Newsletter
Vermont Monitoring Cooperative
Vermont's Cooperative Forest Ecosystem Monitoring & Research Program

Fall-Winter 2011-12 Volume 15 Issue 1

VMC Establishes Urban Forest Monitoring Site

Larry Forcier and Carl Waite

In July 2010, Danielle Fitzko and Steve Sinclair, of the Vermont Department of Forests Parks and Recreation (FPR), suggested using i-Tree research by the U.S. Forest Service to develop student interests and skills in urban foresty. The idea fit for an introductory course in UVM's Rubenstein School and, in concert with VMC goals, provided opportunity to expand our monitoring sites to include the most urban area in Vermont. Recent studies on threats to forest ecosystems and services they provide have most often cited development and social factors as major concerns. VMC's Steering Committee, Advisory Committee, and staff had begun discussing a plan to establish other monitoring sites which would include social pressures that don't exist in our relatively undisturbed sites on Mount Mansfield and Lye Brook Wilderness Area.

Danielle and Steve made the case that Vermont, through the VMC, should have an urban forest monitoring and research site in or near Burlington. Danielle also was familiar with the i-Tree suite of software tools (www.itreetools.org), developed by the research branch of the Forest Service, to assess conditions and trends to manage the nation's urban forests. The software tool, i-Tree Eco, uses data from plots located throughout a study area, along with local hourly air pollution and meteorological data, to quantify urban forest structure, environmental effects, and community value. The iTree Eco program calculates:

- ***Urban forest structure***: Species composition, tree cover, tree density, tree health (crown dieback, tree damage), leaf area, leaf biomass, and information on shrubs and ground cover types.
- ***Pollution Removal***: Hourly pollution removal by the urban forest for ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, and particulate matter (PM10). The model accounts for potential negative effects of trees on air quality due to Biogenic Volatile Organic Compound emissions.

City of Burlington, Vermont. Photo provided by State of Vermont.

- ***Carbon dioxide***: Effect of trees on building energy use and related reductions in carbon dioxide emissions.
- ***Carbon Storage***: Total carbon stored and net carbon sequestered annually by trees.
- ***Pest susceptibility***: Susceptibility to gypsy moth, Asian longhorned beetle, and emerald ash borer.
- ***Exotic Species***: Composition of exotic species.

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Urban Forest Monitoring Site *continued from Page 1*

The VMC staff was excited about this idea, and after several months of discussion and input from the VMC Steering and Advisory Committees and with encouragement and support from the Burlington Department of Parks and Recreation, it was decided to implement an iTree project in Burlington in October 2011. The project included a service learning component in the course, NR 1, *Field Ecology and Natural History*, the first course in the core undergraduate curriculum of the Rubenstein School of Environment and Natural Resources (RSENR). This course has more than 200 students divided into about 70 three-person lab teams.

In preparation for the project, VMC personnel at the Rubenstein School and 12 members of the NR 1 teaching team participated in a one day i-Tree Eco workshop. The workshop was taught by Dave Bloniarz from the Forest Service, with assistance from the Forest Service's Mark Twery, RSENR faculty member, and FPR forester Dan Dillner. Other attendees included staff from Burlington Parks and Recreation and FPR, as well as several guests. The i-Tree project also involves Burlington City Arborist Warren Spinner and his Burlington Parks and Recreation team, Vermont Urban and Community Forester Danielle Fitzko, Vermont State Forester Steve Sinclair, and other professionals.

On October 11th, the student lab teams in NR 1 began to establish and collect data from nearly 200 "i-Tree Eco" permanent monitoring plots located throughout Burlington. Previous NR 1 courses had conducted ecological forest surveys in a number of rural Vermont forest stands. This year's efforts were the first to begin to build a long-term urban forest database that can be re-surveyed to assist Burlington and the State in assessing overall forest health trends in Vermont's most urban community. Burlington citizens and other Vermonters highly value their trees and forests, and the i-Tree Eco effort will allow students in NR 1 to contribute directly to the community while simultaneously developing the personal knowledge and skills expected in the first course in RSENR's core curriculum.

All sampling was non-destructive and results will be provided to Burlington and the state as they are processed, validated, and reviewed. It is expected that this year's work will not only establish a baseline for long-term forest assessment in Burlington, but also will provide important assistance to the VMC in its efforts to collaboratively monitor important changes in Vermont's forest ecosystem health. As part of this monitoring effort, NR 1 students specifically looked city-wide for evidence of emerald ash borer and Asian longhorned beetle.

