

Visitor management and revegetation efforts on a degraded Lake Superior cliff edge

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Abstract: Rock climbing has grown to be a major recreational sport in the United States. Yet, resource degradation caused by recreational rock climbing has become a controversial issue throughout the United States (Access Fund 1999). Some resource agencies such as the U.S. Forest Service, National Park Service, and Bureau of Land Management are struggling to establish functional management policies that allow appropriate rock climbing practices while protecting the natural resource (Devine 2001). Resource managers tend to favor restriction of climbing activities to protect the resource. Yet, without adequate understanding of rock climbing, this approach can become controversial. A less controversial approach toward rock climbing influences on natural resources can be to include the rock climbing community in management planning. The result can be increased protection of the resource while allowing recreational climbing to continue (Hynek 1999).

In an effort to address both public recreational needs and to protect the natural resource of Shovel Point, a popular rock climbing site in Tettegouche State Park on the edge of Lake Superior in northeastern Minnesota, USA, a study was conducted during the summer of 1998 to identify types of recreational users, impacts from their use behaviors, and to survey climber attitudes toward a proposed management plan that would influence climbing on the site.

The results of this study were implemented into a long range management plan that has resulted in modified climber impact on the environment and allows a rehabilitation of the site that is hoped to preserve the unique natural resource. Innovative vegetative rehabilitation of the climbing site has been successfully implemented. This is an excellent example of positive conflict resolution through research, management through public participation, and resource rehabilitation and protection.

Introduction

Rock climbing has grown to be a major recreational sport in the United States. Minnesota has become one of the leading states in the nation for rock climbing because of its well known and excellent climbing sites. Situated along the North Shore of Lake Superior, in Northeastern Minnesota, lies a spectacular cliff called Shovel Point. Shovel Point has become one of the premier climbing sites in Minnesota (Thompson 1996). Shovel Point also lies within the boundaries of the Tettegouche State Park in northeastern Minnesota.

In addition to being a sought after rock climbing site, Shovel Point has been discovered as a popular short hike for tourists traveling along the North Shore of Lake Superior. The pressure on the land from recreational users has caused vegetation to die along the cliff edge. This die back, or kill zone, has occurred because of severe soil compaction and resultant erosional problems. Shovel Point is considered a unique

micro-habitat because of the combination of poor, shallow depth, soils and a short growing season from the cold climate created by Lake Superior. The result is a situation where there is a significant negative environmental impact from human recreational use on a particularly sensitive landscape (Hargrave 1994).

The Minnesota Department of Natural Resources began to establish a management plan that would manage rock climbers' and recreational hikers impacts while striving to protect and even restore the natural landscape along the cliff edge of Shovel Point (Thompson 1996).

In 1995, the park manager of Tettegouche State Park began an innovative program to encourage a pro-active means of self regulation among rock climbers. The manager established a citizens' advisory committee for rock climbing combined with consultation from natural resource and recreation professionals to develop a plan to minimize user impacts while stopping the kill zone from moving further inland and restoring native vegetation.

A primary goal was to avoid closure of the climbing sites or implementing some other type of imposed regulatory control without loss of habitat. The park manager has been striving to establish an effective management scheme to preserve the fragile natural environment along the cliff edge while minimizing restrictions on rock climbers and hikers. The Tettegouche State Park Management Plan has recommended that techniques be developed to manage the “cliff edge for safety, recreational enjoyment, and resource preservation...” (Thompson 1996, p. 59).

The purpose of this project was to establish baseline data on hiker and climber attitudes and behavior toward the management plan. It has been shown that climber participation is critical for compliance for resource managers worldwide (Access Fund 2004). In addition, the kill zone needs to be accurately measured to assess the extent of it and to help determine if it is recovering from the new management practices.

This study gathered baseline data on rock climber and recreational hiker attitudes and behaviors to help determine if natural resource degradation will be stopped and the extent that restoration is possible. These baseline data were used to help refine the recommendations made toward management of the site. They also serve to monitor the effects of the management plan.

