



Forest Ecosystem Monitoring Cooperative Strategic Plan

2018-2020

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Forest Ecosystem Monitoring Cooperative

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Letter from the FEMC Steering Committee

The Forest Ecosystem Monitoring Cooperative brings together practitioners from a range of disciplines and institutions to work together on monitoring and assessing the forested ecosystems of the northeastern temperate forests. Building on over 25 years of experience in Vermont, the FEMC is continuing to expand the cooperative model to surrounding states through sustained and direct engagement. In 2014, the VMC Steering Committee formed a Strategic Planning Committee to evaluate the role of the VMC within the larger network of natural resource professionals. This strategic planning exercise charted a course for VMC, both in terms of broad goals and objectives, and specific activities and deliverables. As the VMC expanded to become the FEMC, a revision to the previous strategic plan was needed to provide updated guidance and direction for the FEMC staff and its partners.

This Strategic Plan affirms and renews FEMC's long-standing mission, outlines critical gaps that FEMC can fill in the capacity of our larger collaborative network, and identifies the activities needed to sustain the health of the region's forested ecosystems. While the needs for forest health monitoring and research professionals in the region are wide-ranging and complex, this plan reaffirms the consensus among stakeholders that the core FEMC activities – maintaining long-term ecosystem and environmental monitoring, securing and providing broad access to this data, and facilitating collaboration among organizations, disciplines and arenas – remain essential to our collective success.

In addition to building on the historical strengths of VMC and new strengths of the FEMC, this Strategic Plan identifies new or previously unrecognized synergies with our partner organizations. Specifically, this includes overlapping objectives and activities defined by the US Forest Service Northeastern Area, the Maine Forest Service, the Massachusetts Department of Conservation and Recreation, the New Hampshire Division of Forests and Lands, the New York Department of Environmental Conservation, the Vermont Department of Forests, Parks and Recreation, the Green Mountain National Forest, the US Forest Service Northern Research Station, the Vermont Department of Environmental Conservation, the Vermont Fish and Wildlife Department, and the Rubenstein School of Environment and Natural Resources (see page 21). Many challenges are ahead, ranging from the threat of continued climate change to institutional pressures of shrinking budgets. In light of these, working together to find shared goals and greater efficiency is a crucial step in maximizing the impact of our collective activities.

Many thanks go to all the partners who had a hand in shaping this plan. Not only did they help sharpen the focus of the original VMC mission and objectives, they brought to light a wealth of opportunities to further engage our current collaborators, broaden stakeholder involvement, and connect leadership from across the many organizations represented in our network. In particular, we are deeply indebted to the members of the original VMC Strategic Planning Committee who volunteered their time, expertise and enthusiasm. The FEMC is in the end, the sum of its parts, and we are both encouraged by and thankful for the many dedicated colleagues who have already contributed so generously to the Forest Ecosystem Monitoring Cooperative, and their continued efforts to strengthen the Cooperative into the future.

Sincerely,

The Forest Ecosystem Monitoring Cooperative Steering Committee

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An Introduction to the Forest Ecosystem Monitoring Cooperative

Established in 1990 as a partnership among the USDA Forest Service, the State of Vermont Agency of Natural Resources and The University of Vermont (UVM), the mission of the Forest Ecosystem Monitoring Cooperative (FEMC) mirrors and builds upon the priorities of these partners. The FEMC serves as a hub to facilitate collaboration among federal, state, non-profit, professional and academic institutions towards ongoing monitoring of forested ecosystems across the region and an improved understanding of forested ecosystems in light of the many threats they face.

The FEMC is unique in its relatively small staff who function to support and facilitate the activities of a much larger network of actively engaged collaborators. While FEMC funding primarily supports ongoing monitoring, outreach, coordination and data management, the bulk of FEMC activities are accomplished by “in kind” contributions provided by the larger collaborative network. Over 250 professionals actively contribute to current and ongoing monitoring and research projects, and more than a hundred other contributors have bolstered the monitoring record through their work in years past. Beyond these direct contributions, the Cooperative encompasses many more individual environmental researchers, land managers, decision makers, environmental advocates, educators, industry professionals and faculty from over 50 organizations across Maine, Massachusetts New Hampshire, New York and Vermont, and other states in the area. This committed group of active collaborators synthesize and utilize this information based on a shared interest in the health and management of forested ecosystems across the region.





Figure 2. FEMC Soil Climate Analysis Network site at Lye Brook Wilderness Area in Manchester, VT.



Figure 2. FEMC forest canopy tower at the Proctor Maple Research Center in Underhill, VT.

Over the 27-year history of the FEMC, its core priorities have remained closely aligned with its founding partners: to provide the information necessary to conserve and manage forested landscapes, identify and monitor threats to forest health and function, and to facilitate collaboration among a diverse group of stakeholders. To this end, the FEMC has collected and maintained one of the longest and most expansive records of forest health, wildlife, soil, air and water quality data in the region. Made discoverable and downloadable via FEMC's online data archive, this information has been critical to resource managers, researchers and policy makers across the region. FEMC is also playing an increasingly important role in translating data to information products, apps and dashboards, to increase the accessibility and utility of data in the archive.

Originally these FEMC monitoring and research efforts were focused at two intensive sites: Lye Brook Wilderness Area on the Green Mountain National Forest in southern Vermont, and State-owned lands located on the slopes of Mt. Mansfield within the Browns River, Stevensville Brook and Ranch Brook watersheds. Focusing efforts on these intensive sites provided the capability to co-locate studies to better understand ecosystem processes and impacts across biotic and abiotic strata. Considering the lack of Vermont's representation in other long-term ecological networks (e.g. Long Term Ecological Research Network, National Ecological Observatory Network, experimental forests), and the demonstrated sensitivity of these ecosystems (Vogelmann, 1982; DeHayes et al., 1991; DeHayes et al., 1999, Schaberg et al., 2000) these intensive sites filled a critical gap in environmental monitoring efforts.

Over the past decade, the then-VMC expanded its scope efforts beyond these intensive sites, in part by design to improve our understanding of a diversity of habitat types, but also because of the widening network of collaborators working across the region. The FEMC database now contains data from across the region on a diverse array of topics. While many of these datasets and products are maintained directly with FEMC financial and technical support, additional programs and products (denoted by *) are collected by FEMC collaborators, with the FEMC fulfilling the role of data archiving, synthesis and distribution.

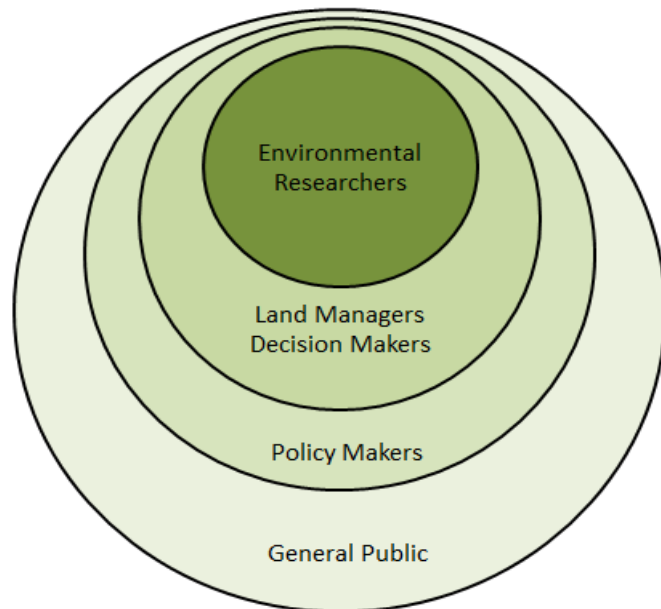


Figure 3. FEMC's core of cooperators and scientists who provide data and information to land managers and decision makers, policy makers and the public.

Through their efforts of the Cooperative, made up of scientists, researchers, land managers and decision makers from a range of public agencies, the findings of the FEMC collaborative are regularly communicated to policy makers, practitioners and the general public. FEMC information assists partners at the local, state and regional levels in managing forested landscapes while considering the social dimensions represented by the people who live, work and play in those same forests. With the growing interest in quantifying, preserving and enhancing the ecosystem services provided by the region's forested landscapes, there is a need to understand how human activity relies upon and impacts those services. Long-term ecosystem monitoring provided by the FEMC generates the data that will be needed to quantify those services, as well as to detect changes or signs of potential degradation from both social and environmental stressors.

As a collective group, the FEMC provides the connection between data, researchers, managers and practitioners to compile a more comprehensive assessment of the region's forests. While individuals come and go through positions, and funding is often unstable, the FEMC has provided a continuous source of environmental monitoring, from trees to water, air, soils and wildlife, leading to a more complete assessment of environmental conditions, long-term analyses of trends and integration across datasets. This tremendous accumulation of environmental monitoring records places FEMC at a unique position, where synthesis and integration of long-term datasets provide opportunities to understand

how changing social and environmental factors have affected, and will continue to affect, the structure and function of the region's forests. In this way the FEMC is providing critical information to sustain forest health and the many benefits healthy forested ecosystems provide.



Overview of the Strategic Planning Process

Over the past decade the then-Vermont Monitoring Cooperative has undertaken several visioning and review activities. In 2001 the VMC Operations Guide¹ was updated by VMC staff with input from the Steering and Advisory Committees. In 2002, an external review team with members from the Missouri Department of Conservation, US Geological Survey and US Forest Service convened to review the VMC program and activities². This was followed in 2004 by an internal review of VMC staff positions and duties, and overall VMC activities. In March 2014, the VMC Steering Committee initiated a strategic planning process to revisit the VMC mission statement, examine how it aligns with the missions and goals of our partners and identify a set of priority activities for VMC focus moving forward. In 2017, the VMC changed to the FEMC, and in 2018, FEMC staff updated the Strategic Plan to reflect the expanded nature of the Cooperative and its shifting focus.

FEMC's mission and goals most directly align with the goals and objectives of the forest management agencies of its partner states, as well as its foundation partners, including the Northeastern Area State and Private Forestry, Green Mountain and Finger Lakes National Forests, the Vermont Department of Environmental Conservation and the Vermont Fish and Wildlife Department. Historically, the FEMC plan has been guided by the 2010 Forest Resources Plan published by the Vermont Department of Forests, Parks and Recreation (FPR). That Plan delineates five major areas of concentration and concern including: biological diversity, forest health and productivity, forest products and ecosystem services, land ethic and legal, institutional and economic framework. FEMC goals, objectives and activities address many strategies in each of these areas. The Forest Resources Plan's format is used to write the federal narrative to request FEMC funding from US Forest Service Northeastern Area State and Private Forestry and to prepare status reports to FPR from UVM. More recently, the FEMC narrative has been expanded to address key plan elements from each partnering state.

Unifying themes across most, if not all, of our partnering organizations included conservation of forested landscapes, maintaining biodiversity (plant and animal), protecting rare and endangered species, promoting recreational opportunities in forested landscapes, promoting sustainable forest management practices to support timber harvesting, mitigate threats and protect and maintain water quality, maintaining resiliency and promoting adaptation of plant and animal species in the face of climate change. For a

¹ Available online at http://www.uvm.edu/vmc/documents/2001_VMCOperationsGuide.pdf.

² Available online at http://www.uvm.edu/vmc/documents/2002_VMCReviewFinalReport.pdf.

full list of priorities and objectives for each of FEMC's partnering organizations and how FEMC contributes to the success of these objectives, see Appendix C.

Informed by these previous planning activities as well as the strategic planning undertaken by each of the primary partnering organizations that comprise the FEMC, the 2014 strategic planning process outlined an iterative evaluation of the then-VMC mission, objectives and activities to sharpen our focus, strengthen relationships across organizations, and ensure continued relevance and impact of the collaborative. The 2018/2019 revision built off the 2014 work to expand and update the plan to address the expanded regional partnerships of the FEMC. This process is summarized on the next page.

Overview of the Strategic Planning Process

Table 1. Overview of the Forest Ecosystem Monitoring Cooperative Strategic Planning Process

<p>Advisory Committee Working Session <i>April 18, 2014</i></p>	<p>The VMC Advisory Committee reviewed and edited an initial list of strengths, weaknesses, opportunities, threats (SWOTs) generated by the VMC staff, reviewed the current VMC mission statement and proposed changes, and drafted an initial set of goals for later consideration by the Strategic Planning Committee.</p>
<p>Strategic Planning Committee Retreat <i>June 5, 2014</i></p>	<p>VMC held a retreat for the Strategic Planning Committee, comprised of cooperators and leaders from state and federal partnering organizations. This group defined a set of high-level objectives and related activities that they felt VMC should pursue over the next ten years in order to meet the larger mission and goals.</p>
<p>Cooperative-Wide Survey <i>Jul-Aug, 2014</i></p>	<p>To solicit feedback on these draft objectives and related activities, a quantitative survey was delivered to cooperators in August 2014. The survey asked VMC collaborators to identify priority focus areas by asking them to prioritize the draft objectives, rank specific activities where VMC should focus its efforts, and identify collaborator needs.</p>
<p>Steering Committee Review, Public Release <i>Oct – Dec, 2014</i></p>	<p>The VMC 2015–2020 Strategic plan was reviewed and approved by the VMC Steering Committee and released to the public in December leading up to the VMC Annual Conference.</p>
<p>Revision of Plan for Expanded Regional Cooperative <i>2018 to 2019</i></p>	<p>FEMC staff reviewed the 2014 plan and proposed updates to the goals, objectives and activities to reflect the expansion of the VMC to the FEMC. These changes were approved by the FEMC Steering Committee, and staff assessed alignment with regional entities.</p>
<p>Review and Recalibration <i>2015 – 2020</i></p>	<p>In 2020, the FEMC will reconvene a new Strategic Planning Committee to revisit the goals, objectives and activities of the organization in light of the changing environment.</p>



The Forest Ecosystem Monitoring Cooperative Mission

The mission of the Forest Ecosystem Monitoring Cooperative is to serve the northeast temperate forest region through improved understanding of long-term trends, annual conditions, and interdisciplinary relationships of the physical, chemical, and biological components of forested ecosystems.

The FEMC also promotes the efficient coordination of multi-disciplinary environmental monitoring and research activities among federal, state, university, and private-sector agencies with common interests in the long-term health, management, and protection of forested ecosystems.



Goals of the Forest Ecosystem Monitoring Cooperative



Figure 5. Panel presentation at the 2016 Conference.



Figure 5. Working group session on earthworm identification at the 2016 Conference

FEMC fills an essential niche by providing long-term, reliable and professional coordination of monitoring and research activities in the region across federal, state and private-sector agencies, organizations and institutions. This role at the regional scale builds upon 26 years of success in Vermont in maintaining this focus and funding to perform this service. In today's funding environment it is more important than ever to minimize duplication of effort and to leverage available funding to provide the data and information necessary to inform policy and management decisions affecting the forested landscapes of our region. Through its annual conferences, archive, website, workshops and other information outlets, FEMC consistently provides important information about forest ecosystems to land and resource managers, decision-makers, cooperators, researchers and the public.

Goal 1

To promote the efficient **COORDINATION** of multidisciplinary environmental monitoring and research activities among Federal, State and private sector agencies and institutions with common interests in the long-term understanding, management or protection of forested ecosystems

Objective 1.1

Provide regular opportunities for networking across disciplines and organizations

- ACTIVITY 1.1.1** **Regularly convene environmental professionals at an annual meeting**
Deliverable: Expanded FEMC annual conferences with a target of 200 attendees, 50 presenters and 3 structured networking sessions
-
- ACTIVITY 1.1.2** **Provide FEMC database training workshops to expand the use and contribution of data**
Deliverable: Mobile training workshops offered at least twice a year at partnering institutions
-
- ACTIVITY 1.1.3** **Maintain multiple outlets for disseminating information to collaborators and stakeholders**
Deliverable: Development, deployment and continued support of social media, listserv and ecoNEWS VT
-
- ACTIVITY 1.1.4** **Maintain a committee structure that enables networking and collaboration across organizations and disciplines**
Deliverable: Functioning Committees directly involved in the project work and governance of the FEMC

Objective 1.2

Coordinate efforts around high priority issues to produce integrated products

- ACTIVITY 1.2.1** **Conduct mini-grant competitions to support high priority research, monitoring, integration and synthesis efforts***
Deliverable: Development of a Request for Proposals, with selection guided by the FEMC Steering and State Partnership Committees
-
- ACTIVITY 1.2.2** **Identify and engage partners for integrated analyses around high priority issues**
Deliverable: Completion of state partnership sprint projects and regional work plan items; Development of funding proposals with partners

*Activities may be dependent on securing additional sources of funding.

