

REGIONAL NATURAL AREAS PLAN, ENVIRONMENTAL CORRIDORS, AND BIODIVERSITY CASE STUDY



CASE STUDY

AUGUST 2014

INTRODUCTION

This summary serves as a case study of implementation under the Lake Michigan Watershed Academy's 2012 small project grant program. In this study, the Southeastern Wisconsin Regional Planning Commission (SEWRPC) summarizes its Natural Areas and Critical Species Habitat Protection and Management Plan, and extends and complements its prior efforts as part of the Academy, particularly as related to riparian corridors. The work also addresses the 2012 Academy theme of biodiversity and climate adaptation.

The seven-county Southeastern Wisconsin Region serves as a microcosm of change in the southern part of the Lake Michigan watershed and much of the Great Lakes basin. Here, massive land clearing of the past, urbanization, and agricultural practices have had significant and adverse effects on local plant and animal communities. Many habitat types have been virtually eliminated and most have been seriously degraded. As habitat is lost, so, typically, are the species dependent on that habitat. The result for many species has been local and regional elimination.

Despite Federal and State regulatory measures designed to protect rare, threatened, and endangered species, natural areas and their species continue to suffer development-related impacts. If natural areas and native species are to be effectively protected and wisely managed in southeastern Wisconsin, adequate information concerning such resources should be made available to concerned citizens and agencies.

The Natural Areas Plan was prepared by SEWRPC to map the location and prevalence of remaining natural areas and critical species habitats within the Region, and to develop recommendations for the preservation and management of these areas.



Upper Left—New England Aster, *Photo Source: SEWRPC.*

Lower Left—Eastern Prickly-Pear Cactus. *Photo Source: Richard A. Bautz.*

Upper Right—Yellow Lady Slipper Orchid. *Photo Source: Gary Birch, WisDOT.*

Lower Right—Camp Wowitan Esker and Fen in Washington County. *Photo Source: Donald M. Reed.*

THE SOUTHEASTERN WISCONSIN REGION

The Natural Areas inventory encompasses the seven-county Southeastern Wisconsin Region, approximately 2,700 square miles of rolling, glacially-influenced terrain to the west of Lake Michigan. Though encompassing only 5 percent of the State's area, it includes 35 percent of the population, resulting in extreme pressure on the natural resource base. For example, Milwaukee County—Wisconsin's most densely populated County—is estimated to have lost 96 percent of its forests, 70 percent of its wetlands, and more than 99 percent of its prairies. About 37 percent of the County's native plant species are presumed to be extirpated (locally extinct).



The Prairie white-fringed orchid (*Platanthera leucophaea*) is a Wisconsin endangered and Federally threatened plant found in undisturbed mesic to wet mesic prairies. In Southeastern Wisconsin, this showy orchid is extremely rare and restricted to only a few of the highest quality prairies.

Photo Source: Christopher J. Jors.



Mayapple (*Podophyllum peltatum*) is a perennial herb that forms clonal colonies from rhizomes in rich woodlands. It is dependent on soil fungi—mycorrhizae—for the uptake of nutrients. Flowering in the month of May, it produces a single, yellowish, egg-shaped fruit (berry). This ripened berry is edible in small amounts; the rest of the plant is toxic. Mayapple is well known for its medicinal properties, ranging from the topical treatment of viral warts to the potential of treating some malignant tumors by blocking their cell division.

Photo Source: Donald M. Reed.

HISTORIC LOSS OF NATURAL AREAS AND NATIVE SPECIES

The Region has experienced more than a century-and-a-half of settlement, involving cutting of forests, plowing of prairies, filling of wetlands, intensifying agricultural practices, ongoing urbanization, and increasing human population. Thus, the overall losses of the natural landscape, natural communities, and native species are to be expected. Newer threats have also altered the landscape:

Pathogens and destructive insects (e.g., Dutch elm disease, larch sawfly, butternut canker) and the arrival of emerald ash borer and its potential effects on ash trees;

Introductions of non-native plants and animals;

Hydrologic changes, such as channelization and drying up of streams; and

Fragmentation and increased isolation of natural areas (and their component species) and reduction in size.

ASPECTS OF BIODIVERSITY

A high degree of biodiversity is usually considered an indicator of healthy and sustainable communities. For example, a healthy prairie remnant would include among its component species not only plants, but grassland birds, mammals, amphibians and reptiles, fungi, bacteria, and the almost innumerable arthropods (butterflies, spiders, et al) that occur both above and below ground. All these organisms act with each other and in concert with their physical environment to produce a self-sustaining ecosystem.

