GILSON CREEK WATERSHED – RED BANKS ALVAR SITE CONSERVATION PLAN

Introduction

The Red Banks and Gilson Creek area is located in the Towns of Scott and Green Bay in Brown County. Red Banks-Gilson Creek was identified as a regionally significant site for the health of the Lake Michigan watershed in Landscapes of Opportunity, a report on conservation needs of Wisconsin's Lake Michigan basin prepared by the Lake Michigan Shorelands Alliance. This area is biologically and geologically very rich, but it is under threat from development from the Green Bay metropolitan area. This plan was developed using a collaborative approach to conservation planning and involved several partners. The goal of this site conservation plan is to identify threats to the Red Banks-Gilson Creek area and propose strategies to protect its important natural resources.

History of the Region

Geology

The Red Banks-Gilson Creek area lies within the once-glaciated portion of Wisconsin and contains highly unique geologic features. Dolomites and shales underlie the glacial deposits that blanket virtually the entire landscape in Brown County.

The dolomite Niagara Escarpment is the major bedrock feature --approximately 69% of Brown County lies within the Niagara Escarpment, which runs from the northeast to the southwest part of the county. The Niagara Escarpment is the steep face of a 650-mile sickle-shaped cuesta (bedrock ridge) that runs from New York to southeastern Wisconsin. A series of dolomite cliffs in Brown County provide critical habitat for rare terrestrial snails, bats and specialized plants.

The Red Banks site in particular is perched on top and at the edge of the Niagara Escarpment and is characterized by areas of exposed bedrock and very thin soils. The primary glacial landform is lakeplain.

Human settlement

The Gilson Creek and Red Banks area is in the Towns of Scott and Green Bay, located just east of the City of Green Bay, in the northeast corner of Brown County. Since the time of the glaciers, which receded roughly 10,000 years ago, the Green Bay region has supported several Native American cultures with its rich fisheries, waterfowl, wild rice, forests and water. Archeological evidence shows these early people inhabited the Red Banks area on Green Bay's east shore as far back as 7000 BC.

In the 1700s and early 1800s the Green Bay area, with its ideal location, became a center for the fur trade. Logging was also a big industry in the 1800s until the land was cleared, marking the beginning of the region's agricultural business – an industry that is still an important economic factor in the area today.

Inland from Green Bay, along the Fox River (which feeds into Green Bay), the Fox River Valley experienced great success with paper production. However, by 1927 the Wisconsin State Board of Health reported that raw sewage, oil slicks, wastes from canning factories and paper mills, and dead fish floated along the Fox River's surface and lower Green Bay.

At one time, Green Bay supported the largest commercial fishery in Wisconsin, but due to overfishing, competition from exotics, and the dumping of toxic PCBs (polychlorinated biphenyls) into the Lower Fox River, emptying into Green Bay, the fishing industry in the area was ruined.

Today, the Fox River Valley is still the largest paper production industry in the world, but before 1979 when they were banned, PCBs were still being used by paper mills as a vehicle for holding and delivering ink in carbonless copy paper. Much of this copy paper was recycled and reprocessed, releasing an estimated 50,000 kilograms of PCBs to the Fox River and Green Bay via the mills' wastewater discharges. The widespread effects of PCBs on fish and wildlife in the region include walleyes with tumors, frogs with deformed spines and the decline of bald eagles. PCBs also harm humans – they are thought to cause cancer and a variety of other health problems.

A comprehensive cleanup plan for the Fox River and Green Bay is currently being developed by the Wisconsin Department of Natural Resources and the U.S. Environmental Protection Agency. The proposed plan, if implemented, will result in the cleanup of sediments that will lead directly to the protection of human health and the environment. However, the final project could take more than 10 years to complete.

Land Use & Development

A high concentration of urban development can be found in and around the City of Green Bay, with the majority of shoreline in Brown County also developed. Brown County, according to 2003 estimates, has a population of 233,888, with a population density of 429 people per square mile – over four times the average density of the state. It is also an area of high growth, experiencing a 16.5% increase in population in the 1990s, compared to a 9.6% increase in the state. The Green Bay Metropolitan area has consistently grown faster than both the Wisconsin and national averages and had the fastest rate of population growth among Wisconsin's Metropolitan areas between 1990 and 2000.

Red Banks, with its close proximity to the City of Green Bay, is feeling the pressure from excessive residential development. As agriculture becomes less economically viable, there is concern that the open farmland in eastern Brown County could be purchased and developed.