A vegetation analysis along the cliff edge was conducted to monitor the recovery and/or expansion of the kill zone. Finally, a review of management practices by resource agencies was conducted to determine what other agencies were doing to provide rock climbing opportunities while protecting the natural resource.

Methods

This study is a long-range design with annual assessments made to guide changes in management of the site. The purpose of this study was to establish baseline information on the effects of the existing management plan on user behavior and toward resource protection. In addition, the impact zone (kill zone) was measured to determine its severity. This research began June 8, 1998. There were five distinct parts to this study. They are identified below.

- 1) A *geo-referenced map* of human-made and natural features of Shovel Point was designed. This map is used to guide physical management features such as trail developments as well as to physically monitor the cliff edge kill zone.
- 2) *Rock climbers were surveyed* on their attitudes toward the proposed changes made along Shovel Point. An opinion survey was designed to interview climbers about their attitudes regarding the new management procedures. Included was their commitment to adhere to the plans. All climbers were interviewed on alternating Saturday's,

Wednesdays, and Fridays at two distinct time periods (morning and afternoon). In addition, user types (hiker/climber) and frequency of use was assessed. The survey was field tested to ensure appropriate validity.

- 3) A *vegetation analysis* was conducted to measure the kill zone. The cliff edge was used as the constant. The depth of the kill zone was measured. Second, the extent of soil and vegetation destruction was assessed using photographs and vegetation analysis (measuring species types and numbers). This will serve as the basis from which to determine whether or not the kill zone is recovering.
- 4) A *review of management practices* in state parks, national parks, and national forests concerning rock climber behaviors and their impacts on natural resources was conducted to determine if a similar situation may be able to be applied to Shovel Point. Since most management practices are not published in professional journals, it was necessary to determine where climbing sites are located around the nation. This was conducted with help from the *Access Fund*, a national organization that promotes responsible climbing and fosters positive working relationships between climbers and resource agencies. Park managers were interviewed for their insights into similar issues relevant to Shovel Point. A literature review was conducted to examine research concerning climbing and natural resource protection.
- 5) *Revegetation of site using origin species*: We chose a trampled, eroding hillside for plant trials to see if we could grow vegetation on a harsh, actively used site. We chose to plant a grass, *Danthonia spicata*, and the creeping, woody *Potentilla tridentata* because they are common on site and appear to be able to colonize disturbed areas. We collected seed from shoreline habitats within 2 km of Shovel Point and grew seedlings in a greenhouse over the winter. Plants were robust and had large root mass by the time we planted in June 2001. We chose soil amendment treatments with potential to ameliorate the harsh conditions on site.

We established three blocks of six .25 m² treatment plots for each species, for a total of 36 plots. We dug these plots to 10 cm, or bedrock, and filled them with plants and a soil amendment. Plants were randomly assigned to plots and were placed 10 cm apart, 5 cm from edges, and 10 cm deep. Twenty-five plants were placed in each plot for a total of 450 plants of each species. In addition, two plots in each block were established but not planted – one was tilled and one was left untilled – to assess the ability of vegetation to colonize without assistance.

To assess survival rates we counted all live plants at 13 weeks and one year. To assess plant growth we tallied the number of live stems at ground level. We

counted only *P. tridentata* stems with fully expanded leaves, and *D. spicata* stems longer than two cm. We counted stems in all plots at 13 weeks. At one year we counted stems in one of the treatment blocks.

Defining and “hardening” trails

We had earlier experience with visitors trampling revegetation efforts on Shovel Point so we were unwilling to leave these plantings unprotected. We used several techniques to guide hikers and climbers around the planting site: roping off areas; placing signs at critical points; adding wooden curbs to help define designated trails; placing gravel to improve some walking surfaces; and constructing low boardwalks to identify paths to climbing areas.

