. Visitors were then surveyed and interviewed to determine how to provide an improved visitor experience. Several strategies were proposed and tested during 2007 to see which actions were most effective in reducing the level of human-caused noise. For example, signs were placed establishing quiet areas within certain areas of the park and quiet days were enacted park-wide. The signs asked visitors to turn off their cell phones, talk in a low voice, and tread softly as they made their way through the park. These experiments led to the establishment of a permanent quiet zone in Cathedral Grove and changes in park operations to reduce noise.

In an effort to reduce the amount of human-produced noise that detracts from nature's beauty, the National Park Service established quiet zones within Muir Woods, including at Cathedral Grove, and posted signs to remind visitors to be mindful of others, to keep their voices down, and to turn off their cellular phones.



CRAIG STOCKS



Fog that rolls off the Pacific Ocean provides the moisture necessary for coast redwoods to reach their dizzying heights. Resource managers are concerned what effect climate change will have on the amount of fog that reaches Muir Woods and researchers are studying this relationship.

### *CLIMATE CHANGE—A WARMER WORLD MEANS UNKNOWN EFFECTS ON PARK RESOURCES*

The effects of climate change on the park's wildlife, coast redwoods, and other trees and plants are potentially threatening, but are ultimately unknown at this time. Fog plays a tremendous role in the coast redwood and Douglas-fir ecosystem, so any changes in the formation and presence of fog could have widespread consequences. A study published by researchers from the University of California at Berkeley in 2010 found fog frequency has decreased by 33 percent—or three fewer hours of fog each day—along California's coast since the early 20th century.

Some of Golden Gate National Recreation Area's planning documents suggest that precipitation and storm intensity are expected to increase within the area under current climate change scenarios, which would likely increase erosion and floods. Since coast redwood trees

are not adversely affected by flooding, this could help coast redwood seedlings become established, though other species could be negatively affected. Other possible climate-related changes, such as increases in stream temperatures or reduced dissolved oxygen in ocean environments, would adversely affect salmonids.



Steps designed to mirror the Civilian Conservation Corps' designs from the early to mid-1900s mark the path for hikers within Muir Woods National Monument.

### CULTURAL RESOURCES—AREA IS HOME TO EXTENSIVE HUMAN HISTORY

Muir Woods National Monument scored an overall 67 out of 100 for the condition of cultural resources, including history, historic structures, cultural landscapes, archaeology, and museum collection and archives. A score of 67 indicates that the park's cultural resources are in "fair" condition. The scores for cultural resources are based on the results of indicator questions that reflect the National Park Service's own *Cultural Resource Management Guideline* and other policies

related to cultural and historical resources.

Key challenges park staff face in caring for the monument's cultural resources include threats to the park's historic structures (e.g., destructive carpenter ants, falling trees, deterioration/rot, collapsing foundations, and erosion), the lack of formal ethnographic studies, and almost no data on the park's archaeological resources. Planning documents, inventories, reports, and assessments and the funding to produce them are also needed in order for staff to best manage resources. Needed staff positions include a part-time historic landscape architect and a part-time assistant archaeologist.



#### HISTORY—FURTHER STUDIES NEEDED

The human history of the land within Muir Woods National Monument extends back to the Huimen Coast Miwok people who lived in the area when European explorers arrived in the late 16th century, and it continues with Euro-American settlement, early efforts to preserve the land as a national monument, and federal management of the park today. Primary themes staff interpret are the park's significance to the American conservation movement in the late 19th and early 20th centuries and its continued efforts to preserve the area's remaining old-growth coast redwood forests.

The Olmsted Center for Landscape Preservation completed a historic resource study for Muir Woods National Monument in 2006. The study provided significant information on the park's history and cultural resources, particularly relating to the cultural landscape. The authors recommended several additional baseline cultural resource documents be produced, including a cultural landscape report, an archaeological survey to discover pre-contact use of Muir Woods, and a site survey to accurately locate boundaries, structures, and natural features. After the historic resource study was completed, the authors nominated the historic core of Muir Woods National Monument for listing as a historic district in the National Register of Historic Places. This nomination was accepted on January 9, 2008, the 100th anniversary of the establishment of the monument. The Dipsea Trail, the route of the oldest trail-running race in the United States, was listed in the National Register in June 2010. Constructed in 1904, the trail stretches 7.5 miles from Stinson Beach to Mill Valley, across portions of Mount Tamalpais State Park, Muir Woods National Monument, and Golden Gate National Recreation Area.

