HURON MOUNTAIN WILDLIFE
FOUNDATION

Summer 2011
Newsletter

HMWF Funded Research Provides New Insights Into White Pines

Robert Fahey

By Jill Riddell

For thousands of years up until 160 years ago, the white pine was a common species of tree in the Upper Peninsula and throughout the northeastern United States. These exceptionally tall conifers, some of which stick out high above the rest of the forest canopy, were frequently commented upon in the notes of early explorers. Some reacted to the sight with poetry: Thoreau declared "there is no finer tree" than the white pine, and claimed they were "like great harps on which the wind makes music."

But as astounding as the trees appeared when standing, the white pine seemed to be even more miraculous as a building material. The wood was soft and easily worked; it took paint well; and the tree's great height was matched by surprising straightness in its trunk. White pine lumber was perfect for use as studs and joists of buildings. Best of all, it was light enough to float down streams and lakes, and so, unlike heavy maples, it could be transported from the northern forests to the young boomtowns springing up along the Great Lakes. "By the late eighteen hundreds, pretty much all the white pine that could be harvested was harvested," says Robert Fahey, a forest ecologist at The Morton Arboretum in Lisle, Illinois.

Fahey recently completed a study on white pines for his Ph.D. dissertation, supported in part by a two-year grant from the Huron Mountain Wildlife Foundation. Fahey was curious to learn how white pine regenerates in intact northern hardwoods/hemlock/white pine forest. The question is a critical one for wildlife managers as well as foresters, as white pines play a disproportionately important role for nesting raptors: bald eagles and ospreys both favor white pines for perches and nesting sites. Below the canopy, the trunks are important for mammals. Hollow pines provide better den sites for foxes and bears than other species, because the diameter of white pine tends to be larger and the wood is slow to decompose. Such coarse dead wood is useful for animals, and for all these reasons and more, land

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A LIST OF BEST PLACES TO SEE WHITE PINES

We asked Bob Fahey for his favorite places to see white pines in the Huron Mountains. Here are suggestions for seeing big trees, old trees, and multiple ages of trees where you can see succession in action.

Large White Pines Found in Profusion

Fisher Creek trail has the best example of many big trees growing in mesic hardwood forest. These trees are two to three hundred years old, and a favorite feature of this popular hiking trail.

The Oldest Known White Pine

In a wet area along the trail up the north side of Huron Mountain, in a little cleft off of Rush Lake, is a tree that Fahey determined to be 340 years old. This is the oldest one he knows of on the Huron Mountain property.

Best Place to Observe Multiple Ages of White Pines

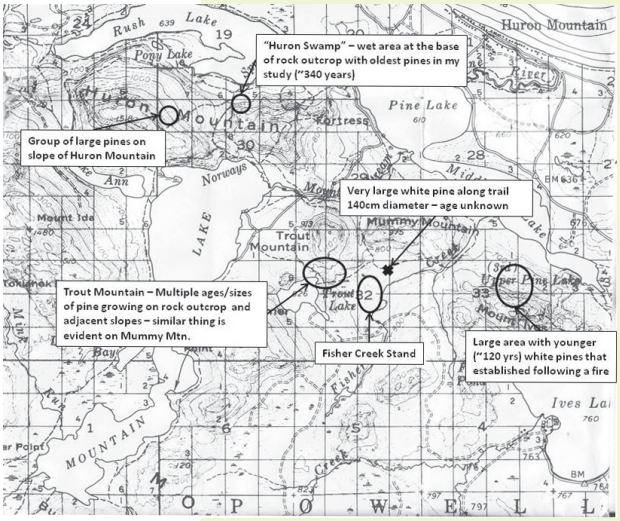
Where the trail from Mountain Lake crosses Trout Mountain, pines of many different ages can be seen regenerating at the outcrops. As you come down off of the slopes of Trout Mountain, there are white pines growing a little bit away from the trail in denser woods on upland mesic soils. Almost certainly the seeds came from the outcrop, demonstrating what Fahey's research is showing.

Cluster of Large Pines on Huron Mountain

On the slope of the tallest mountain grows a group of white pines that date back to fires in the eighteenth and nineteenth century. They are very near the trail on the steep, rocky slopes only a little bit below the ridgeline.

120-year old pines

When the Huron Mountain Club was first established, this grove of handsome white pines that were mere seedlings. They can be found on the north-facing slope of Mount Ives, in an area not near any maintained trails.