However, a prairie that has been over-grazed, plowed, or suffered from natural fire suppression will have lost species through habitat alteration. Interactions between species will have been reduced and the disturbed ecosystem will have been simplified. Overall biodiversity is lowered.

There are many reasons to maintain biodiversity, among them environmental services such as nutrient cycling, pollination, water quality, and flood protection. A greater wealth of species (and their interactions) can make ecosystems more productive and stable. Greater biodiversity enables species and ecosystems to better respond to, and recover from, environmental stresses and changes.

From a human perspective, there are also potential consequences from loss of biodiversity. Prescription drugs are often derived from a variety of plant species, and food crops depend on wild genes for disease and pest resistance. For example, two derivatives of the Mayapple, a forest floor plant, have shown promise in treating some forms of cancer.

LANDSCAPE ECOLOGY

Landscape Fragmentation

Any attempt at natural area and species preservation in Southeastern Wisconsin must consider the fragmented nature of the human-dominated landscape, where scattered remnants of the pre-settlement vegetation are surrounded by farmland and development. These small patches of natural communities have experienced various degrees of disturbance, altering the physical as well as biological nature of these patches.

For example, woodlands have been divided into smaller and smaller parcels, with the effect of increasing the proportion of disturbed edges and, consequently, light penetration, wind, predators, and noise. Thus, the interiors of the remaining woods have begun to resemble their perimeters.

Landscape fragmentation has two primary effects on species. First, the creation of distinct fragments limits the ability of some species to disperse to areas of suitable habitat, and gaps between fragments may open up colonization pathways for competitors. Second, the reduced habitat area and relative increase in “edge” primarily will reduce or restrict population size and, consequently, increase predation and extinction rates.

Habitat Area

The number of species present in a particular habitat is strongly influenced by the size of the habitat. While some species in some groups of organisms can cope with smaller habitats, other organisms are area-dependent, and some of the larger predators require hundreds of square miles of habitat.

Reducing the size of habitat lowers the number of species able to co-exist. Smaller patches tend to contain fewer habitat types, thus reducing the potential pool of species that could be supported. Furthermore, as the sizes of natural area patches decrease, the relative proportion of edge versus interior increases until there is effectively no interior environment. This is especially true for shady mesic (or medium-wet) forests, where woodlots smaller than six acres are dominated by edge species.



Blanding's turtle (*Emydoidea blandingii*), a Wisconsin special concern species, occurs in all seven Southeastern Wisconsin counties. The special concern status of this turtle is explained by its poor reproduction caused by nest predation from mammals such as skunks, opossums, and raccoons—which readily adapt to the urban environment. Urban and suburban sprawl have also contributed to the fragmentation of suitable upland nesting habitats; turtle mortality due to road crossings; and shrub invasions and increases which alter the nest incubation environment.

Photo Source: Robert Hay.



Suitable breeding habitat for forest interior and grassland nesting birds continues to be fragmented and lost in Southeastern Wisconsin. The Scarlet tanager (*Piranga olivacea*), shown above, is one of Wisconsin's migratory birds that require forest interior habitat of sufficient size and suitable structure to successfully breed.

Photo Source: Brian Tang/www.hardrain.me.

Environmental Corridors

When human settlements were few and low density, a larger variety of species existed in a well-connected landscape. Wildlife movements were not impeded and plants could migrate via seed dispersion or vegetative propagation. But with increasing human populations,

urban expansion, large-scale agriculture, and a network of highways, species have found it increasingly difficult to move about. Simply preserving isolated refuges does little to enhance the flow of organisms and diverse genetic material across a landscape.

If a species should become extirpated within an isolated habitat patch, the chances of it repopulating that patch depend upon several factors, including the dispersal mechanisms of that particular species and the proximity to another population. In addition, isolated populations of species in remnant patches potentially suffer from genetic stagnation as a result of inbreeding. Dramatically reduced genetic variation may have negative effects on a species.

Relief from some of these adverse effects may be found in connections, or environmental corridors, that link similar habitat patches. Broadly defined as linear areas of natural habitat in the landscape, environmental corridors are strips of habitat connecting otherwise isolated patches that serve as a practical and valuable tool for preserving biodiversity.

Connections may be wide or narrow, such as fence-rows, and either upland or lowland, such as riparian corridors. SEWRPC has provided guidance on riparian buffers as part of its work with the Lake Michigan Watershed Academy.

Natural corridors serve as conduits, facilitating gene flow across landscapes by enabling organisms to move from one patch to another. They may be crucial in the survival of certain species. In fact, interconnections between patches may be at least as important as the patch or “island” area in maintaining species diversity.

