# An Order establishing the Rhinelander Experimental Forest

By virtue of the authority vested in me by 7 CFR 2.60(a) and 36 CFR 251.23, I hereby designate as the Rhinelander Experimental Forest the lands described in the preceding establishment record prepared by Deahn Donner on July 6, 2015 and recommended by Michael T. Rains, Station Director, Northern Research Station in concurrence of Paul Strong, Forest Supervisor, Chequamegon-Nicolet National Forest and Kathleen Atkinson, Regional Forester, Region 9. These lands shall hereafter be administered as an experimental forest, subject to the regulations at 36 CFR 251.23 and instructions issued thereunder.

Mary Wagner
FOR Thomas Tidwell, Chief

12.29.2015
Date

**WASINGTON OFFICE REVIEW PAGE**

for

EXPERIMENTAL FOREST ESTABLISHMENT RECORD

# Rhinelander Experimental Forest

Oneida County, Wisconsin

Establishment of the Rhinelander Experimental Forest for the described purposes has been reviewed by the following:

| | | |
|---|---|---|
| Reviewed by: | GREGORY C. SMITH, DIRECTOR, LANDS AND REALTY MANAGEMENT | Date: |
| Concurrence of: | LESLIE WELDON, DEPUTY CHIEF, NATIONAL FOREST SYSTEM | Date: |
| Reviewed by: | TORAL PATEL-WEYNAND, DIRECTOR, SUSTAINABLE FOREST SERVICE MANAGEMENT RESEARCH STAFF | Date: Dec 17, 2015 |
| Concurrence of: | CARLOS RODRIGUEZ-FRANCO, ACTING DEPUTY CHIEF, RESEARCH AND DEVELOPMENT | Date: 12/21/2015 |
| Reviewed by: | OFFICE OF GENERAL COUNCIL Vince Vukelich, Associate Regional Attorney OGC-Milwaukee | Date: 12/23/2015 |

**WASINGTON OFFICE REVIEW PAGE**

for

EXPERIMENTAL FOREST ESTABLISHMENT RECORD

# Rhinelander Experimental Forest

Oneida County, Wisconsin

Establishment of the Rhinelander Experimental Forest for the described purposes has been reviewed by the following:

Reviewed by: _____ Date: 12/28/2015
GREGORY C. SMITH, DIRECTOR, LANDS AND REALTY MANAGEMENT

Concurrence of: _____ Date: 12-28-15
LESLIE WELDON, DEPUTY CHIEF, NATIONAL FOREST SYSTEM

Reviewed by: _____ Date: Dec 17, 2015
TORAL PATEL-WEYNAND, DIRECTOR,
SUSTAINABLE FOREST SERVICE MANAGEMENT RESEARCH STAFF

Concurrence of: _____ Date: 12/21/2015
CARLOS RODRIGUEZ-FRANCO, ACTING DEPUTY CHIEF,
RESEARCH AND DEVELOPMENT

Reviewed by: _____ Date: _____
OFFICE OF GENERAL COUNCIL

**WASINGTON OFFICE REVIEW PAGE**

for

EXPERIMENTAL FOREST ESTABLISHMENT RECORD

# Rhinelander Experimental Forest

Oneida County, Wisconsin

Establishment of the Rhinelander Experimental Forest for the described purposes has been reviewed by the following:

| | | |
|---|---|---|
| Reviewed by: | _____ GREGORY C. SMITH, DIRECTOR, LANDS AND REALTY MANAGEMENT | Date: _____ |
| Concurrence of: | _____ LESLIE WELDON, DEPUTY CHIEF, NATIONAL FOREST SYSTEM | Date: _____ |
| Reviewed by: | Toral Patel-Weynand TORAL PATEL-WEYNAND, DIRECTOR, SUSTAINABLE FOREST SERVICE MANAGEMENT RESEARCH STAFF | Date: Dec. 17, 2015 |
| Concurrence of : | CARLOS RODRIGUEZ-FRANCO, ACTING DEPUTY CHIEF, RESEARCH AND DEVELOPMENT | Date: 12/21/2015 |
| Reviewed by: | _____ OFFICE OF GENERAL COUNCIL | Date: _____ |

**SIGNATURE PAGE**

for

EXPERIMENTAL FOREST ESTABLISHMENT RECORD

# Rhinelander Experimental Forest

Oneida County, Wisconsin

Establishment of the Rhinelander Experimental Forest for the described purposes is recommended by the following:

Prepared by: _____ Date: 7-27-2015
SUE M. LIETZ, FORESTER, NRS, RHINELANDER, WI

Prepared by: _____ Date: 7-27-15
DEAHN DONNER, PROJECT LEADER, NRS, RHINELANDER, WI

Recommended by: _____ Date: 8/13/2015
MICHAEL T. RAINS, DIRECTOR, NRS, NEWTOWN SQUARE, PA

Concurrence of: _____ Date: 8/3/15
PAUL STRONG, SUPERVISOR, CHEQUAMEGON-NICOLET NATIONAL FOREST, RHINELANDER, WI

Concurrence of: _____ Date: 8/18/15
KATHLEEN ATKINSON, REGIONAL FORESTER, EASTERN REGION, MILWAUKEE, WI

United States Department of Agriculture

Forest Service

July 2015

# Establishment Record for Rhinelander Experimental Forest

## Lands Administered by the Forest Service in Oneida County, Wisconsin

Cover photos:

Pine Plantation and Karnosky Lab, D. Bauman, 2010

Langley Lake, S. Lietz 2014

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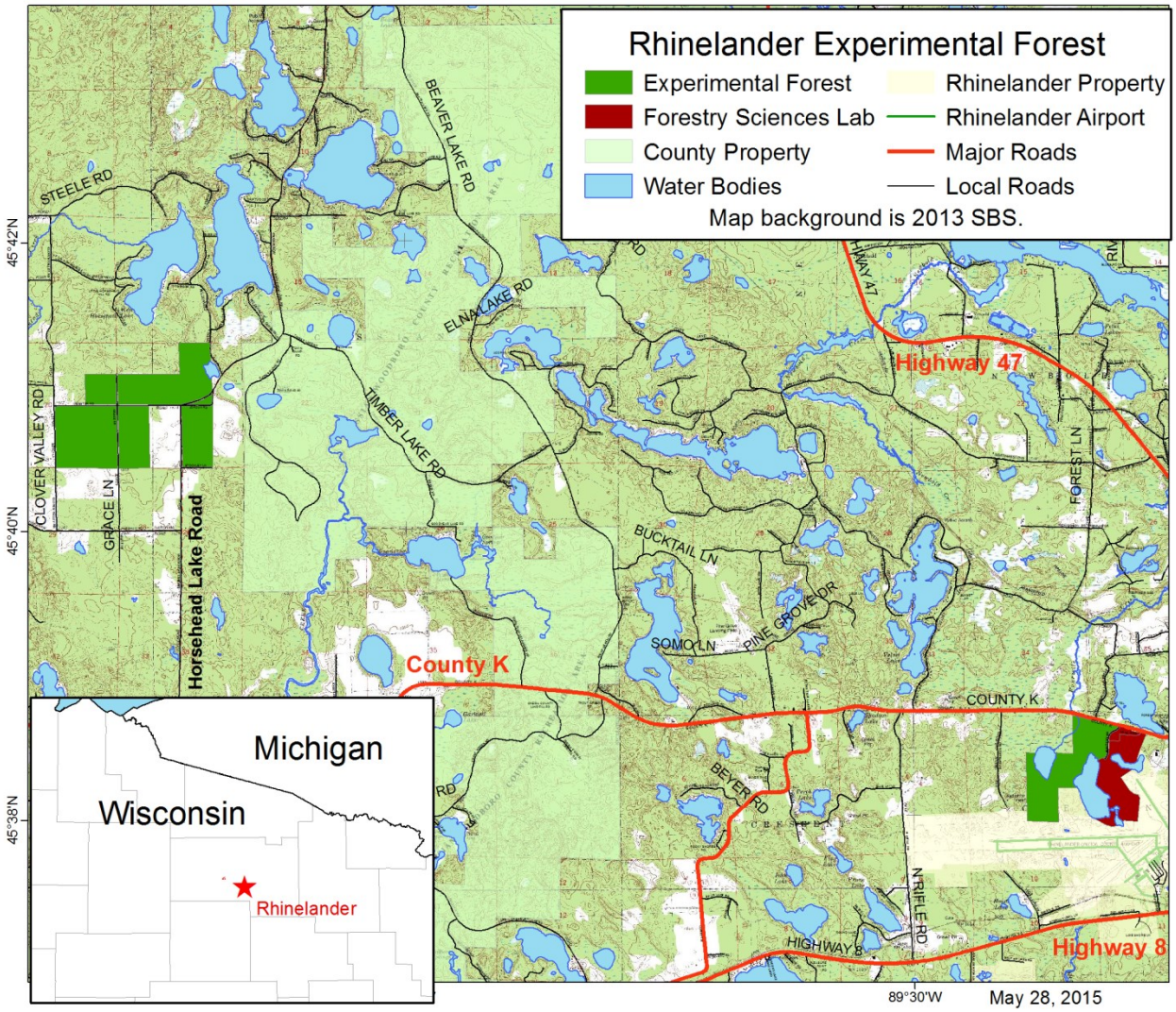
# 1. LOCATION, BOUNDARIES, AND OWNERSHIP