Topics for further historic research include the area's historic ranches and work done by the Civilian Conservation Corps in the 1930s.

#### CULTURAL LANDSCAPES—PARK INCLUDES HISTORICALLY SIGNIFICANT LANDSCAPE

Cultural landscapes illustrate how people have shaped and been shaped by their surroundings over time. Muir Woods National Monument has one cultural landscape, which was recently recognized as historically significant. More than 400 acres of the park were added to the National Register of Historic Places on the 100th anniversary of the establishment of the park. Lands added to the park after 1947 were excluded from the designation because these lands were determined to be outside of the park's period of significance. The main features of the park's historic district include the old-growth coast redwood forest, Bohemian Grove, Cathedral Grove, and the trail and road systems, including the Ben Johnson Trail, Hillside Trail, Main Trail, Toll Road, and the park's two major roads. According to the park's 2007 cultural landscape inventory, this historic district is considered to be in "good" condition, which means that there is no clear evidence of disturbance or deterioration and that no immediate corrective action is required to maintain its current condition.

In addition to the old-growth coast redwood forest, Muir Woods National Monument also includes Camino del Canyon, which is known as the Camp Monte Vista tract. Congress authorized the National Park Service to purchase 50 acres in this adjacent residential subdivision from 1972 to 1983. This tract was administratively added to the park as a buffer zone and was not granted national monument status because it did not contain coastal redwood forest and was not significant to the American conservation movement. Park staff have initiated a National Register of Historic Places determination of eligibility and started the process of incorporating Camino del Canyon into the park's interpretive program.

The National Park Service completed a cultural landscape inventory, an important

identification and survey document, for Muir Woods in 2007. Now that this baseline research has been completed, the park needs a cultural landscape report to detail treatment recommendations and guide the long-term management of the landscape, and a cultural landscape specialist to implement the recommendations and help the park better, manage, interpret, and protect its cultural landscape. This position could be based at Golden Gate National Recreation Area and assigned to Muir Woods on a part-time basis.

#### HISTORIC STRUCTURES—MAJORITY IN “GOOD” CONDITION

Muir Woods’ historic structures are generally related to two eras—the early American conservation movement (e.g., Emerson Memorial and William Kent Memorial) and the National Park Service era of rustic building (e.g., the Administration-Concessions Building and the Superintendent’s Residence). The park also includes historic trails (e.g., the Main or Bootjack Trail, which dates to 1868, and the Hillside Trail, which was built in 1908 by the Mount Tamalpais and Muir Woods Railway Co.) and trails built by the Civilian Conservation Corps. The condition of these structures was most recently evaluated in 2009. Of the 32 historic buildings, structures, and objects that contribute to the park’s listing as a historic district, 20 are noted as being in “good” condition, eight are in “fair” condition, and four—the Dipsea Fire Road, Hillside Trail, Muir Woods Equipment Shed, and the Muir Woods Residence Storage Shed—are in “poor” condition. The park has funding to rehabilitate some trails to reduce deterioration and erosion.

In 2007, a contractor completed a determination of eligibility for listing in the National Register of Historic Places for eight structures in Camino del Canyon. This work was needed because the Park Service has plans to redevelop the area for maintenance and natural resource protection purposes, which would necessitate

the demolition of certain structures. One property, Hillwood Camp, was determined to be eligible for inclusion in the National Register as it is the oldest surviving youth camp in Marin County.

Park staff completed a nomination for listing in the National Register of Historic Places for the Dipsea Trail in spring 2010. The trail was listed in June 2010. A determination of eligibility for Druid Heights, a 1950s bohemian enclave that thrived through the 1970s, is in progress as well.

The park’s historic structures receive regular maintenance, including cleaning and monitoring. However, the structures are threatened by carpenter ants, falling trees, rot, collapsing foundations, erosion, and deterioration. The park has requested funds to better maintain historic structures and to complete a historic structure report for the buildings constructed in the National Park Service rustic architecture style between 1920 and 1940.

