Rapid Ecological Assessment for the Green Bay West Shores Wildlife Area

A Summary of Biodiversity Values Focusing on Rare Plants, Selected Rare Animals, and High-quality Natural Communities in Preparation for the Development of a New Property Master Plan

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Cover photo taken by Emmet Judziewicz at the Pecor Point Unit of the Green Bay West Shores Wildlife Area.

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Purpose and Objectives

This report is intended to be used in conjunction with other sources of information for developing a new master plan for the Green Bay West Shores Planning Group (GBPG), including Green Bay West Shores Wildlife Area, Charles Pond State Natural Area, Peshtigo Harbor Lacustrine Forest State Natural Area, Peshtigo River Delta Marshes State Natural Area, and Bloch Oxbow State Natural Area. The Green Bay West Shores Wildlife Area includes the following 11 units:

- Charles Pond Unit
- Little Tail Unit
- Long Tail Unit
- Oconto Marsh Unit
- Peats Lake Unit
- Pecor Point Unit
- Pensaukee Unit
- Peshtigo Harbor Unit
- Rush Point Unit
- Sensiba Unit
- Tibbett – Suamico Unit

This assessment addresses issues specifically related to the conservation of biological diversity for this property.

The primary objectives of this assessment were to collect biological inventory information relevant to the development of a master plan for the GBPG and to analyze, synthesize and interpret this information for use by the master planning team. This effort focused on assessing areas of potential habitat for rare species and identifying natural community management opportunities.

Survey efforts for the GBPG were limited to a "rapid assessment" for 1) identifying and evaluating ecologically important areas, 2) documenting rare species occurrences, and 3) documenting occurrences of high quality natural communities. This report can serve as the "Biotic Inventory" document used for master planning, although it is a scaled-down version in terms of both the time and effort expended when compared to similar projects conducted on much larger properties. The information collected was the result of survey work primarily done in 2008. There will undoubtedly be gaps in our knowledge of the biota of this property, especially for certain taxa groups; some of these have been identified in the future needs section.

Methods

The Wisconsin Natural Heritage Inventory (NHI) program is part of the Wisconsin DNR's Bureau of Endangered Resources and a member of an international network of natural heritage programs representing all 50 states, as well as portions of Canada, Latin America, and the Caribbean. These programs share certain standardized methods for collecting, processing, and managing data for rare species and natural communities. NatureServe, an international non-profit organization (see *www.NatureServe.org* for more information), coordinates the network.

Natural heritage programs track certain *elements* of biological diversity: rare plants, rare animals, high-quality examples of natural communities, and other selected natural features. The NHI Working List contains the elements tracked in Wisconsin; they include Endangered, Threatened, and Special Concern plants and animals as well as the natural community types recognized by NHI. The NHI Working List is

periodically updated to reflect new information about the rarity and distribution of the State's plants, animals, and natural communities. The most recent Working List is available from the Wisconsin DNR Web site (*http://www.dnr.wi.gov/org/land/er/wlist/*).

The Wisconsin NHI program uses standard methods for biotic inventory to support master planning (Appendix A). Our general approach involves collecting relevant background information, planning and conducting surveys, compiling and analyzing data, mapping rare species and high quality natural community locations into the NHI database, identifying ecologically important areas, and providing interpretation of the findings through reports and other means.

Scientific names for all species mentioned in the text are included in a list at the end of the document (page 32).

General Background Information

The Green Bay West Shores Planning Group is located along the west shore of Green Bay in Lake Michigan in Brown, Marinette, and Oconto counties and comprises 8,628 acres (Figure 1).

Management Units of the Green Bay West Shores Wildlife Area include:

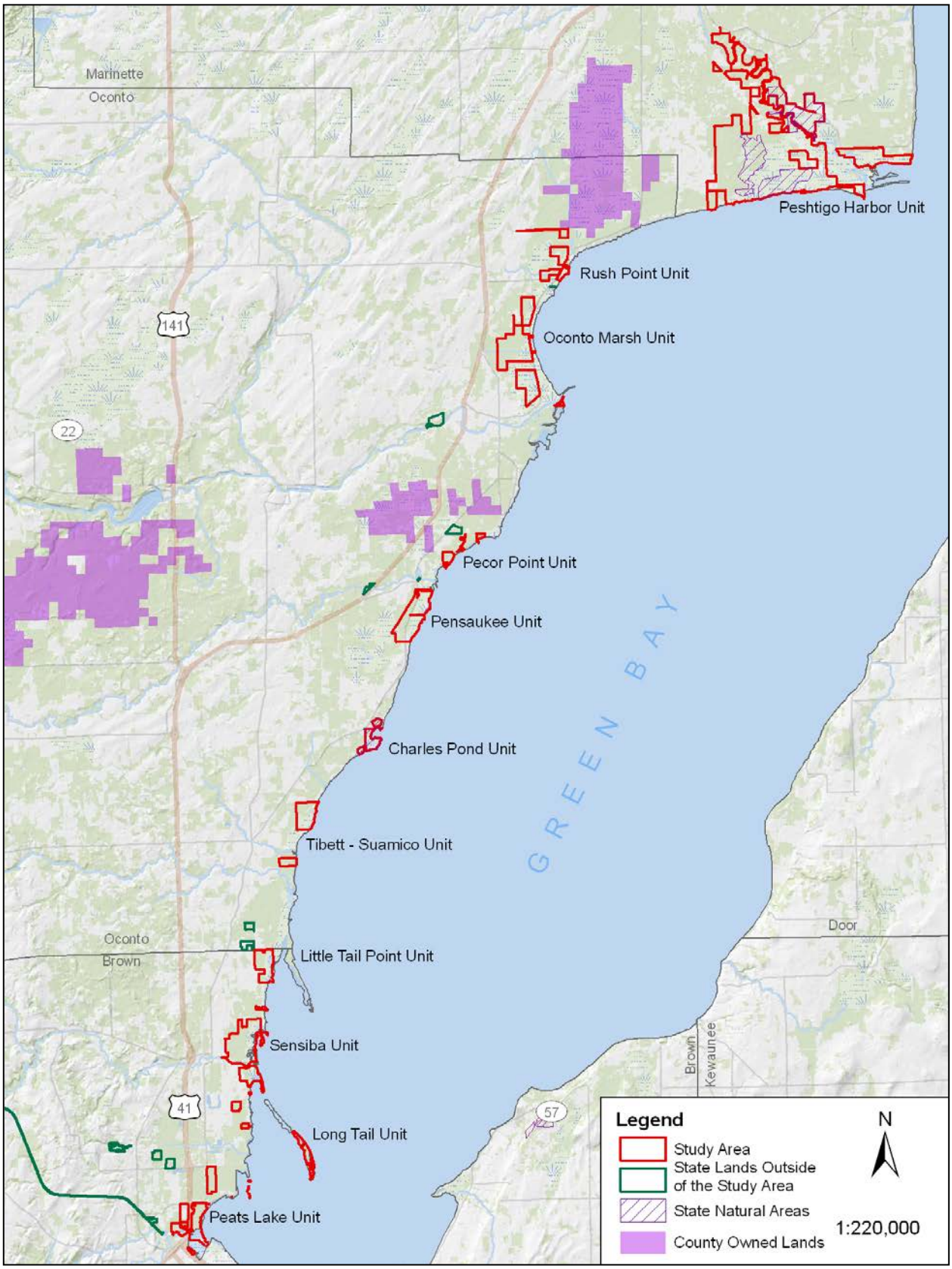
- Charles Pond Unit (87 acres) is located in Oconto County, about nine miles southwest of the town of Pensaukee and includes Charles Pond State Natural Area (SNA).
- Little Tail Point Unit (293 acres) is located in Brown County, about three miles north of the village of Suamico.
- Long Tail Point Unit (434 acres) is located in Brown County, about 1 mile east of the village of Suamico, south of the Suamico River.
- Oconto Marsh Unit (928 acres) is located in Oconto County, about one mile northeast of the city of Oconto.
- Peats Lake Unit (317 acres) is located in Brown County, about one mile north of the city of Green Bay.
- Pecor Point Unit (130 acres) is located in Oconto County, about two miles northeast of the town of Pensaukee.
- Pensaukee Unit (370 acres) is located in Oconto County, just south of the town of Pensaukee.
- Peshtigo Harbor Unit (4,894 acres) is located in Marinette County, at the mouth of the Peshtigo River and upstream along both sides of the river. Peshtigo Harbor Lacustrine Forest SNA and Peshtigo River Delta Marshes SNA are located within this unit. The Bloch Oxbow SNA is connected to this unit.
- Rush Point Unit (226 acres) is located in Oconto County, north of the city of Oconto.
- Sensiba Unit (570 acres) is located in Brown County, about 1 mile east of the village of Suamico, north of the Suamico River.
- Tibbett – Suamico Unit (307 acres) is located in Oconto County, about one mile east of the town of Little Suamico.

Important areas for biodiversity outside of this study area include Seagull Bar SNA, the Lower Green Bay islands, and a large swamp along the Oconto and Marinette county line.

Maps within this report are intended to be used only within the context of this report. The "Study Area" and "State Lands Outside of the Study Area" were generated using the DNR's Managed Lands GIS layer. This layer represents the boundaries of lands managed by the Wisconsin DNR and can include lands managed through ownership, easements, or leases. This data set may include errors and omissions. Low levels of Green Bay have created exposed lake bed that may not be represented as

DNR managed lands in this layer. This data should not be interpreted as legal representation of legal ownership boundaries. The “County Owned Lands” areas on maps were generated using a GIS layer managed by the Wisconsin DNR. This layer may contain errors and should not be interpreted as legal representation of legal ownership boundaries.

Figure 1
Location of the Green Bay West Shores Planning Group.



Previous efforts

Green Bay Integrity Assessment
The Green Bay Integrity Assessment, conducted by the Nature Conservancy in partnership with other conservation organizations, was completed in 2006 (Grimm 2006). The project developed conservation targets, threats to those targets, and strategies to sustain the targets and improve the overall health of the bay. Conservation targets included Green Bay coastal wetland complexes, littoral zone, benthic community, northern pike, lake sturgeon, migratory diving ducks, and island dependent colonial nesting birds. The Green Bay Integrity Assessment can be used in conjunction with this Ecological Assessment and other planning documents when developing the Master Plan.

Coastal Wetlands Assessment
The Lower Green Bay area, the Pensaukee River Wetlands, the Lower Peshtigo River, and Oconto Marsh were recognized as Exemplary Sites coastal wetlands near Wisconsin's Great Lakes, in the report *Data Compilation and Assessment of Coastal Wetland's of Wisconsin's Great Lakes* (Epstein et al. 2002).

Land Legacy Report
The Land Legacy Report (WDNR 2006a), developed to identify Wisconsin's most important conservation and recreation needs for the next 50 years, identified two "Legacy Places" on the GBPG:

- The Peshtigo Harbor Marsh Legacy Place was assigned a score of five points on a five-point scale for conservation significance, meaning it possesses "outstanding ecological qualities, is of adequate size to meet the needs of critical components, and/or harbors natural communities or species of global or continental importance." Restoration efforts, if needed, have a high likelihood of long-term success.
- The West Shore Green Bay Wetlands Legacy Place was assigned a score of four points on a five-point scale for conservation significance, meaning it possesses "excellent ecological qualities, is of adequate size to meet the needs of most of the critical components, and/or harbors natural communities or species of continental or Great Lakes regional significance." Restoration efforts have a high likelihood of success.
- The Oconto River Marsh Legacy Place; Seagull Bar Legacy Place; and the Suamico, Little Suamico, and Pensaukee Rivers Legacy Place were each assigned a score of three points on a five-point scale for conservation significance, meaning they possess "good ecological qualities, is of adequate size to meet the needs of some of the critical components, and /or harbors natural communities or species of state significance." Restoration efforts will typically be important and have a very good chance of success.
- The Peshtigo River Legacy Place was assigned a score of two points on a five-point scale for conservation significance, meaning it possesses "good ecological qualities, may be of adequate size to meet the needs of some of the critical components, and/or harbors natural communities or species of state or Ecological Landscape significance." Restoration efforts are likely needed and have a good chance of success.