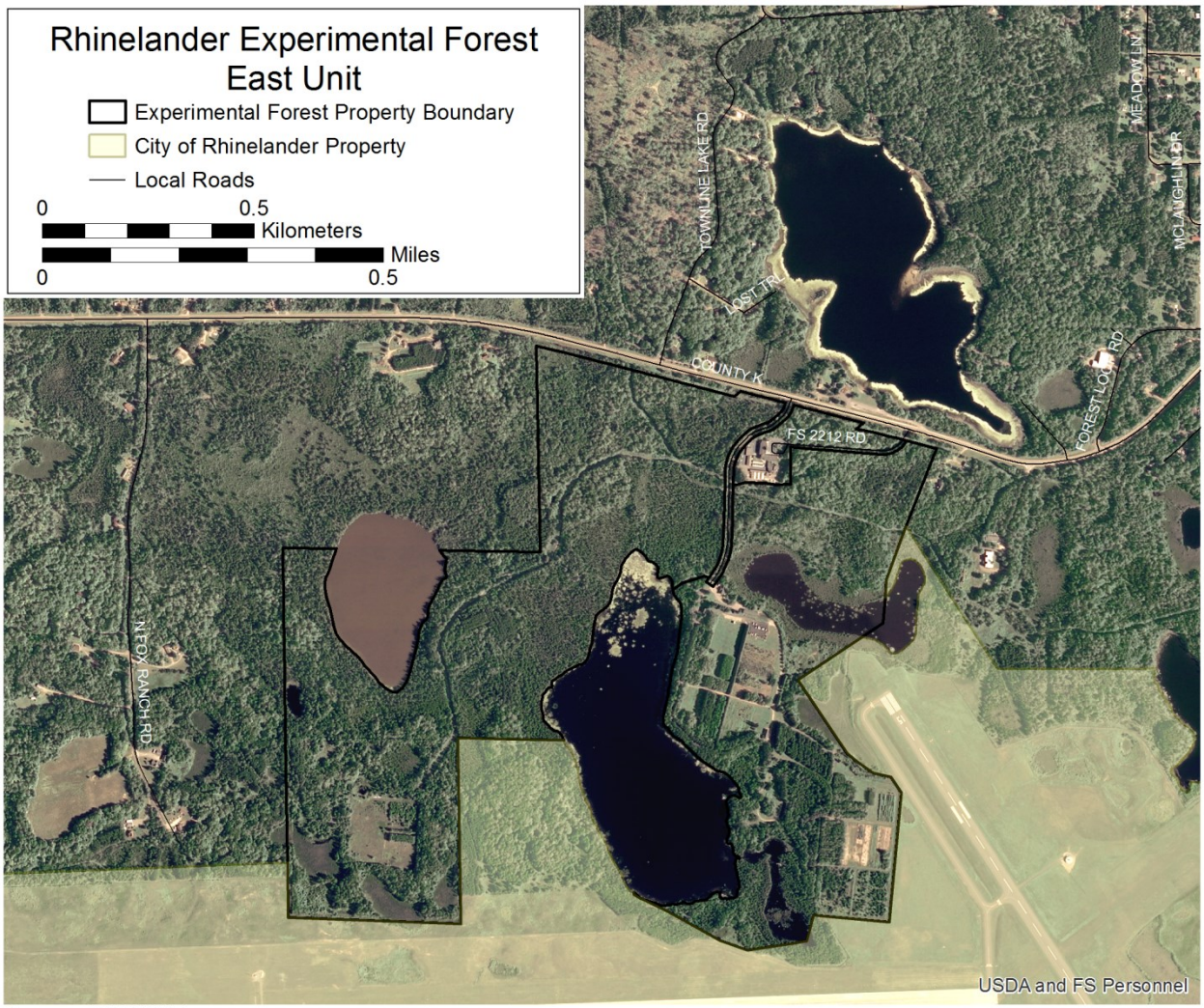
The Rhinelander Experimental Forest encompasses 580 acres in Oneida County, Wisconsin. It consists of two locations: 1) West Unit and 2) East Unit. These units are approximately 12 miles apart.

The legal description of Rhinelander Experimental Forest is attached as Appendix E. Property boundaries and other spatial GIS data are on file at the Forest Service Research and Development office, Northern Research Station, 5985 Highway K, Rhinelander Wisconsin.

## Map 1 – Experimental Forest Location Map



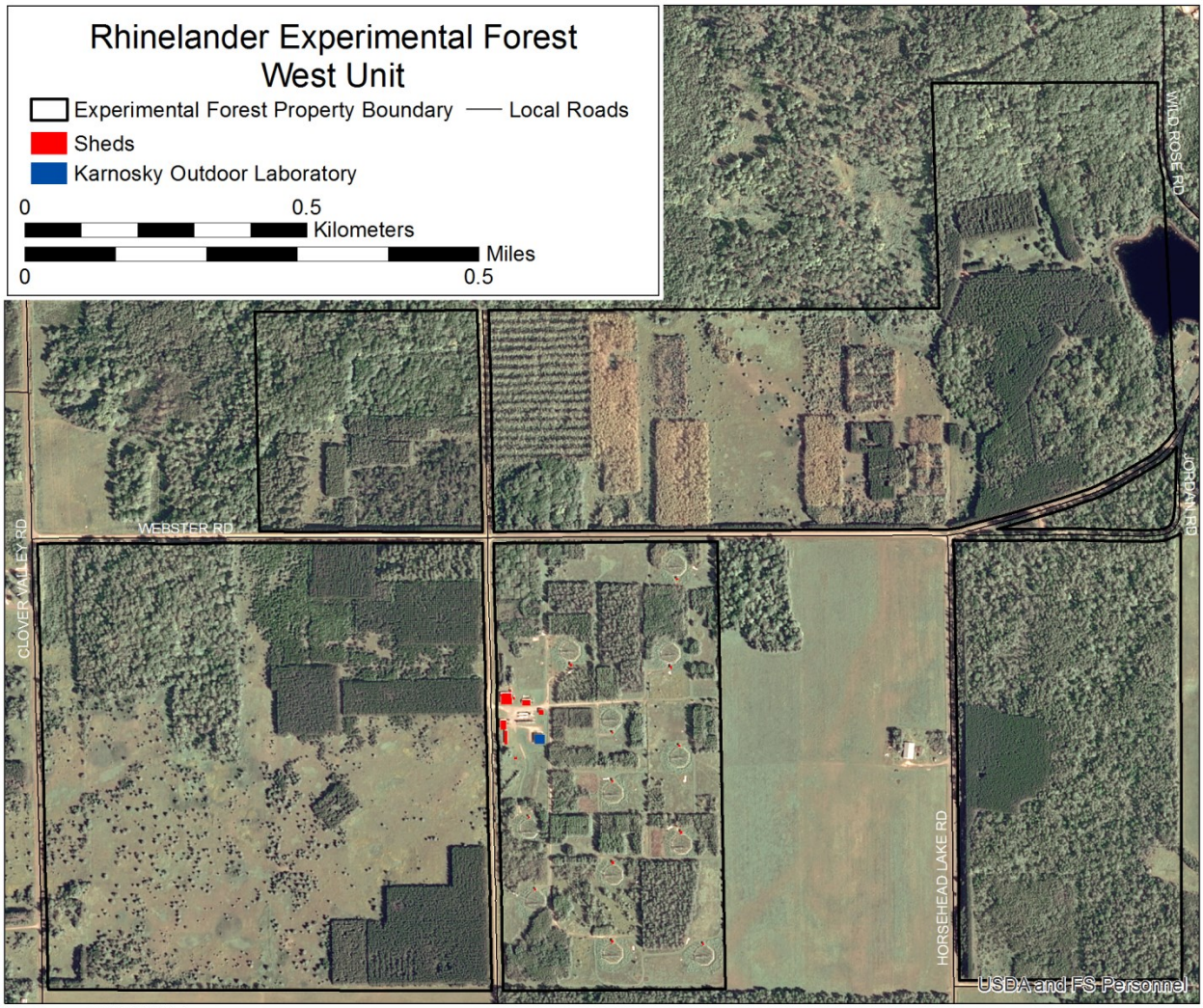
## Map 2 – East Unit Landscape Overview Map




Source: 2010 NAIP Imagery

May 28, 2015

## Map 3 – West Unit Landscape Overview Map




Source: 2010 NAIP Imagery

May 28, 2015

## PHOTOS

All photographs used in this Establishment Record are the property of the Northern Research Station but not copyrighted. The original photos are with the site file housed in the Rhinelander office of the Station. An electronic file is part of this establishment record.

