

# Investigating the Potential of Restoring Crevice Communities

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### Abstract:

Alpine ecosystems are home to many rare and endangered species. These endangered species exist in a zone of extreme climatic variation. Due to the variation, alpine vegetation normally experiences prolonged recovery times after natural disturbances.



As such, a significant degree of trampling by humans can create severe and long-lasting effects to local environment, including loss of vegetation cover, soil erosion, and soil

compaction. These ecosystems are threatened by direct human impact, typically trampling from hikers and other recreationalists. Mt. Monadnock, located within Monadnock State Park in the state of New Hampshire, is the most climbed mountain in North America with over 100,000 visitors annually. To assess the potential of the summit of Mt. Monadnock for restoration, the vegetation and substrate of the summit cone and two levels of degraded communities were described. In addition, three experimental approaches were tested to restore vegetation to the most degraded communities. Soil scarification, the addition of compost, and the use of jute matting were all evaluated as possible amendments to aid in restoration. The summit cone substrate is comprised of 65% rock and 33% soil, with the remaining 2%

being a mix of steep, rocky cliffs and areas of gravel. This assessment of the summit cone substrate also shows that that 0.6 hectares of the 3.9 hectare summit is in need of restoration. Due to vandalism the results of the experimental restoration techniques were inconclusive; however, results suggest that the jute mat and compost addition may aid in restoring vegetation to the impacted summit areas. In addition, alpine bentgrass may be the species most likely to aid in hastening succession in these areas.

### Introduction:

Degradation of alpine communities is growing at astronomical rates. The growth of recreation is correlated with increased degradation. In 1978, Brown et al. were already suggesting that recreation was one of the fastest growing causes of disturbance in alpine regions. Through the 1990s, some peaks in Colorado saw an increased usage of 300%. On Mt. Monadnock in New Hampshire, the most climbed mountain in North America, over 100,000 people visit annually.



While research has been conducted on the physical characteristics of hiking trails, much of it has focused on the macro

indicators of degradation and erosion. This type of research has allowed us to understand where degradation is likely to occur, but has so far been

unable to unravel the intricacies of restoring those environments.

This study describes the summit of Mt. Monadnock at various scales and quantifies the potential restorable area. In addition, three common methods of restoring vegetation in alpine communities were evaluated. This study also highlights some 3 techniques that may benefit the restoration of alpine areas if included in future restoration research.

**Methods:**

This study was conducted around the summit of Mt. Monadnock. Mt. Monadnock is located within Monadnock State Park in Jaffrey, NH at 42°51'39"N / 72°6'29"W. Four types of sampling were conducted on Mt. Monadnock. Three types were used in order to describe the community, and a fourth was used to examine the efficacy of various vegetation restoration methods. The four sampling methods include: (1) In

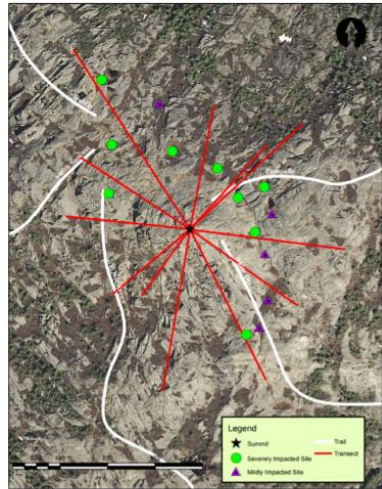


Figure 2. Site locations of each type of sampling on the summit of Mt. Monadnock in Jaffrey, NH.

order to describe the substrate and vegetation cover at the community level, twelve transects were run covering the entire summit cone. (2) To investigate soil depth, vegetation height, and cover for mildly degraded crevice communities, plot sampling was used. (3) Severely degraded crevice communities were described using

soil depth and vegetation cover, prior to experimental alteration. (4) Experimental alteration included three restoration methods and the sites were then reexamined post-experimentation using plot sampling to determine the effectiveness of restoration methods.

**Results:**

Of the soil found on the summit, 50.8% had less than total vegetation cover and 14.8% has less than 50%

cover. While three of the four quadrants had areas of 0% cover to 100% cover, the southwestern quadrant had no cover less than 10%.

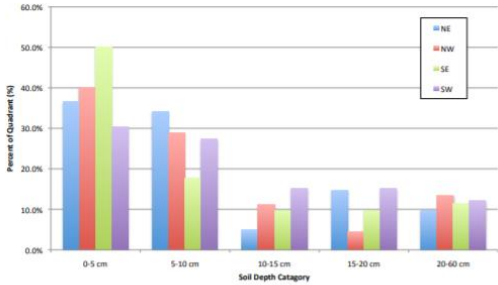


Figure 8. Mean soil depth by category as a percentage of the quadrant on the summit of Mt. Monadnock, NH.

Herbaceous and grass species seen include alpine bentgrass, cotton sedge, mountain sandwort, mountain goldenrod, and highland rush. Shrub species include mountain holly, sheep laurel, mountain cranberry, lowbush blueberry, black chokeberry, labrador tea, three-toothed cinquefoil, mountain azalea, mountain shadbush, and steeplebush. White pine and mountain were present, as well as woodfern and numerous moss species.

**Discussion:**

Of paramount importance is finding the best ways to prevent access and vandalism to areas being restored. This research would examine the efficacy of different forms of signage, exclosures, pathways, education, and many other possibilities. Without the ability to remove unwanted access, scientific experiments—such as this study—will continue to have difficulty measuring the effectiveness of various methods and their impacts. In addition, it is highly likely that any effective restoration technique will, at least in part, include closure or restrictive access to the restoration area. The results of this study suggest that the use of compost and a jute mat may be very helpful in restoring vegetation to degraded areas; however, further study with a larger sample size is needed to confirm this result. In addition, expanding the study to examine the effects of compost and jute mats on the physical and biological properties of the degraded soils would be extremely beneficial. These measurements are particularly important if we are looking to restore full function to the degraded area as the vegetation will not and cannot fully recover with significantly diminished soil properties.

seen include alpine bentgrass, cotton sedge, mountain sandwort, mountain

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