Sun Notch Trail Rehabilitation:

Summary of 2012 Revegetation Efforts

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December 2012

Related PMIS projects: 159011 and 98177
Related PEPC project: 29386

Introduction

The Sun Notch area is one of the park's most heavily visited sites, as it leads park visitors through a subalpine meadow/forest ecotone to offer spectacular views of Crater Lake and Phantom Ship. It has been impacted by social trails since the Rim Drive opened up access in the 1930s:

> *"After World War II, NPS planners identified the rim viewpoint at Sun Notch as a prospective tenth observation station for the Rim Caravan. The existing "trail," however, is actually a network of social paths that lack design integrity and have caused unsightly impacts, particularly along the rim. Rehabilitation is essential and should consist of a curvilinear loop trail through the woods, one designed to discourage visitors from straying into the meadow before reaching the rim."* -- Mark and Watson, 2009

An effort to rehabilitate the Sun Notch area by rerouting the trail around the edge of the meadow system (Figure 1), obliterating the old trail and social trails, and rehabilitating disturbed areas commenced in February of 2003. The planning stage included entering two projects into the Project Management Information System (PMIS), conducting plant surveys, and ensuring project compliance with all federal and state regulations as documented in the Planning, Environment, and Public Comment (PEPC) system.

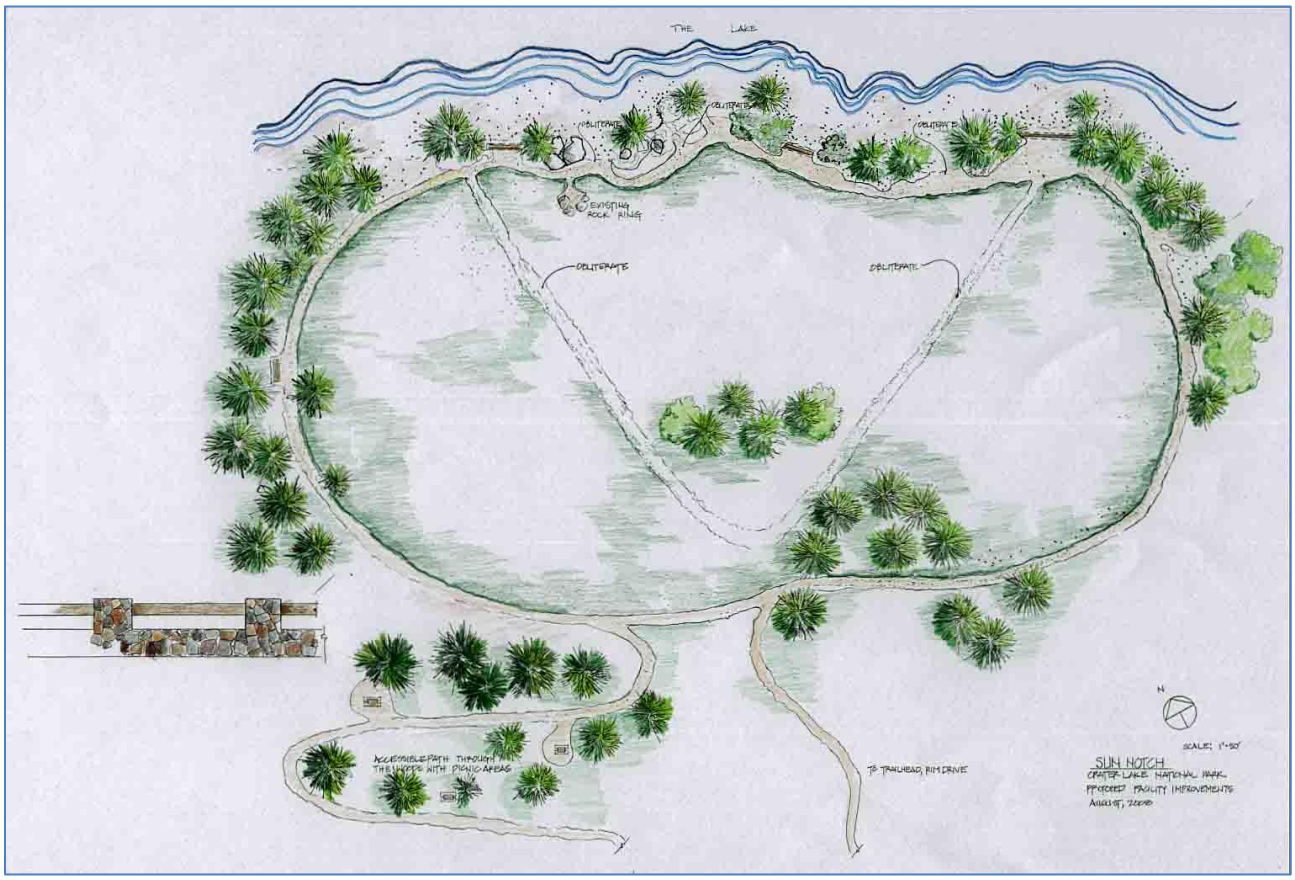

Figure 1. Sketch of the proposed Sun Notch trail rehabilitation.

Groundbreaking work on the Sun Notch Trail Rehabilitation project commenced in 2011 under direction of the Crater Lake NP (CRLA) Trails program. The CRLA Botany program was responsible for subsequent revegetation efforts to restore native vegetation in disturbed areas. This summary serves to document revegetation efforts made during the 2012 season and outline future needs.

Background

The park's first documented rehabilitation efforts at Sun Notch were made in 1993 by two CRLA Biological Science Technicians with volunteer assistance from the Sierra Club. Conditions at Sun Notch before rehabilitation are reported as such:

> *"As Crater Lake is primarily a drive-in park, Sun Notch is also one of the few automobile turnouts where the highway eases its noose-like strangle hold around the rim of the lake. As a result, the average park visitor who stops at Sun Notch is treated to a hike through vegetation communities that s/he might not otherwise take the time to see. However, the high visitation that Sun Notch receives has led to the development of social trails that have had a negative impact on its vegetation and aesthetic attributes. While some of these trails short-cut a main trail that has grown excessively wide in some spots, several others lead down into the caldera, contributing to erosion of the caldera and risking the safety of the visitors."* –Parker and Martinson, 1993

