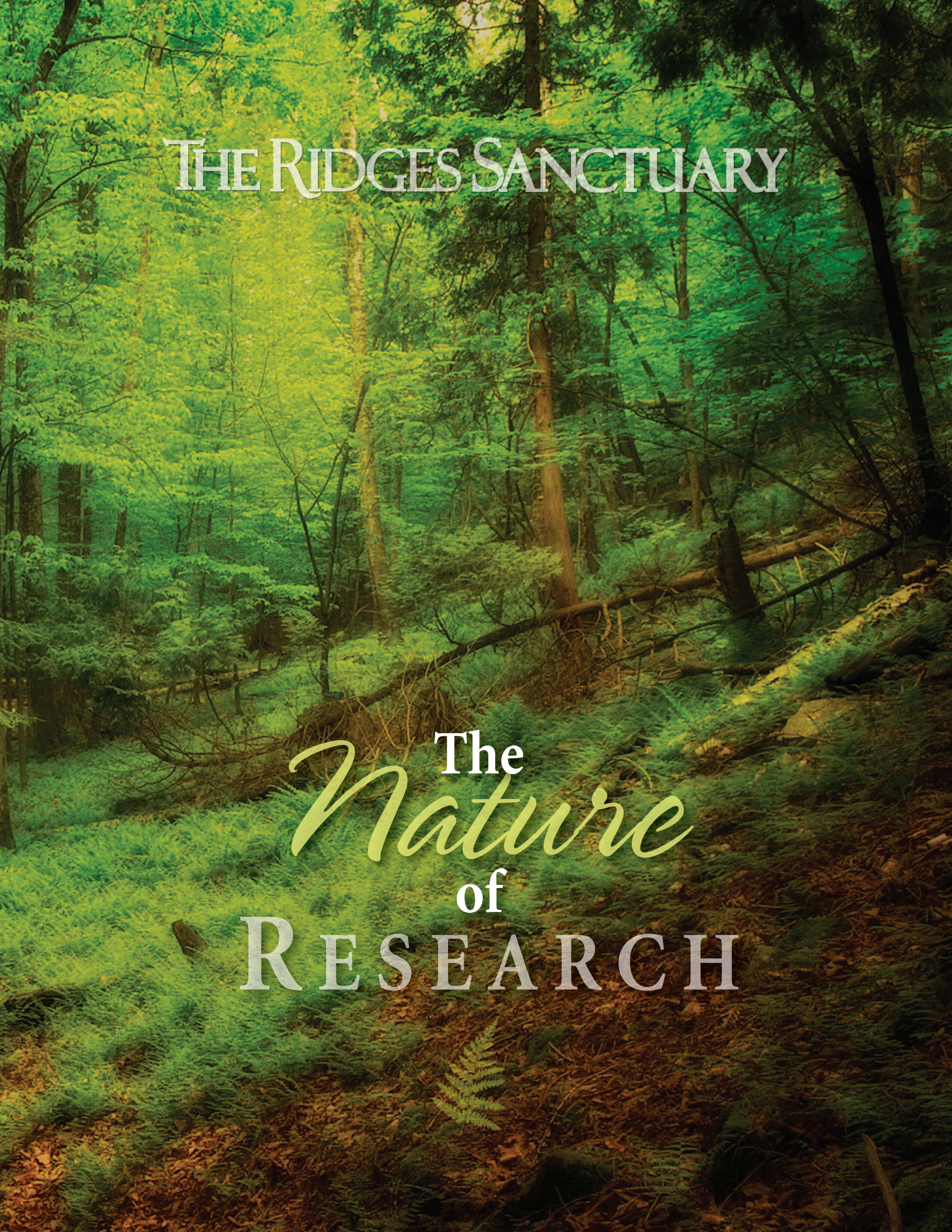
THE RIDGES SANCTUARY
The
Nature
of
RESEARCH

Are we going to let future generations inherit a Wisconsin denuded of its forests and swamps, or are we going to set aside here and there through the state, areas where bits of the state in its pristine beauty can be seen by them.

"Our Wisconsin Orchids and Their Preservation"
- Albert Fuller, 1926

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EDUCATION • RESEARCH • PRESERVATION

THE RIDGES

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The Brookby Foundation seeks to promote community well-being primarily by supporting endeavors that advance artistic and scientific literacy, with a special interest in those that protect or improve the environment.

November, 2014
PO Box 152, Baileys Harbor, WI 54202 • www.RidgesSanctuary.org

Using Research to Inspire Learning and Stewardship

Mention Wisconsin's proud tradition of conservation and a handful of well-loved individuals automatically spring to mind: John Muir, Increase Lapham, Robert La Folllette, Aldo Leopold, Norm Fassett, Gaylord Nelson among them.

However, if you have ever marveled at the amazing diversity of flora at The Ridges Sanctuary, hiked along the Woodland Dunes Nature Trail at Kohler-Andrae State Park, welcomed spring alongside the pasque flowers blooming on the hillsides of the Southern Kettle Moraine State Forest, viewed the aquatic plants from the boardwalk running through the Cedarburg Bog or gazed at the flowering spires of the prairie white-fringed orchid at Chiwaukee Prairie, then you have shared in the legacy of landscapes left to us by the man who was the catalyst for the founding of The Ridges, as well as one of the unsung heroes in Wisconsin conservation history – botanist Albert Fuller.

In 1933, Fuller became curator of botany at the Milwaukee Public Museum. Hard hit by the Depression, the museum canceled lecture programs, field research and museum publications. Using an infusion of federal funds, Fuller began designing ecological exhibits in the hopes that the dioramas would nurture conservation efforts. He also conducted field work, collecting specimens to add to the growing Herbarium at the museum.