Other areas of Brown County contain small forest patches, agricultural lands, low density housing and quarry operations of differing sizes.

Description of Site

Gilson Creek Watershed

Regional Context

The Gilson Creek Watershed is located in the Northeast corner of Brown County along the shore of Green Bay. This region falls within the Central Lake Michigan Coastal (CLMC) Ecological Landscape – one of 16 Ecological Landscapes in Wisconsin that are based on a system of land classification developed by the Department of Natural Resources. This system divides the state into ecological units based on combinations of biotic and environmental factors, which include climate, geology, soils, hydrology, and vegetation.

The climate of the CLMC Landscape is highly influenced by its proximity to Lake Michigan, giving the area cooler summers, warmer winters and precipitation levels greater than

at locations farther inland. Its generally flat topography consists of clay and silt loam soils. Historically, most of this landscape was vegetated with mesic hardwood forest, but due to the heavy development pressure in the Green Bay area much of the land cover is now primarily urban and agricultural. There are some remnants of northern hardwood forest with maple, beech, and some hemlock, plus conifer swamps, hardwood swamps, and riverine marshes.

The biota in this region is especially noteworthy for the rare regional endemic plants associated with Lake Michigan shoreline habitats and the highly specialized animals inhabiting the Niagara Escarpment. The coastal areas annually host significant concentrations of migratory birds and provide seasonally critical habitat for numerous animals. However, the CLMC Landscape has the worst relative pollution ratings for watershed and streams according to the rankings by the Wisconsin DNR.

An area loosely referred to as Red Banks is found in the Gilson Creek Watershed and contains an unusual and unique array of natural communities. Red Banks supports Wisconsin's best example of an alvar community and unusual variants of the prairie-savanna and cedar forest communities. Invertebrate diversity is high in both the insect and land snail groups, with many rare taxa represented. The Gilson Creek Watershed is also home to the rare and threatened dwarf lake iris *(Iris lacustris).*

Red Banks

Species, Natural Communities, Scenic/Recreational Value

The Red Banks Alvar was designated a State Natural Area in 2001. Alvar communities are extremely rare and are distinguished by naturally open areas of very shallow soils over essentially flat limestone or dolomitic bedrock. An unusual blend of boreal, southern and prairie species, -- relicts of the post-glacial environment and the warmer, dryer period that followed -- characterizes alvar ecosystems. Alvars are important sites for (1) the protection of biodiversity including threatened plant communities and rare and threatened species of flora and fauna; (2) biological research and environmental monitoring; and (3) ecotourism.

Red Banks Alvar contains one of the most diverse snail communities known in the Midwest and is one of the most important areas in Wisconsin for land snails – colonies of 25 different groups of highly specialized and rare glacial relict snails can be found from the base to the top of the escarpment. A few rare plants found at the alvar include cream gentian *(Gentiana alba)*, Crawe's sedge *(Carex crawei)*, and Richardson's sedge *(C. Richardsonii).* There have also been at least 20 species of butterflies documented within the community and there is an old-growth mesic forest on the slope below the dolomite escarpment.

A unique white cedar woodland community also occurs at Red Banks, bordering Gilson Creek. This community is dominated by white cedar, native sedges and the common juniper. The rare Great Lakes endemic, dwarf lake iris, is a local dominant in the groundlayer.

The dwarf lake iris is listed both by the State of Wisconsin and by the United States government as a threatened species. Its rarity is due both to a limited amount of habitat and to increasing disturbance by shoreline development. The dwarf lake iris must have just the right combination of light, humidity, soil, moisture and temperature to live – it thrives on the cool air that flows off the lakes, and the thin, moist, sandy or rocky soils that can be found in a few sites near the shores of the northern Great Lakes. The iris is appreciated for its deep blue to purple blossoms and its great genetic potential.

Current conditions (e.g. degraded, pristine)

Some of the major disturbance factors affecting the Red Banks site include hydrologic disruption, invasive plants, quarrying, heavy grazing, encroachment by residential development, and fragmentation by roads and power line corridors. These factors, together with a long history of fire suppression, have altered the composition and structure of the alvar community by increasing the dominance of woody species. The vegetation has formed an almost closed canopy dry forest, with small scattered openings supporting plants characteristic of savanna or prairie communities – exotics, such as Kentucky bluegrass and smooth brome, are common and sometimes dominant in these openings.

In terms of the specific habitat of the dwarf lake iris -- its lakeshore habitat has been greatly reduced by shoreline development. Residential and vacation homes, as well as associated road-widening, chemical spraying and salting, and off-road vehicle use have caused disturbance and destruction of habitat.