Wisconsin Wildlife Action Plan Conservation Opportunity Areas
The Wisconsin Wildlife Action Plan (WDNR 2006b) recognized the Great Lakes and their shorelines and the Green Bay West Shores as being globally significant Conservation Opportunity Areas. Conservation Opportunity Areas are places in Wisconsin that contain ecological features, natural communities, or habitat for Species of Greatest Conservation Need for which Wisconsin has a unique responsibility for protecting when viewed from the global, continental, upper Midwest, or state perspective.

Important Bird Areas
Important Bird Areas (IBA) are critical sites for the conservation and management of Wisconsin's birds (WDNR 2007).

- The Green Bay West Shore Wetlands IBA has long been recognized as an important area for migrating waterfowl, shorebirds, and neo-tropical migrants, foraging shorebirds, and breeding rare birds.
- The Lower Peshtigo River IBA is important to a diversity of birds that reflect the mosaic of habitat types present, including the most significant wetland and riparian forest habitats in the Green Bay area.

Wisconsin Wetland Association Wetland Gem
The West Shore Green Bay Wetlands was recognized by the Wisconsin Wetland Association as a "wetland gem" because of their significance with regards to the extent of wetland habitat and the use of the site by many native and rare animals (Wisconsin Wetlands Association 2009).

The Peshtigo River Delta was also recognized as a "wetland gem" because of the diversity of natural community types present that provide habitat for numerous rare species (Wisconsin Wetlands Association 2009).

Great Lakes Conservation Area
The Nature Conservancy's *Binational Conservation Blueprint for the Great Lakes* (2005) recognized the Green Bay West Shore as a "Conservation Area," an area that supports Great Lakes biodiversity, within the Great Lakes Ecoregion.

Special Wetlands Inventory Study
Special Wetlands Inventory Study (SWIS), a joint state and federal project to study the wetlands of the Green Bay Area, was completed in 1993 and resulted in a database that classified and characterized 4,000 wetlands in the area (Kasprzak and Walter, 2001). The database is currently being re-formatted by the Bay-Lake Regional Planning Commission. When completed, this dataset could be used for many studies, including studying the impacts of common reed grass (*Phragmites australis*) on wetland flora.

Priority Landscape for Grassland Birds
The sedge meadows of the Green Bay West Shores were recognized by the WDNR as a Priority Landscape for Grassland Bird Management because of the opportunity for management of sedge meadow birds, including yellow rail (Sample and Mossman 1997).

Ecological Context

The GBPG is located along the west shore of Green Bay in the Central Lake Michigan Coastal and Northern Lake Michigan Coastal Ecological Landscapes (Figure 2). The study area occurs on ground moraine and lacustrine plains (WDNR In Prep. a). Lacustrine plains within the study area are created where the Oconto, Pensaukee, Suamico, and Peshtigo Rivers; Duck Creek; and other smaller rivers and streams create deltas upon entering Green Bay. Important landform features are also created by long-shore currents in Green Bay.

Water levels of Green Bay are extremely important to both form and function of the study area. The elevation of many of the wetlands is equal to the elevation of the bottom of Green Bay. This results in water of the bay flowing through these wetlands and found behind them. Daily, seasonally, and long-term water levels affect the fish, wildlife, and plant communities location and use within the GBPG. Daily changes, produced by seiches, can inundate a dry area with a few inches of water and then dry out again. Annual flooding events allow small streams and tributaries to run for a month or two, creating important wildlife habitat and fish spawning areas. Long-term changes in the water levels of Green Bay, although difficult to notice, have large impacts on the ecology of the area. Wetland natural communities shift within the GBPG depending on water levels. An Emergent Marsh may shift to Southern Sedge Meadow, Shrub-carr, and eventually Southern Hardwood Swamp as water levels decrease. Upon a rise in the water level of Green Bay, this area may become open water, killing trees and shrubs and possibly shifting the natural community back to Emergent Marsh.

The GBPG is located within three Landtype Associations (LTAs):

- Lewiston Basin (212Te10). The characteristic landform pattern is nearly level lake plain with many swamps. Soils are predominantly somewhat poorly drained loamy fine sand over sandy lacustrine.
- Brookside Moraines (212Tb28). The characteristic landform pattern is nearly level till and lake plain complex. Soils are predominantly somewhat poorly drained fine sandy loam over calcareous loamy till or lacustrine.
- Green Bay Plains (212Zb06). The characteristic landform pattern is nearly level lake plain with scattered low dunes. Soils are predominantly somewhat poorly drained loamy fine sand over sandy and silty lacustrine and beach deposits.

Figure 2
The Ecological Landscapes of Wisconsin. The star indicates the approximate location of the Green Bay West Shores Planning Group.

Presettlement Vegetation

Data from the original Public Land Surveys are often used to infer vegetation cover types for Wisconsin prior to widespread European Settlement. Public Land Surveys for the area comprising the GBPG were conducted between 1836 and 1840. Finley's (1976) Original Vegetation Map described the GBPG as being dominated by marsh, sedge meadow, wet prairie, and lowland shrubs with swamp conifers and oak forests also common.

Table 1. Original vegetation cover for the Green Bay Planning Group (Finley 1976)

Vegetation Type	Percent
Marsh and sedge meadow, wet prairie, lowland shrubs	48%
Swamp conifers -- white cedar, black spruce, tamarack, hemlock	30%
Oak -- white oak, black oak, bur oak	15%
Hemlock, sugar maple, yellow birch, white pine, red pine	5%
Beech, sugar maple, basswood, red oak, white oak, black oak	1%
Beech, hemlock, sugar maple, yellow birch, white pine, red pine	<1%
Water	<1%
Sugar maple, basswood, red oak, white oak, black oak	<1%

Pensaukee Marsh. Photo by Emmet Judziewicz.

Current Vegetation

The current vegetation for the GBPG is a matrix of wetland natural communities, varying from open to shrub dominated to forested, with limited upland areas. The wetland natural communities on the GBPG include: Emergent Marsh, Great Lakes Beach, Southern Sedge Meadow, Shrub-carr, Riverine Mud Flat, Southern Hardwood Swamp, and Floodplain Forest. The limited upland areas are typically composed of Northern Dry-mesic Forest. Land use surrounding the GBPG is characterized as an agricultural dominated landscape with large population centers (Figure 3).

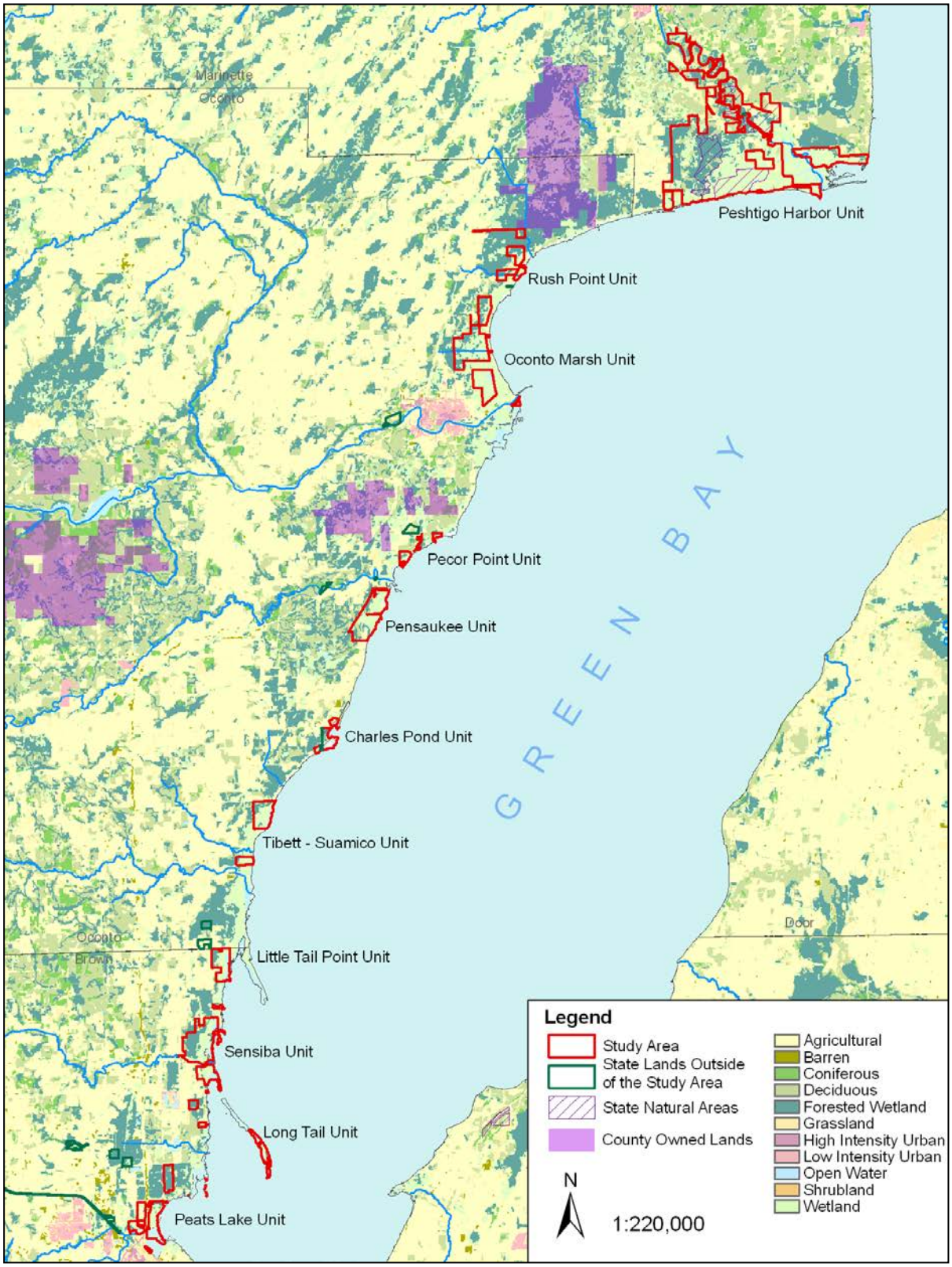
Emergent Marshes of the GBPG are extensive and impacted by Lake Michigan water levels, wave action, ice scouring, and invasive species. They are dominated by broad-leaved cat-tail (*Typha latifolia*) and soft-stem bulrush (*Schoenoplectus tabernaemontani*) with associated species including common three-square bulrush (*Schoenoplectus pungens*), nodding beggar-ticks (*Bidens cernuus*), needle spike-rush (*Eleocharis acicularis*), bald spike-rush (*Eleocharis erythropoda*), false pimpernel (*Lindernia dubia*), marsh purslane (*Ludwigia palustris*), whorled water-milfoil (*Myriophyllum verticillatum*), nodding water-nymph (*Najas flexilis*), comb pondweed (*Stuckenia pectinata*), Canadian rush (*Juncus canadensis*), Pursh's bulrush (*Schoenoplectus purshianus*) , algae, and the invasive variety of common reed grass. On drier, landward, less frequently inundated areas, characteristic species are common boneset (*Eupatorium perfoliatum*), blue vervain (*Verbena hastata*), and common agalinis (*Agalinis tenuiflora*). The invasive purple loosestrife (*Lythrum salicaria*) is occasional, but not dominant.