One area Fuller returned to frequently for field work was a 40-acre area in Baileys Harbor on the Door Peninsula that he referred to as a "paradise for a botanist." In addition to 24 species of the royal orchid family that grew within the parcel, he also found his beloved queen, the showy lady's-slipper. In early 1937, he learned that the county planned to build a trailer park on the land and the botanist, typically described as reserved and soft-spoken wrote, "I set up a howl that was heard over all of Door County." He advocated tirelessly for the preservation of the area through articles and field trips. Often accompanied by his friend and fellow conservationist, Jens Jensen, he gave countless presentations to residents of the area, including Emma Toft, Olivia Traven, William Sieker and George Sieker. It was Fuller's inspirational presentations which sparked a grass roots movement throughout Baileys Harbor and the greater Door County community to protect the original 40 acres. Once the land was protected, these individuals and others formed The Ridges Sanctuary organization to continue this conservation movement of land protection, research and education under the banner of the original mission statement adopted on October 4, 1937:

> *"To acquire by gift, purchase or otherwise, part or all of the real estate in the area in the town of Baileys Harbor, Wisconsin known as 'The Ridges' or 'The Bog' . . .*
>
> *To acquire and hold other pieces of real estate in Wisconsin and elsewhere, and to protect and preserve the native plant and animal life found thereon.*
>
> *To carry on educational and scientific activities which will promote the cause of conservation and preservation . . ."*

The projects described in this publication exemplify the vision of Albert Fuller, our founders and our mission today – to protect the Sanctuary and inspire stewardship of natural areas through programs of research, education and outreach.

Albert Fuller (at right) mentoring lifetime member, the late Chester Cook, 1937

The Orchid Restoration Project

Reintroducing Key Orchid Species

In 1933, Albert Fuller published "Studies on the Flora of Wisconsin: The Orchids; Orchidaceae" in which he discussed the two primary ways to achieve conservation of native orchids: 1) by establishing permanent wildlife sanctuaries; and, 2) by cultivating orchid species to protect populations threatened by development and invasive species. Fuller referenced Dr. W. M. Wheeler's article "The Flora of Milwaukee County," published almost 45 years earlier: "Our native orchids are fast vanishing, partly because of their damp haunts are being rapidly converted into spots more accessible and useful to man, and partly because, like the majority of our more delicate native species, they are unable to compete in the struggle for existence with those robust European weeds, which can adapt themselves to all sorts of conditions and are consequently flooding our county." Even then, Fuller perceived the threat of development and invasive species looming over the orchids.

Albert Fuller had incredible foresight and a vision for what was needed to save orchid species throughout Wisconsin. With the support of the Baileys Harbor community, he and other individuals founded Wisconsin's first land trust – The Ridges Sanctuary. Buoyed by the success of that conservation initiative, Fuller and others employed the same model to start the State Natural Areas program. Now, some 80 years later, we are working to fulfill his other vision: *cultivating key orchid species to restore threatened populations in the Sanctuary and throughout Door County.*

Background

The 1500 acres of The Ridges Sanctuary are home to 25 of Wisconsin's 40 native orchid species. However, while these rare plants appear plentiful in the Sanctuary, their populations are decreasing. Unauthorized collection in the wild, loss of habitat to development, deer predation and changes in tree canopy cover have led to the decline of certain orchid species here and in other locations in Door County where they once grew in abundance. This population decline has led to increased interest in orchid conservation, particularly reintroductions and understanding the specific ecological requirements of different orchid species. Orchid reintroductions are an important tool in conserving orchids and furthering knowledge of orchid ecology. Reintroductions have been attempted, but usually only for one or a few species. The Ridges is currently undertaking a large scale, multi-year project focused on reintroducing multiple orchid species, and understanding their unique habitat requirements.

In 2013, Ridges citizen science volunteers led by botanist Melissa Curran entered the first phase of this project to reintroduce key orchid species in the restored ridges and swales bordering the north end of the new interpretive center. No adult or juvenile plants will be removed or damaged during the course of this project. Only seed pods are required to start the reintroduction process.

The Orchid Restoration Project

continued

Species Selection

Although we will most likely work with additional species in later phases, we are working with the following species for this first phase of the restoration: ram's-head lady's-slipper (*Cypripedium arietinum*), showy lady's-slipper (*Cypripedium reginae*), yellow lady's-slipper (*Cypripedium parviflorum*) and grass pink (*Calopogon tuberosus*), pictured top to bottom at right.

Orchid photos credit - Douglas Sheman

These species were chosen for the following reasons:

1) All species have established germination success.
2) All species have documented outplanting success. That is, they can be transplanted from a nursery bed, greenhouse, or other location to an outside area.
3) The ram's-head lady's-slipper is a State Threatened species and therefore has high conservation value.
4) All species are showy and colorful.
5) Suitable habitat is present at The Ridges.
6) The ram's-head lady's-slipper can be outplanted relatively quickly (2015), while the remaining species will be outplanted in subsequent years.
7) The showy lady's-slipper was once very abundant at The Ridges, but has seen a significant decline in number over the last few decades.

Germination and Reintroduction

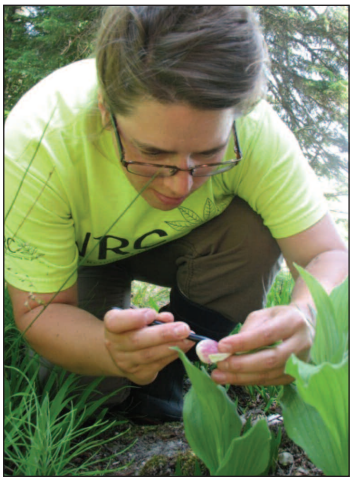
Orchid seed was secured from locally available sources within or very near The Ridges. Selective hand-pollination efforts were painstakingly performed for the ram's head and showy lady's-slippers. Mature, healthy mother plants were located and selected as seed sources based on their size and vigor. Hand pollination is preferred over wild pollinated plants since the timing of fertilization and subsequent seed maturity can be determined and controlled; but also, hand pollination generally produced larger seed pods. Once the seed pods were mature, the hand-pollinated seed from ram's head and showy lady's-slipper along with wild-pollinated seed from yellow lady's-slipper and grass pink were collected and transported to the appropriate laboratory for germination.