Map by Robert Fahey

Early photographs like this one from Cliff Lake show how open the landscape was a hundred years ago. Situations like this were ideal for white pine regeneration because the seedlings had ample sunlight to get a strong headstart. ***Photograph by W.C. Weber, taken 1912. University of Michigan archives***

managers are eager to restore more white pines. "We knew that white pine comes back well on sandy soils," says Fahey. "It was competitive with other species there. This is where they are frequently replanted. But what happens on finer textured soils where the seed source has been removed—that was the question."

Fahey studied remnant hardwood/hemlock forests in eleven different locations in the Huron Mountains, as well a number of other sites in the Porcupine Mountains and in northern Wisconsin. "The Huron Mountains are an unbelievable resource," says Fahey. "As far as a resource for studying old growth forests, there isn't any better place in the Great Lakes region."

White pine is an "early successional species," meaning that it takes hold and manages to grow in the early stages after a disturbance of some sort: a wind throw or a fire, for example. It requires high light levels when it's young, so is unable to regenerate in closed forest stands. The question is what happens if the seed sources for white pine are no longer present when such an opportunity comes along—how could white pine regenerate then? This is the situation facing current forest managers.

Fahey determined that the answer appears to be that if white pines growing in more open areas—such as on the edges of lakes or wetlands or on rock outcrops—are near enough to supply a seed source when a new sunny spot opens up in the interior woods, white pines can regenerate in those disturbances. "At the Huron Mountains, these natural edge areas are so numerous that no part of the forest is ever very far from a rock outcropping or the bank of a lake or river," notes Fahey. "That's how white pine likely maintained itself."

Fahey's analysis of white pine planting experiments suggests that reintroduction of white pine to stands on moister, fine-textured soils may still be possible, but that the success of such management may be dependent on controlling understory light conditions by creating canopy openings. His studies showed that the canopy seems to need to be at least 35 percent open to allow enough light to shine through for white pine seedlings to grow well. In highly managed forests this would entail removal of canopy trees to create gaps, but in natural areas a more opportunistic approach may be needed.

"By the late eighteen hundreds, pretty much all the white pine that could be harvested was harvested."

The research conducted at the Huron Mountains has provided an important piece of missing information on white pine regeneration for forest managers, one that may end up helping the white pines throughout the U.S. This could help restore a majestic species to its rightful place, soaring high in the sky above the canopy and providing habitat below.

White pines grow well on the rocky slopes of Ives Mountain. Fahey's research suggests white pines persisting in such marginal habitats provide seed sources for other areas. ***Photograph by Kerry Woods***

Welcome to the 2011 Research Season

Dear Friends,

As this newsletter goes to press, the Red House is once again turning red. After a few years of renovation conducted with financial support from the National Science Foundation, the new shingles are being stained red and the house is being put to use by our 2011 season scientists.

We are so pleased at the result of the renovation that we're having a party! Please join us on the evening August 5th for an open house pig roast, and art auction to celebrate the work of the Huron Mountain Wildlife Foundation and our renovated facility.

This year, HMWF is seeking to increase contributions to our endowment fund. The Hornblower family established the endowment, and contributions were added last year through very generous bequests from Elizabeth Rumely and Frank Farwell. We seek to honor these gifts and those who made them by growing the endowment further so that we secure the long-term effectiveness of the foundation's work. We hope you will come to the open house, participate in the art auction, and consider a special gift this year to the endowment fund.

HMWF CALENDAR

Red House Celebration
Location: Ives Lake
When: Friday, August 5th
5:00 PM to 9:00 PM

White Pines, Pig Roast,
Art Auction, Lost Creek Band

This newsletter describes the research program for 2011. It's impressive to see the variety and depth of the projects underway. Please come out to Ives Lake to visit with the researchers and find out more about what they are up to. When you do, you will likely see Cynthia Prior who joined the HMWF team this season. Wayne is cutting back his time – or so he says – so Cynthia has agreed to help out at Ives Lake and we are very pleased to have her.

Finally, I want to report that HMWF is starting a mapping project that will include data sets from HMWF research in a GIS format. This is made possible through a special gift from Tracy and Chip Walklet. Soon we will be able to produce maps of research data and site locations so that we can provide more information about what is being found at the Huron Mountains. Stay tuned for more news on this project.

Have a great summer and I hope you get a chance to enjoy the deep north woods of the Huron Mountains.

Sincerely,
Tim Brown
President

Summary of Projects for 2011

By Kerry Woods, Director of Research

With 24 active research projects unfolding over the course of the year, the 2011 field season looks like our liveliest one yet. The opening of the Red House means we'll have no difficulty accommodating an expected modest increase in "researcher-days" compared to the last couple of years. In fact, we were able to operate for the first weeks of the season using only the Red House. Since it's more easily heated than the Stone House, this move provided significant energy savings.

