



Appendix D—Case Studies

Lake Valhalla Project Plan

Henry M. Jackson Wilderness, Wenatchee National Forest, WA.

Description of the Area

Lake Valhalla is in the Henry M. Jackson Wilderness along the Pacific Crest Trail, about 5 miles (8 kilometers) north of the trailhead at Stevens Pass on U.S. Highway 2 in Washington. At 4,828 feet (1,472 meters), Lake Valhalla (figure D-1) is an easy 3-mile (4.8-kilometer) hike.

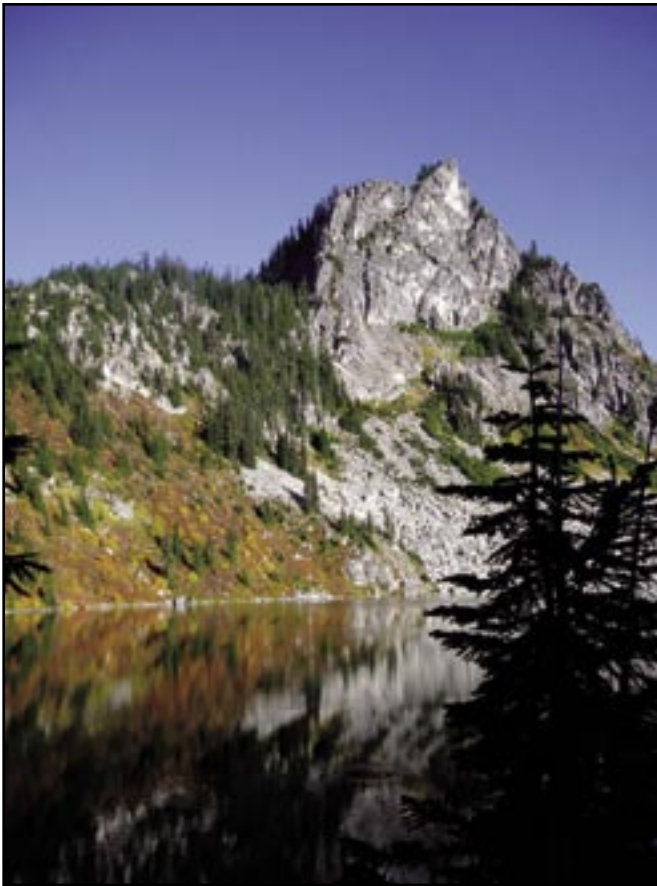


Figure D-1—Lake Valhalla in the Henry M. Jackson Wilderness, WA, has three major factors that place it at risk from damage by visitors. The lake is only a 3-mile hike from the trailhead; it is very picturesque; and it is situated in a fragile heath community.

The lake basin holds some 25 campsites, ranging from just a few square feet (about 0.3 square meter) of trampled vegetation to sites covering more than 3,000 square feet (279 square meters) that are devoid of vegetation. Use could be characterized as moderate to heavy. The lake is one of the Wenatchee River Ranger District's most popular day hiker and backpacker destinations. During the 1990 field season, wilderness rangers encountered an average of 11 groups at the lake during weekends. During the 1991 field season, rangers encountered an average of 12 groups per day on weekends and 4 groups each weekday. Peak use may be considerably higher. On October 5, 1991, a Saturday, a wilderness ranger encountered 27 groups (97 individuals and 3 stock animals) on round-trip day hikes to the lake using the Smithbrook Trail.

Stock use is fairly light, consisting mostly of a few parties of day riders each week who access the lake primarily from the Stevens Pass Trailhead of the Pacific Crest Trail. Some stock users camp overnight at the lake, but most take day trips. The small meadow at the lake is not suitable for grazing stock.

Key resource degradation problems at Lake Valhalla center around six issues:

1. Proliferation of social trails and erosion from them.
2. Damage to soils and vegetation at campsites because of trampling. Eleven sites are not in compliance with forest plan standards.
3. Damage to campsite vegetation and trails by pack and saddle stock.
4. Vegetative damage to the small meadow and soil erosion on the banks of the inlet stream because of grazing by pack and saddle stock.
5. Damage to standing trees and depletion of natural levels of woody debris because of firewood gathering.
6. Loss of the area's wilderness character because of lack of solitude, frequent encounters with other groups, and visible site degradation (figure D-2).



Figure D-2—Fragile sites, such as this campsite at Lake Valhalla, are easily degraded.

Analysis of Current Situation

Problems at Lake Valhalla are caused largely by the social trail network that accesses the lake and lake basin campsites. The Pacific Crest Trail actually skirts the lake, but there has never been a designated system trail to access the lakeshore. Campsites at the lake were never constructed nor defined, resulting in sprawling sites linked by a maze of trails. There is no designated stock holding area or designated stock-user campsite. There have been frequent problems with stock being tied close to water or in campsites.

An additional source of problems at Lake Valhalla is the relatively high level of use, coupled with somewhat infrequent patrol by wilderness rangers. The high level of use has resulted in the area being stripped of firewood. Litter and improperly disposed feces also are frequent problems. At the lake, two Wallowa-style (unenclosed) toilets are used frequently enough to require that they be moved twice a year.

Because of this high level of use, it is virtually impossible for visitors to experience the “solitude or unconfined type of primitive recreation” called for by wilderness designation. On weekends, it is seldom possible to be away

from the sights and sounds of others. Often, all of the lake’s main campsites are occupied.

Proposed Actions

Unless restrictions on the level of use are implemented (which is not being proposed at this time), none of the impacts occurring at Lake Valhalla can be managed effectively. Rehabilitation of campsites is not practical if use patterns remain unchanged. Some significant actions could be taken to improve conditions at the lake, bringing the area closer to meeting forest plan goals and standards.

Our current proposal is for a work project during the 1992 field season, using a high school work group of the Student Conservation Association. The work plan will be written in discrete sections, allowing for incremental implementation, depending on the availability of resources.