The optimal approach to enhancing biological diversity throughout a region is to maximize connectivity, that is, to maintain physical connections between patches. Smaller patches serve as “stepping-stones” between larger patches, with the migration of species facilitated by corridors.

A related issue is the extended environmental corridor that borders Lake Michigan and is used by millions of migrating birds each spring and fall. Nearly 200 species of migratory birds stop in Milwaukee County each year. The actual habitat along this flyway is discontinuous, broken up by past and present human disturbances; it is imperative that there be no further loss of adequate stopover sites. Migratory species require quality habitat to rest, feed, and seek shelter from sudden changes in weather conditions during their long journeys.

CLIMATE CHANGE

Climate change is generally considered to be a significant threat to biodiversity. It is especially harmful to plants and small animals, which can only expand their ranges over a series of generations. Habitat linkages (i.e., corridors) are the only way for such species to naturally migrate. Species have always shifted their ranges in response to changes in climate. The problem exists when change occurs faster than species can move, and especially where there are physical barriers present, such as urbanization.

The climate may change too fast for some species to move within an environmental corridor, as well. These species may be lost from the Region. Others will be able to adjust, but only if the corridor is intact. Thus, it is essential that corridors be maintained between preserves to provide a variety of species with migratory routes.

EXOTIC SPECIES

Non-native (i.e., exotic) species may be defined as plant or animal species originating in another region or country. Many, if not most, such species are not invasive. But some are especially problematic when they invade natural areas, where they can overwhelm native habitat systems and cause the reduction in, or loss of, native species diversity.

General properties of invasive exotic species include:

1. Aggressive reproduction—rapid growth; high reproductive capability; efficient, widespread dispersal of offspring; vigorous vegetative spread in plants;
2. High adaptability;
3. Tolerance of a range of environmental conditions;
4. A lack of natural enemies (e.g., predators, herbivores, disease) in the new habitat; and
5. The ability to out-compete native species for such elements as essential nutrients, light, space, and water. They may also alter the food web and physical environment.

Invasive plant species have become recognized as a major threat to the integrity of natural areas, as some aggressively invade natural plant communities. In extreme situations, they displace native species, reducing biodiversity and simplifying community structure.

Key elements of management for invasive plant species include:

1. Monitoring and prevention—which is generally considered to be effective, economical, and ecologically sound. This involves early detection and eradication of invasives as they become apparent.
2. Control—which can be costly and ecologically harmful. The major methods are manual (pulling, digging, flooding, mulching, burning, etc.); mechanical (hoeing, cutting, girdling, mowing, chopping, etc.); chemical (herbicides and pesticides); biological (animals, fungi, diseases); and cultural (modify conditions so as to control invasives).
3. Maintenance of the ecological health and integrity of the native plant communities—the best, most economical, and least ecologically injurious methods.

The following exotic plant species are considered particularly harmful to natural areas and critical species habitats in the Region: 1. common buckthorn (*Rhamnus cathartica*), 2. glossy buckthorn (*Rhamnus frangula*), 3. garlic mustard (*Alliaria officinalis*), 4. the shrub honeysuckles (*Lonicera morrow*), 5. purple loosestrife (*Lythrum salicaria*), 6. reed canary grass (*Phalaris arundinacea*), and 7. dame's rocket (*Hesperis matronalis*).

Such non-native species as 8. zebra mussels, 9. quagga mussels, and 10. the rusty crayfish are among many introduced animal species causing ecological problems in the Region. Asian carp maybe a potential future problem in the Region's waterways.

4. Cultural and educational value
5. Economic value
6. Aesthetic value

The first essential step in protecting natural areas in the Region is creating an inventory of locations and evaluating their quality. However, not every small woodlot, remnant prairie, or other small portion of the “natural” landscape can be included in an inventory, as this would make it unwieldy and practically useless. SEWRPC devised a method to evaluate and rank potential natural areas for inclusion in the Natural Areas Plan, based on such relevant factors which include degree of disturbance, number of native species, presence of rare species, habitat size, and rarity of a particular community in the landscape.



NATURAL AREAS

The SEWRPC Natural Areas Plan identifies key reasons for preserving natural areas:

1. Maintenance of biodiversity
2. Support basic scientific research
3. Functional values



Photo Source: 1. Steve D. Eggers, 2. Steve D. Eggers, 3. Wisconsin Department of Natural Resources, 4. Wisconsin Department of Natural Resources, 5. Retzer Nature Center, 6. Donald M. Reed, 7. Elizabeth J. Czarapata. 8. U.S. Geological Survey Archive, 9. Utah Division of Wildlife Resources, and 10. U.S. Geological Survey Archive.