Although threats remain very high to this region and it is considered a priority for immediate conservation attention by the DNR, there are portions of this site that are relatively intact or restorable.

Niagara Escarpment

Geology

The Niagara Escarpment is the steep face of a 650-mile sickle-shaped cuesta that runs from the northeastern United States south of Rochester, New York, across portions of southeastern Canada, and the southward north and west of Lake Michigan to southeastern Wisconsin. In geological terms, a cuesta or escarpment is a ridge composed of gently tipped rock strata with a long, gradual slope on one side and a relatively steep scarp or cliff on the other. In Wisconsin, the Escarpment extends over 230 miles, from Rock Island, off the northern tip of the Door Peninsula, south to northern Waukesha and Milwaukee counties.

The primary bedrock type is dolomite, formed from accumulated sediments of an ancient sea 405-425 million years ago during the Silurian Period of the Paleozoic Era. The Escarpment was formed over millions of years through the differential erosion of rocks of different hardnesses – a cap of erosion-resistant dolomite overlays weaker, more easily eroded weather shale rocks, that when gradually eroded left a series of cliffs. This series of bluffs can be found along the shoreline of Red Banks in the Gilson Creek Watershed.

Species, Natural Communities, Scenic/Recreational Values

The geology of the Escarpment greatly influences its ecological attributes. Cold air and sometimes water move through the fractured rock creating unique microhabitats in which many highly specialized species, such as rare terrestrial land snails and bats, can be found.

The Niagara Escarpment is as much a hydrological as a geological feature. The headwaters of several rivers rise in the Escarpment and the area is important for groundwater recharge. The uncontaminated water of many Escarpment aquifers is in heavy demand from the bottled water industry.

The area of the Escarpment in the Gilson Creek Watershed is home to the rare dwarf lake iris and Red Banks Alvar. There are also trees growing on the forested portion of the Niagara Escarpment that include some of the oldest red and white cedars in Wisconsin.

Current conditions (e.g. degraded, pristine)

Shoreline near the Escarpment has been extensively developed near the City of Green Bay and the Town of Scott, in the vicinity of Red Banks – mostly for residential uses. As you move away from large cities a mix of agricultural land, woodlands, and locally concentrated developments can also be found.

Another form of development that is a concern is the number of county operated or privately owned quarries that supply crushed stone from the Escarpment primarily for road base or concrete aggregate. Areas along the Niagara Escarpment, such as Red Banks, have thin soil deposits due to glacier scouring and relatively post glacial deposition. These conditions of shallow soils lying directly over fractured bedrock make the area susceptible to groundwater contamination.

Other protected areas

The portion of the Niagara Escarpment occurring in Ontario, Canada has been designated as a World Biosphere Reserve by the United Nations Education, Scientific and Cultural Organization.

The work being done at Red-Banks Gilson Creek is also ongoing at several other sites within the Lake Michigan basin by the Lake Michigan Shorelands Alliance.

Conservation Targets

While the Red Banks area is rich in biological, ecological, geological & historic diversity, the partners on this plan are focused on a few key elements. It is hoped that protection of these features will serve to ensure preservation of the whole ecological landscape.

Conservation Goals

Dwarf lake iris

- protection of all known occurrences
- restoration of intact, functioning habitat with full spectrum of species & communities
- genetic study of population to compare with Door County population

Escarpment

- intact, continuous ecological/habitat gradient from top to bottom
    - intact hydrology
- protection of all intact examples of escarpment communities
- sufficient area of plateau protected to conserve recharge areas critical to health of watershed

Trout stream

- self-sustaining population of brook trout
- creek hydrology delineated

Groundwater recharge areas

- protection of all recharge areas which impact other conservation targets

Threats to Targets

The most prominent threats to the viability and health of the conservation targets for the site are those arising from **residential development** of the area. As the Green Bay metropolitan area grows, and as agricultural production becomes less economically viable, the open acres of farmland in eastern Brown County are more attractive to developers and homebuyers. The resulting patchwork of development has multiple cascading effects on the species and natural communities of the site.

