Holt Research Forest

University of Maine - Holt Research Forest
Strategic Planning - Board of Visitors Report
4-6 October 2017

Board of Visitors:

Dr. Mark Ashton, Yale School of Forestry and Environmental Studies

Dr. Brian Kloeppel, Highlands Biological Station, Western Carolina University

Dr. William Schuster, Black Rock Forest Consortium

Dr. Jennifer Seavey, Shoals Marine Laboratory, University of New Hampshire and Cornell University

Dr. Hilary Swain, Archbold Biological Station

Board of Visitors Agenda

4 October 2017 Activities

Overview and Discussion of Holt Research Forest with Board of Visitors
Attending from University of Maine: Aaron Weiskittel, Mac Hunter, Jack Witham
Attending from Maine TREE Foundation: Kevin McCarthy, Bruce Wiersma

1:00 pm - Site Review Goals and Objectives
1:30 pm - Holt Research Forest History
1:45 pm - Overview of Maine Tree Foundation and Perspectives on Holt Research Forest
2:00 pm - Open Discussion
3:00 pm - Site Visit and Tour

5 October 2017 Activities

Holt Research Forest Workshop at the Patten Free Library
Attendees list - See Appendix

9:00 am - **Introduction and Welcome**
9:15 am - **Landscape Context of Holt Research Forest (HRF)**
- Ecological Significance of Kennebec Estuary: Mitch Hartley, North Atlantic Coordinator, Atlantic Coast Joint Venture, US Fish & Wildlife Service
- Land protection in the Kennebec Estuary: Andy Cutko, Director of Science, The Nature Conservancy, Maine Chapter

10:00 am - **Coffee break, Posters**
10:30 am - **HRF Research**
- Holt Research Forest Overview: Mac Hunter, Department of Wildlife, Fisheries, and Conservation Biology, University of Maine
- Research and Data: Jack Witham, School of Forest Resources, University of Maine
- Forest Dynamics: Aaron Weiskittel, School of Forest Resources, University of Maine

12:00 pm - **Lunc**h
Posters
1:00 pm - **HRF Research continued**
- Of voles and seeds: demographic mechanisms linking tree seeds and rodent population fluctuations: Alessio Mortelliti, Department of Wildlife, Fisheries, and Conservation Biology, University of Maine
- Long-term numerical and spatial response of birds to a group-selection timber harvest in Maine: Steve Campbell, Conservation Biologist, Albany Pine Bush Preserve Commission

2:00pm - **Wrap up and HRF Tour** (Bus transportation to Arrowsic)

6 October 2017 Activities

Discussion with Board of Visitors
Attending from University of Maine: Aaron Weiskittel, Mac Hunter, Jack Witham

8:00 am - Open Discussion and Brainstorming
10:00 am - Final Report Outline and Writing
12:00 pm - Adjourn

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Executive Summary

The Hold Research Forest was established in 1983 and has been the site of long-term ecosystem research to better understand the ecosystem structure and function in the managed mid-coast Maine landscape. A Board of Visitors gathered onsite in October 2017 to review the research, educational outreach, data management, facilities, administrative structure, financial support, and future outlook for Holt Research Forest.

The Board of Visitors provided suggestions to develop three research foci for Holt Research Forest and to build a 10-year vision to enhance the research, education, and collaborative impact of its scientists and staff. A major ecosystem treatment is one of those suggestions that would build collaborations with other organizations, universities, and resource managers. The Board of Visitors also suggested improvements to the facilities, environmental data base management, endowment structure, and to initiate a survey to community partners to continue and broaden community support for Holt Research Forest.

I. Introduction

Since 1983, the University of Maine Holt Research Forest (HRF; http://holtforest.org/) in mid-coast Maine has been the site of long-term ecosystem research. The site is an oak-pine forest type with several long-term data sets including avian, small mammals, trees and regeneration, herbaceous, and others. Holt Research Forest celebrated their 35th anniversary and have experienced a number of recent changes including the funding foundation, retirements of the original project Principal Investigators (PIs) (Dr. Malcolm Hunter, Mr. Alan Kimball, and Dr. Alan White), and transition to new leadership (Dr. Aaron Weiskittel). This is an opportunity to assess where HRF has been, the current status, and explore future opportunities.

