Cascade Carrying Capacity Exceeded

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Wilderness mountain summits are highly popular destinations that draw millions of hikers and tourists to the Adirondack Park each year to climb their dizzying heights, or just to gaze upon their serene, unspoiled, natural beauty. This tourism supports the local economy, however high-elevation forests, alpine zones, and designated Wilderness areas are particularly susceptible to degradation from human recreational impacts. Noise from human activity is also recognized as particularly disruptive to wildlife, which is an area currently under study (Smith, Z. A., Glennon, M. J., Karasin, L. N. 2012).

Proper management and protection of the ecological integrity of mountain summits and Wilderness areas requires managers of protected lands and waters (New York State government) to assess their potential for outdoor recreation, establish their "carrying capacity," and implement management actions to protect visitors, the resource, and the wilderness.

Carrying capacity addresses how much visitor use can be accommodated in a specific area without unacceptable impacts to the environment or visitor experience. That means determining what types of changes are acceptable and which are not. One method of determining carrying capacity is to establish indicators and standards of quality in order to guide site analysis and management. Trail design and construction, education and other actions can impact or increase the carrying capacity of an area.

The Limits of Acceptable Change (LAC) sliding scale is a useful tool for establishing quantitative indicators that can be used to measure human-induced changes to the landscape. By monitoring these indicators it is possible to determine the extent of damage over time, and use them to make informed management decisions.

History of the Cascade Trail from Rt. 73:

An approach to Cascade's summit beginning between the Upper and Lower Cascade Lakes existed as early as the 1850s. Cascade's current trail is in its third generation, following a route set in 1974 (Adirondack Forty-Sixers, 2011). With each "new" trail the carrying capacity has been increased. Higher levels of recreational use could occur without negatively impacting and changing the resource beyond limits of acceptable change. Current use now exceeds the level that could be sustained on previous and existing trails. The new fourth generation trail will be a great improvement, until its capacity is exceeded.

By the 1980s, visitor use had exceeded capacity and grown to more than 10,000 hikers per year. Serious erosion, resource damage and safety issues prompted a major rebuild by the Adirondack Mountain Club with paid professional and volunteer trail crews putting in rock staircases and waterbars, and other drainage and trail work. The trail's projected capacity increased to an estimated 15,000 to 20,000 hikers per year, greater than the use at the time.

Fast forward to 2015 and registered use levels exceeded 30,000 hikers per year, and of equal importance, peak day use hit new records of 300 or more. The rebuilt trail's capacity was exceeded. Damage resulted and the lack of trail maintenance has exacerbated impacts. Registered use (usually assumed to be well below actual use levels) has now exceeded 30,000 every year since 2015, more than three times the use of the trail when it was last rebuilt, and perhaps double the physical carrying capacity.

A new sustainable trail is being built via a new route, and the plan is to close the old trail. New and better trails are an important part of addressing overuse. Management and control of use levels, in some places at some times, and improved trails and infrastructure, more education, and more staff including Forest Rangers, are all recognized by experts and the Department of Environmental Conservation (DEC) as essential components of wilderness management. The new trail may be able to physically handle 40,000 to 60,000 people per year.

Physical Aspects of Cascade Mountain:

Cascade Mountain lies within the High Peaks Wilderness, which is New York's largest designated wilderness area at 275,460 acres. Its main trailhead is along Route 73 about six miles east of Lake Placid and 22 miles from Interstate 87. At an elevation of 4,098 feet, Cascade's direct approach and ease of access make this a popular choice. It is especially attractive to prospective "46ers" whose goal is to summit each of the park's 46 peaks originally thought to exceed 4,000 feet in elevation.

The 1.1 million acres of state land classified as "wilderness" is managed under stricter regulations than other Forest Preserve lands, even though all Forest Preserve is protected as "forever wild" under the NYS Constitution. Wilderness lands are motor-free landscapes with few or no permanent structures, bisected only by foot trails. (Other classifications allow for designated snowmobile trails, roads, bridges, power boat launches, etc.)

Due to the extremely high use of the High Peaks Wilderness and the sensitivity of the landscape, there are additional regulations in place here that do not apply in other wilderness areas. These include a ban on open fires, group size limits of 15 for day use and 8 for overnight, and required use of bear-resistant containers for food storage when camping overnight between April and November. Overnight use is rare for Cascade as it has no designated campsites, but "at-large" camping is allowed per rules pertaining to pristine locations: below 3,500 feet in elevation, and more than 150 feet from trails, roads, and water.