Orchid seeds are tiny dust like seeds that contain little in the way of food reserves. In nature they will not germinate unless infected by a mycorrhizal or symbiotic fungus, which supplies the young plants with all the sugars and nutrients they need until the plants are large enough to produce food on their own. The newly germinated seed will continue to grow for many weeks, months or even years depending on species, until large

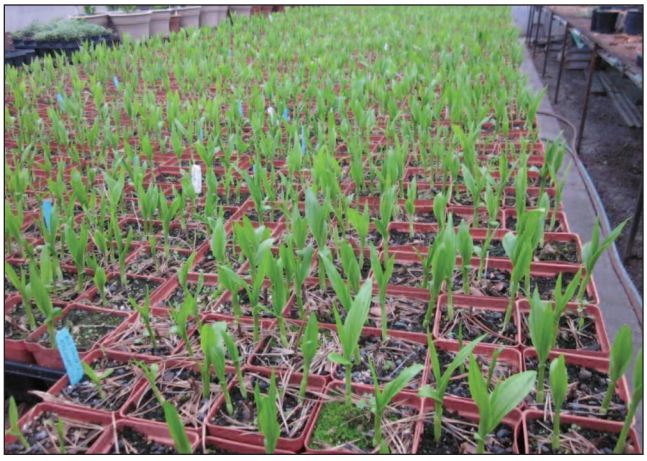
The Orchid Restoration Project

continued

enough to produce leaves and roots. In terrestrial orchids it is vitally important that the orchid/fungus relationship is maintained during the early stages of the plants life, as the germinated seed is subterranean and cannot produce any food of its own.



The Ridges is working with lab specialists who germinate orchid seed under sterile conditions using tissue culture laboratory techniques known as asymbiotic germination. Asymbiotic germination uses no fungus to germinate the orchid seed, but instead the seed is grown in an agar medium which contains all the sugars and minerals the seed needs to germinate and grow. Once the plants have reached a suitable size (top left), they will be planted out in community flats (bottom left) to acclimate to their environmental or planted directly into suitable habitat within The Ridges.



Establishing orchids in the field is challenging, because complex ecological requirements of individual species are not well understood. Since no soil borne fungus is used during the germination process, the orchids will be reintroduced into The Ridges without an associated fungus. However, the seedlings will naturally be exposed to native, on-site fungi which are assumed to be present within The Ridges. The seedlings and subsequent adult plants may form an association with the native soil fungi, and the subsequent seeds from the adult plants may utilize the on-site fungi for germination of new plants. The emergence of new seedlings from the reintroduced plants will be carefully studied and documented as part of the monitoring program.

Why The Ridges?

Why is The Ridges the right place for orchid conservation? Our ability to complete a project of this scope and magnitude is unique to the landscape of orchid conservation. We feel The Ridges offers a unique combination of criteria for orchid conservation which will ensure the success of this project for future generation. The following are just a few reasons why The Ridges is the right place.

Specialized Habitat Conditions

How species will adapt to a changing climate is a significant concern for restoration and conservation of native species. Due to ecosystem fragmentation resulting from widespread land use changes, species have limited ability to migrate naturally in response to a changing climate. This often results in small isolated habitat and associated species populations rather than large contiguous natural areas. These small patches of habitat provide refugia - areas in which a population of organisms can survive through a period of unfavorable climate conditions - for species and seed sources for future restoration and conservation efforts.

The Orchid Restoration Project

continued

The Ridges Sanctuary is a great example of refugia with high species diversity in a small localized area and illustrates the importance of conserving such hotspots of biodiversity.

Orchids require very particular conditions for germination and are often slow growing, slow to disperse and take years to flower. For this reason, when orchid habitat is fragmented, and populations exist in isolated colonies, they are in danger when climate factors affect habitat change. Climate change needs to be considered when designing restoration and conservation projects, especially when working with species which require a considerable amount of effort and time to reintroduce. Conservation effort should avoid habitats where a changing climate greatly effects native species composition, timing of seasonal events and invasion of alien species. The Ridges is unique in that it contains community types which are more typical of northwestern Wisconsin. The cool waters of Lake Michigan heavily influence the local climate, allowing more northern species to thrive. In fact, some of the early season orchid species flower almost two weeks later than in northern Minnesota. This suggests that the local climate has some resiliency to a changing climate and the proximity to Lake Michigan may buffer The Ridges from warming trends, making it an ideal habitat for orchid species that require northern climes.

Access & Education

Often times when orchid species are reintroduced, it's at a nature preserve far outside the public awareness. The locations are generally secret, and the public is not encouraged to participate. Conversely, our goal for this project is for the public to be fully engaged in the process.

Photo credit - Douglas Sheman

In the 77 years since its founding, the campus of The Ridges has offered a wealth of opportunities for scientific research and environmental education. In 2015, our new interpretive center will provide improved access to The Ridges for visitors of all ages and abilities, as well as an informed introduction to the on-site experience. Just to the north of the Cook-Albert Fuller Center, the Hidden Brook boardwalk route traverses an area of restored ridges and swales that will become not only a living exhibit, but also a living laboratory for the study of ecology and preservation. When completed, key educational waysides along the boardwalk will feature panels that interpret the diversity of the landscape and the rich mosaic of plants and animals found

The Orchid Restoration Project

continued

here. In this outdoor classroom, Ridges naturalists, guest speakers and presenters will conduct programs designed to shape visitors' understanding and appreciation of the orchid restoration project as well as other critical habitats they pass through on the trail.

Management & Monitoring

Just as there are limited opportunities for the public to share in an experience like the orchid restoration, there are also very few examples of an introduction which is monitored for an extended period of time. Ridges staff and citizen scientist volunteers are trained in the active monitoring of recurring animal and plant life cycle events in the Sanctuary and their timing as it relates to weather and climate. Collection of data on these cycles or on species abundance and distribution is a major tool for rating change over time. Physical, chemical and biological information ultimately lays the foundation to draw conclusions about local and regional environmental health and form the basis for educational programs and outreach.