The NR 1 labs were coordinated by Sara Williams, Laboratory Teacher and Graduate Student Research Assistant. The labs were taught by UVM graduate students Connor Stedman, Liz Mills, Ryan Morra, Kate Ostroot, Vinson Pierce, Jackie Devino, Liz Brownlee, Becky Cushing, Sophie Mazowita, and Carly Brown. A QA/QC plan was written by the VMC staff, in consultation with the NR 1 teaching team, to assure that data quality standards were at acceptable levels. VMC also provided funding to purchase certain sampling equipment and hire temporary staff, Lisa Fredette, Josh Benes, and Sam Hoadley, and undergraduate student interns, Andrew McDonough and Samatha Smits, to help with data collection and QA/QC efforts.

Student field crews learned the collection system and completed about 100 survey plots in two weeks of half-day labs, with each individual lab team spending two afternoons in the field. These data are currently being entered into the i-Tree Eco Program, and we hope to have a preliminary analysis of the forest completed over the holidays. Another 100 plots have been randomly located in the city; we plan to perform a second round of sampling in the fall of 2012. The two years of data collection should provide an intensity of sampling in the city and permanent plot record that is more intensive than the other iTree-Eco sampled cities.

As we draw conclusions from forest analyses provided by iTree-Eco, we know that there will be surprises and additional questions. The random plots and baseline data will support future analyses and development of more intensive sampling required to address future questions and concerns about Burlington's forests. Furthermore, the VMC will be able to compare the Burlington forest to the ecosystems on Mt. Mansfield and at Lye Brook.

Many people in Burlington and in other parts of the state were supportive of the student service-learning efforts and allowed permanent sampling plots to be established on or near their homes. The interest and goodwill of these citizens is greatly appreciated, and we know they will be eager to hear about Burlington's urban forests over time. Some 220 new people now know how to do the field work associated with iTree; and no evidence of emerald ash borer nor Asian longhorned beetle was found in the numerous forays into Burlington's wooded areas. The work on the Burlington i-Tree project has been a good example of the energy and mutual support that VMC cooperators provide each other with the overall goal of protecting the vitality of Vermont forest ecosystems.

A Little Bird Told Me

Miriam Pendleton, VMC Field and Program Technician

Adult Bicknell's Thrush on a nest in a balsam fir tree. Photo by James Goetz of the Cornell Lab of Ornithology.

What can a rarely seen little songbird tell us about the health of our forests? As it so happens, quite a lot. Nineteen years of Bicknell's Thrush monitoring data collected on VMC intensive sites have yielded information on wildlife response to development pressure, mercury pollution, and climate change.

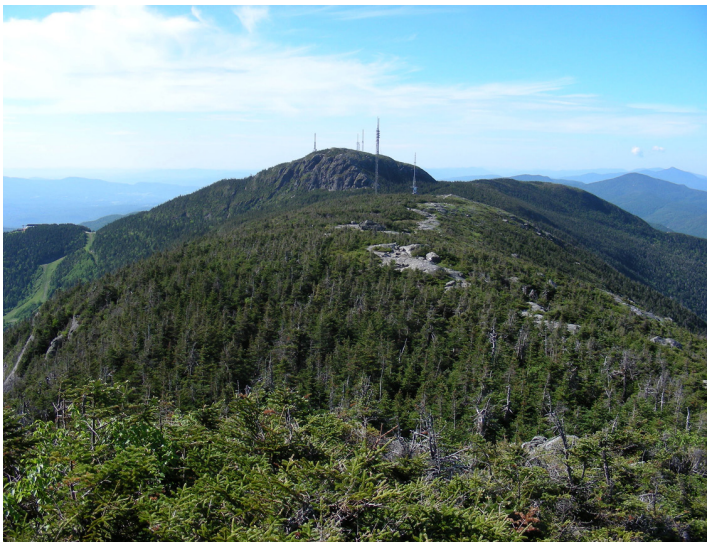
The Bicknell's Thrush is a secretive and habitat specific songbird that makes high elevation balsam fir- dominated forests its breeding grounds. **Chris Rimmer**, **Kent McFarland**, and their colleagues at the Vermont Center for Ecostudies (VCE) have been VMC cooperators since 1992. VCE's focus is on conservation, and they have been studying the thrush using monies that the VMC awards to researchers. With backgrounds in ornithology and conservation biology, Chris and Kent are among the founding staff of the Vermont Center for Ecostudies. VCE grew into a stand-alone institution from roots in the Conservation Biology Department at the Vermont Institute of Natural Science. Other species monitored in this project are Blackpoll Warbler, Swainson's Thrush, Winter Wren, and White-throated Sparrow.