From Route 73, the red-marked trail, the route which was earlier relocated, to the summit of Cascade steeply climbs about 1,800 feet over 2.1 miles to a junction. Here, a trail branching to the right (south) and continuing another 0.7 miles leads to the summit of Porter Mountain, while Cascade's open summit is another 0.3 miles ahead. This summit was completely forested prior to the wildfire of 1903. As one of the most disastrous in Adirondack history, the fire burned over 600,000 acres in the course of six weeks. Fires spread as far as 150 miles south, and ash fell from the sky in Utica and New York City. The fires killed off the spruce and fir trees that densely covered Cascade's higher elevations. Soils quickly eroded and exposed the bare bedrock which is seen today. The current open summit boasts 360-degree

views with significant open space that now hosts the large crowds that are commonly seen on summer weekends.

While the trail from Route 73 is used to summit Cascade by the majority of hikers, two other approaches exist. From Marcy Field, there is a trail with significantly more elevation gain to Porter Mountain. Over 4.5 miles it climbs approximately 2,700 feet over Blueberry Mountain and on to Porter's summit, where hikers can also continue an additional mile to Cascade. From the Cascade Lakes, there is a bushwhack approach to Cascade's summit by climbing from a streambed to a slide (enlarged by Hurricane Irene), and then on to the top. This is dangerous and has recently been the site of fatalities (Izzo, 2019); it should not be attempted by inexperienced hikers. A former approach beginning in Keene Valley has been closed since June 2018. This trail passed over private property on its way from The Garden to Little Porter. Due to instances of hiker trespass, the landowner revoked the permission that had allowed the public to cross (Levine, 2018).

Most High Peak trails were "stomped out" rather than formally designed. Early guides and hikers bushwhacked directly up the mountains. This created steep paths which eroded into rocky drainages over time. Maintenance on the existing trail up Cascade from Route 73 has been halted for the past two years. State officials plan to close it upon completion of the newest (and fourth) trail up the mountain, a sustainably designed trail leading from the Mt. Van Hoevenberg Sports Complex to a new junction between the summits of Cascade and Porter.

By contouring the new trail to the terrain and hardening the surface, erosion and weathering will be minimized. Labor is being performed by several organizations: DEC, the Adirondack program of the Student Conservation Association (SCA), and the private trail construction organization Tahawus Trails working under contract for the state. Being designed to handle significantly more use than the existing trail, the new trail will be notably different. State officials say they want this effort to set the "gold standard" of sustainable trail design. This will be a narrow corridor of about two feet wide, aiming to generally rise at a gradient no greater than 8-10% except where rock staircases are built to gain elevation faster. Sides of the trail will be reinforced with boulders quarried from the immediate area, and buried under 6-8 inches of crushed rock (Bauer, 2019). This architecture stabilizes the trail so it can withstand heavy, sustained foot traffic on a hardened surface rather than the soft, organic soils commonly found in higher elevations. These combined design features will greatly reduce erosion from water and foot traffic.

Cascade's existing trail had seen significant improvement in the late 1980s and early 1990s in order to withstand increasing hiker numbers at the time. In a significant financial and time investment, stonework such as rock staircases and water bars were added in order to accommodate the 10,000 hikers per year that were visiting Cascade. Hiker numbers have continued to rise since then, with Cascade now annually seeing over three times that amount (NYS DEC, 2019). These unprecedented numbers have caused the trail to continue widening, causing some stone features to fail. Research by Clarkson University students in 2019 measured cross-sections along 1.8 miles of trail and calculated soil loss. It was determined that ***up to 269 dump truck loads of silt and soil had been eroded from the***

Cascade trail (Gifford, F., Lewis, L., Mattice, E., et al 2019). While an approximation, this number helps to visualize the large amounts of erosion experienced by this older type of steeply-graded trail.