To contribute to the efficient **COORDINATION** of multidisciplinary environmental monitoring and research activities among existing efforts and institutions with common interests in the long-term understanding, management or protection of forested ecosystems

Objective 1.3

Provide a forum to inform future activities among partners

ACTIVITY 1.3.1 Convene collaborators to reevaluate the FEMC strategic plan, identify gaps, strengths and weaknesses in collective FEMC efforts on a regular basis

Deliverables: Yearly internal strategic plan review and action plan, summarized in yearly reports to Eastern Region State and Private Forestry; Preliminary Strategic Plan internal review in 2017; Reconvene the Strategic Planning Committee for renewal and update of the Strategic Plan in 2020

ACTIVITY 1.3.2 Provide a forum for multidisciplinary groups to identify emerging needs and work on proposals for external funding.

Deliverable: Facilitated working groups at FEMC Annual Conferences

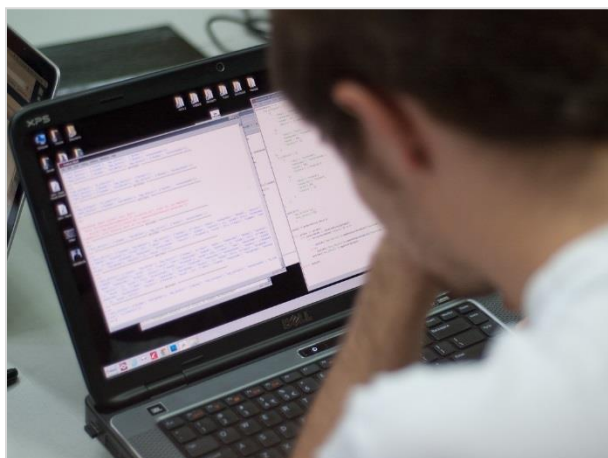


Figure 7. VMC data are available for reference, reuse or incorporation into new research and monitoring activities.

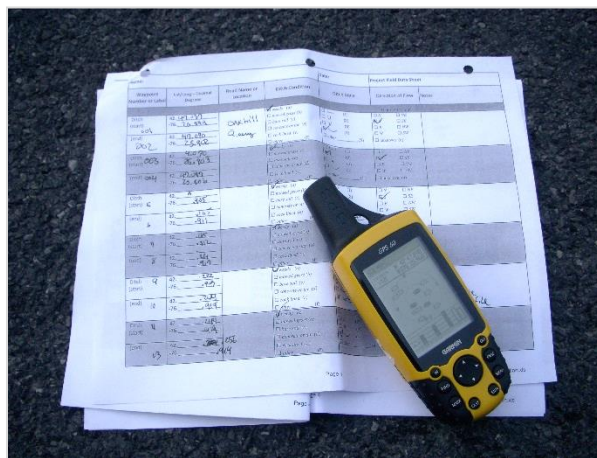


Figure 6. Working with partners, key data are archived beyond the life of individual projects.

FEMC cooperators and stakeholders have repeatedly identified the value added by FEMC through post-collection data analyses, synthesis and reporting, and that these services allow them to do their jobs better. FEMC has allocated increasing amounts of staff time and resources for these ventures, both to do novel analysis and to develop tools and products that enable people to access and understand information better.

As the VMC, this organization periodically produced integrated data summaries or synthesis reports, including a Data Integration Pilot Project (Martin et al., 1994), an Ecological Data Integration (Martin, 1998) project, a study of atmospheric mercury in Vermont and New England (Burkins et al., 2009), and a synthesis of the first 20 years of VMC monitoring data (VMC, 2009). Beginning in 2014, VMC/FEMC staff have produced yearly long-term monitoring updates summarizing trends in key long-term datasets for Vermont (Pontius et al. 2014, Duncan et al. 2015, Duncan et al. 2016, Duncan et al. 2017) and, more recently, the region (Kosiba et al. 2017). The 2009 Vermont's Changing Forests (VMC, 2009) report may present a model for producing future synthesis and integration reports at a regional scale. During this endeavor the VMC acted as the coordinating organization that brought together like-minded cooperators interested in working on the report, and paid for some of their time to do data analyses and integration, and actual writing of chapters for the report.

FEMC also continues to expand its role in producing data portals, online data integration and discovery tools, and other products that provide both information and context as well

as access to raw data. Some examples include the Vermont Forest Indicators Dashboard³ and the Northeastern Forest Health Atlas⁴. This collection of tools and products represent a significant offering for partners in the region for going beyond data access and providing tools for integration and understanding.

³ <https://www.uvm.edu/femc/indicators>

⁴ <https://www.uvm.edu/femc/forest-health-atlas>

Objective 2.1

Facilitate the development and distribution of FEMC data syntheses

- ACTIVITY 2.1.1** Convene collaborators to participate in reporting and explaining long-term trends in environmental conditions
Deliverable: FEMC long-term monitoring updates; Vermont Forest Indicators Dashboard
-
- ACTIVITY 2.1.2** Promote FEMC project reports and findings developed through state and regional work to other stakeholders in the region
Deliverable: Presentations at regional conferences/meetings on products developed by the FEMC

Objective 2.2

Provide state-of-the-art tools for preserving, accessing and exploring data

- ACTIVITY 2.2.1** Maintain and improve the FEMC archive as a regional resource for archiving environmental data
Deliverable: New users and datasets added to the archive; Additional functionality and features added to the archive.
-
- ACTIVITY 2.2.2** Promote affordable FEMC web, data and analytical services to partners
Deliverable: Development of customized online and offline data products for partners



Figure 8. Meteorological monitoring at the FEMC forest canopy environmental monitoring tower



Figure 9. Measuring the diameter of trees on permanent forest health monitoring plots.

The Vermont Monitoring Cooperative was founded on the premise that a commitment to long-term environmental monitoring and research is essential to collecting baseline data needed to detect changes in conditions and trends and help identify new threats to our forested ecosystems. The Forest Ecosystem Monitoring Cooperative carries this commitment forward. Long-term environmental monitoring has been a hallmark of the VMC and FEMC for 27 years. VMC and FEMC have maintained a significant commitment to and history of continued support for monitoring and research projects over this duration.

These long-term data records have allowed our cooperators to detect changes in trends of bird, amphibian and reptile populations, identify changes in forest tree species distributions and growth rates and track changes in water chemistry of our lakes and streams. From these data, researchers were able to show that much of Vermont’s air pollution (sulfate, nitrate and mercury) was transported to the region on air masses originating in the mid-west and south, and these pollutants could even be traced back to specific sources at mid-western coal-fired electrical generating plants.

The lack of an LTER or major experimental forest in Vermont makes it imperative for these long-term records to continue, to match what is collected in other states in the region. The FEMC and its infrastructure are the logical choice to support and coordinate these important data collections in Vermont, as well as providing secure archiving and widespread distribution of the data.

Objective 3.1

Maintain long-term monitoring activities

ACTIVITY 3.1.1 **Continue to supply granting money for monitoring projects**
Deliverable: Consistent funding of long-term monitoring efforts in yearly FEMC budgets; Application for external funding from appropriate granting agencies

ACTIVITY 3.1.2 **Support and tracking of on-going monitoring and research projects**
Deliverable: Regular updates to key datasets in FEMC data archive

ACTIVITY 3.1.3 **Maintain integrity of long-term research sites**
Deliverables: Ongoing monitoring and permitting for use of intensive locations

ACTIVITY 3.1.4 **Document impact (outcomes) of FEMC related activities for funding justification**
Deliverable: Yearly summary of products and outcomes provided to the Cooperative through Annual Conference and reporting

Objective 3.2

Monitor and report on current environmental conditions and potential threats

ACTIVITY 3.2.1 **Summarize current conditions for key FEMC long-term datasets into yearly long-term monitoring updates**
Deliverable: FEMC long-term monitoring updates

ACTIVITY 3.2.2 **Provide online tools, dashboards and collections around key topics and locations**
Deliverable: Online tools for interpreting data and accessing information

CONNECTIONS TO PARTNERING ORGANIZATIONS

The Forest Ecosystem Monitoring Cooperative is designed to service the needs of a wide array of partners, and the table below summarizes how each activity meets the various goals and objectives of major partners and contributors to the FEMC. The partnering organization’s strategies, goals and activities are identified by numbers or letters, and are defined in Appendix D.

Goal 1. To contribute to the efficient COORDINATION of multidisciplinary environmental monitoring and research activities among existing efforts and institutions with common interests in the long-term understanding, management or protection of forested ecosystems			
Objective	Activity	Deliverable	Alignment with Partners⁵
1.1: Provide regular opportunities for networking across disciplines and organizations	1.1.1: Regularly convene environmental professionals at an annual meeting	Expanded FEMC annual conferences with a target of 200 attendees, 50 presenters and 3 structured networking sessions	VT FPR: 3.9, 3.12, 11.47, 11.54, 12.57, 15.74 ME DACF: 3.7, 3.9, 3.16, 4.1, 4.5, 4.8, 5.2, 6.3, 6.12, 6.13, 6.14 NH DNCR: I.A.1, I.A.6, I.A.9, I.C.6, II.B.2, III.B.3 MA DCR: -- NY DEC: 3.1, 7.3 NA: I, J VT DEC: 3, 6 VT FWD: 8 GMNF: 18, 19, 20

⁵ See Appendix D for the definitions of each partnering agency goal or objective.

Goals of the Forest Ecosystem Monitoring Cooperative

	<p>1.1.2: Provide FEMC database training workshops to expand the use and contribution of data</p>	<p>Mobile training workshops offered at least twice a year at partnering institutions</p>	<p>ME DACF: 6.3 MA DCR: 2.3 NH DNCR: I.A.6, I.A.9 NY DEC: -- VT FPR: 3.9, 3.12, 3.12, 15.72 NA: C, D, H, I, J VT DEC: 1, 3, 6 VT FWD: 1, 2, 5 GMNF: 5, 15, 18, 19</p>
	<p>1.1.3: Maintain multiple outlets for disseminating information to collaborators and stakeholders</p>	<p>Development, deployment and continued support of social media, listserv and ecoNEWS VT</p>	<p>ME DACF: 1.2, 1.12, 3.15, 3.16, 4.1, 4.2, 4.5, 5.2, 6.12, 6.13, 6.14 MA DCR: 1.3, 2.3 NH DNCR: I.A.1, I.A.6, I.A.8, I.A.9, I.C.3, I.C.6, II.B.2, III.B.3 NY DEC: 3.1, 3.2, 5.1, 8.1, 9.3 VT FPR: 3.9, 3.12, 3.12, 7.27, 9.42, 10.43, 10.44, 10.45, 11.47, 11.52, 11.54, 15.72, 15.74 NA: C, D, H, I VT DEC: 1, 3, 6 VT FWD: 1, 4, 5 GMNF: 18, 19</p>
	<p>1.1.4: Maintain a committee structure that enables networking and collaboration across organizations and disciplines</p>	<p>Functioning Committees directly involved in the project work and governance of the FEMC</p>	<p>ME DACF: 3.7, 3.9, 3.16, 4.1, 4.5, 4.8, 6.3, 6.12, 6.13, 6.14, 7.1, 7.2 MA DCR: 1.1, 1.2, 1.3 NH DNCR: I.A.1, I.A.9, I.C.6, II.A.2, II.B.2, II.C.4, III.B.2 NY DEC: 3.1, 3.2, 7.1, 7.3, 8.1, 9.3 VT FPR: 1.3, 2.7, 3.9, 3.12, 4.14, 5.20, 7.27, 7.28, 9.42, 11.47, 11.54, 12.55, 12.57, 15.72, 15.74, 15.77 NA: C, D, H, I, J VT DEC: 1, 3, 6 VT FWD: 1, 2, 5 GMNF: 5, 15, 18, 19</p>

Goals of the Vermont Monitoring Cooperative

1.2: Coordinate efforts around high priority issues to produce integrated products	1.2.1: Conduct mini-grant competitions to support high priority research, monitoring, integration and synthesis efforts* *Contingent on receiving additional funds	Development of a Request for Proposals, with selection guided by the FEMC Steering and State Partnership Committees	ME DACF: 1.2, 1.12, 3.7, 3.9, 4.2, 4.8, 5.4, 7.1 MA DCR: -- NH DNCR: II.C.4 NY DEC: 3.2 VT FPR: 3.9 NA: C, D, F, H, I, J VT DEC: 1, 3, 5, 6 VT FWD: 2, 5, GMNF: 9, 18, 19, 20
	1.2.2: Identify and engage partners for integrated analyses around high priority issues	Completion of state partnership sprint projects and regional work plan items; Development of funding proposals with partners	ME DACF: 1.2, 1.12, 3.15, 4.2, 5.4, 6.3, 6.12, 6.13, 6.14, 7.1, 7.2 MA DCR: 1.1, 1.2, 2.3, 3.1, 3.2, 3.3 NH DNCR: I.A.1, I.A.6, I.A.8, I.C.4, II.A.2, II.C.3, II.C.4, III.B.2 NY DEC: 3.2, 5.1, 7.1, 7.3, 9.3 VT FPR: 1.3, 2.7, 3.9, 3.10, 4.14, 9.42, 12.55, 12.57, 15.72, 15.77 NA: C, D, F, H, I, J VT DEC: 1, 3, 4, 6 VT FWD: 1, 2, 5, GMNF: 9, 18, 19
1.3 Provide a forum to inform future activities among partners	1.3.1: Convene collaborators to reevaluate the FEMC strategic plan, identify gaps, strengths and weaknesses in collective FEMC efforts on a regular basis	Yearly internal strategic plan review and action plan, summarized in yearly reports to Eastern Region State and Private Forestry; Preliminary Strategic Plan internal review in 2017; Reconvene the Strategic Planning Committee for renewal and update of the Strategic Plan in 2020	ME DACF: 6.12, 6.13, 6.14 MA DCR: -- NH DNCR: I.A.1 NY DEC: -- VT FPR: 3.9, 5.20 NA: C, D, F, H, I, J VT DEC: 1, 3, 6 VT FWD: 5, 7 GMNF: 18

Goals of the Forest Ecosystem Monitoring Cooperative

	1.3.2: Provide a forum for multidisciplinary groups to identify emerging needs and work on proposals for external funding.	Facilitated working groups at FEMC Annual Conferences	ME DACF: 3.7, 3.9, 4.8, 5.4, 6.3, 6.12, 6.13, 6.14, 7.1 MA DCR: 1.1, 1.2, 3.1, 3.2, 3.3 NH DNCR: I.A.1, I.C.3, I.C.4, II.A.2, II.C.3, II.C.4, III.B.2 NY DEC: 3.2, 7.1, 7.3, 8.1, 9.3 VT FPR: 1.3, 2.7, 3.9, 4.14, 12.55, 12.57, 15.77 NA: C, D, H, I, J VT DEC: 1, 3, 5, 6 VT FWD: 3, 4, 5, 8 GMNF: 18, 19
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Goal 2. To promote an improved understanding of trends and relationships in the physical, chemical and biological components of the forested ecosystems through DATA ANALYSIS AND SYNTHESIS

Objective	Activity	Deliverable	Alignment with Partners
2.1: Facilitate the development and distribution of FEMC data syntheses	2.1.1 Convene collaborators to participate in reporting and explaining long-term trends in environmental conditions	FEMC long-term monitoring updates; Vermont Forest Indicators Dashboard	ME DACF: 1.2, 1.12, 3.16, 4.1, 4.2, 4.5, 5.2, 6.12, 6.13, 6.14, 7.2 MA DCR: 1.1, 1.2, 3.1, 3.2, 3.3 NH DNCR: I.A.1, I.A.6, I.C.4, II.A.2, II.C.3, II.C.4, III.B.2 NY DEC: 3.2, 5.1, 7.1, 7.3, 9.3 VT FPR: 2.7, 3.9, 3.10, 3.11, 5.21, 7.27, 7.28, 9.38, 9.42, 11.47, 11.52, 11.54, 12.57, 15.72, 15.74, 15.77 NA: A, B, C, D, F, H, I, J VT DEC: 1, 3, 6 VT FWD: 1, 2, 5 GMNF: 18, 19

