

# HOLT

Research Forest

## *STRATEGIC PLAN*

2019-2029

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# OUR VISION

To provide research, education, and guidance to ecologically and economically maintain and manage oak-pine forest ecosystems.

## Welcome

Welcome to the Holt Research Forest, where forest ecology research blends with K-12 science studies and brings students, teachers, and families into the woods. The Maine TREE Foundation (Timber Research and Environmental Education) is a statewide not-for-profit organization whose mission is to educate and advocate for the sustainable use of the forest and the ecological, economic, and social health of Maine's forest communities. We accomplish this broad mission in a number of ways, including the development and delivery of forestry education curricula based in outdoor classrooms. With active outreach to many communities in Maine, our programs and networks span the entire length of the state.

Maine TREE has been the steward of this forest in Arrowsic since 2014. It is an important focus of the organization, as it provides an opportunity to combine the rigors of university-led research with school-based citizen science. It also serves as a template for schools and communities to follow in beginning local forest-based scientific inquiries.

With this strategic plan, we are pleased to have the opportunity to integrate the Holt Forest's 36 years of ecological research with our programs. Our work here will help the public to become better educated about forest ecology and the importance of forests to Maine and the broader region. We expect our work will inform big-picture issues such as forests' role in mitigating the impacts of climate change as well as topics like invasive species and the influence of mammals on tree regeneration. With the development of this strategic plan, we anticipate a mutually beneficial strategic partnership with the University of Maine and we look forward to the next cycle of forest ecology research to be conducted at the Holt Research Forest.

*Henry Whittemore  
Executive Director  
Maine TREE Foundation*



*Cover Photo: View over salt marsh from Holt Research Forest. Photo courtesy Jack Witham.*

# OUR MISSION

To utilize and collect quality long-term, multi-taxon data to generate critical synthesis science that will inform and teach forest, wildlife, and watershed scientists, managers, landowners, students, and the public.

## Executive Summary

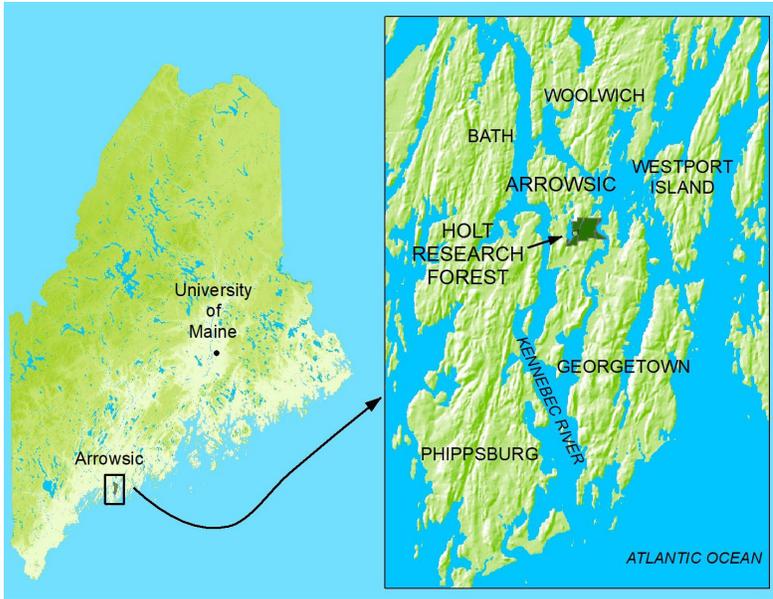
The Holt Research Forest was established in 1983 and has conducted place-based long-term ecosystem forest research with rigorous data standards. These studies have helped to better understand the ecosystem structure and function in the managed mid-coast Maine landscape. This strategic plan grew from a Board of Visitors review in October 2017 to consider the research, educational curricula, outreach, data management, facilities, administrative structure, financial support, and future outlook of Holt Research Forest. The following mission, vision, and strategic plan outlines goals and initiatives to promote research, education, and outreach over a 10-year timeframe. In addition, the strategic administrative and facility development are characterized along with measures of accountability and success. Major milestones for success are listed and potential model comparisons of terrestrial biological field stations are provided for the administrative leadership of Holt Research Forest to review, explore, consider, and compare. A major ecosystem treatment is one potential unifying collaboration that may strengthen relationships with other organizations, universities, and resource managers. Further collaborations are needed to better cement local, regional, and statewide support for Holt Research Forest.