1. Develop system trail day-use-only areas for access to the lakeshore.

Objectives: Eliminate the current problem of eroded, braided trails that access the lakeshore. Improve opportunity for visitor solitude by channeling day users away from campsites. Reduce visual impact of degraded trails. Eliminate the current situation in which one or two camping parties can monopolize the best lakeshore viewpoints.

This action will require the development of a hardened, defined trail tread and the rehabilitation of several sections of badly eroded trail. Campsite VL-02 would be closed and become the junction of the proposed lake access trail and the Pacific Crest Trail. The new trail section would skirt above boggy areas near the inlet creek, pass near site VL-11, then switch-back to the lake near site VL-10.

Sites VL-10 and VL-11 would become designated day-use areas, because these two sites represent the only easily accessible section of lakeshore.

A small, oak bulletin board, and possibly one or two oak directional signs, will be made and posted. The bulletin board would be placed along the Pacific Crest Trail at the junction of the proposed lake access trail and would include a map of the lake area showing campsites and the location of the day-use area.

2. Designate a stock hitching area and a stock camp.

Objectives: Alleviate conflicts between hikers and stock users. Protect soils, vegetation, and water quality at the inlet of Lake Valhalla. Provide appropriate camping and hitching areas for stock.

Site VL-01 would become a designated stock-hitching area for persons taking day rides to the lake. This area would be signed and the location shown on the bulletin board at the lake. The site can accommodate a permanent highline as well as one or two hitch rails. These facilities should be adequate for current levels of stock use and should protect the nearby meadow and campsites from trampling.

A good site for overnight stock use is about 1 mile (1.6 kilometers) south of Lake Valhalla along the Pacific Crest Trail. This site has good feed in a nearby resilient meadow. The site would be signed as a stock site and a sign would be placed there advising stock users that overnight camping with stock is prohibited at Lake Valhalla.

3. Establish defined tread for the Pacific Crest Trail between sites VL-04 and VL-02.

Objectives: Allow recovery of trampled vegetation and the braided trail tread near the main inlet creek.

Establish tread and build a creek crossing where the Pacific Coast Trail crosses the main inlet creek. This project will include construc-

tion of a turnpike and/or a rock ford crossing.

4. Provide heavy maintenance for the Pacific Coast Trail in the vicinity of Lake Valhalla.

Objectives: Reconstruct tread, improve drainage of the Pacific Coast Trail, provide fill material, and transplant vegetation for trail rehabilitation at Lake Valhalla.

Widen the tread, install drain dips and/or waterbars, and clean existing drainage features. Transport any usable fill material or plant material to the worksite to rehabilitate eroded social trails leading to the lake from site VL-03.

5. Prepare a special order prohibiting overnight stock use.

Objectives: Allow implementation of stock-use aspects of this plan.

An enforcement plan will be drafted and will outline education to make stock users aware of the closure and the alternative site for overnight camping with stock.

6. Consider future implementation of a campfire closure for the lake basin.

Objectives: Analyze the needs for such an action, which are primarily to protect trees from damage and to reduce impacts at campsites.

Despite an apparently abundant source of wood in the surrounding area, available firewood is scarce near campsites. However, tree damage and availability of firewood needs to be addressed in more detail before we would propose to ban campfires at lake campsites.

Strategy for Implementation

During the 1991 field season, seed was collected from the Lake Valhalla basin for propagation of subalpine spiraea (*Spiraea densiflora*), subalpine fir (*Abies lasiocarpa*), Sitka mountain-ash (*Sorbus sitchensis*), mountain hemlock (*Tsuga*

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mertensiana), and several sedges and herbaceous plants. A portion of this material will be saved for direct seeding, while some is being propagated by the Forest Service's Wind River Nursery.

The projects listed above would require roughly 1,000 to 2,000 hours of work, depending on the extent to which fill material is brought in to backfill eroded trail sections. Collection of seed or cuttings for plant propagation could take much longer, depending on the scope of specific site-related projects.

Possible offsite sources of fill and plant material for transplants are in the Smithbrook area outside of the wilderness. Such material may need to be transported by helicopter, greatly increasing costs.

Our current plan is to accomplish the bulk of this project with a crew from the Student Conservation Association, probably a 7-person high school work crew. Additional project work will be accomplished by the district wilderness and trail crews.

The estimated first-year cost of the project will be \$15,000. Followup work would be required to seed sites and transplant vegetation. In addition, we expect that an increased presence of wilderness rangers will be required over the next few years. The district also hopes to recruit volunteers to assist with some of the followup work. In view of the amount of vegetation needed to rehabilitate trails in this area, the district also may pursue partnerships with other interested groups, such as the Washington Native Plant Society.

Written by:

Rich Haydon, lead wilderness ranger

Wenatchee River Ranger District

1991

2004 Update

This project was implemented largely as described in 1992. A Student Conservation Association high school work crew (figures D-3a and 3b) completed the initial trail work, as well as campsite and trail closures. All fill was collected and hauled locally without the use of a helicopter. A fall

planting of greenhouse-grown plant stock was successful, but a spring planting failed, probably because of a lack of soil moisture during the summer season. Because of declining budgets and turnover in personnel, ongoing maintenance of signs and stock structures has been a challenge. The campfire prohibition has been put in place. Overall, area conditions are improving because trails and campsites were reconfigured to handle the level of use in a more sustainable fashion.



Figures D-3a and 3b—Teenagers on a Student Conservation Association high school work crew spent many hours installing and backfilling rock (top) and installing log checkdams (bottom) to stabilize erosion at Lake Valhalla.