Experienced Ridges volunteers also assist staff in controlling non-native, invasive plant species that threaten the ecological integrity of the Sanctuary. Invasive species management is a priority of The Ridges. Management efforts have been on-going, and will continue as current or new invasive species threaten to degrade the quality of The Ridges. Few reports exist that detail management methods specific to orchid populations and their habitat. If needed, species specific management efforts will be developed to ensure the restored orchid populations are not negatively impacted by non-native, invasive plant species.

Because of its staff, its dedicated and highly educated volunteers and its educational infrastructure, The Ridges has the ability to monitor the reintroduced populations and conduct invasive species management for decades. These characteristics set The Ridges apart from other similar projects and will add significantly to the success of this project.

Future Efforts

This winter Ridges staff, citizen science volunteers and Melissa Curran will meet to discuss and develop an orchid conservation strategic plan which will outline goals and objectives, species in need of conservation and a long range timeline to achieve the conservation priorities and increase opportunities for volunteer involvement. The Ridges is taking the right steps to become a leader in orchid conservation. Our methods, results and lessons learned will be shared with other organizations worldwide that are interested in orchid conservation.

Timeline - 2014

- Pollinated orchids, fenced as necessary
- Trial outplanting of ram's-head
- Monitor outplanting success
- Identify 2015 outplanting sites
- Collected capsules as needed

Timeline - 2015

- First outplanting of ram's-head
- Monitor outplanting
- Pollinate, monitor and collect seed as necessary
- Identify outplanting sites for grass pink orchids
- Nursery beds?

Timeline - 2016

- Monitor previous outplantings
- Pollinate, monitor and collect seed as necessary
- Care for plants in nursery beds
- Identify outplanting sites for the yellow and showy lady's-slippers

Timeline - 2017

- First outplanting of yellow and showy lady's-slippers
- Monitor previous outplantings
- Pollinate, monitor and collect seed as necessary

The Hidden Brook Boardwalk

Research Informs Practice

One of the best examples of the relationship between research and education is the Hidden Brook Boardwalk project. The objective of the boardwalk is to provide access for people of all ages and abilities to experience and learn from one of Wisconsin's most biologically diverse landscapes. Located at the northeast end of the building site, the handicapped accessible boardwalk will connect the new Center to the existing Sanctuary trail loop. In doing so, it winds through over a quarter mile of critical wetland habitat for native orchids, the federally threatened dwarf lake iris and the federally endangered Hine's emerald dragonfly.

Although the link between research and education is assumed, there can often be a considerable gap between information gathering and application. In the case of the Hidden Brook boardwalk project, multiple agencies collaborated successfully to develop guidelines for installing a boardwalk in a sensitive environment. Working with the US Fish & Wildlife Service (USF&W), the US Corps of Engineers, the Wisconsin Department of Natural Resources (DNR), the Town of Baileys Harbor and multiple Door County departments, best management practices were defined to create a model for building an experience that protects resources, but also completely immerses the visitor in the surrounding habitat. In particular, key initiatives in both the US Fish & Wildlife Recovery Plans for the Hine's emerald dragonfly and the dwarf lake iris were used as our guide with the project (see sidebars).

In order to ensure that the boardwalk placement minimized impact without sacrificing connections to key habitats, a number of surveys were conducted along the trail route. Stantec, environmental consultants based in Green Bay, conducted a wetland delineation

Dwarf Lake Iris Recovery Plan

(US Fish & Wildlife Service, April 2012)

Goal:

Removal from the Federal List of Endangered and Threatened Plants

Objectives:

- To ensure the long-term persist ence of a minimum number of viable populations across a majority of the species' geographic range through protection of habitat and conservation under a management plan;
- To advance the understanding of dwarf lake iris ecology through research and experimental management practices; and
- To improve public awareness of dwarf lake Iris.

The Hidden Brook Boardwalk

continued

Dwarf Lake Iris Comparison Chart

DLI in the path (or potential shading) by the Boardwalk	DLI Potential Growth along Boardwalk with Thinning of Canopy
72 sq ft	440 sq ft
178 sq ft	624 sq ft
227 sq ft	768 sq ft
477 sq ft	1832 sq ft

survey to determine and flag the boundaries of the area. Enlisting the aid of Ridges volunteers, Stantec botanist Melissa Curran surveyed plant species. Two surveys were conducted specifically on dwarf lake iris: Ridges volunteers measured density along the trail, and the DNR subsequently charted the irises for study plots. Tree species were also surveyed by the DNR. Along the east end of the trail, graduate students from the University of South Dakota plotted potential Hine's emerald dragonfly habitat. Upon availability of all survey data, the tree canopy was thinned along the proposed boardwalk route and in other key areas to restore dwarf lake iris and orchid habitats. In addition, placement of the boardwalk was reconfigured to avoid both the high populations of dwarf lake iris and the numerous crayfish burrows in which the Hine's emerald larvae (pictured below) live.

Opening the canopy for the boardwalk provided an opportunity to study how best to maintain existing dwarf lake iris (*Iris lacustris*) populations as well as repopulate the Hidden Brook area that had been grazed at one time. The Ridges hired Stantec consultants who worked with volunteers to identify dwarf lake iris populations along the boardwalk route. The boardwalk design then was mapped out next to, but not impacting, these populations. In addition, the DNR received a USF&W grant to study the effects of canopy thinning on flowering, patch size, seed viability, and leaf litter of dwarf lake iris. Twelve .5 square meter plots were identified. 6 were controlled with no manipulation and 6 with thinning the canopy to allow more light.

Initial results showed seed viability was extremely high (up to 99%) and did not differ between thinned and unthinned plots. These unexpected results suggest that more data are needed to determine the value of canopy thinning on dwarf lake iris before this management tool is used on a larger scale. Overall, it advanced the understanding of dwarf lake iris ecology for our restoration needs and best management practices in the recovery plan.