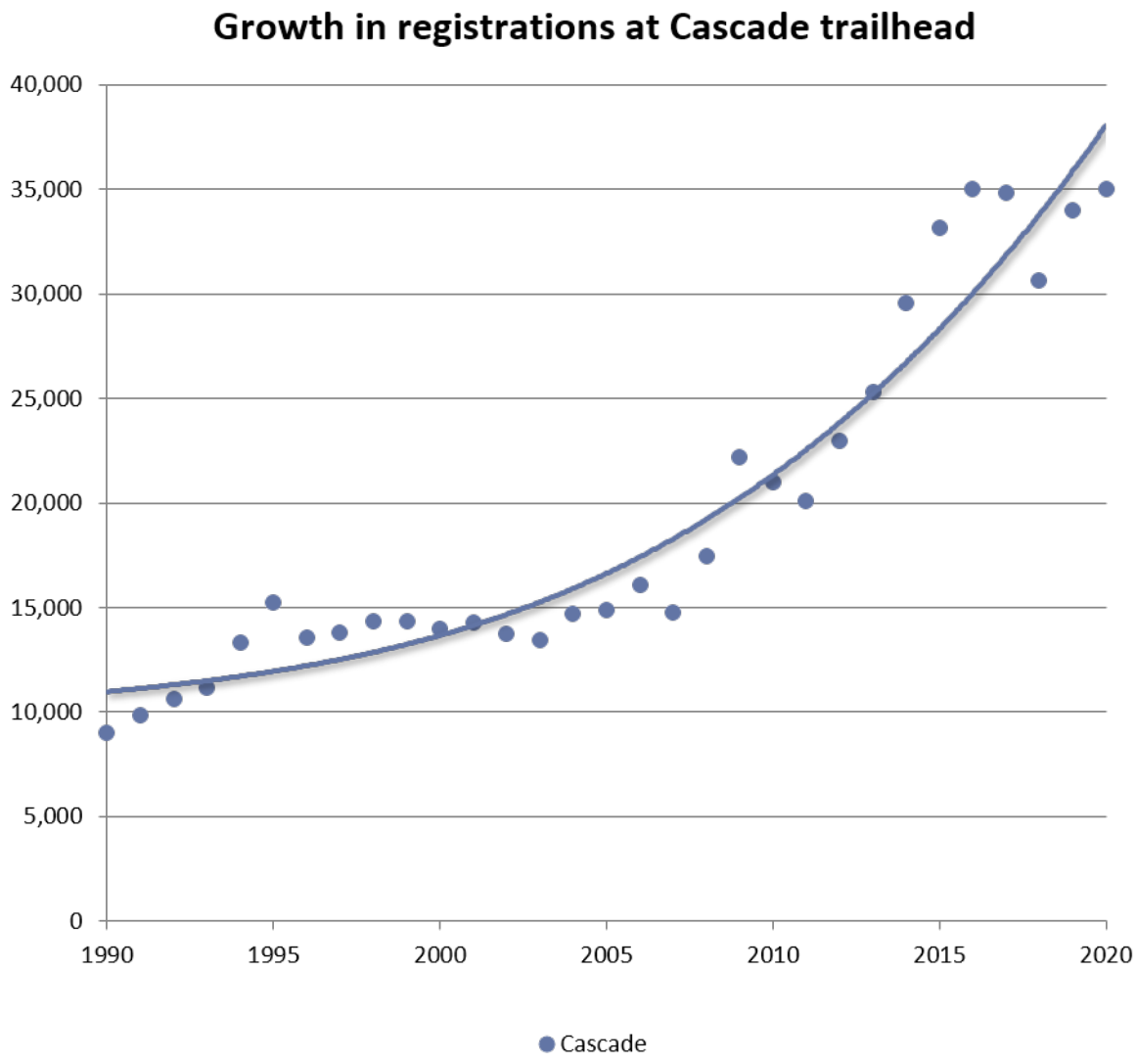

Figure 1: Sharp rise in hikers seen since 2010 (NYS DEC, 2019).

Social Aspects of Cascade Mountain:

Cascade is an attractive choice for the beginning hiker. At 2.4 miles and 1,900 feet elevation gain it is one of the shortest High Peak approaches, and can be easily combined with neighboring Porter Mountain. The popularity of the Adirondack 46ers has grown accordingly, with “aspiring members” climbing these two in order to add to their list of High Peaks summited. As a result, many new hikers may not yet be familiar with the elements of Leave No Trace (a set of outdoor recreation ethics for limiting damage) or special regulations pertaining to the High Peaks.

Parking is limited to four paved pull-off areas along Route 73, combined with unmarked roadside parking. The 1999 High Peaks Wilderness Area Unit Management Plan lists Cascade as having 10 parking spots, although several new pull-offs have been added, increasing the capacity to 73 vehicles. These expansions are dwarfed by regular weekend crowds of 150 or more vehicles, mostly forced to park along the road (Figure 2). Dangerous traffic situations are often created as drivers search for parking spots along the 55 MPH road, and walk along the roadside on their way to the trailhead (Izzo, 2019). This danger should be reduced upon completion of the new foot trail from Mt. Van Hoevenberg.