Great Lakes Beaches of the GBPG are narrow, dynamic systems that change based on Lake Michigan's water level and storm events. The amount of vegetation cover varies. Some areas have scattered, mostly open sand areas with common evening-primrose (*Oenothera biennis*), witch grass (*Panicum capillare*), common cocklebur (*Xanthium strumarium*), and the invasive variety of common reed grass. More densely vegetated areas have nodding beggar-ticks, curly-top knotweed (*Polygonum lapathifolium*), rice cut grass (*Leersia oryzoides*), southern hair grass (*Agrostis hyemalis*), plains cottonwood seedlings (*Populus deltoides*), cursed crowfoot (*Ranunculus sceleratus*), dotted smartweed (*Polygonum punctatum*), bald spike-rush, Pursh's bulrush, green ash (*Fraxinus pennsylvanica*), meadow willow seedlings (*Salix petiolaris*), Canadian horseweed (*Conyza canadensis*), Allegheny monkey-flower (*Mimulus ringens*), orange jewelweed (*Impatiens capensis*), barnyard grass (*Echinochloa crusgalli*), and the invasive reed canary grass (*Phalaris arundinacea*). Exposed sand has zebra mussel shells.

Southern Sedge Meadows of the GBPG are open wetlands dominated by tussock sedge (*Carex stricta*), blue-joint grass (*Calamagrostis canadensis*), and broad-leaved cat-tail. Shrub cover varies and is composed of meadow willow, red osier dogwood (*Cornus stolonifera*), and *Spiraea sp*. Associated species within the sedge meadow include common lake sedge (*Carex lacustris*), tussock sedge, beaked sedge (*C. rostrata*), orange jewelweed, cinnamon willow-herb (*Epilobium coloratum*), water smartweed (*Polygonum amphibium*), marsh fern (*Thelypteris palustris*), spotted Joe-Pye-weed (*Eupatorium maculatum*), and the invasive varieties of common reed grass, purple loosestrife, and reed canary grass.

Shrub-carr is found within the open wetlands of the GBPG and has a moderate shrub cover of meadow willow, red osier dogwood, and glossy buckthorn (*Rhamnus frangula*). The ground layer is dense and dominated by tussock sedge and the invasive reed canary grass with spotted Joe-Pye-weed, Canadian goldenrod (*Solidago canadensis*), purple loosestrife, common mountain mint (*Pycnanthemum virginianum*), and panicled aster (*Aster lanceolatus*) as associates.

Figure 3
Generalized 1992 Landcover for the Green Bay West Shores Planning Group area from the Wisconsin DNR WISCLAND GIS coverage (WDNR 1993)



Great Lakes Barrens are rare within the state, with most found on Lake Superior. Within the GBPG, this natural community type is atypical because it is composed of open-grown 3-6 in dbh (up to 24 in dbh) Hill's oak (*Quercus ellipsoidalis*) instead of the more typical red pine (*Pinus resinosa*) and white pine (*Pinus strobus*). The Great Lakes Barrens within the GBPG is located on an ancient sandy beach ridge with a shrub layer dominated by black huckleberry (*Gaylussacia baccata*) and American red raspberry (*Rubus idaeus*) and a ground layer dominated by Pennsylvania sedge (*Carex pensylvanica*), with bracken fern (*Pteridium aquilinum*) and poverty oat grass (*Danthonia spicata*) as associates.

Riverine Mud Flats are found on newly exposed, damp, sandy muck flats colonized by a dense carpet of wetland herbs. Species include common agalinis, purple false foxglove (*Agalinis purpurea*), common boneset, common spike-rush (*Eleocharis palustris*), Canadian rush, Dudley's rush (*Juncus dudleyi*), black bulrush (*Scirpus atrovirens*), purple loosestrife and reed canary grass. This dynamic, somewhat ephemeral, community develops in periods of low water.

Southern Hardwood Swamps of the GBPG have a moderately dense canopy dominated by green ash with slippery elm (*Ulmus rubra*) as an associate. The subcanopy has high cover of green ash with red maple (*Acer rubrum)* and slippery elm as associates. The sapling layer has low coverage of green ash, red maple, and slippery elm. The shrub layer has a low cover of speckled alder (*Alnus incana*), mountain holly (*Ilex mucronata*), and glossy buckthorn. The ground layer has a high cover of *Impatiens sp*, fowl manna grass (*Glyceria striata*), brome-like sedge (*Carex bromoides*), nodding sedge (*C. gynandra*), blue-joint grass, and sensitive fern (Onoclea sensibilis).

Floodplain Forests of the GBPG are located along the Peshtigo River and vary in quality from recently logged to mature. Canopy cover is moderate to dense and dominated by silver maple (*Acer saccharinum*) (10-18 inches diameter at breast height (dbh), some 30 inches dbh) with black ash (*Fraxinus nigra*), green ash, basswood (*Tilia Americana*), swamp white oak (*Quercus bicolor*), red oak (*Q. rubra*), hackberry (*Celtis occidentalis*), and yellow-bud hickory (*Carya cordiformis*) as associates. Subcanopy cover is moderately dense to dense with all canopy species. The sapling layer is sparse to moderately dense with all canopy species. Shrub cover varies from very sparse to moderately dense and is dominated by prickly ash (*Zanthoxylum americanum*) and hornbeam (*Carpinus caroliniana*) with buttonbush (*Cephalanthus occidentalis*) as an associate. The ground layer cover is dense with stinging nettle (*Urtica dioica*), ostrich fern (*Matteuccia struthiopteris*), Virginia wild-rye (*Elymus virginicus*), small-spike false nettle (*Boehmeria cylindrical*), calico aster (*Aster lateriflorus*), tussock sedge, nodding sedge, common lake sedge, common hop sedge (*Carex lupulina*), bent-seeded hop sedge (*C. tuckermanii*), marsh-pepper knotweed (*Polygonum hydropiper*), sensitive fern, meadow horsetail (*Equisetum pretense)*, common wood-reed (*Cinna arundinacea*), creeping-Charlie (*Glechoma hederacea*), jumpseed (*Persicaria virginiana*) and clustered black snakeroot (*Sanicula gregaria*). An inclusion of northern wet-mesic forest dominated by northern white-cedar (*Thuja occidentalis*) and black ash is present. Fences indicate past grazing.

Above the Floodplain Forests on slightly higher terraces of the Peshtigo River are Northern Mesic Forests. Northern Mesic Forests of the GBPG have a canopy that is moderately dense and dominated by red oak, sugar maple (*Acer saccharum*), and hemlock (*Tsuga canadensis*) with yellow birch (*Betula alleghaniensis)*, American beech (*Fagus grandifolia*), and hornbeam as associates. Canopy trees are 10-14 inches dbh, with some 24 inches dbh. Subcanopy cover is moderately dense with red oak, sugar maple, and hemlock. Sapling cover is also moderately dense and dominated by sugar maple with red oak, hornbeam, American beech, and hemlock as associates. Shrub cover is sparse and dominated by beaked hazelnut (*Corylus cornuta*) with maple-leaved viburnum (*Viburnum acerifolium*) as an associate. Ground layer cover is sparse to moderate with Pennsylvania sedge, rough-leaved rice grass (*Oryzopsis asperifolia*), wild sarsaparilla (*Aralia nudicaulis*), Canada mayflower (*Maianthemum canadense*),

interrupted fern (*Osmunda claytoniana*), bracken fern, and Indian cucumber-root (*Medeola virginiana*) (Special Concern). Some areas of Northern Mesic Forest have been selectively logged.

Northern Dry-mesic Forests of the GBPG are located on gently rolling sandy uplands along the Peshtigo River. The canopy is dominated by red maple and red oak, with white pine, red pine, hemlock, American beech, and white oak (*Quercus alba*) and bur oak (*Quercus macrocarpa*) as associates. The subcanopy is moderately dense and dominated by red maple and red oak, with black cherry (*Prunus serotina*), hemlock, and American beech as associates. The sapling layer is moderately dense and dominated by red maple, with black cherry, white pine, red oak, hemlock, and American beech as associates. The shrub layer is moderately dense hazelnut (*Corylus sp.)*, mountain holly, common blackberry (*Rubus allegheniensis*), bristly dewberry (*Rubus hispidus*), common buckthorn (*Rhamnus cathartica*), and common dewberry (*Rubus flagellaris*) as associates. The ground layer is moderately dense with wild sarsaparilla, Pennsylvania sedge, bracken fern, northern tree club-moss (*Lycopodium dendroideum*), interrupted fern, Canada mayflower, and mosses. Inclusions within the forest include mesic areas with hemlock, American beech, red maple, and red oak and dry forests dominated by black oak (*Quercus velutina*).

Numerous small streams and drainages are extremely important to the ecology of the GBPG. Aquatic features of the GBWS planning group include the Peshtigo, Oconto, Pensaukee, Suamico, and South Branch Suamico rivers; Duck Creek; Dyers Slough; and the shoreline of Green Bay.

Rare Species and High Quality Natural Communities of the Green Bay West Shores Planning Group

Numerous rare species and high-quality examples of native communities have been documented on the Green Bay West Shores Planning Group (Table 2). See Appendix C for summary descriptions of species and natural communities documented on the GBPG and mapped in the NHI Database (does not include SCGN).

Table 2. Documented rare species and high-quality natural communities for the GBPG. Species actively tracked by NHI are indicated by a "Y" and species on the NHI Watch List are indicated by a "W" (WNHI 2009). For an explanation of state and global ranks, as well as state status, see Appendix D.

Common Name	Scientific Name	Year Last Observed	State Rank	Global Rank	State Status	Federal Status	SGCN	Actively Tracked by NHI
Animals								
American Bittern	*Botaurus lentiginosus*	2009	S3B	G4	SC/M		Y	Y
American Black Duck	*Anas rubripes*	2009	S2B	G5	SC/M		Y	Y
American Bullfrog	*Lithobates catesbeianus*	2009	S3	G5	SC/H		N	Y
American Eel	*Anguilla rostrata*	1974	S2	G4	SC/N		Y	Y
American White Pelican	*Pelecanus erythrorhynchos*	2009	S1B,S1N	G3	SC/M		N	Y
American Woodcock	*Scolopax minor*	2009	S4B	G5	SC/M		Y	W
Bald Eagle	*Haliaeetus leucocephalus*	2009	S4B,S2N	G5	SC/P		Y	Y
Black Tern	*Chlidonias niger*	2006	S2B	G4	SC/M		Y	Y
Black-crowned Night-heron	*Nycticorax nycticorax*	2009	S2B	G5	SC/M		N	Y
Blanding's Turtle	*Emydoidea blandingii*	2006	S3	G4	THR		Y	Y
Blue-winged Teal	*Anas discors*	2009	S4B	G5	SC/M		Y	W
Blue-winged Warbler	*Vermivora pinus*	2006	S4b	G5	SC/M		Y	W
Broad-winged Skipper	*Poanes viator*	1993	S3	G5	SC/N		N	Y
Brown Thrasher	*Toxostoma rufum*	2006	S4B	G5	SC/M		Y	W
Canada Warbler	*Wilsonia canadensis*	2003	S3B	G5	SC/M		Y	Y
Caspian Tern	*Sterna caspia*	2009	S1B,S2N	G5	END		Y	Y
Cerulean Warbler	*Dendroica cerulea*	2003	S2S3B	G4	THR		Y	Y
Common Moorhen	*Gallinula chloropus*	2008	S2B	G5	SC/M		N	Y
Common Tern	*Sterna hirundo*	1999	S1B,S2N	G5	END		Y	Y
Eastern Meadowlark	*Sturnella magna*	2009	S4B	G5	SC/M		Y	W
Field Sparrow	*Spizella pusilla*	2009	S4B	G5	SC/M		Y	W
Forster's Tern	*Sterna forsteri*	2008	S1B	G5	END		Y	Y
Golden-winged Warbler	*Vermivora chrysoptera*	2009	S4B	G5	SC/M		Y	W
Great Egret	*Ardea alba*	2009	S2B	G5	THR		Y	Y
Greater Redhorse	*Moxostoma valenciennesi*	1976	S3	G4	THR		Y	Y
King Rail	*Rallus elegans*	1988	S1B	G4	SC/M		Y	Y
Least Bittern	*Ixobrychus exilis*	2009	S3B	G5	SC/M		N	Y
Least Flycatcher	*Empidonax minimus*	2006	S4B	G5	SC/M		Y	W
Longear Sunfish	*Lepomis megalotis*	1957	S2	G5	THR		Y	Y
Louisiana Waterthrush	*Seiurus motacilla*	1998	S3B	G5	SC/M		Y	Y
Mulberry Wing	*Poanes massasoit*	1993	S3	G4	SC/N		N	Y