As a final step, using all of the survey data, Schmeeckle Reserve Interpreters, UW-Stevens Point, identified key educational waysides along the boardwalk and incorporated them as part of The Ridges Interpretive Master Plan. The conceptual exhibits contained in the plan will be used to design specifications for the interpretive panels that will explain the ongoing research projects taking place along the route – orchid restoration, water quality s tudies, Hine's emerald habitat – along with presenting ecological concepts and background on The Ridges' rich cultural history. The result will be an enriching and meaningful learning experience for all visitors.

Photo credit - Dan Soluk

Hine's Emerald Dragonfly Recovery Plan

(US Fish & Wildlife Service, September 2001)

Goal:
Removal from the Federal List of Endangered and Threatened Wildlife and Plants

Actions:

- Protect and manage extant populations
- Conduct studies
- Conduct searches for additional Hine's populations.
- Conduct information and education program
- Conduct a reintroduction and augmentation program
- Review and track recovery progress

The Ridges Watershed

A Holistic Approach to Protection

From 2006 to 2007, Paul Sager, Ronald Stieglitz and Mike Stiefvater from UW-Green Bay mapped out The Ridges watershed – the drainage area that channels surface water into the swales and Pickerel Pond before entering into Lake Michigan. The watershed reaches as far north as the intersection of 42/57 in Sister Bay and as far west to the intersection of County Roads A and F in the middle of the county.

In 2008, Ken Bradbury published a paper for the US Fish & Wildlife Service identifying groundwater recharge areas for the Hine's emerald dragonfly. Subsequently, we formed partnerships and facilitated a number of citizen science monitoring programs. This study showed that the swales are also influenced by the Peil Creek watershed, west of Baileys Harbor. The water from Peil Creek percolates down into the bedrock, flows under Baileys Harbor, and then remerges back into the swales at the Sanctuary.

As a result of these two studies, we identified our "watershed neighbors" and the need for outreach programs, helping others become stewards of their own lands in order to protect the surface and groundwater flowing into the Sanctuary. Subsequently, we formed partnerships and facilitated a number of citizen science monitoring programs. Our outreach programs not only help protect the Hine's and other critical habitats, but also build awareness about the protection of personal drinking water.

Stream Monitoring

We began a stream monitoring program in cooperation with the Wisconsin Water Action Volunteer network (WAV) to support volunteers in stream monitoring protocols. The Ridges facilitated a volunteer training with WAV to assess the chemical, physical and biological properties of local streams. Chemical analysis looks at dissolved oxygen (amount of available oxygen in the water for animal life), temperature and several other parameters. Physical tests look at water clarity (assessing suspended particles that could have a negative influence on aquatic life) and observations to any changes of the stream bank due to erosion. Finally, a biological assessment defines the diversity and types of aquatic invertebrates collected and can tell the story of water quality over a given time. Certain species like mayflies, caddisflies and dragonflies need more dissolved oxygen than sowbugs and blood worms – decomposers of the aquatic habitat. Most invertebrates, like the dragonflies, live in the stream for a year or more, depending on the species. If you collect dragonflies in your stream, you know the dissolved oxygen level has been fairly high and consistent for some time. If all you collect are decomposers, like sow bugs, it means there isn't sufficient balance to support a variety of aquatic life.

The Ridges Watershed
continued

After this training, interest in monitoring grew beyond our watershed to streams throughout Door County. Since 2010, our volunteers have been observing the following streams: north and south Reiboldt's Creek, - Peil Creek, Stony Creek, Hibbards Creek, Logan Creek, Three Springs, Hein's Creek, Hidden Brook, Pickerel Pond Creek.

Sucker Monitoring

When UW-Madison researcher Evan Childress contacted The Ridges and asked for assistance in monitoring the white sucker spawning in local tributaries, the stream monitoring volunteers and several others quickly jumped on the opportunity to help.

Childress and fellow researcher Peter McIntyre are studying what triggers white and longnose suckers to move in the spring, and whether it is flow or temperature that provides the cues to fish that it's time to spawn. Fish migrations are an indicator of spring along Great Lakes tributaries and are just one of the many processes potentially affected by looming climate shifts. Possible migration cues include day length, stream flow, and water temperature. While environmental triggers like the number of daylight hours remain constant, stream flow fluctuates depending on precipitation quantity, intensity and frequency, as well as daily temperatures. Changes in migration timing could have implications for egg survival, interactions with other species and the role of migratory fish in driving stream productivity.

Citizen scientists played a key role in this study by gathering initial data on weather, water depth and fish arrival along a variety of peninsula tributaries over a period of two years. Data was monitored daily each year from March 15 until past peak migration.

Culvert Monitoring for Watershed Health

Sediment is one of the primary pollutant threats to our water quality. Road stream crossings can become a conduit for this pollution when excessive soil from roads or eroding banks at the culvert site flow into a tributary. These crossings can range from 18-inch culverts to two lane highway bridges.

The cumulative effects of sedimentation are an area of concern in stream systems as they can directly affect diverse fish and riparian dependent wildlife. A variety of fish utilize tributaries around the Great Lakes to complete their life cycle on an annual basis. Road crossings on streams can block fish migrations and prevent fish from finding spawning and feeding habitat. Sediment can cover aquatic spawning beds and clog fish gills as well as impair water quality.

Fortunately, poorly designed or failing road crossings can be replaced with structures that are easily