Goals of the Vermont Monitoring Cooperative

	2.1.2 Promote FEMC project reports and findings developed through state and regional work to other stakeholders in the region	Presentations at regional conferences/meetings on products developed by the FEMC	ME DACF: 1.2, 1.12, 3.15, 4.2, 5.2 MA DCR: 1.1, 1.2, 2.3, 3.1, 3.2, 3.3 NH DNCR: I.A.6, I.A.8, I.A.9, I.C.3, I.C.4, I.C.6, II.A.2, III.B.2, III.B.3 NY DEC: 3.1, 7.3, 8.1 VT FPR: 3.9, 3.10, 3.12, 7.27, 9.42, 11.47, 11.52, 11.54, 15.72, 15.72, 15.74 NA: I, J VT DEC: 3, 6 VT FWD: 1, 3, 5 GMNF: 1, 6, 9, 18, 10
2.2: Provide state-of-the-art tools for preserving, accessing and exploring data	2.2.1: Maintain and improve the FEMC archive as a regional resource for archiving environmental data	New users and datasets added to the archive; Additional functionality and features added to the archive.	ME DACF: 7.2 MA DCR: -- NH DNCR: I.A.6, I.C.6 NY DEC: 3.1, 7.1 VT FPR: 3.9, 3.10, 3.12, 5.21, 15.72 NA: B VT DEC: 1, 3 VT FWD: 1, 5 GMNF: 18, 19
	2.2.2: Promote affordable FEMC web, data and analytical services to partners	Development of customized online and offline data products for partners	ME DACF: -- MA DCR: -- NH DNCR: I.C.6 NY DEC: 3.1 VT FPR: 3.9, 3.12, 15.72 NA: B VT DEC: 1, 3 VT FWD: 1, 5 GMNF: 18, 19

Goal 3. To conduct LONG-TERM MONITORING in order to report on current forest ecosystem health and emerging threats

Objective	Activity	Deliverable	Alignment with Partners
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Goals of the Forest Ecosystem Monitoring Cooperative

3.1 Maintain long-term monitoring activities	3.1.1 Continue to supply granting money for monitoring projects	Consistent funding of long-term monitoring efforts in yearly FEMC budgets; Application for external funding from appropriate granting agencies	ME DACF: 5.4, 7.1, 7.2 MA DCR: 1.2, 3.1, 3.2, 3.3 NH DNCR: I.A.3, II.A.2 NY DEC: -- VT FPR: 2.5, 3.9, 3.10, 3.11, 5.20, 5.21, 7.27, 7.28, 9.38 NA: A, C, D, F, H, J VT DEC: 1, 3, 6 VT FWD: 1, 2, 5, GMNF: 5, 15, 18, 19
	3.1.2 Support and tracking of on-going monitoring and research projects	Regular updates to key datasets in FEMC data archive	ME DACF: 7.2 MA DCR: -- NH DNCR: III.B.3 NY DEC: 3.2, 5.1 VT FPR: 2.5, 3.9, 3.10, 3.11, 5.20, 5.21, 7.27, 7.28, 9.38 NA: A, B, C, D, G, H, I, J VT DEC: 1, 3, 6 VT FWD: 1, 2, 5 GMNF: 18, 19
	3.1.3 Maintain integrity of long-term research sites	Ongoing monitoring and permitting for use of intensive locations	ME DACF: 7.1 MA DCR: -- NH DNCR: -- NY DEC: -- VT FPR: 3.9, 3.10, 3.11, 5.20, 5.21, 7.27, 7.28, 9.38, 3.9 NA: B, C, D, F, G, I VT DEC: 1, 3, 6 VT FWD: 1, 2, 5 GMNF: 5, 15, 18, 19
	3.1.4 Document impact (outcomes) of FEMC related activities for funding justification	Yearly summary of products and outcomes provided to the Cooperative through Annual Conference and reporting	ME DACF: -- MA DCR: -- NH DNCR: -- NY DEC: -- VT FPR: 3.9 NA: A, B, C, D, F, H, I VT DEC: 1, 3, 6 VT FWD: 1, 2, 5, GMNF: 5, 9, 15, 18, 19

Goals of the Vermont Monitoring Cooperative

3.2 Monitor and report on current environmental conditions and potential threats	3.2.1 Summarize current conditions for key FEMC long-term datasets into yearly long-term monitoring updates	FEMC long-term monitoring updates	ME DACF: 1.2, 1.12, 3.15, 3.16, 4.1, 4.2, 4.5, 7.2 MA DCR: 1.1, 1.2, 3.1, 3.2, 3.3 NH DNCR: I.A.3, I.A.8, I.C.3, I.C.4, II.A.2, II.B.2, II.C.3, III.B.2 NY DEC: 3.2, 5.1, 7.1, 7.3 VT FPR: 2.5, 2.7, 3.9, 3.10, 3.11, 5.21, 7.27, 9.42, 10.43, 10.44, 10.45, 11.47, 11.52, 11.54, 12.57, 15.72, 15.77 NA: A, B, C, D, F, H, I VT DEC: 1, 3, 6 VT FWD: 1, 2, 5, GMNF: 5, 9, 15, 18, 19
	3.2.2: Provide online tools, dashboards and collections around key topics and locations	Online tools for interpreting data and accessing information	ME DACF: 1.2, 1.12, 3.16, 4.1, 4.2, 4.5, 5.2, 6.3 MA DCR: 1.1, 1.2, 2.3, 3.1, 3.2, 3.3 NH DNCR: I.A.3, I.A.6, I.A.8, I.A.9, I.C.3, I.C.4, I.C.6, II.A.2, II.B.2, II.C.3, III.B.2, III.B.3 NY DEC: 3.1, 5.1, 7.1, 7.3, 8.1, 9.3 VT FPR: 2.5, 3.9, 3.10, 3.12, 3.12, 9.42, 10.43, 10.44, 10.45, 11.47, 11.52, 11.54, 15.72 NA: B, C, D, F, I VT DEC: 1, 3, 4, 6 VT FWD: 1, 3, 5, 8 GMNF: 18, 19



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PHOTO CREDITS

Title Page

Cover photo. Hemlock cones. Photo available at https://www.flickr.com/photos/fauxto_dkp/3246038060 and reproduced under CC BY-ND 2.0 license.

An Introduction to the Vermont Monitoring Cooperative Section

Cover photo. Eastern hemlock (*Tsuga canadensis*) branch. Photo available at <https://www.flickr.com/photos/dendroica/8396096003/> and reproduced under CC BY 2.0 license.

Figure 2. FEMC Soil Climate Analysis Network site at Lye Brook Wilderness Area in Manchester, VT. VMC archive.

Figure 2. FEMC forest canopy tower at the Proctor Maple Research Center in Underhill, VT. VMC archive.

Overview of the Strategic Planning Process Section

Section cover photo. Spring Peeper (*Pseudacris crucifer*) male perched on hemlock branch. Photo by Dave Huth, available online at <https://www.flickr.com/photos/davemedia/14007130769/in/set-72157594516044649> and reproduced under CC BY-NC 2.0 license

Revised Vermont Monitoring Cooperative Mission Section

Section cover photo. An Aerochem wet/dry precipitation sampler (foreground), instrument shelter with atmospheric mercury sampling equipment on the roof and meteorological tower at the VMC Air Quality site in Underhill, VT. Photo by Jim Duncan.

Goals of the Vermont Monitoring Cooperative Section

Section cover photo. Permanent plot marker for the VMC 200-year soil monitoring study located at Mt. Mansfield and the Lye Brook Wilderness Area. VMC archive.

Figure 5. Photo by Jim Duncan, VMC archive.

Figure 5. Photo by Jim Duncan, VMC archive.

Figure 7. VMC data are available for reference, reuse or incorporation into new research and monitoring activities. Photo by Sebastian Sikora, available online at <https://www.flickr.com/photos/hello-sebastian/8207477274> and reproduced under CC BY 2.0 license.

Figure 6. Working with partners, key data are archived beyond the life of individual projects. Photo by UConn Libraries MAGIC, available online at <https://www.flickr.com/photos/uconnlibrariesmagic/4749175829/> and reproduced under CC BY NC 2.0 license.

Figure 8. Meteorological monitoring at the FEMC forest canopy environmental monitoring tower VMC archive.

Figure 9. Measuring the diameter of trees on permanent forest health monitoring plots. VMC archive.

Citations and Credits Section

Section cover photo. US Geological stream gage station at Gwynns Falls, Glyndon, Maryland. Available online at <http://md.water.usgs.gov/BES/01589180/>.

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Appendix A: Details of the Strategic Planning Process

NOTE: This text remains unchanged from the original VMC Strategic Plan, and serves to document the original process used.

Over the past decade the VMC has undertaken several visioning and review activities. In 2001 the VMC Operations Guide was updated by VMC staff with input from the Steering and Advisory Committees. This document clearly summarized the VMC mission and goals and outlined critical VMC activities and services¹⁴. The following year, 2002, an external review team with members from the Missouri Department of Conservation, US Geological Survey and US Forest Service convened to review the VMC program and activities¹⁵. This was followed in 2004 by an internal review of VMC staff positions and duties, and overall VMC activities. In March 2014, the VMC Steering Committee decided to initiate a strategic planning initiative to revisit the VMC mission statement, examine how it is aligned with the missions and goals of our partners and identify a set of priority activities for VMC focus moving forward.

Informed by these previous activities, as well as the strategic planning undertaken by each of the primary partnering organizations that comprise the VMC collaborative, we outlined an iterative evaluation of the VMC mission, objectives and activities in 2014 to sharpen our focus, strengthen relationships across organizations, and ensure continued relevance and impact of the collaborative. This planning process allowed for full input from the Advisory Committee, refinement by the Strategic Planning Committee and then feedback from the larger group of VMC collaborators.

APRIL 18, 2014 ADVISORY COMMITTEE MEETING

The VMC Advisory Committee reviewed and edited a list of SWOTs (strengths, weaknesses, opportunities, threats) generated by the VMC staff. Among VMC's **strengths** the committee listed its continuous, long-term data records and data archive, co-location of cross-cutting research/monitoring projects, the new website and data portal, cross-cutting Annual Meeting format, VMC's dedicated network of cooperators and philosophy of collaboration,

¹⁴ Available online at http://www.uvm.edu/vmc/documents/2001_VMCOperationsGuide.pdf.

¹⁵ Available online at http://www.uvm.edu/vmc/documents/2002_VMCReviewFinalReport.pdf.

multidisciplinary perspective, and education and outreach. For the full list of SWOTs see (Appendix B).

Also at the meeting, committee members reviewed the current VMC mission statement which reads: “Its mission is to serve Vermont through improved understanding of long-term trends, annual conditions and interdisciplinary relationships of the physical, chemical and biological components of forested ecosystems in Vermont. The VMC facilitates the collection of environmental data, and provides to Vermonters and others the information needed to understand, protect and manage forested ecosystems within a changing global environment.”

The following goals were identified by the Advisory Committee as being crucial to VMC’s future mission:

Goal 1: Monitoring and Analyzing conditions and trends (DOING)

To promote an improved understanding of the conditions, trends and relationship in the physical, chemical and biological components of the forested ecosystems in Vermont.

Goal 2: Efficient Coordination (COORDINATING)

To promote the efficient coordination of multidisciplinary environmental monitoring and research activities among Federal, State and Private Sector Agencies and Institutions with common interests in the long-term understanding, management or protection of forested systems.

Goal 3: Outreach (USING)

Disseminate information to inform natural resource professionals, resource managers, policy makers, and the public about important environmental issues. This should include documenting and describing impacts of VMC monitoring and research done by our cooperators.

Goal 4: Planning.... looking forward

Keep an eye on the horizon to identify the next threat or threats to Vermont’s forested ecosystems and develop plans to collect data needed to fill knowledge gaps and make scientifically sound policy and management decisions to mitigate detrimental consequences. This includes periodic review and update to the Strategic Plan to keep VMC nimble and able to respond to relevant Vermont and regional environmental issues.

JUNE 5, 2014 VMC STRATEGIC PLANNING COMMITTEE RETREAT

In June, a specially-formed Strategic Planning Committee comprised of cooperators and leaders from state and federal partnering organizations considered the VMC mission and goals put forth by the Advisory Committee as a part of a larger strategic planning effort.

This group defined a set of high-level objectives and related activities that they felt VMC should pursue over the next ten years in order to meet the larger mission and goals.

The proposed VMC mission statement from Strategic Planning Retreat appears on pages 12 of the Strategic Plan. The full list of priorities and activities to achieve those priorities developed at the Strategic Planning Retreat appears on page 6 of Appendix A.

JULY 2014 ELECTRONIC SURVEY:

To solicit feedback on these draft objectives and related activities, a quantitative survey was designed to better understand where VMC collaborators feel efforts should focus. Such feedback is particularly crucial to ensure that the VMC continues to provide valuable services to the environmental community, filling current gaps in our collective efforts and minimizing overlap with activities that may be more efficiently completed by others. In a time when budgets are stretched thinner, yet the need for monitoring, research and coordination around environment grows, this information will allow the VMC to focus its efforts for maximum impact.

Specific questions were targeted to:

- Prioritize stated objectives
- Rank specific activities where VMC should focus efforts
- Prioritize a set of high level objectives and activities to help refine VMC goals
- Identify collaborator needs - Solicit other objectives and activities to achieve those objectives

Overall, this survey provided a unique opportunity to evaluate how collaborators would like to see VMC finances and efforts directed. The results indicate that the continuation of long-term monitoring activities, analysis and reporting of the resulting information and facilitation of networking among collaborators are priorities. However, it is important to consider that the results of this effort allocation activity represent an idealized world, where activities that may be of highest priority are represented by relatively low “effort” cost compared to the true costs of successfully accomplishing them. For example, while maintaining funding for long-term monitoring was the highest valued activity, with the largest effort point allocation (14% of total available), in reality maintaining ongoing monitoring of forest health, wildlife populations, air and water quality currently require over 50% of the VMC budget and staff time. Adding on costs associated with data management, web functionality and access consumes an additional 25% of the current VMC budget and staff time. So while these results are useful to prioritize activities, the full

list that can successfully be accomplished may differ from the idealized list presented here. While this may pose a challenge during yearly VMC budget discussions, this information should prove useful to direct resources for the greatest benefit or identify other activities to cut if necessary in the future.

VMC Strategic Planning Survey Summary

This group defined a set of objectives and related activities that the VMC should pursue over the next ten years in order to meet the larger mission and goals. To solicit feedback on these draft objectives and related activities a quantitative survey was designed to better understand where VMC collaborators feel efforts should focus. Such feedback is particularly crucial to ensure that the VMC continues to provide valuable services to the environmental community, filling current gaps in our collective efforts and minimizing overlap with activities that may be more efficiently completed by others. In a time when budgets are stretched thinner, yet the need for coordination around environmental monitoring and research grows, this information will allow the VMC to focus its efforts for maximum impact.

Survey Structure and Response

In August of 2014, VMC collaborators, steering and advisory committee members were asked to complete an online survey to evaluate and rank the suite of objectives and activities outlined in the VMC draft strategic plan.

While the overarching goals were set by the strategic planning committee, respondents were asked to prioritize each of the individual objectives included under each goal based on a 1 (lowest) to 5 (highest) scale.

Goal 1 - To promote the efficient coordination of multidisciplinary environmental monitoring and research activities among Federal, State and Private Sector Agencies and Institutions with common interests in the long-term understanding, management or protection of forested systems						
Objective 1 - Provide regular opportunities for networking across disciplines and organizations						
Priority	<input type="radio"/> 1 (low)	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5 (high)	<input checked="" type="radio"/> No response
Objective 2 - Coordinate efforts around high priority issues to produce integrated products						
Priority	<input type="radio"/> 1 (low)	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5 (high)	<input checked="" type="radio"/> No response
Objective 3 - Provide a forum to inform future activities among partners						
Priority	<input type="radio"/> 1 (low)	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5 (high)	<input checked="" type="radio"/> No response

Similarly, potential activities to accomplish each goal were ranked, but with respondents asked to assume a limited amount of financial resources available to conduct their selected activities.

From a pool of 100 total “points” respondents were able to allocate points as they deemed appropriate, with the ability to more heavily weight activities they felt were more important, or equally weight a larger number of activities. The concept follows both financial and effort allocation, such that assigning 10 effort points would correspond with approximately 10% of the available VMC budget and staff effort.

You have 100 points to "spend" on the set of activities you think are most important. You can give all your points to one thing, or spread them out, use them all or leave some unspent

Points remaining: 70 out of 100

Proposed activity	Points
Host annual meetings to convene a wide audience of environmental professionals	0
Provide VMC database training workshops to expand data integration	10
Inform collaborators of upcoming meetings, trainings and workshops	20
Expand the VMC collaborative base through outreach and presentations	0
Disseminate regular newsletters with the latest environmental findings	0

There were also opportunities to provide feedback, additional ideas and information. This information is summarized below, and reflected in this final strategic plan to ensure that the VMC is able to best meet the needs of researchers, ecosystem professionals and policy makers across the region.