Grouse and Hemlock Lakes Campsite Restoration Project, Desolation Wilderness, Eldorado National Forest, CA

Description of Project Environment

Grouse and Hemlock Lakes (figures D-4a and 4b) are located in the subalpine zone at 8,200 to 8,400 feet (2,499 to 2,560 meters) in the Crystal Range of the Sierra Nevada Mountains. The dominant tree species include lodgepole pine, mountain hemlock, and western white pine. The



Figures D-4a and 4b—Ease of access to Grouse and Hemlock Lakes (top) in the Desolation Wilderness, CA, led to extensive impacts (bottom).

dominant understory vegetation is mountain heather, a short flowering plant that grows on the forest floor. Meadow vegetation also is prominent on the east side of Grouse Lake. Both Grouse and Hemlock Lakes are relatively small. The area surrounding these lake basins consists mostly of granitic soils with sparse vegetation and steep terrain.

Access

Grouse and Hemlock Lakes are about a 3-mile (4.8-kilometer) hike (Hemlock Lake is about ½ mile, 0.8 kilometer, past Grouse Lake) from the Twin Lakes Trailhead, which is in the popular Wrights Lake Recreation Area. Because it is so close to a popular recreation area, the Twin Lakes Trailhead is one of the more heavily used trailheads for the Desolation Wilderness. With Grouse and Hemlock Lakes just a short hike from such a popular trailhead, these lakes receive high overnight and day use.

Visitor Attractions

- Lakes serve as a destination (scenic beauty, fishing opportunity)
- Relatively short hike from an easily accessed trailhead (the trailhead is near a popular campground and summer homes tract; access to the trailhead is by a paved road)

Causes of Impacts and Management of the Wilderness Resource

With Grouse and Hemlock Lakes just a short hike from a popular trailhead, these lake basins receive a great deal of overnight and day use. Because of the terrain, most of this use is concentrated in a small area in the sensitive lake basins. The amount of visitor use has resulted in a proliferation of campsites and social trails around the lakes. Most of this use is during the summer months (June through September), with the peak use during July and August. In most years, this area is covered by snow from November through June.

Management Actions Taken To Reduce Impacts

Grouse and Hemlock Lakes were being impacted by camping at sites within the sensitive lakeshore zone, riparian areas, and meadows. The impacts associated with this use included:

- Loss of native vegetation
- Soil compaction
- Increased erosion
- Reduced water quality because the sediment load increased after vegetative cover was lost and the soil was compacted
- Reduced visual and scenic beauty

The following is a brief description of the management actions taken to reduce impacts. More specific information will be provided later.

- Established designated campsites within 500 feet (152 meters) of Grouse and Hemlock Lakes.
- Restored eliminated campsites and social trails to natural conditions. Restoration activities involved revegetating the area by breaking up compacted soil, mulching with native materials, transplanting native plants found onsite, and placing rocks and logs to give the area a natural appearance and to encourage groups to use the well-established, durable sites and avoid the sensitive areas (figure D-5).
- Installed temporary signs where necessary to keep visitors from walking through and trampling the restoration site. Rocks and logs couldn't do the job everywhere.
- Increased wilderness ranger presence to provide education and inform the public about the project.
- Prepared a forest order for implementation (to be completed in 2004).
- Conducted monitoring (observations by wilderness rangers and photopoint documentation). Subsequent restoration has been completed based on the monitoring information.



Figure D-5—Rocks and logs were installed on social trails and closed campsites to deter use and provide microhabitat for plantings.

Standards, Guidelines, and Direction From the Wilderness Management Plan

The Desolation Wilderness Management Guidelines restrict camping within 500 feet (152 meters) of Grouse and Hemlock Lakes to designated sites. The number of designated sites will be correlated with the quota so campers will not have to be assigned a specific site, but will have the freedom to choose their preferred designated site. Campers can camp without restriction if they are farther than 500 feet (152 meters) from the lakeshore. Allow natural recovery in areas where vegetation that has been impacted can revegetate naturally in less than 10 years. If recovery is expected to take longer than 10 years, develop and implement site-specific restoration plans to include closure to use and/or revegetation using species native to the area.

In addition, the Desolation Wilderness Management Guidelines provide direction to implement a zone quota system, which has been an effective method of dispersing campers and appears to have reduced the number of overnight visitors to Grouse and Hemlock Lakes. The quota for this zone is 12 people, which was implemented in 1999. Before 1999, a trailhead quota system was in place. The quota for the trailhead was 39 people. Because there was no control over where the 39 people ended up, Grouse Lake

often was overcrowded. It was the first lake backpackers came to after a steep climb.

Results of Minimum Requirements Analysis

1. Is the action necessary? Yes.
2. What are the minimum tools? Because other techniques failed to return the area to standards, restoration treatments were part of the minimum tool necessary to meet management direction. No motorized equipment was needed.

Prescription for Restoration

The Three Es:

Engineering—You must be able to remove or reduce the impact to the site.

Education—When sites are being impacted by recreational use, you must inform the public to get cooperation.

Enforcement—When engineering and education don't do the job, you must be able to fall back on law enforcement.

Site Protection and Confinement

Campsites were designated within 500 feet (152 meters) of Grouse and Hemlock Lakes. The number of designated campsites was correlated with the quota so that users would not be assigned a specific site, but would have the freedom to choose their preferred designated site. Designated campsites were selected based on campsite durability and proximity to the lakeshore, streams, meadow areas, and other campsites. Four sites were designated at Grouse Lake and three sites were designated at Hemlock Lake. The zone quota for the Hemlock Lake zone (which includes Grouse and Hemlock Lakes) is 12 people.

- Reduced or eliminated use from impacted sites (or restoration sites).
- Encouraged use at selected campsites and areas suitable for visitor use.

- Used rocks and logs for a natural appearance, and to encourage groups to use the well-established, durable sites and discourage use of the sensitive areas. Rocks and logs were partially buried in closed campsites and at the beginning of social trails leading to sensitive areas and old campsites.
- The tools used included: shovel, rock bar, Pulaski, and a come-along.

Soil Treatments

- Broke up compacted soil using a shovel and Pulaski.
- Mulched the bare ground using native materials from the area, including pine needles and meadow grasses.