Investigators come from about 20 different institutions in eight states. Six projects are new this year. HMWF is providing partial funding for about half of this year's projects (several of these have additional grant support from other sources). Some of the projects entirely supported by other funders were initiated under HMWF grants in previous years; our efforts to prioritize use of our modest research budget as "seed money" for project initiation seem to be paying off.

Here is a summary of the 2011 program under four headings:

1. Understanding Biodiversity

Understanding patterns of biological diversity is one of the primary challenges of ecological science, and has long been a focus of HMWF's research program. Some projects target the most basic element of biodiversity studies, documentation of species occurrences. While the biota of the Hurons is unusually thoroughly catalogued (see our website for the current "All Taxa Biodiversity Inventory" or ATBI), there remain many groups that are little known, some of which are likely to yield further species new to science.

In this category, **Ron Priest** (Michigan State University) continues his studies of leaf-mining insects; **Eric North** (All Things Wild consulting) is surveying moths and butterflies, which are surprisingly poorly documented, considering how popular they are. North is also studying the land snails. **Mark Wetzel** (Illinois Natural History Survey) will continue sampling aquatic invertebrates, particularly annelid worms.

Other studies add analyses of population distributions and dynamics, or studies of genetic diversity within species. **Charles Krueger and Andrew Muir** (Great Lakes Fishery Commission) are attempting to determine the genetic relationships between the Rush Lake's distinctive "humper" or deep-water lake trout "morphotype" and similar varieties in other lakes and typical lake trout that co-occur in Rush Lake. This project follows up on ground-breaking work by **Mara Zimmerman** several years ago. **Casey Huckins** (Michigan Technological University) will continue long-term monitoring of the breeding population of lake-run "coaster" brook trout in the Salmon Trout River.

Evelyn Williams (University of Wisconsin) is in the final year of her work on the taxonomic relationships and population dynamics of a

poorly understood group of odd, tiny ferns in the genus *Botrychium.* **Oliver Gailing and Erik Lilleskov** (Michigan Technological University) continue analyses of the genetics of two species of oaks – northern red oak and Hill's oak – and their hybrids. **Dana Richter** (Michigan Technological University) continues his long-term monitoring of fruiting in mycorrhizal (root-associated symbiotic) fungi in red pine plantations. Dana and his students have also been updating and revising the full listing of fungus species in our ATBI.

Phil Myers and Alexa Unruh (University of Michigan) are in the second year of an attempt to document diversity and population patterns of shrews. These tiny mammals are particularly difficult to study, and their distributions are very poorly understood. This project follows Phil's much-recognized recent work on changing distributions of rodent species. His studies in the reference ecosystems at Huron Mountains provided critical evidence that species distributions are already showing substantial shifts likely due to climatic warming.

2. Terrestrial Ecosystem Studies

Several projects make use of the extensive old-growth forests at the Huron Mountains. As one of the largest and best-protected such tracts remaining, they're becoming something of a magnet for researchers trying to understand forest dynamics without an overlay of a century or more of active management. In a follow up to previous work on the effects of canopy gaps on soil properties, **Jim Bockheim and Trent Mayr** (University of Wisconsin) are attempting to model the effects of soil properties on susceptibility of trees to wind-throw.

Dennis Riege's (University of Maryland) ongoing study of white pine regeneration and population dynamics on permanent plots near Fisher Creek attempts to further understanding of the role of major disturbances a century or more later. **Bob Fahey** (Morton Arboretum) will be following up on his more extensive studies of white pine demography (the basis of his just-completed Ph.D.), using ground-based LIDAR. LIDAR – "Light Detection and Ranging" – is a radar-like application of a pulsed, low-power laser technology that can be used to analyze three-dimensional structure of forest canopies.

I'll be conducting some research of my own this season, using a new technology to assess soil nutrient availability in half-century-old permanent study plots in several locations in old-growth hemlock-hardwood forests. This approach uses six-inch stakes that are treated with a resin that has absorptive properties similar to plant roots; inserted in the soil for several weeks, these allow us to analyze the actual nutrient environment experienced by growing plants.

Even in the most pristine ecosystems, changes in the surrounding landscape can have large consequences. For example, deer herds have increased dramatically with landscape fragmentation and loss of large predators. As early as 1938, Aldo Leopold warned of the consequences for tree regeneration. Researchers now believe the results of intensified deer browse are much more far-reaching, and that is the focus of a project initiated last year by **Don Waller** (University of Wisconsin), using a large "deer exclosure" to assess effects of deer browse on everything from understory plant communities to nesting bird and invertebrate populations. The exclosure at Huron Mountain provides an important comparative anchor, in unlogged forest, for a more extensive study involving several comparable exclosures across northern Wisconsin and Michigan.