*Brian D. Kloeppe, Ph.D.  
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and Natural Resources  
Dean, Graduate School and Research  
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To learn more  
about  
Holt Research Forest  
visit  
[holtforest.org](http://holtforest.org)

# History of the Holt Research Forest

The Holt Research Forest (HRF) is a field station located in southern mid-coastal Maine with a 36-year history of multidisciplinary ecological research. The land base of approximately 125 ha (300 acres) features a red oak-white pine forest ecosystem, an important and relatively understudied forest type in Maine. The vast majority of the property is forested uplands while 20 ha (50 acres) 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 northern and southern boundaries of the property are adjacent to largely forested conservation land held by The Nature Conservancy and the Maine Department of Inland Fisheries and Wildlife.



Holt Research Forest is located in Arrowsic, Maine.

Funding for the Holt Research Forest was first provided in 1981 and research began in 1983. 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 forest management practices. The concomitant forest management goals were able to provide a sustainable crop of high-quality timber and habitat for a diversity of wildlife while maintaining aesthetics, which aligns 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. A team of scientists conducted a peer review of the project in 1996 and applauded the comprehensive and long-term research emphasis because it included elements of critical importance to maintaining healthy forests and to meeting the needs of woodland owners in Maine and adjacent states. They suggested that maintenance of a productive healthy oak-pine ecosystem should remain the key element of the research vision because of its economic and biological value to the region. One of their conclusions was that the maintenance of research activity is crucial to reap the future benefits of the past investment in data collection. The 2017 Board of Visitors Report reinforced these conclusions with more urgency given to the continuation of the research and expansion of outreach and education at Holt Research Forest.

Long-term baseline data has been collected on many aspects of the forest system, but the primary focus is on components that are



# Holt: Long-Term Ecological Research

*Long-term ecological research* is rare due to the expense and time required. The Holt Research Forest, a unique coastal oak-pine ecosystem in southern Maine, is a fine example of the value and importance of conducting long-term ecological research. Since 1983, University of Maine faculty have led studies on forest vegetation and wildlife in response to land management at Holt Research Forest. Amazingly, most of this research has been overseen and implemented by one scientist: Jack Witham. This vital research has provided insights into the complexity of forest ecosystems and shifts in certain ecological communities due to management as well as changing environmental conditions. However, the current research program at the Holt Research Forest is at a key transition with changes in university faculty involvement, a shift of oversight to the Maine TREE Foundation, and the last active management being conducted over three decades ago.

Change does create opportunity and with the support of the National Science Foundation, a new ten-year strategic vision has been developed for the Holt Research Forest with the help of an outstanding Board of Visitors that included Drs. Mark Ashton, Brian Kloeppe, William Schuster, Jennifer Seavey, and Hilary Swain. Additional input and ideas were generated by more than twenty faculty and researchers from a variety of institutions at the review held in December 2018. The unique strengths of the Holt Research Forest and potential strategic opportunities have been identified and are elaborated on in this ten-year strategic plan. I believe the successful implementation of this plan will create another rich four decades of research that leverage the last three decades of effort.

I look forward to continuing to partner with the Maine TREE Foundation to execute this exciting and innovative strategic vision that maintains the uniqueness of long-term research at the Holt Research Forest.

*Dr. Aaron Weiskittel*  
Director

*University of Maine Center for  
Research on Sustainable Forests*



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## *History continued*

reliable and meaningful to monitor; in particular, woody and herbaceous vegetation, birds, small mammals, and salamanders. 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. Today, the Holt Research Forest remains a unique field site with significant opportunities for additional research due to its proximity to a major metropolitan area, ecological features, and extensive multidisciplinary ecological database, as well as important ancillary components that should be monitored.

The Holt Woodland Research Foundation owned the property and funded the research program from 1981 until 2014 when it was dissolved and all assets were turned over to the Maine TREE (Timber Research and Environmental Education) Foundation, a statewide organization with a strong forest education agenda. This strategic plan is a key step for sustaining Holt Research Forest's research and education programs through another three decades or more.