Vegetative Treatments

- Transplanted mountain heather, lodgepole pine seedlings, and meadow grasses.
- Used a lawn-coring aerator (nonmotorized), grass plugger, and a mulch of meadow grasses when spreading the seed in the meadow areas.
- Most of the transplanting was completed in the late fall, when the plants had gone dormant and precipitation was likely.

Regulations, Signs, and Education

- Temporary signs are in place at selected restoration sites where it was difficult to discourage visitor use through engineering. The signs are on a 4- by 4-inch (about 100- by 100-millimeter) wooden post: "Restoration Site: Please help restore this area by walking and camping elsewhere." (figure D-6).



Figure D-6—Restoration closure signs helped deter use at closed sites.

- Information about the restoration project and a map with the designated campsites is included in a wilderness-regulation handout that is attached to each overnight wilderness permit.
- Increased wilderness ranger presence is being provided at these sites to allow rangers to talk with the public about the project and enforce the camping restrictions.
- A forest order, which would prohibit camping outside of designated campsites within 500 feet (152 meters) of Grouse and Hemlock Lakes, has not been completed, but is planned to be in place in 2004. For the most part, this project has been well received and compliance has been about 90 percent. Most of the success has probably been because of the increased presence of the wilderness rangers and the public contacts they have made.

Work Accomplished

Budget: \$8,000 (fee demo)

Workforce: Project leader and five-person crew

Partnerships: None. Because this was our first wilderness restoration project, we decided to accomplish the work with employees instead of volunteers. Now that we have experience with this type of project, volunteers could be used effectively.

Monitoring Results

Monitoring was conducted through wilderness ranger observations, campsite condition inventories, and photo documentation. Although the restoration project was a success, monitoring results indicate some followup work is needed.

Wilderness Ranger Observations

There has been about 90-percent compliance for the designated campsite restrictions within 500 feet (152 meters) of Grouse and Hemlock Lakes. The temporary signs at selected restoration sites have reduced the amount of use (visitors walking through or camping on these sites) to a level that will allow the site to recover within 5 to 10 years. In addition, dissemination of information about the restoration work and the designated campsite restrictions has improved, making users more aware of the problem and leading to better compliance with the restrictions.

Campsite Condition Inventories and Photo Documentation

Campsite inventories were conducted at Grouse and Hemlock Lakes in 1992. Twenty-two campsites were documented at Grouse Lake and eight campsites were documented at Hemlock Lake. By 2001, just 16 campsites were documented at Grouse Lake. The number of documented campsites at Hemlock Lake had not changed. After the

project, the number of campsites at Grouse Lake was reduced to eight (four designated sites within 500 feet (152 meters) of Grouse Lake and four campsites outside the 500-foot (152-meter) zone). At Hemlock Lake, the eight campsites were reduced to five (three designated sites within 500 feet (152 meters) of Hemlock Lake and two campsites outside the 500-foot (152-meter) zone). Photopoints were established for each campsite.

Followup Actions and Lessons Learned

Additional restoration has been completed since the initial work in 2001. Most of the additional work was transplanting, with some minor rock and log moving to provide a more natural appearance at the restoration sites that were still being used.

Tips and Lessons Learned

- No instant gratification—Restoration projects take years to complete and even longer before the improvements become apparent.
- Recognize long-term implications—Monitor progress and plan for additional work. You can't just do the initial work and then leave an area to recover on its own.
- Don't take on too much—Concentrate your efforts in a few small sites or on a portion of a larger site.
- Transplanting can be difficult—Don't spend a lot of time on transplanting until you know your plants will survive and become established.
- Monitoring is important—At a minimum, establish photopoints and record locations of the restoration sites using a global positioning system receiver.

Report submitted by:

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Eldorado National Forest

Mill Flat Restoration Pine Valley Mountain Wilderness, Dixie National Forest, UT

Description of the Area

Mill Flat is a subalpine meadow in the Pine Valley Mountain Wilderness on the Pine Valley Ranger District of the Dixie National Forest in southern Utah. Mill Flat is about a 20-acre (8.1-hectare) grassy meadow at 8,500 feet (2,591 meters). The surrounding vegetation is mixed conifer and high-elevation shrubs, such as mountain mahogany, service-berry, and juniper. The mixed-conifer forest includes Engelmann spruce, white fir, Douglas-fir, ponderosa pine, and aspen. The meadow includes the upper reaches of Mill Creek and an unnamed, seepy, grassy, riparian area.

Causes of Impacts and Management of the Wilderness Resource

Mill Flat (figure D-7) is a pleasant mountain meadow that has always provided livestock respite from the summer heat at lower elevations. Recreational livestock and permitted



Figure D-7—Mill Flats had substantial changes in vegetative composition because of overgrazing. Restoration involved improving management of grazing. No active revegetation was needed.

cattle have overgrazed the area, leaving stunted and severely damaged forage plants and forbs. Much of the area is denuded of plants, which has led to gullying and erosion in the riparian areas. Cows like to wallow and root with their heads in the soft earth of the gully banks, enlarging the gullies.

When I first became aware of the conditions at Mill Flat, I asked the question, “Why doesn’t grass grow in Mill Flat?” Often, the answer was, “Grass won’t grow in Mill Flat, never has, never will.” I determined to discover if this was true.

Prescription for Restoration

I enlisted the help of various specialists, such as soil scientists, hydrologists, vegetation specialists, and wildlife biologists, searching for a reason why grass wouldn’t grow in Mill Flat. Their answers were the same, “Grass can grow in Mill Flat, there must be a mechanical reason why it’s not growing. Maybe horses and cows.” We obtained a special order to restrict grazing by recreational livestock and enlisted the help and cooperation of the grazing permittees to limit grazing by permitted cattle. Because we couldn’t afford to station a herder or wilderness ranger at the meadow to monitor the meadow full time, we decided to use a three-wire electric fence to control grazing (figure D–8). This decision came as the result of an informal minimum-tool evaluation.

