

PENOBSCOT EXPERIMENTAL FOREST: RESOURCES, ADMINISTRATION, AND MISSION

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Abstract.—The Penobscot Experimental Forest (PEF) was established more than 60 years ago as a result of private forest landowners' interest in supporting forest research in Maine. In 1950, nine pulp and paper and land-holding companies pooled resources and purchased almost 4,000 acres of land in east-central Maine. The property was named the Penobscot Experimental Forest and was leased to the U.S. Department of Agriculture, Forest Service for 99 years to provide a location for long-term forest management research in a mixed northern conifer forest.

The PEF is large enough to encompass a variety of stand, site, and soil conditions. From the very beginning, its proximity to the University of Maine has fostered a close working relationship among U.S. Forest Service and university researchers. In 1994, the landowners donated the PEF to the University of Maine Foundation. The deed and subsequent memorandum of understanding outlined the mission of the PEF, its management, and its governance as a joint venture by the U.S. Forest Service, the University of Maine, and the University of Maine Foundation. Today the PEF supports a broadened research mission; provides scholarships for students at the University's School of Forest Resources; and exemplifies the benefits of a lasting, shared commitment to long-term silvicultural and ecosystem research, education, and outreach.

PROPERTY HISTORY

The 3,855-acre Penobscot Experimental Forest (PEF) is centrally located in Maine, east of the Penobscot River in the towns of Bradley and Eddington (Fig. 1). Since 1950, the PEF has been the site of internationally recognized long-term forest ecosystem and silvicultural research on Northern Forest types. The University of Maine Foundation has owned the PEF since 1994. Today the PEF has a broadened research mission and provides scholarship support for students at the University's School of Forest Resources.

The PEF arose from private forest landowners' need for and willingness to support forest research in Maine. In the mid-1940s, nine pulp and paper and land-holding companies discussed establishing a long-term research area for the spruce-fir (*Picea-Abies*) forest type so important to Maine.

The history of the PEF before 1950 is not well documented. It is known that by 1859 there were 14 single-board mills, 3 mills with gangs of saws, 4 clapboard mills, 4 lath machines, and 3 shingle mills in Bradley village alone (Town of Bradley 2012). Only a small portion of the PEF was cleared for agriculture or grazing, though most of the area was cut lightly in the 20 to 40 years before 1950 for pine (*Pinus*), hemlock (*Tsuga*), and spruce sawlogs. Earlier cutting may have been heavier. The presence of charcoal and old burned stumps in some areas indicates that fires occurred following the cutting of pine stands. In 1950, stands on the PEF were 60 to 100 years old with a few older trees scattered throughout the area (U.S. Forest Service 2006).

In 1950, the nine companies pooled resources and purchased close to 4,000 acres of land in east-central Maine, 10 miles north of the city of Bangor and