Results

The results of this study will present the changes in visitor behavior and the site rehabilitation.

Visitor behavior

The positive support provided by climbers is very evident, even when asked if other climbers would abide to management plans to determine truthfulness of response. All questions indicated at least 80% favorable responses toward all recommendations. It is interesting to note that over 52% of climbers indicated they did not have a current permit to climb. However, many respondents were members of an organized group and were unaware if the group leader possessed a permit.

While most comments were strongly supportive of the efforts to protect the land from negative user impacts, the negative comments revealed a strong attitude of wanting a nature-based experience with minimal to no contrivances. Thus, manipulating the land was considered unacceptable, even if the manipulation was intended to preserve the native character of the land. Finally, a few respondents indicated a distrust for human made support. The concern expressed was unreliability due to malicious tampering. Primary results are identified as:

- Surveyed climbers showed a strong willingness to comply with proposed park management actions that focus and in some cases restrict how they use Shovel Point. Willingness to comply was achieved through understanding that rehabilitation and development efforts were to protect the land. Otherwise there was strong initial resistance to the plan.
- Climbers believed that other climbers would be willing to comply with proposed actions.
- Follow-up comments provided by some climbers indicated that, even if they disagreed with the proposed action, they would support it if they believed it would help maintain their climbing access to Shovel Point.

- Tallies of trail use showed heavy use of some trail segments and very light or no observed use on others. These results suggest where trails might be easily closed and revegetated, where “hardening” with gravel or boardwalks might be appropriate, and where visitor patterns may be difficult to change.

Site Rehabilitation

A vegetation analysis was conducted. The analysis entailed establishing a specific zone to be measured, establishing specific procedures to follow to ensure accuracy in monitoring vegetation change. Vegetation type was catalogued. Finally, origin species were collected and propagated. Seedlings were planted on site using various methods of treatment to determine greatest success of survival. Detailed results are as follows:

Plantings

- Overall survival rates were high at 13 weeks: 98.7% for *D. spicata* and 86.9% for *P. tridentata*. Overall survival rates remained high after 1 year: 96.7% for *D. spicata* and 79.1% for *P. tridentata*.
- 1 year survival rates varied little among treatments for *D. spicata* but did show variation for *P. tridentata*
- After 13 weeks *D. spicata* treated with hydrogel and fertilizer had significant growth compared to other treatments (mean change in stem number $P \leq 0.0001$). *P. tridentata* treated with hydrogel, sterile soil, or sterile + forest soil had significant growth compared to other treatments (mean change in stem number $P \leq 0.0195$).
- After 1 year *D. spicata* growth appears poorest with fertilizer or woodchips. After 1 year *P. tridentata* growth appears best with sterile + forest soil.
- After 1 year the 3 tilled, but unplanted plots recruited a total of 9 *D. spicata* seedlings, each with 1 or 2 stems. The 3 untilled, unplanted plots had no recruitment.

Trail Rehabilitation

To date, trail rehabilitation efforts have succeeded. Trails have been marked in a manner that is unobtrusive to the scenic value of the site, yet visitors are guided more effectively through the use of wooden curbs. In addition roped off areas with accompanying signs indicating “revegetation site” have succeeded in eliminating spur trails. The addition of signs have been key toward gaining compliance by the climbers.

Finally, wooden platforms have been erected at key “staging” areas where groups of climbers place their gear and plan climbs. These platforms have reduced soil compaction and erosion resulting in protection of root systems. Thus, the expansion of the kill zone has been stopped.

Discussion and Conclusion

Review of management practices of established climbing sites

A literature review revealed no specific information to resource agency management practices toward natural resource protection and rock climbing impacts. However, with increasing popularity of rock climbing and the subsequent impact on natural resources is increasingly controversial between the resource manager and the rock climbing community (Access Fund 1999, 2004).