**West Unit -** Major facilities include (a) David F. Karnosky Outdoor Laboratory, (b) office and shop, and (c) and implement shed.

Major community types include (a) upland shrub, scrub with naturally regenerating pines, (b) Aspen-Birch mixed forest, (c) Red Pine (*Pinus resinosa* A.) plantations, and (d) hybrid poplar plantations.

**East Unit -** Undeveloped shorelines from Langlade Lake (left) and Vicks Lake (right).

Major forest communities (left) mixed swamp conifer primarily composed of Tamarack (*Larix larcinia* K.) and Black Spruce (*Picea mariana* Mill.*)*, and (right) mixed upland hardwood primarily composed of Quaking Aspen (*Populus tremuloides*), Northern Red Oak (*Quercus rubra* L.), Eastern White Pine (*Pinus strobus* L.) and Balsam Fir (*Abies balsamea* L.).

# 2. ESTABLISHMENT RECORD

## a. INTRODUCTION

This Establishment Record has been prepared pursuant to Forest Service Manual direction (FSM 4062.1). Establishment of the Rhinelander Experimental Forest (REF) is documented with an accompanying Designation Order.

The Rhinelander Experimental Forest is located on lands west of Rhinelander, Oneida County, Wisconsin. The experimental forest is composed of a West (501 acre; 203 ha) Unit and a East (184 acres; 74 ha) Unit. The total 685 acres (277 ha) are considered administrative lands of the Chequamegon-Nicolet National Forest (CNNF), but are not within the proclamation boundary of the Forest.

**Historical Land Use** – The West Unit was purchased by the USDA Forest Service Research and Development mission area in 1972, at which time it was used predominantly as agricultural fields (see Appendix D photo). Since 1972, lands have been managed as the Harshaw Forestry Research Farm and used by the Northern Research Station for short rotation intensive culture, mixed genetics trials, and global change research (see Table 7 for a list of legacy studies). The Township (T36N R8E; East Unit) was subdivided by William E. Daugherty in 1863 (BCPL 2004). Of interest are citations within those notes stating: "*Surface rolling Soil 3rd rate. Timber Birch, Aspen, and Pine.*"

The East Unit has been an administrative unit of the CNNF since 1962 after a land exchange with Branham Woodland, Inc. These lands are west of Nursery Road and adjacent to the Forest Service Research and Develop office, which was previously known as the Northern Institute of Forest Genetics. Established in 1957, the former institute was one of three forest genetics institutes in the U.S. Forest Service. Historical research focused on 1) pioneering genomics research, 2) genetics of northern conifers, and 3) maximum fiber yield through short rotation woody crops (Jeffers 1971). Field research has been limited within the East unit. Much of northern Wisconsin was heavily logged in the late 1800s and large forest fires occurred in subsequent years. The Township (T37N R7E; West Unit) was subdivided by Joseph H. Jenkins in 1863 (BCPL 2004). Of interest are citations within those notes stating: "*Surface rolling; Soil 3rd rate. Timber Pine, Birch, Tamarack and Spruce. Undergrowth fir and hemlock.*"

**Congressionally Designated Areas -** The Rhinelander Experimental Forest does not occur within any other administratively or congressionally designated areas, such as a Wilderness Area or National Recreation Area.

**Ecological Units -** The Rhinelander Experimental Forest is located in the Laurentian Mixed Forest Province (212), Northern Highlands (212X) Section, Subsection Northern Highlands Pitted Outwash (212Xb) of the Ecological Units of the Eastern United States (Cleland et al. 2007).

## b. PURPOSE OF ESTABLISHMENT

Rhinelander Experimental Forest will be managed to meet the objectives of the USDA National Experimental Forest program including:

1) silviculture and forest management options,
2) forest growth and development,
3) wildlife habitat characteristics,
4) long-term research on ecosystem processes.

The purpose for establishing the Rhinelander Experimental Forest (REF) is to provide (1) lands for conducting research that serves as a basis for management of northern forests including continued genomics research, (2) education opportunities and facilities for the general public, Forest Service staffs, and other cooperating organizations such as universities and state agencies to pursue scientific inquiry, and (3) sites for local, regional, and global long-term environmental monitoring data.

## c. AREA BY COVER TYPES

A range of physiography and ecosystems native to the region are represented within the REF boundaries. The West Unit represents upland, dry communities, while land within the East Unit represent lowland forest ecosystems and riparian communities. Combined, the Units offer research opportunities across a gradient of land uses and disturbances. Historically agricultural land, manipulative research has been conducted on most of the lands within the West Unit since it was acquired by the USDA Forest Service. Conversely, little research activities have been conducted on the East Unit.

**West Unit** – Several small woodlots of red pine and second-growth upland hardwoods (primarily aspen, paper birch, and red maple) provide opportunities for silvicultural, ecological, and physiological research. Areas of fallow pasture are currently being invaded by native conifers and provide opportunities for research on forest succession, agroforestry, or reforestation. Lands and facilities have been used in global climate change research, and bioenergy plantations. There are 2 fenced areas: 1 of 80-acres, and 1 of 40-acres that provide opportunities for enclosure research, or forest farming of non-timber products (e.g., Native American cultural forest plants).

**East Unit** – Primarily composed of mixed swamp conifer and mixed upland hardwoods with pockets of wet meadows. In addition, lands surround over two-thirds of Vicks Lake and a third of Langley Lake offering opportunities for research on lowland-riparian forest ecosystems, natural shoreline, lotic systems, and fisheries research. Both lakes have undeveloped shorelines.

The greatest research opportunities are for new or follow-up studies on existing plantations (see Map 8), establishment of new model forest studies, expanding genetics work, phytoremediation, agroforestry, and establishing new long-term research projects.

## MAP 4 – EAST UNIT VEGETATION

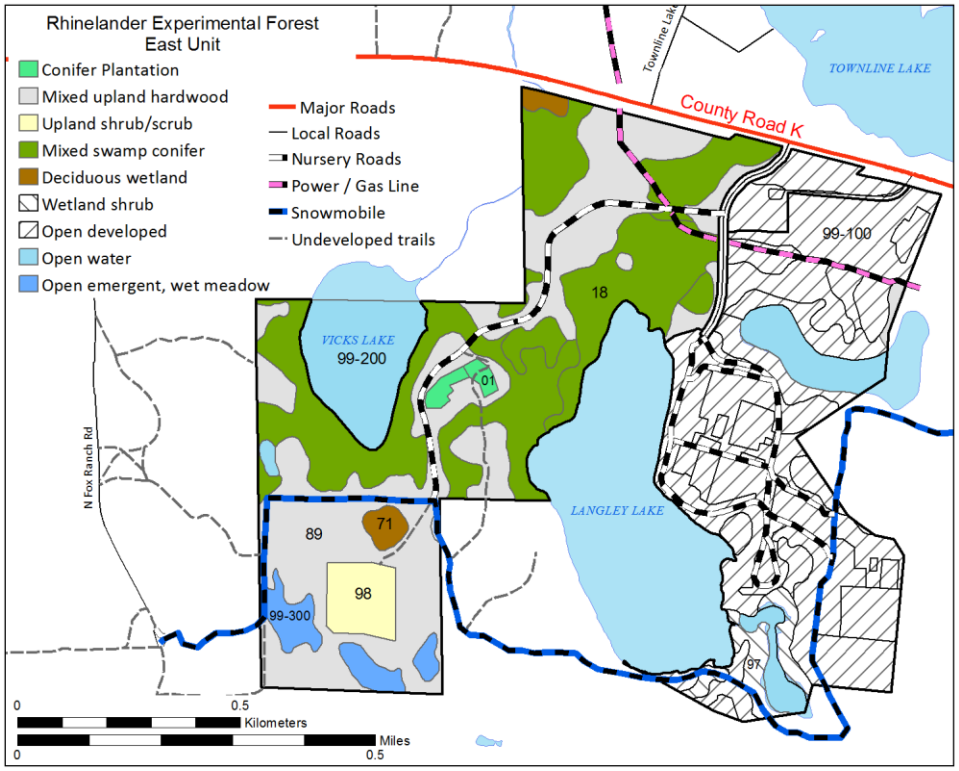



**Table 1**. USDA Forest Service existing vegetation (EV) in East Unit and key to map 4.

| EV Code | Existing Vegetation | GIS Acres | Hectares |
|---|---|---|---|
| 89 | Mixed Upland Hardwood | 73.94 | 29.92 |
| 18 | Mixed Conifer Swamp | 65.67 | 26.58 |
| 01 | Conifer Plantation | 1.90 | 0.77 |
| 99-100 | Developed - Laboratory Property[1] | 103.88 | 42.04 |
| 98 | Upland Shrub/Scrub | 6.14 | 2.48 |
| 71 | Deciduous Wetland | 2.90 | 1.17 |
| 99-200 | Open Water | 26.97 | 10.91 |
| 99-300 | Emergent; Wet Meadow | 6.43 | 2.60 |
| | **Grand Total** | **183.94** | **74.44** |

[1]Lands not included within the experimental forest boundaries, but retained in table to describe larger facilities and complex available to researchers.

