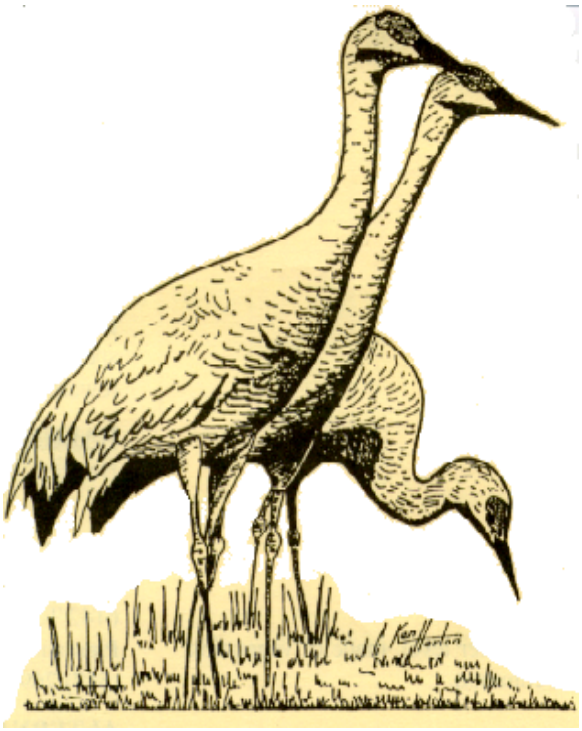
A Concept of Management
For the
Phyllis Haehnle Memorial Sanctuary



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I. INTRODUCTION

The Phyllis Haehnle Memorial Sanctuary is a special place that is held in trust for the people of Michigan by the Michigan Audubon Society. The sanctuary has expanded from the original gift of 497 acres in 1955 to its present size of 963 acres. During the past 5 decades, vegetation, wildlife populations, wildlife management practices and the demand for recreation have changed. The purpose of this document is to provide a concept for managing the Haehnle Sanctuary based on its historic and present environmental setting.

Wildlife related recreation is an integral part of Michigan's recreation and tourist industry. It is also important for the quality of life of Michigan residents. The main purpose of Michigan Audubon Society owning the Phyllis Haehnle Sanctuary is to establish natural and healthy wildlife populations with opportunities for research, public education and enjoyment. However, upward trends in human population growth in the southern one-half of Michigan have led to major changes in wildlife populations. Urban expansion and intensified farming practices have had a significant negative influence on wildlife habitat. Acquisition and management of lands at Haehnle will help meet Michigan's needs for conservation of wildlife.

This Concept of Management is specific enough to provide clear guidance for planning, implementing and monitoring management practices and polices. A description of the history, environment, human characteristic and threats at Haehnle were used to arrive at a general plan for management. These concepts are intended to be the basis for developing the specific management practices described in another document, "Wildlife Conservation Plan for the Phyllis Haehnle Memorial Sanctuary".

II. SANCTUARY LOCATION

The Phyllis Haehnle Memorial Sanctuary contains 963 acres of wildlife habitat in Leoni and Henrietta Townships (T2S, R1E, sections 2, 3 and 11) in northeastern Jackson County, Michigan (Figure 1). Seymour Road borders the sanctuary on the south and Wooster Road on the west. Interstate I-94 lies two miles to the south (Figure 2).

Haehnle is surrounded by major population centers in south-central Michigan. Jackson County's population was 160,248 in 2010, and two adjacent counties with large populations are Ingham with 280,895 people and Washtenaw with 344,791 people (US Dept. Commerce). Nearby Wayne County had more than 1,820,584 residents and over 9,883,640 people lived in Michigan in 2010 (US Dept. Commerce).

III. HISTORY

A. Archaeological and Historical Sites

The Pottawatomie were the last tribe of Indians to reside in Jackson County, although Chippewa and Wyandot (Huron) Indians traveled through the area. Shortly after the Treaty of Detroit in 1807, the U.S. government acquired Indian land in this part of the state. Most of the Indians were removed from the area in 1839-40 and sent to Green Bay, Wisconsin (DeLand 1903).

Numerous Indian trails crossed northeastern Jackson County. Some of these trails were used to "portage" from the headwaters of the Huron River into Portage River which flows downstream into the Grand River north of Jackson. Instead of following the shoreline of the Great Lakes, this route shortened the distance for those traveling across the Lower Peninsula. Wampler (1825) records two Indian paths crossing the south boundary of T1S, R1E, section 36 about ¾ of a mile east of the present sanctuary. Wampler (1825) recorded no paths crossing section lines in the sanctuary. A Hinsdale map (1931) shows a north-south trail passing east of Mud Lake, but not within the sanctuary.

Hinsdale's map (1931) shows a burial ground and village west of Mud Lake, but Wampler (1825) records no mention of paths crossing the section lines bounding section 3 so the village probably was located west of the sanctuary. An area at Wooster Road by the Portage River is reported to have contained a large number of arrowheads, possibly because it was an Indian battle ground where a fight over trapping

rights on the river to place (Ann. 1979). It is unknown from this general description of the location if it is within the sanctuary. Robert Whiting recovered 43 pieces of earthen pottery from an archaeological dig on the north side of Eagle Lake.

Between 1816 and 1856, Michigan was systematically surveyed by the General Land Office. The township and section lines of the survey established the political boundaries of counties and townships throughout the state. Joseph Wampler did much of the surveying in Jackson County. An excerpt from Wampler (1825) notes describes the line between sections 2 and 3 starting at the south corner post (west edge of sanctuary at Seymour Road) and traveling north.

"16.00 Small lake" [notes added by authors 16 chains = 1,056 ft. north of the Seymour Rd. starting point, he encountered Eagle Lake]

"26.00 Leave lake" [1,716 ft. from starting point was north shoreline of Eagle Lake]

"40.00 Set qt post" [set a quarter section post 2,640 ft. (1/2 mile) from starting point]

"B.oak 24 N 81 E 26" [black oak witness tree 24" diameter was 81 degrees east of north (almost straight east) of quarter post at distance of 17 ft.]

"Boxwood 6 N 74 W 53" [either Juneberry or flowering dogwood witness tree 6" diameter was 74 degrees west of north at a distance of 35 ft.]

"41.00 Enter prairie" [2,706 ft. from starting point enter wet prairie"

"66.50 Outlet of lake 35 lks wide from w" [4,389 ft. from starting point encountered a stream 35 links wide (23 ft.) flowing from the west]

"82.90 N Branch of Grand River 180 lks wide course w Deep" [5,471 ft. from starting point encounter north branch of Grand River (later called Portage River) that was 180 links wide (118.8 ft.) flowing west]

"84.47 Intersect N boundary & set stake bearings omitted" [5,575 ft. from starting point intersected the previously established section line, set a stake, but no bearing trees described because in wet prairie. If the section was square he should have intersected the line at 80 chains (5,240 ft.)]

Several times in his notes he described encountering "bad marsh" as he surveyed the section lines in the present day sanctuary.

