

Building New Knowledge in a Special Place

The Mount Mansfield Science and Stewardship Center

The need for a mountain field station

Mountain forests and alpine zones of the Northeast are sensitive ecosystems that provide valuable opportunities for recreation, industry, and natural resource management. Because of their distinct biological and cultural attributes, they are important subjects for the study of ecosystem function, effects of natural and anthropogenic change, and the dynamics of social-ecological systems. However, the expense and logistical challenges of remote mountain research have hampered gains in knowledge and integration among academic and professional disciplines. This problem is especially pronounced in the region's montane spruce-fir forests, which lack a permanent platform for investigating climate change, acidification, mercury deposition and other anthropogenic stressors that disproportionately affect high elevations. The Mansfield Center presents a rare opportunity to expand the frontiers of mountain science while fulfilling the National Research Council's 21st-century vision of enhanced biological infrastructure. Conversion of the Mount Mansfield Summit Station to a biological field station will enable scholars, educators, and natural resource managers to work alongside students and visitors to acquire, share, and apply new knowledge.



Figure 1. Mount Mansfield's Summit Station, a decommissioned communications facility at 1,175 m elevation, proposed for renovation as the Mount Mansfield Science and Stewardship Center.

Description of the existing facility

At present, the Summit Station is a 1.5-story, concrete-block building situated at the terminus of the Mount Mansfield Auto Toll Road at an elevation of 1,175 m (Figures 1 and 2). The structure and its surrounding eight hectares are owned by Stowe Mountain Resort, a project partner interested in leasing the building to the University of Vermont on a long-term basis. The station, which measures 20 m x 12 m, was erected in 1968 as a commercial broadcasting facility. Over the years it has also housed a gift shop, cafe, restrooms, and interpretive displays. The last of the telecommunication equipment was removed in 2010, leaving most of the building vacant. The Green Mountain Club maintains a small collection of natural history exhibits in the foyer, which is open to the public during the hiking season as The Mount Mansfield Visitor Center. Beyond the building's immediate vicinity lies the Mount Mansfield Natural Area, 160 ridgeline hectares

owned by the University of Vermont and managed to fulfill its research and educational missions. Both the Summit Station and Natural Area are embedded within the Mount Mansfield State Forest, nearly 18,000 ha managed by the Vermont Department of Forests, Parks and Recreation for research, water-resource protection, wildlife habitat, timber, and recreation.

Unique aspects of the ecosystem and organisms

The renovation that we propose for the Summit Station will establish the only field station in eastern North America located in a high-elevation spruce-fir forest. It will create an excellent opportunity to advance scientific research, conservation, and citizen engagement in this iconic, but threatened, ecosystem.

The slopes of Mount Mansfield provide ready access to a variety of plant and animal communities, with regionally representative and rare communities occurring in close proximity along a sharp elevation gradient. These range from northern hardwood forests at lower elevations to the state's largest patch (81 ha) of alpine tundra at the mountain's 1,339 m summit. The seven-kilometer gravel road that leads to the Summit Station passes through mid-elevation forests of red spruce and heartleaf paper birch (a montane endemic), and terminates at the ridgeline in stunted "krummholz" forest that is dominated by balsam fir. Ecologically significant features also include freshwater sites, as the proposed Center is close to several headwater streams, as well as to Lake of the Clouds (1,197 m) and Bear Pond (1,077 m), Vermont's two highest bodies of water.

The broad range of abiotic and biotic conditions that occur from valley floor to alpine ridge provide numerous opportunities to examine ecological and evolutionary consequences of environmental variation. Mount Mansfield's elevation, steep slopes, and shallow, poorly buffered soils increase the ecosystem's sensitivity to both natural perturbations and anthropogenic stressors. The Mansfield Center and its environs thus provide a natural laboratory to investigate phenomena that range from atmospheric deposition of toxins to ecosystem acidification to climate change. Biological communities in the Center's immediate vicinity are subject to an array of disturbances and management strategies, which range from outright protection that assures little direct human impact, to high public recreational use and intensive management. This mosaic affords rich opportunities for applied research to enhance stewardship of montane and alpine environments, and to educate visitors. Further, the relatively easy access to rare biological communities, significant both regionally and globally, yields outstanding potential for autecological studies of species like Bicknell's Thrush. Most knowledge of the breeding ecology of this rare, migratory songbird — one of North America's highest avian conservation priorities — derives from research conducted on Mount Mansfield in the vicinity of the proposed Center.