While nonindigenous invasive species are not a prominent presence in the Huron Mountains, one important group of invaders, Eurasian earthworms, is having large effects on old-growth forest processes where they have established. **Erik Lilleskov** (Michigan Technological University) and collaborators are maintaining their long-term monitoring on effects on soil properties and other ecosystem functions across a moving earthworm "invasion front."

Two other studies focus on behavioral ecology of native species. **Craig Frank** (Fordham University) will continue his studies of the hibernation physiology of chipmunks. Funded by the National Science Foundation, this study is another applying new technology. Craig will use temperature-sensitive miniaturized radio-collars on free-ranging chipmunks, monitoring their body temperature throughout hibernation; data will be logged by telemetry from a tracking station at the Ives Lake Field Station. This work promises to give insight on the challenges faced by hibernators as the climate warms.

Lisa Horth (Old Dominion University) is planning an initial, exploratory visit to assess the possibilities of field studies on the behavior of insect pollinators of native orchids, with particular attention to their response to ultraviolet light.

3. Aquatic Ecosystem Studies

Aquatic studies focusing on ecosystem properties continue to establish important baseline data-sets and look at potential effects of environmental change in these systems. Ongoing studies by **Casey Huckins, Amy Marcarelli** (Michigan Technological University), and **Sue Eggert** (U.S. Forest Service) are monitoring biological productivity in the Salmon Trout River and assessing baseline levels of metals in the aquatic foodchain in the River's tributaries and headwaters. **Scott Tiegs** (Oakland University) and **Donna Kashian** (Wayne State University) will continue their geographically extensive studies of ecosystem function and food-chain metals concentrations in several other watersheds in and near the Huron Mountains.

David Costello and Allen Burton (University of Michigan) are expanding on a preliminary study from last year. They will be implementing a more intensive study of the effects of dissolved metals on "biofilms," which are the thin layers of attached algae and bacteria that cover stream and lake bottoms. Biofilms sit at the base of aquatic food chains and are critical to the functioning of aquatic ecosystems.

Jay Lennon and Mario Muscarella (Kellogg Biological Station, Michigan State University) are examining changes in microbial aquatic communities associated with "browning" of lake waters. The phenomenon of lake "browning" results from increased export of organic material from terrestrial ecosystems into lakes; this increase is due, in turn, to increasing temperatures. This project will assess the relationship between the degree of browning and microbial diversity and ecosystem function; once again, the undisturbed watersheds of the Huron Mountains offer a premiere location for a valuable baseline analysis.

4. Landscape Mapping and Monitoring

This category includes projects that provide the baseline data that are crucial to support long-term and integrative research in the future. **Jim Bockheim** (University of Wisconsin) and **Ken Hinkel** (University of Cincinnati) continue their development of a detailed map of the surface geology and soils of Huron Mountain Club lands, with a special focus on the diverse and distinctive glacial geology of the area. This summer, they will complete detailed, sonar-derived bathymetric maps of all of Huron Mountain lakes. (See the image in this newsletter.) The underwater geomorphology of some of these basins includes some of the most distinctive glacial features in the region. With **Fritz Nelson** (University of Delaware), Hinkel is also continuing a long-term study of microclimatic patterns, documenting the sometimes startling interactions of complex terrain and the influences of Lake Superior. Finally, studies of aerial deposition of particulates – an important avenue for input of materials to terrestrial ecosystems – will be initiated this year in collaboration with **Tom Holsen** (Clarkson University).

Summary

Our researchers are attracted by the HMWF's combination of world-class "reference ecosystems" (both aquatic and terrestrial), unusual diversity of biota and habitat, and our secure field site. (Elsewhere, vandalism of field equipment and study sites can have great costs in lost data and work.) This is all made possible by the long-term management under Huron Mountain Club. The comfortable and well-supported working environment at the Foundation's Ives Lake Research Station adds substantially to researcher appeal.

This combination of opportunities is nearly unique in the upper Great Lakes region. Researchers regularly voice their appreciation and excitement at the opportunity to work here. While we operate on a budget that's quite small compared to most major research stations, we continue to draw world-class researchers. Each year, we see increased productivity from HMWF-sponsored research, and the resulting papers and presentations continue to raise our profile in the research community.

It's a great pleasure for me to be able to facilitate all of this; for that and for the value of the work itself, I extend my thanks to the Foundation supporters whose generosity makes it all happen.