The Ridges Watershed

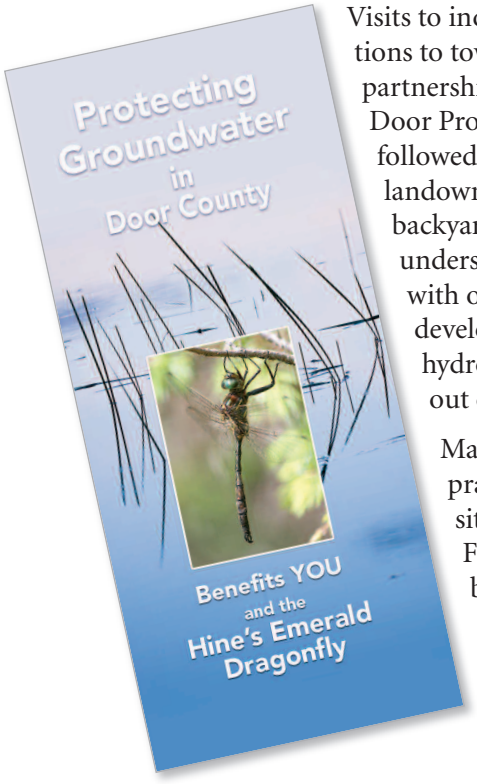
continued

passable by fish. Culverts and bridges are assessed to identify barriers and prioritize potential future fish passage projects. After completing a pilot survey in watersheds on the west shores of Green Bay, the Wisconsin DNR called for volunteers to assist in documenting road stream crossings statewide. In 2012, Citizen Scientist volunteers completed culvert surveys to gain a better understanding of subwatershed health around the thumb. Data collected at the crossings and supplied to the DNR included detailed information about the location, road characteristics (width, shoulder, drainage, approaches, surface), culvert condition, erosion and runoff problems. Stream characteristics such as width, depth, current and substrate were also recorded.

Photo credit - Carol Freeman

Best Management Practices to protect the Hine's Emerald Dragonfly

In 2011, The Ridges received a US Fish & Wildlife grant to further investigate land uses in our watershed and other groundwater contributing areas based off of the 2008 Bradbury study. Marne Kaeske, Stewardship Coordinator, mapped out karst features and land uses in each contributing area. Once she understood the land use, best management practices were identified to help protect The Ridges watershed and Door County's groundwater.



Visits to individual landowners, presentations to town boards, and promotion of partnerships (like the Safe Lawns program Door Property Owners coordinate) followed to build awareness and help landowners become stewards of their own backyards. There is a continued effort to understand our watershed and work with our "watershed neighbors" to develop a better understanding of our hydrology and connections throughout our watershed.

Many of these best management practices were implemented in the site design for the new Cook-Albert Fuller Center. The site design will be used to educate visitors on best management practices they can use in their own backyards.

Best Management Practices

- Eliminate Pesticide and Synthetic Fertilizer Usage on Residential Lawns, Public Spaces and Recreational Fields.
- Protect exposed bedrock
- Maintain Private Onsite Wastewater Treatment Systems.
- Develop and Implement a Storm Water Management Plan
- Install Storm Water Infiltration Systems to Mitigate Impervious Surface Runoff
- Use Door County Greenprint to Guide Development in Protection of Areas Crucial for HED Recovery
- Properly Dispose of Pharmaceuticals and Hazardous Waste

Our Nocturnal Neighbors

Monitoring Door County's Flying Squirrels

Reports of flying squirrels nesting in bluebird houses in the Baileys Harbor area are a common occurrence. When a Northern flying squirrel was found outside the Upper Range Light in the fall of 2012, it led us to examine the role of The Ridges in the protection of flying squirrel habitat.

Northern flying squirrels (Glaucomys sabrinus) are recognized in Wisconsin as species of special concern and a species of greatest conservation need. Their habitat preference, distribution and local abundance is not well understood. In April of 2013, The Ridges received a Citizen Based-Monitoring grant from the WDNR to launch a nest box monitoring project. With assistance from the Sectional Ecologist of the DNR and UW-Stevens Point wildlife staff, a monitoring project was designed to answer two questions; 1) are there Northern and/or Southern flying squirrels on the peninsula, and 2) is there a difference in micro-habitat selection based on forest type and site physiology?

Because nest boxes can be useful in supporting populations until forest structure develops to provide large cavity trees, snags, and woody debris, nest boxes were placed at the following locations on The Ridges campus – 15 throughout the restored ridges and swales at the west end of the Baileys Harbor Sanctuary complex, 15 along the Family Discovery Trail and 30 at the Logan Creek property. These sites represent some of the oldest forests in Door County. In addition, 30 nest boxes are currently placed on private properties throughout the county.

As part of the ongoing research needed for successful management and conservation of this species, The Ridges Sanctuary will serve as the main monitoring site and reference area for the other nest box locations throughout the Peninsula. Ridges Citizen Science volunteers are assisting with this research project by checking nest box activity at The Ridges or by hosting a nest box on their property. Participants with nest boxes on private property are asked to monitor their boxes once a month. Nest boxes at The Ridges are monitored May through September and in November. Monitoring takes place during daylight hours to ensure maximum occupancy due to the nocturnal nature of the species.

Additional information on life history and ecology of flying squirrels in the upper Midwest, including micro- and macro-habitat preferences, is needed before specific forest management guidelines can be developed that aid conservation of this species.

For the Birds

Avian Monitoring for Botulism Lake Events (AMBLE)

The Great Lakes are constantly undergoing large-scale ecosystem changes, including invasions by non-native mussels and fish, warmer water temperatures, and the growth of nuisance algae. Together these changes have unpredicted impacts that may be causing more frequent outbreaks of type E botulism among wildlife that depend upon the lakes.

In recent years, over one hundred thousand birds and fish in the Great Lakes—including the federally endangered piping plover, common loons, and lake sturgeon—have died from this form of "food poisoning" caused by toxins produced by the naturally occurring bacterium, Clostridium botulinum. The anaerobic bacteria that produce the toxin live in aquatic environments, and current environmental conditions within the Great Lakes basin may be contributing to enhanced production of the toxin.

Along with their direct environmental impacts, outbreaks of avian botulism present other challenges to the Great Lakes like affecting the use of beaches and other recreational activities such as hunting and bird watching. Increased lake temperatures and lower water levels associated with climate change may further increase the likelihood of future botulism outbreaks.

When a research team was formed to study botulism outbreaks in the Great Lakes, The USGS approached The Ridges to assist in setting up a program to gather data from the shorelines of the Door Peninsula. Supported by the Great Lakes Restoration Initiative the AMBLE (Avian Monitoring for Botulism Lakeshore Events) monitoring program kicked-off in 2011.