Common Name	Scientific Name	Year Last Observed	State Rank	Global Rank	State Status	Federal Status	SGCN	Actively Tracked by NHI
Animals								
Northern Harrier	*Circus cyaneus*	2009	S3B,S2N	G5	SC/M		Y	W
Osprey	*Pandion haliaetus*	2009	S4B	G5	THR		Y	Y
Piping Plover	*Charadrius melodus*	1940	S1	G3	END	LE	Y	Y
Red-headed Woodpecker	*Melanerpes erythrocephalus*	2009	S3B	G5	SC/M		Y	W
Red-necked Grebe	*Podiceps grisegena*	1993	S1B	G5	END		Y	Y
Red-shouldered Hawk	*Buteo lineatus*	2009	S3S4B,S1N	G5	THR		Y	Y
Veery	*Catharus fuscescens*	2009	S4B	G5	SC/M		Y	W
Willow Flycatcher	*Empidonax traillii*	2009	S4B	G5	SC/M		Y	W
Wood Thrush	*Hylocichla mustelina*	2006	S4B	G5	SC/M		Y	W
Wood Turtle	*Glyptemys insculpta*	2008	S2	G4	THR		Y	Y
Yellow Rail	*Coturnicops noveboracensis*	1990	S1B	G4	THR		Y	Y
Yellow-billed Cuckoo	*Coccyzus americanus*	2009	S3B	G5	SC/M		Y	Y
Plants								
Adder's-tongue	*Ophioglossum pusillum*	1956	S2	G5	SC		NA	Y
American Sea-rocket	*Cakile lacustris*	2001	S3	G5	SC		NA	Y
Capitate Spikerush	*Eleocharis olivacea*	2000	S2	G5	SC		NA	Y
Crinkled Hairgrass	*Deschampsia flexuosa*	2007	S3	G5	SC		NA	Y
Downy Willow-herb	*Epilobium strictum*	2003	S2S3	G5?	SC		NA	Y
Few-flower Spikerush	*Eleocharis quinqueflora*	2000	S2	G5	SC		NA	Y
Indian Cucumber-root	*Medeola virginiana*	2007	S3	G5	SC		NA	Y
Many-headed Sedge	*Carex sychnocephala*	2000	S2	G4	SC		NA	Y
Marsh Bedstraw	*Galium palustre*	1995	S1	G5	SC		NA	Y
Marsh Horsetail	*Equisetum palustre*	2003	S2	G5	SC		NA	Y
Northern Wild-raisin	*Viburnum nudum var. cassinoides*	2009	S2	G5T5	SC		NA	Y
Pale Green Orchid	*Platanthera flava var. herbiola*	2003	S2	G4T4Q	THR		NA	Y
Slim-stem Small-reedgrass	*Calamagrostis stricta*	1999	S3	G5	SC		NA	Y
Snow Trillium	*Trillium nivale*	1999	S3	G4	THR		NA	Y
Twining Screwstem	*Bartonia paniculata*	2003	S1	G5	SC		NA	Y
Variegated Horsetail	*Equisetum variegatum*	2000	S3	G5	SC		NA	Y
Wolf Spikerush	*Eleocharis wolfii*	2003	S1	G3G4	END		NA	Y
Yellow Screwstem	*Bartonia virginica*	2003	S3	G5	SC		NA	Y
Natural Communities								
Alder Thicket		1976	S4	G4	NA		NA	Y
Emergent Marsh		2007	S4	G4	NA		NA	Y
Floodplain Forest		2007	S3	G3?	NA		NA	Y
Great Lakes Barrens		2001	S1	G2	NA		NA	Y
Great Lakes Beach		2001	S2	G3	NA		NA	Y
Northern Dry-mesic Forest		2007	S3	G4	NA		NA	Y
Northern Mesic Forest		2007	S4	G4	NA		NA	Y
Northern Sedge Meadow		2007	S3	G4	NA		NA	Y

Common Name	Scientific Name	Year Last Observed	State Rank	Global Rank	State Status	Federal Status	SGCN	Actively Tracked by NHI
Natural Communities								
Northern Wet-mesic Forest		1976	S3S4	G3?	NA		NA	Y
Riverine Mud Flat		2003	SU	GNR	NA		NA	Y
Shrub-carr		2007	S4	G5	NA		NA	Y
Southern Dry-mesic Forest		2003	S3	G4	NA		NA	Y
Southern Hardwood Swamp		2007	S2	G4?	NA		NA	Y
Southern Sedge Meadow		2003	S3	G4?	NA		NA	Y

Management Considerations and Opportunities for Biodiversity Conservation for Green Bay West Shores Planning Group

Migratory Bird Stopover Site
The Great Lakes shoreline plays a crucial role for millions of migrating birds (Grveles and Matteson 2008). The GBPG was determined to be a high-quality Migratory Bird Stopover Site by the ongoing Wisconsin DNR's Strategy for Protecting Bird Migration Stopover Habitats in the Western Great Lakes project (Grveles and Matteson 2008). The GBPG provides stopover habitat to up to 10,000 waterfowl, shorebirds, and other waterbirds; up to 1,000 raptors; and 10,000+ neo-tropical landbirds during the spring and fall migrations. Many factors contribute to the GBPG's ability to provide all of the resources needed (e.g. shelter, protection from predation, food, and water) for many individuals of numerous bird species to replenish fat reserves during migration. The location of the GBPG in a landscape dominated by agriculture and urban settings makes the remaining natural habitats, especially those with high structural diversity near water, very important foraging and perching opportunities.

Threats to Migratory Bird Stopover Sites and migratory birds include habitat destruction and habitat alteration (Duncan 2002). Habitat alteration includes the simplification of forest structure or the alteration of forest composition, including invasive species that may change the kinds, quantity, and quality of food resources (Duncan 2002).

Fish Spawning Habitat
The coastal wetlands along the west shore of Green Bay have long been recognized for their importance for fish spawning (Brazner and Beals 1997; WDNR 2006b). The small perennial and interconnected streams and wetlands provide a nursery area for native fish such as northern pike. Habitat restoration, fish stocking, and acquisition projects have been conducted to enhance the habitat quality for spawning fish.

Ecological Priorities
Ecological Priorities identify the natural communities in each Ecological Landscape that are most important to the Species of Greatest Conservation Need. Numerous SGCN are known from the GBPG and they, along with the natural communities they inhabit, represent Ecological Priorities for the Northern Lake Michigan Coastal and Central Lake Michigan Coastal Ecological Landscapes (see *dnr.wi.gov/org/land/er/wwap/explore/tool.asp* for more information) (WDNR 2006b). Appendix B highlights the Ecological Priorities for the GBPG by giving a matrix with the vertebrate SGCN and their associated natural communities for the Northern Lake Michigan Coastal and Central Lake Michigan Coastal Ecological Landscapes. Note that these Ecological Priorities include all of the natural communities that we have determined to provide the best opportunities for management on the GBPG from an ecological / biodiversity perspective.

Natural Community Management Opportunities
The Wisconsin Wildlife Action Plan (WAP) (WDNR 2006b) identifies 33 natural communities for which there are "Major" or "Important" opportunities in the Northern Lake Michigan Coastal Ecological Landscape; of these, the following fourteen natural communities are present on the GBPG:

- Alder Thicket
- Emergent Marsh
- Floodplain Forest
- Great Lakes Barrens

- Northern Dry-mesic Forest
- Northern Mesic Forest
- Northern Sedge Meadow
- Northern Wet-mesic Forest
- Riverine Mud Flat
- Southern Dry-mesic Forest
- Southern Hardwood Swamp
- Southern Sedge Meadow
- Warmwater Rivers
- Warmwater Streams

The WAP identifies 28 natural communities for which there are "Major" or "Important" opportunities in the Central Lake Michigan Coastal Ecological Landscape; of these, the following six natural communities are present on the GBPG:

- Emergent marsh
- Great lakes beach
- Shrub-carr
- Southern sedge meadow
- Warmwater Rivers
- Warmwater Streams

Priority Conservation Actions
Priority Conservation Actions identified in the Wisconsin Wildlife Action Plan (WDNR 2006b) for the GBPG include:

- Opportunities for the restoration and management of lakeshore marshes, sedge meadows, and wet forests along the west shore of Green Bay.
- Maintenance of migratory corridors, resting, and feeding areas for migratory birds, including raptors, songbirds, and waterfowl is important throughout the Ecological Landscape.
- Expand protection for Lake Michigan shoreline habitats, especially those areas receiving heavy use by migratory birds, fish, and colonial birds.
- Connect habitat remnants where possible, especially along shorelines and stream corridors.

Invasive Species
Many invasive species are present within the GBPG and some are well established. Documented invasive species include: common reed grass, purple loosestrife, common buckthorn, glossy buckthorn, moneywort (*Lysimachia nummularia*), marsh-pepper knotweed, creeping-Charlie, motherwort (*Leonurus cardiaca*), Japanese barberry (*Berberis thunbergii*), Tatarian honeysuckle (*Lonicera tatarica*), common dandelion (*Taraxacum officinale*), common St. John's-wort (*Hypericum perforatum*), reed canary grass, spotted knapweed (*Centaurea biebersteinii*), Japanese knotweed (*Polygonum cuspidatum*), Eurasian water-milfoil (*Myriophyllum spicatum*), gypsy moth, rusty crayfish, and zebra mussels.

Some of the most prolific herbaceous invasive species of the GBPG include common reed grass, common and glossy buckthorn, and reed canary grass. Control of many of the species has been on-going and efforts will continue to be essential to restoring suitable habitat for rare species.

High Conservation Value Forests
The Wisconsin DNR manages 1.5 million acres statewide that is certified by the Forest Stewardship Council (FSC) and the Sustainable Forest Initiative. Forest certification requires forests to be managed

using specified criteria for ecological, social, and economic sustainability. Principle 9 of the *Draft 7 FSC-US Forest Management Standard* concerns the maintenance of High Conservation Value Forests (HCVF). High Conservation Value Forests are defined as possessing one or more of the following High Conservation Values:

1. contain globally, regionally or nationally significant concentrations of biodiversity values (e.g., endemism, endangered species, refugia), including rare, threatened, or endangered species and their habitats;
2. globally, regionally or nationally significant large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance;
3. are in or contain rare, threatened or endangered ecosystems;
4. provide basic services of nature in critical situations (e.g., watershed protection, erosion control);
5. are fundamental to meeting basic needs of local communities (e.g., subsistence, health); or,
6. are critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities).