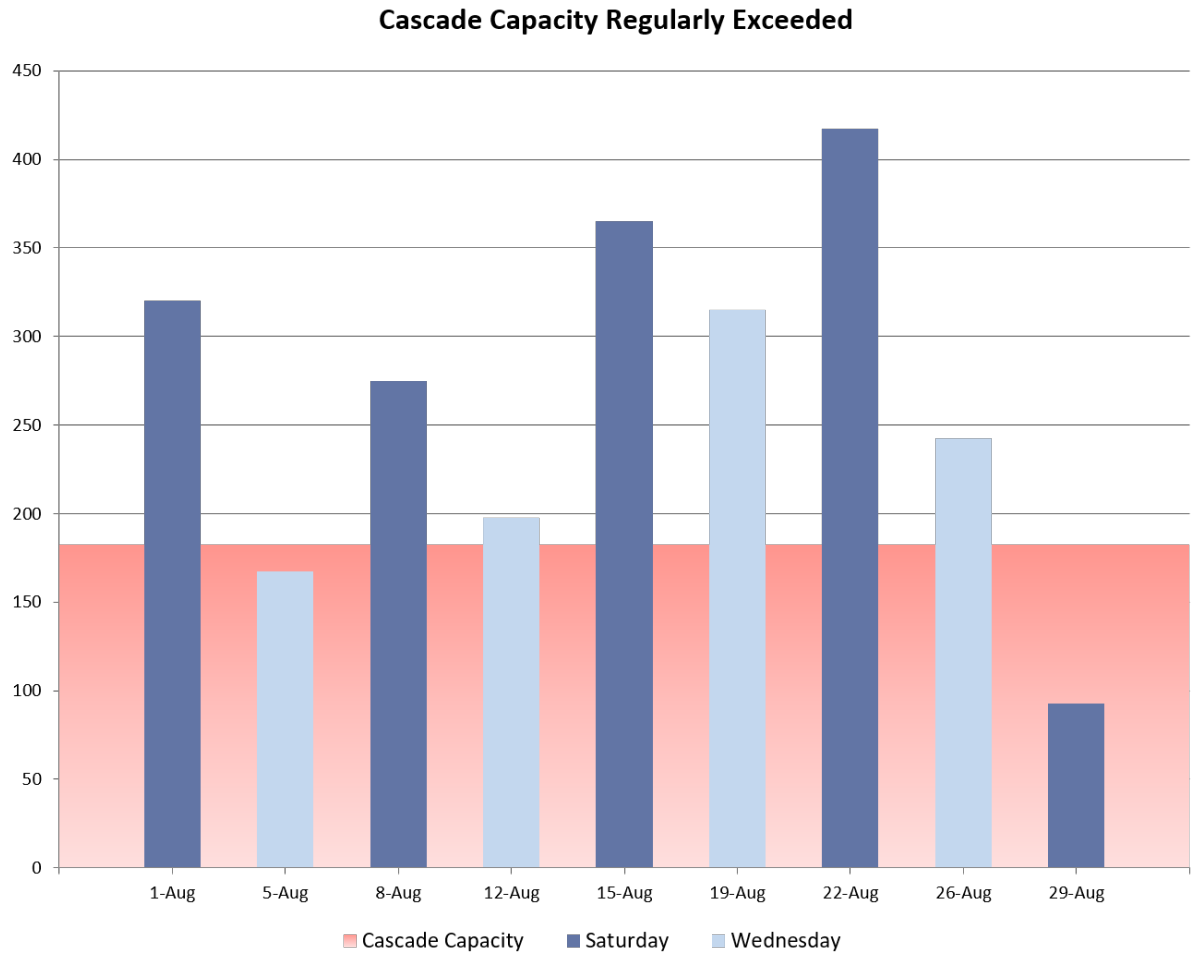

Figure 2: Hikers on Cascade trail at 11:00AM, August 2020.[1]

Unintentional behaviors such as walking on vegetation off trail at or below high elevations lead to increased wear on Cascade's trail corridor and the summit. Originally thickly forested, the

[1] Vehicles parked at the Cascade trailhead were counted by the Adirondack Council at 11:00am each Wednesday and Saturday of August, 2020. Capacity is set forth in the High Peaks Unit Management Plan, as is the average number of 2.5 hikers per vehicle. (HPUMP, NYS DEC 1999)

aforementioned fires of 1903 caused the loss of 80% of soil on the summit (Monz, Marion, Goonan, et. al. 2010). While Cascade does not have true Arctic-alpine tundra, it does provide habitat for subalpine species such as Three-toothed cinquefoil (*Sibbaldia tridentata)*, bog bilberry (*Vaccinium uliginosum*), and cotton sedge (*Eriophorum spp.*). According to the New York Natural Heritage Program these species are not rare or threatened, but have been heavily damaged by hiker trampling in the past. As of 2015 they were holding steady without further degradation, likely due to hiker education provided by the High Peaks Summit Stewardship Program (White, Jones 2020).