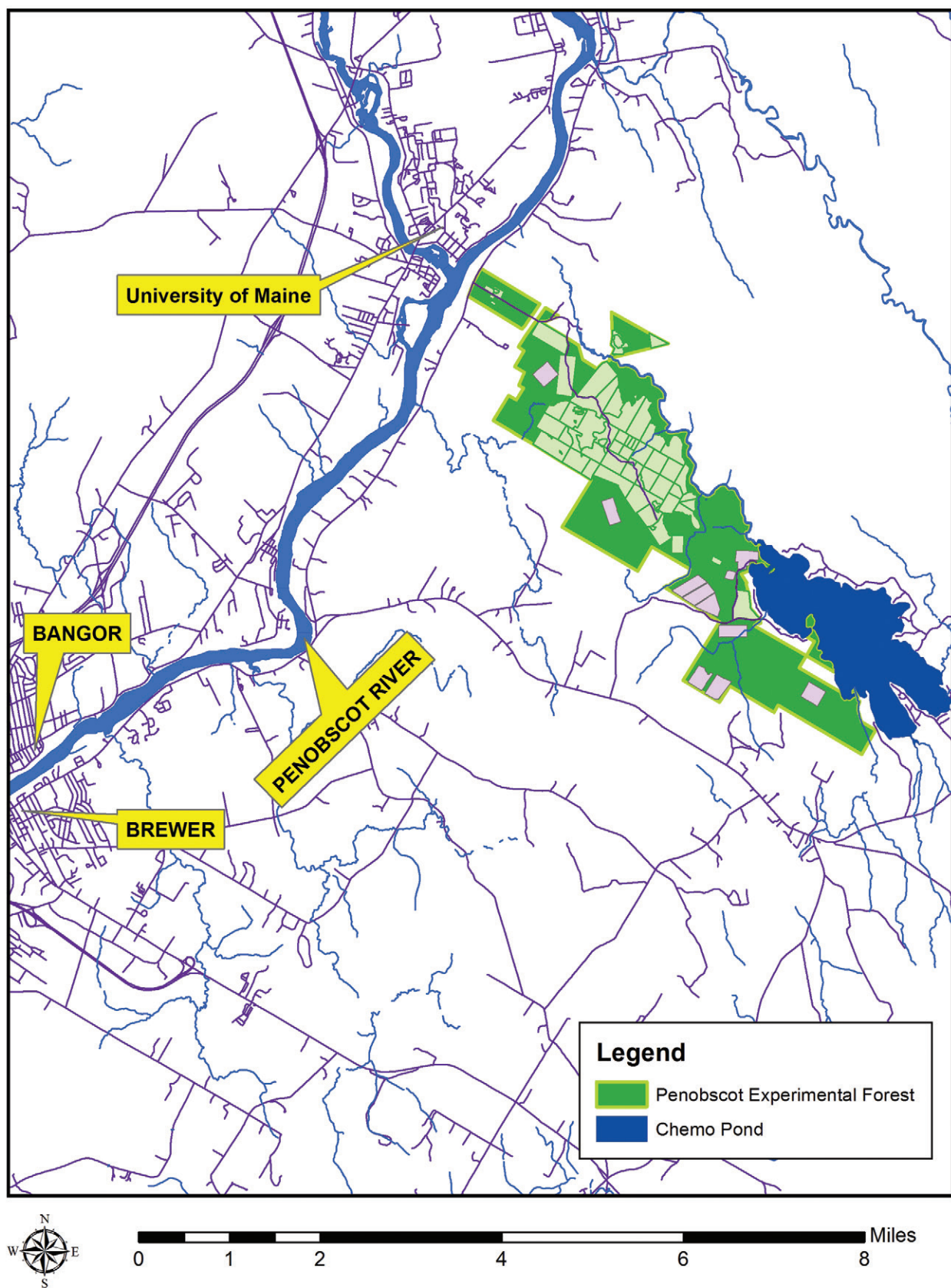


Figure 1.—Location of the Penobscot Experimental Forest.

15 miles from the University of Maine campus. The property was named the Penobscot Experimental Forest and was leased to the U.S. Department of Agriculture (USDA), Forest Service, Northeastern Forest Experiment Station (now the Northern Research Station) for 99 years to provide a location for long-term forest management research in a mixed northern conifer forest.

In 1984, the then-12 private firms that owned the PEF in common, undivided ownership each deeded their respective interest in the 225 acres surrounding the historic Leonard's Mills dam to the Maine Forest and Logging Museum, Inc. This transaction reduced the PEF to its present size. All 12 deeds reserved rights of way over and across Government Road and also across what is now known as the IP Road.

In 1994, the landowners donated the PEF to the University of Maine Foundation. The deed and subsequent memorandum of understanding (MOU) between the Northeastern Forest Experiment Station and the University of Maine contained specific language outlining the mission of the PEF and its governance. According to the MOU, "The primary mission of the PEF is to provide a location where long-term research, developmental activities, and demonstrations on forested ecosystems may be carried out... Closely related to the primary mission is the role that the PEF plays in the education of students, professionals, and the general public."

Under the MOU between the University of Maine and the Northeastern Forest Experiment Station, the U.S. Forest Service will maintain control of its 1,257 acres of long-term research sites for the balance of the original 99-year lease; any new research on the PEF is subject to approval by the Research Operations Team, a committee comprising University and U.S. Forest Service scientists.