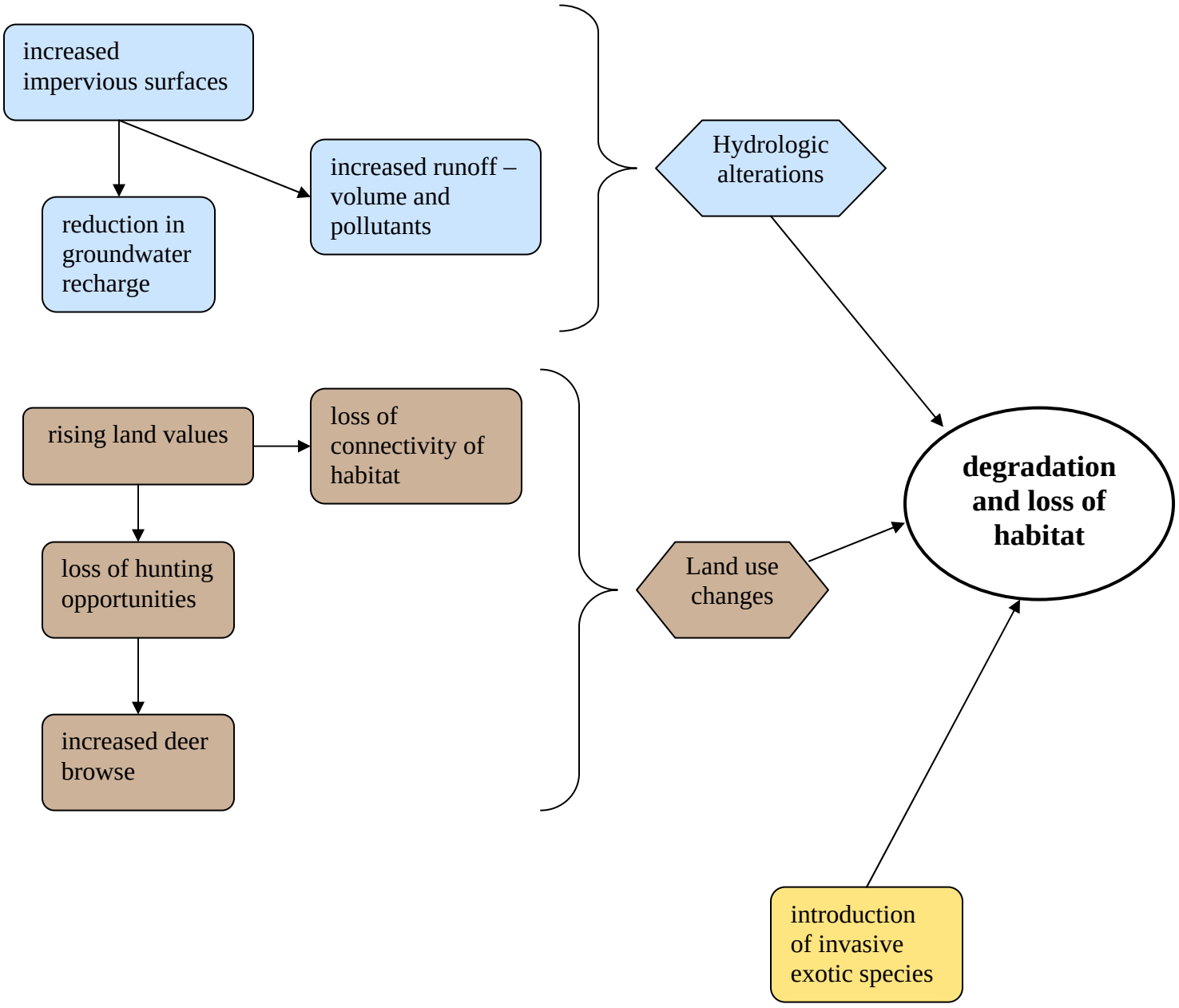
- *Increased impervious surfaces* – driveways, roads, roofs, parking lots – reduce infiltration of precipitation and runoff into the ground. This alters the hydrology of a watershed, changing stream flows, water temperature and flood cycles. Stormwater runoff moves across the landscape more quickly, and brings with it more toxins accumulated from the paved surfaces. The impact of a single home and driveway is minimal, but the combined impact of a subdivision or strip mall development can radically alter many facets of stream ecology.

- *Habitat loss and fragmentation* – Developed land has a direct impact on species habitat through the loss of acreage. In addition, the scattered nature of development breaks up formerly contiguous habitats, resulting in smaller, isolated parcels. This has two negative results; first, it decreases or eliminates the ability of individuals of a population from moving across their full habitat, and second, many species which are area-sensitive can no longer survive on the smaller parcels, even when they contain appropriate habitat.