Volunteers were trained in bird identification, how to document the physical parameters of the beach, safety protocols of participating in a Federal program, how to use a GPS and reporting procedures. Participants were asked to walk about a mile of one section of beach once weekly or twice monthly, from June – November.

Three years of data were collected by citizen scientists from around the thumb, from 2011-2013. In 2014 USGS Wildlife Biologists and Statisticians discontinued the volunteer monitoring portion of the program to analyze the data. Currently a model is being developed to better understand botulism outbreaks around Great Lakes shorelines and how to mitigate them.

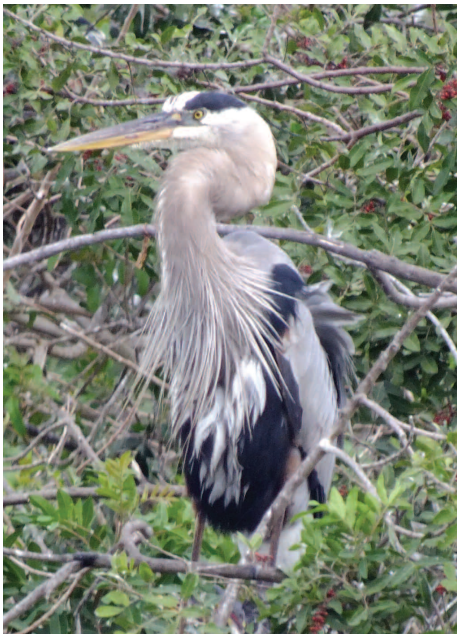


Photo credit: R. Ruffin

Chronicling Cranes

The Annual Midwest Crane Count

The Annual Midwest Crane Count was established in 1976 by the International Crane Foundation and remains one of the largest citizen-based inventories in the world. Each year in mid-April, over 2,000 volunteers travel to their local wetlands and favorite birding locations to participate in the Count and assist the ICF with monitoring the abundance and distribution of cranes in the upper Midwest. In the 1930's, an estimated 25 pairs of Sandhill Cranes resided in Wisconsin. By the year 2000, the Count tallied more than 13,000 Sandhill Cranes.

This annual survey of Sandhill and Whooping Cranes spans over 100 counties in six states of the upper Midwest (Wisconsin and portions of Illinois, Indiana, Iowa, Michigan, and Minnesota) and is organized by county. Records at The Ridges document our participation beginning in 1999.

Crane Count data are used to study Sandhill Crane population trends and new areas where cranes are colonizing, while the survey itself is a powerful tool for creating awareness about cranes and their Wetland habitats. Beginning in 2012 with the inclusion of the survey data into eBird, biologists and birdwatchers worldwide have the opportunity to use the data which now also includes sightings for 100 other bird species.

In 2014, Ridges citizen scientist counters in 10 monitoring sections throughout Door County recorded a total of 90 Sandhill Cranes. The highest Sandhill Crane count in any one section was 27. Other bird sightings were also recorded during the Count. The highest recorded species count in any one sector was 23.

To participate in the Crane Count, you first need to contact your County Coordinator to be assigned a site and receive additional instructions. In Door County, The Ridges acts as the county coordinator. If you live outside Door County, you can obtain a list of County Coordinators at www.savingcranes.org/annual-midwest-crane-count.html .

The Great Migration

The Importance of Monarch Tagging

Those of us who follow Monarchs are all too aware that the population has been declining over the last decade and has experienced significant drops each year for the last three years. But some experts are hopeful that we will see a modest increase in the number of Monarchs in 2014.

Since 2003, Ridges members and volunteers have participated in tagging and releasing Monarchs as part of the University of Kansas Entomology Monarch Watch program. In addition, Ridges naturalists have conducted programs to instruct individuals on tagging and releasing Monarchs in their own backyards. Tagging data is returned to Monarch Watch for inclusion in a tagging database. As tagged Monarchs are recovered and reported, information about the location, date and circumstances of the recovery are entered into a recovery database. Using both the tagging and recovery data, Monarch Watch then calculates the distance travelled by that particular monarch.

While large scale habitat restoration remains a high priority in the Midwest, tagging Monarchs is an important way of monitoring their numbers and tracking any shifts in the origins of those that reach Mexico. Regional tagging also helps in that it demonstrates how Monarchs respond to the physical conditions and quality of the habitats in each area and helps us understand the overall dynamics of the Monarch population.

In 2014, Ridges volunteers tagged and released 77 Monarchs in the Sanctuary between August 22 and September 13.

Flying High

The Christmas Bird Count

The National Audubon Society's Christmas Bird Count is the longest running citizen science survey in the world, attracting tens of thousands of participants and providing critical data on population trends.

For over one hundred years, the desire to both make a difference and to experience the beauty of nature has driven dedicated people to leave the comfort of a warm house during the Holiday season. Each citizen scientist who annually braves snow, wind, or rain, to take part in the Christmas Bird Count makes an enormous contribution to conservation. Audubon and other organizations use data collected in this longest-running wildlife census to assess the health of bird populations – and to help guide conservation action.

From feeder-watchers and field observers to count compilers and regional editors, everyone who takes part in the Christmas Bird Count does it for love of birds and the excitement of friendly competition – and with the knowledge that their efforts are making a difference for science and bird conservation. Data from over 2,300 count circles are entered after the Count and are made available on the Audubon Society's website.

Since 1984, The Ridges has participated in this important survey and, again in 2013 -14, coordinated citizen scientists in the Ephraim count circle. Counting took place from December 14, 2013 – January 5, 2014. Data submitted for the 2013-2014 count were:

- **Brussels** – 14 counters in the field, 7 counters at feeders, 46 species counted
- **Sturgeon Bay** – 12 counters in the field, 31 counters at feeders, 47 species counted
- **Ephraim (included Baileys Harbor/The Ridges Sanctuary)** - 7 counters in the field, 13 counters at feeders, 38 species counted
- **Washington Island** – 7 counters in the field, 14 counters at feeders, 36 species counted

Count circle maps typically become available in mid-November. Outside Door County, find your local count circle and contact at http://birds.audubon.org/get-involved-christmas-bird-count-find-count-near-you.