The full proposed list of objectives and associated activities available for consideration is summarized here with activities bulleted under each related objective and goal. Because this feedback from the ranking and prioritization of this full list was used to subset and finalize the final set of guiding objectives and activities included in this final strategic plan, you may note that there are activities listed here that are not included in the final strategic plan. Narrowing down activities allows the VMC to focus its efforts where they are needed, while allowing other, lower impact activities to be removed from our responsibilities. In the next several pages we summarize the results of this ranking process, and how decisions were made to retain, remove or add activities in response to this survey.

Original Full List of VMC Objectives and Associated Activities Included in the Survey

Goal 1: coordination

To promote the efficient coordination of multidisciplinary environmental monitoring and research activities among Federal, State and Private Sector Agencies and Institutions with common interests in the long-term understanding,

management or protection of forested systems.

Objective 1: Provide regular opportunities for networking

- Host annual meetings
- Provide database training workshops
- Provide event information
- Develop an outreach plan
- Expand circulation of newsletters
- Coordinate volunteer and student interns
- Enhance web access and functionality

Objective 2: Coordinate efforts around high priority issues to produce integrated products.

- Mini-grant competitions
- Coordinate grant writing for external funding

Objective 3: Provide a forum to inform future activities among partners.

- Reevaluate the VMC strategic plan
- Identify emerging needs

Goal 2: data analysis and synthesis

To promote an improved understanding of trends and relationship in the physical, chemical and biological components of the forested ecosystems through data analysis and synthesis

Objective 1: Facilitate the development and distribution of VMC data syntheses.

- Data syntheses and trends

- Novel integrated analyses
- Comparison to other long-term research sites
- Identify new data users

Objective 2: Initiate analyses of and integration across new datasets.

Goal 3: long-term monitoring

To conduct long-term monitoring in order to report on current forest ecosystem health and emerging threats.

Objective 1: Maintain long-term monitoring activities.

- Maintain funding for monitoring
- Data management and archive
- Maintain intensive sites
- Document impact

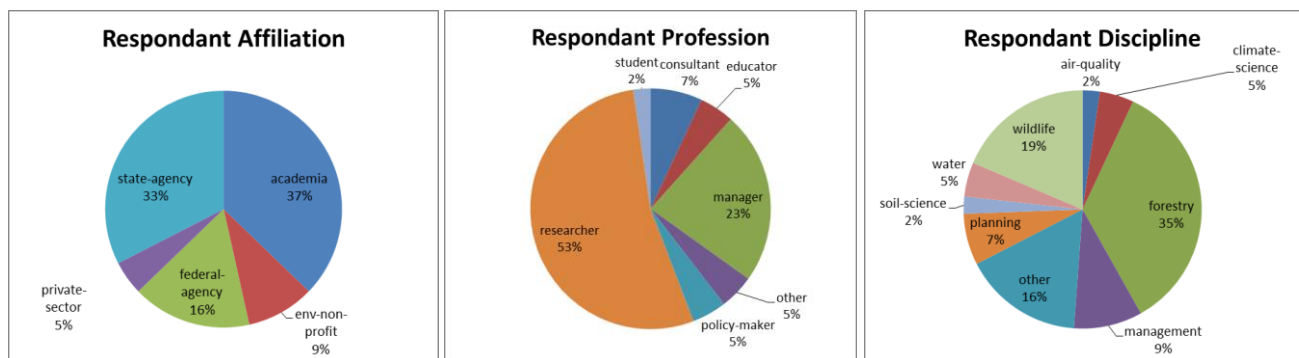
Objective 2: Monitor and report on current environmental conditions and potential threats.

- Annual report of current conditions and threats
- Public relations support
- Online indicators dashboard

Survey Results

Survey Demographics

Of the 45 participants, response was highest from academic institutions and the Vermont Agency of Natural Resources, but also included responses from Federal Agencies such as the US Forest Service and US Geological Survey, non-profit organizations and the private sector. The majority of respondents were researchers and land managers. Responses from those involved in policy, education and consulting were lower, indicating that a secondary effort to elicit their opinions may be warranted to ensure the VMC captures the diversity of perspectives expected in our regional natural resource community. By discipline, most respondents worked in forestry and wildlife. Because ongoing VMC efforts also include monitoring of water, soil and air resources, it may be warranted to increase representation from collaborators working on water, soil and climate/air quality issues.



Objectives

The mean ranking of all seven proposed objectives was over 4, indicating that most respondents consider each of these to be important objectives for VMC to pursue. However, there was a distinction among the objectives, with **Objective 3.1** (Maintain long-term monitoring activities, mean rank = 4.76, median rank = 5) significantly higher than most almost all other objectives. Other high ranking objectives included **Objective 3.2** (Monitor and report on current environmental conditions and potential threats, mean rank = 4.53, median rank = 5), **Objective 2.1** (Facilitate the development and distribution of VMC data syntheses, mean rank = 4.46, median rank = 5) and **Objective 1.1** (Provide regular opportunities for networking, mean rank = 4.37, median rank = 5). While still considered relatively high priority on the 1-5 scale, objectives pertaining to expanded data syntheses (new analyses around high priority issues, (**Objective 1.2**, mean rank = 4.04, median rank = 4) or data integration and analysis efforts (**Objective 2.2**, mean rank = 4.06, median rank = 4)) were significantly lower than those associated with monitoring, reporting and networking efforts. The lowest ranked objective involved providing a forum to inform future activities among partners (**Objective 1.3**, mean rank = 4.02, median rank = 4).

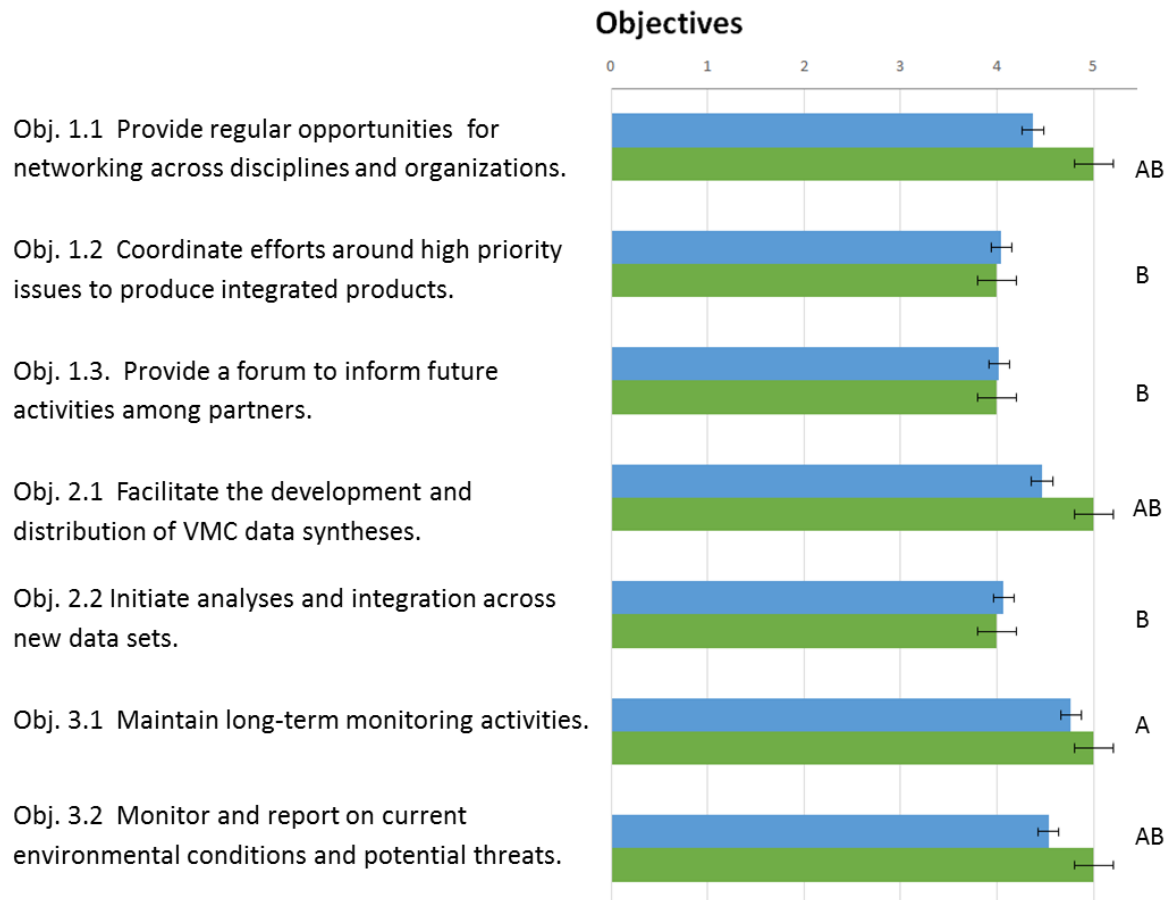


Figure 10. Mean (blue) and median (green) ranks of the seven proposed objectives with standard error. Objectives that share a letter designation are not significantly different.

Activities

Although the potential activities were ranked independently of the objectives, survey results followed a similar pattern, with the highest prioritization going to activities under Objective 3.1 (Maintain long-term monitoring activities) and Objective 1.1 (Provide regular opportunities for networking). However, within objectives, certain activities were allocated significantly more resources than others, providing an opportunity to target a smaller subset of activities to accomplish each objective. To summarize this, each of the activities evaluated in the survey are presented here within their associated objectives. Statistical analyses of points allocated were then used to identify if more effort targeted on a subset of activities should be the focus of VMC efforts moving forward. To reiterate the value ranking of objectives discussed above, objectives are presented in order, from highest to lowest rank.

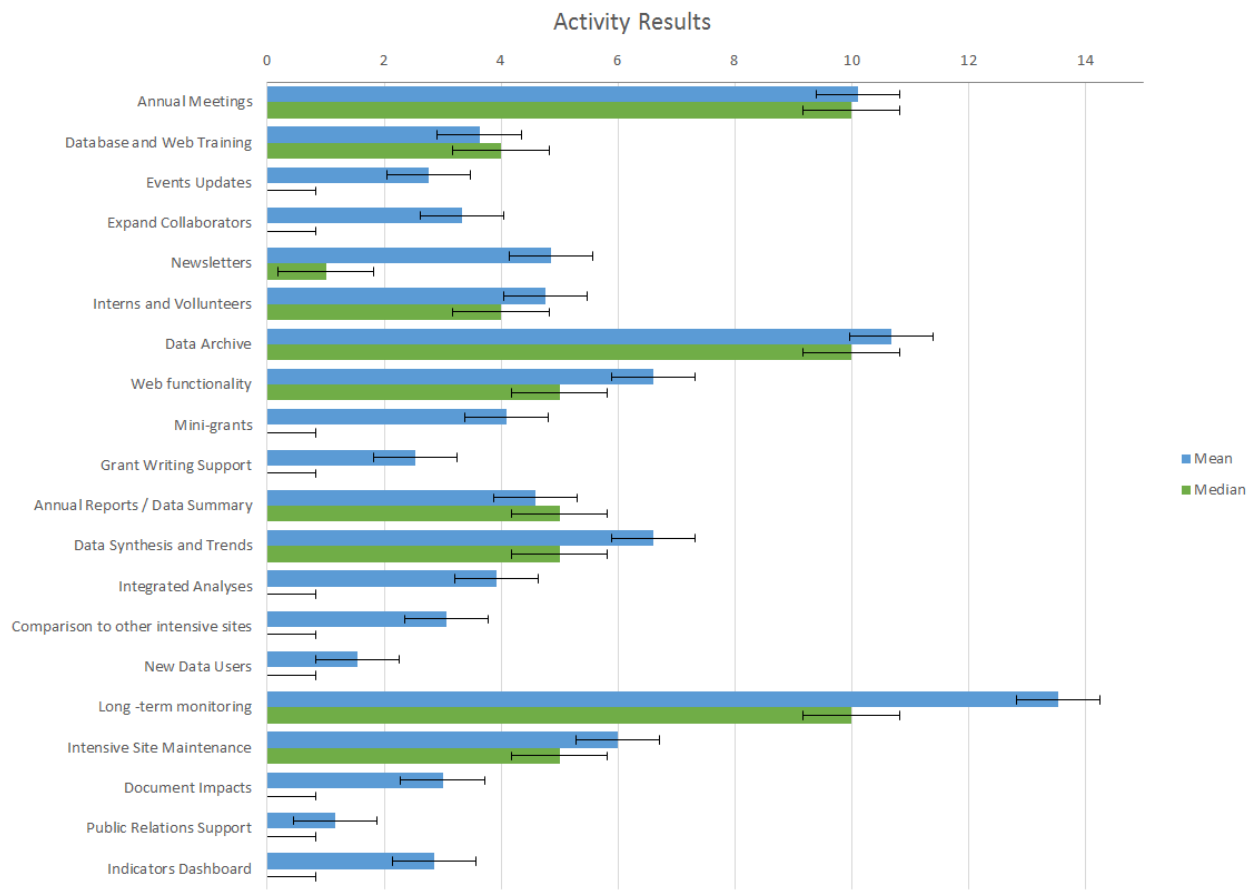


Figure 11. Mean (blue) and median (green) ranks of the twenty proposed activities with standard error.

Objective 3.1 Maintain long-term monitoring activities.

Following Objective 3.1's top ranking among objectives, two associated monitoring activities were also allocated the greatest number of effort points. These activities involved maintaining funding for long-term monitoring (mean = 13.5, median = 10) and data management and maintenance of the VMC database archive (mean = 10.7, median = 10). These were assigned significantly higher points than the other long-term monitoring related activities (Intensive site maintenance mean = 6.0, median = 5) and documenting impacts of monitoring activities (mean = 3.0, median = 0). While this might justify dropping infrastructure maintenance and documentation of how data is utilized from VMC's priority list, it is clear that without these activities, the others would not be possible. Without maintaining infrastructure, air quality, water quality and climate data would be jeopardized. Similarly, without directing efforts to documenting impacts, justification of VMC funding and collaborator participation is at risk. The strategic planning committee therefore determined that all four activities under objective 3.1 should be retained.

Final Objective 3.1 activities to maintain long-term monitoring activities.

- Maintain funding for long-term monitoring (rounded mean 14, *actual requirement 51)
- Data storage, access and archive support (rounded mean 11)
- Maintain intensive site infrastructure and permitting (rounded mean 6)
- Document impact of VMC related activities (rounded mean 3)

Final Objective 3.1 Effort: 71 effort units

**Note that the mean survey allocation to maintain funding for long-term monitoring does not reflect the actual costs required to do so (currently 51% of the VMC budget). Therefore, effort allocation has been adjusted to reflect what is required to accomplish this (the highest ranked) activity.*

Objective 3.2 Monitor and report on current environmental conditions and potential threats

While monitoring and reporting on environmental conditions was the second highest ranked objective, when faced with assigning a limited number of points to specific activities, reporting-related activities were not ranked as high as collaboration and networking activities. Among reporting activities, the publication of an annual report to summarize current conditions of long-term VMC monitoring datasets (mean = 4.6, median = 5) received almost double the points allocated to the creation of an indicators dashboard to summarize current conditions relative to historical baselines (mean = 2.9, median = 0). Also included in this objective, activities designed to disseminate these findings to the public and facilitate public relations was the lowest ranked of all activities (mean = 1.2, median = 0). This indicates that collaborators recognize the importance of analyzing and reporting VMC collected data on a regular basis, rather than focusing efforts only on the data collection and storage itself. These results further suggest that the publication of a high quality annual report should be sufficient to meet this objective. Therefore, we chose to allocate the sum of effort units for this objective to the production of formal VMC annual reports.

Final Objective 3.2: Monitor and report on current environmental conditions and potential threats

- Annual report of current conditions and threats (objective sum 9)
- ~~Public Relations support~~
- ~~Online indicators dashboard~~

Final Objective 3.1 Effort: 9 effort units

Total Cumulative Effort by Ranked Objective Order: 80 out of 100 available effort units

Objective 2.1 Facilitate the development and distribution of VMC data syntheses

VMC data analysis and synthesis activities were highly ranked among both the objectives and activities. Respondents prioritized coordinating syntheses of VMC for examination of long-term trends (mean = 6.6, median = 5) and threat identification as high as data management activities. This indicates that while the collection and safe storage of data is important, respondents recognize that allocating the time and expertise to interpreting this information is essential. While syntheses have been conducted sporadically in the past,

planning for regular coordination of cooperators to both summarize and synthesize long-term data sets will be given a higher priority for VMC efforts over the coming years.

Final Objective 2.1: Facilitate the development and distribution of VMC data syntheses.