Bicknell's Thrush is among the highest conservation priorities of songbird species in eastern North America, partly due to its specialized habitat requirements. High-elevation fir forests are threatened by development, such as ski areas or communication towers, and by relatively high exposure to air pollutants since mountain tops receive more pollution–laden precipitation than lower elevation habitats. Montane forests also are more likely to receive particulate pollution from far-off sources just by virtue of their altitudes. At higher altitudes there is nothing between the source of pollution and the mountains where the pollutants are deposited. Since Bicknell's Thrush is so specific in its habitat requirements, it serves as an indicator of the health of these forests.

VCE's research has two components: 1) long term monitoring of bird populations over an elevational gradient at both VMC intensive sites (Mt. Mansfield and Lye Brook) and 2) long-term and shorter-term demographic and ecological studies of target montane bird species on the ridgeline of Mt. Mansfield. This design allows the effects of climate change, mercury pollution and development pressures on these indicator species to be observed and quantified. Since Bicknell's Thrush is so particular in its choice of breeding habitat, changes in abundance or location over the elevational gradient may indicate changes in climate which could compromise the suitability of high elevation habitats for this bird.

As part of the collaboration with VMC, feather and blood samples have been analyzed to measure mercury burdens in Bicknell's Thrush – resulting in the first documentation of mercury bioaccumulation in a terrestrial songbird – information that has been used to make the case for legislation curbing industrial pollution. Data from this research have also helped guide the siting of communications towers and have helped ski areas mitigate their impact on this fragile habitat.

Since the Bicknell's Thrush is migratory, wintering primarily on the island of Hispaniola, VCE conducts monitoring and research there as well. This work is not directly supported by the VMC, but nationals from Haiti and the Dominican Republic have been trained by VCE staff in the subtle science of monitoring a reclusive species. VCE's ongoing efforts have also catalyzed a coalition, The International Bicknell's Thrush Conservation Group, to protect the bird and its habitat across the species' entire migratory range. The population monitoring of this species funded by the VMC has led to fascinating scientific discoveries, as well as to the involvement and education of lay people in the importance of protecting fragile mountain top habitat, highlighting the benefits of continuing this type of work.



Mountain summit habitat of Bicknell's Thrush. Photo by Kent McFarland of the Vermont Center for Ecostudies.

VMC Interview with Researcher Jennifer Pontius

Judy Rosovsky, VMC Monitoring Assistant

Jennifer Pontius, VMC Cooperator and Advisory Committee member

University of Vermont (UVM) Forest Ecosystem Health and Remote Sensing Research Assistant Professor **Jennifer Pontius** started her work in remote sensing at the Forest Service Northern Research Station in Durham, New Hampshire. She received her master's and her PhD at the University of New Hampshire while continuing her association with the Forest Service (FS). Continuing to bridge the Forest Service and academia, Dr. Pontius holds a joint position between the Rubenstein School of Environment and Natural Resources at UVM and the USDA's Northern Research Station at the Aiken Forestry Sciences Laboratory in South Burlington, Vermont. This was a connection initially forged by former UVM Professor and former Dean **Don DeHayes** and UVM adjunct faculty member **Paul Schaberg**, Plant Research Physiologist at the Aiken Lab.

Dr. Pontius's collaboration with the Forest Service extends into her classroom where she teaches natural resources statistics as a service learning class and has her students analyze FS data. In addition to serving on the VMC Advisory Committee, Dr. Pontius's links to the VMC include her thesis advisor, former VMC Executive Director **Jennifer Jenkins**, and her recent NASA grant award with long time VMC cooperator UVM Associate Professor **Beverely Wemple**. An interview with Dr. Pontius follows.

What is your connection to the VMC?

I've been on the VMC advisory committee since coming to Vermont two years ago. This "newbie" status means that I am still discovering all the strengths of the VMC program and exploring the depths of the data archive.

What and where is your current position; what are your research interests?

I hold a unique, joint position between the U.S. Forest Service Northern Research Station and the Rubenstein School at UVM. This allows me to maintain my research focus while being able to work with students (something I truly enjoy). My official title at the Forest Service is Research Ecologist and at UVM, is Research Assistant Professor.

My research is cross-disciplinary with the ultimate goal of scaling plot-based forest health relationships to a landscape scale using remote sensing and GIS modeling. To date, this work has focused on the detection and mapping of pre-visual forest decline symptoms resulting from hemlock woolly adelgid in the Northeast, emerald ash borer in the Midwest and acid deposition/nutrient depletion in the Catskills region of New York. These techniques provide a much-needed tool for the early detection of new and existing stressors and will allow forest management agencies to focus management efforts before stands are severely impacted.