Capabilities for supporting scientific research and training

The Mansfield Center has existing infrastructure capable of supporting research and training activities. This includes the structure itself, a well-maintained road, and a network of ski and hiking trails that provide access to the mountain's diverse biological communities. These features also encourage frequent visits by the public; over 40,000 individuals travel to the ridgeline each year, affording excellent opportunities to interact with scientists and educators. Many visitors reach the mountain's ridgeline by the Long Trail, a footpath that traverses the state and passes directly in front of the Summit Station. The Green Mountain Club, which maintains

the trail in cooperation with UVM and the Vermont Department of Forests, Parks and Recreation, stations caretakers on the mountain each summer. Their presence creates opportunities to combine research with stewardship at an accessible site, and to engage the public as both “citizen scientists” and “practicing stewards.” Ongoing research and monitoring of the mountain ecosystem can be highlighted through interactive displays and demonstrations. Thus best practices for mountain stewardship and natural restoration can be communicated both indoors and out. We expect that researchers will be strongly attracted to this setting; institutions including the University of Vermont (and its associated scientists at government facilities like the George D. Aiken Forest Sciences Lab), Johnson State College, Middlebury College, and Dartmouth College are all within a short drive. The Center would also support activities of researchers at the numerous institutions associated with the Vermont Monitoring Cooperative (VMC). Many of these currently conduct research on Mount Mansfield.

History of research

Mount Mansfield has attracted scientific study for over 170 years, since the pioneering naturalist Zadock Thompson estimated the summit's elevation in his classic *History of Vermont*. The first analysis of the mountain's geology was reported to Vermont's governor in 1859, the year that Charles Darwin introduced his theory of evolution by natural selection. That same year, the University of Vermont acquired approximately 160 hectares along the ridgeline to support scientific and educational endeavors. Since then, the scope of inquiry on Mount Mansfield has steadily increased. It now encompasses earth and atmospheric sciences, botany, zoology, chemistry, and interdisciplinary fields such as ecology and biogeochemistry. Over time, science and stewardship activities on Mount Mansfield have grown in sophistication and number. Dozens of research institutions, public agencies, and private organizations have worked from the base of the mountain to its summit on independent projects and efforts supported by the Vermont Monitoring Cooperative.

VMC is a unique partnership among Vermont's Agency of Natural Resources, the USDA Forest Service and the University of Vermont. Since 1990, VMC has monitored and conducted research of forest ecosystem health at study sites on Mount Mansfield (northern VT) and at the Lye Brook Wilderness Area (southern VT). In addition, VMC coordinates data collection and synthesis, and provides centralized data and information management and distribution. Its mission is “to provide the information needed to understand, manage, and protect Vermont's forested ecosystems in a changing global environment.”

For nearly 25 years, VMC has conducted and coordinated research on and near the summit of Mount Mansfield (Figure 2). Projects with VMC support have focused on cloud water chemistry, classification and mapping of the area's alpine vegetation, documentation of disturbed alpine communities, vegetation analysis and long-term vegetation monitoring, photographic monitoring of fragile and rare alpine environments, and long-term soil monitoring. Work on faunal groups includes long-term studies of forest bird and amphibian populations, including the ecology and demographics of Bicknell's Thrush (see Research and Training Use on page 11).