Orin Rogers was the first person to lay claim to 40 acres in section 2 SE1/4 of SE1/4 from the United States government on October 20, 1835, but this parcel is outside the present day sanctuary (Ann. 2007). The 40 acres that contains the present day parking lot on Seymour Road was purchased by John Taylor from the government June 6, 1836. Ownership has changed hands many times since then with some of the land going back to the government in the 1850s because of unpaid taxes. Remains of foundations from possibly a cabin and several houses are still evident.

B. History of Land Acquisition

In 1955, after several years of gentle persuasion by Harold Wing, Casper Haehnle donated 497 acres to the Michigan Audubon Society in memory of his daughter, Phyllis Haehnle Clancy (Fig. 3). The sanctuary has grown to its present size of 963 acres through additional gifts, purchases, land exchanges and deed restrictions (Table 1). Judy Corey, Phyllis Clancy's daughter, and James Schroer generously donated 172 acres in 1986. Between 1987 and 1999, Judy Cory gave an additional net 6 acres. Six parcels totaling 234 acres were purchased outright, a net of 45 acres were gained from an exchange with the State of Michigan, and 9 acres after granting hunting privileges on 4 acres of sanctuary. Not counting land exchanges, $270,483.98 has been spent on land acquisition. Conservation easements are held on 340 acres of land enrolled in the Wetland Reserve Program, US Department of Agriculture and on 41 acres by the US Fish & Wildlife Service and Ducks Unlimited as part of a North American Wetland Conservation Act agreement.

IV. DESCRIPTION OF ENVIRONMENT

A. Regional Landscape

The Haehnle Sanctuary maybe put into a regional landscape context using a classification system proposed by Albert (1995). Based on the National Hierarchy of Ecological Units (ECOMAP 1993) Haehnle is located in the:

Humid Temperate Domain
Humid Hot-Summer Continental Division
Eastern Deciduous Forest Province
Southern Lower Michigan Section
Washtenaw Subsection (6,000 sq. miles)
Jackson Interlobate Sub-subsection (2,500 sq. miles)

It is the interaction of ecosystem components: physiography, soil, climate, plants and animals that shape ecosystems at the various hierarchical levels and thereby determine plant communities. Human disturbances such as agriculture, drainage, fire, fire exclusion, introduction of alien species, and residential development also affect plant communities. Most of the privately owned uplands in the Jackson Interlobate Sub-subsection have been farmed and now these agricultural lands and remaining forested lands are rapidly being converted into residential developments. The one exception is the 20,300-acre Waterloo State Recreation Area lying to the east of Haehnle.

B. Physiography and Geology

The Hillsdale-Lapeer Hilly Upland, a physiographic division of Michigan's Lower Peninsula, is found in the Jackson Interlobate (Sommers 1977). Topographic features of the area are the result of erosion or deposition during the Wisconsin Period glaciation and postglacial forces. As ice melted, a mantle of glacial drift was left on beds of sandstone, limestone and other sedimentary bedrock of the Paleozoic Age. Parma Sandstone is exposed at the surface near the Wooster Road parking lot.

Glacial landforms include kettle lakes such as Eagle Lake, and Mud Lake before it was drained in 1920. Outwash plain and glacial channels cover most of the sanctuary. The Portage River flows through a valley cut by a much larger glacial river. An end moraine is located east of the sanctuary.

Topography at Haehnle ranges from flat to gently undulating. Local relief is less than 40 ft. The highest point is 941 ft. above sea level in Section 3 and the lowest is 906 ft. in Mud Lake Marsh.

C. Soils

Soils are formed through the interaction of parent material, climate, relief, plant and animal life, and the length of time these elements have had to act. Most of the dominant parent materials found in soils at Haehnle (Figure 4, Table 2) were deposited as outwash deposits and organic material about 10,000 to 12,000 years ago. Jackson County's climate has changed from that of the glacier to one that is cool and humid. Relief ranges from rolling to nearly level where water is often ponded. Oak and hickory forests influenced well-drained upland soils such as Arkport-Okee, Spinks, Hillsdale and Riddles. Poorly drained soils such as Dixboro, Gilford-Colwood were affected by soft maple, elm and ash. Organic soils such as Henrietta, Houghton and Palms muck with high acidity formed where grasses, sedges and water-tolerant trees grew in very poorly drained areas and experienced little decomposition. The more alkaline (pH 6.8-8.2) Edwards and Martisco mucks are associated with prairie fens. They have a substratum of marl that was deposited with a constant supply of groundwater high in bicarbonates that drained through them.

Most of the 14 soil types present in the area are unsuitable for cropland and have severe to moderate limitations for other uses (McLeese 1981). Hydric soils (Gilford –Colwood complex, Houghton muck, Cohoctah fine sandy loam, Edwards muck, Palms muck, Martisco muck, Histosols and Aquents and Henrietta muck) covered about 84% of the sanctuary (Table 2). These soils are limited for use because of high water table, low in some micronutrients, soil blowing and subsidence after drainage. Upland soils with severe to moderate limitations for use as cropland (Boyer-Oshtemo sandy loams, Spinks sand 6-25% slope, Arkport-Okee loamy find sands 6-12% slope, and Dixboro very fine sandy loam) covered about 6% of the area. Soil blowing, water erosion, steepness of slope, seasonal

droughtiness, and rapid permeability limit these upland soils for most uses. Another 2% of the sanctuary is covered with water. The remaining 8% of the area is rated as fair to good for raising crops (Spinks sand 0-6% slope, Arkport-Okee loamy fine sands 2-6% slope, Eleva sandy loam, and Hillsdale-Riddles sandy loams).

D. Climate

Jackson County has a humid, temperate climate. Because of the prevailing westerly winds, it experiences some lake effect. However, this is minimal and essentially limited to increased cloudiness during the late fall and early winter. A summary of pertinent weather data for a station 10 miles southwest of Haehnle is presented in Table 3.

Based on the 1951-80 period, the average yearly temperature was 47.8 ^{o}F (Ann. 1989). Average winter temperature was 24.7 ^{o}F and the average summer temperature was 69.8 ^{o}F. The average last freezing temperature was May 7, while the average date for the first freezing temperature in the fall was October 7. The freeze-free period, or growing season, averaged 152 days. Because of numerous lowlands, there is great danger of late spring frosts. The average yearly temperature increased from 47.8 ^{o}F during 1951-80 to 48.3 ^{o}F in 1981-2010 (Ann. 2011).

The total annual precipitation is 29.7 inches. Of this 17.7 inches (60%) usually falls in April through September. Average seasonal snowfall is 37.4 inches. During the period, 70 days per season average 1 inch or more of snow on the ground. The heaviest 1-day rainfall during the period of record was 5.3 inches on June 21, 1937. Evaporation data from the Class "A" pan were not available from the Jackson station, but these data should be similar to those observed at East Lansing. During the 1951-80, the pan evaporation for April through October exceeded the average precipitation by 94%. Therefore, soil moisture replenished during fall and winter months are important in maintaining water levels. The average mean precipitation increase from 29.11 inches during 1951-80 to 31.43 inches during the next 30 years (Ann. 2011).