Most recently, I've taken a more historical perspective by examining archives of Landsat imagery to quantify how forest condition has changed over the past several decades and identify the most vulnerable forest types and conditions across the region. We are also using historical imagery to quantify changes in the timing of spring leaf out. Most forest phenology studies are site specific, so this will allow us to see how the larger landscape is responding to climate change.

In what ways do VMC data contribute to your research or teaching efforts, and what could the VMC do to make these data more useful or relevant?

Because of the scale and scope of my research, the availability of historical and archival data is imperative. As a government employee (and by personal ethic) I share all of the data I collect in hopes that others can use them to advance science. The work that VMC does in its data archive does exactly this. This type of data collection and archiving is so important in ecology. Each of us has research plots and specific research questions, but often we miss the more interesting story that the combination of datasets can tell us.

In addition to research, my teaching philosophy centers on problem based learning. This past spring I used VMC data in an applied environmental statistics course. Students were given a set of VMC requested hypotheses to test. They were able to download the data, research the literature, and conduct statistical analyses to explore some of the VMC data sets. This approach to teaching allows students to engage with real world data and hopefully provide useful information to our VMC partners. Students are certainly thankful to have purpose to their assignments and sometimes the peering of so many eyes with different perspectives can uncover new patterns or relationships in the data.

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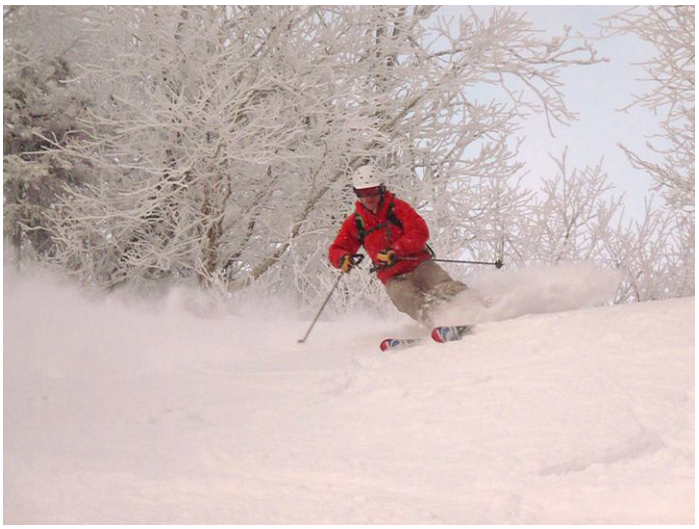
Greetings from VMC's New Data and Web Manager



Aaron Rice, VMC's new Data / Web Manager

Greetings to our VMC Cooperators; I'd like to introduce myself. My name is **Aaron Rice**, and I am the new data/web manager for the VMC. I grew up in Acton, Massachusetts, just outside of Boston, and in 2008, I moved up to Burlington to go to school at UVM. I am now a senior in the Rubenstein School of the Environment and Natural Resources, majoring in environmental science with a concentration in assessment and analysis, as well as minoring in chemistry and computer science.

I am on the UVM Club Ultimate Frisbee team three seasons of the year. Skiing is my biggest passion, however, and I am the Backcountry Ski and Avalanche Awareness Program Coordinator for the UVM Outing Club. Last season I skied more than 75 days between October 2nd and the 4th of July at Tuckerman Ravine on Mount Washington.

January of this year, I received a "job spam" email from a past computer science professor and saw that the job request was from **Carl Waite**, whose name I recognized from the Rubenstein School Greening of Aiken internship I had participated in. Many, if not most of the "job spam" emails leave my inbox as quick as they enter it. However, I had been keeping an eye out for a listing that could combine environmental work with some of the computer science skills I had learned, so I applied for the job at the Vermont Monitoring Cooperative.

At the VMC, I coordinate data and website activities. This entails day to day website maintenance as well as working with project data sets. One of the overarching tasks I have been working on is automating more tasks. On the website the rss feed is automatically updated when a news entry is added. On our end, most of the quality assurance and quality control is now automatically run on a daily basis. This means that the datasets that are downloaded from the website will have up-to-date data.

In addition to work in the office, once or twice a week, I travel out to Proctor Maple Research Center in Underhill, Vermont to collect rain water samples for field and lab analysis. It is great to have the chance to get out into the environment that we are monitoring.

If you have any feedback, input or needs around our website and data management, please let me know. We are always looking for ways to improve our services.