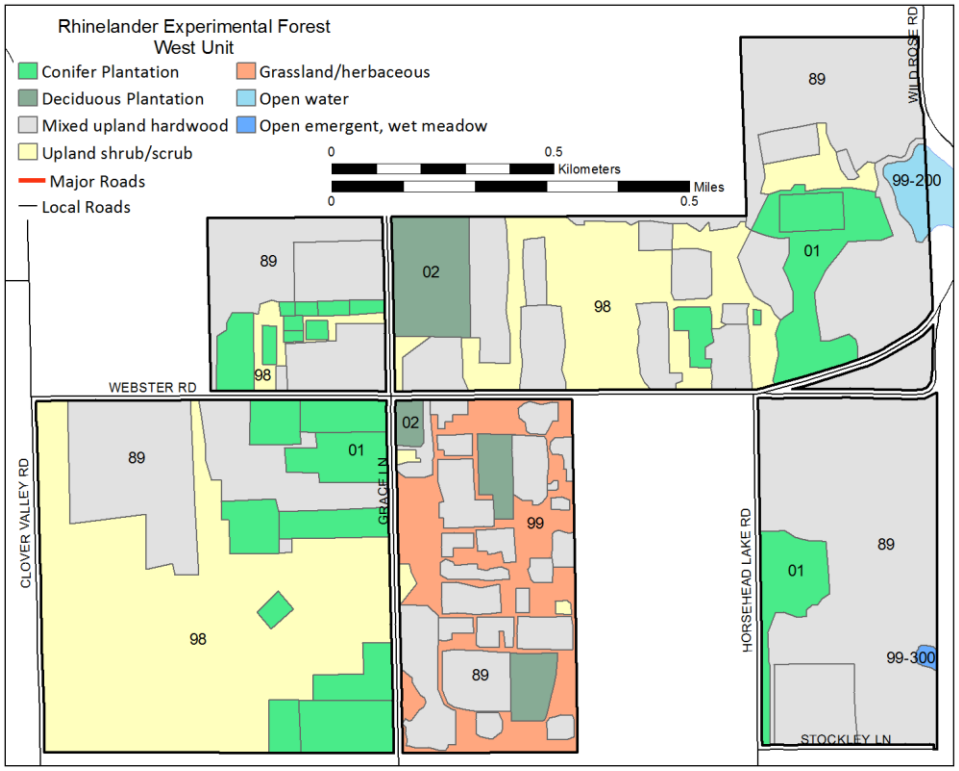



**Table 2**. USDA Forest Service existing vegetation (EV) in West Unit and key to map 5.

| EV Code | Existing Vegetation | GIS Acres | Hectares |
|---|---|---|---|
| 89 | Mixed Upland Hardwood | 245.73 | 99.45 |
| 01 | Conifer Plantation | 66.65 | 26.97 |
| 02 | Deciduous Plantation | 19.89 | 8.05 |
| 99 | Grassland; Herbaceous | 31.35 | 12.69 |
| 98 | Upland Shrub/Scrub | 133.97 | 54.22 |
| 99-300 | Open Emergent; Wet Meadow | 0.52 | 0.21 |
| 99-200 | Open Water | 3.17 | 1.28 |
| | **Grand Total** | **501.28** | **202.87** |

## d. PHYSICAL SITE DESCRIPTION AND CLIMATIC CONDITIONS

**Location** – Rhinelander Experimental Forest is located west of Rhinelander, Oneida County, in the state of Wisconsin. The East Unit is located in Crescent Township and the West Unit in Cassian Township.

The East Unit's Mercator coordinates are 45.64 N latitude and 89.46 W longitude. This Unit is found on the Rhinelander USGS Quadadrangle, and is contained within T36N R8E Sections 2 and 3. This Unit is approximately three miles west of Rhinelander on County Road K.

The West Unit's Mercator coordinates are 45.68 N latitude and 89.63 W longitude. This Unit is found on the Harshaw USGS Quadadrangle, and is contained within T37N R7E Sections 20 and 21. The Unit is approximately 15 miles west of Rhinelander just north of County Road K and Horsehead Lake Road.

See Location, Boundaries, and Ownership Section for *Location Maps* and *Landscape Overview Maps.*

**Size in Acres/Hectares** – The Rhinelander Experimental Forest encompasses 685.22 acres (277.31 ha).

**Elevation Range** – Topography is gently rolling to level. Elevations range from 1,574 feet (480 meters) to 1,676 feet (511 meters) above sea level. For comparison, the highest point in Wisconsin, Timm's Hill, is 1,951 feet (595 km) located in Price County approximately 48 miles southwest of the experimental forest.

**Climatic Data** – The weather station nearest to the Rhinelander Experimental Forest is Rhinelander, station no. 477113, latitude 45° 37' N, longitude 89° 25' W, elevation 1,533 ft (467.2 m). This station is adjacent to the East Unit and about 12 miles east of the West Unit. Climatic normals from the years 1981 to 2010 are given in table 3 (MRCC 2003).

**Table 3.** Climate Normals for Rhinelander Experimental Forest from 1981 to 2010.

| Temperature | °F | °C |
|---|---|---|
| Mean annual | 41.7 | 5.4 |
| Mean April through September | 65.9 | 18.8 |
| Mean October through March | 15.1 | -9.4 |
| Average daily maximum | 52.4 | 11.3 |
| Average daily minimum | 31.0 | -0.6 |
| Average extreme high | 100.0 | 37.8 |
| Average extreme low | -12.4 | -24.7 |
| **Precipitation** | **inches** | **cm** |
| Average annual rainfall | 31.4 | 79.8 |
| Average April through September | 11.2 | 28.4 |
| Average October through March | 3.5 | 8.9 |
| Average annual snowfall | 39.1 | 99.4 |

**Geology** – The Rhinelander Experimental Forest is located in the major physiographic region called the Northern Highlands (WGNHS, 2013). The Northern Highlands is a dissected glacial pitted outwash plain, end and ground moraines, and smaller areas of hilly terrain; kettle lakes and depressions are common in the northern part. The bedrock in and around the REF is composed of Precambrian rocks of Proterozoic age, Lower Proterozoic System described as metamorphic, metavolcanic and metasedimentary rocks: mafic, intermediate and felsic metavolcanic rocks with subordinate metasedimentary rocks; dominantly of greenschist metamorphic facies; more than one metavolcanic sequence is recognized (WI DNR, 2012a).

**Soils** – ***West Unit*** – Soils consist of young, glaciated, Alfasols, predominantly mixed, frigid, coarse loamy Alfic Haplorthods of the padus-loam series, characterized by a loamy drift over stratified sandy and gravelly outwash (USDA NRCS 2013). Prior to Forest Service ownership, most of the site was farmed for potatoes and small grains for approximately 50 years creating a 30 cm plow layer over much of the area. (reference Map 6, Table 4)

***East Unit*** – Soils consist of a blend of lowland (54%) and upland (46%) soils. The lowland soils are made of primarily very poorly drained Carbondale, Lupton, and Markey mucks (USDA NRCS 2013). The black muck of this soil type range from a depth of 26 to 60 inches deep and in places the surface layer is mucky peat or peat (Soil survey 1993). These mucks are a combination of herbaceous and woody organic materials over sandy outwash (reference Map 7, Table 5). The upland soils are made primarily of the well-drained Keweenaw-Sayner complex, which is loamy and sandy drift over gravelly loamy sand drift best suited for growing trees. These upland soils occur on moderately steep areas such as knolls, ridges, and side slopes. In most areas it has stones in the surface layer. (reference Map 7, Table 5)