E. Water Resources

The Haehnle Sanctuary is in the Grand River Watershed, 106,441-acre Portage River Subwatershed and 15,886-acre Portage River Lower Branch Subbasin. A small stream flowing northward crosses Seymour Road and enters Mud Lake Marsh at the southwest corner. Several small, intermittent streams and subsurface flow add water from the east and west. Water flows out at the northwest corner of Mud Lake Marsh and into the Portage River Drain. Water levels in Mud Lake were lowered from 913 ft. elevation (1919 topographic map) to the present 909 ft. when the Portage River was straightened and deepened in 1921-22. Mud Lake then became a marsh and the Portage River was renamed Portage River Drain. Eagle Lake was lowered from 914 ft. (1919 topographic map) to the present elevation of 910.4 ft. Part of the 48-acre Eagle Lake is in the sanctuary.

Historically, water was filtered through an extensive complex of wetlands before entering the Portage River. This meandering river then carried much of the water in northeastern Jackson County and southeastern Ingham County to the Grand River north of Jackson. A variety of wildlife flourished in undisturbed marshes along the Portage. First to affect the watershed were early settlers who harvested marsh hay and pastured livestock in adjacent wetlands. Further changes occurred when many small drains were built and the Portage River was dredged in 1921-22. Compared to the amount of wetlands in 1800, now only 34% remain in the Portage River Lower Branch Subbasin (Ann. 2003). With most of the wetlands drained, farming flourished. Farmers were able to grow onions, lettuce, peppermint, sod and a variety of other specialty crops on the rich muck soils throughout the watershed, including Haehnle.

A decline in farming began in the 1950s due to a combination of factors. Over time, fallen trees, sediment, and other debris clogged not only the Portage, but also the Grand River in many locations causing widespread flooding. Much of the farmland along the lower portions of the Portage River Drain was abandoned because of flooding, late spring and early fall frosts, crop depredations by wildlife and depressed crop prices. Several hundred acres of the sanctuary were once farmed and then abandoned.

Several attempts have been tried to restore the water levels at the sanctuary. A Michigan Department of Conservation 1944 map shows a proposed dike and two dams on the outlet from Mud Lake Marsh. One dam is labeled "Old Dam" and the other "El. Top of dam 907.7 New Dam 1944". Remnants of these dams are still evident. In recent years, over 2,000 acres of hydric cropland soil along the Portage River Drain have been enrolled in the Wetland Reserve Program, including 340 acres of the sanctuary in 2001.

The Portage Drain gradient is less than 0.85 feet/mile resulting in languid flow velocities of less than 0.5 feet/sec. during stable flow conditions fostering sedimentation of suspended solids on available habitat (Wuycheck 2003).

F. Flora

Presettlement Vegetation

Based on the General Land Office surveyor, Joseph Wampler, November 1825 records and topographic maps, biologists from the Michigan Natural Features Inventory have developed maps of the landscape prior to wide-spread European settlement (Comer, P. J. et al. 1995). Presettlement vegetation primarily reflected differences in landform and topography. The Washtenaw Subsection (see above A. Regional Landscape) was mostly white oak-black oak savannas and forests and beech-sugar maple forest while the Jackson Interlobate Sub-subsection had a higher percentage of oak-hickory forests, hardwood swamps, prairie fens and bogs (Albert 1995). Oak-hickory forest covered most of the uplands while wetlands were swamp forest, wet prairie, or marsh. Black oak was probably the dominant forest species at droughty sites, white oak and hickory at slightly wetter areas and red oak at moister locations. Shrub swamp, hardwood swamp, or tamarack swamp typically occurred around kettle lakes, swampy depressions and along the drier margins of marshes. Shrub swamps dominated by silky dogwood, red-osier dogwood, grey dogwood, dwarf willow and poison sumac occupied areas between wetter marshes and drier forest swamps. Elm, ash, white oak and soft maple swamps were dominate species in hardwood swamps. Tamarack swamps were found in more acid, mucky soils than the hardwood swamps. Extensive marshes blanketed much of the glacial drain way where the Portage River now flows. Marshes were also sandwiched between the deep water of lakes and wooded swamps. Fire was important for maintaining oak forest and sedge dominated wetlands.

The following presettlement cover types were once present at the sanctuary (Fig. 5).

Oak Barrens A savanna type of scattered and clumped trees and shrubs in a matrix of grass was maintained by periodic fires. Dominant plants included pignut hickory, black and white oak in canopy; and little bluestem, big bluestem and sedges in ground layer.

Oak Forest Black oak and white oak were dominant in the canopy of this dry-mesic southern forest. Associated trees were red maple, pignut hickory, white ash, black cherry, scarlet oak, and sassafras. Baneberry, bedstraw, black snakeroot, witch-hazel and hop-hornbeam are other characteristic plants.

Inland Wet Prairie Native lowland grasslands were found on saturated, level, seasonally inundated sites in which fire was an important component. Bluejoint, cordgrass, and sedges were dominant plants.

Emergent Marsh A shallow water marsh was characterized by emergent narrow- and broad-leaved herbs and grass-like plants as well as floating-leaved herbs. Dominant plants were: bull rushes, cattails, sedges, yellow water lily, white water lily, and wild rice.

Conifer Swamp A forested peatland located at stream headwaters, in end moraines, or kettle depressions. Dominant plants: tamarack, red maple, yellow birch, black ash, poison sumac, and winterberry. Drainage and the larch sawfly have greatly reduced this community.

Present Vegetation

Present vegetation at Haehnle is divided into plant communities found in uplands, wetlands, lakes and rivers (Fig. 6). Two climax forest communities are present in the uplands – Beech-Maple Forest and Oak Hickory and their seral stages. Four classes of wetlands (Cowardin et al. 1979) are found at Haehnle:

aquatic bed, emergent, shrub and forest. Because of is unique importance fen is indicated as a kind of wetland shrub.

Oak Hickory Forest (Dry-Mesic Hardwood) is a type of Central Hardwood Forest covering about 14% of the sanctuary. This dry deciduous forest is primarily found north of Eagle Lake. A combination of the lack of water due to drought and fires causes the trees to be stressed thus favoring oaks and hickories. Besides oaks (black, white and red) and hickories (bitternut, pignut and shagbark), black cherry, red maple, flowering dogwood, and sassafras are common associates. The understory has hazel-nut, serviceberry, spicebush, witch hazel, honeysuckles, and multiflora rose. Violets, blue vervain, New England aster, May apple, hog peanut, strawberry, and garlic mustard are common in the ground layer.

The natural process of fire formerly perpetuated oak forests by killing competing vegetation and releasing nutrients to promote growth of fire dependent species such as oaks. Oak forests are notoriously difficult to regenerate. The partially open forest canopy created by periodic wildfire has tended to close in, producing too much shade for oak seedlings. Without fire, most oak forests at Haehnle will convert in 50-200 years to a shade tolerant beech-maple woods.

Upland Grassland including Old Field, is an early seral stage of ecological succession in upland forests covering 4% of the sanctuary. It is dominated by herbaceous vegetation. Two types are found at Haehnle; those dominated by non-native, cool-season grasses and those dominated by native warm-season grasses. Quack, timothy, goldenrod, daisy fleabane, and brome are common species in cool-season grass areas. Native, warm-season species such as bluestems, Indian grass, native forbs, and switchgrass have been planted on 37 acres to restore native prairie conditions or as a seral stage of Oak Barrens. Both grassland types are maintained by cultivation, mowing or fire.