HRF received a National Science Foundation Field Station and Marine Lab (FSML) planning grant. Development of a strategic plan is the primary objective of this grant. A step in this process was a team of visiting scientists who were on-site on 4-6 October 2017 to evaluate the history, the current status, and to provide recommendations for improvements at the field station.

Initial funding for the Holt Research Forest was first provided in 1981 by the Holt Woodland Research Foundation (HWRF) which was created by the former owners Bill and Winnifred Holt and their son Rodney. The project began in 1983 with the acceptance of a Research and Management Plan and the hiring of an onsite scientist/property manager and a 3-person student crew. HWRF retained ownership and responsibility for the land and its facilities and contracted with University of Maine for the research.

Initially, the Holt Research Forest had two primary goals, (1) maintain the property as a site for long-term forest ecosystem studies and (2) develop a demonstration forest where state-of-the-art multiple use management techniques can be presented to the public. These goals intersect well as the ecosystem studies monitor the long-term effects of the various forest management practices. The concomitant forest management goals were providing a sustainable crop of high-quality timber, habitat for a diversity of wildlife, and maintaining aesthetics, which all align well with the objectives of most non-industrial private forest owners.

Since its inception, Holt Research Forest has been a site for cooperating researchers, training opportunities for graduate and undergraduate students, and public service and outreach to the community. Holt Research Forest is located in southern coastal Maine and its facilities consist of two buildings on a land base of approximately 125 ha. The vast majority of the property is forested uplands dominated by an oak-pine ecosystem. Some 20 ha are wetlands of various types, primarily salt marsh. The property is bordered by the Back River, an estuarine tributary of the Kennebec River, on the east. Sewell Pond, the largest pond on Arrowsic Island, forms the western boundary. The adjacent properties, north and south of the study area, are forested

conservation land held by The Nature Conservancy and Maine Department of Inland Fisheries and Wildlife.

Long-term baseline data have been collected on many aspects of the forest system, but has focused on components that are reliable and meaningful to monitor. The primary focus has been the woody and herbaceous vegetation. Complete tree inventories in a 40 ha study area have been repeated three times (>30,000 trees per survey) with additional partial inventories. Individual stems have been mapped on 20 ha of the forest. Complete and partial relevé descriptions of plant communities have also been repeated. Numerous sampling methods have been used to evaluate the tree regeneration including stem-mapping on 1.2 ha while seedlings and seeds are monitored annually. Past sampling has included phenological observations as well as fruit production and an examination of reproductive effort by understory herbaceous and woody plants. Numerous other additional studies have been conducted on the forest and include destructive sampling for tree volume and biomass, seed fall traps, and dendrochronology.

Bird studies have included 35 years of bird censusing via territory mapping, plus limited all season strip censusing, and behavioral observations. Mammals have been inventoried by track counts and annual small mammal trapping. Upland salamanders have been extensively sampled and an array of artificial cover boards is used for seasonal population monitoring. The 25 x 25 m resolution study grid has allowed for the development of an extensive spatial database of many components including oak-pine ecosystem types, high intensity soils maps, forest canopy gaps, bird territories, and more. Overall, these projects and others have created a database that provides insights into many aspects of the ecosystem as it dynamically responds to forest management, changes in climate, and various disturbance agents.

II. Mission and Vision for Holt Research Forest

Vision:

Capitalize on the extremely valuable long-term multi-taxon data to generate critical synthesis science that will address and inform forest management and set the stage for the next generation of strategic research. Data management strategies to provide wide access will facilitate collaborations.

Focus on a new treatment(s) such as forest cutting edge, a radical long-term consistent experiment such as removal of deer, or new initiatives for integrated science (e.g. One Health, Ecosystem Health {forest to the sea}, innovative forest management). The impact and outcomes from these and additional steps including ecological manipulations and/or extensions into other components of health, sustainability, and/or climate change should cast a light on

modern environmental and social issues. These treatments should be constructed and championed by the University of Maine.

III. Programs and Facilities

a. Programs at Holt Research Forest - Why does Research at HRF Matter?