- Data syntheses and long-term trends (rounded mean 7)

Objective 2.1 Effort: 7 effort units

Total Cumulative Effort by Rank Order: 87 out of 100 available effort units

Objective 1.1 Provide regular opportunities for networking

The next two highest ranking activities also reflect the high ranking of Objective 1.1. Specifically, respondents prioritized hosting annual meetings (mean = 10.2, median = 10) and expanding the VMC website for enhanced data search, download, visualization and analysis across datasets (mean = 6.6, median = 5). This was significantly higher than providing regular newsletters (mean = 4.9, median = 1), coordinating interns and volunteers (mean = 4.8, median = 4), providing data management training (mean = 3.6, median = 4), expanding the collaborative base (mean = 3.3, median = 0) or maintaining a calendar with updated event information across organizations (mean = 2.8, median = 0). Similar to some activities required for long-term monitoring, some of the lower-ranked activities here are necessary to ensure the success of the higher-ranked activities. For example, data management and web training is necessary to ensure that collaborators are able to fully utilize the structures that result from the (highly ranked) web and database enhancement. Other lower-rated activities can be considered “low cost” in that much of the work or organization required to complete them is already completed. For example, a recent collaboration with organization comprising the ecoNEWS effort has ensured that regular newsletters with the most recent environmental findings and information can continue with minimal VMC resources moving forward. Considering this, the final list of recommended high priority activities to accomplish Objective 1.1 in the strategic plan include the following:

Final Objective 1.1 activities to provide regular opportunities for networking

- Host Annual meetings (rounded mean 11)
- Provide database training workshops (rounded mean 4)
- ~~○ Provide Event Information~~
- ~~○ Develop an Outreach Plan~~
- Expand circulation of newsletters (rounded mean 5)
- ~~○ Coordinate volunteer and student interns~~
- Enhance web access and functionality (rounded mean 7)

Cumulative Objective 1.1 Effort: 27 effort units

Total Cumulative Effort by Rank Order: 114 out of 100 available effort units

Objective 1.2 Coordinate efforts around high priority issues to produce integrated products

While overall this objective receives a mean rank of 4.04 on the 1-5 scale, most respondents ranked both associated activities (providing mini-grants to support directed

work (mean = 4.1, median = 0) and facilitating external grant writing (mean = 2.5, median = 0) as non-priorities (median of 0). This suggests that while the overall goal of coordinating efforts around high priority issues is worthwhile, when resources are limited other activities are favored. Therefore, this strategic plan maintains support for mini-grants, but other new initiatives such as grant writing support will remain limited in scope.

Final Objective 1.2: Coordinate efforts around high priority issues to produce integrated products.

- Mini-grant competition (rounded mean 4)
- *Focus on novel integrated analyses (lumped from objective 2.2 below)*
- ~~Coordinate grant writing for external funding~~

Cumulative Objective 1.2 Effort: 4 effort units

Total Cumulative Effort by Rank Order: 118 out of 100 available effort units

Objective 2.2 Initiate analyses of and integration across new datasets

Similar to the results for coordinating efforts around high priority issues, the objective of initiating integrated analyses across new datasets received relatively low rankings for all proposed activities, with the majority of respondents listing them as non-priorities for VMC. Of the integrated analysis activities, the initiation of novel integrated analyses was the highest ranked activity (mean = 3.9, median = 0). If in the future the VMC advisory and steering committees wish to initiate such activities, it would be possible to design a mini-grant to support such an activity. The strategic plan has therefore been modified to include the initiation of integrated analyses across datasets into Objective 1.2 for more streamlined efforts moving forward. While the comparison of VMC data to other long-term intensive sites is a valuable opportunity to provide regional context to VMC efforts, the realities of budget, staff and time constraints indicates that such activities may not be possible at this point.

~~Objective 2: Initiate analyses of and integration across new datasets.~~

- *Novel integrated analyses (moved to objective 1.2 above)*
- ~~Comparison to other long-term research sites~~
- ~~Identify new data users~~

Cumulative Objective 2.2 Effort: 0 effort units

Total Cumulative Effort by Rank Order: 118 out of 100 available effort units

Objective 1.3 Provide a forum to inform future activities among partners.

Specific activities related to Objective 1.3 were not included in the prioritization exercise in this survey. These activities were considered necessary to the relevance and function of the organization as a whole, and thus not up for debate. Without regular discussions of the current state and future direction of the organization, the VMC would fail to meet its charge. The forested landscape is constantly changing and responding to changing environmental conditions. The ability to redirect energy and resources is key to staying on top of a complex reality. Therefore, this strategic plan includes by default a charge to regularly discuss and revise the goals, objectives and activities of the group. These

activities will naturally manifest in other activities described here (e.g. the focus of mini-grant competitions, synthesis reports or annual meeting themes). But in addition, the charge is to revisit this strategic plan every 5 years. As such, this objective should occupy a small (and highly variable depending on the 5-year strategic planning cycle) effort. For accounting purposes here, 2 effort points should be reserved in each year to represent these discussions.

Objective 1.3 Provide a forum to inform future activities among partners.

- Reevaluate the VMC strategic plan
- Identify emerging needs

Cumulative Objective 1.3 Effort: 2 effort units

Total Cumulative Effort by Rank Order: 120 out of 100 available effort units

Survey Summary

Overall, this survey provides a unique opportunity to evaluate how collaborators would like to see VMC finances and efforts directed. The results indicate that the continuation of long-term monitoring activities, analysis and reporting of the resulting information and facilitation of networking among collaborators are priorities. However, it is important to consider that the results of this effort allocation activity represent an idealized world, where activities that may be of highest priority are represented by relatively low “effort” cost compared to the true costs of successfully accomplishing them. For example, while maintaining funding for long-term monitoring was the highest valued activity, with the largest effort point allocation (14% of total available), in reality maintaining ongoing monitoring of forest health, wildlife populations, air and water quality currently require over 50% of the VMC budget and staff time. Adding on costs associated with data management, web functionality and access consumes an additional 25% of the current VMC budget and staff time. So while these results are useful to prioritize activities, the full list that can successfully be accomplished may differ from the idealized list presented here. While this may pose a challenge during yearly VMC budget discussions, this information should prove useful to direct resources for the greatest benefit or identify other activities to cut if necessary in the future.

Revised List of VMC Objectives and Associated Activities Based on Survey Feedback

Goal 1: coordination

To promote the efficient coordination of multidisciplinary environmental monitoring and research activities among Federal, State and Private Sector Agencies and Institutions with common interests in the long-term understanding, management or protection of forested systems.

Objective 1.1: Provide regular opportunities for networking

- Host annual meetings
- Provide database training workshops
- Expand circulation of newsletters
- Enhance web access and functionality

Objective 1.2: Coordinate efforts around high priority issues to produce integrated products.

- Mini-grant competition
- Focus on novel integrated analyses

Objective 1.3: Provide a forum to inform future activities among partners.

- Reevaluate the VMC strategic plan
- Identify emerging needs

Goal 2: data analysis and synthesis

To promote an improved understanding of trends and relationship in the physical, chemical and biological components of the forested ecosystems through data analysis and synthesis

Objective 2.1: Facilitate the development and distribution of VMC data syntheses.

- Data syntheses and trends

Goal 3: long-term monitoring

To conduct long-term monitoring in order to report on current forest ecosystem health and emerging threats.

Objective 3.1: Maintain long-term monitoring activities.

- Maintain funding for monitoring
- Data management and archive
- Maintain intensive sites
- Document impact

- Annual report of current conditions and threats

Objective 3.2: Monitor and report on current environmental conditions and potential threats.

OCTOBER 14, 2014 STEERING COMMITTEE MEETING:

The Strategic Planning document, having been informed and revised with results from the Electronic Survey, will be presented to the VMC Steering Committee for discussion, and approval. This will include a newly-worded mission statement and VMC priorities for the next 5 years. Input and discussion from this meeting will be incorporated into a final draft of the Strategic Planning document to be publically unveiled at the 2014 VMC Annual Conference.

DECEMBER 11, 2014 VMC ANNUAL CONFERENCE:

The newly-adopted VMC Strategic Plan will be made public.

The strategic plan is intended to not only guide our activities going forward, but also to serve as an action plan. In developing these objectives and specific activities, we have provided specific milestones and timelines to demonstrate our commitment to achieving these goals.

2018 TO 2019, REVISION OF STRATEGIC PLAN AFTER TRANSITION TO FEMC

In May, 2017, the VMC changed its name to FEMC. In June, 2018, FEMC staff undertook an update to the strategic plan to align it with the new, expanded mission of the FEMC, defining new objectives and activities for approval by the Steering Committee. Following this adoption, FEMC staff assessed alignment with additional state forest action plans. A full strategic planning process will be implemented by 2020 to update all goals.

Appendix B: Vermont Monitoring Cooperative Strengths, Weaknesses, Threats and Opportunities

(Summarized from the April, 2014 VMC Advisory Committee Meeting)

STRENGTHS (What does VMC do well?)

Facilitating collaborations

- Dedicated collaborators
- Long history of collaborations across organizations and disciplines
- Cross cutting Annual Meeting
- Opportunities for regular connections among collaborators
- Funding for small scale / pilot projects

Monitoring

- Cross ecosystem monitoring.....trees, air, water, soils, wildlife
- LONG TERM – historical archive
- Continuity of a large number of environmental datasets
- Co-location of research projects (intensive research sites for data integration)
- Synthesis of disparate datasets (e.g. 2009 Synthesis Report)

Data Management

- Safe and accessible data archiving
- New database structure for improved search capabilities and links to other databases
- New web portal for easier data discovery, visualization, access and download
- Providing access to spatial datasets relevant to forest health beyond what is available at state level geospatial clearinghouses

Outreach and Impact

- Communicating scientific findings via regular newsletters
- Informing land management decisions
- Education –outreach to the community of environmental professionals
- Stimulating new research ideas among collaborators

WEAKNESSES (What VMC should be doing, doing better, specific gaps in our activities or misplaced resources?)

- Lack of national visibility and relevance
- Poorly articulated connection to national forest health program
- Lack of diversification of funding structure
- Structure and leadership.... lack of stability in administration, successional plans, clarity in how roles are assigned.
- Focus on Lye Brook and Mt. Mansfield intensive may not represent other biophysical regions.
- Perception of interest only in intensive sites limits inclusion of datasets from other locations.
- Plethora of data not included (or linked) to the database for integration / synthesis.

In addition, VMC could be:

- Linking collaborators to work on competitive proposals
- Documenting the importance of our forested ecosystem / ecosystem services provided
- Compiling more regular synthesis reports
- Publishing yearly updates and trends in environmental datasets
- Documenting how funds are leveraged
- Documenting outcomes
- Offering opportunities for new blood / energy in collaborative network and governance structure

OPPORTUNITIES (What could strengthen VMC's impact?)

- New strategic plan to more directly align VMC with partner priorities and identify focus of ongoing activities
- Opportunity now to expand beyond collecting data to integrating data.
- Regularly bring together collaborators to summarize and update findings from long-term monitoring efforts.
- Connect with outside researchers to use our existing datasets for analysis to produce "actionable science"
- Leveraging joint efforts (efficiencies) across organizations.
- Tie into the work of other consortium organizations (e.g. the rivers program, the water quality monitoring program, climate assessment groups).
- Connecting across the region (comparisons of conditions and trends)
 - o Connect to other long term ecosystem monitoring programs (FIA, LTER, NEON, NERC)

- Comparisons to other sites (Harvard Forest, Hubbard Brook, Bartlett, Huntington Forest (NY))
- New website development...great way to engage collaborators and public to showcase environmental efforts for all collaborators
- Web portal / database workshops to increase use and utility of VMC data system

THREATS (What obstacles does VMC need to overcome?)

- Instability (and lack of diversity) in funding sources
- Upcoming retirements (attrition) and resulting weaker connections to organizations
- Lack of clarity/awareness of VMC beyond current collaborators.

Appendix C: Forest Ecosystem Monitoring Cooperative Partner Connections Review

MAINE DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY

2010 Maine State Forest Assessment and Strategies⁸

The Maine Forest Service Department of Conservation (now the Maine Department of Agriculture, Conservation and Forestry) safeguards the state’s natural resources, protects biodiversity, provides access for recreation activities, and fosters a robust energy and timber products industry. Within this department, Maine’s Forest Policy and Management Division developed the 2010 Forest Assessment and Strategies report to provide a comprehensive analysis of forest-related conditions, trends, threats, and opportunities, as well as strategies to achieve state forest policy goals.

Maine DACF Objectives	FEMC Efforts that Fulfill Maine DACF Objectives
Goal 1: Keeping forests as forests	
1.2. Provide information, technical assistance, and financial assistance to family forest owners interested in maintaining and improving their forest land holdings.	- Communication of long-term trends; data exploration tools; new analysis and synthesis of important issues; support for long-term monitoring; forest health monitoring
1.12. Provide information, technical assistance, and financial assistance to municipalities interested in maintaining and improving their urban and community forest resources.	- Communication of long-term trends; data exploration tools; new analysis and synthesis of important issues; support for long-term monitoring

⁸ Available online at https://www.maine.gov/dacf/mfs/publications/reports/maine_assessment_and_strategy_final.pdf

Maine DACF Objectives	FEMC Efforts that Fulfill Maine DACF Objectives
Goal 3: Protecting forests from harm	
3.7. Vigorously solicit collaborative partnerships and outside resources to address forest health and sustainability issues of common interest.	- Annual conference; cross-organization networking through committees; shared work plan development process
3.9. Continue to develop cooperative projects with neighboring jurisdictions to address forest health and sustainability issues of common interest.	- Annual conference; cross-organization networking through committees; shared work plan development process
3.14. Proactively address protection of important habitat features, including, but not limited to, late successional and old growth forests, large woody material (cavity trees, snags, down logs), and ecological reserves, with a focus on cooperative, non-regulatory efforts.	- Information resources; communication of long-term trends; connecting partners across organizations; amphibian and avian long-term monitoring
3.15. Support efforts to reduce atmospheric greenhouse gas levels and damage to forests.	- Providing information on how changing environmental conditions, including climate change, are affecting forests; phenology and forest health monitoring for understanding change
3.16. Promote efforts to allow forests to adapt to climate change – e.g. maintain large contiguous areas as forests; Reduce other stressors; Encourage species suited to future climates.	- Providing information and resources to inform management; supporting networks that include practitioners

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Maine DACF Objectives	FEMC Efforts that Fulfill Maine DACF Objectives
Goal 4: Maintaining healthy trees and woodlands in urban and community areas	
4.1. Encourage proactive efforts at municipal level to maintain healthy urban and community forests.	- Providing information and resources to inform management; supporting networks that include practitioners
4.2. Provide information, technical and financial assistance to municipalities.	- Communication of long-term trends; data exploration tools; new analysis and synthesis of important issues; support for long-term monitoring
4.3. Reduce the impacts of land use change, fragmentation and urbanization of forest landscapes.	- Synthesis analysis; tracking and reporting on trends in data; compilation of resources on specific topics
4.5. Protect and improve air and water quality.	- Providing information and resources to inform management; supporting networks that include practitioners; air quality monitoring at Underhill, VT; long-term monitoring updates on these topics
4.8. Build and enhance partnerships that increase the effectiveness of state urban forestry programming, and improve Maine’s urban and community forests.	- Annual conference; cross-organization networking through committees; shared work plan development process
Goal 5: Maintaining the capacity of the Maine Forest Service as an institution to serve the citizens of Maine	
5.2. Continue to track and highlight success stories and disseminate through various internal and external channels.	- Annual conference; outreach and communications efforts; online tools and information resources
5.4. Reach out to non-governmental entities for sponsorship and funding for programs and events.	- Shared work plan development process; state sprint projects; support for regional partner-driven projects

Maine DACF Objectives	FEMC Efforts that Fulfill Maine DACF Objectives
Goal 6: Increasing the environmental literacy of Maine citizens	
6.3. Expand capacity building efforts to increase effectiveness of collaborating organizations. Focus on the use of adult learning concepts and effective teaching techniques.	- Professional development at annual conference; opportunities for engagement and learning across organizations through committee structure and project work; outreach and training on tools
6.12. Continue developing new partnerships for program delivery, technology transfer, and information exchange by reaching beyond our traditional partnership base.	- Most of FEMC's work focuses on this, specifically shared work plan development process; state sprint projects; support for regional partner-driven projects; annual conference
6.13. Continue to increase national and regional level partnerships for fresh perspectives and more effective education impact while working to strengthen existing conservation education networks.	- Most of FEMC's work focuses on this, specifically shared work plan development process; state sprint projects; support for regional partner-driven projects; annual conference; outreach and engagement efforts; online tools.
6.14. Continue to identify and reach new audiences while maintaining our traditional audience base.	- Most of FEMC's work focuses on this, specifically shared work plan development process; state sprint projects; support for regional partner-driven projects; annual conference; outreach and engagement efforts; online tools.
Goal 7: Maintaining and enhancing forest biodiversity	
7.1. Support research that addresses this issue.	- Coordination of cooperators for applying for grant funding; avian and amphibian monitoring
7.2. Monitor the conditions in Maine's forests as regards biodiversity.	- Data archiving and synthesis activities; networking among cooperators; Mountain Bird Watch support

MASSACHUSETTS DEPARTMENT OF CONSERVATION AND RECREATION

2010 Assessment and Strategies of the Forest Resources of Massachusetts⁹

The Massachusetts Department of Conservation and Recreation drafted the 2010 Assessment and Strategies of the Forest Resources of Massachusetts, which “describes and quantifies the remarkable set of functions, benefits, and values that emanate from the forests of Massachusetts. It also discusses a daunting array of drivers, issues, and threats that influence the size, continuity, character, and condition of our forests.”