Upland Shrub/scrub areas are a seral stage that follows grasslands and precedes development into upland forests. About 1% of the sanctuary is covered with upland shrub/scrub. Disturbed abandoned grasslands soon revert to small trees and shrubs (<20 ft. tall) before being considered a forest. Dogwoods (red osier, gray, silky), winged sumac, boxelder, Juneberry, aspen, black cherry, elm, and red cedar are common at this stage. Autumn olive, honeysuckles and multiflora rose are very invasive and now dominate native shrubs in many areas.

Beech-Sugar Maple Forest (Mesic Southern Hardwood or Southern Hardwood) is found in a 2-acre area along the east side of the sanctuary. This cover type is dominated by mature beech and tuliptree and contains subordinates of basswood, red oak, flowering dogwood, and white ash. There are no records of sugar maple. Due to the relatively shaded conditions, very few shrubs are found in mesic hardwood forests. Spicebush, Juneberry, ironwood, and prickly gooseberry are sometimes found here. In spring before the leaves emerge from buds, the ground layer should be covered with an array of spring wildflowers such as trout lily, toothwort, Dutchman's breeches, and squirrel corn. Spring beauty, May apple, Jack-in-the-pulpit, violets, and round-lobed hepatic have been found here. Other flowers might include large-flowered trillium, wild ginger, bloodroot, wild geranium, and ferns. Rare plants associated with beech-maple forest are prairie trillium, green trillium, nodding pogonia, cranefly orchid, purple twayblade, and ginseng.

Wetland Forest (Palustrine Forest), including Lowland Hardwoods, Swamp, Floodplain Forest, is a deciduous forest type found on flat, poorly drained sites. Wetland forest type is also found along the banks of the Portage River Drain. Wetland forest covers about 5% of the sanctuary.The most common trees are red and silver maple, black and white ash. American elm was common before the spread of Dutch elm disease. Emerald ash borer is probably going kill most of the ashes. Associates are cottonwood, river birch, yellow birch, trembling aspen, boxelder, red maple, and swamp white oak. Understory often has spicebush, gray dogwood, willow, poison sumac, Michigan holly, and glossy buckthorn.

Shrub/scrub Wetland (Palustrine Shrub/scrub, carr) is composed of small trees and shrubs (<20 ft. tall) growing on hydric soils. This is an intermediate, seral stage between emergent and forested wetlands that covers about 22% of the sanctuary. Dominant species display a continuum of preferred soil moistures. Buttonbush is found in areas with standing water during much of the year, silky dogwood and red osier in areas inundated periodically and gray dogwood at drier sites. Glossy buckthorn is replacing many of the

native shrubs. Shrub wetlands have increased in coverage since the exclusion of fire and lower water tables.

Fens are a rare shrub and herbaceous wetland community. Currently, about 85 prairie fens are identified in Michigan totaling about 2,000 acres. Fens generally characterized as containing peat that is constantly saturated with cold, calcareous groundwater and maintained by fire. Little peat covers marl at the Haehnle fens. Shrubby cinquefoil, bog birch, larch, and meadow sedge and rushes are common in this community. Massasauga rattlesnakes, a State Special Concern Species, and white lady-slippers, a State Threatened Species, have been found at Haehnle's fens. The sedge-shrub association of prairie fens at Haehnle covers about 70 acres, but another 60 acres classified as wetland shrub/scrub may be degraded fen.

Emergent Wetlands (Palustrine Emergent) are characterized by erect, rooted, herbaceous vegetation that covers 37% of the sanctuary. Several intermediate cover types are influenced by water depth. Moving from deeper to shallower water they are: swamp loosestrife, pickerel weed, bulrushes, common cattail, sedges, narrow-leaf cattail. Alien species such as reed canary grass, phragmites, and purple loosestrife have replaced some of the native plants. Narrow-leaf cattail coverage is expanding at the expense of common cattail and other emergents. Drainage and the absences of fire have diminished this habitat from presettlement coverage.

Aquatic Bed (Palustrine Aquatic Bed) are open water wetlands too small or shallow (< 20 acres and water depth < 6.6 ft.) to be considered lakes now covers about 8% of the sanctuary. They are mostly permanent or seasonally flooded areas which are dominated by plants that grow on or below the surface of water. Various pondweeds (*Potamogeton* spp.), wild rice, water shield, water lilies, and duckweeds are often dominating species.

Lakes (Lacustrine) are areas >20 acres with the deepest water >6.6 ft. at low water times. About 14 acres of the 48-acre Eagle Lake is within the boundary of the sanctuary. Aquatic plants are similar to those found in wetlands.

Rivers (Riverine) have water contained within a channel that is usually flowing covers about 1% of the sanctuary. An unnamed stream enters Mud Lake Marsh from the south and flows out to the Portage River Drain. Wild celery and yellow water lily are common plants in the stream. Few if any aquatic plants grow in the Portage River Drain because of high sedimentation and carp. Trees, shrubs, or persistent emergents that are present on the banks are considered part of the surrounding wetlands.

Almost 400 taxa of plants have been identified at the sanctuary (Table 4). These including 295 that are believed to be native species, 86 adventive (plants spread into Michigan from a source outside of Michigan since pre European settlement, Herman et. al 1996) and 13 are of undetermined origin. Based on a 3.58 mean coefficient of conservatism and a floristic quality index of 70, the Haehnle Sanctuary is considered to represent a significant component of Michigan's native biodiversity (Herman et al. 1996). White-ladyslipper, wild rice, cup plant and rattlesnake master are consider State Threatened Species (Michigan Dept. Nat. Res. 2009). The last two were planted in warm-season grassland areas.

G. Animal Resources

Fauna at the Haehnle is representative of those species found in southern Michigan. Although numerous surveys and studies such as the Michigan Natural Features Inventory, Breeding Bird Atlas Survey and Christmas Bird Counts have been conducted at Haehnle, most are not quantitative. Most of the records are incidental observations from various people. Except for birds, lists of vertebrates are sketchy at best, but more complete than records of invertebrates.

Invertebrates Forty species of butterflies and moths have been identified at Haehnle (Table 4). One of them, the buck moth, is a Michigan Species of Special Concern (Michigan Dept. Nat. Res. 2009) .

Fish: Warm-water species such as: largemouth bass, bluegill, sunfish, black crappie, northern pike, yellow perch, bowfin, bullheads, and carp are probably found in Eagle Lake (Table 5). Carp and bullheads are common in the Portage River.

Amphibians Of the 17 species of amphibians expected to be found in Jackson County (Harding and Holman 1999), 8 have been observed at Haehnle (Table 6).

Reptiles There potentially could be 21 species of reptiles at Haehnle of which only 5 have been confirmed (Table 7). One species (massasauga rattlesnake) is on the state Special Concern Species list.

Birds At least 226 species of birds have been seen at Haehnle (Table 8). Thirteen of those species are considered historic records because they were observed before 1960 by Lawrence Walkinshaw and have not been seen since. Excluding the 13 historic species, 5 species are Michigan Endangered Species, 8 are Threatened Species and 9 are Special Concern Species (Michigan Dept. Nat. Res. 2009).