AREA DESCRIPTION

The PEF is located on the east side of the Penobscot River northeast of Bangor, Maine and presently contains 3,855 acres¹ in the towns of Bradley and Eddington. The PEF is accessible by the Chemo Pond Road from Maine Route 9 when traveling east from Brewer, or from Maine Route 178 to the main entrance in Bradley. From the main entrance the Government Road, a gravel road, traverses the PEF for 5 miles to the Chemo Pond Road; a gravel road continues southerly across the remaining PEF property for another 1.5 miles. Along the Government Road there are multiple side roads that provide gated access to various parts of the PEF.

The PEF is in the heart of the region known as the lower Penobscot Valley. The cities of Bangor and Brewer are less than 15 miles from the PEF (Fig. 1) and represent one of the largest and fastest growing population centers in Maine. The towns around this urban center report increased residential home and second home construction. A recent report by the U.S. Forest Service suggests that this portion of Maine "is among the 15 watersheds in the Nation projected to experience the greatest increases in housing density on private forests by 2030" (Stein et al. 2005: 7). If expectations about population and home construction prove true, the forest land surrounding the PEF will be subjected to substantial development pressure. Consideration of these trends will have to be part of the management and research planning process. Increased growth holds a variety of implications for recreational use, wildlife habitat, invasive species, and the economics of the timber industry in the immediate area and entire region.

¹ Most acreages quoted in this document are based on geographic information systems analysis using a combination of photo interpretation and global positioning system technology. These are not survey acres and this document does not intend to represent them as such.

Forest Soils

The soil survey published by the USDA Natural Resources Conservation Service for Penobscot County (Soil Survey Staff 1963) includes a general soil map that shows the vicinity of the PEF as being covered by three distinct soil associations. These three associations are arranged from northwest to southeast and from the shores of the Penobscot River to the shores of Chemo Pond. The association that lies along the Penobscot River is the Suffield-Buxton-Biddeford association, described as silty, well-drained to very poorly drained soils on rolling and depressional topography that developed in the fine-textured lacustrine or marine materials deposited when the glaciers sunk Maine's coastline. Soils of marine origin are found along the Penobscot River to Passadumkeag, and up the Passadumkeag River nearly to Saponac Lake. Farther from the river, the Plaisted-Thorndike-Howland association occurs and is characterized by moderately well to well-drained, stony and ledgy, deep to shallow, granitic and slaty soils that developed in the glacial tills of the upland. The Monarda-Burnham-Dixmont association surrounding Chemo Pond is composed of wet, dominantly very stony soils that also developed in the glacial tills of the uplands. This coarse overview is useful for placing the soils into a landscape context. Figure 2 depicts the soils of the PEF categorized by drainage class.

Water Resources

About 6.5 miles of the PEF property boundary fall along Blackman Stream and Chemo Pond (Fig. 2). The pond, the stream, their tributaries, and several hundred acres of associated wetlands (both forested and nonforested) contribute to the beauty, diversity, and habitat value of the PEF. The many wetlands adjacent to and flowing into Blackman Stream and Chemo Pond from the PEF afford locally and regionally important habitat for a host of game and nongame species. Wood ducks, otters, mink, turtles, and frogs are abundant in these wetlands. Moose, beavers, great blue herons, black ducks, loons, and eagles are often seen by those enjoying the winding, flat water as they paddle upstream on Blackman Stream from Leonard's Mills to Chemo Pond.

Chemo Pond is a large, predominantly shallow (maximum depth 24 feet), warm-water pond. Anglers enjoy fast action for white perch, yellow perch, chain pickerel, and small-mouthed bass in both winter and summer. Chemo Pond has slightly below-average water quality. The surrounding peatlands and wetlands contribute phosphorus responsible for the tea-like color of the water. The Pond has a number of seasonal and year-round homes that ring the shore on all but the PEF frontage. These homes are reached from Route 9 easterly via the private Chemo Pond Road; northerly via Bruckoff, Scott Point, and Getchell Roads; or westerly via Yawaca Road. There is a commercial campground and boat launch, Dean's Landing, located where the Chemo Pond Road meets the pond shore. The stream and pond are thus important recreational resources for people living along them as well as for visitors from the entire region.