#### ARCHAEOLOGY—RESOURCES ARE UNKNOWN; ADDITIONAL RESEARCH IS NEEDED

Muir Woods National Monument’s archaeological resources remain virtually unknown. No archaeological surveys have been completed because of a lack of funding and staff. Golden Gate National Recreation Area completed an archaeological overview and assessment in 2003, but this document did not specifically focus on the archaeological resources or needs of Muir Woods. Historic sites that could be surveyed for archaeological resources include the Ben Johnson Cabin (Johnson was William Kent’s caretaker), the Keeper’s House (where Johnson lived as gatekeeper for the Tamalpais Sportsmen’s Association), features from the 1892 Bohemian Club encampment (site of a gathering of prominent men where a 70-foot Daibutsu Buddha was erected), and elements related to the terminus of the Mount Tamalpais and Muir Woods Railway, which was known as



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“the crookedest railroad in the world” (remaining elements include ruins of a hotel and tavern that were built for visitors).

The park’s archaeological resources are afforded some level of protection by remaining undiscovered. However, this could be threatening the resources as staff and visitors could be unwittingly damaging artifacts simply by walking throughout the park. The first step toward protecting the park’s archaeological resources is to complete site surveys to identify the locations of sites. After locations of sites are determined, more in-depth surveys will be

needed to evaluate the prehistoric or historic resources and their significance.

Golden Gate National Recreation Area has one full-time archaeologist who serves more than 78,000 acres, including areas within Muir Woods. Archaeological resources would benefit from the addition of an assistant archaeologist to help identify, document, and protect sites throughout the Golden Gate National Recreation Area’s units, including Muir Woods.

Visitors to Muir Woods National Monument pass beneath this arch, built in the Civilian Conservation Corps-style to resemble an earlier entrance arch.



One of the most prominent interpretive displays at the park is this cross-section of the trunk of a redwood tree that dates from A.D. 960. Park staff have affixed markers that point to years in which certain historic events took place.

#### MUSEUM COLLECTION AND ARCHIVES—MOST PARK ARTIFACTS ARE STORED OFF-SITE

Muir Woods' entire museum collection and archives are housed at Golden Gate National Recreation Area except for three items—a painting of William Kent, a painting of John Muir, and a preserved northern spotted owl specimen, which are all in the Muir Woods staff office. Park staff would like to display additional items from the park's collection but do not have adequate exhibition space. Items stored at Golden Gate National Recreation Area include

several historic signs and plaques, including the original Muir Woods entrance sign, stonework from earlier structures, and letters written between William Kent and Theodore Roosevelt.

Golden Gate National Recreation Area has a supervisory curator, curator, museum specialist and various archival technicians who care for the museum collections and archives of several park areas, including Muir Woods. Approximately 80 percent of the total Golden Gate National Recreation Area collection has not been cataloged, with archival items and archaeological items comprising the biggest

segment of uncataloged items. Several documents pertaining to Golden Gate's museum and archival collections are being updated, including the collection management plan (scheduled for fiscal year 2015), and a checklist for the preservation and protection of museum property, which is updated and submitted annually. Both of these documents cover Muir Woods' collections.

#### ETHNOGRAPHY—HUMAN HISTORY OF THE AREA DATES BACK THOUSANDS OF YEARS

Muir Woods National Monument lies within California's Coast Range in southern Marin, the traditional territory of the Huimen Coast Miwok American Indians. They likely used the land that is now protected within the park for fishing, hunting, and gathering food. No formal ethnographic studies, such as an ethnographic overview and assessment or traditional use studies, have been completed. Such studies are needed to identify ethnographic resources and contribute information to enhance interpretive messages. However, the park and the Federated Indians of Graton Rancheria, which is recognized as the park's associated American Indian tribe, have carried out studies together on traditional ecological knowledge as part of the natural resources restoration project at the mouth of the watershed at Muir Beach. The park has used this knowledge to develop vegetation restoration plans, craft interpretation programs, and guide archaeological exploration and public celebrations.

Spanish colonists came to the Bay Area in the mid-1700s, where missionaries built several missions and began to work to convert the local American Indians to Catholicism. This interaction brought disease that decimated the Huimen Coast Miwok population. By 1840, only an estimated 10 percent of the original Huimen Coast Miwok population remained.