No single species of birds attracts more attention at Haehnle than Sandhill cranes. Although their numbers have increased dramatically in recent years they are the "cornerstone species" at the sanctuary. Their numbers have increased from a low of 17 pairs in the Lower Peninsula in 1931 to more than 21,000 counted in 2010. At Haehnle their numbers presently range from usually less than 100 in the spring including 4-5 breeding pairs to several thousand in autumn.

Mammals Of the 42 species of mammals expected to be found in Jackson County (Baker 1983), 12 have been document at Haehnle (Appendix J). None of the mammals at Haehnle are Endangered, Threatened or Special Concern Species. Many of the large carnivores and hoofed animals (12 species) once found in Jackson or Washtenaw Counties are now extirpated (Baker, 1983). White-tailed deer populations are above the carrying capacity of the sanctuary and they are significantly altering the vegetation. Domestic and feral cats are probably affecting bird populations.

H. Human Community Characteristics

The area around the Haehnle Sanctuary is rapidly changing from a farming community to one of rural residences and recreation land. Landowners now find it more profitable to break up farmland into small parcels and sell them than to continue farming. Land too wet for farming or for homes is often purchased for hunting. More than 2,000 acres along the Portage River Drain have been enrolled in the Wetland Reserve Program. This program restores wetlands and holds conservation easements on enrolled properties.

The largest population centers, City of Jackson and two villages are within 6 miles of the sanctuary. In 2000, Jackson had 36,459 residents, Grass Lake 1,082 people and Munith less than 500 residents (US Dept. Commerce). Most of the sanctuary is located in Leoni Township that had 13,459 residents in 2000 (US Dept. Commerce). Haehnle is in the East Jackson School District. Typically, residents commute to work in Jackson, Ann Arbor, Lansing, or Detroit.

The 21,000-acre Waterloo State Recreation Area attracts a large number of tourists, especially to the many lakes and both state and private campgrounds. No recent user surveys have been conducted, so accurate data is not available about the kind and amount of use of the recreation area. However, it is apparent that wildlife viewing, sight seeing, fishing, mushroom hunting, berry picking, trapping, and walking are common activities during most of the year. The biggest influx of visitors occurs during the autumn when fall colors and hunting entice visitors.

I. Threats

Trespass The sanctuary is a temping place for people to trespass because of its abundant wildlife. Most of the trespass problems have involved hunters entering the north and east parts of Haehnle looking for deer. Tree stands, shooting lanes, bait piles and ATV tracks are often evident in the fall. Each year, a few fishermen believe that because the sanctuary is open to the public they can access Eagle Lake from the Seymour Rd. parking lot.

Human Disturbance Because Haehnle has such a diverse and concentrated population of wildlife, it attracts large numbers of people. Photographers often inquire about entering Mud Lake Marsh in hopes of getting closer to the cranes. Low flying airplanes and hot air balloons have frighten waterfowl and cranes. Often people come to Haehnle looking for solitude only to find the parking lot filled with cars

especially in the fall. In order to get a better view of plants or wildlife they can trample vegetation or scare wildlife.
Dogs not kept on a lease can be a problem. These and other forms of human disturbance will place additional stress on wildlife as the demand for wildlife viewing opportunities increases.

Hydrology Channelization of the Portage River in 1921-22 lower sanctuary water levels about 4 feet. As a result it destroyed wetlands along the Portage and accelerated plant succession in Mud Lake Marsh. South of Seymour Rd. a man-made impoundment reduces water entering the sanctuary.

Numerous water quality issues exist in the Portage River Watershed, primarily due to sediment loading to streams from a variety of sources. A number of studies have indicated problems in water quality from high sediment delivery which in turn has caused a build up of sediment, lower dissolved oxygen and higher suspended solids. These problems impact warm-water fishery and other aquatic life, wildlife, and recreation. The comprehensive Upper Grand River Watershed Management Plan has ranked the Potage River Lower Branch Subbasin as one of the worst of the 37 sub-basins in the Upper Grand River Watershed (Ann. 2003). The main concerns were from a lack of riparian vegetative cover, off-field soil loss, nitrite/nitrate pollution (fertilizers), and decline of remaining wetlands. These problems currently severely impact the Portage River Drain as it passes through the sanctuary.

Invasive Species Various exotic plant and animal species significantly affect native biotic communities at Haehnle. Purple loosestrife, phragmites, autumn olive, multiflora rose, honeysuckle (Amur and Tartarian) spotted knapweed, common and glossy buckthorn, garlic mustard are just a few of the invasive plants which have the potential to dominate an area, replacing native species and thereby reducing plant diversity. Emerald ash borers have become established during the last two years and it is expected they will kill most of the ash trees. In the surrounding area, larch sawflies have killed portions of tamarack stands and recent outbreaks of gypsy moths defoliated oaks. Carp are abundant in the permanent water areas. Mute swans have nested at Haehnle but not presently. Both feral and domestic dogs and especially cats probably take a toll of wildlife as more people move to the area and allow their pets to roam.

Dumping and Littering Trash is left at the Wooster Rd. bridge and the Seymour Rd. parking several times a year. At least once-a-year roadside litter needs to be picked up.

Vandalism and Theft Benches and signs through the years have been vandalized. A “money tree” used to collect donations has been broken into and the whole structure stolen in 2006.

V. CONCEPT of MANAGEMENT

Management Principles

Michigan Audubon is committed to ecosystem management using ecological principles to manage natural resources at the Phyllis Haehnle Sanctuary that will ensure:

1. All plants and animals are maintained at viable levels in their native habitats,
2. Basic abiotic processes and components of air, soil and water are perpetuated indefinitely, and
3. Human use and occupancy are accommodated within these constraints.

Management Objectives

Audubon’s objectives are to manage and control activities so that those activities are in keeping with the sanctuary goals.

Goal 1: Conserve native flora and fauna at the sanctuary, especially sandhill cranes.

Objective 1: Maintain sanctuary boundary.

Objective 2: Restrict public access to environmentally sensitive areas including fens and wetlands used by cranes.

Objective 3: Restore water levels to elevations that occurred prior to construction of the Portage Drain.

Objective 4: Restore, enhance and maintain native biotic communities i.e. grasslands, savannahs, fens, wetlands.

Objective 5: Manage native plant and animal species.
Objective 6: Enlarge the sanctuary through gifts and purchase of additional land.
Objective 7: Reduce invasive plants and animals.

Goal 2: Increase public understanding of the sanctuary, its wildlife and their environment.
Objective 1: Conduct guided tours.
Objective 2: Provide educational materials.
Objective 3: Provide opportunities for self-guided wildlife viewing
Objective 4: Publicize sanctuary activities, wildlife, etc.
Objective 5: Maintain a historical account of Haehnle.
Objective 6: Hire a part-time steward.

Goal 3: Increase scientific knowledge of wildlife and their environment though research.
Objective 1: Maintain an inventory of plants, insects, amphibians, reptiles, birds and mammals
Objective 2: Permit scientific studies of wildlife.

These objectives are a framework from which detailed and specific short-and long-range programs of management will be developed and implemented. These goals should be reviewed at least every 5 years.

Access and Recreation Management

Access management is critical to the goals of the sanctuary. To protect the wild character of Haehnle, people's activities, their distribution and numbers and effects that result must be controlled.