2013 Christmas Bird Count

Species Sightings – Ephraim Circle

American Crow – 98
American Goldfinch – 96
American Robin – 1
American Tree Sparrow – 3
Bald Eagle – 2
Black-capped Chickadee – 91
Blue Jay – 16
Bufflehead – 1
Canada Goose – 36
Cedar Waxwing – 57
Common Merganser – 1
Common Raven – 9
Cooper's Hawk – 1
Dark-eyed Junco – 62
Downy Woodpecker – 17
European Starling – 5
Golden-crowned Kinglet – 1
Great Horned Owl – 1
Hairy Woodpecker – 10
Herring Gull – 2
House Finch – 4
House Sparrow - 12
Mallard – 3
Mourning Dove – 64
Northern Cardinal – 35
Northern Goshawk – 1
Northern Harrier – 1
Pileated Woodpecker – 8
Purple Finch – 2
Red-bellied Woodpecker – 10
Red-breasted Nuthatch – 18
Red-headed Woodpecker – 4
Red-tailed Hawk – 1
Rough-legged Hawk – 1
Ruffed Grouse – 4
Snow Bunting – 7
White-breasted Nuthatch – 16
Wild Turkey – 49

The Nature of Research

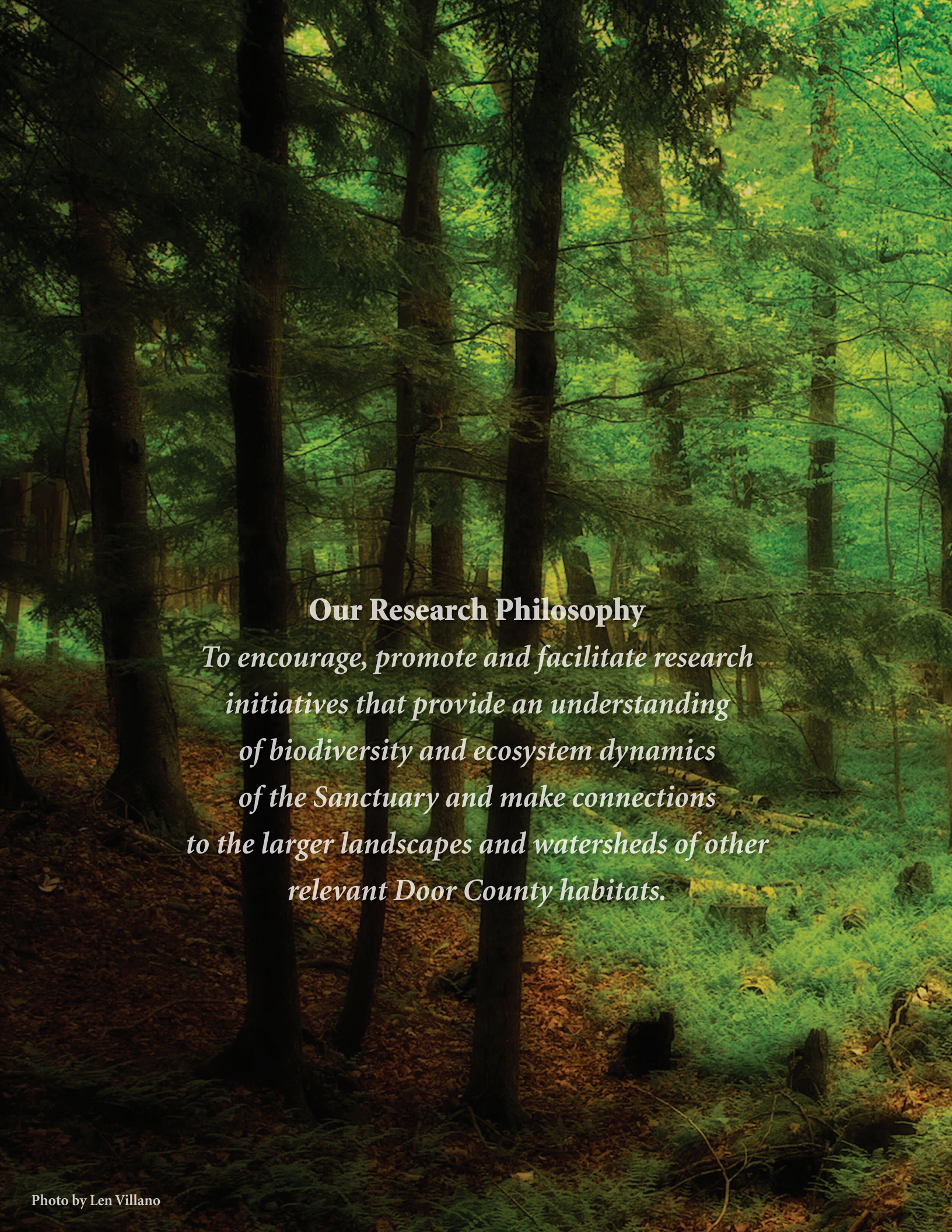
Why conduct research?

At its most basic level, research is undertaken to expand our knowledge and understanding of the world around us. But as the projects described in this publication demonstrate, we've learned that the answer is considerably more complicated. Each new project, each new survey, each piece of data gives rise to more questions. And exploring those questions moves us beyond inventories and statistical compilations and toward a better understanding of the complex interconnections in our natural environment and how they relate to The Ridges as an organization and, ultimately, to all of us as individuals.

How You Can Get Involved With The Ridges

The Ridges Citizen Science based programs like the ones described in this publication offer volunteers the opportunity to assist with important field work and to acquire an increased understanding of our watersheds and climate. If you are interested in participating in a one-time project or an ongoing seasonal program, contact us at 920-839-2802.

Photo by Len Villano



Our Research Philosophy

To encourage, promote and facilitate research initiatives that provide an understanding of biodiversity and ecosystem dynamics of the Sanctuary and make connections to the larger landscapes and watersheds of other relevant Door County habitats.

Photo by Len Villano