Today the descendants of the Huimen Coast Miwok peoples are included in the Federated

Indians of Graton Rancheria. The Federated Indians of Graton Rancheria have produced some ethnographic information, including a list of native plants and their uses by their ancestors. Some of the native plants once used by the Huimen Coast Miwoks of the Marin Peninsula are still found within Muir Woods. The park has an excellent relationship with the Federated Indians of Graton Rancheria and proactively coordinates with them through the work of Paul Scolari, one of Golden Gate National Recreation Area's historians. Scolari also publishes a regular newsletter called *Native Update*, which keeps the associated tribes of Golden Gate National Recreation Area apprised of relevant issues, including those pertaining to Muir Woods.

Staff work to incorporate the built environment into the park's cultural and natural landscapes by using natural building materials in a style reminiscent of the Civilian Conservation Corps' work in the 1930s.



TYLER WESTCOTT



A trail crew member performs maintenance on a section of the park's boardwalk.

## STEWARDSHIP CAPACITY

### *FUNDING AND STAFFING—ADDITIONAL FUNDING NEEDED TO IDENTIFY AND PROTECT RESOURCES*

The most significant factor affecting a park's ability to protect its resources is the funding it receives from Congress and the administration. In fiscal year 2010, Muir Woods National Monument has an annual enacted operating budget of \$620,300 to support staff and fund resource protection projects. This level of funding does not allow for staff training, information technology upgrades, office improve-

ments, or fully meeting the needs of approximately 800,000 visitors each year.

Muir Woods has four interpretive staff members, one visitor and resource protection ranger, one maintenance staff member, and two seasonal staff. In addition, the park relies on shared cultural and natural resource staff from Golden Gate National Recreation Area, who must also serve other areas. The pool of cultural resource professionals staffing Golden Gate National Recreation Area includes an archaeologist, two historians, an architectural historian, a chief curator, archival and museum specialists, and a historical architect. Because these profes-

sionals serve multiple, disconnected areas, Muir Woods is still in need of part-time assistance in cultural resources to help complete resource plans and guide archaeological and cultural landscape work.

To complete work beyond basic maintenance on trails that are not included in the Trails Forever program, staff have recognized the need for an additional habitat restoration specialist to oversee volunteers, as well as four additional maintenance staff, three natural resources staff, and two more law enforcement rangers.

Muir Woods National Monument is also in need of additional interpretive staff. Currently the park has just four staff to provide interpretation to the nearly 800,000 visitors it receives each year. One of these works as the volunteer coordinator. Another is the site supervisor, who also serves other areas of Golden Gate National Recreation Area in the Marin Headlands. The monument has requested the funding to hire three additional interpretive staff, which was recognized as a regional priority. Because of the lack of staff, the park has focused on installing interpretive signs along trails that introduce and explain the park's cultural and natural resources to visitors.

#### PLANNING—SEVERAL PLANNING DOCUMENTS NEEDED

Muir Woods National Monument was incorporated into Golden Gate National Recreation Area in 1972, and since then many of the monument's planning and management documents have been included within the recreation area's processes and plans. Golden Gate National Recreation Area completed a fire management plan in 2005, which provides staff with detailed information on weather, air quality, and vegetation within Muir Woods. The plan offers several goals regarding the use of fire within Muir Woods, namely restoring the role of fire where relevant, reducing fuel loads, and studying the effects of fire in old-growth coast redwood forests.

Golden Gate National Recreation Area is in the process of updating its general management plan, which dates from 1980. The key issues for Muir Woods National Monument include visitor access and transportation; recreation opportunities and conflicts; sustainable natural and cultural resources protection; reaching new and diverse audiences; and climate change. One of the main goals of the park's updated general management plan will be addressing how to make park resources available to the greatest number of people and providing a full visitor experience while ensuring that those resources are fully protected.

Private contractors completed a historic resource study for Muir Woods in 2006 and the National Park Service finalized the cultural landscape inventory in 2007. Currently Muir Woods National Monument is in need of several base-

A volunteer helps park staff replant native vegetation as part of the park's habitat restoration efforts.



line resource reports, studies, and plans, including a cultural landscape report, historic structure report, archaeological overview and assessment, ethnographic overview and assessment, and traditional use studies.