The Board of Visitors commends the remarkable achievements of the HRF over the last 35 years. The research includes meticulously collected data from a 35-year long-term spatially explicit integrated study of a suite of forest ecosystem components and processes from tree demography and seed production, to understory plants, salamanders, arthropods (notably ticks), small mammals, and birds. These data on organismic and forest dynamics have already generated many important papers addressing change over time in individual and groups of related taxa. There are many more data to be analyzed and papers to be written.

With the increasing emphasis at HRF on data management to integrate multi-taxa spatial and non-spatial data and the incorporation of new technologies including LIDAR and hyperspectral analysis, the HRF is poised to develop a synthesis of entire community interrelationships and to examine the complexity of responses to abiotic and biotic drivers.

b. Location of Holt Research Forest

i. HRF Setting

Strategic Location: The Board of Visitors were impressed with how many stakeholders recognized and commented on the strategic location of HRF for a myriad of topics:

- It is a key physio-biogeographical location to serve as a natural laboratory for the northern extent of the oak-pine ecoregion/biogeographical provinces forest type.
- The property lies in the critical Kennebec watershed whose residents look to HRF knowledge and research to help guide their conservation decisions.
- Although previous research emphasis has been on the forest treatments, the HRF also includes key forest to salt marsh estuarine, bog, and lacustrine gradients and transitions.
- The HRF contains a latitude and spatial juncture for detecting changing distributions of species in response to climate change comprising plants, birds, and mammals including several listed as threatened or endangered at state or federal levels.
- HRF lies in a fundamentally different forest landscape from northern Maine, with urbanization and changing socio-economic patterns, small private forest management centered around woodlots, and a very high incidence of tick-borne diseases.
- HRF property is protected by conservation easement on all but 15 acres. The adjacent properties are protected, on the northern boundary by The Nature Conservancy and on

the southern boundary by the Maine Department of Inland Fisheries and Wildlife. There are several thousand acres of conservation land within a 10 mile radius.

ii. Evaluation of Existing Facilities and Grounds

The on-site facilities consist of a log house, and a two-story garage/lab. The log house is the residence for the on-site researcher/manager. The second floor garage/lab is primarily used as office space for the on-site staff but also has a multipurpose work area, kitchen, and bathroom. A small travel trailer on a developed site serves as temporary housing for students and others working on the site.

A recently constructed pavilion serves as the site for outdoor educational programming with a large parking area that provides parking for about twenty vehicles or several buses.

No broadband internet connection is currently available. Access is limited to a digital subscriber line (DSL) with upload speeds of 1 Mbps and download speeds of 9.0 Mbps or less.

c. Environmental Monitoring and Data Base Management

Efforts are currently underway to improve data management systems. This includes a focus to update and complete metadata for each data set and make data available for access on sites such as the Forest Ecosystem Monitoring Cooperative (https://www.uvm.edu/femc/). Protecting and effective sharing of the rich HRF data resource, through both easy access in a searchable online relational database, but also advertisement of its existence and broad utility to further analysis is essential to producing the most long-term value.

d. Administrative Structure

i. University of Maine

The Holt Research Forest is ideally positioned to join with other institutions or networks including educational institutions, estuarine research sites, etc., although it is not currently integrated with any other consortia.

ii. Maine TREE Foundation

The mission of the Maine TREE Foundation (MTF) is to educate and provide a voice for the sustainable use of the forest and the ecological, economic, and social health of Maine's forest community.

The Maine TREE Foundation was founded in 1989 by a diverse group of forestland owners and members of Maine's business community. MTF currently has twelve volunteer Board members, three paid employees and between twenty and thirty volunteers depending on the projects

underway. MTF is at an opportunistic juncture in its history. Long-time executive director, Sherry Huber whose tenure spanned 22 years, retired in February 2018. The foundation's new executive, Henry Whittemore, was hired in February 2018 to develop a strategic plan with an eye to build on prior work and further solidify the delivery of our Education and Research mission by placing new emphasis on research and creating improved continuity among our core education, outreach and research programs. Holt Research Forest has been elevated to a core program by the new leadership of MTF.