## MAP 6 – WEST UNIT SOILS

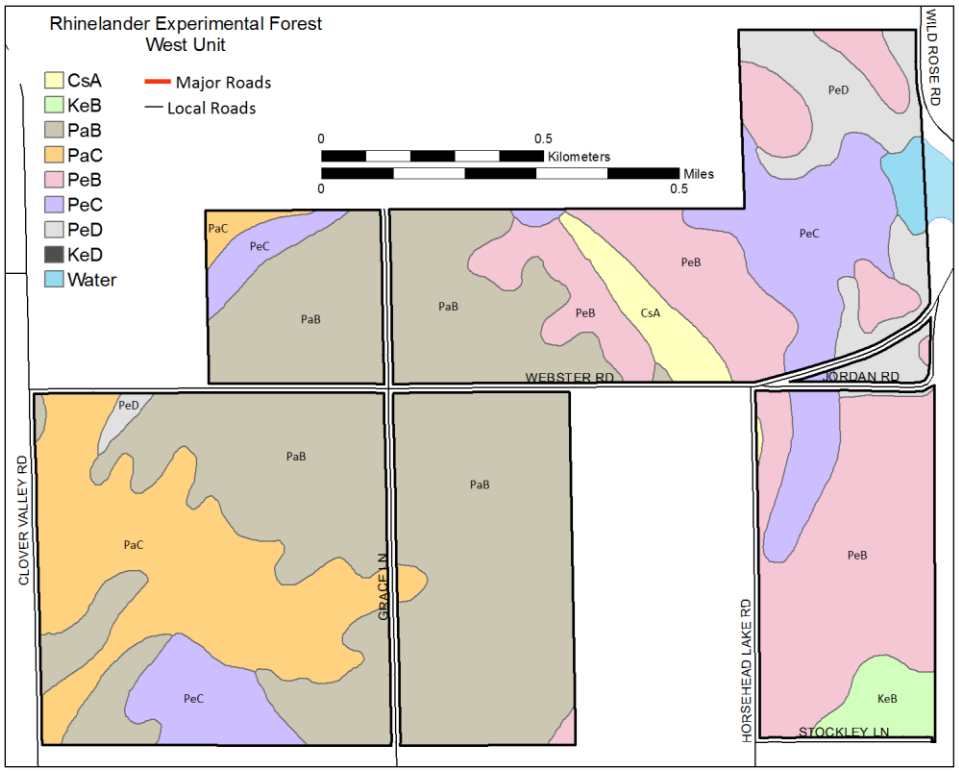



**Table 4**. NRCS Soils in West Unit and key to map 6.

| Code | Map Unit Name | GIS Acres | Hectares |
|---|---|---|---|
| CsA | Croswell loamy sandy, loamy substratum, 0-3% slopes | 10.47 | 4.24 |
| KeB | Keweenaw sandy loam, 1-6% slopes, stony | 8.92 | 3.61 |
| PaB | Padus loam, 0-6% slopes | 209.78 | 84.90 |
| PaC | Padus loam, 6-15% slopes | 69.88 | 28.28 |
| PeB | Padus-Pence sandy loams, 1-6% slopes | 108.22 | 43.79 |
| PeC | Padus-Pence sandy loams, 6-15% slopes | 61.38 | 24.89 |
| PeD | Padus-Pence sandy loams, 15-45% slopes | 29.11 | 11.79 |
| KeD | Keweenaw sandy loam, 15-25% slopes, stony | 0.02 | 0.01 |
| W | Water | 3.51 | 1.42 |
| | **Grand Total** | **501.30** | **202.88** |

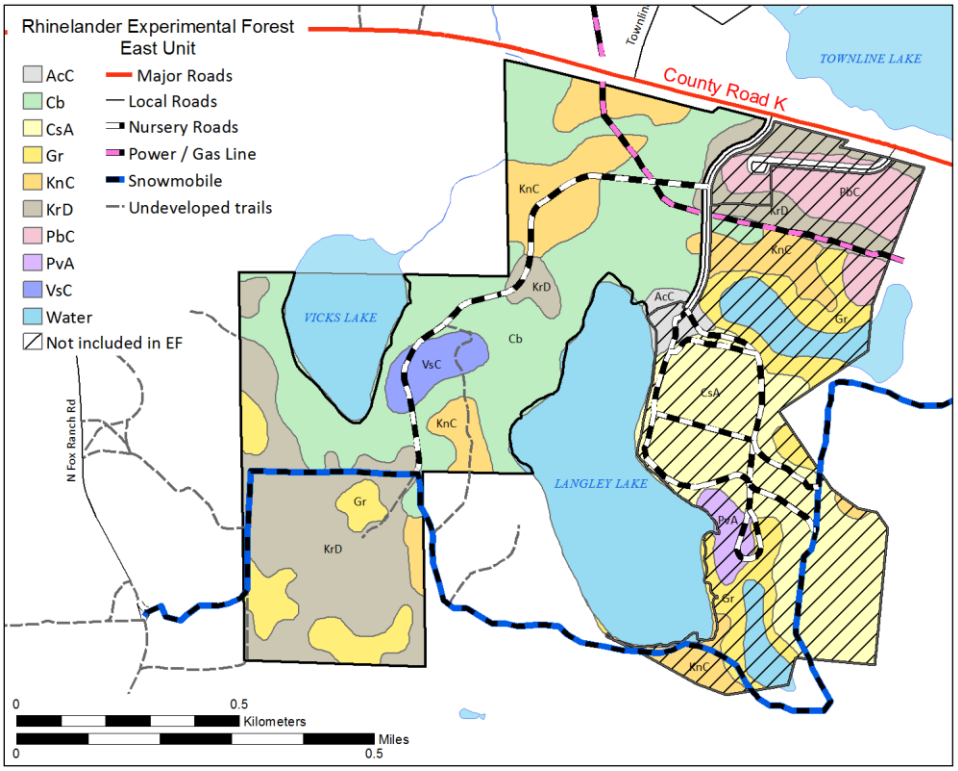



**Table 5**. NRCS Soils in East Unit and key to map 7.

| Code | Map Unit Name | GIS Acres | Hectares |
|---|---|---|---|
| AcC | Alcona fine sandy loam, 6-15% slopes | 0.92 | 0.37 |
| Cb | Carbondale, Lupton, and Markey mucks, 0-1% slopes | 73.60 | 29.78 |
| Gr | Greenwood, Loxley, and Dawson peats, 0-1% slopes | 11.48 | 4.65 |
| KnC | Keweenaw-Vilas complex, 6-15% slopes, stony | 22.00 | 8.90 |
| KrD | Keweenaw-Sayner complex, 15-30% slopes, stony | 43.78 | 17.71 |
| VsC | Vilas Loamy sand, 6-15% slopes | 5.94 | 2.41 |
| W | Water | 15.42 | 6.24 |
| | **Grand Total** | **173.12** | **202.88** |

## e. DESCRIPTION OF AND IMPACT UPON LAND AND RESOURCE VALUES

### (1) TIMBER

There are currently 332.3 forested acres (134.5 ha) on the West Unit and 144.4 forested acres (58.4 ha) on the East Unit. The timber on these lands is not included in estimates of the CNNF managed properties (i.e., inventory on the Forest Plan) due to lands being administrative units. Establishing the Rhinelander Experimental Forest will not affect the timber values of the area.

### (2) WATERSHED VALUES

The East Unit is within the Rhinelander Flowage watershed and the West Unit is within the Middle Tomahawk River watershed; both watersheds are within the Upper Wisconsin water basin (WI DNR 2013). Many of the streams and several of the lakes in this water basin are classified as either exceptional resource waters (ERW) or outstanding resource waters (ORW) by the Wisconsin Department of Natural Resources. The depth to the water table ranges from 20-50 feet. Two-thirds of Vicks Lake and the northern half of Langlade Lake are within the East Unit boundaries. Vicks Lake is a 19 acre lake with low water clarity and a mucky bottom. The maximum depth of this lake is 12 feet. Langlade Lake is a 49-acre lake with moderately clear water and a maximum depth of 9 feet (WI DNR 2014). The bottom of this seepage lake is mostly muck (70%) including 10% sand, 5% gravel, and 15% rock. In the West Unit, half of a small wet meadow is found within property boundaries.

### (3) FORAGE

There is currently no grazing on REF lands.

### (4) MINERALS

The Rhinelander Experimental Forest lies within the "greenstone belt", a large geologic bedrock formation across the Precambrian shield that has been explored for massive sulfide ore bodies. There has been some limited discovery of valuable mineral deposits within the greenstone belt, but no known exploration work for valuable mineral deposits has occurred in the general area of the Rhinelander Experimental Forest. There are no historic mines in the general area. The probability of future exploration and discovery of valuable mineral deposits on the experimental forest properties is quite low.

The Mineral and Oil rights on both Units are owned by the federal government via the quit claim deeds for the East Unit and 'Out-right Owned' by the US government for the West Unit.