We have experienced fairly good success with the electric fence, although at first we did have some vandalism and some visitors let the fence down so their stock could graze inside. It took some time to change the attitude of some visitors and ranchers so they could accept the fence and the idea that the fence was going to stay. I think persistence and patience on our part have been the reasons for their change of attitude. We also have tried to explain the project’s goals to visitors. In the past few years, folks have begun to accept and support the project.



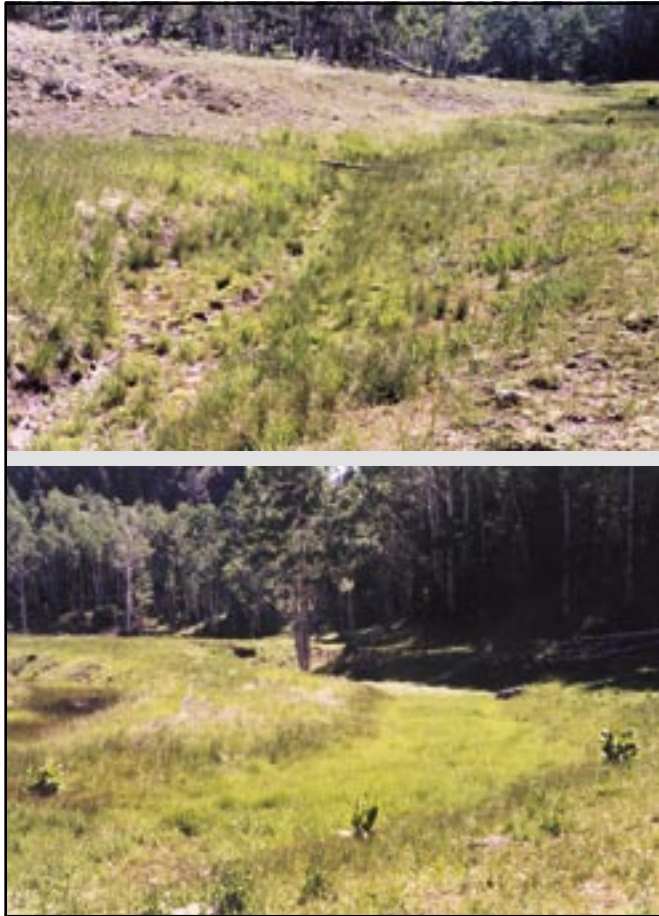
Figure D–8—Commercial livestock were rotated between three pastures separated by electric fences.

Monitoring Results

After 9 years of protection by the electric fence, vegetation is healing and rehabilitating itself (figures D–9a and 9b) in the meadow area. The gully banks have filled in with grasses and forbs, the uplands are now showing a great deal of cover, and the tiny grasses are starting to grow to a more natural height. There has been significant recovery throughout the meadow, including the filling in of the 100-year-old trail that has run through the middle of it. This trail has been rerouted to the edge of the meadow. There has been a significant recovery of quaking aspen. Many new shoots and saplings now grow within the fenced area. We have not done any other restoration, such as scarifying or reseeding.

We have a very good working partnership with the local chapter of the Back Country Horsemen of America. They help us put up and take down the fence, help monitor the fence, and maintain it during the summer. Because of reductions in wilderness and trail budgets, we rely heavily on these volunteers.

In conclusion, I would say that we have been successful with this project. The visitors and the cattlemen are cooperating with the closure. After 9 years of protecting this meadow, I can say without qualification: “Grass will grow in Mill Flat.”



Figures D-9a and 9b—These before (top) and after (bottom) photos show the response of vegetation after grazing pressure was reduced at Mill Flats.

If I can be of any further help or assistance, or can supply any other information, please feel free to contact me. I can be reached at 435-652-3124.

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Edith Lake Campsite Restoration Project, Sawtooth Wilderness, Sawtooth National Recreation Area, ID

Description of Project Environment

Edith Lake (figure D-10) was formed by glaciation. The lake sits in a small cirque basin formed in the Idaho batholith at about 8,660 feet (2,640 meters) in the subalpine zone of the Sawtooth Mountains of south-central Idaho. The dominant tree species include lodgepole pine and subalpine fir. Grouse whortleberry is dominant in the understory. Slopes are steep, vegetation is sparse, and soils in this area are predominantly shallow, silty pockets along shorelines or among granitic outcrops. Temperatures are extreme, the growing season is short, and moisture comes predominantly in the form of snow.



Figure D-10—Edith Lake in the Sawtooth Wilderness, WA.

Access

Edith Lake is accessed by traveling 6 to 12 miles (about 10 to 20 kilometers) from any one of three trailheads on the east side of the Sawtooth Wilderness. Of the four most used wilderness trailheads, two provide direct access to Edith Lake. Several other popular lakes can be accessed by the Edith Lake Trail. Visitors can incorporate a loop into their trip by using this trail. Campsites at Edith Lake have been popular since the 1930s, receiving both overnight and day use.

Visitor Attractions

- Destination area for scenic beauty and fishing
- Edith Lake Trail provides access to other highly popular lakes, as well as an option for a loop hike
- Relatively short hike from an easily accessed trailhead (the trailhead is near a popular campground and a summer-home tract)

Causes of Impacts and Management of the Wilderness Resource

Edith Lake has been a popular Sawtooth Mountain destination since the early 1900s. Snow often does not leave campsites until July. Users arrive before the campsites have dried out, while the soil is still wet and easily compacted. Visitors' activity has reduced the possibility for spring revegetation and increased compaction and the potential for sheet erosion. Because access is easy, both day and overnight use are fairly high. The peak use occurs during July and August, coinciding with the very short growing season.

Management Actions Taken To Reduce Impacts

Soils in most of the overused campsites are compacted. The surface layer has a platy structure, with surface compaction ranging from 6 to 12 inches (about 150 to 300 millime-

ters) deep. Before the compacted areas can revegetate, the surface soil must be broken up or loosened so seeds can penetrate the soil.