# Strategic Direction

Direction

## 1 Research Excellence

Goal 1.1: Archive research data, document with metadata, and create long-term online accessibility for all existing Holt Research Forest data

Initiative 1.1.1: Process existing data into a common format that is stable and consistent with other online ecological data

Initiative 1.1.2: Locate Holt Research Forest data on server space off site to maximize accessibility and minimize internet traffic for on site personnel and visitors

Goal 1.2: Identify and summarize research studies at Holt Research Forest

Initiative 1.2.1: Collect and archive research study plans, investigator contact information, study site location data, and maps to maximize study visibility, promote research collaboration, and minimize study interferences with each other

Goal 1.3: Increase research use of Holt Research Forest

Initiative 1.3.1: Create online research site use form to promote inquiry from other scientists and easier management of research site use requests at Holt Research Forest

*Above: More than 30,000 trees have been carefully measured to document growth and changes in the 40 hectare study area. Opposite: Summer camp kids visit Holt Forest (photo by Becky Kolak). Outdoor education for all ages has become a new focus at HRF.*

Goal 1.4: Identify, discuss, and initiate planning for a long-term manipulative research treatment that will integrate a research focus at Holt Research Forest

Initiative 1.4.1: Consider manipulative treatments such as forest cutting edge, total deer removal, or innovative forest management

Initiative 1.4.2: Identify research collaborators and funding sources to support the pretreatment data collection, treatment, and initial follow-up data collection

Initiative 1.4.3: Identify funding agencies, institutes, and collaborators to support hypothesis-driven research on the framework of the long-term manipulative treatment

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## Direction 2 Education Excellence

Goal 2.1: Identify target education audiences for college and university faculty, staff, and students

Initiative 2.1.1: Initiate and improve educational programming at Holt Research Forest to include educational programming targeted to schools and community partners

Initiative 2.1.2: Provide access to Holt Research Forest scientists to lead field tours and research presentations

Initiative 2.1.3: Summarize list of colleges and universities that can potentially benefit from access to field research sites and scientists at Holt Research Forest

Initiative 2.1.4: Develop plan to invite and recruit faculty to utilize educational resources at Holt Research Forest by presenting at college and university seminars and inviting faculty to introductory site visits at Holt Research Forest

Initiative 2.1.5: Collaborate with Maine TREE Foundation to strengthen and improve educational programming by prioritizing audiences best served by the Maine TREE Foundation and audiences best served by the Holt Research Forest



## 3 Outreach Excellence

Goal 3.1: Formalize Holt Research Forest outreach plan and process

Initiative 3.1.1: Summarize audiences to be served by Holt Research Forest in collaboration with the Maine TREE Foundation, including primary schools, secondary schools, general public, and special audiences

Initiative 3.1.2: Identify outreach process to reach each audience including website, social media, on-site presentations, off-site presentations, printed materials, other media

Initiative 3.1.3: Determine the training, expertise, and funding required to further develop outreach staff including the timing and scheduling of staffing over weekly and annual time scales, and linkages that need to be built with collaborating and competing outreach partners



## 4 Administrative Excellence

Goal 4.1: Create an administrative structure for Holt Research Forest to lead it for the next 10 years

Initiative 4.1.1: Support the Director of Holt Research Forest with field research staff

Initiative 4.1.2: Support the Director of Holt Research Forest with data management and web content management staff

Initiative 4.1.3: Support the Director of Holt Research Forest with education and outreach staff

Initiative 4.1.4: Support the Director of Holt Research Forest with budgeting and accounting staff support

*Above: Workshop at the HRF pavilion. As a result of numerous workshops for natural resource professionals and forest landowners, research has been transformed into practical knowledge. Right: Lady slippers. By documenting changes in the plants of HRF we have seen a decline in the abundance of many understory herbaceous and woody species; we believe primarily due to white-tail deer herbivory.*

Goal 4.2: Clarify relationship between Maine TREE and Holt Research Forest

Initiative 4.2.1: Review, discuss, clarify, and write expectations of both Maine TREE to Holt Research Forest and Holt Research Forest to Maine TREE, including agreements of formal funding and in-kind support

Initiative 4.2.2: Maximize the Maine TREE Holt Endowment yield to the Holt Research Forest and increase additions to the endowment to solidify and expand programming

Goal 4.3: Clarify relationship between the University of Maine and Holt Research Forest