The Maine TREE Foundation has recently bolstered HRF's efforts to fully implement a data management plan for its extensive data sets. Supplemental funding of $36,500 will enable HRF to complete review and quality checks on data in preparation for sharing of these data sets.

IV. Action Step Recommendations from the Board of Visitors

a. Mission and Vision for Holt Research Forest

Develop three research foci, suggestions include:

- Health research proposal: ticks, deer, ecosystem health; the intersection of ecological health and human health, particularly in light of the expansion of ticks and tick-borne disease. A radical experiment regarding deer and forest management could lead to exploration of whole system functioning.
- Ecosystem approach: a forest management transition from the terrestrial forest to Kennebec estuary
- Capitalize on data sets to focus the next research question/mission
- Connect to the University of Maine Center for Research on Sustainable Forests
- Need to connect to TREE mission. Add value to them to develop their buy-in
- Develop a one-pager or video about the Holt Research Forest
- Promote conservation topic success areas
- National Socio-Environmental Synthesis Center (*SESYNC*) proposal for synthesis product

Suggested Activities to Identify the Holt Vision:

- Write proposal to organize and upload data and to get all the long-term data into a format that is useful and accessible to researchers.
- Develop a Research Symposium workshop to identify strongest research ideas and specifically high research value experiments that Holt could undertake that results in a research proposal.

b. Research Foci at Holt Research Forest

Notes on three potential research areas above.

- Island-wide treatment of removing all deer (~10 square miles):
  - remove deer tick populations - human health impacts
  - impact of 'One Health'
  - monitor forest regeneration recovery after treatment
  - value ($) of oak regeneration recovery
  - small land owner buy-in that their island is a model for recovery after tick
  - example of how Holt Research Forest could become a destination for study

*Potential contacts and/or partners for this study:
immunocontraception: Gona-Con, Dr. Doug Eckery, National Wildlife Research Center; PZP, Dr. Allen Rutberg, Tufts School of Veterinary Medicine; deer capture and removal or sterilization: Dr. Paul Curtis, Cornell Department of Natural Resources; deer removal through sharpshooting: Dr. Anthony DeNicola, President, White Buffalo, Inc.; USDA APHIS; killing ticks on mice with Fipronil: Dr. Rick Ostfeld, Cary Institute of Ecosystem Studies.

- Ecosystem scale approach to conservation:

TNC, KELT, and others seem keen and have resources to join forces to approach Kennebec Estuary from a holistic ecosystem scale. Climate change impacts and scale would be the unifying themes to hold the research and activities together. It must be determined whether the forest will also continue to serve a role in informing communities and forest owners in the oak/pine forest about management techniques, and if so, using a portion of the property to implement new studies of modern silviculture, timber production, and harvest techniques toward developing best practices in these ecosystems should be pursued.

- Forest Management:

What forest management treatment could Holt forest undertake that would generate science questions for small woodlot owner and/or at in the intersection of growing urban areas and working forest?

c. Education Broader Impact

The forest could have greater educational impact, especially if on-site educational staff could were supported. Core understanding of life and earth sciences could readily be taught on site as well as modern environmental issues, human health, and scientific methods. The findings of the long-term research investment and commitment at the HRF should be conveyed to students and residents of the area and championed for the outstanding resources that they represent. If

the Bath, Brunswick, and Freeport (and Lewiston?) school districts each contributed $25 K per year toward a shared educator position, this could be supported. Black Rock Forest Consortium is a model where this works. BRF's model also includes several colleges and universities, which could also be explored at HRF.

Nearly as essential is a new structure to ensure its continued collection and training of a new generation of scientists. Mac and Jack have produced an outstanding legacy that should be championed and they should be used as outstanding mentors for teaching and training excellence in field ecological methods. School of Forestry and School of Wildlife could both benefit by developing field courses and training programs built around Mac and Jack complemented by data analysis courses and new, powerful technologies like G-LiHt. With proper oversight by a PI and coordinators these educational efforts could fill much of the function of continuing and extending these datasets.