Edith Lake was being heavily impacted by camping in sites that straddled the trail or that were within the sensitive lakeshore zone. The impacts associated with this use included:

- Loss of native vegetation
- Soil compaction
- Increased erosion
- Reduced water quality because of increased sediment load after vegetation was lost and the soil was compacted
- Reduced visual and scenic attractiveness

The following is a brief description of the management actions taken to reduce impacts. More specific information is provided later.

- Implemented closure to overnight stock use within 200 yards (183 meters) of the lake in 1998.
- Five sites were rehabilitated after the high-use season in 2002 and left in a condition that made overnight use undesirable, if not impossible. Three of the closed sites either overlapped the system trail or were right beside it. A fourth was on the eastern lakeshore. Compacted soil was broken up and reseeded with locally gathered seeds in the hopes that vegetation could become established once again. (Note: Because the seeds were gathered late in the season, many seeds already had dropped.) Logs were strewn across the sites and large rocks were buried to prevent material from being moved easily by wilderness visitors. Some members of the crew were rehabilitation artists, making the altered sites appear as natural as possible.
- An alternate site (figure D–11), suitable for large groups, was found and a user trail was

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created so visitors could find it. A small area of one of the reclaimed sites was left unaltered to allow a highline to be placed where day riders could tie their stock. An access to the lake was left through another reclaimed site.



Figure D-11—This campsite was opened after five others in less suitable areas were closed and rehabilitated.

- During the summer of 2003, the changes were explained to front desk personnel so they could help visitors locate the preferred group site and understand how they could help the rehabilitation. “Closed to Camping” signs were placed at this site. Another small sign was placed at the junction of the maintained trail and the trail that directed users to the new site for large groups.
- During the late summer of 2003, more local seed was gathered (figure D-12). Our timing was better this year and seeds had not dispersed. The seeds were mixed with mud and manure from the site and formed into small balls that were scattered at the sites.



Figure D-12—Gathering seed used to restore vegetation at closed campsites.

- During 2004, plant growth was inventoried. Tree seedlings and new plugs of grass and whortleberry were transplanted onsite.
- Monitoring information (observations by wilderness rangers and photopoint documentation) was collected. Subsequent restoration was completed based on this documentation.

Standards, Guidelines, and Direction From the Wilderness Management Plan

Direction in the Sawtooth Wilderness Management Plan (Forest Land and Resource Management Plan Amendment 1997) provides:

- Overall Goals
 - Natural biological processes are not changed over time by human use.
 - The visitor is provided opportunities where naturalness, solitude, and freedom are paramount.

- The minimum-tool concept will be used to accomplish site-specific work that least degrades wilderness values.
- Stock users and large groups are encouraged to camp in sites that can withstand their use.

Guidelines for Site Selection

Existing sites should be used whenever possible.

The following guidelines are to be used for establishing new sites or for rehabilitating existing sites.

Designated Group Campsites

- Farther than 100 feet (31 meters) from water, or for existing sites, 50 to 100 feet (15 to 31 meters) from water—with a vegetative buffer
- Farther than 100 feet (31 meters) from trails, or for existing sites, 50 to 100 feet (15 to 31 meters) from trails—with a visual buffer
- Larger than 1,000 square feet (93 square meters)
- Impact levels 3 to 5
- 0- to 5-degree slope

Stock-Holding Facilities

- Rocky terrain with little vegetation
- Less than 2-degree slope within 100 feet (31 meters) of water
- Less than 5-degree slope if 150 to 300 feet (46 to 91 meters) from water
- Less than 10-degree slope farther than 300 feet (91 meters) from water
- Not in draws or where water may concentrate

Toilets

- Farther than 300 feet (91 meters) from water
- Farther than 100 feet (31 meters) from campsites
- Farther than 100 feet (31 meters) from trails
- Not visible from lakeshore or trails

- Not in draws or areas where water may concentrate

Desired Future Condition

Edith Lake is in a Class III opportunity class with the following desired future condition:

Clear evidence of camping. Minimal number of sites generally limited to areas previously disturbed. No further degradation of existing campsites. Expect some loss of ground cover. Evidence of stock confined to stock holding areas. Area of disturbance will have some evidence of soil compaction. Little evidence of wood gathering and some evidence of campfires.

Results of Minimum Requirements Analysis

1. Is the action necessary? Yes.
2. What are the minimum tools? Because other techniques failed to return the area to standards, restoration treatments were part of the minimum tool necessary to meet management direction. Motorized equipment was not considered.

Prescription for Restoration

A holistic restoration prescription was developed to improve conditions for reestablishing vegetation and for redirecting recreational use at the site.

Site Protection and Confinement

Before any restoration, an effort was made to analyze where users would go and the resulting impacts if sites were closed. We identified the sites that would remain open, the sites that should be restored, and a new site where we could direct visitors.

The sites that were selected for restoration were made as unusable as possible. Logs were strewn throughout the site, rocks were iceberged (the larger portion was buried), and native debris (pine needles, fine gravel) was strewn across the site to mimic the appearance of the surrounding area. Logs and rocks were placed on the site to restrict use and provide shade for vegetation.

Soil Treatments

The soil in this area was badly compacted, so we tried to break it up to allow root establishment. We used Pulaskis, shovels, rock bars, and picks, but despite all our effort, we were unable to break up the soil deeper than 6 inches (150 millimeters). Manure was collected onsite and dispersed with the locally gathered seeds.

Vegetative Treatments

Initially, lodgepole and subalpine-fir seedlings were the only transplants. We chose to transplant these seedlings during early fall and watered them heavily during planting. Afterward, we transplanted mountain heather, elk sedge, grouse whortleberry, and saplings (lodgepole, whitebark pine, and subalpine fir).