RECENT PRESENTATIONS AND PUBLICATIONS FROM HMWF SPONSORED RESEARCH

The value of scientific research is realized when results find their way into the larger community of scientists and managers, enhancing understanding and informing further research. The most prominent metrics for success in this arena are publication in peer-reviewed research journals and presentations at scientific conferences.

It's particularly gratifying to see such results emerging at an increasing rate from HMWF-sponsored projects. Here is a list of research products from the last half-year. In addition to these, I'm aware of about a dozen manuscripts and dissertations that are well along on the route to publication. I look forward to listing them and additional conference presentations in future newsletters.

PUBLICATIONS

Anderson-Carpenter, L.L., J.S. McLachlan, S.T. Jackson, M. Kuch, C.Y. Lumibao, H.N. Poinar. 2011. Ancient DNA from lake sediments: Bridging the gap between paleoecology and genetics. *BMC Evolutionary Biology 2011 11:30.*

Burtner, Ashley M., P.B. McIntyre, J.D. Allan, D.R. Kashian. 2011. The influence of land use and potamodromous fish on ecosystem function in Lake Superior tributaries. *Journal of Great Lakes Research* (in press).

Robert T. Fahey. 2011. *Establishment and persistence of early successional pine species in late-successional landscapes of the Great Lakes region.* Ph.D. Thesis, University of Wisconsin - Madison.

Sarah Schliemann and James Bockheim. 2011. Methods for studying treefall gaps: a review. *Forest Ecology and Management* 261:1143–1151.

CONFERENCE PRESENTATIONS

Oliver Gailing: "Development of Genomic Resources in oaks to study local genetic adaptation." North American Oak Genome Workshop, Santa Barbara, CA. November 2010.

Oliver Gailing: "Development of genomic resources in oaks to study local adaptation to drought." 8th Annual Cottonwood Symposium, Flagstaff, AZ. February 2011.

Jennifer Lind, Erik Lilleskov, Oliver Gailing: "Hybridization and adaptive genetic variation in oaks." 2nd Science in the Northwoods Conference, Boulder Junction, WI. September 2010.

Philip Myers: "Climate Change – already affecting northern Michigan's mammals?" Joint meeting, Michigan Chapter of The Wildlife Society, Michigan Bird Conservation Initiative Ornithological Congress, and Michigan Chapter American Fisheries Society. April 2011.

Alexa Unruh: "Shrews and global change: An investigation of the microclimates experienced by shrews in the northern Great Lakes." Third International Conference: Advances in the Biology of Shrews III, Syktyvkar, Russia, September 2010.

Matt Van Grinsven, Alex Mayer, Casey Huckins: "Estimation of Vertical Groundwater Fluxes into a Streambed through Continuous Temperature Profile Monitoring and the Relationship of Groundwater Fluxes to Coaster Brook Trout Spawning Habitat. American Geophysical Union Fall Meeting, San Francisco, CA. December 2010.

Mark Wetzel: "The Aquatic Oligochaetes (Annelida, Clitellata) of the Huron Mountain Club area, Upper Peninsula, Michigan, USA" 24th annual meeting of the Florida Association of Benthologists, Tampa, FL. November 2010.

Evelyn Williams: "Determining annual morphological change of cryptic *Botrychium* ferns." Invited presentation at the microMORPH Workshop, Boulder, CO. April 2011.

Evelyn Williams and C. Bochte: "Examining *Botrychium* ferns with genetics and morphology." Botanical Society of America Conference, Providence, RI. August 2010.

Denizen of the Upper Peninsula: the Arctic Shrew

Philip Myers, an HMWF researcher, took this photo of a fluffy-coated, bright-eyed Arctic shrew *(Sorex arcticus).* In the United States, the Arctic shrew is found only in the far northern Midwest; in Michigan, it's only in the Upper Peninsula, making it in Myers's words, "a real Huron Mountain specialty."

"Shrews are extremely active animals, and have extraordinary appetites," says Myers. "Every day, the Arctic shrew will eat its body weight or even more in insects. If it's a pregnant female, it will consume twice its bodyweight every day. If it's lactating, it consumes *three times its bodyweight."*

The Arctic shrew can be found anywhere alders are present, and where conditions are conducive to finding all those insects: neither extremely dry soil nor overly wet. Try searching around the edges of the Cranberry Bog or along the shores of one of the lakes. *Photo by Philip Myers.*

About the Huron Mountain Wildlife Foundation:
Since 1955, the Huron Mountain Wildlife Foundation has supported original research in a wide variety of scientific fields. The research takes place in the Upper Peninsula of Michigan. More information on the Foundation can be found at: **www.hmwf.org**

We welcome your comments and suggestions on this newsletter. Please send them to:

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