- *Septic systems and wells* – Increased development requires more water withdrawals via wells, reducing groundwater resources which in turn affects stream flows. Development also requires more septic fields. Poorly maintained or inadequately abandoned wells and septic systems can reduce groundwater quality.

- *In-stream development* – Channelization, streambank riprap, and culverts are often associated with both residential development and agricultural operations. These modifications destroy and degrade steam habitats, and fragment remaining habitat.

Negative Impact of Development:



Other threats were also identified. In some cases, these are associated with development but not directly.

- *Invasive exotic species* – Invasive species include plants and animals which are non-native to the region and which outcompete native species for resources. Left alone, these species can take over entire habitats, resulting in a monotypic environment unsuited for other wildlife. In this region, invasives of concern are:
  - *purple loosestrife*
  - *garlic mustard*
  - *buckthorn*
- *Deer browse* – High populations of whitetail deer in the area, combined with shrinking habitat for those deer, has resulted in overbrowsing of native vegetation. Deer browse can dramatically curtail regeneration of certain plant species, and reduces the biodiversity of an area.
- *Lack of information about species and natural communities* – Many of the conservation targets identified for this site are lacking adequate inventories and location mapping. Without knowledge about the current population size, geographic location and health of these targets, it is difficult to target conservation strategies designed to preserve or restore their status.
- *Lack of awareness of conservation targets/low priority for conservation* – The general public are not informed about the ecological significance of the area, the threats facing the region's biodiversity and the need for conservation efforts. As a result, conservation and restoration are given low priority in local land use plans, and inadequately funded at the county level.

A list of threats by targets impacted (key threats in ***bold italics***):

Niagara escarpment:

- ***development***
  - quarrying
  - wind farms
  - logging
  - septic systems
- invasive species
- lack of management/lack of fire
- fragmentation of habitat
- inappropriate agricultural practices

groundwater recharge areas:

- ***residential/commercial development***
  - increased impervious surfaces
  - groundwater withdrawals via wells
  - older septic systems and improperly abandoned wells contaminating groundwater
- lack of best management practices in agriculture
- lack of locational information about recharge areas
- land use changes

trout stream:

- ***development***
  - agricultural
    - nonpoint runoff
    - channelizing and diverting flows
  - residential/commercial
    - increased impervious surfaces – changes in flow patterns
    - culvert placements
    - bank riprapping
- thermal changes from quarry overflows and loss of vegetative cover
- lack of management of in-stream debris

Point Comfort Woods:

- logging
- development – inadequate buffer between woods and residential areas
- invasive species
- deer browse

dwarf lake iris:

- development – loss of habitat
- lack of appropriate management of existing habitat
- deer browse
- invasive species – future concern, not present in iris habitat yet

Conservation Strategies to Mitigate Threats

Many of the strategies developed during partner meetings, when implemented, will have impacts on several of the conservation targets simultaneously. Specific actions to be taken toward implementation are outlined in the accompanying Action Matrices (Appendix A).

To mitigate negative impacts of development:

1) Enact a stormwater runoff fee.

2) *Directing development away from critical areas via comprehensive plans.*
   * need to define and map these critical areas

3) Encourage conservation design development.

4) *Acquire land or easements on highest priority parcels.*
   * iris habitat & alvar community within SNA

5) Work with Brown County on ecologically sensitive areas definition in their sewer plan.

6) Let local towns know about conservation priorities so they can consider conservation needs in comprehensive plans.

To mitigate impacts of invasive exotic species:

1) Develop management plan for Red Banks State Natural Area.

2) Form a Friends of Red Banks organization to implement management activities and fundraise for management needs.

To increase public awareness and appreciation of natural resources:

1) Lead field trips to Red Banks State Natural Area, other sites along escarpment.

2) Form a Friends of Red Banks organization to build community support for protection through education and outreach.

Partners

This plan was developed using a collaborative approach to conservation planning. The partners involved in this planning include:

- The Nature Conservancy – Wisconsin Chapter
- Wisconsin Department of Natural Resources – Bureau of Endangered Resources
- Bay-Lake Regional Planning Commission
- U.S. Fish & Wildlife Service – Private Lands
- Brown County Planning Commission
- Northeast Wisconsin Land Trust
- UW-Extension Basin Educators
- Gathering Waters Conservancy

Sources of Funding/Partnerships

Natural Resources Damage Assessment – related to Fox River PCB loading

Knowles-Nelson Stewardship Fund

Wisconsin Coastal Management Program Grant (NOAA Funding