Supporting Regulations, Signs, and Education

- Special order “Prohibiting camping with equine stock” is in place.
- Carsonite signs with a standard no camping symbol and “Protect the wilderness environment” stickers were placed at each site.
- Signs were displayed on information boards at trailheads. These included a small map indicating where campsites were available.

Work Accomplished

Budget: \$1,430 (salary)

Workforce: A project leader and seven-person crew for 2 days each for the initial implementation. One wilderness ranger spends 1 day annually monitoring the site and doing additional work.

Partnerships: None. The work was accomplished as an end-of-season project by wilderness rangers.

Monitoring Results

Monitoring was conducted through wilderness ranger observations, campsite condition inventories, and photo documentation. Overall, I would consider the project a success. However, the degree of success varied across sites—two of the sites were only partially restored, leaving a portion of the sites for day use by stock and for access to the lake. These two sites have been the least successful. At one of the sites, no plants have grown, but the iceberg rocks are still in place. Recent observations determined that fires have been built, despite a no-campfire regulation that is in effect. The other site allows access to the lake and, despite signs, it appears that camping is continuing. Some of the debris has been removed and there is little regrowth at the site. The remaining three sites have multiple seedlings, and some sedges and grasses are reestablishing themselves (figures D-13a and 13b). All but one of the transplanted saplings survived and appear to be growing.

Future monitoring needs to include growth rates of vegetation.

Use of the new site has been very low. The only sign is at the small user trail that accesses the site. We surmise that users aren’t seeing the sign. We have not identified any proliferation of campsites.



Figures D–13a and 13b—This heavily impacted campsite (top) at Edith Lake has begun to recover (bottom).

Followup Actions and Lessons Learned

Restoration has continued annually since the initial project in 2002. Transplanting and collection and dispersal of local seed has taken place annually and is planned to continue. Some logs had to be moved into the campsites.

Tips and Lessons Learned

- Plan ahead. Understand the implications of closing a site.
- Scarification of soil is critical to establishing new growth.

- Timing is critical. The late season works well for transplants and seed dispersal. Wait too late and you miss the window for collecting seed.
- Monitoring is important to understand success and failure and to plan work. A good inventory as soon as the project is initiated is useful as a baseline.
- Work with your frontliners (receptionists and other employees who contact the public) to ensure that users are informed of your objectives.
- It is better to be successful at a few sites than to be unsuccessful at many sites. Choose your sites carefully.

Report submitted by:

Liese C. Dean, wilderness program coordinator
Sawtooth National Recreation Area

Wilderness Restoration Case Study, Lake of the Woods Campsite Restoration Project, Desolation Wilderness, Pacific Ranger District, Eldorado National Forest

Lake of the Woods (figure D–14) is in the subalpine zone, at about 8,000 feet elevation in the Crystal Range of California’s Sierra Nevada Mountains. Lake of the Woods is one of the larger lakes within the Desolation Wilderness. The lake basin is densely forested with lodgepole pine, mountain hemlock, and red fir. The area surrounding this lake basin consists mostly of granitic soils with sparse vegetation and steep terrain.



Figure D-14—Lake of the Woods in the Desolation Wilderness, CA.

Access

Lake of the Woods is a 5-mile hike when accessed by the popular Echo Lakes Trailhead. With a 15-minute boat taxi, access to Lake of the Woods is a fairly easy 3-mile hike. The boat taxi is very popular, and contributes to the popularity of Lake of the Woods as a destination in the Desolation Wilderness.

Visitor Attractions

- Destination area for scenic beauty, fishing opportunity.
- Relatively short hike from a trailhead that is accessed easily from a major highway near the Lake Tahoe Basin. In addition, the trailhead is near a popular campground and a summer homes tract.

Visitor Use (Amount/Pattern/Type/Season)

Because Lake of the Woods is an attractive destination just a short hike from a popular trailhead, it receives an excessive amount of overnight and day use. The terrain concentrates most use in a small area inside the sensitive lakeshore zone. Lake of the Woods tends to attract larger groups (maximum group size in the Desolation Wilderness is 12 persons per group) compared to other destinations within the Desolation Wilderness. Most use occurs during the summer months (June through September), with peak use during July and August, coinciding with the very short growing season. In most years, the area near Desolation Lake is covered by snow from November through June.

Management Actions To Reduce Impacts

Lake of the Woods was being heavily impacted by camping in sites that were within the sensitive lakeshore zone. The impacts associated with this use included:

- Loss of native vegetation
- Soil compaction
- Increased erosion
- Reduced water quality because of increased sediment load (caused by the loss of vegetative cover and soil compaction)

- Reduced visual and scenic attractiveness

Management actions to reduce impacts included:

- Campsites in undesirable locations were restored to natural conditions. The campsites that had the highest impacts were the first to be restored. Restoration activities involved breaking up compacted soil, placing rocks and logs to give the area a natural appearance, and mulching the surface with native materials (figures D-15a and 15b).

Appendix D—Case Studies



Figure D-15a—Campsites that had the highest impacts were the first to be restored.



Figure D-15b—Campsites in undesirable locations were restored to natural conditions.

Some vegetation was transplanted—with limited success. Because hazard trees had not yet been eliminated, campsites could not be designated before the restoration work was completed. Some obvious campsites were left open to encourage visitors to camp there instead of at the restoration sites.

- Because the campsite proliferation was so extensive (including several campsites that

merged into one large campsite) and rocks and logs to restore the site's natural appearance were in short supply, snags were directionally felled by blasting to provide some ground cover and discourage use (figures D-16a and 16b).



Figure D-16a—Several campsites merged into one large campsite. Rocks and logs to restore the site's natural appearance were in short supply.



Figure D-16b—Snags were directionally felled by blasting to provide some ground cover and discourage use.

Appendix D—Case Studies

- After the blasting project removed the hazard trees, nine campsites were designated.
- Temporary signs were installed where it would have been difficult to use rocks and logs to keep visitors from trampling the restoration site (figures D–17a and 17b).