1993 rehabilitation efforts are summarized in Parker and Martinson (1993). Work occurred outside the caldera for safety reasons. Attempts were made to block access to caldera social trails using barriers made from white fir (*Abies concolor*) boles retrieved from a fuels reduction project in the Panhandle area of the park. These small-diameter (8") logs were used to create 'hitching posts' in an attempt to deter visitor access to the caldera.

Social trails were obliterated using pulaskis, natural slope contours restored using soils from pocket gopher mounds, and soils covered with erosion matting and secured with metal pins. It appears that the rehabilitated areas were seeded with native propagules after erosion control blankets were installed. Seeds used in revegetation efforts were collected earlier that summer at Sun Notch, Sun Creek, Dutton Ridge, and Grayback Ridge.

<u>Species used to seed meadows</u>:

Achnatherum occidentalis

Elymus elymoides

Carex spp.

Eriogonum marifolium

Aconogonon davisiae var. *davisiae*

Lupinus latifolius

<u>Species used to seed forests</u>:

Luzula sp.

Lupinus latifolius

Parker and Martinson (1993) recommended subsequent monitoring of revegetation efforts with additional seeding and planting occurring as needed; however, there is no record of any follow-up work. They made additional recommendations including a) installing adequate signage to clearly mark the official trail; b) installing "revegetation zone" signs in rehabilitated areas to discourage foot traffic; c) narrowing of the main trail; and d) rehabilitating social trails inside the caldera. It is unclear if any of these recommendations were implemented.

In 2008, the Botany program revisited the 1993 restoration project (Roe-Andersen 2008). The restoration of disturbed areas within the forest was deemed a success, as old social trails were not evident. The rehabilitation of the old social trail through the meadow was moderately successful – however, the old trail was still visible and vegetation cover was reported as 'sparse' 15 years later. The upper third of the rehabilitated trail had been successfully rehabilitated with adequate vegetation cover present. The rehabilitation efforts along the rim did not fare as well – the 'hitching posts' had long since decomposed, social trails were abundant (including the trail inside the caldera), and vegetation was reported as "denuded."

Recent Progress

The Trails crew started rerouting the trail in the summer of 2011. This work continued into 2012, with the new loop trail constructed around the meadow edge at gentle grades that comply with Americans with Disabilities Act (ADA) standards for accessibility. Additionally, benches and masonry handrails were installed with the intent of attracting park visitors to the most spectacular views of Crater Lake and Phantom Ship, and hopefully discouraging the use of social trails and short-cutting to access any possible viewpoint of the lake. The new trail has been topped with crushed rock and many features have been added (e.g., planting islands; rockwork along trail edges; see Figure 2) that not only improve trail aesthetics but also serve to keep park visitors on the trail and protect sensitive subalpine vegetation.