### (5) RECREATION

The area within and surrounding the experimental forest is valued for hunting large and small game, hiking, and berry picking. These activities are not likely to interfere with use of the area for research. Camping, campfires, and firewood gathering are not permitted.

### (6) WATER USE

Two wells at the West Unit supply non-potable water to two on-site buildings used for field research. Establishment of the Rhinelander Experimental Forest will provide potential sites for aquatic monitoring data, and continue to protect aquatic resources.

## (7) CULTURAL/HERITAGE VALUES

American Indian tribes lived on the lands that make up the CNNF and northern Wisconsin for thousands of years with a long and complex history. They hunted, fished, gathered food, obtained forest products for shelter, moved plants from other areas, and sometimes used fire to manipulate the land. Many of these practices continue today under reserved treaty rights (treaties of 1837 & 1842) with eleven Ojibwe tribes.

While other Indian tribes currently live in Wisconsin, Ojibwe tribes specifically retained the right to hunt, fish, and gather on lands throughout northern Wisconsin including CNNF through a series of session treaties. The Forest Service (and Eastern Region, Northern Research Station and USFS Law Enforcement) recognizes treaty rights through a "Memorandum of Understanding" with eleven sovereign and federally recognized tribes of Ojibwe Indians (Tribal-USDA MOU). Today, these treaty rights are being exercised by Ojibwe Indian tribes under rules promulgated and enforced by the tribes. Establishment of the Rhinelander Experimental Forest will have no impact on the current cultural value of the area, and treaty rights will be honored.

The Northern Research Station continues to work with the Ojibwe and other Native Tribes to build relationships and foster research collaborations on REF lands.

## (8) OTHER USES OR VALUES

**Wildlife** – Animals inhabiting the experimental forest that are commonly hunted are black bear (*Ursus americanus*), white-tailed deer (*Odocoileus virginianus*), ruffed grouse (*Bonasa umbellus)* and wild turkey (*Meleagris gallopavo)*. See appendix 3 for a preliminary list of major animal species commonly found on the Rhinelander Experimental Forest. Suitable habitat exists in the West Unit for some Wisconsin threatened, endangered or sensitive (TES) species (listed Table 5), although none of these species have been observed in the experimental forest during the 2005 environmental assessment (Argonne National Lab 2006).

**Table 6**. Potential Wisconsin Natural Heritage Inventory threatened, endangered, or sensitive species (Argonne National Lab 2005, WI DNR 2012b).

| Common Name | Scientific Name | State Status, Heritage Rank[1] |
|---|---|---|
| **East Unit (T036N R008E)** | | |
| Large-flowered Ground-cherry | *Leucophysalis grandiflora* | SC, S1 |
| Brown Beak-rush | *Rhynchospora fusca* | SC, S2 |
| Bald eagle | *Haliaeetus leucocephalus* | SC/P S4B,S4N |
| Northern Flying Squirrel | *Glaucomys sabrinus* | SC/P, S3 |
| Water Shrew | *Sorex palustris* | SC/N, G5 |
| Wood Turtle | *Glyptemys insculpta* | THR, S3 |
| | | |
| **West Unit (T037N R007E)** | | |
| Bald eagle | *Haliaeetus leucocephalus* | SC/P S4B,S4N |
| Red-shouldered hawk | *Buteo lineatus* | THR, S3S4B,S1N |
| Northern harrier | *Circus cyaneus* | SC/M, S3B,S2N |
| Evening grosbeak | *Coccothraustes vespertinus* | SC/M, S2S3B |
| Black-throated blue warbler | *Setophaga (=Dendroica) caerulescens* | SC/M, S3B |

| Common Name | Scientific Name | State Status, Heritage Rank[1] |
|---|---|---|
| **East Unit (T036N R008E)** | | |
| Merlin | *Falco columbarius* | SC/M, S3B,S2N |
| Gray jay | *Perisoreus canadensis* | SC/M, S3B |
| Gray wolf | *Canis lupus* | SC/H, S4 |
| Woodland jumping mouse | *Napaeozapus insignis* | SC/N, S2S3 |
| Artic shrew | *Sorex arcticus* | Not found on list |
| Pigmy shrew | *Sorex hoyi* | Not found on list |
| Water shrew | *Sorex palustris* | SC/N, S3 |
| Tawny crescent | *Phyciodes batesii* | SC/N, S3S4 |
| Wood Turtle | *Glyptemys insculpta* | THR, S3 |
| | | |

[1] see Appendix E: *Wisconsin Natural Heritage Working List – Rank Definitions*

**Disturbance History** - Agricultural was the primary land use and disturbance prior to US Forest Service ownership on the West Unit. Fire and logging in the 1800s occurred on both units, but no large-scale disturbances have occurred since.

## f. ACCESSIBILITY

All portions of the experimental forest can be accessed by county or township roads. The local roads are weight restricted every spring from approximately March 15 to May 1.

**West Unit** – Beginning at the intersection of County Road K and Nursery Road, travel west on County Road K 7.75 miles to Horsehead Lake Road. Turn north and travel 1.5 miles to Harshaw Road. Turn west for 0.5 miles to Grace Lane. Turn north and travel 0.75 miles to the security gate access to the building facilities, which are in the middle of REF lands.

**East Unit** – Starting from the intersection of State Highway 47 and County Road K in Rhinelander, travel west approximately 0.8 mile to Nursery Road. The intersection of County Road K and Nursery Road is the northeast corner of this Unit.

## g. EXISTING FACILITIES

**West Unit** – All current facilities are located within the 80 acre secure study area on Grace Lane. Facilities include: a 1,520 $ft^2$ office and shop, 1,536 $ft^2$ fiberglass storage shed, a 3,600 $ft^2$ implement shed, and a 2,700 $ft^2$ field laboratory (see West Unit photos). There are twelve 120 $ft^2$ sheds distributed evenly throughout the 80 acre secure study area, interconnected to the office building by a buried optic fiber network. There is electrical power at each shed.

The 2,700 $ft^2$ David F. Karnosky Outdoor Laboratory is located at the secure study area. The Laboratory has two overhead doors providing access to two work areas suitable for processing field samples. A third work area contains four standard household refrigerators and two chest freezers and a 17 $ft^3$ ultra cold (-80° C) chest freezer. The field laboratory also has a tornado-proof shelter.

An instrumented meteorological monitoring tower is currently located at the north end of the secure study area. Voice and data communications are available.

**East Unit** – There are no facilities on this unit, but there is good road access to the land. A gated 0.7 mile stretch of maintained gravel road traverses through the center of the unit and paved roads (Nursery Road, County Road K) border the east and north sides of the unit. Langlade Lake has a public boat ramp; however, no public access exists for Vicks Lake except by hiking. The unit is adjacent to the Forest Service Research and Development office that has offices, greenhouses, and chemical, soil and genetic analytical laboratories.

Approximately 40 acres of this unit are enclosed within a 12' fence, which is accessed through a drive-through and locked gate (secured area) at the end of a gravel road accessed from Nursery Road.

## MAP 8 – WEST UNIT PLANTATIONS

**Table 7**. Plantations established in the West Unit and key to map 8.

| Plantation ID | Year Initiated | Description |
|---|---|---|
| 1 | 1973 | Jack pine full sibs |
| 2 | 1974 | Black spruce seed source study |
| 3 | 1973 | Larch hybrids |
| 4 | 1975 | Larch arboretum |
| 5 | 1978 | Jack pine half sibs |
| 6 | 1977 | White spruce hybrids |
| 7 | 1984 | White spruce phenology |
| 8 | 1976 | White spruce phenology |
| 9 | 1977 | White spruce Consolidated superior |
| 10 | 1976 | Hybrid spruce |
| 11 | 1978 | Jack pine T.D.R. |
| 12 | 1979 | Jack pine index populations |
| 13 | 1979 | White spruce phenology |
| 14 | 1979 | Ontario spruce grafts |
| 15 | 1978 | Jack pine hybrids |
| 16 | 1978 | Jack pine see orchard |
| 17 | Unk | White ash |
| 18 | Unk | Jack pine grafts |
| 19 | 1982 | White spruce Ontario selections |
| 20 | 1983 | Tamarack selections |
| 21 | 1986 | Poplar clonal conversion |
| 22 | 1983 | Site species study |
| 23 | 1984 | Hybrid poplar weed control |
| 24 | 1993 | Oak under pine |
| 25 | 1997 | Willow clone orchard |