Blackman Stream and Chemo Pond are currently priority waters in the forefront of a major collaborative effort to improve passage for sea-run fish to their original habitats in several major watersheds in New England. One of the goals of this effort is to reestablish the impressive spawning runs of alewives in Blackman Stream that have been impossible since the construction of the first timber crib dams at Veazie and Great Works in the 1830s (Watts 2003). Currently the Penobscot River Restoration Trust is working to enhance energy production at the dams in Stillwater, West Enfield, and Medway so that the Veazie and Great Works dams can be breached or removed to allow passage for Atlantic salmon, alewives, herring, sturgeon, and eels (Penobscot River Restoration Trust 2013). In addition, they plan to establish a bypass for fish around the Howland dam. Based on the apparent success of those efforts, the U.S. Department of the Interior, Fish and Wildlife Service and the Atlantic Salmon Federation approached the Maine Forest and Logging Museum and built an aesthetically complementary fishway around the historic Leonard's Mills dam in Bradley. Protecting the shorelines, water quality, wetlands, and associated viewsheds of Blackman Stream and Chemo Pond all need to be considered when planning management and research activities within the PEF.

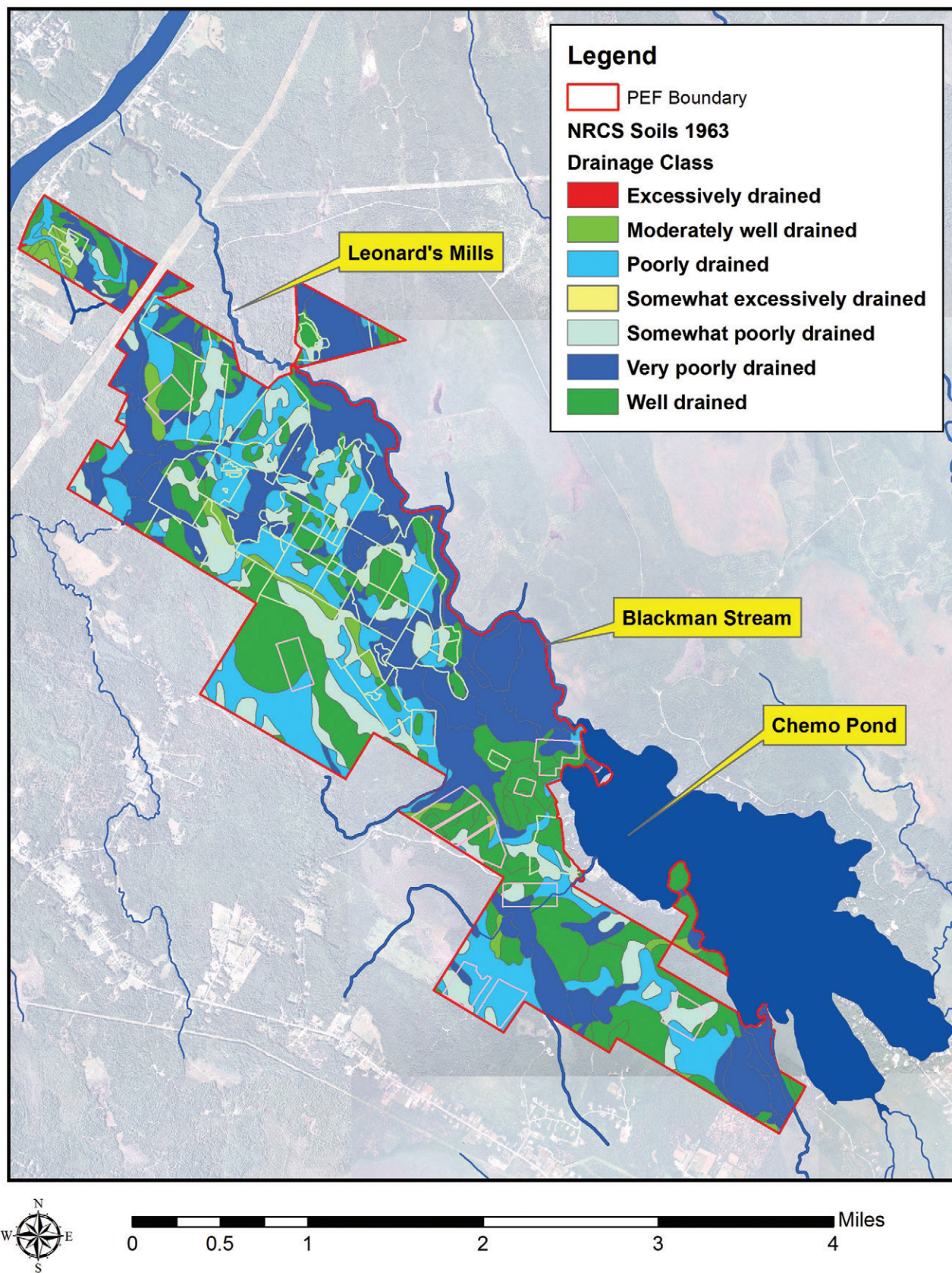


Figure 2.—Soils of the Penobscot Experimental Forest by drainage class.

Special Management Zones and Conservation Areas

State Shoreland Zoning (SLZ) regulations govern management on a sizable portion of the PEF. Maine's minimum mandatory shoreland zoning requirements currently call for SLZ partial-harvest or no-harvest buffer distances of 75 to 250 feet around water bodies, riparian corridors, and significant wetlands, depending on the size and character of the feature. These buffers directly influence the management options on more than 225 acres of the PEF. Additional special habitat areas occur on the PEF and receive specific protections.

An eagle nest on the south side of Chemo Pond receives special protection at the State and Federal levels. Management of the forest around the nest is conducted under guidelines from the Maine Department of Inland Fish and Wildlife. Harvesting is prohibited within 330 feet of the nest and this buffer area overlaps with the shoreland zoning buffer as well. The PEF staff takes extra care to identify nest sites to ensure that management activities do not negatively affect them.

ADMINISTRATION AND MANAGEMENT