Figure 2. New trail features include benches, masonry handrails, and rockwork along trail edges.

Figure 3. Sun Notch trail reroute showing trails to be obliterated in dashed lines. Map by Chris Wayne.

In early August 2012, a Friends of Crater Lake group rehabilitated several social trails leading to viewpoints along the caldera rim. Their efforts included grubbing out social trails with hand tools and scattering woody debris and duff across rehabilitated areas to discourage foot traffic (Figure 4).

Figure 4. Example of social trail obliteration work performed by the Friends of Crater Lake.

The Northwest Youth Conservation Corps (NWYCC) obliterated the right segment of the meadow trail (Figure 5) using hand tools. Waterbars were installed to slow erosion and consisted of on-site logs half-buried into the old trail bed. Woody debris was strewn across the old trail bed to discourage foot traffic.

Figure 5. NWYCC rehabilitation work on the right meadow trail segment.

The Trails program tasked the Botany crew with rehabilitating the left meadow trail segment. Similar techniques were used on both meadow trail segments – obliterating the old trail using hand tools to decompact soils, installing waterbars, and scattering woody debris along the old trail bed to discourage foot traffic. Additionally, large branches and logs were used as barricades near junctions with the new trail to discourage foot traffic.

Timeline of events:

- 2/18/03: Rehabilitate Sun Notch Trail project input into PMIS (#98177).
- Summer 2003: Plant survey conducted in project area. No rare or non-native plant species encountered. Plant species list provided for propagation efforts. Recommended revegetation to consist of propagated plants and broadcast seeding with use of erosion matting -- seed collection restricted to 300' of site.
- Summer 2009: Another plant survey conducted in project area. No rare or non-native plant species encountered. Plant species list provided for propagation and seed collection efforts. Recommended revegetation to consist of propagated plants and broadcast seeding with use of erosion matting -- seed collection restricted to 300' of site.
- 12/15/09: Rehabilitate the Sun Notch Trail to provide ADA-compliant access to the Phantom Ship viewpoints project input into PMIS (#159011).
- 12/29/09: Project input into PEPC program.
- 3/10/11: Compliance granted for Sun Notch Rehabilitation project.
- Summer 2011: Trails crew begins trail reroute work.
- Summer 2012: Trails crew continues trail reroute work; NWYCC and Botany crews obliterate meadow trails; Friends of Crater Lake obliterate social trails around caldera rim; Botany crew seeds and places erosion matting over old trailbeds.

2012 Revegetation Efforts

Despite recommendations made twice in plant surveys (Coleman 2003, 2009) that seeds from local native plants be collected for propagation, no funds were allocated to accommodate this work. This may be due to staff turnover in both the Maintenance and Resource Preservation and Research divisions. In 2012, the Botany program received $5,000 from the Rehabilitate Sun Notch project (PMIS 159011) for revegetation efforts related to obliteration of old trails and social trails. This funding was used to pay for two pay periods of a GS-06 Biological Science Technician to coordinate revegetation efforts including plant surveys, seed collection, and rehabilitation of the old trail. Remaining funds were used to purchase jute erosion control matting and metal pins to secure the matting.

The area to be rehabilitated was surveyed for area (ft^2), slope changes, and vegetation composition in mid-August. Seeds were collected in August and September 2012 from the Sun Notch meadow. Seeds were collected when ripe, mixed with native soils from pocket gopher mounds, and immediately broadcast onto old trail segments both along the caldera rim and within the meadow. Phenology

progressed from higher elevation to lower elevations in the Sun Notch basin – seeds ripened at the upper portions of the meadow at least a week earlier than those at the lower portions of the meadow. This may be due to snowmelt patterns, with the gentler slopes at the bottom of the meadow retaining snow cover a bit longer than the upper, steeper segments. Additionally, meadow species have their own phenology – with Anderson's lupine (*Lupinus andersonii*) and fleeceflower (*Aconogonon davisiae* var. *davisiae*) maturing early and rabbitbrush goldenweed (*Ericameria bloomeri*) being one of the last species to bear ripe seeds. After broadcasting seeds, the old trail beds were immediately covered with a thin layer of soil (either manually or with a rake) in an effort to keep them in place.