Based on the current draft criteria for defining HCVFs (Forest Stewardship Council 2009) it is clear that the GBPG has areas that should be considered High Conservation Value Forests. Based on our results, the best HCVF candidates on the GBPG are represented by the "Primary Sites" described below.

Primary Sites: Significance and Summaries

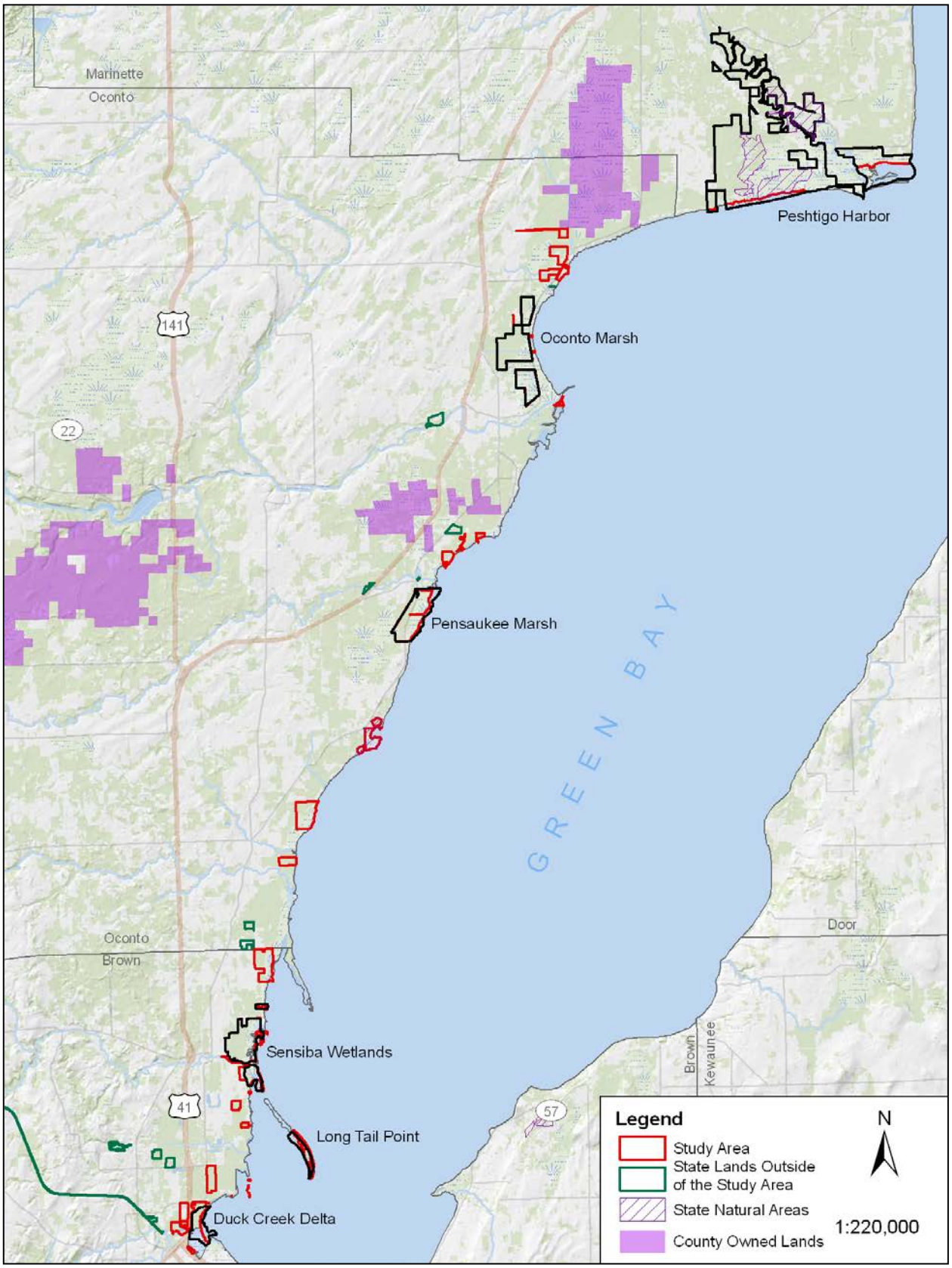
Primary Sites generally encompass the best examples of 1) both rare and representative natural communities and 2) rare species populations that have been documented to date within the GBPG. The significance of each Primary Site on the GBPG was evaluated according to the condition, quality, and extent of natural communities present; the number and size of the rare species populations; and the ecological context of these features (Table 3). Sites with high or medium significance warrant high protection and/or restoration consideration during the development of the new property master plan. Sites of lower significance possess economic, recreation, and ecological values and may also deserve consideration for long-term restoration or other special management designation. All Primary Sites can be considered High Conservation Value Forests for the purpose of Forest Certification. This report is meant to be considered along with other information when identifying opportunities for various management designations during the master planning process. The site boundaries are illustrated on Figures 5-11.

Significant portions of the Primary Site descriptions are from the report *A Data Compilation and Assessment of Coastal Wetlands of Wisconsin's Great Lakes* (2002).

Table 3. Significance of Primary Sites on the GBPG

Site ID	Site Name	Significance
GBPG01	Peshtigo Harbor	High
GBPG02	Oconto Marsh	Medium
GBPG03	Pensaukee Marsh	Medium
GBPG04	Sensiba Wetlands	Low
GBPG05	Long Tail Point	Low
GBPG06	Duck Creek Delta	Medium

Figure 5
Location of Green Bay West Shores Planning Group Primary Sites



GBPG01. Peshtigo Harbor – 6,375 acres. High Significance.

The Peshtigo Harbor site, including Bloch Oxbow SNA, Peshtigo Harbor Lacustrine Forest SNA, and Peshtigo River Delta Marshes SNA, is a very large wetland situated on poorly drained sand lakeplain located along the northwest shore of Green Bay in Marinette County. The wetland extends upstream for two miles from the mouth of the Peshtigo River.

A number of different natural communities and habitat features occur here, including Emergent Marsh, Southern Sedge Meadow, Shrub-carr, Floodplain Forest, abandoned oxbow lakes, beach, sand bar, and channels within the river delta. The lower two miles of the river form an extensive delta, with river channels winding through large stands of good quality Emergent Marsh and Southern Sedge Meadow.

The Wisconsin Department of Natural Resources and The Nature Conservancy-Wisconsin Chapter have partnered with other agencies and organizations in Wisconsin and throughout the Great Lakes for the Strategy for Protecting Bird Migration Stopover Habitats in the Western Great Lakes Region project (a.k.a. Stopover Project) (Grveles and Matteson 2008). The first step of this ongoing project was to compile and synthesize information on Great Lakes stopover sites for waterfowl, raptors, shorebirds, waterbirds, and landbirds. The estimates of migratory bird use at Peshtigo Harbor are in Table 4.

The result of compiling and synthesizing data on this site was recognition that Peshtigo Harbor is a high-quality site that provides shelter and protection from predation and may contain habitat niches that provide unique or rare resources to specialized species. Peshtigo Harbor is of high importance for resident diurnal raptors (Bald Eagle, Osprey, Red-shouldered Hawk, and Northern Harrier) as well as for high numbers of migrant diurnal raptors. The Peshtigo River and its associated bottomland forest, open marshes and wetlands are rare elsewhere in the local landscape and provide a good prey base to support high numbers of diurnal raptors.

Table 4. Estimated migratory bird usage at Peshtigo Harbor

Peshtigo Harbor		
	Spring	Fall
Estimated number of waterfowl	1,000-9,999	1,000-9,999
Estimated number of diurnal raptors	101-999	101-999
Estimated number of nocturnal raptors	51-100	51-100
Estimated number of shorebirds	101-999	101-999
Estimated number of waterbirds	1,000-9,999	1,000-9,999
Estimated number of neo-tropical landbirds	1,000-9,999	1,000-9,999

Site significance is high due to its size, diverse mosaic of wetland communities present, good overall condition of the vegetation, and many rare resident and migratory bird species. This site likely contains the most diverse and least disturbed wetland complex on the west shore of Green Bay. Management opportunities include continuing the habitat management work (invasive species control and prescribed burning) that supports rare species habitat.

GBPG02. Oconto Marsh – 918 acres. Medium Significance.

Oconto Marsh is within one of the largest wetlands along the western shoreline of lower Green Bay north of the Oconto River mouth. Most of the wetland is a complex of Southern Sedge Meadow and Emergent Marsh, though Shrub-carr is also present in association with these communities. Patches of Southern Hardwood Forest are also present further inland.

The marsh is an important breeding area for birds and receives significant use from migrating waterfowl and shore birds. It is important to many species that have been forced to abandon former habitat in the

southern part of the bay because of high water levels, wetland filling, and pollutants. Tern nesting activity in this area has declined substantially possibly due to water level fluctuations and competition with Ring-billed Gulls.

The ongoing Strategy for Protecting Bird Migration Stopover Habitats in the Western Great Lakes Region project (Grveles and Matteson 2008) determined Oconto Marsh to be a high-quality site that provides shelter and protection from predation and may contain habitat niches that provide unique or rare resources to specialized species.

Water quality remains a problem in Green Bay. Point and nonpoint pollution discharges into the Oconto River may adversely affect the marsh. There is development pressure to the west of the site and the shoreline of Green Bay is developed.

Management considerations include continued work to improve water quality and to control invasive species. Declines in rare species populations at this site should be monitored and habitat restoration work continued.

GBPG03. Pensaukee Marsh –621 acres. Medium Significance.

The Pensaukee Marsh is located on a sandy lake plain near the mouth of the Pensaukee River in Oconto County. Along the bay, Emergent Marsh is dominated by soft-stem bulrush, rushes, and rice cut grass. To the west is a low quality Shrub-carr and Southern Sedge Meadow complex dominated by reed canary grass, common reed grass, and cat-tails (*Typha sp)*. On a remnant Pleistocene sandy beach ridge is a Hill's oak-dominated forest (currently typed as a Great Lakes Barrens) that provides habitat for the rare crinkled hair grass (*Deschampsia flexuosa*).

Pensaukee Marsh has been recognized as an important spawning area for many fish, including northern pike, yellow perch, and muskellunge. In 2008 restoration work was conducted to remove a berm that channeled water directly into the bay. This enhanced available habitat and allowed water from wetlands upstream to flow through the marsh, which allows sediment and nutrients to be filtered before entering Green Bay. (http://www.epa.gov/Region5/sites/foxriver/current/foxcurrent200812.pdf)

The estimates of migratory bird use at Pensaukee Marsh from the ongoing Strategy for Protecting Bird Migration Stopover Habitats in the Western Great Lakes Region project (Grveles and Matteson 2008) are in Table 5. The result of compiling and synthesizing data on this site was recognition that Pensaukee Marsh provides habitat where birds can safely rest and at lest minimally refuel as they move through to higher quality sites.