- Wildlife viewing opportunities abound at Haehnle and are in harmony with the goals of the sanctuary when done with knowledge and respect for the wildlife being observed as well as for other wildlife viewers. Large groups and overuse of certain areas at certain times of the year disturb wildlife and compromise the very opportunities that people seek. Management and user education about wildlife viewing are critical and required to ensure a continuing and rewarding experience.
- People will be encouraged to remain on marked pathways (non-motorized trails).
- Certain areas at Haehnle are especially sensitive to human disturbance. Mud Lake Marsh that attracts large numbers of Sandhill Cranes during autumn and the fragile nature of fens require special restriction on access.
- Hunting, fishing and trapping shall be prohibited.
- Wheeled motorized vehicles, snowmobiles and motorized boats shall be prohibited.
- Pets shall be kept on lease at all times.
- Camping and horseback riding shall be prohibited.
- Adequate parking areas have been provided for visitor convenience. No additional parking areas should be developed except for public safety.

Wetland Management

Data from the Michigan Natural Features Inventory estimates that Southern Lower Michigan has lost 43% of its wetlands since settlement by Europeans. Much of what remains is degraded and fragmented. When the Portage River in Jackson County was straighten and deepened in 1921-22, more than 7,000 wetland acres were degraded.

During spring migration, several thousand ducks (mallards, northern pintails, American black ducks, ring-necked ducks, etc.) and members of the southern James Bay Canada goose population use flooded areas along the Portage River Drain, but leave as soon as floodwaters flow back into the drain leaving a degraded wetland that supports a low biodiversity. Restoring these wetlands will increase waterfowl use during spring migration and provide brood habitat for mallards, black ducks and other waterfowl that nest in southern Michigan.

American bitterns, least bitterns, sandhill cranes and sedge wrens nest at the sanctuary and each year northern harriers, osprey, and bald eagles forage there. Haehnle is the eastern most major fall staging area for sandhill cranes in the United States, attracting over 3,000 cranes. Restoring an area of low biodiversity dominated by reed canary grass will provide additional breeding and nesting habitat. It is

expected that northern harriers will once again nest. Osprey and bald eagles will benefit from additional feeding areas during spring migration.

Grassland and Savannah Management

Grassland avifauna has been declining over much of North America, especially in the Midwest (Robbins et al. 1986). Based on the Michigan Breeding Bird Survey (Brewer et al. 1991), 12 of 16 grassland species have experienced significant declines in the state. Most of the grassland birds reported at Haehnle by Hoffman and Hoffman (1986) have not been seen in recent years. Those grassland species that have disappeared from Haehnle and the decade they last were seen are bobwhite '70s, Savannah sparrow '80s, grasshopper sparrow'30s, Henslow's sparrow '60s (observed again Sept. 2005 and evidence of nesting in 2007), eastern meadowlarks 80s, and bobolink '80s. Pheasants are still infrequently seen in this unit while harriers are observed mostly during the fall hunting in the marsh. Sandhill cranes formerly foraged in the open fields.

Large tracts of grassland have especially been lost. Species highly sensitive to area size require grasslands >125 acres while those moderately area sensitive need tracts >25 acres (Swanson. 1996).

Many reptile species have declined in number (e.g. spotted turtle, snapping turtle, and blue racer) because of habitat destruction and killing. This is especially true for the eastern massasauga rattlesnake which is a federal candidate species for listing under the Endangered Species Act and a Michigan Special Concern Species.

The massasauga moves seasonally between different habitats. In the spring and fall it prefers wetter habitats near its hibernacula. In the summer, it prefers upland sites such as old fields, or areas with prairie grasses. It does not hibernate communally as do many species of snakes, but usually occurs either singly or in small groups of two or three. This species hibernates below the frost line, usually in mammal or crayfish burrows. These burrows are often located in moist areas where the water table is near the surface. By hibernating in moist burrows the massasauga can escape lethal low temperatures and reduce the chance of desiccation.

Stands of shrubs that separate wetlands from upland grasslands can disrupt seasonal movement of snakes and turtles between the two habitats. The amount of wetland shrubs at Haehnle has increased due to drainage and the lack of fire. Maintaining healthy grasslands and emergent wetlands will benefit these reptiles.

Data from the Michigan Natural Features Inventory estimates that Southern Lower Michigan has lost >99% of its oak savanna since settlement by Europeans. Oak barrens once covered >84,000 acres of Jackson County. Side oats gramma and prairie smoke are examples of rare plants that once grew in this community. Rare animal species that utilize oak barrens include grasshopper sparrow, prairie warbler, eastern massasauga, and eastern box turtle. Exclusion of fire, conversion to agriculture, and encroachment of woody vegetation and invasive exotics has all but destroyed this community.

Establishing and maintaining grasslands and a savannah next to emergent wetland will provide habitat for rare plants and animals. Fire, mechanical (cutting, mowing, disking, etc.) and chemicals are management tools that will be used.

Nesting Structures

Using man-made nesting structures focuses on one aspect of a species needs rather than the broader factors affecting its abundance. Most management efforts should be aimed at the biotic community level instead specific habitat requirements. However, nesting structures do have a place in attracting and increasing certain species.

Osprey, a State Threatened Species, is uncommon during migration at Haehnle. Despite population increases since the 1970s in the northern parts of the state, there is a lack of nesting pairs in southern Michigan. It is expected that a breeding population will eventually become established in southern Michigan. A nesting platform was erected in 1988 and maintained since then in hopes of attracting a nesting pair. To date, no nesting has taken place.

Bluebirds were once a common species in Michigan, but by the 1950s they were uncommon around people's homes. Bad winters, foreign bird competition, use of pesticides, and loss of nest cavities in trees and wooden posts contributed to their decline. Erecting and maintaining nest boxes has restored bluebirds to a common species at Haehnle.

Wood ducks are another species that once was common, declined in numbers and more recently have become more abundant. Lost of nesting cavities and increased predation from raccoons has suppressed the population. Wood duck nest boxes were first erected in 2005.

Invasive Species Management

Invasive plants have the potential to dominate an area, replacing native species and thereby reducing plant diversity. A large number of invasive species of plants are found at Haehnle. Some are widespread and highly invasive while others are confined to local areas and are less invasive. Invasive animal species are also present at Haehnle. The most problematic species should be managed within constrains of time and money.

Invasive animal species are also present at Haehnle. The most problematic species should be managed within constrains of tie and money.

Portage River Drain Streambank Management

Boxelder, ash, American elm, Tartarain honeysuckle, white mulberry, common and glossy buckthorn, multiflora rose, and oriental bittersweet commonly grow along the streambank of the Portage River Drain. Disease and insects are killing elms and ashes. Some of the other species are not native and have minimal benefits for water quality. Planting native, long-lived trees will reduce runoff, lower water temperature by providing shade and be more attractive to wildlife.

Private Land Ownership and Adjacent State Land

There are more than a dozen privately owned parcels of land near the Phyllis Haehnle Sanctuary while State of Michigan land borders the sanctuary at two locations. Some of these parcels are important for maintaining wildlife habitat and the unique character of Haehnle These lands, whether state owned or privately owned, serve as a buffer between the sanctuary and nearby development and should receive as much protection as possible from any use that is inconsistent with the goals of Haehnle. This is especially important where the adjacent lands contain valuable riparian or wetland habitats, wildlife travel corridors or species and natural communities of special concern.