Massachusetts DCR Objectives	FEMC Efforts that Fulfill Massachusetts DCR Objectives
Goal 1: State Lands Management	
1.1 Conduct Balanced, Long Term, Sustainable Forest Management on State Lands	- Providing information and resources to inform management; supporting networks that include practitioners; long-term monitoring updates on relevant topics; forest health monitoring
1.2 Protect rare species habitat and habitats of concern (wetlands and water resources including vernal pools and riparian areas); maintain ground and surface water quality while conducting forestry activity on state lands.	- Information resources; communication of long-term trends; connecting partners across organizations; amphibian and avian long-term monitoring; long-term monitoring updates on these topics
1.3 Provide public outreach and informational services about forest management on state lands.	- Outreach and engagement services; convening groups across agencies for communication

⁹ Available online at <https://www.mass.gov/service-details/massachusetts-forest-action-plan>

Massachusetts DCR Objectives	FEMC Efforts that Fulfill Massachusetts DCR Objectives
Goal 2: Service Forestry	
2.3 Explore and implement new technology to reach a broader landowner audience, to respond effectively to environmental concerns (such as invasive pests) and to evaluate program effectiveness.	- Data exploration tools; trainings with interested stakeholders; data synthesis and analysis projects
Goal 3: Forest Health	
3.1. Monitor the Commonwealths urban and rural forests using a system of aerial and ground survey techniques.	- Data synthesis and analysis projects; online tools and dashboards; long-term monitoring updates; forest health monitoring
3.2. Participate in region wide USFS sponsored forest monitoring programs to identify and report on the health of Massachusetts forests.	- Data synthesis and analysis projects; online tools and dashboards; long-term monitoring updates; forest health monitoring
3.6. Provide assistance to DCR Forests and Parks utilizing in house tree crews performing arboricultural services; provide arboricultural services to cities and towns in declared natural emergencies. Assist other Forestry Bureau’s with analysis of forest health conditions.	- Data synthesis and analysis projects; online tools and dashboards; long-term monitoring updates; forest health monitoring

NEW HAMPSHIRE DEPARTMENT OF NATURAL AND CULTURAL RESOURCES

2010 Forest Resources Plan¹⁰

The Department of Resources and Economic Development (now the Department of Natural and Cultural resources), in cooperation with the New Hampshire Forest Advisory Board, developed the Forest Resources Plan to guide the management of New Hampshire forests. As part of this effort, they developed the New Hampshire Forest Resource Strategies document, which outlines goals and strategies to accomplish the Plan.

New Hampshire DNCR Objectives	FEMC Efforts that Fulfill New Hampshire DNCR Objectives
Goal I.A. Conserve New Hampshire’s Forested Landscape - Good Forest Stewardship of New Hampshire’s Forests	
I.A.1. Retain successful grassroots collaboration to sustain natural resources and the economy (Strategy 1)	- Most of FEMC's work focuses on this, specifically shared work plan development process; state sprint projects; support for regional partner-driven projects; annual conference
I.A.3. Implement New Hampshire’s Wildlife Action Plan as it relates to forests (SWAP strategies 204,205,206 and 502)	- Avian and amphibian monitoring; land cover change mapping; state sprint projects e.g. forest clearing assessment
I.A.6. Sustaining forest management on public land (Strategies 19 and 26)	- Data archiving and access; outreach and engagement with broader community; online dashboards and tools; cooperative synthesis and analysis
I.A.8. Public Use (Strategy 33)	- Outreach and engagement services; data synthesis and analysis; online tools and dashboards

¹⁰ Available online at <https://www.nhdfi.org/reports/forest-action-plan>

Appendix C: Vermont Monitoring Cooperative Partner Connections Review

New Hampshire DNCR Objectives	FEMC Efforts that Fulfill New Hampshire DNCR Objectives
I.A.9. Supporting New Hampshire’s private and public forests through outreach and education (Strategies 37, 39, 40, 41)	<ul style="list-style-type: none"> - Annual conference; networking of professionals through committees; outreach and engagement with cooperators, schools and other stakeholders; training opportunities for young professionals; dissemination of informational products and tools
Goal I.C. Sustainable Forest Based Economy	
I.C.3. Sustaining a forested land base (Strategies 80, 82)	<ul style="list-style-type: none"> - Online tools and dashboards; development of long-term monitoring updates; dissemination of information on long-term trends
I.C.4. Developing timely data about New Hampshire's forests (Strategy 83)	<ul style="list-style-type: none"> - Additional long-term analysis and synthesis of other datasets; online tools and dashboards making data easier to interact with; engaging cooperators in analysis and synthesis activities; long-term monitoring updates
I.C.6. Supporting New Hampshire’s wood based businesses through outreach and education (Strategy 54)	<ul style="list-style-type: none"> - Annual conference; outreach and engagement efforts; delivery of information through multiple avenues, including online dashboards and tools
Goal II.A. Protect New Hampshire’s Forests from Harm - Protect Forests from Threats	
II.A.2. Threats to forests from invasive plants, insects, and diseases (Strategies 95, 97)	<ul style="list-style-type: none"> - Cross-state analysis and synthesis efforts; forest health monitoring; methods comparison and development; connecting partners to engage on specific projects; regional and state project work
Goal II.B. Protect New Hampshire’s Forests from Harm - Maintain Ecosystem Health	

Appendix C: Forest Ecosystem Monitoring Cooperative Partner Connections Review

New Hampshire DNCR Objectives	FEMC Efforts that Fulfill New Hampshire DNCR Objectives
II.B.2. Being prepared for climate change (Strategy 107)	- Regional and state project work; shared work plan development; recent focus on climate change in work planning and annual conference
Goal II.C. Protect New Hampshire’s Forests from Harm - Response to Forest Damage	
II.C.3. Tracking, documenting, and inventory and assessment (Strategy 12)	- Data synthesis and analysis projects; online tools and dashboards; long-term monitoring updates
II.C.4. Responding to climate change (Strategy 124)	- Engagement of many partners for collaborative research and proposal writing; networking among professionals for shared work plan development
Goal III.B. Enhance Benefits from New Hampshire’s Trees & Forests - Sustaining Environmental Services from New Hampshire’s Forests	
III.B.2. Sustaining environmental benefits in the face of climate change (Strategy 143)	- Data synthesis and analysis projects; networking of collaborators for shared work plan development; long-term monitoring updates
III.B.3. Issue 3 Sustaining environmental benefits through education and outreach (Strategy 145)	- Outreach and engagement activities; annual conference; professional development opportunities for young adults and educational opportunities in schools; information products and online dashboards

NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION

2010 – 2015 Forest Resource Assessment & Strategy

The New York State Department of Environmental Conservation manages New York’s forests to conserve, improve, and protect the state’s natural resources and environment. The New York Division of Lands and Forests developed the 2010 – 2015 Forest Resource Assessment and Strategy to evaluate the status of New York’s forest land and provide practical recommendations on how land managers can work to sustain the many ecosystem services the forests provide.

New York DEC Objectives	FEMC Efforts that Fulfill New York DEC Objectives
Goal 3. Sustainable Forestry Practices	
3.1. Cultivate a long-term "Forest Stewardship Ethic" (Action 3.1.1.)	- Annual conference; outreach and engagement efforts; delivery of information through multiple avenues, including online dashboards and tools
3.2. Develop a systematic agenda w/ State Extension Forester, local cooperative extension associations, The Nature Conservancy (TNC) & State Environmental Facilities Corporation for maximizing efficiency & cooperative results of private forest landowner outreach efforts. (Actions 3.2.8, 3.2.9)	- Networking cooperators for shared work plan development; regional and state sprint projects
Goal 5. Water Quality and Supply	
5.1. Protect high quality watersheds, shorelines & riparian areas. (Actions 5.1.1, 5.1.10)	- Development of long-term monitoring updates; data integration, synthesis, analysis and information delivery to support management; outreach and engagement efforts
Goal 7. Forest Health	
7.1. Fight invasive pests & diseases. (Action 7.1.3)	- Data archiving and synthesis activities; networking professionals across organizations for information exchange

New York DEC Objectives	FEMC Efforts that Fulfill New York DEC Objectives
7.3. Expand public education programs on forest health issues. (Action 7.3.5, 7.3.7)	- Online tools and dashboard; data integration, synthesis and analysis; outreach and engagement; annual conference; networking professionals across organizations for information exchange
Goal 8. Adapting to Climate Change	
8.1. Recognize the role of forests to mitigate & adapt to climate change. (Action 8.1.3, 8.1.5)	- Data integration, analysis and synthesis; networking professionals for shared work plan development; outreach and engagement through online and in person dissemination
Goal 9. Urban Tree Canopy and Green Infrastructure	
9.3. Develop a statewide database of community tree inventories. (Action 9.3.2, 9.3.4)	- Data integration and analysis; networking professionals for information exchange; regional and state projects

VERMONT DEPARTMENT OF FORESTS, PARKS AND RECREATION

2017 Vermont Forest Action Plan¹¹

The Vermont Department of Forests, Parks and Recreation manages the state’s forest land base for a range of uses, including production, recreation and conservation. The Vermont Division of Forests developed the 2017 Vermont Forest Resources Plan to provide strategic direction in managing the state forests. The plan provides an assessment of conditions and trends of the forest resources in the state, discusses threats to them, identifies priority areas to focus resources, and identifies long-term strategies.

Vermont FPR Objectives	FEMC Efforts that Fulfill Vermont FPR Objectives
Goal 1. Maintain and enhance a mix of forest structure and complexity across the landscape.	
1.3. Strengthen collaborative land use planning and policy efforts with partners to conserve forests, developing strategies to reduce or mitigate the rate of forest conversion and reduce forest fragmentation and parcelization at local, statewide, and regional levels.	- Networking partners for shared planning and information exchange; development of data integration and access tools for understanding
Goal 2. Protect, conserve ecological function, connect, and restore landscapes, habitats, natural communities, and species of greatest conservation need.	
2.5. Identify landscapes, habitats, and species of greatest conservation need, including natural communities and rare, threatened, and endangered species, and monitor trends and indicators.	- Avian and amphibian monitoring; data integration and synthesis analysis

¹¹ Available online at https://fpr.vermont.gov/forest/vermonts_forests/action_plan

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Vermont FPR Objectives	FEMC Efforts that Fulfill Vermont FPR Objectives
2.7. Encourage management activities and develop conservation plans to protect and restore landscapes; habitats; genetic diversity; rare, threatened, and endangered species; species of greatest conservation need; and other species at risk.	- Data integration, synthesis and analysis; convening collaborators across disciplines for information exchange
Goal 3. Understand and monitor ecosystem health and ecological productivity.	
3.9. Enhance our understanding of forest ecosystems across rural and urban landscapes, including collaborating with the Forest Ecosystem Monitoring Cooperative, and supporting research by academic, government, and citizen science groups.	- All aspects of FEMC work
3.10. Monitor for forest health and ecological productivity across all landscapes.	- Forest health monitoring; avian and amphibian monitoring; phenological monitoring; data archiving and analysis; online dashboards and information tools; long-term monitoring updates
3.11. Survey for potential forest health threats, including non-native invasive species.	- Forest health monitoring; phenological monitoring; data integration, synthesis and analysis; long-term monitoring updates
3.12. Support education and outreach on forest health and ecological productivity and sustainability.	- Annual conference; outreach and engagement efforts; convening stakeholders on key issues and across disciplines
3.13. Support access to forest health data archives and collections.	- Data archiving services; online information and data access portals

Appendix C: Vermont Monitoring Cooperative Partner Connections Review

Vermont FPR Objectives	FEMC Efforts that Fulfill Vermont FPR Objectives
Goal 4. Manage health and productive capacity of forests.	
4.14. Encourage landscape level planning and management activities that maintain health, productivity, and ecological functions across all forests.	- Networking partners for shared planning and information exchange; development of data integration and access tools for understanding
Goal 5. Retain native flora and fauna across the landscape and restore where appropriate.	
5.20. Monitor, plant, and retain native flora and fauna, including supporting native species restoration efforts with the Vermont Fish & Wildlife Department and other partners.	- Forest health monitoring; avian monitoring; amphibian monitoring; networking collaborators for information exchange
5.21. Support efforts by the Vermont Fish & Wildlife Department to develop a collaborative, statewide monitoring, and adaptive management program and to evaluate and improve the effectiveness of conservation strategies.	- Avian monitoring; amphibian monitoring; data archive; data analysis and integration
Goal 7. Maintain and enhance soil, air, and water resources, and increase flood resilience.	
7.27. Support research and monitoring that improves the understanding of trends in air quality, weather, and climate and their effect on forests.	- Air quality monitoring; forest health monitoring; phenological monitoring; data integration and long-term trend analysis; long-term monitoring updates
7.28. Support research and monitoring that improves the understanding of trends in soil conditions and relationships between forest management and soil health.	- Soil monitoring; air quality monitoring; networking partners across organizations; data integration and analysis

Appendix C: Forest Ecosystem Monitoring Cooperative Partner Connections Review

Vermont FPR Objectives	FEMC Efforts that Fulfill Vermont FPR Objectives
Goal 9. Maintain and enhance the role of forests in climate change mitigation.	
9.38. Support research that improves the understanding, measuring, and monitoring of trends in forest carbon sequestration.	- Forest health monitoring; data integration and synthesis
9.42. Support climate policy that reflects forest contributions to achieving substantial net reductions in greenhouse gas emissions.	- Data integration, analysis and synthesis; outreach and communication efforts, including online data delivery
Goal 10. Educate the public about forest ecosystems and promote forest values and the critical role they play in sustaining Vermont.	
10.43. Foster a recognition of the ecological, social, and economic contributions that forest ecosystems provide to Vermont, and the need to sustain forest health and productivity to ensure continued benefits for this and future generations.	- Data integration and synthesis; online tools and dashboards; outreach and engagement activities
10.44. Improve public media outreach and technology transfer.	- Data integration and synthesis; online tools and dashboards; outreach and engagement activities
10.45. Support forest and forestry educational programs and peer-to-peer programs for students, educators, landowners, loggers, and citizens.	- Data integration and synthesis; online tools and dashboards; outreach and engagement activities

Appendix C: Vermont Monitoring Cooperative Partner Connections Review

Vermont FPR Objectives	FEMC Efforts that Fulfill Vermont FPR Objectives
Goal 11. Provide leadership in sustainable forest management through demonstration, education, technical assistance, and citizen engagement.	
11.47. Increase the capacity of natural resource professionals, including loggers, to provide high-quality goods and services.	- Annual conference; data integration and synthesis; online dashboards and tools; outreach and engagement efforts; convening partners across disciplines for information transfer
11.52. Provide technical support for pest management and other information about maintaining tree health to landowners, resource managers, and other citizens.	- Forest health monitoring; phenology monitoring; long-term monitoring updates; online tools and dashboards
11.54. Provide information and technical assistance to landowners, (public and private) and professionals who influence land use decisions, such as realtors and engineers to help them understand, evaluate, and/or implement actions to advance sustainable use and stewardship of Vermont’s forests.	- Annual conference; data integration and synthesis; online dashboards and tools; outreach and engagement efforts; convening partners across disciplines for information transfer
Goal 12. Expand financial opportunities to support Vermont’s forests.	
12.55. Pursue new funding opportunities to support local, state, and regional efforts for forest conservation, forest health, and sustainability.	- Networking and convening collaborators around high priority issues; shared work plan development by committee members
12.57. Work with partners to support organizational viability and capacity.	- Annual conference; shared work plan development with collaborators; data integration, analysis and synthesis

Vermont FPR Objectives	FEMC Efforts that Fulfill Vermont FPR Objectives
<p>Goal 15. Maintain an organizational structure and capacity within the division of forests to support and encourage sustainable management, protection, conservation, and use of Vermont’s forests.</p>	
<p>15.72. Promote cross-program cooperation to improve efficiency and effectiveness.</p>	<ul style="list-style-type: none"> - Networking cooperators across disciplines for shared work plan development and information exchange; integration and synthesis supporting high priority needs
<p>15.73. Maintain and develop data management systems and share data among partnerships to enhance internal and external communications and collaborations.</p>	<ul style="list-style-type: none"> - Data archiving; outreach and engagement efforts; online tools and dashboards

US FOREST SERVICE NORTHEASTERN AREA STATE AND PRIVATE FORESTRY

2013 Northeastern Area State and Private Forestry – Strategic Plan¹²

The Northeastern Area State and Private Forestry (NA S&PF) works to protect, conserve, and manage forest resources by collaborating with a range of stakeholder to. Through collaborations, leadership, technical support, sound science, and financial assistance NA S&PF helps to ensure the continued provision of clean water, forest products, wildlife habitat, recreation, and other benefits from the nation’s forest base.