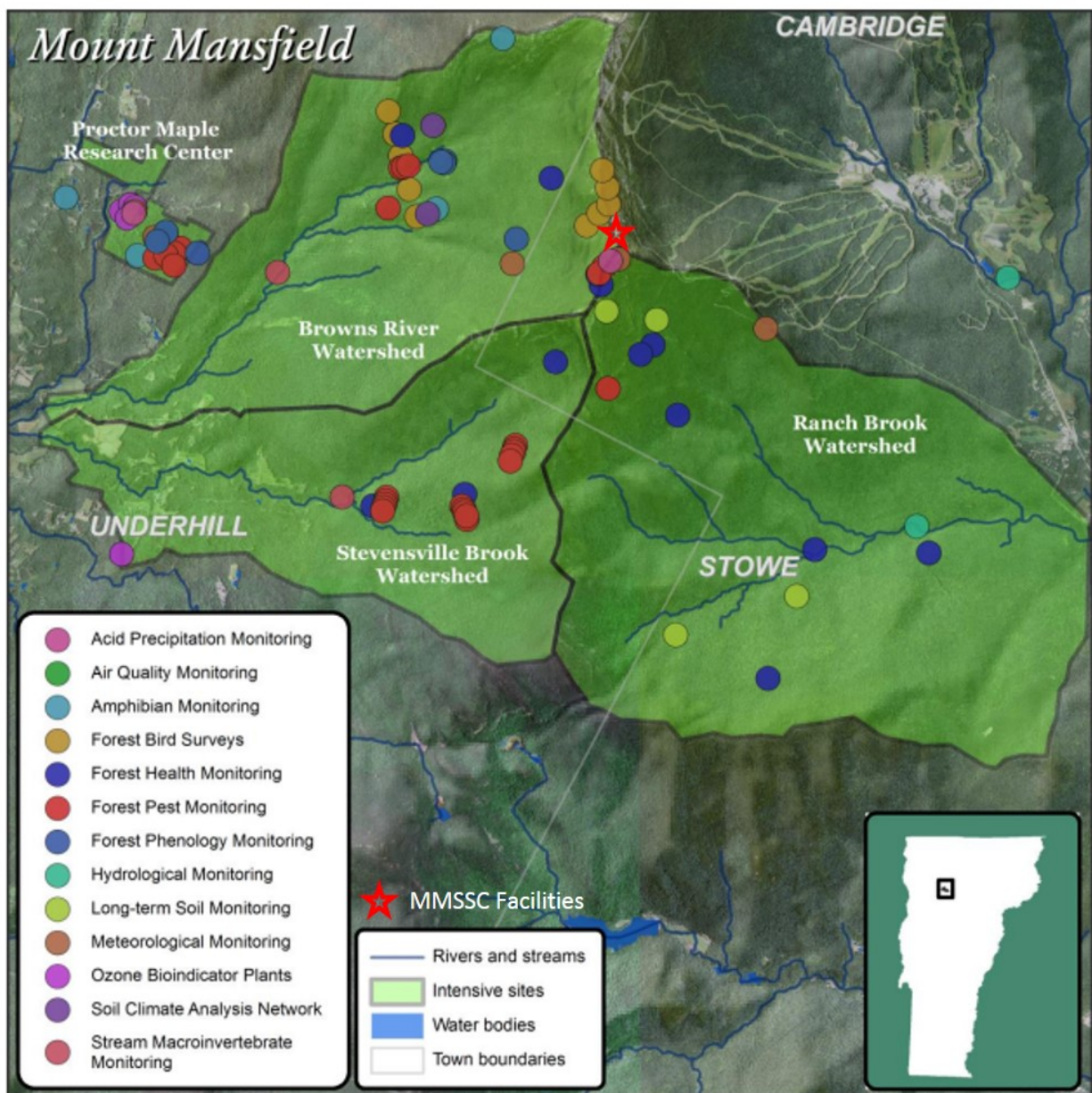


Figure 2. The red star indicates the location of the Summit Station, future home of the Mount Mansfield Science and Stewardship Center. The VMC has supported long-term monitoring and multi-disciplinary research in surrounding areas on Mount Mansfield since 1990. Complementary data sets exist at the Lye Brook Wilderness Area in southern Vermont.

The existence of this well-established structure for coordination of monitoring data would immediately enable the Mansfield Center to interface with regional and international networks for data collection and analysis. It would leverage investment in the Center and greatly enhance its visibility, value and impact.

Conclusion

The long history of research and stewardship on Mount Mansfield has produced an extensive body of knowledge and a rich tradition of cooperative enterprise. These provide a firm foundation to expand science and stewardship programs. We envision a community of scholars, students, and visitors who interact and learn from one another, fostering a deeper understanding of high-elevation ecology. New knowledge will emerge from this collaborative setting to assure better stewardship of mountain habitats now and in the years to come. As concerns heighten for the future of high-elevation ecosystems, this facility could play an important role in the emerging global network of mountain observatories.