The administration of the PEF is governed by the 1994 deed from Penobscot Experimental Forest, Inc. to the University of Maine Foundation and was further clarified in the MOU that was signed in 1995 between the Northeastern Forest Experiment Station and the University of Maine's College of Natural Sciences, Forestry and Agriculture (NFA). The deed specifies the provision of an annual Penobscot Experimental Forest Scholarship, which covers in-state undergraduate tuition to the University of Maine for 1 year for a student majoring in forest resources. It also specifies that this scholarship be fully funded each year before any other expenditures are made for research or management on the PEF. The MOU was to remain in effect for 50 years (the balance of the U.S. Forest Service's 99-year lease), with periodic reviews every 5 years.

In compliance with the 1995 MOU, a Research Operations Team (ROT) was formed consisting of one representative from NFA appointed by the dean, one representative from the Maine Agricultural and Forest Experiment Station appointed by the director, and two representatives from the U.S. Forest Service appointed by the director of the Northeastern Forest Experiment Station. Any new research on the PEF is subject to approval by the ROT. The ROT administers the research funds derived from harvests on the PEF and as funds permit, issues requests for proposals and awards those research funds on a competitive basis.

Chairing of the ROT alternates annually between University and U.S. Forest Service personnel. The ROT works with the forest manager of the University of Maine (who is also the forest manager for the University of Maine Foundation) to set policies for the PEF. The University's forest manager and the chair of the PEF ROT are responsible for the day-to-day operations, management, and maintenance of the PEF. The University's forest manager is responsible for non-research management activities on the PEF, e.g., property boundary line and road maintenance, oversight of harvesting activities, and interaction with recreational users and municipal and state authorities.

In 2007, a new MOU was signed between the U.S. Forest Service, Northern Research Station and the University of Maine's School of Forest Resources. This MOU made only minor revisions (mostly recognizing the new names for the respective agencies) and was in effect for 5 years. Work is underway on the next MOU, which will add the University of Maine Foundation as signatory and reflect the evolution of the administration of the PEF.