Figure D–17a—Access trails leading to campsites in undesirable locations also need to be closed.



Figure D–17b—Temporary signs were installed at access trails and campsites to keep visitors from trampling the restoration site.

This was particularly important because the designated campsite restrictions were not in place before the restoration work was completed.

- Wilderness ranger presence was increased to inform the public about the project and its purpose.

Standards, Guidelines, and Direction from the Wilderness Management Plan

Desolation Wilderness Management Guidelines (final environmental impact statement signed in 1998):

- Restrict camping within 500 feet of Lake of the Woods to designated sites. The number of designated sites will be correlated with the quota so that users will not be assigned a specific site, but have the freedom to choose their preferred designated site. Campers can camp unrestricted if they are more than 500 feet from the lakeshore.
- Allow areas where vegetation has been impacted by human use to revegetate naturally if recovery is expected to take less than 10 years. Where recovery is expected to take longer than 10 years, develop and implement site-specific restoration plans to include closure to use and/or revegetation using species native to the area.

Results of Minimum Requirements Analysis

1. Is the action necessary? Yes.
2. What are the minimum tools? Because other techniques failed to return the area to standards, restoration treatments were part of the minimum tool necessary to meet management direction. Some traditional restoration techniques were not adequate for larger campsites

areas, so snags were blasted as a restoration technique (figures D–18a and 18b).

Relying on blasting rather than using crosscut saws to fell snags allowed the natural wilderness character to be maintained. If the trees had been felled with crosscut saws, saw marks would have been left on the trees. Motorized equipment was not considered.



Figure D–18a—This stump appears to have been broken off naturally, helping to maintain the wilderness character.



Figure D–18b—After blasting was complete, the campsite had a natural appearance and the fallen logs discouraged camping on the restored site.

Site Protection and Confinement

Before any restoration work began, managers made an effort to analyze where users would go and the impacts they would cause if sites were unavailable at Lake of the Woods. We identified the campsites that would be designated for continued use and those that should be restored.

- Groups were encouraged to use the well-established, durable sites that were designated for camping.
- Use was reduced or eliminated from impacted sites (or restoration sites).
- Rocks and logs were added and partially buried so they appeared to have been placed naturally and to discourage visitors from trying to move them.

Soil Treatments

Because the soil in this area was severely compacted, pulaskis and shovels were used to break it apart to allow root establishment. The bare ground was mulched with native materials from the area, including pine needles.

Vegetative Treatments

Some native vegetation was transplanted, but success was limited. Breaking up the compacted soil and discouraging visitor use should allow vegetation to recover over the long term.

Regulations, Signs, and Education

- Signs are in place at selected restoration sites where it was difficult to discourage visitor use with rocks and logs. The signs are on a 4- by 4-inch (100- by 100- millimeter) wooden post saying: “Restoration Site: Please help restore this area by walking and camping elsewhere.”

Appendix D—Case Studies

- Information about the restoration project and a map with the designated campsites are included in a wilderness regulations handout that is attached to each overnight wilderness permit.
- The time wilderness rangers spent at these sites was increased so they could talk with the public about the project and enforce the camping restrictions.
- A Forest Order was implemented that prohibits camping outside of designated campsites within 500 feet of Lake of the Woods.

For the most part, this project has been well received and compliance has been about 90 percent. Most of the success is probably due to the increased time wilderness rangers have spent in the area and the contacts they have made with the public.

Work Accomplished

Budget: \$23,000 (2-year project), of which \$8,000 was for blasting. The cost includes project planning, environmental analysis, and implementation (partially funded by a grant).

Workforce: Initial restoration work, 2004—project leader and five-person crew for 2 weeks; blasting, 2004—2 certified blasters, 2 packers, 11 mules, 6 other crewmembers for 3 days, 15 cases (800 pounds) of explosives; restoration work, 2005—project leader and 11 volunteers for 4 days.

Partnerships: Worked with Wilderness Volunteers (<http://www.wildernessvolunteers.org>), a nonprofit organization, during 2005.

Monitoring Results

Monitoring was conducted through wilderness ranger observations and photo documentation.

August 2004: Initial restoration work was completed. About 12 campsites/areas were restored, two of which were larger areas. The restoration work was completed before

hazard trees could be removed from some campsites, so those campsites could not be designated. Some campsites in less sensitive areas were left open to encourage visitors to use those sites, rather than the restored campsites. For the most part, this approach was successful. However, visitors moved a few rocks and logs so they could use some of the restored campsites.

October 2004: A blasting project was undertaken to remove hazard trees from designated campsites and to provide fallen logs in areas where logs and other material needed to restore campsites were in short supply. Nine campsites were designated at this time.

June 2005: After one winter, we were extremely pleased with the results. The fallen logs were especially effective at closing sensitive areas and discouraging use.

August 2005: More restoration work was completed with the Wilderness Volunteers nonprofit organization. The restoration work focused on several of the campsites that had been missed during the initial restoration work and two large barren areas where restoration was begun—but couldn't be completed—in 2004.

Followup Actions and Lessons Learned

Some minor restoration work probably will continue in the area over the next several years, but it will probably be completed by wilderness rangers during routine patrol.

Lessons Learned

- Blasting trees (figure D–19) was an extremely effective restoration method, particularly in areas where rocks and fallen logs were not readily available. This technique was especially helpful at larger campsite areas where it would have been difficult to discourage visitor use otherwise. This technique produced immediate results.

Appendix D—Case Studies



Figure D-19—Strapping explosives to trees.

- Not only did blasting provide fallen logs, it also provided mulch materials (tree bark, needles, branches) for ground cover.
- Blasting maintained the wilderness character, leaving a natural appearance rather than saw marks on smooth stumps and the ends of logs.

Report submitted by:

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Desolation Wilderness Area

Eldorado National Forest, Pacific Ranger District