The Commission's initial Natural Areas Plan, Planning Report No. 42, *A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin*, completed in 1997, identified 447 natural areas, about 90 square miles, and 142 critical plant and animal species habitat areas. The *Amendment to the Natural Areas and Critical Species Habitat Protection and Management Plan for the Southeastern Wisconsin Region, 2010* includes new information concerning regional natural areas and identified changes in the landscape. This update incorporates additional sites, for a total of 494 natural areas and 271 critical species habitat sites, and a combined area of about 131 square miles.

In addition to specific natural areas and critical species habitats, suitable breeding habitat for many bird species, particularly those requiring relatively large expanses of grassland or forest, is becoming a critical need. To help remedy this, naturalists determined that relatively large tracts of grassland and forest interior—outside of identified natural areas—should be re-established. As such, six forest interior sites and four grassland reserve sites, for a total of about 22 square miles, have been identified as areas to enhance native bird populations.



Kittenails (*Besseyia bullii*) is a State of Wisconsin-designated threatened plant species. Its distribution in Southeastern Wisconsin is essentially restricted to the sandy and gravelly soils of oak openings and dry to dry mesic prairie habitats of the Kettle Moraine.

Photo Source: Thomas M. Slawski.

The importance of environmental corridors was a major factor in the preparation of the Natural Areas Plan. Location within a primary environmental corridor was a basic consideration in recommending priorities for the protection of individual sites. Additionally, site-specific information collected during the natural areas inventory process permits a more precise delineation on environmental corridors.

MANAGEMENT

A common misconception is that natural areas will recover and thrive if left alone; in other words, they merely need to be “fenced in” to sustain themselves.

Instead, under most circumstances, natural communities need to be managed to sustain native biodiversity. Much depends on the extent of past disturbance. Proper management is intended to allow natural processes to function as fully as possible and to minimize human-induced disturbance.

Whether executing controlled burning of a prairie or oak savanna, or removing exotic species such as garlic mustard or buckthorn from an oak forest, proper management is essential for biodiversity to be achieved. Ideally, the management goal should be to restore and maintain conditions that will assure the long-term preservation of native species and communities.



Control burn management not only helps to manage the invasion of woody vegetation, it also releases essential nutrients which contribute to the flowering and seed production of native prairie plants. This management practice, combined with shrub cutting and targeted herbicide treatment, has effectively contributed to the maintenance of high quality prairie. The above photograph was taken during such a controlled burn at the Chiwaukee Prairie State Natural Area in Pleasant Prairie, Wisconsin.

Photo Source: Jerry Ziegler, The Nature Conservancy.

As part of its Lake-wide Management Plan (LaMP), the U.S. Environmental Protection Agency has developed a set of “endpoint goals to describe the desired levels of ecosystem integrity and ecological services required to restore beneficial uses and provide healthy human and natural communities in the [Lake Michigan] basin.” The Commission's adopted Natural Areas and Critical Species Habitat Protection and Management Plan for the Southeastern Wisconsin Region addresses these end goals including:

- All habitats are healthy, naturally diverse, and sufficient to sustain viable biological communities.
- Land use, recreation, and economic activities are sustainable and support a healthy ecosystem.
- Ecosystem stewardship activities are common and undertaken by public and private organizations in communities around the basin.
- Collaborative ecosystem management is the basis for decision-making in the Lake Michigan basin.
- We have enough information/data/understanding/indicators to inform the decision-making process.

CONTACT INFORMATION

A list of references, and further information is available by contacting:

Southeastern Wisconsin Regional Planning Commission

Email: gkorb@sewrpc.org

Phone: (262) 547-6721

Fax: (262) 547-1103

Mail: W239 N1812 Rockwood Drive

P.O. Box 1607

Waukesha, WI 53187-1607



The Purple pitcher plant (*Sarracenia purpurea*) is Wisconsin's largest carnivorous plant. Its modified leaves or pitchers are used as a “pitfall” trap to capture its prey. While not an endangered or threatened plant in Wisconsin, the pitcher plant is restricted to bogs and a few fens in Southeastern Wisconsin. Native plants, such as the pitcher plant, contribute to the Region's biodiversity. The above photograph was taken at the Beulah Bog State Natural Area located in the Town of East Troy, Walworth County.

Source: Steve D. Eggers.

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REGIONAL PLANNING COMMISSION
W239 N1812 ROCKWOOD DRIVE
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WAUKESHA, WISCONSIN 53187-1607