It also seems that the Maine TREE Foundation, with their involvement in HRF and stated core mission of environmental education, could/should play a major role in expanding education programs. They should be part of the discussion in developing the future educational programming at the forest. It does not seem that they have done much in this area to date which begs the question of whether they are an appropriate partner (and controller of the endowment funds).

d. New Facility Needs at Holt Research Forest

Facilities are lacking and purchasing and repairing the church, with its rich history of rattlesnakes, ghosts, and lake monsters, could provide a real beachhead for the University. Alternately or in addition, a yurt campus could be constructed for low cost (see pacific yurt company or better yet the Copperthwaite yurts elsewhere in Maine). Eventually new, customized office, lodging, lab, conference and classroom facilities could be constructed.

Broadband internet access is essential. There are some modern, low-cost technologies using 802.11 b and 900 MHz radios, possibly using the existing met tower, which might help solve this issue (see SayCel).

To increase staffing support, leverage the University of Maine Center for Research on Sustainable Forests existing staff. The potential long-term HRF staffing model could include: Resident Manager, Scientist, Outreach Manager, Field Technician, and Data Manager.

e. Environmental Monitoring and Data Base Management

An annual or biannual Research Symposium should be held regionally or at Holt Research Forest and be integrated with other interested research partners and stakeholders in

and around the Kennebec Estuary and college/university, conservation, and non-profit communities.

Communicate the story:

- Need better presentation about the context of HRF in the landscape
- Need to connect the studies and talk about what is unique about data/research
- How do we scale the dynamics at HRF to the region?
- Holt Research Forest needs branding, not individual scientists

f. Other Processes for Improvement at Holt Research Forest

- Endowment

A more transparent treatment of the endowment funds seems like an important first step. There may be more productive ways to invest and use these funds. Holt Research Forest does not need a $1 milion / year budget, at least not right away, but $75,000 per year is completely untenable. Endowment investment policies and management should be re-evaluated and perhaps changed. But additional investment beyond the endowment is clearly needed.

- Develop a survey for partner/community members:
    - What could the Holt Forest mean for your group?
    - How could a partnership with the HRF increase the impact of your organization?
    - Input on Strategic Priorities for Holt Research Forest

- A small grants annual fund competition of $50 k per year could generate a lot more activity and science, even if it only lasted for 5 to 10 years.

- Simplified Budget: list all costs at Holt Forest, regardless of whether University of Maine or Maine TREE is paying them

Appendix A. List of Attendees at HRF Research Workshop, 5 October 2017

Name	Affiliation	Role
Mark Ashton	Yale University	Board of Visitors
Si Balch	New England Forestry Foundation	participant
Justin Becknell	Colby College	participant
Barrie Brusila	Maine TREE Board	participant
Steve Campbell	Albany Pine Bush Preserve	presenter
Clarke Cooper	UMaine	participant
Andy Cutko	TNC	presenter
Kevin Doran	Maine Forest Service	participant
Susan Elias	UMaine and Vector-Borne Disease Lab	poster
Nicholas Fisichelli	Schoodic Institute	participant
Susan Gallo	Maine Audubon	participant
Mitch Hartley	USFWS	presenter
Libby Henderson	MMC Vector-Borne Disease Laboratory	poster
Mac Hunter	UMaine	presenter
Tori Jackson	UMaine Coop. Ext.	participant
Patty Jones	Bowdoin College	participant
Alan Kimball	UMaine retired	participant
Carrie Kinne	Kennebec Estuary Land Trust	participant
Brian Kloeppel	Western Carolina University	Board of Visitors
Kevin McCarthy	Maine TREE Board	host committee
Alessio Mortelliti	UMaine	presenter
Steve Pelletier	Stantec Consulting Services	participant
Bill Schuster	Black Rock Forest	Board of Visitors
Jennifer Seavey	Shoals Marine Lab	Board of Visitors
Laura Sewall	Bates College Morse Mountain	participant
Nancy Sferra	The Nature Conservancy	participant
Joanne Sharpe	independent researcher at HRF	poster
Joe Staples	University of Southern Maine	participant
Hilary Swain	Archbold Research Station	Board of Visitors
Aaron Weiskittel	UMaine	presenter
Andy Whitman	Manomet	participant
Jack Witham	UMaine	presenter
Chris Woodall	USFS Durham	participant