**Table 8**. Legacy and current research studies conducted at the Rhinelander Experimental Forest.

| Year Initiated | Study Title |
|---|---|
| **West Unit Studies** | |
| 1974 | Range-wide provenance test for black spruce. |
| 1975 | Hybrid spruce study. |
| 1976 | Heritable insect resistance in jack pine. |
| 1976 | Potential for European and Japanese larch hybrids. |
| 1977 | Inheritance in white spruce. |
| 1978 | Jack pine open-pollinated progeny test. |
| 1978 | Selection for juvenile height and early flowering in jack pine. |
| 1979 | Population index study of jack pine. |
| 1980 | Provenance hybridization in jack pine. |
| 1982 | Tamarack provenance test. |
| 1982 | Weed control in hybrid poplar intensive culture plantations. |
| 1983 | Intensive culture of *Larix* for biomass production. |
| 1984 | Matching species to site for maximum biomass yield. |
| 1984 | Induced strobili production of early- and late-flushing white spruce. |
| 1986 | Conversion of hybrid poplar stands to a new *Populus* clone after harvest. |
| 1996 | Aspen FACE elevated $CO_2$ and ozone experiment. |
| 2000 | Use of willow clones for biomass production. |
| **East Unit Studies** | |
| 1965 | The Radiation Genetics Program (decommissioned) |
| | |

## h. ARRANGEMENTS FOR MANAGEMENT, ADMINISTRATION AND PROTECTION

The official responsible for administration and protection of the Rhinelander Experimental Forest is the Project Leader, Forest Service Research and Development office, Northern Research Station (5985 County Road K, Rhinelander, WI; 715-362-7474). The research coordinator is the Station Director, Northern Research Station (11 Campus Blvd, Suite 200, Newtown Square, PA; 610-557-4162). The Northern Research Station Director establishes and maintains a system for archiving data and reports from experimental forests in a manner that will facilitate the exchange and transfer of information among stations, forests, and scientists. The Project Leader of the Forest Service Research and Development office, Northern Research Station, is the designated lead research scientist for the experimental forest and will assume the day-to-day management of the area as well as approve and coordinate research conducted in the experimental forest.

Safety is a critical consideration while working in this experimental forest. A year-round safety plan will be developed for all users of the experimental forest. A communication plan will be part of the safety guidelines for all employees to follow. Emergency evacuation procedures will be developed for the REF to cover all foreseeable circumstance.

Hard copies of research data files will be maintained in the following office:

Northern Research Station
Institute for Applied Ecosystems Studies
5985 County Road K
Rhinelander, WI 54501

# Appendix A: BIBLIOGRAPHY

Below is all literature cited in this establishment record, useful references for researchers, and publications that have resulted from studies conducted on the REF.

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# Appendix B: FLORA LIST

Nomenclature for trees and plants follows The PLANTS database 2012.

**Table 8**. Rhinelander Experimental Forest common vascular plants.

| Rhinelander Experimental Forest Common Tree List | |
|---|---|
| **Common name** | **Scientific name** |
| Balsam fir | *Abies balsamea* |
| Red maple | *Acer rubrum* |
| Sugar maple | *Acer saccharum* |
| Paper birch | *Betula papyrifera* |
| Tamarack | *Larix laricina* |
| Black spruce | *Picea mariana* |
| White spruce | *Picea glauca* |
| Red pine | *Pinus resinosa* |
| White pine | *Pinus strobus* |
| Jack pine | *Pinus banksiana* |
| European larch | *Larix decidua* |
| Northern red oak | *Quercus rubra* |
| Northern pin oak | *Quercus ellipsoidalis* |

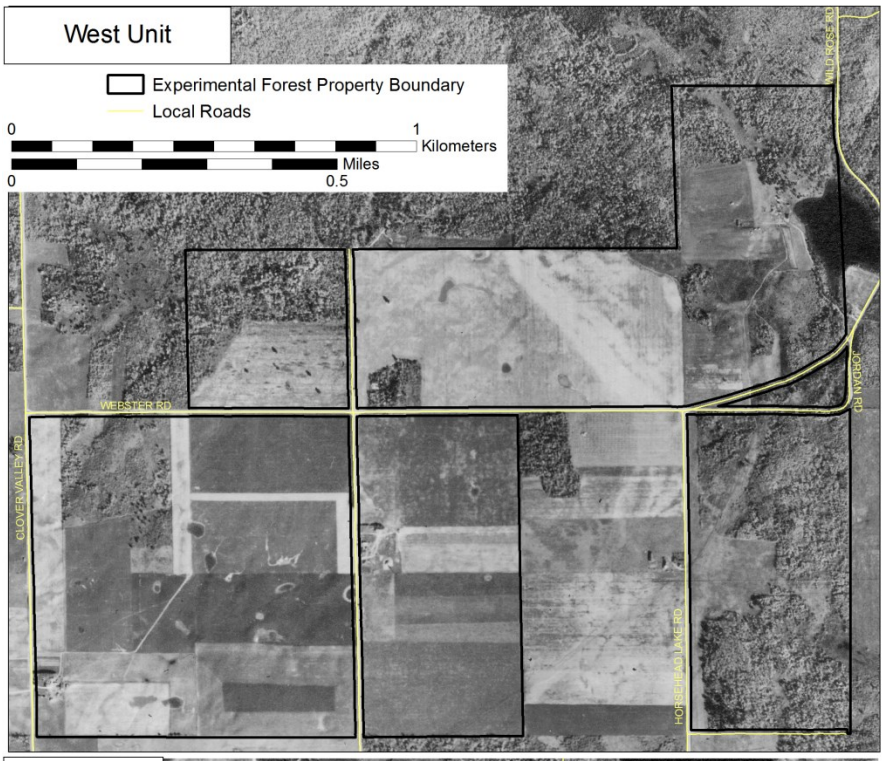
# Appendix C: FAUNA LIST

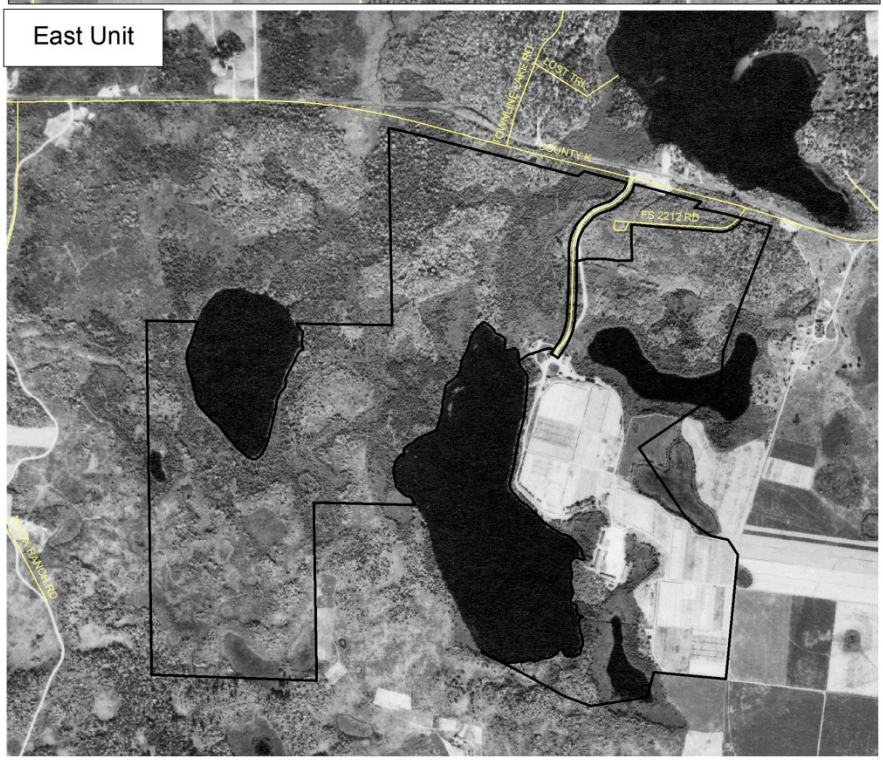
Nomenclature for birds follows AOU Bird Checklist 2014; nomenclature for mammals and herpetofauna follows Watermolen, Murrell 2001.