Four foot wide jute matting was then rolled down the old trail beds and secured with metal pins. Adjacent duff, soil, and seeds were gently raked onto the jute in a very thin layer to blend the erosion matting into the meadow environs and increase probability of successful seed germination. Large limbs and woody debris were also added on top of the jute matting throughout the project area to discourage visitor use.

Figure 6. Jute erosion control matting was installed over rehabilitated and seeded old trail beds.

Seeds were collected by the Botany crew and volunteers. Seeds were collected as they ripened – this often was determined by the ease at which seeds were removed from inflorescences or fruits. Seeds that easily came off inflorescence stalks or were easily dislodged from dry fruits were broadcast across old trail beds. Seeds were collected adjacent to the locations where they were broadcast. Species used included (nomenclature follows the Oregon Flora Project):

- Needlegrass (*Achnatherum* sp.)
- California brome (*Bromus carinatus*)
- Pussypaws (*Calyptridium umbellatum*)
- Sedges (*Carex* sp.)
- Fireweed (*Chamerion angustifolium* var. *canescens*)
- Cascade aster (*Eucephalus ledophyllus*)
- Rabbitbrush goldenweed (*Ericameria bloomeri*)
- Anderson's lupine (*Lupinus andersonii*)
- Fleeceflower (*Aconogonon davisiae* var. *davisiae*)
- Squirreltail (*Elymus elymoides* ssp. *elymoides*)
- Variable Phacelia (*Phacelia mutabilis*)
- Bluegrass (*Poa* sp.)
- Orange agoseris (*Agoseris aurantiaca*)
- Mountain buckwheat (*Eriogonum marifolium*)

Figure 7. Sun Notch meadow trail before rehabilitation. Cascade aster blooms purple in the background.

One problem observed after the jute matting was installed was its tendency to unravel, yielding long jute fibers next to rehabilitated areas. This will need to be closely monitored in the summer of 2013 and jute matting removed if it continues to unravel, as this is a serious concern for park wildlife. Additionally, as jute matting may hinder the ability of some plant species to colonize old trail beds, some sections of rehabilitated trail will have jute matting experimentally removed to see if seed germination and vegetative recovery is better in areas covered with erosion matting or mat-free.

2013 Needs

The Sun Notch Trail Rehabilitation project has not been completed, as the forested trail in the bottom of the project area (see Figure 3) has not been rehabilitated. Revegetation efforts will need to follow any trail obliteration, yet there are no funds available to support this work. Additionally, the area rehabilitated in 2012 will need to be monitored for success/failure and findings clearly documented. Experimental removal of jute matting should occur to see if vegetation establishes more quickly in these areas. Jute matting needs to be inspected for any unraveling and any loose jute threads removed. Areas rehabilitated in 2012 may need supplemental seeding to augment vegetation recovery.

The Botany program currently has sufficient jute matting and metal pins to stabilize soils after trail obliteration in the forested project areas. But without revegetation efforts, recovery in this area will be slow. The Botany program also has "Revegetation Area – Please Do Not Enter" signs that will be installed as soon as the snow melts to help discourage shortcutting across the meadow to the caldera rim. The Botany crew witnessed several parties of park visitors take the new trail halfway up to the viewpoints along the caldera rim, then shortcut down the rehabilitated trail because this was seen as the shortest route back to the parking area. This behavior needs to be discouraged and halted if restoration efforts are to be successful.

It is unclear how the Botany program will support rehabilitation and revegetation work for the remainder of the Sun Notch Trail Rehabilitation project without additional funds. A lapse proposal will be submitted to the Management Team in the winter of 2013 with hopes of funding this work.

Recommendations for Future Trail Rehabilitation Work

When trail rehabilitation projects propose to disturb large areas such as those in the Sun Notch project, it is recommended that communication between the Trails and Botany programs initiates early and that rehabilitation work is closely coordinated.

It is recommended to secure funds to support seed collection for propagation to restore large areas. Planting established seedlings 'jump starts' restoration efforts and may also deter visitors from trampling newly rehabilitated areas. This involves bringing the Botany program into the planning effort at least three years ahead of project implementation.

Projects need to be designed to fully support revegetation efforts for all project phases. This includes seed collection, propagation, planting, erosion control, and effectiveness monitoring.

References

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