Initiative 4.3.1: Review, discuss, clarify, and write expectations of both University of Maine to Holt Research Forest and Holt Research Forest to University of Maine, including formal funding and in-kind support

Direction

## 5 Facility Development

Goal 5.1: In collaboration with Maine TREE Foundation, summarize 10-year expectations for facility development at Holt Research Forest

Initiative 5.1.1: Programming drives personnel needs and personnel drives facility needs. Quantify the need for flexible multipurpose space that will meet the needs of research first, education second, and outreach third

Initiative 5.1.2: Determine the size, characteristics, and location of research and data management space

Initiative 5.1.3: Determine the size, characteristics, and location of housing for short-term seasonal staff, long-term visitors, and short-term visitors, or resident staff

Initiative 5.1.4: Determine the size, characteristics, and location of education and outreach space

Initiative 5.1.3: Quantify the internet capacity needed now for non-limiting on site research, education, and outreach and the source and funding to deliver this capacity to Holt Research Forest



# Direction 6 Accountability & Success Measures

Goal 6.1: Generate annual report of research, education, and outreach products

Initiative 6.1.1: Summarize publications, published data sets, and website maps and products

Initiative 6.1.2: Summarize educational products including publications, theses and reports, presentations and posters, student field trip user days, and in-residence student user days



Initiative 6.1.3: Summarize outreach products including number of presentations, Holt Research Forest visitors, and website hits

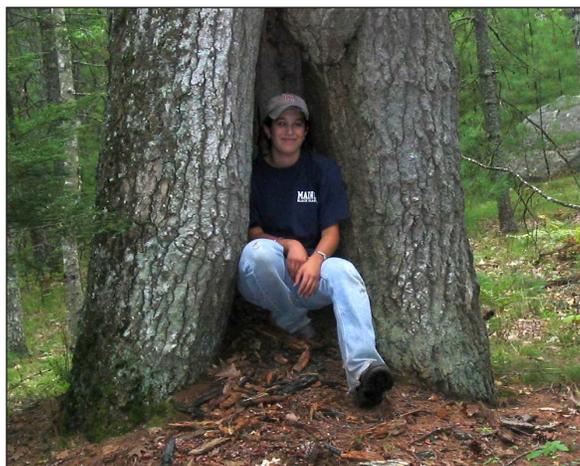
Initiative 6.1.4: Summarize annual budget of Holt Research Forest, including funding from Maine TREE, University of Maine, submitted proposals and funded grants, user fees, and donations

Goal 6.2: Identify three annual foci from Strategic Plan

Initiative 6.2.1: Holt Research Forest and leadership team identifies three foci from the Strategic Plan to facilitate continuous improvement each year

Goal 6.3: Assess strategic plan progress and direction

Initiative 6.3.1: Reconvene Board of Visitors every five years to assess progress, impact, and direction of Strategic Plan



*Above:* UMaine researcher Dr. Aaron Weiskittel, Holt Research Forest ecologist Jack Witham, and remote sensing specialist Dave Sandilands. The availability of GPS, new aerial photography, and G-LiHT data from NASA have greatly improved our ability to monitor changes to the structure of the forest community. *Bottom right:* Field crew student on break. Summer work experience gained at HRF has led many students to outstanding natural resource careers.

# ACKNOWLEDGMENTS

Maine TREE, Holt Research Forest site manager Jack Witham, and the Center for Research on Sustainable Forests greatly appreciate the contributions to this plan from participants at the October 2017 Board of Visitors meeting (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), and financial support from the National Science Foundation Field Stations and Marine Laboratories Program (Grant #1624065).



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## APPENDICES

### **Appendix 1: Milestones in Holt Research Forest Development**

1. Develop staffing plan to build the ability to make the Holt Research Forest web presence a destination, data accessible, current data collection sustainable, educational programming visible, and facilities usable.
2. Secure National Science Foundation funding for facility development: structure in phase 1, phase 2, phase 3, etc.
3. Apply forest treatment such as deer exclusion, tree openings or other habitat alteration, target tree species removal, etc. Forest treatments must be replicated in multiple locations to facilitate critical peer review of results emanating from scientific hypotheses
4. Increase student engagement in pre- and post-treatment data collection
5. Increase collaboration of potential research partners from foundation of forest treatments and resulting data collection
6. Increase educational excellence and outreach excellence based on data and research results