Areas of Management and Research Responsibility

The original MOU gave the U.S. Forest Service full administrative control over all PEF areas containing ongoing research or demonstrations installed prior to the date of the agreement (see Figure 3). The U.S. Forest Service's long-term research area is located

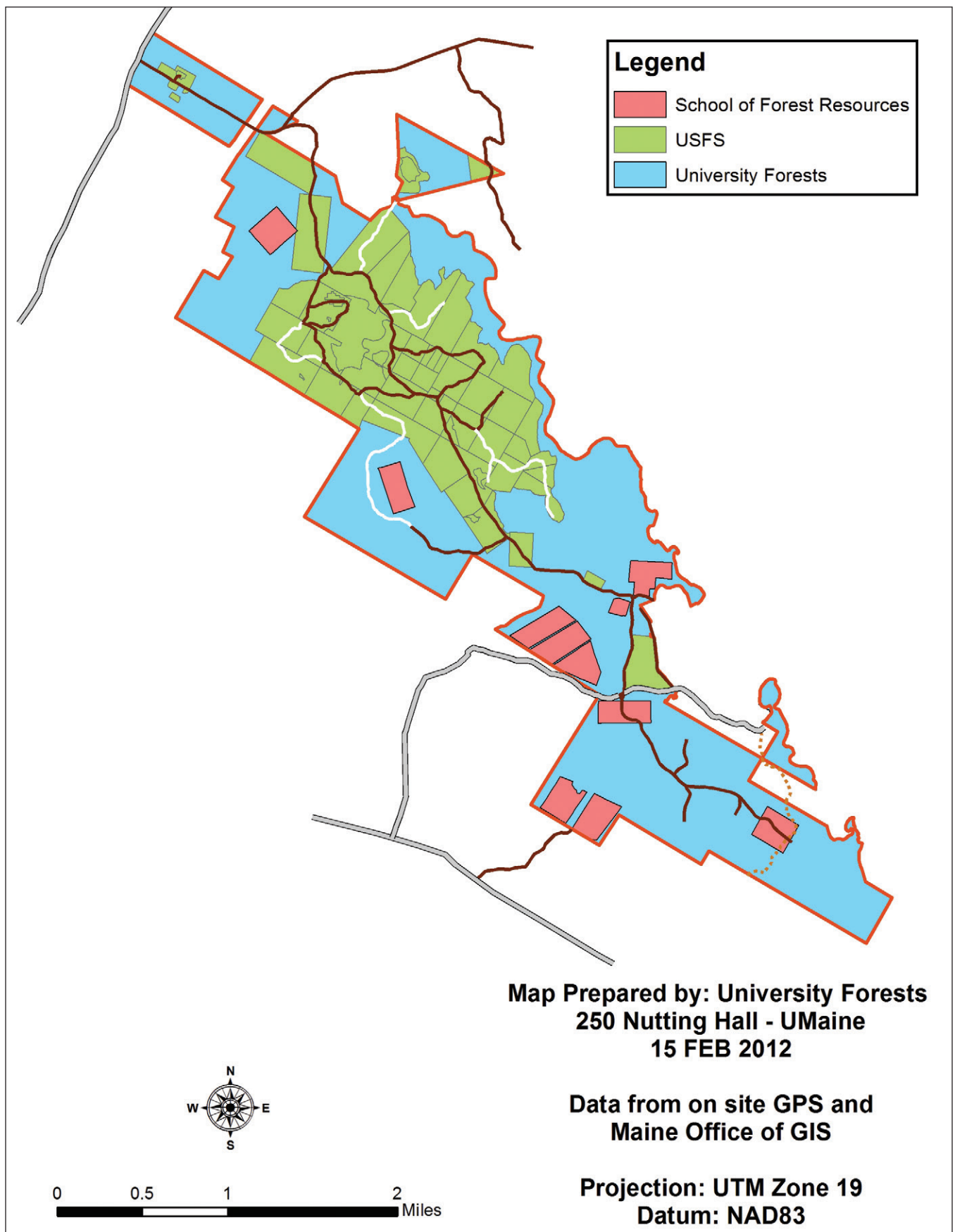


Figure 3.—Research and management responsibility at the Penobscot Experimental Forest.

approximately in the middle of the PEF and covers 1,257 acres (Table 1). This area has been host to a number of cooperative studies with University researchers including work on forest growth and development, wildlife habitat, forest insects, and studies of commercial thinning (the last in cooperation with the School's landowner-funded Cooperative Forestry Research Unit).