It is important that Audubon cooperate with restoration efforts in the Portage River Watershed and support MDNR management of land in the Waterloo State Recreation Area that are consistent with the goals and objectives of Haehnle. Audubon should seek assistance from and develop partnerships with private organizations as well as governmental entities.

It is critical that that Audubon gain public support by fostering an increased awareness and understanding of the value and uniqueness of Haehnle. Public support should be increased by regular communication with conservation organizations, area businesses, local and regional units of government, private landowners and the general public.

Phyllis Haehnle Sanctuary Committee

To keep the Phyllis Haehnle Sanctuary true to its purpose and responsive to changing conditions and public use, the Phyllis Haehnle Sanctuary Committee was formed February 11, 1978. The Michigan Audubon Society has delegated stewardship responsibilities for Haehnle to the Jackson Audubon Society, Haehnle Committee. The Committee is responsible for planning, programs, activities and management as approved by the Michigan Audubon Society, Conservation Committee.

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Michigan Special animals http

Figure 1. Location of the Phyllis Haehnle Memorial Sanctuary in Michigan.

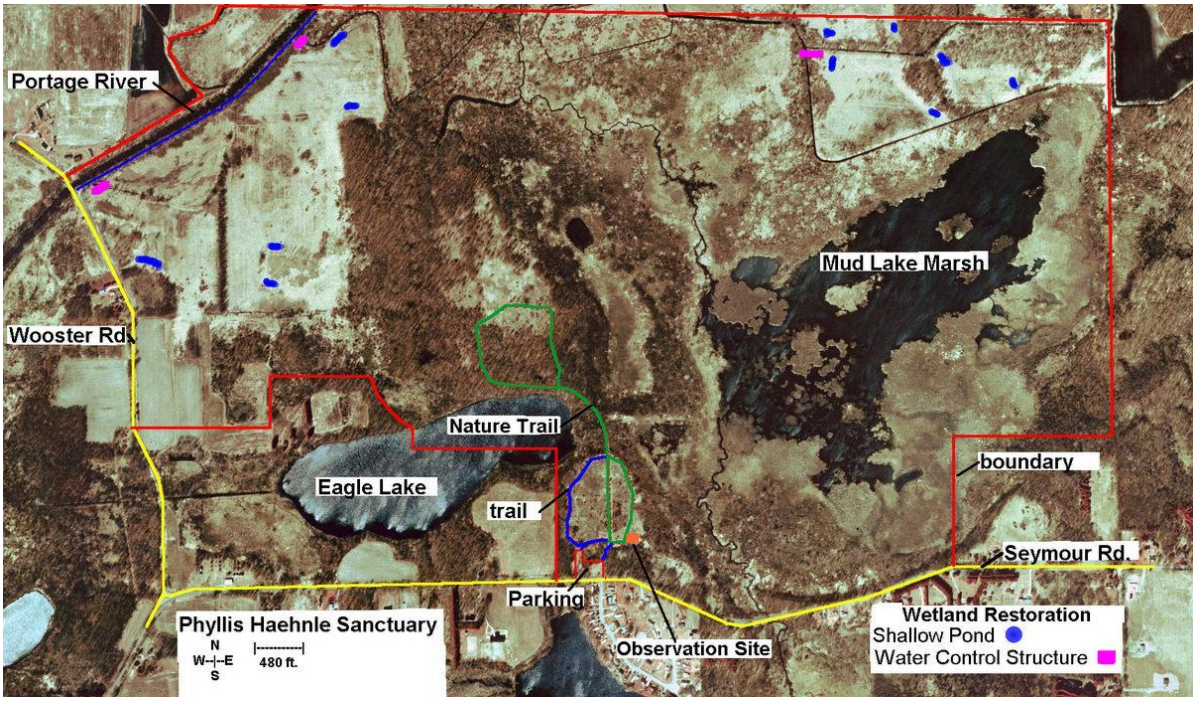

Figure 2. Phyllis Haehnle Memorial Sanctuary.

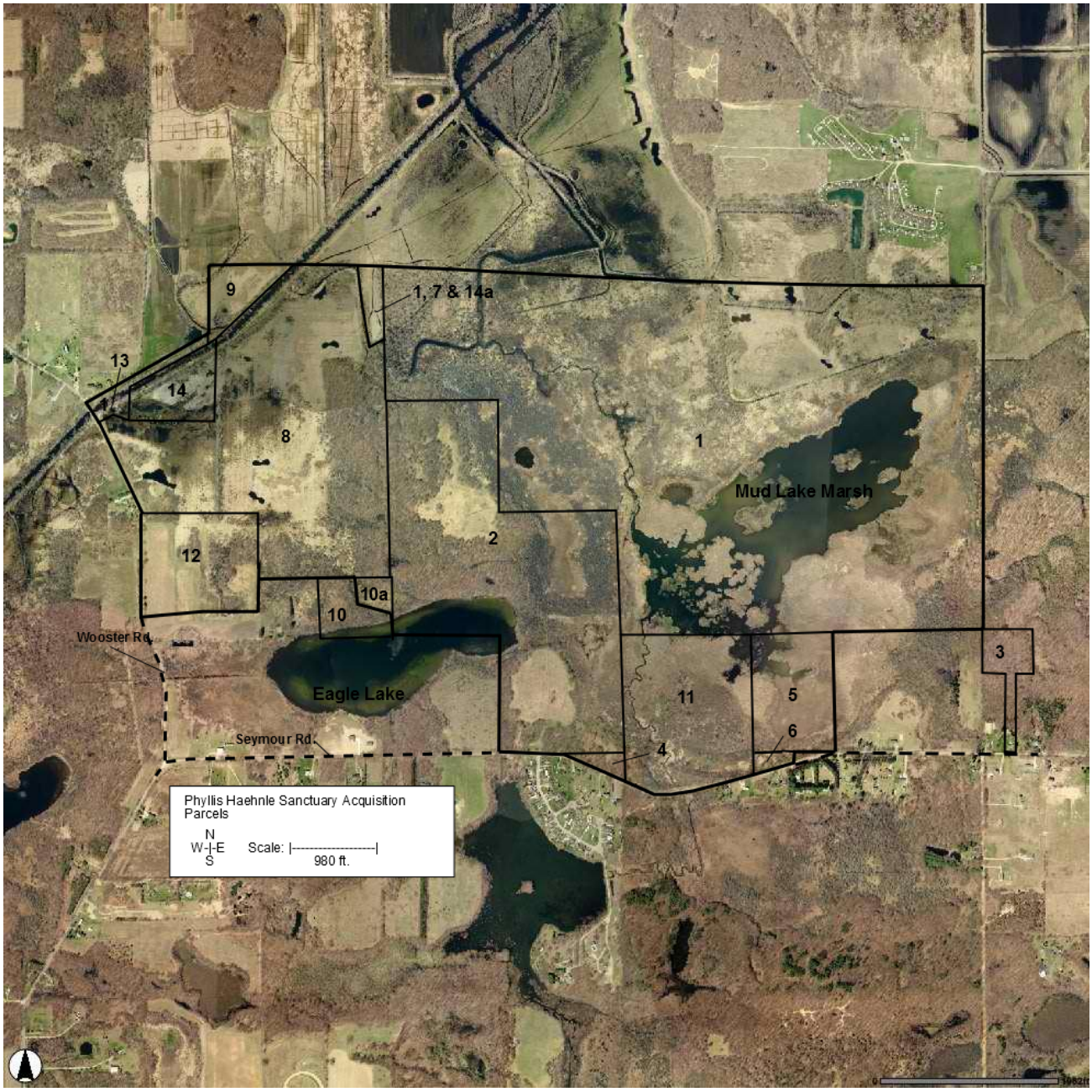

Figure 3 Phyllis Haehnle Memorial Sanctuary map of acquired parcels (see Table 1for description).