NA S&PF Objectives	FEMC Efforts that Fulfill NA S&PF Objectives
A. Contribute to conservation of important forest landscapes across the urban to rural continuum	<ul style="list-style-type: none"> - Continue Burlington i-Tree work & develop protocols to sample the urban-to-rural gradient, extending from urban Burlington to rural Jericho and on to the top of Mt. Mansfield - Continue to assist with development of the Mt. Mansfield Science and Stewardship Center as a way to advance conservation and stewardship at this fragile alpine site
B. Support sustainable forest management for biodiversity and multiple benefits for people	<ul style="list-style-type: none"> - Provide data and information to support sustainable management of habitats
C. Support the management of trees and forests for resilience to natural and human-caused disasters and threats	<ul style="list-style-type: none"> - Continue to gather, archive and distribute data on invasive pests, acid deposition and other forest threats and perturbations - Could involve intervention if specific perturbations/remedies are determined and found to be practical & effective

¹² Available online at <https://www.fs.usda.gov/naspf/sites/default/files/publications/na-strategic-plan-2013-2018-lr.pdf>

Appendix C: Forest Ecosystem Monitoring Cooperative Partner Connections Review

NA S&PF Objectives	FEMC Efforts that Fulfill NA S&PF Objectives
D. Promote forest management approaches that facilitate resilience and adaptation to, and mitigation of, climate change	<ul style="list-style-type: none"> - Continue to support monitoring/research on carbon sequestration such as long-term forest health monitoring plot assessments and long-term soil monitoring - Continue to support collection, archiving and public distribution of long-term meteorological/climate data and data on environmental pollutants - Be vigilant and work with our partners to support activities to detect and document forest threats (invasive insects, pathogens and plants)
F. Advance conservation and sustainable management of trees and forests for water quality across all landscapes	<ul style="list-style-type: none"> - Continue to support collection of water chemistry data at Lye Brook and Mt Mansfield high altitude ponds - Continue to fund watershed flow and support water chemistry and sedimentation measurements at the Mt. Mansfield Paired Watershed Study - Support lake/pond sedimentation work
G. Support a competitive forest industry with diversified markets, forest-related jobs, and sustainable use of woody biomass for energy	<ul style="list-style-type: none"> - Continue to support air quality monitoring to inform the impact of biomass use for generation of electricity and heating
H. Support engagement and inclusion of urban residents and communities to maintain the benefits provided by trees and forests	<ul style="list-style-type: none"> - Continue support for Burlington i-Tree work – service learning aspect involves students and instructors, not only to collect data, but also interact with and provide information to land owners and city residents - Continue to provide survey results to city officials for public distribution
I. Expand and deliver technical expertise, improve communications and productivity, capitalize on new technology, and ensure employee safety	<ul style="list-style-type: none"> - Provide improved communication with new database and web interface - Continue to work with partners toward improved effectiveness and efficiency - VMC testing of i-Tree as a long term monitoring tool

NA S&PF Objectives	FEMC Efforts that Fulfill NA S&PF Objectives
<p>J. Leverage resources and technical expertise in a transparent and collaborative way with other Federal agencies, State agencies, academia, American Indian tribes, non-profits, and other partners in support of common goals</p>	<ul style="list-style-type: none"> - Continued networking, coordinating and information-sharing conducted of the VMC

VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION

2013 Vermont Department of Environmental Conservation Strategic Plan¹³

The Vermont Department of Environmental Conservation’s (DEC) mission is to preserve, enhance, restore and conserve Vermont’s natural resources and protect human health for the benefit of this and future generations.

Vermont DEC Objectives	FEMC Efforts that Fulfill DEC Objectives
1) We manage air, soil and water resources for environmental and public health. We measure environmental conditions for status and trends	<ul style="list-style-type: none"> - Continue to support collection, archiving and public distribution of long-term monitoring across many variables - New VMC website and database supports searches and integration of data variables across projects - Incorporation of spatially-referenced data in the VMC database
2) We issue licenses and permits, and enforce environmental regulations to ensure compliance with state and, in many cases, federal law	<ul style="list-style-type: none"> - Provide scientific data to inform testimony on critical issues – this need will increase in the future (e.g. road management - erosion, stream silting, permitting upper elevation development) - Informing stakeholders and partners through VMC website, meeting venues and newsletters (i.e. ecoNEWS VT) that pertinent data are available
3) We collect, interpret and communicate environmental scientific information to Vermonters, and provide a forum for public comment on our work	<ul style="list-style-type: none"> - Contribute articles to ecoNEWS VT about current monitoring and research of interest to our cooperators and others, and relevant to Vermont and the region - Development and public release of new website to utilize new database structure, including project display, search capabilities, user management and visualization

¹³ Available online at <http://www.anr.state.vt.us/dec/co/documents/DECStrategicPlan2013-2015.pdf>

Appendix C: Vermont Monitoring Cooperative Partner Connections Review

Vermont DEC Objectives	FEMC Efforts that Fulfill DEC Objectives
4) We provide technical assistance to landowners, businesses, municipalities and individuals regarding environmental issues and resource management	<ul style="list-style-type: none"> - Provide data and information through the VMC website and annual meetings - Provide pertinent data and information through articles contributed to ecoNEWS VT - Facilitate regular meetings with partners and stakeholders to determine data and information that are needed and let them know what data are available
5) We manage funding and support for environmental projects including site clean-up, recreational access, and infrastructure including water supply, stormwater and wastewater systems	<ul style="list-style-type: none"> - Provide grants for mini-projects to answer environmental questions raised by other organizations, as funding is available
6) Our scientists, managers, and field staff provide expert testimony and assistance to other organizations, partners, and sister agencies at the state, federal, local and regional levels to advance our mission and people’s understanding of our natural environment, its importance and relevance	<ul style="list-style-type: none"> - VMC collaborators provide expert testimony when needed

VERMONT FISH AND WILDLIFE DEPARTMENT

2005 Vermont Wildlife Action Plan¹⁴

The Vermont Fish and Wildlife Department's (FWD) mission is “the conservation of all species of fish, wildlife, and plants and their habitats for the people of Vermont.” The Department’s dedicated professionals enforce laws, manage Wildlife Management Areas, conduct species-specific research, restoration and management actions, issue licenses, grow fish, and provide educational and outreach services. Three of the Department’s planning goals are: Conserve, enhance, and restore Vermont’s natural communities, habitats, and species and the ecological processes that sustain them. Through the Wildlife Action Plan, Vermont has developed a comprehensive “all-species conservation strategy” to meet these goals.

Vermont FWD Objectives	FEMC Efforts that Fulfill FWD Objectives
1) Identify wildlife distribution and abundance: Provide information on the distribution and abundance of species of wildlife, including low and declining populations as the State Fish and Wildlife Dept. deems appropriate, that are indicative of the diversity and health of the State's wildlife.	<ul style="list-style-type: none"> - Provide subgrants to support long-term monitoring of amphibians and reptiles and toward updating the VT Reptile and Amphibian Atlas - Provide subgrants to support long-term monitoring of forest songbirds - Provide subgrants to support monitoring of rare amphibian and bird species (i.e. Bicknell’s Thrush)
2) Describe location and condition of key habitats: Describe the locations and relative condition of key habitats and community types essential to conservation of species identified in (1).	<ul style="list-style-type: none"> - Provide 28 years of aerial forest disturbance survey data

¹⁴ Available online at https://vtfishandwildlife.com/sites/fishandwildlife/files/documents/About%20Us/Budget%20and%20Planning/VT_Wildlife_Action_Plan_Main_Document.pdf

Vermont FWD Objectives	FEMC Efforts that Fulfill FWD Objectives
<p>3) Describe key problems and research needs: Describe problems that may adversely affect species identified in (1) or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats.</p>	<ul style="list-style-type: none"> - Provide structured time during the VMC Annual Conference Working Group Sessions to convene biologists, managers and others to discuss key problems and look for possible solutions and/or define avenues of research to help find solutions.
<p>4) Describe and prioritize conservation actions: Describe conservation actions proposed to conserve the identified species and habitats and priorities for implementing such actions.</p>	<ul style="list-style-type: none"> - Help facilitate discussions among collaborators and stakeholders around prioritization of conservation actions to conserve identified species and habitats
<p>5) Monitor species, habitats and conservation actions: Describe plans to monitor species identified in (1) and their habitats; monitor the effectiveness of the conservation actions proposed in and, adapt these conservation actions to respond appropriately to new information or changing conditions.</p>	<ul style="list-style-type: none"> - Support Vermont forest health monitoring plot assessments – archived data provide intensive measurements of stand variables which are important indicators of certain wildlife species habitats

Appendix C: Forest Ecosystem Monitoring Cooperative Partner Connections Review

Vermont FWD Objectives	FEMC Efforts that Fulfill FWD Objectives
<p>7) Coordinate with other plans: Coordinate the development, implementation, review, and vision of the Action Plan with Federal, State, and local agencies and Indian tribes that manage significant land and water areas within the State or administer programs that significantly affect the conservation of identified species and habitats.</p>	<ul style="list-style-type: none"> - The VMC Strategic Plan has already compiled information on the plans of its partners and may be a useful resource
<p>8) Include public participation: Describe public participation in the development, revision, and implementation of the Action Plan and projects and programs. Plant conservation and education and law enforcement projects are not eligible for State Wildlife Grants funding. We expect that species, community and landscape level conservation will provide secondary benefits including addressing the needs of many plant Species of Greatest Conservation Need (SGCN).</p>	<ul style="list-style-type: none"> - Provide venues such as the at VMC Annual Conference for planning meetings or workshops to gather outside public input

US FOREST SERVICE GREEN MOUNTAIN AND FINGER LAKES NATIONAL FORESTS

2006 Green Mountain National Forest Management Plan¹⁵

National forests were established to provide watershed protection and continual forest resources for the nation. The Green Mountain National Forest (GMNF), covering 400,000 acres in central and southern Vermont, manages for both the present and future generations by balancing a range of activities and uses. Management of the forest is guided by the 2006 GMNF Land and Resource Management Plan, with an emphasis on long-term ecological, social and economic sustainability.

GMNF Objectives	FEMC Efforts that Fulfill GMNF Objectives
Goal 1: Provide for a wide range of uses and activities in an ecologically, socially, and economically sustainable way	<ul style="list-style-type: none"> - Incorporation of VMC and cooperator projects in the Monitoring and Evaluation framework adopted by GMNF
Goal 2: Maintain and restore quality, amount, and distribution of habitats to produce viable and sustainable populations of native and desirable non-native plants and animals	<ul style="list-style-type: none"> - Continued gathering of terrestrial flora and fauna monitoring data to inform GMNF efforts to sustainably manage viable populations - Continued long-term monitoring of forest bird populations and demographics and associated habitat - Continued long-term monitoring of amphibian and reptile populations and associated habitat

¹⁵ Available online at https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5334042.pdf

Appendix C: Forest Ecosystem Monitoring Cooperative Partner Connections Review

GMNF Objectives	FEMC Efforts that Fulfill GMNF Objectives
Goal 3: Maintain or restore the natural, ecological functions of the soil	<ul style="list-style-type: none"> - Long Term Soil Monitoring Project tracks changes in soil health over time, including regular assessments of soil mercury levels. - Cooperators studied the spatial variability in nitrogen export from forested watersheds related to differences in soil nitrogen soil nitrogen - Cooperators established and maintain Soil Climate Analysis Network site
Goal 4: Maintain or restore aquatic, fisheries, riparian, and wetland habitats	<ul style="list-style-type: none"> - Through monitoring, VMC informs GMNF efforts to sustainably manage viable populations of aquatic wildlife. - Lake chemistry monitoring by cooperators on Lye Brook through the Long-Term Monitoring of Acid Sensitive Lakes program - VMC partnered with GMNF and DEC to conduct intensive biological and chemical surveys of acid-sensitive lakes in the Lye Brook Wilderness
Goal 5: Maintain or improve air quality on the GMNF	<ul style="list-style-type: none"> - VMC cooperators maintain particulate monitoring and precipitation chemistry monitoring (NADP/NTN) and particulate levels (IMPROVE) near Lye Brook
Goal 6: Maintain or restore ecological processes and systems on the GMNF within desired ranges of variability, including a variety of native vegetation and stream channel types, and their patterns and structural components	<ul style="list-style-type: none"> - Establishment of the Long Term Ecosystem Monitoring Program to assess change in forest, soil, air and wildlife conditions at permanent monitoring plots, and future integration with expanded VMC forest health monitoring network

Appendix C: Vermont Monitoring Cooperative Partner Connections Review

GMNF Objectives	FEMC Efforts that Fulfill GMNF Objectives
Goal 8: Provide for a sustainable supply of forest products	<ul style="list-style-type: none"> - Help establish and expand the Long Term Ecosystem Monitoring Program to assess change in forest, soil, air and wildlife conditions, providing information on forest condition is needed for planning forests supplies into the future - Aggregate and provide data on aerial detection surveys of pest and disease impacts on forest health
Goal 9: Demonstrate innovative, scientifically, and ecologically sound management practices that can be applied to other lands	<ul style="list-style-type: none"> - Forest Ecosystem Management Demonstration Project on Mt. Mansfield provides new silvicultural approaches account for soil, wildlife and water-related impacts
Goal 12: Provide a diverse range of high-quality, sustainable recreation opportunities that complement those provided off National Forest System lands	<ul style="list-style-type: none"> - Incorporation of recreation and tourism values of forested landscapes into spatial decision making tools through the McIntire-Stennis grant at UVM - Comparison of streamflow and chemistry at disturbed and undisturbed watersheds to inform ski area management and planning
Goal 13. Manage designated wilderness to preserve an enduring resource that represents ecosystems and natural processes unique to northeastern forests while providing opportunities for solitude and unconfined recreation consistent with the Wilderness Act of 1964 and subsequent legislation	<ul style="list-style-type: none"> - Informing resource management planning and expectations through long-term monitoring activities in Wilderness - Lye Brook Subcommittee coordinated research and monitoring activity planning across institutions - Participating in the 50th Anniversary of Wilderness Act to showcase monitoring work taking place on the GMNF
Goal 15: Maintain or enhance visual resources such as viewsheds, vistas, overlooks, and special features	<ul style="list-style-type: none"> - Incorporation of recreation and tourism values of forested landscapes into spatial decision making tools through the McIntire-Stennis grant at UVM

Appendix C: Forest Ecosystem Monitoring Cooperative Partner Connections Review

GMNF Objectives	FEMC Efforts that Fulfill GMNF Objectives
Goal 17: Support regional and local economies through resource use, production, and protection	<ul style="list-style-type: none"> - Evaluation of economic impacts of different management practices and harvest regimes, including for biomass, through Forest Ecosystem Management Demonstration Project
Goal 18: Maintain and enhance partnerships with communities and organizations	<ul style="list-style-type: none"> - Serve as a partner to the GMNF in providing monitoring data and coordinating the research and monitoring activities of partners
Goal 19: Provide a diverse range of information and education opportunities that will enhance the understanding of the GMNF	<ul style="list-style-type: none"> - Disseminate information about forest condition and monitoring through newsletters and ecoNEWS VT - Networking and information exchange opportunities provided through the annual VMC Conference - Dissemination of data collected by and on the GMNF to a wider audience through the VMC website - Participation in the 50th Anniversary of Wilderness Act to showcase monitoring work taking place on the GMNF
Goal 20: Coordinate Forest planning and implementation with federal, State, and local agencies	<ul style="list-style-type: none"> - Participate in the Lye Brook Subcommittee, which coordinates research and monitoring activity planning across institutions - Inform the planning process with data and information gathered by VMC and its cooperators

Appendix D: List of Forest Ecosystem Monitoring Cooperative Partner Objectives

Below are the various goals, objectives, strategies and/or activities of the key organizations that contribute to the governance of the Forest Ecosystem Monitoring Cooperative. These codes are used to identify matches with FEMC's strategic goals, objectives and activities presented in the main text of the Strategic Plan.