**Table 9**. Rhinelander Experimental Forest common fauna .

| **Rhinelander Experimental Forest Common Fauna List** | |
|---|---|
| Common Name | Scientific Name |
| Ruffed grouse | *Bonasa umbellus* |
| Blue jay | *Cyanocitta cristata* |
| Wild turkey | *Meleagris gallopavo* |
| Black-Capped Chickadee | *Poecile atricapillus* |
| Red-breasted nuthatch | *Sitta canadensis* |
| Hermit thrush | *Catharus guttatus* |
| American robin | *Turdus migratorius* |
| Black-throated green warbler | *Setophaga virens* |
| Nashville warbler | *Oreothlypis ruficapilla* |
| Song sparrow | *Melospiza melodia* |
| White-throated sparrow | *Zonotrichia albicollis* |
| Dark-eyed junco | *Junco hyemalis* |
| Purple finch | *Haemorhous purpureus* |
| American goldfinch | *Spinus tristis* |
| | |
| Black Bear | *Ursus americanus* |
| Coyote | *Canis latrans* |
| Red fox | *Urocyon cinereoargenteus* |
| Eastern cottontail | *Sylvilagus floridanus* |
| Snowshoe hair | *Lepus americanus* |
| Striped skunk | *Mephitis mephitis* |
| Eastern Gray Squirrel | *Sciurus carolinensis* |
| Red Squirrel | *Tamiasciurus hudsonicus* |
| Eastern Chipmunk | *Tamias striatus* |
| | |
| Wood frog | *Rana sylvatica* |
| Northern spring peepers | *Pseudacris crucifer crucifer* |
| Chorus frog | *Pseudacris triseriata* |

# Appendix D: HISTORICAL 1938 AERIAL PHOTOS




Source: 1938 NAIP Imagery; University of Wisconsin Digital Collection

November 11, 2014

**LAND DESCRIPTION VERIFICATION**
**FEDERAL LAND**

Purchase/Exchange Name: Harshaw Farms

Forest Name: USFS Experimental Station Tract No.: _____

Assessor's Parcel Number: _____

County, Town, or Borough: Oneida Co, Cassian Township State: Wisconsin

**1. Legal Description:** (Include subdivision part, Section, Township, Range, Meridian; or lot, block, warrant, parcel, grant, etc., as appropriate.)

The Southeast 1/4, and SE 1/4 NE 1/4 of Section 20. The West 1/2 SW 1/4, the South 1/2 NW 1/4, the West 1/2 NE 1/4 and the West 1/2 SE 1/4 of Section 21, all in Township 37 North, Range 07 East, Cassian Township, Oneida County, Wisconsin.

| **2. Area:** | Official (Public Land Survey) | Record (title/deed/county) | Actual (land survey, infor.) | Tax Assessor's (taxing authority) |
|---|---|---|---|---|
| | 520 acres | 520 acres | | |

**3. Record Documents:**

**4. Comments:**

The legal description for the above described lands, proposed for conveyance by the UNITED STATES OF AMERICA, has been reviewed for technical sufficiency and acceptability for patent or deed purposes and practicability for locating boundary lines.

For purposes of conveyance, the acreage is: 520 acres.

Randy R. Erickson 09-19-2013
Land Surveyor, USDA Forest Service Date

(attach additional pages as necessary for items 1 thru 4) Page 1 of 1

**LAND DESCRIPTION VERIFICATION**
**FEDERAL LAND**

Purchase/Exchange Name: USFS Experimental Station Nursery Area

Forest Name: USFS Experimental Station Tract No.: _____

Assessor's Parcel Number: _____

County, Town, or Borough: Oneida Co, Crescent Township State: Wisconsin

**1. Legal Description:** (Include subdivision part, Section, Township, Range, Meridian; or lot, block, warrant, parcel, grant, etc., as appropriate.)

The NW 1/4 SE 1/4, The SW 1/4 NE 1/4, Government Lot #1, that part of the East 1/2 NE 1/4 NE 1/4 lying south of Hwy "K", in Section 03. That part of Government Lots 2,3, 13 and 14 lying south of Hwy "K", west of the East side of "Nursery Road" and North of the South side of Road to Langley Lake Boat landing, in Section 02, all in T 36 N, R 08 E, Crescent Township, Oneida County, Wisconsin.

| **2. Area:** | Official (Public Land Survey) | Record (title/deed/county) | Actual (land survey, infor.) | Tax Assessor's (taxing authority) |
|---|---|---|---|---|
| | 160.7 | 171.3 +/- | 171.3 +/- | |

**3. Record Documents:**

Subdivison of Section 3 by Jean Resvick U.S.F.S. surveyor in 1963 (L 855 Oneida Co. Surveyor records) and U.S.G.L.O. dependent resurvey of Section 2.

**4. Comments:**

Area in Section was digitized from a DNR website.

The legal description for the above described lands, proposed for conveyance by the UNITED STATES OF AMERICA, has been reviewed for technical sufficiency and acceptability for patent or deed purposes and practicability for locating boundary lines.

For purposes of conveyance, the acreage is: 171.3 +/- acres.

Randy R. Erickson 09-19-2013
Land Surveyor, USDA Forest Service Date

(attach additional pages as necessary for items 1 thru 4) Page 1 of 1

# Appendix F: WISCONSIN NATURAL HERITAGE WORKING LIST – Rank Definitions

The Wisconsin NHI Working List records which elements are tracked in the state. The working list is revised as species' populations change (increase or decrease) and as knowledge about their status and distribution in Wisconsin increase. The Working List was revised in 2011. Definitions of ranks are provided below, along with definitions for other abbreviations used in the Working List.

US Status: Current federal protection status designated by the Office of Endangered Species, U.S. Fish and Wildlife Service indicating the biological status of a species in Wisconsin. LE = listed endangered; LT = listed threatened; PE = proposed as endangered; NEP = nonessential experimental population; C = candidate for future listing; CH = critical habitat

State Status: Protection category designated by the Wisconsin DNR. END = Endangered; THR = Threatened; SC = Special Concern.

WDNR and federal regulations regarding Special Concern species range from full protection to no protection. The current categories and their respective level of protection are as follows: SC/P = fully protected; SC/N = no laws regulating use, possession, or harvesting; SC/H = take regulated by establishment of open closed seasons; SC/FL = federally protected as endangered or threatened, but not so designated by WDNR; SC/M = fully protected by federal and state laws under the Migratory Bird Act.

Special Concern species are those species about which some problem of abundance or distribution is suspected but not yet proved. The main purpose of this category is to focus attention on certain species before they become threatened or endangered.

Global Element Ranks

G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

G2 = Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.

G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single state or physiographic region), or because of other factor(s) making it vulnerable to extinction throughout its range; typically 21-100 occurrences.

G4 = Uncommon but not rare, (although it may be quite rare in parts of its range, especially at the periphery) and usually widespread. Typically >100 occurrences.

G5 = Common, widespread, and abundant (although it may be quite rare in parts of its range, especially at the periphery). Not vulnerable in most of its range.

GH = Known only from historical occurrence throughout its range, with the expectation that it may be rediscovered.

GNR = Not ranked. Replaced G? rank and some GU ranks

GU = Currently unrankable due to lack of data or substantially conflicting data on status or trends. Possibly in peril range-wide, but status is uncertain.

GX = Presumed to be extinct throughout its range (e.g. Passenger pigeon) with virtually no likelihood that it will be rediscovered.

Species with a questionable taxonomic assignment are given a "Q" after the global rank.

Subspecies and varieties are given subranks composed of the letter "T" plus a number or letter. The definition of the second character of the subrank parallels that of the full global rank. (Examples: a rare subspecies of a rare species is ranked G1T1; a rare subspecies of a common species is ranked G5T1.)

State Element Ranks

S1 = Critically imperiled in Wisconsin because of extreme rarity, typically 5 or fewer occurrences and/or very few (<1000) remaining individuals or acres, or due to some factor(s) making it especially vulnerable to extirpation from the state.

S2 = Imperiled in Wisconsin because of rarity, typically 6 to 20 occurrences and/or few (1000-3000) remaining individuals or acres, or due to some factor(s) making it very vulnerable to extirpation from the state.

S3 = Rare or uncommon in Wisconsin, typically 21-100 occurrences and/or 3000-10,000 individuals.

S4 = Apparently secure in Wisconsin, usually with >100 occurrences and >10,000 individuals.

S5 = Demonstrably secure in Wisconsin and essentially ineradicable under present conditions.

SNA = Accidental, non-native, reported, but unconfirmed, or falsely reported.

SH = Of historical occurrence in Wisconsin, perhaps having not been verified in the past 20 years, and suspected to be still extant. Naturally, an element would become SH without such a 20-year delay if the only known occurrence were destroyed or if it had been extensively and unsuccessfully looked for.

SNR = Not Ranked, a state rank has not yet been assessed.

SU = Currently unrankable. Possibly in peril in the state, but status is uncertain due to lack of information or substantially conflicting data on status or trends.

SX = Apparently extirpated from the state.

State Ranking of Long-Distance Migrant Animals

Ranking long distance aerial migrant animals presents special problems relating to the fact that their non-breeding status (rank) may be quite different from their breeding status, if any, in Wisconsin. In other words, the conservation needs of these taxa may vary between seasons. In order to present a less ambiguous picture of a migrant's status, it is necessary to specify whether the rank refers to the breeding (B) or non-breeding (N) status of the taxon in question. (e.g. S2B,S5N). (http://dnr.wi.gov/topic/NHI/documents/NHIWorkingList.pdf; Last Revised: June 2014)

# Appendix G: CONTRIBUTORS

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