Figure 4. Phyllis Haehnle Memorial Sanctuary soil map.

Soil Symbol/Soil Name: 11 Boyer-Osthemo loam, 14 Spinks sand, 18 Gilford-Colwood, 20 Houghton muck, 22 Cohoctah sand, 30 Edwards muck, 35 Arkport-Okee sand, 37 Palms muck, 43 Dixboro loam, 45 Martisco muck, 47 Histosols & Aquents, 49 Hillsdale-Riddles loam, 55 Eleva loam, 63 Henrietta muck.

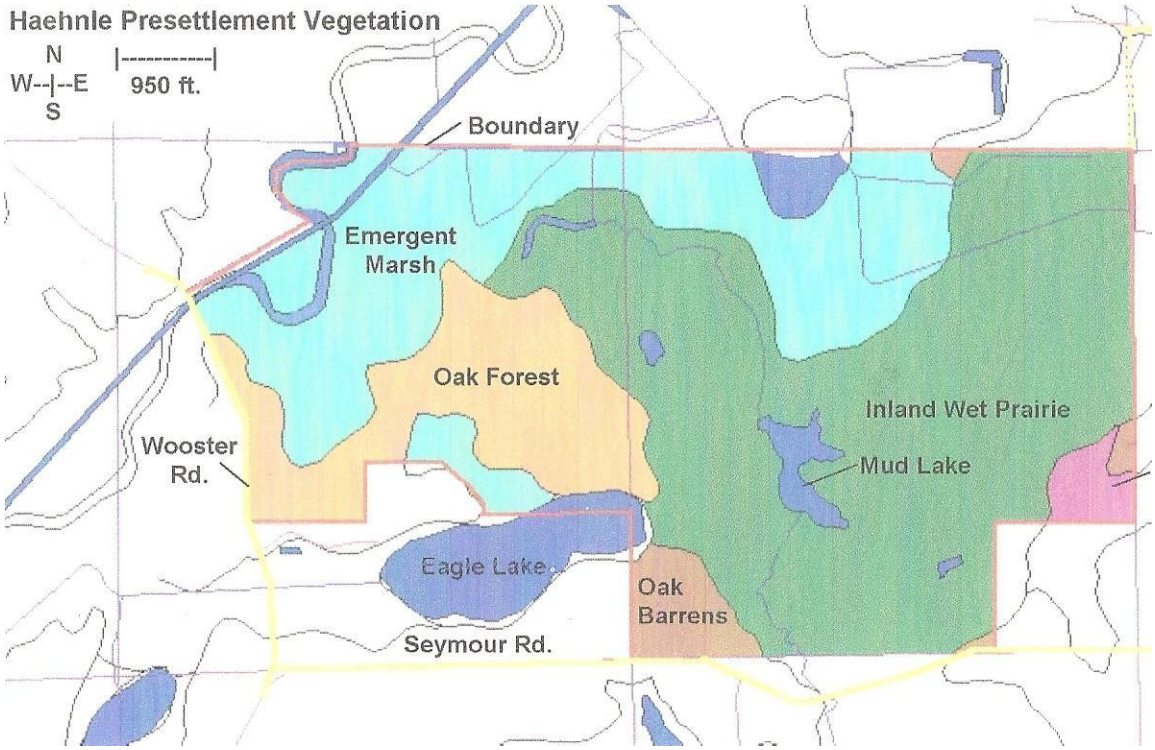

Figure 5. Presettlement Vegetation.

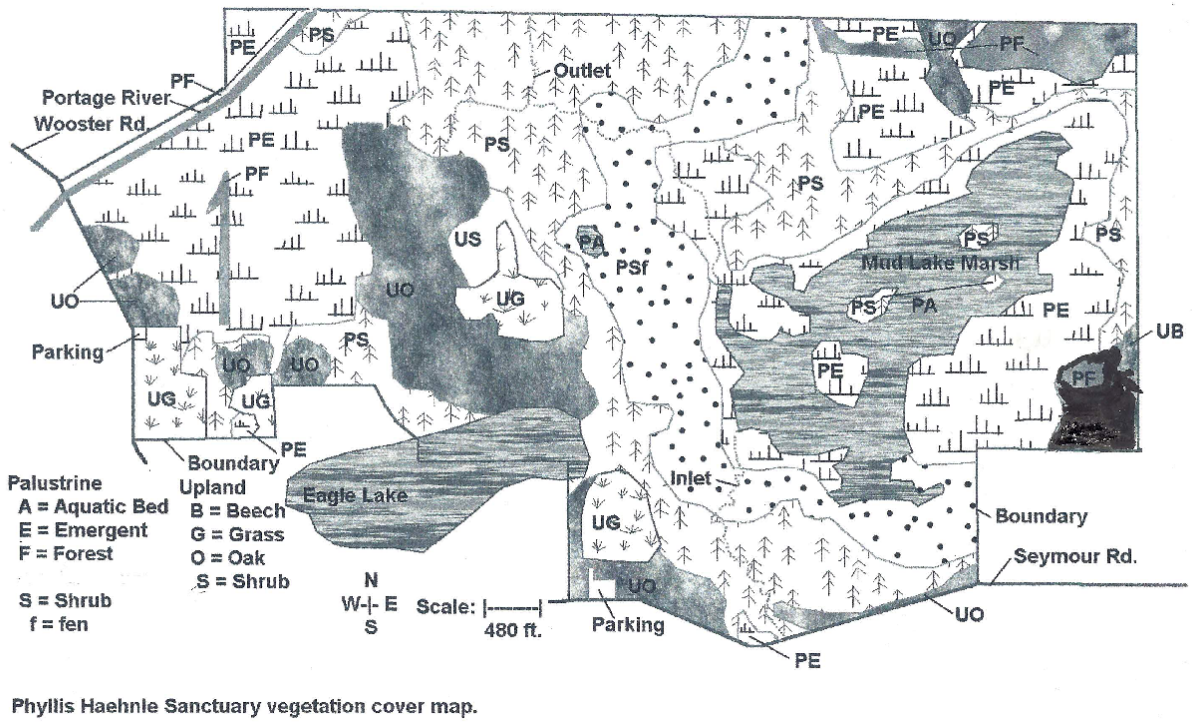

Figure 6. Phyllis Memorial Sanctuary vegetation cover map.