MAINE DEPARTMENT OF CONSERVATION, AGRICULTURE AND FORESTRY (ME DACF)

- 1: Keeping forests as forests
 - 1.2. Provide information, technical assistance, and financial assistance to family forest owners interested in maintaining and improving their forest land holdings.
 - 1.12. Provide information, technical assistance, and financial assistance to municipalities interested in maintaining and improving their urban and community forest resources.
- 3: Protecting forests from harm
 - 3.7. Vigorously solicit collaborative partnerships and outside resources to address forest health and sustainability issues of common interest.
 - 3.9. Continue to develop cooperative projects with neighboring jurisdictions to address forest health and sustainability issues of common interest.
 - 3.14. Proactively address protection of important habitat features, including, but not limited to, late successional and old growth forests, large woody material (cavity trees, snags, down logs), and ecological reserves, with a focus on cooperative, non-regulatory efforts.
 - 3.15. Support efforts to reduce atmospheric greenhouse gas levels and damage to forests.
 - 3.16. Promote efforts to allow forests to adapt to climate change – e.g. maintain large contiguous areas as forests; Reduce other stressors; Encourage species suited to future climates.
- 4: Maintaining healthy trees and woodlands in urban and community areas
 - 4.1. Encourage proactive efforts at municipal level to maintain healthy urban and community forests.
 - 4.2. Provide information, technical and financial assistance to municipalities.
 - 4.3. Reduce the impacts of land use change, fragmentation and urbanization of forest landscapes.
 - 4.5. Protect and improve air and water quality.
 - 4.8. Build and enhance partnerships that increase the effectiveness of state urban forestry programming, and improve Maine's urban and community forests.
- 5: Maintaining the capacity of the Maine Forest Service as an institution to serve the citizens of Maine
 - 5.2. Continue to track and highlight success stories and disseminate through various internal and external channels.
 - 5.4. Reach out to non-governmental entities for sponsorship and funding for programs and events.
- 6: Increasing the environmental literacy of Maine citizens
 - 6.3. Expand capacity building efforts to increase effectiveness of collaborating organizations. Focus on the use of adult learning concepts and effective teaching techniques.

- 6.12. Continue developing new partnerships for program delivery, technology transfer, and information exchange by reaching beyond our traditional partnership base.
- 6.13. Continue to increase national and regional level partnerships for fresh perspectives and more effective education impact while working to strengthen existing conservation education networks.
- 6.14. Continue to identify and reach new audiences while maintaining our traditional audience base.
- 7: Maintaining and enhancing forest biodiversity
 - 7.1. Support research that addresses this issue.
 - 7.2. Monitor the conditions in Maine's forests as regards biodiversity.

MASSACHUSETTS DEPARTMENT OF CONSERVATION AND RECREATION (MA DCR)

- 1. State Lands Management
 - 1.1. Conduct Balanced, Long Term, Sustainable Forest Management on State Lands
 - 1.2. Protect rare species habitat and habitats of concern (wetlands and water resources including vernal pools and riparian areas); maintain ground and surface water quality while conducting forestry activity on state lands.
 - 1.3. Provide public outreach and informational services about forest management on state lands.
- 2. Service Forestry
 - 2.3 Explore and implement new technology to reach a broader landowner audience, to respond effectively to environmental concerns (such as invasive pests) and to evaluate program effectiveness.
- 3. Forest Health
 - 3.1. Monitor the Commonwealths urban and rural forests using a system of aerial and ground survey techniques.
 - 3.2. Participate in region wide USFS sponsored forest monitoring programs to identify and report on the health of Massachusetts forests.
 - 3.6. Provide assistance to DCR Forests and Parks utilizing in house tree crews performing arboricultural services; provide arboricultural services to cities and towns in declared natural emergencies. Assist other Forestry Bureau's with analysis of forest health conditions.

NEW HAMPSHIRE DEPARTMENT OF NATURAL AND CULTURAL RESOURCES (NH DNCR)

- I.A. Conserve New Hampshire's Forested Landscape - Good Forest Stewardship of New Hampshire's Forests
 - I.A.1. Retain successful grassroots collaboration to sustain natural resources and the economy (Strategy 1)
 - I.A.3. Implement New Hampshire's Wildlife Action Plan as it relates to forests (SWAP strategies 204,205,206 and 502)
 - I.A.6. Sustaining forest management on public land (Strategies 19 and 26)
 - I.A.8. Public Use (Strategy 33)
 - I.A.9. Supporting New Hampshire's private and public forests through outreach and education (Strategies 37, 39, 40, 41)
- I.C. Sustainable Forest Based Economy
 - I.C.3. Sustaining a forested land base (Strategies 80, 82)

Appendix D: List of Vermont Monitoring Cooperative Partner Objectives

- I.C.4. Developing timely data about New Hampshire's forests (Strategy 83)
- I.C.6. Supporting New Hampshire's wood based businesses through outreach and education (Strategy 54)
- II.A. Protect New Hampshire's Forests from Harm - Protect Forest from Threats
 - II.A.2. Threats to forests from invasive plants, insects, and diseases (Strategies 95, 97)
- II.B. Protect New Hampshire's Forests from Harm - Maintain Ecosystem Health
 - II.B.2. Being prepared for climate change (Strategy 107)
- II.C. Protect New Hampshire's Forests from Harm - Response to Forest Damage
 - II.C.3. Tracking, documenting, and inventory and assessment (Strategy 12)
 - II.C.4. Responding to climate change (Strategy 124)
- III.B. Enhance Benefits from New Hampshire's Trees & Forests - Sustaining Environmental Services from New Hampshire's Forests
 - III.B.2. Sustaining environmental benefits in the face of climate change (Strategy 143)
 - III.B.3. Issue 3 Sustaining environmental benefits through education and outreach (Strategy 145)

NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NY DEC)

- 3. Sustainable Forestry Practices
 - 3.1. Cultivate a long-term "Forest Stewardship Ethic" (Action 3.1.1.)
- 3. Sustainable Forestry Practices
 - 3.2. Develop a systematic agenda w/ State Extension Forester, local cooperative extension associations, The Nature Conservancy (TNC) & State Environmental Facilities Corporation for maximizing efficiency & cooperative results of private forest landowner outreach efforts. (Actions 3.2.8, 3.2.9)
- 5. Water Quality and Supply
 - 5.1. Protect high quality watersheds, shorelines & riparian areas. (Actions 5.1.1, 5.1.10)
- 7. Forest Health
 - 7.1. Fight invasive pests & diseases. (Action 7.1.3)
 - 7.3. Expand public education programs on forest health issues. (Action 7.3.5, 7.3.7)
- 8. Adapting to Climate Change
 - 8.1. Recognize the role of forests to mitigate & adapt to climate change. (Action 8.1.3, 8.1.5)
- 9. Urban Tree Canopy and Green Infrastructure
 - 9.3. Develop a statewide database of community tree inventories. (Action 9.3.2, 9.3.4)

VERMONT DEPARTMENT OF FORESTS, PARKS AND RECREATION (VT FPR)

- 1. Maintain and enhance a mix of forest structure and complexity across the landscape.
 - 1.3. Strengthen collaborative land use planning and policy efforts with partners to conserve forests, developing strategies to reduce or mitigate the rate of forest conversion and reduce forest fragmentation and parcelization at local, statewide, and regional levels.
- 2. Protect, conserve ecological function, connect, and restore landscapes, habitats, natural communities, and species of greatest conservation need.
 - 2.5. Identify landscapes, habitats, and species of greatest conservation need, including natural communities and rare, threatened, and endangered species, and monitor trends and indicators.

Appendix D: List of Vermont Monitoring Cooperative Partner Objectives

- 2.7. Encourage management activities and develop conservation plans to protect and restore landscapes; habitats; genetic diversity; rare, threatened, and endangered species; species of greatest conservation need; and other species at risk.
- 3. Understand and monitor ecosystem health and ecological productivity.
 - 3.9. Enhance our understanding of forest ecosystems across rural and urban landscapes, including collaborating with the Forest Ecosystem Monitoring Cooperative, and supporting research by academic, government, and citizen science groups.
 - 3.10. Monitor for forest health and ecological productivity across all landscapes.
 - 3.11. Survey for potential forest health threats, including non-native invasive species.
 - 3.12. Support education and outreach on forest health and ecological productivity and sustainability.
 - 3.13. Support access to forest health data archives and collections.
- 4. Manage health and productive capacity of forests.
 - 4.14. Encourage landscape level planning and management activities that maintain health, productivity, and ecological functions across all forests.
- 5. Retain native flora and fauna across the landscape and restore where appropriate.
 - 5.20. Monitor, plant, and retain native flora and fauna, including supporting native species restoration efforts with the Vermont Fish & Wildlife Department and other partners.
 - 5.21. Support efforts by the Vermont Fish & Wildlife Department to develop a collaborative, statewide monitoring, and adaptive management program and to evaluate and improve the effectiveness of conservation strategies.
- 7. Maintain and enhance soil, air, and water resources, and increase flood resilience.
 - 7.27. Support research and monitoring that improves the understanding of trends in air quality, weather, and climate and their effect on forests.
 - 7.28. Support research and monitoring that improves the understanding of trends in soil conditions and relationships between forest management and soil health.
- 9. Maintain and enhance the role of forests in climate change mitigation.
 - 9.38. Support research that improves the understanding, measuring, and monitoring of trends in forest carbon sequestration.
 - 9.42. Support climate policy that reflects forest contributions to achieving substantial net reductions in greenhouse gas emissions.
- 10. Educate the public about forest ecosystems and promote forest values and the critical role they play in sustaining Vermont.
 - 10.43. Foster a recognition of the ecological, social, and economic contributions that forest ecosystems provide to Vermont, and the need to sustain forest health and productivity to ensure continued benefits for this and future generations.
 - 10.44. Improve public media outreach and technology transfer.
 - 10.45. Support forest and forestry educational programs and peer-to-peer programs for students, educators, landowners, loggers, and citizens.
- 11. Provide leadership in sustainable forest management through demonstration, education, technical assistance, and citizen engagement.
 - 11.47. Increase the capacity of natural resource professionals, including loggers, to provide high-quality goods and services.
 - 11.52. Provide technical support for pest management and other information about maintaining tree health to landowners, resource managers, and other citizens

Appendix D: List of Vermont Monitoring Cooperative Partner Objectives

- 11.54. Provide information and technical assistance to landowners, (public and private) and professionals who influence land use decisions, such as realtors and engineers to help them understand, evaluate, and/or implement actions to advance sustainable use and stewardship of Vermont's forests.
- 12. Expand financial opportunities to support Vermont's forests.
 - 12.55. Pursue new funding opportunities to support local, state, and regional efforts for forest conservation, forest health, and sustainability.
 - 12.57. Work with partners to support organizational viability and capacity.
- 15. Maintain an organizational structure and capacity within the division of forests to support and encourage sustainable management, protection, conservation, and use of Vermont's forests.
 - 15.72. Promote cross-program cooperation to improve efficiency and effectiveness.
 - 15.73. Maintain and develop data management systems and share data among partnerships to enhance internal and external communications and collaborations.
 - 15.74. Support professional development, continued learning, and succession planning for Division staff.
 - 15.77. Cultivate new strategic partnerships while enhancing existing collaborations to reach the desired future conditions outlined in this 2017 Plan.

US FOREST SERVICE NORTHEASTERN AREA, STATE AND PRIVATE FORESTRY (NA)

- A. Contribute to conservation of important forest landscapes across the urban to rural continuum
- B. Support sustainable forest management for biodiversity and multiple benefits for people
- C. Support the management of trees and forests for resilience to natural and human-caused disasters and threats
- D. Promote forest management approaches that facilitate resilience and adaptation to, and mitigation of, climate change
- E. Support efforts to reduce wildfire threats to people, communities, and natural resources
- F. Advance conservation and sustainable management of trees and forests for water quality across all landscapes
- G. Support a competitive forest industry with diversified markets, forest-related jobs, and sustainable use of woody biomass for energy
- H. Support engagement and inclusion of urban residents and communities to maintain the benefits provided by trees and forests
- I. Expand and deliver technical expertise, improve communications and productivity, capitalize on new technology, and ensure employee safety
- J. Leverage resources and technical expertise in a transparent and collaborative way with other Federal agencies, State agencies, academia, American Indian tribes, non-profits, and other partners in support of common goals

VT DEPARTMENT OF ENVIRONMENTAL CONSERVATION (VT DEC)

1. We manage air, soil and water resources for environmental and public health. We measure environmental conditions for status and trends
2. We issue licenses and permits, and enforce environmental regulations to ensure compliance with state and, in many cases, federal law
3. We collect, interpret and communicate environmental scientific information to Vermonters, and provide a forum for public comment on our work
4. We provide technical assistance to landowners, businesses, municipalities and individuals regarding environmental issues and resource management

5. We manage funding and support for environmental projects including site clean-up, recreational access, and infrastructure including water supply, stormwater and wastewater systems
6. Our scientists, managers, and field staff provide expert testimony and assistance to other organizations, partners, and sister agencies at the state, federal, local and regional levels to advance our mission and people's understanding of our natural environment, its importance and relevance

VT FISH AND WILDLIFE DEPARTMENT (VT FWD)

1. Identify wildlife distribution and abundance: Provide information on the distribution and abundance of species of wildlife, including low and declining populations as the State Fish and Wildlife Dept. deems appropriate, that are indicative of the diversity and health of the State's wildlife.
2. Describe location and condition of key habitats: Describe the locations and relative condition of key habitats and community types essential to conservation of species identified in (1).
3. Describe key problems and research needs: Describe problems that may adversely affect species identified in (1) or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats.
4. Describe and prioritize conservation actions: Describe conservation actions proposed to conserve the identified species and habitats and priorities for implementing such actions.
5. Monitor species, habitats and conservation actions: Describe plans to monitor species identified in (1) and their habitats; monitor the effectiveness of the conservation actions proposed in and, adapt these conservation actions to respond appropriately to new information or changing conditions.
6. Develop a plan review process: Describe procedures to review the Wildlife Action Plan at intervals not to exceed ten years.
7. Coordinate with other plans: Coordinate the development, implementation, review, and vision of the Action Plan with Federal, State, and local agencies and Indian tribes that manage significant land and water areas within the State or administer programs that significantly affect the conservation of identified species and habitats.
8. Include public participation: Describe public participation in the development, revision, and implementation of the Action Plan and projects and programs. Plant conservation and education and law enforcement projects are not eligible for State Wildlife Grants funding. We expect that species, community and landscape level conservation will provide secondary benefits including addressing the needs of many plant Species of Greatest Conservation Need (SGCN).

US FOREST SERVICE GREEN MOUNTAIN NATIONAL FOREST (GMNF)

1. Provide for a wide range of uses and activities in an ecologically, socially, and economically sustainable way
2. Maintain and restore quality, amount, and distribution of habitats to produce viable and sustainable populations of native and desirable non-native plants and animals
3. Maintain or restore the natural, ecological functions of the soil
4. Maintain or restore aquatic, fisheries, riparian, and wetland habitats
5. Maintain or improve air quality on the GMNF
6. Maintain or restore ecological processes and systems on the GMNF within desired ranges of variability, including a variety of native vegetation and stream channel types, and their patterns and structural components
7. Protect rare or outstanding biological, ecological, or geological areas on the GMNF
8. Provide for a sustainable supply of forest products
9. Demonstrate innovative, scientifically, and ecologically sound management practices that can be applied to other lands
10. Provide other resource benefits through coordinated timber harvesting
11. Provide opportunities for renewable energy use and development

12. Provide a diverse range of high-quality, sustainable recreation opportunities that complement those provided off National Forest System lands
13. Manage designated wilderness to preserve an enduring resource that represents ecosystems and natural processes unique to northeastern forests while providing opportunities for solitude and unconfined recreation consistent with the Wilderness Act of 1964 and subsequent legislation
14. Provide a safe, efficient, and effective Forest transportation system that meets both the needs of the Forest Service and the public
15. Maintain or enhance visual resources such as viewsheds, vistas, overlooks, and special features
16. Provide protection and stewardship for significant heritage resources on the GMNF
17. Support regional and local economies through resource use, production, and protection
18. Maintain and enhance partnerships with communities and organizations
19. Provide a diverse range of information and education opportunities that will enhance the understanding of the GMNF
20. Coordinate Forest planning and implementation with federal, State, and local agencies
21. Protect human life, property, and facilities from wildland fire hazards
22. Meet anticipated future needs and opportunities on public lands and improve management effectiveness of the National Forest through adjustment of land ownership