Two University-sponsored programs—the Acadian Forest Ecosystem Research Program (AFERP) and the Land-Use Effects on Amphibian Populations Program (LEAP)—were initiated as long-term research on the PEF separate from the U.S. Forest Service studies. These two programs occupied 302 acres across the PEF (Table 1). Part of the AFERP study area was later used for the University's Silvicultural Intensity and Species Composition (SIComp) Study. As of October 2009 the two LEAP arrays on the PEF were discontinued and now AFERP constitutes the largest area of University research outside of the U.S. Forest Service's long-term research area (Fig. 3).

Deducting PEF land used in the U.S. Forest Service studies, AFERP, and SIComp (Table 1 and Fig. 3) leaves the working forest portion, which is managed by the University Forests office in accordance with the 2009 forest management plan (Morrill and Kimball 2009). Faculty, staff, and students at the School of Forest Resources, as well as U.S. Forest Service personnel and practicing professionals from across

New England, worked together to develop this plan. A current forest inventory and forest simulation software were used to create multiple management scenarios, the results of which were evaluated both spatially and temporally. Sustainable harvest estimates, derived from growth modeling with the Landscape Management System software, were integrated into a comprehensive harvest planning schedule.

Compartments A, B, and C (1,260 acres; Table 1) are managed under this plan. Most of Compartment D, which borders Blackman Stream to the north and includes a large percentage of forested and unforested wetland along the riparian zone, is designated as a reserve area (629 acres).

The original MOU states, "All forestry operations will be planned and executed in such a way that research needs are given priority" and further defines the role of the PEF to include educating students, professionals, and the public. The management objectives for the working forest portion of the PEF are designed to:

1. Yield a sustainable supply of timber and associated income to satisfy scholarship, research, and management goals. In addition, management actions will achieve the reasonable regulation of acreage and volumes harvested over the long term. The forest will be managed for a diversity of structural conditions using a variety of silvicultural systems.

Table 1.—Acres of Penobscot Experimental Forest features and research

From PEF 2009 management plan	U.S. Forest Service research area	University of Maine research area	Non-forested wetland	Roads and landings	Non-wetland reserves	SLZ 75-foot buffer	No current access	Forest land under University of Maine management	Grand total acres
Compartment A	NA	26	70	5.86	0	27	87	244	460
Compartment B	NA	105	0	15.53	0	4	0	495	620
Compartment C	NA	148	111	11.47	29	69	0	521	889
Compartment D	NA	23	426	1.94	180	NA	NA	0	631
Total acres	1,257	302	607	34.8	209	100	87	1,260	3,857

2. Continue support of current research projects and provide opportunities for new projects in the future. As outlined in the MOU, obligations of annual contributions to research and scholarship funds will be fulfilled. Venues and support for field demonstrations and tours open to students, forestry professionals, and the public will be provided.
3. Support biodiversity by providing a diversity of plant species, developmental stages, and structures across all management compartments. Diverse and unique habitat types, significant to a broad spectrum of plant and animal species, will be maintained and enhanced where appropriate. Unique habitats and imperiled species will be protected.
4. Maintain water quality and soil integrity through attention to appropriate silvicultural and operational principles to include meeting or exceeding all applicable state water quality Best Management Practices.
5. Protect historical and cultural resources.
6. Provide a spectrum of safe recreational experiences for a variety of users insofar as that is possible without compromising the first five objectives. The PEF is first and foremost a research forest; recreation is therefore a second-tier objective. Nonetheless, given the projections of rapid development in the lower Penobscot watershed, the recreational pressure on the area's three largest public forests—the Bangor City Forest, the University's Dwight B. Demeritt Forest, and the PEF—can only be expected to increase.

THINKING BACK AND LOOKING FORWARD

The PEF's last 60 years stand as an example of what can be accomplished through cooperation and a lasting, shared commitment to long-term silvicultural and ecosystem research. The U.S. Forest Service,

University of Maine, and University of Maine Foundation are committed to continuing the PEF's long-standing leadership in supporting a diversity of research in the Acadian Forest Region. As we celebrate the accomplishments of the first 60 years, it is with renewed resolve to ensure that the PEF remains a focal point of applied forest research, education, and outreach vital to Maine and the entire Acadian Forest Region for decades to come.

ACKNOWLEDGMENTS

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