#### RESOURCE EDUCATION—DESPITE LACK OF STAFF, PARK PROVIDES EXCELLENT PROGRAMS

Muir Woods National Monument has a very successful educational program, especially for young schoolchildren who visit the coast redwood and Douglas-fir forest and learn about the natural and cultural resources within the park and the need to preserve them. The park's proximity to a large urban area provides staff with the opportunity to introduce a broad and diverse audience to the natural and cultural resources of Muir Woods. The park offers brochures and maps, educational programs for schoolchildren both on- and off-site, and a self-guided interpretive trail featuring new waysides. Updates are needed for the outdated exhibits and interpretive signage at the park's entrance area and within the visitor center.

Muir Woods' visitor center is not large enough to accommodate the number of visitors that the park receives on a daily basis. The visitor center was intentionally designed to be small to encourage visitors to spend their time in the park outdoors. However, since the structure was built the space has been converted to include a bookstore and a fee collection station, leaving little room for exhibits about park resources. Even so, there are no plans to expand the current visitor center or construct a new one at this time.

#### EXTERNAL SUPPORT—VOLUNTEERS PROVIDE INVALUABLE SUPPORT

Muir Woods National Monument has a long history of benefitting from the outside assistance—beginning with William Kent, who donated the land that would become the monument and served as the park's first volunteer.

Today, faced with significant funding and staffing shortfalls, the park increasingly relies on partners and volunteers to bridge the gap between what is needed and what the park can afford. In 2009, 514 volunteers contributed 9,285 hours of service, numbers that have steadily increased during the past decade. This incredible amount of support is mainly channeled toward assisting park staff with interpretive services—performing interpretive talks, staffing the welcome table, and educating school groups—as the volunteer coordinator is part of the interpretive staff and is only supposed to be coordinating interpreter volunteers. The monument would like to expand the number of volunteers who can assist park staff with natural resource monitoring and protection, gather data during resource projects, and help to revegetate social trails. Expanding the scope of volunteer duties beyond interpretation is one of the reasons the park would like to add a restoration specialist who could coordinate volunteers.

Muir Woods National Monument has a strong partnership with the Golden Gate National Parks Conservancy—an advocate for park protection that contributes funds and volunteers for many projects throughout Golden Gate National Recreation Area. This partnership has become possibly too successful as the number of volunteers has outstripped the park's ability to effectively use them. To fully realize the benefits from volunteers, the park needs additional resources and infrastructure.

At Muir Woods the conservancy operates the Redwood Creek Nursery, handles fee collection, provides staff for the park's visitor entrance station and bookstore, organizes the volunteers for the Trails Forever program, and coordinates volunteer steward programs and public outreach events. The Redwood Creek Nursery has provided more than 60,000 native plants for restoration projects in the lower Redwood Creek watershed and coast redwood understory in Muir Woods. The support and volunteers that



the conservancy provides has allowed the park's interpretive staff to focus on education and interpretation. During peak visitation periods, six to eight staff people from the conservancy provide approximately 84 hours of support each week. The Golden Gate National Parks Conservancy provides funding to the park through membership fees, cultivation of donors, and revenue from retail sales.

The park hosts community service days that are attended by members of the Boy Scouts, Student Conservation Association, and Conservation Corps of the North Bay (AmeriCorps), to name a few, as well as employees from a number of Bay Area corporations. The park works with faculty and students from San Francisco State University and California State University at Chico. Park staff have recognized opportunities to better collaborate with park managers from neighboring Mount Tamalpais State Park. Models of this type of cooperation between federal and state park managers in California are also seen at Redwood National and State Parks and Santa Monica Mountains National Recreation Area.

Muir Woods National Monument has received grants over the past nine years from the Save the Redwoods League for two educational, interpretive programs. The league has supported the park's Into the Redwood Forest program for the past nine years. This educational program brings students in grades 3, 4, and 5 to Muir Woods for a day to explore plant and animal communities within the park's ancient redwood forest. The Save the Redwoods League also funded the creation of the Quest at Muir Woods program in 2007. During a quest, families, students, and other park visitors follow a series of clues placed throughout the park, which lead participants to a special treasure at the end of their journey. A Save the Redwoods League grant also provided funding for a two-day workshop, during which environmental educators from around the Bay Area helped Muir Woods' education staff develop the quest.