There were a few sites around the United States that have implemented similar management practices and/or made recommendations that lend support to the Tettegouche plan. A few agencies have taken an abrupt approach of simply banning climbing. For example, the Ohio Department of Natural Resources manages a park near Yellow Springs, Ohio called "Clifton Gorge". This area is approximately 1.5 miles wide by five miles long and runs in an east-west direction. A small stream bisects the gorge which is comprised of limestone cliffs 20'-30' high. The southern half of the park has restricted access to protect sensitive, with some endangered, plant life. The northern half of the park was designated for hiking and rock climbing. Because of intense climbing pressure and hard to control practices, the impact on the gorge became so negative that the park managers simply closed the park to climbing.

A less controversial approach has been followed in Acadia National Park (ANP) in Maine. ANP has a similar situation to Shovel Point at one of their climbing sites called Otter Cliff (Gregory 1998). Because Acadia does not have written documentation of their restoration project, the following information was gathered by a phone interview with the park botanist. The park has installed fixed anchors for climbers to use and has placed signs telling climbers to use the fixed anchors instead of trees. The fixed anchors have helped in the recovery process. The park has also roped off protected areas and has placed signs asking people to please stay off those areas. By just keeping people off those areas for one year, small amounts of vegetation re-growth have occurred.

Also interviewed was Sam Davidson, the senior policy analyst for The Access Fund. The Access Fund is a non-profit organization dedicated toward climbing access, conservation of natural resources, and promotion of the sport of rock climbing. Davidson (1998) said that fixed anchors have helped in some areas to reduce the impact of climbers. Mississippi Palisades and New River Gorge are two examples he gave. At these locations the anchors were placed over the rim of the cliff edges to be less obtrusive. However, the climbers start from the bottom of the cliff unlike Shovel Point where climbers belay from the top of the cliff edge.

Davidson (1998) also stated that decks have been built to protect staging areas. He suggested that a deck should be tested at one location to see how it works. When asked about the use of curbing and its effectiveness, he said that it usually works getting climbers to the climbing areas, but not at the staging areas. For the staging areas he suggested low-key benches or a deck, if that much development was acceptable to the park management. Davidson also recommended that signs such as, "please stay on trails", and "do not walk on vegetation", help.

The result is that while the need for more clear site planning and implementation is necessary, the success of the popularity of rock climbing is creating adversarial relationships with resource managers who view the natural resource as the higher priority to protect. The scant information that was available revealed that the Tettegouche State Park plans are sound and correct.

Consequently, our findings are identified as:

- Climber surveys gave the Minnesota Department of Natural Resources confidence to spend the time, money and effort required to redirect hiker and climber activity and to attempt revegetation of degraded areas.
- The techniques we used to guide visitors away from revegetated areas seem to work. We observed no obvious trampling damage to the plantings. Visitors we talked to on site or at the park office were generally appreciative of attempts to halt and reverse degradation.
- We were surprised by plant survival rates given the harsh, bare nature of the site and the lack of measurable rainfall for five weeks after planting.
- Both *D. spicata* and *P. tridentata* are good choices for future plantings in similar settings. *D. spicata*'s better survival and more aggressive growth may make it a better choice for trying to stop erosion.
- Hydrogel treatment is worth considering in future plantings. The gel crystals are relatively easy to apply and treated plants showed improved growth at 13 weeks and were still showing good survival and growth at one year.
- Fertilizer treatment, while giving an initial boost to *D. spicata*, does not seem to provide benefits after one year.
- Results from sterile + forest soil treatments suggest that *P. tridentata* may be benefiting from associations with mycorrhizal fungi. A next step would be to test if commercially available fungi also improve survival and growth and thus be a more practical amendment than locally harvested soil.

We were encouraged enough by the results of this work to plant an additional 4000 local seed-source seedlings in 2002. We also learned that educating the

visitor on the value of natural resource rehabilitation and management lends toward acceptance and compliance of managed recreational use. This is a significant issue between natural resource managers and rock climbers nation wide.

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