Table 5. Estimated migratory bird usage at Pensaukee Marsh

Pensaukee Marsh		
	Spring	Fall
Estimated number of waterfowl	101-999	101-999
Estimated number of diurnal raptors	20-50	20-50
Estimated number of nocturnal raptors	20-50	20-50
Estimated number of shorebirds	51-100	51-100
Estimated number of waterbirds	101-999	101-999
Estimated number of neo-tropical landbirds	101-999	101-999

Overall the site provides diverse habitat for a wide range of songbirds, gulls, terns, shorebirds, invertebrates, plants, and spawning fish. The Great Lakes Barrens natural community is a globally rare type that is found in very few places in Wisconsin and has limited opportunities outside of the known

sites. Management opportunities at this site include restoring the Great Lakes Barrens and restoring other areas that provide habitat for rare species (Table 8) and spawning fish.

GBPG04. Sensiba Wetlands – 720 acres. Low Significance.

This site, north and south of where the Suamico River enters Green Bay, is comprised of the Sensiba Unit and the northern part of the Long Tail Unit (the area is also known as Dead Horse Bay) and lies on poorly-drained sandy lakeplain.

This mostly wetland site is characterized by a large Emergent Marsh dominated by cat-tails and interlaced with open water channels, weedy areas and clones of common reed grass; a sizable but highly disturbed, open canopied, forested wetland dominated by ash and other swamp hardwoods lying between the Emergent Marsh and uplands to the west; and a Southern Sedge Meadow dominated by blue-joint grass and cat-tail with common reed grass and purple loosestrife as common associates.

The estimates of migratory bird use at Sensiba Wetlands from the ongoing Strategy for Protecting Bird Migration Stopover Habitats in the Western Great Lakes Region project (Grveles and Matteson 2008) are in Table 6. The result of compiling and synthesizing data on this site was recognition that Sensiba Wetlands is a high-quality site that provides shelter and protection from predation and may contain habitat niches that provide unique or rare resources to specialized species.

Table 6. Estimated migratory bird usage at Sensiba Wetlands

Sensiba		
	Spring	Fall
Estimated number of waterfowl	1,000-9,999	10,000+
Estimated number of diurnal raptors	101-999	101-999
Estimated number of nocturnal raptors	101-999	101-999
Estimated number of shorebirds	1,000-9,999	10,000+
Estimated number of waterbirds	1,000-9,999	1,000-9,999
Estimated number of neo-tropical landbirds	10,000+	10,000+

Sensiba Wetlands, along with portions of Long Tail Point and Duck Creek Delta, is included within the Lower Fox River and Green Bay Area of Concern (AOC) (www.epa.gov/glnpo/aoc/greenbay.html). This AOC, which includes the lower 11.2 km of the Fox River below DePere Dam and a 55 km^2 area of southern Green Bay out to Point au Sable and Long Tail Point was designated primarily because of water quality problems and public use restrictions. The acquisition of property within the Green Bay West Shores Wildlife Area is part of the action to enhance fish, wildlife, and habitat within the AOC.

This wetland remains an important breeding site for marsh birds and as a migratory stopover for waterfowl, waterbirds, shorebirds, raptors, and neo-tropical landbirds. The site is estimated to have the highest numbers of all west shore areas for numerous migratory bird groups with the fall season having extreme importance. The marsh and meadow communities, water resources, and forest cover provide all critical aspects important large numbers of migratory birds. Both rare plants and animals have been documented at this site, although much of the habitat that previously supported these species has been destroyed or severely degraded through a system of dikes and ditches and invasive species.

GBPG05. Long Tail Point – 138 acres. Low Significance.

Long Tail Point is located on the west shore of lower Green Bay, two miles east of Suamico in northern Brown County. It is a narrow sand spit and associated embayment resting upon poorly drained sand lakeplain soils that stretch to the southeast for nearly four miles into lower Green Bay. The size and shape of the peninsula combined with the fluctuating water levels in lower Green Bay result in a very diverse

assemblage of wetland flora and fauna. During high water level periods the point becomes a series of small islands.

The water table is at or near the surface throughout the entire site. Patches of black willow (*Salix nigra*) and plains cottonwood thicket occupy the highest ground, grading to the west into sizable monotypic clones of common reed grass and, finally, a large good quality Emergent Marsh dominated by cat-tails, soft-stem bulrush, and common three-square bulrush. The invasives common reed grass and purple loosestrife are common associates here and are a threat to displace the currently dominant native species. On the eastern side of the point there is sandy beach that is well developed at times of low water levels.

The estimates of migratory bird use at Long Tail Point from the ongoing Strategy for Protecting Bird Migration Stopover Habitats in the Western Great Lakes Region project (Grveles and Matteson 2008) are in Table 7. The result of compiling and synthesizing data on this site was recognition that Long Tail Point is a high-quality migratory bird stopover site that provides shelter and protection from predation and food and water resources important to many birds. Forested stands on site contribute important migratory stopover habitat for estimates of extremely high numbers of songbirds, particularly those forest blocks that have high structural diversity with a strong oak component. Because agriculture, large expanses of open water, and urban development dominate the surrounding landscape, these forest patches offer respite to exhausted birds traversing across mainly in-hospitable terrain.

Table 7. Estimated migratory bird usage at Long Tail Point

Longtail Point		
	Spring	Fall
Estimated number of waterfowl	1,000-9,999	1,000-9,999
Estimated number of diurnal raptors	101-999	101-999
Estimated number of nocturnal raptors	unknown	unknown
Estimated number of shorebirds	1,000-9,999	1,000-9,999
Estimated number of waterbirds	1,000-9,999	1,000-9,999
Estimated number of neo-tropical landbirds	10,000+	10,000+

Long Tail Point, along with portions of Duck Creek Delta and Sensiba Wetlands, is included within the Lower Fox River and Green Bay Area of Concern (AOC) (www.epa.gov/glnpo/aoc/greenbay.html) (See GBPG02. Duck Creek Delta).

Management of this site is complex considering that it has previously supported populations of state endangered species, is an important migratory bird stopover site, is impacted by invasive species (common reed grass and zebra mussel shells), and is a popular recreation area.

GBPG06. Duck Creek Delta– 254 acres. Medium Significance.

Duck Creek Delta (also called Peats Lake and Atkinson Marsh Complex) is located near the southern end of Green Bay, west of the mouth of the Fox River and on either side of the mouth of Duck Creek. This wetland complex is situated in shallow water in lower Green Bay and is characterized by stands of emergent aquatic macrophytes on extensive mudflats. The invasive common reed grass has formed large monotypic clones and dominates much of the area. Shrub-carr, dominated by meadow willow and red osier dogwood, is between the Emergent Marsh and the highway. Condition of this marsh is variable and many portions of it have been extensively diked and filled, degrading the site and reducing its acreage and functions.

The estimates of migratory bird use at Duck Creek Delta from the ongoing Strategy for Protecting Bird Migration Stopover Habitats in the Western Great Lakes Region project (Grveles and Matteson 2008 are

in Table 8. Estimates indicate very high numbers of migratory shorebirds likely utilizing the mudflats and low water areas of the delta for foraging areas. The extensive fruit-producing shrubs at the site are important for fall migratory landbirds.

Table 8. Estimated migratory bird usage at Duck Creek Delta

Duck Creek Delta		
	Spring	Fall
Estimated number of waterfowl	1,000-9,999	1,000-9,999
Estimated number of diurnal raptors	101-999	101-999
Estimated number of nocturnal raptors	unknown	unknown
Estimated number of shorebirds	10,000+	10,000+
Estimated number of waterbirds	1,000-9,999	1,000-9,999
Estimated number of neo-tropical landbirds	1,000-9,999	1,000-9,999

Duck Creek Delta, along with portions of Sensiba Wetlands and Long Tail Point, is included within the Lower Fox River and Green Bay Area of Concern (AOC) (www.epa.gov/glnpo/aoc/greenbay.html) (See GBPG02. Duck Creek Delta).

Duck Creek Delta is an important migratory bird stopover area for shorebirds, waterfowl, waterbirds, and neo-tropical landbirds during both the spring and fall migration. This site also provides habitat for rare species dependent on Emergent Marsh vegetation. Management opportunities at Duck Creek Delta include maintaining migratory bird stopover habitat for both spring and fall migrations and maintaining the Emergent Marsh vegetation.

Special Management Designations

State Natural Areas

State Natural Areas within the GBPG include: Bloch Oxbow SNA, Charles Pond SNA, Peshtigo Harbor Lacustrine Forest SNA, and Peshtigo River Delta Marshes SNA. State Natural Areas are places on the landscape that protect high quality examples of natural communities, rare species populations, significant geological formations, and archeological sites.

Figure 6
Peshtigo Harbor Primary Site on the Peshtigo Harbor Unit of the Green Bay West Shores Wildlife Area

The data shown on this map have been obtained from various sources, and are of varying age, reliability and resolution. Element Occurrence (EO) locations were generated using 02 February 2010 NHI data records. Each symbol may represent more than one EO and symbols may overlap each other. The absence of evidence does not indicate evidence of absence. This map is not intended to be used for navigation, nor is this map an authoritative source of information about legal land ownership or public access. Users of this map should confirm the ownership of land through other means in order to avoid trespassing. No warranty, expressed or implied, is made regarding accuracy, applicability for a particular use, completeness, or legality of the information depicted on this map.

1:60,000

- Study Area
- State Lands Outside of the Study Area
- State Natural Areas
- County Owned Lands
- Primary Sites
- Community
- Plant
- Animal
- Other

N

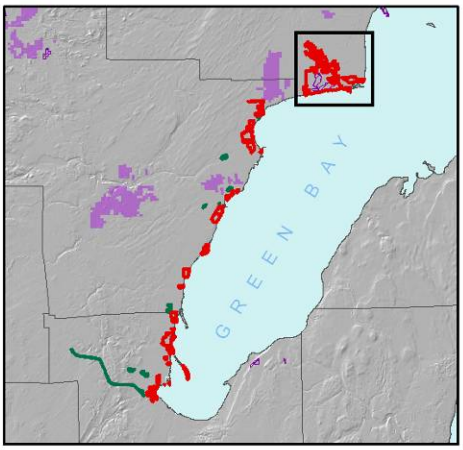


Figure 7
Oconto Marsh Primary Site on the Oconto Marsh Unit of the Green Bay West Shores Wildlife Area