VMC Interview with Jennifer Pontius

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What would be helpful to have: from a GIS perspective it would be so helpful if geographic locations of data collection sites could be included with the data. Even better, an interactive map of plot locations that would allow access based on location rather than data set could be really interesting.

Also (and this may be my bias as a number cruncher), having ALL of the data sets stored in one database so that disparate data sets could be queried and exported jointly would be great. An example of this problem can be seen under the FORESTS data. There are 8 separate data sets for forest health/damage monitoring. It would be easier if, for example, I could query all data on sugar maple and results could pull from all existing data sets, essentially spitting out any values for any sugar maple at any location from any project. Theoretically, one could refine that to query only sugar maple data from Mt. Mansfield, or only sugar maple on Mt. Mansfield collected during the last 3 years. The key is not having to find and download data independently from different links of the data access page. Think of it as a one stop shopping (filter) to get exactly the data you want.

Program from October 2011 VMC Annual Meeting

Welcome and Introductory Remarks
Lawrence Forcier, Principal Investigator, Vermont Monitoring Cooperative

A Contemporary Ecological Perspective on Invasive Species in Forests
Thomas Vogelmann, Dean and Professor, College of Agriculture & Life Sciences, University of Vermont

A Contemporary Legal and Political Perspective on Invasive Species in Vermont Forests
David Mears, Commissioner, Vermont Department of Environmental Conservation

News from VMC Cooperators
Update on Emerald Ash Borer & Asian Long-horned Beetle
Barbara Burns, Forest Health Program Manager, Vermont Department of Forests, Parks & Recreation

Lye Brook Aerosol Monitoring: Progress and Problems
Rich Poirot, Air Quality Planner, Vermont Department of Environmental Conservation

Update on Burlington i-Tree Project
Sara Williams, Laboratory Teacher and Graduate Student, Rubenstein School, University of Vermont

Mount Mansfield Research and Stewardship Center
Chris Rimmer, Director, Vermont Center for Ecostudies
Rick Paradis, Director, Natural Areas Center, Environmental Program, University of Vermont

Panel: *Invasive Species Effects on Forest Ecosystem Production and Stability*
Deane Wang, Moderator, Associate Professor, Rubenstein School, University of Vermont
Jim Kellogg, Aquatic Biologist, Vermont Department of Environmental Conservation
Sharon Plumb, Invasive Species Coordinator, Vermont Chapter of The Nature Conservancy
Bob Popp, Department Botanist, Vermont Fish & Wildlife Department
Kathy Decker, Forestry District Manager, Vermont Department of Forests, Parks & Recreation

Summary Remarks
Michael Snyder, Commissioner, Vermont Department of Forests, Parks & Recreation

Posters
Assessing the Implications of High-Elevation Housing and Recreatioinal Development on Cold Season Processses and Runoff Production in Northern New England, USA
B. Wemple and J. Shanley, University of Vermont and U.S. Geological Survey

Could Freezing Injury Threaten American Chestnut Restoration in the North?
T.M. Saielli, P.G. Schaberg, G.J. Hawley, J.M. Halman, and K.M. Gurney
University of Vermont, U.S. Forest Service, and The American Chestnut Foundation

Northeastern States Research Cooperative: A Research Program for the Northern Forest
USDA Forest Service and NSRC Affiliates

Remote Sensing of Canopy Condition Trends in Northern VT: 1984-2009
J. Pontius, M. Olson, K. White, W. Young, and E. Regan, University of Vermont and U.S. Forest Service

Soil Carbon Monitoring Plots in Vermont's Sustainably Managed Forests
D. Ross, J. Juillerat, and S. Wilmot
University of Vermont Plant & Soil Science Department and Vermont Department of Forests, Parks & Recreation

Student Data Mining: A VMC Database Exploration
J. Pontius, University of Vermont, U.S. Forest Service, and the Vermont Monitoring Cooperative

For presentations, contact information and project data, please visit our website at http://www.uvm.edu/vmc/

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Reminder to Cooperators:

Researchers conducting work in 2012 on state or federal land or at VMC study sites must update their study site permit and project description with VMC. Any changes should be sent to Carl Waite at cwaite@uvm.edu. In addition, if your research is located on the Green Mountain National Forest, please contact VMC and Brian Keel, Research and Monitoring Coordinator of the GMNF, at (802) 362-2307 ext 214 or bkeel@fs.fed.us.

If an existing project remains active and unchanged, please confirm your status with VMC to ensure your study site permit remains active. If you need a copy of your study site application on file, please let us know.

Thank you!

For more information about VMC, please visit our website at http://www.uvm.edu/vmc.

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