NATIONAL PARK SERVICE/CRAIG STOCKS

Volunteers perform invaluable services for the Park Service at Muir Woods, including leading interpretive walks and programs.

### WHAT YOU CAN DO TO HELP:

- **Participate in park planning efforts:** The public is invited to provide input on all park plans and studies. Check [www.nps.gov/muwo](http://www.nps.gov/muwo) for information on park planning work and ways to participate.
- **Support or become a member of a group helping to protect the park,** such as Golden Gate National Parks Conservancy ([www.parksconservancy.org](http://www.parksconservancy.org)), Save the Redwoods League ([www.savetheredwoods.org](http://www.savetheredwoods.org)), or NPCA ([www.npca.org/support\\_npca](http://www.npca.org/support_npca)).
- **Volunteer.** Many parks are looking for dedicated people who can lend a helping hand. To learn about opportunities at Muir Woods National Monument, contact the park at 415.561.4755.
- **Become an NPCA activist and learn about legislative initiatives affecting parks.** When you join our activist network, you will receive *Park Lines*, a monthly electronic newsletter with the latest park news and ways you can help. Join by visiting [www.npca.org/takeaction](http://www.npca.org/takeaction).



## APPENDIX: METHODOLOGY

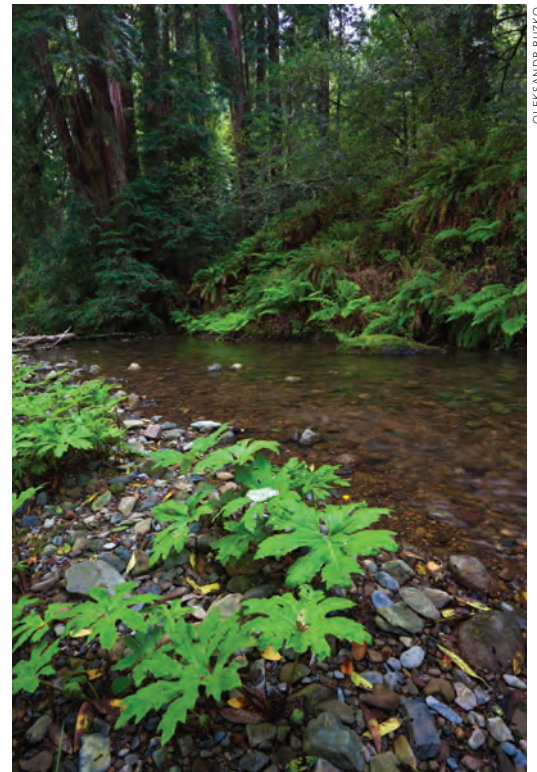
To determine the condition of known natural and cultural resources at Muir Woods National Monument and other national parks, the National Parks Conservation Association developed a resource assessment and ratings process. The assessment methodology can be found online at NPCA's Center for State of the Parks website: [www.npca.org/stateoftheparks](http://www.npca.org/stateoftheparks).

Researchers gather available information from a variety of research, monitoring, and background sources in a number of critical categories. The natural resources rating reflects assessment of more than 120 discrete elements associated with environmental quality, biotic health, and ecosystem integrity. Environmental quality and biotic health measures address air, water, soil, and climatic change conditions, as well as their influences and human-related influences on plants and animals. Ecosystems measures address the extent, species composition, and interrelationships of organisms with each other and the physical environment.

The scores for cultural resources are determined based on the results of indicator questions that reflect the National Park Service's own *Cultural Resource Management Guideline* and other Park Service resource management policies.

Stewardship capacity refers to the Park Service's ability to protect park resources and includes discussion of funding and staffing levels, park planning documents, resource education, and external support.

For this report, researchers collected data and prepared technical documents that



OLEKSANDR BUZKO

Muir Woods National Monument protects both aquatic and terrestrial habitats that support a host of plants and animals.

summarized the results. The technical documents were used to construct this report, which underwent peer review and was also reviewed by staff at Muir Woods National Monument prior to publication.

NPCA's Center for State of the Parks represents the first time that such assessments have been undertaken for units of the National Park System. Comments on the program's methods are welcome.

# ACKNOWLEDGMENTS

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