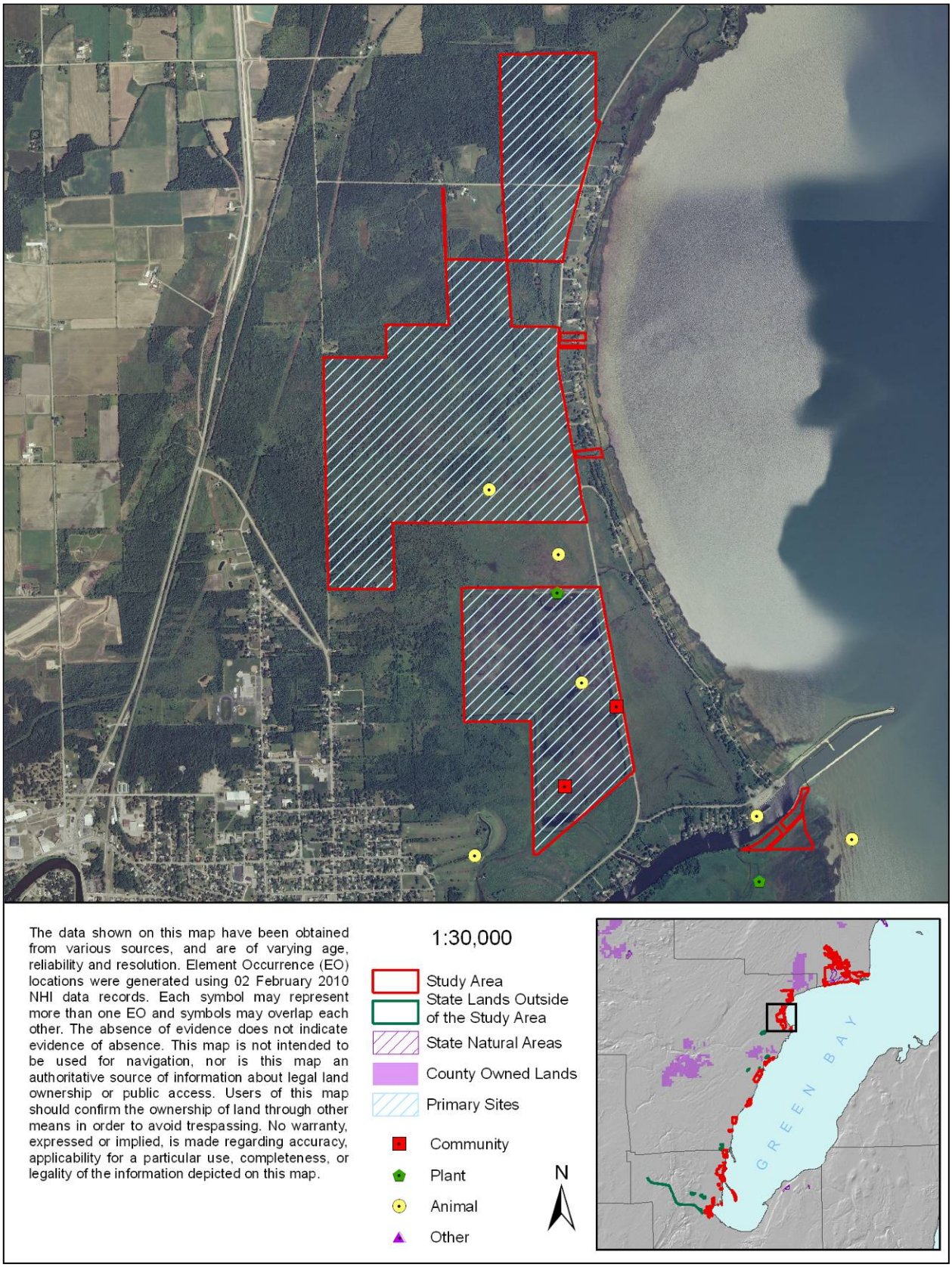


Figure 8
Pensaukee Marsh Primary Site on the Pensaukee Unit of the Green Bay West Shores Wildlife Area

The data shown on this map have been obtained from various sources, and are of varying age, reliability and resolution. Element Occurrence (EO) locations were generated using 02 February 2010 NHI data records. Each symbol may represent more than one EO and symbols may overlap each other. The absence of evidence does not indicate evidence of absence. This map is not intended to be used for navigation, nor is this map an authoritative source of information about legal land ownership or public access. Users of this map should confirm the ownership of land through other means in order to avoid trespassing. No warranty, expressed or implied, is made regarding accuracy, applicability for a particular use, completeness, or legality of the information depicted on this map.

1:20,000

Study Area
State Lands Outside of the Study Area
State Natural Areas
County Owned Lands
Primary Sites
Community
Plant
Animal
Other

N

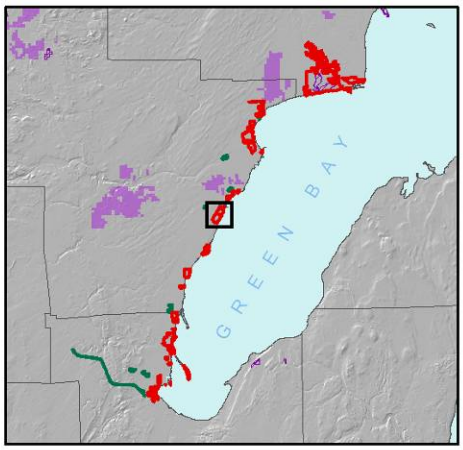


Figure 9
Sensiba Wetlands Primary Site on the Sensiba Unit of the Green Bay West Shores Wildlife Area

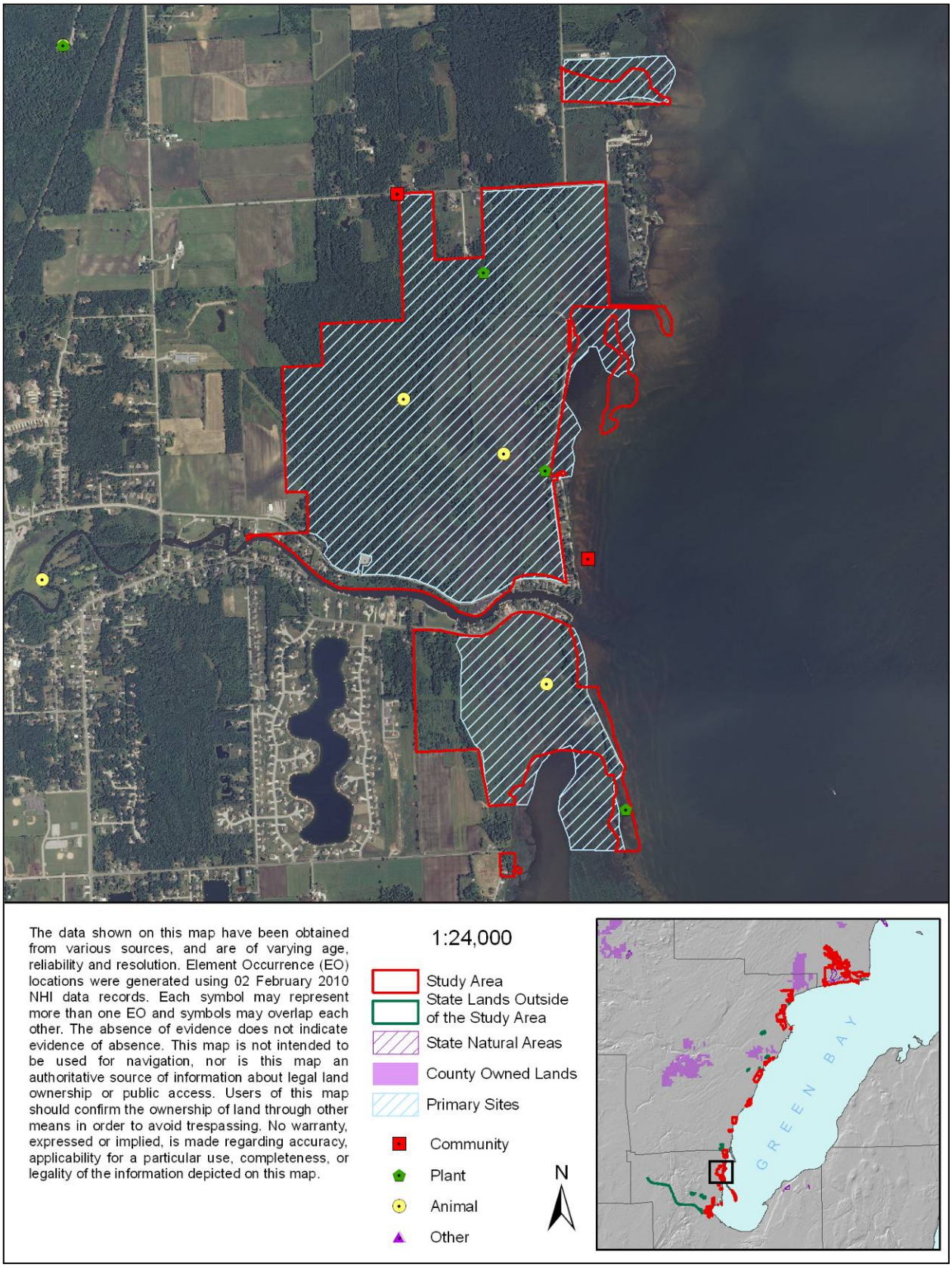


Figure 10
Long Tail Point Primary Site on the Long Tail Unit of the Green Bay West Shores Wildlife Area

The data shown on this map have been obtained from various sources, and are of varying age, reliability and resolution. Element Occurrence (EO) locations were generated using 02 February 2010 NHI data records. Each symbol may represent more than one EO and symbols may overlap each other. The absence of evidence does not indicate evidence of absence. This map is not intended to be used for navigation, nor is this map an authoritative source of information about legal land ownership or public access. Users of this map should confirm the ownership of land through other means in order to avoid trespassing. No warranty, expressed or implied, is made regarding accuracy, applicability for a particular use, completeness, or legality of the information depicted on this map.

1:20,000

Study Area
State Lands Outside of the Study Area
State Natural Areas
County Owned Lands
Primary Sites

Community
Plant
Animal
Other

N

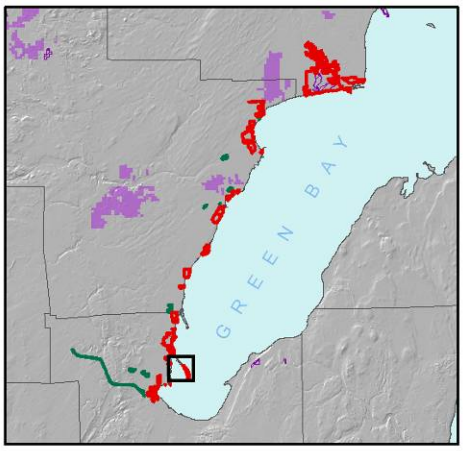
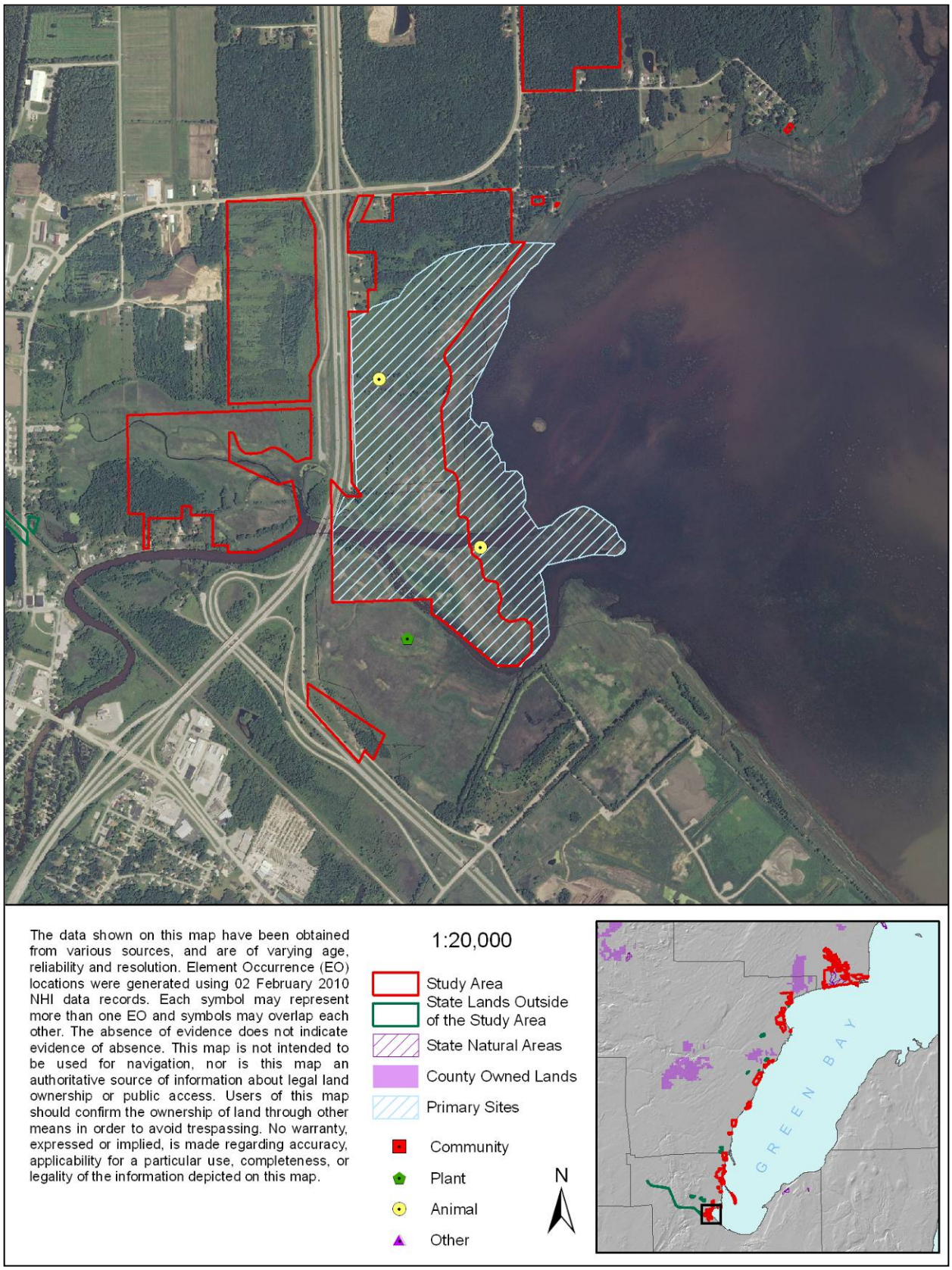