Cascade provides a unique educational opportunity with its vegetated open summit. High Peaks Summit Stewards focus on above-treeline habitat and are regularly stationed here to inform visitors of proper hiking practices, in hopes that they take this knowledge with them when visiting other locations with true alpine vegetation (White, Jones 2020). This program is a partnership of the Adirondack Mountain Club, DEC, and the Nature Conservancy. Traditionally, stewards have been present on Cascade's summit during weekends and holidays in order to educate hikers in Leave No Trace principles and perform trail work above treeline. Approximately 5% of the trail is above treeline, stewards have built three cairns and hundreds of feet of rock wall in order to prevent trampling and soil loss here. Additionally, areas of open soil that are in danger of erosion are protected through the process of rock packing. Stewards press fist-sized rocks into open soil in order to hold it down and prevent erosion due to wind or water. When left undisturbed, vegetation will take hold between the rocks and completely cover them over. This has not been extended to the other 95% of the trail below treeline, where brushing-in of braided sections and similar efforts to keep hikers on trail have failed. Stewards have also constructed and installed two pit privies in high elevation locations, as well as digging new pits and relocating them when they become full.

Beginning in 2017, volunteers from Adirondack 46ers have instituted a Trailhead Steward program. This program supplements the Adirondack High Peaks Summit Stewardship program by answering hiker questions and providing Leave No Trace education at the trailhead. With an informational display set up directly adjacent to Cascade's trail register, volunteers provide navigation information, proper waste disposal demonstrations, and answer any questions hikers may have about the area and trails.

The COVID-19 pandemic forced both organizations to drastically cut back their presence during the 2020 summer season. In order to avoid large crowds, summit steward coverage was reduced to one day mid-week as opposed to full weekends and holidays. Their focus was mainly on above-treeline trail maintenance rather than public outreach, and the 46er trailhead stewardship program was placed on hold as well.

Left: Cascade 1966, Ed Ketchledge **Right:** Cascade 2017, Ryan Nerp

Left: Cascade 1966, Ed Ketchledge **Right:** Cascade 1999, Matt Scott

Figure 3: Photopoint locations on Cascade, monitored by the High Peaks Summit Stewardship Program.

Capacity and Future Recommendations:

Recreational use has exceeded Cascade's carrying capacity several times over. Rebuilding trails has increased the physical capacity. Human waste, crowded viewpoints, trampling of vegetation, dangerous parking, and a severely eroded trail have all been regular complaints from hikers on the summit (White, K. personal communication, 2020). Personal and anecdotal observations suggest that some of the characteristics of wilderness set forth in the High Peaks Wilderness Area management plan have been lost due to the high number of visitors.

In order to monitor the condition of soil and vegetation above treeline, photo point monitoring is conducted periodically by the Summit Stewardship program (Figure 3). Some locations have data going back as far as the mid-1960s. This process was last carried out in 2015 and is again scheduled to occur during summer 2021. A steward hired specifically for this study will retake photographs of trail and alpine vegetation, matching previously determined locations and perspectives. Analysis of these

pictures compared to those taken in 2015 will determine change in vegetation, soil, and bare rock. Recent surveys have shown a slow but steady overall increase in the percent vegetative cover visible in photographs. These monitored locations above treeline have been subject to extensive physical work, and education to limit and change hiker behavior.

The regular occurrence of “weekend-level” hiker numbers during weekdays on Cascade suggest that opportunities for solitude are rare. Through the development of sliding-scale Limits of Acceptable Change scales and public surveys, it can be quantified if, and how much, the visitor experience is being degraded. Researchers specializing in visitor management on public lands, such as Drs. Abbie Larkin and Steve Lawson, have developed precise and accurate methods for measuring these aspects, as well as measuring the density of hikers on trail and on the summit. With funding support from stakeholders and Adirondack nonprofits, research can be conducted together in order to make these determinations and inform future management decisions.

Conclusion:

The capacity of the Cascade trail corridors has been exceeded. Actions have been and are being taken to mitigate some of those impacts. As has been necessary at other locations, land management experts have currently placed some limits on use. Other actions to manage user levels will be needed in some places at some times, coupled with more trails, more parking, more rangers, and continued educational outreach at the trailhead and on the summit. All should be part of a coordinated and well-funded comprehensive wilderness protection and visitor use management system. Research and monitoring to inform iterative management is critical in helping land managers to respond and make changes over time. The Cascade Trail demonstrates this clearly.

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