### **Appendix 2: Model Comparisons for Terrestrial Biological Field Stations**

*BlackRock Forest Consortium, New York*

Director, Dr. William Schuster, [wschuster@blackrockforest.org](mailto:wschuster@blackrockforest.org)

*Kemp Natural Resources Station, University of Wisconsin-Madison, Wisconsin*

Station Superintendent, Dr. Scott Bowe, [sbowe@wisc.edu](mailto:sbowe@wisc.edu)

*Mountain Lake Biological Station, University of Virginia, Virginia*

Associate Director, Dr. Eric Nagy, [esn8n@virginia.edu](mailto:esn8n@virginia.edu)

*Raystown Field Station, Juniata College, Pennsylvania*

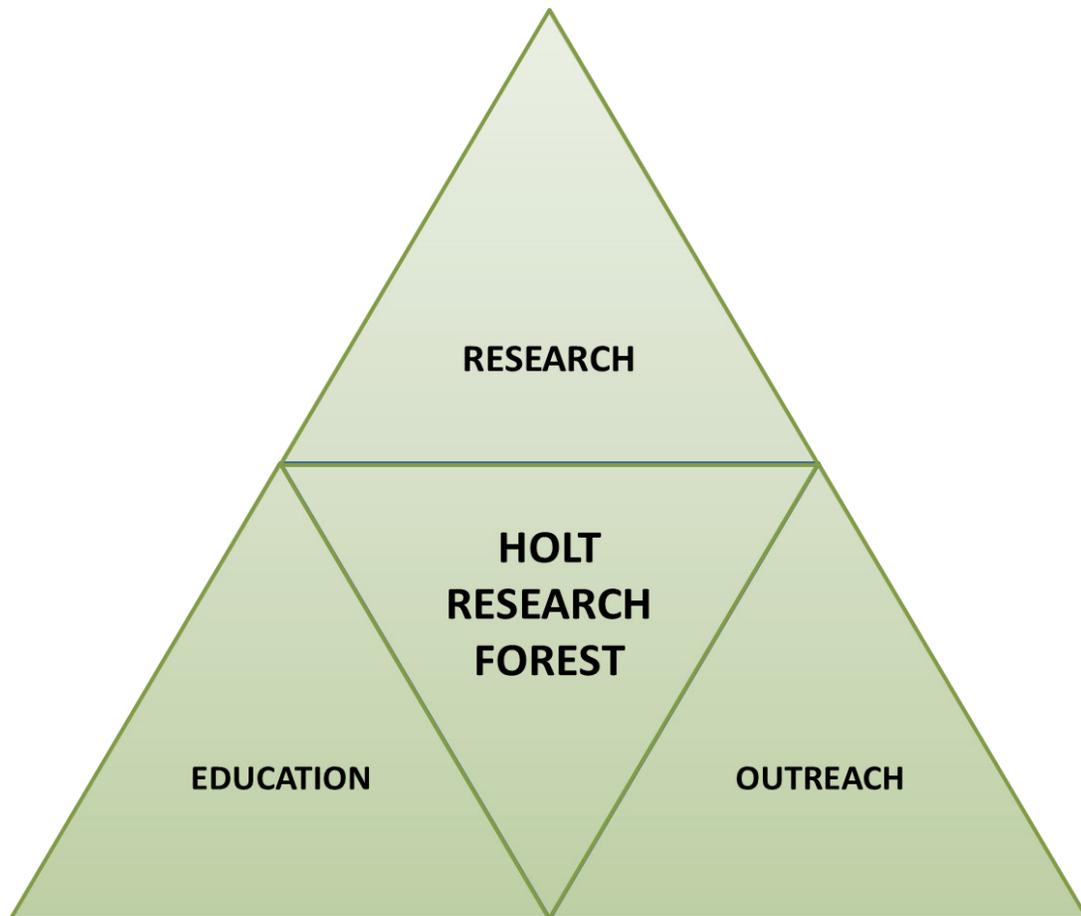
Director, Dr. Chuck Yohn, [yohn@juniata.edu](mailto:yohn@juniata.edu)

*Thomas More Field Station, Thomas More University, Kentucky*

Director, Dr. Christopher Lorentz, [Christopher.Lorentz@thomasmore.edu](mailto:Christopher.Lorentz@thomasmore.edu)

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