Figure 11
Duck Creek Delta Primary Site on the Peats Lake Unit of the Green Bay West Shores Wildlife Area



Future Needs

This project was designed to provide a rapid assessment of the biodiversity values for the GBPG. Although the report should be considered adequate for master planning purposes, additional efforts could help to inform future adaptive management efforts, along with providing useful information regarding the natural communities and rare species contained in the GBPG.

- Invasive species monitoring and control – establishing an invasives monitoring protocol will be important for the GBPG. The abundance of invasive plant populations in critical habitat for rare species makes monitoring of the species populations (both rare and invasive) and control methods important.
- Inventory work focusing on terrestrial and aquatic invertebrates in remaining high-quality sedge meadows, beaches, and barrens.
- Additional herptile surveys are needed throughout the GBPG.
- Continued inventory and monitoring of Piping Plover and colonial waterbird nesting locations.

Glossary

Ecological Landscape - landscape units developed by the WDNR to provide an ecological framework to support natural resource management decisions. The boundaries of Wisconsin's sixteen Ecological Landscapes correspond to ecoregional boundaries from the National Hierarchical Framework of Ecological Units, but sometimes combine subsections to produce a more manageable number of units.

element occurrence - an Element Occurrence (EO) is an area of land and/or water in which a rare species or natural community is, or was, present. An EO should have practical conservation value for the Element as evidenced by potential continued (or historic) presence and/or regular recurrence at a given location. For species, the EO often corresponds with the local population, but when appropriate may be a portion of a population (e.g., a single nest territory or long distance dispersers) or a group of nearby populations (e.g., metapopulation). For communities, the EO may represent a stand or patch of a natural community or a cluster of stands or patches of a natural community. Because they are defined on the basis of biological information, EOs may cross jurisdictional boundaries.

Forest Certification – a market-based, non-regulatory forest conservation tool designed to recognize and promote environmentally-responsible forestry and sustainability of forest resources. The certification process involves an evaluation of management planning and forestry practices by a third-party according to an agreed-upon set of standards (from http://www.pinchot.org/project/59). See http://dnr.wi.gov/forestry/certification/ regarding certification of WDNR managed lands.

Landtype Association (LTA) - a level in the National Hierarchical Framework of Ecological Units (see next entry) representing an area of 10,000 – 300,000 acres. Similarities of landform, soil, and vegetation are the key factors in delineating LTAs.

natural community – an assemblage of plants and animals, in a particular place at a particular time, interacting with one another, the abiotic environment around them, and subject to primarily natural disturbance regimes. Those assemblages that are repeated across a landscape in an observable pattern constitute a community type. No two assemblages, however, are exactly alike.

representative - native plant species that would be expected to occur in native plant communities influenced primarily by natural disturbance regimes in a given landscape - e.g., see Curtis (1959).

SGCN (or "Species of Greatest Conservation Need") – native wildlife species with low or declining populations that are most at risk of no longer being a viable part of Wisconsin's fauna (from the "Wisconsin Wildlife Action Plan," WDNR 2006b).

seiche - a wave on the surface of a lake or landlocked bay; caused by atmospheric or seismic disturbances

Species List

The following is a list of species referred to by common name in the report text.

Common Name	Scientific Name
Animals	
black tern	*Childonias niger*
blad eagle	*Haliaeetus leucocephalus*
common tern	*Sterna hirundo*
Forster's tern	*Sterna forsteri*
gypsy moth	*Lymantria dispar*
muskellunge	*Esox masquinongy*
northern harrier	*Circus cyaneus*
northern pike	*Esox lucius*
osprey	*Pandion haliaetus*
red-shouldered hawk	*Buteo lineatus*
ring-billed gull	*Larus delawarensis*
rusty crayfish	*Orconectes rusticus*
yellow perch	*Perca flavescens*
yellow rail	*Coturnicops noveboracensis*
zebra mussel	*Dreissena polymorpha*
Plants	
Allegheny monkey-flower	*Mimulus ringens*
American beech	*Fagus grandifolia*
American red raspberry	*Rubus idaeus*
bald spike-rush	*Eleocharis erythropoda*
barnyard grass	*Echinochloa crusgalli*
basswood	*Tilia americana*
beaked hazelnut	*Corylus cornuta*
beaked sedge	*Carex rostrata*
bent-seeded hop sedge	*Carex tuckermanii*
black ash	*Fraxinus nigra*
black bulrush	*Scirpus atrovirens*
black cherry	*Prunus serotina*
black oak	*Quercus velutina*
black willow	*Salix nigra*
blue vervain	*Verbena hastata*
blue-joint grass	*Calamagrostis canadensis*
bracken fern	*Pteridium aquilinum*
bristly dewberry	*Rubus hispidus*
broad-leaved cat-tail	*Typha latifolia*
brome-like sedge	*Carex bromoides*
bur oak	*Quercus macrocarpa*
buttonbush	*Cephalanthus occidentalis*
calico aster	*Aster lateriflorus*
Canada mayflower	*Maianthemum canadense*
Canadian goldenrod	*Solidago canadensis*
Canadian horseweed	*Conyza canadensis*
Canadian rush	*Juncus canadensis*
cat-tail	*Typha sp.*
cinnamon willow-herb	*Epilobium coloratum*
clustered black snakeroot	*Sanicula gregaria*

Common Name	Scientific Name
Plants	
comb pondweed	*Stuckenia pectinata*
commom three-square bulrush	*Schoenoplectus pungens*
common agalinis	*Agalinis tenuifolia*
common blackberry	*Rubus allegheniensis*
common boneset	*Eupatorium perfoliatum*
common buckthorn	*Rhamnus cathartica*
common cocklebur	*Xanthium strumarium*
common dandelion	*Taraxacum officinale*
common dewberry	*Rubus flagellaris*
common evening-primrose	*Oenothera biennis*
common hop sedge	*Carex lupulina*
common lake sedge	*Carex lacustris*
common mountain mint	*Pycnanthemum virginianum*
common reed grass	*Phragmites australis*
common spike-rush	*Eleocharis palustris*
common St. John's-wort	*Hypericum perforatum*
common wood-reed	*Cinna arundinacea*
creeping-Charlie	*Glechoma hederacea*
crinkled hair grass	*Deschampsia flexuosa*
curly-top knotweed	*Polygonum lapathifolium*
cursed crowfoot	*Ranunculus sceleratus*
dotted smartweed	*Polygonum punctatum*
Dudley's rush	*Juncus dudleyi*
Eurasian water-milfoil	*Myriophyllum spicatum*
false pimpernel	*Lindernia dubia*
fowl manna grass	*Glyceria striata*
glossy buckthorn	*Rhamnus frangula*
green ash	*Fraxinus pennsylvanica*
hackberry	*Celtis occidentalis*
Hazelnut	*Corylus sp.*
hemlock	*Tsuga canadensis*
Hill's oak	*Quercus ellipsoidalis*
hornbeam	*Carpinus caroliniana*
Indian cucumber-root	*Medeola virginiana*
interrupted fern	*Osmunda claytoniana*
Japanese barberry	*Berberis thunbergii*
Japanese knotweed	*Polygonum cuspidatum*
jumpseed	*Persicaria virginiana*
maple-leaved viburnum	*Viburnum acerifolium*
marsh fern	*Thelypteris palustris*
marsh purslane	*Ludwigia palustris*
marsh-pepper knotweed	*Polygonum hydropiper*
meadow horsetail	*Equisetum pratense*
meadow willow	*Salix petiolaris*
moneywort	*Lysimachia nummularia*
motherwort	*Leonurus cardiaca*
mountain holly	*Ilex mucronata*
needle spike-rush	*Eleocharis acicularis*
nodding beggar-ticks	*Bidens cernuus*
nodding sedge	*Carex gynandra*
nodding water-nymph	*Najas flexilis*

Common Name	Scientific Name
Plants	
northern tree club-moss	*Lycopodium dendroideum*
northern white-cedar	*Thuja occidentalis*
orange jewelweed	*Impatiens capensis*
ostrich fern	*Matteuccia struthiopteris*
panicled aster	*Aster lanceolatus*
Pennsylvania sedge	*Carex pensylvanica*
plains cottonwood	*Populus deltoides*
poverty oat grass	*Danthonia spicata*
prickly ash	*Zanthoxylum americanum*
purple false foxglove	*Agalinis purpurea*
purple loosestrife	*Lythrum salicaria*
Pursh's bulrush	*Schoenoplectus purshianus*
red maple	*Acer rubrum*
red oak	*Quercus rubra*
red osier dogwood	*Cornus stolonifera*
red pine	*Pinus resinosa*
reed canary grass	*Phalaris arundinacea*
rice cut grass	*Leersia oryzoides*
rough-leaved rice grass	*Oryzopsis asperifolia*
sensitive fern	*Onoclea sensibilis*
silver maple	*Acer saccharinum*
slippery elm	*Ulmus rubra*
small-spike false nettle	*Boehmeria cylindrica*
soft-stem bulrush	*Schoenoplectus tabernaemontani*
southern hair grass	*Agrostis hyemalis*
speckled alder	*Alnus incana*
spotted Joe-Pye-weed	*Eupatorium maculatum*
spotted knapweed	*Centaurea biebersteinii*
stinging nettle	*Urtica dioica*
sugar maple	*Acer saccharum*
swamp white oak	*Quercus bicolor*
Tatarian honeysuckle	*Lonicera tatarica*
tussock sedge	*Carex stricta*
Virginia wild-rye	*Elymus virginicus*
water smartweed	*Polygonum amphibium*
white oak	*Quercus alba*
white pine	*Pinus strobus*
whorled water-milfoil	*Myriophyllum verticillatum*
wild sarsaparilla	*Aralia nudicaulis*
witch grass	*Panicum capillare*
yellow birch	*Betula alleghaniensis*
yellow-bud hickory	*Carya cordiformis*

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