

MICHIGAN ST

Collins Learning Center

STATE HWY 42 / 57  
Ahnapee State Trail

North Bridge

Pike Passage

Middle Bridge

Cedar Crossing

Hanson Bridge

UTAH ST



**Crossroads**  
at Big Creek  
LEARNING CENTER NATURE PRESERVE

## Ecological Restoration Plan



Landscapes of Place®

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# Crossroads at Big Creek

## Ecological Restoration Plan for Lands from Michigan Street to the Cove

Landscapes of Place, LLC  
09 March 2021

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## ***PREAMBLE***

This plan is intended to guide decisions and activities of Crossroads staff, contractors and volunteers engaged in working to restore and care for the lands of the Crossroads Preserve.

This document and attachments incorporate the relevant Phase One (Spring 2020) Preliminary Ecological Restoration Plan portions, so that this stands alone as a complete Ecological Restoration Plan. It begins with the [Ecological Restoration Vision](#) and [Guiding Principles](#) established in Phase One. Guiding principles can change over time and with experience, but serve as ongoing valuable references in the planning, decision-making, implementation and communication processes. The [Background and Conditions](#) from Phase One is also incorporated here, and expanded.

This plan uses the Society for Ecological Restoration's [Primer on Ecological Restoration](#) and its Outline for Restoration Plans as a restoration framework. The plan is also informed by the Meissner Master Plan and accompanying vegetation surveys, and by ecological findings and references from Crossroads staff, Wisconsin DNR, including Surface Water Data Viewer, USFWS, Door County LIO, USDA soil maps, Wisconsin Historic Aerial Images, and US General Land Office original surveys for Wisconsin.

The Meissner Master Plan of 2008, and the subsequent 27 Vegetation Zones, surveyed in 2011 and 2014, provide a helpful foundation for this plan. In addition to thorough background and context information, the Master Plan recommended and described a number of facilities, features, trails and access improvements, many of which have been completed. It also laid the groundwork for the natural plant communities suited to Crossroads' conditions and programs and a land management strategy. The Vegetation Zone surveys help identify invasive species concerns and also key indicator native species that guide the definition of future habitat and restoration zones and trajectories.

Crossroads has received grants from Fund for Lake Michigan, Sustain Our Great Lakes, and US Fish and Wildlife Service, funding ecological restoration work in the years 2021-2024. The grants oblige Crossroads to a set of restoration activities and zones, as well as monitoring protocols. These commitments will be referenced throughout the plan, but particularly in the Implementation section. Work at Crossroads will continue to occur on all parcels, but grant-funded work in the first four years is limited to 65 acres centered on Big Creek to the Cove; this affects the recommended sequencing of projects.

### ***Acknowledgements***

On behalf of Crossroads, we acknowledge the First Nations people who are the original inhabitants of the region, having ancient historical and spiritual connections to the land that our preserve now resides upon. We acknowledge the First Nations People of Wisconsin.

In 2020, the Crossroads board of directors affirmed that it: *“believes that black lives matter; is committed to addressing diversity; and understands a call to reflection and, more importantly, a call to action.... We are proud of Crossroads’ mission to inspire environmental stewardship in learners of all ages through education, research and outdoor experiences and we work every day to further that goal. We’re realizing, however, that we must do more. A healthy earth, and the enjoyment of it, is a birthright for all, not just some, and the link between environmental justice and social justice is an increasingly direct one.”*

We acknowledge this imperative toward diversity. The restoration plan incorporates incremental steps and flexibility that will allow for mission-supporting implementation projects and teams.

## VISION AND GUIDING PRINCIPLES

### Scope and Setting

Crossroads at Big Creek is located within the city limits of Sturgeon Bay, in the very heart of Door County, Wisconsin. Door County is an ecologically unique biotic refuge. With 300 miles of Lake Michigan shoreline and the massive geological presence of the Niagara Escarpment running its length, Door County supports an abundance of significant, irreplaceable natural landscapes, microclimates and rare plants and animals. *A Guide to Significant Wildlife Habitat and Natural Areas of Door County, Wisconsin* describes it as a “storehouse of biological diversity.” In the foreword, Nina Leopold Bradley writes of the “uncommon natural wonders that are the precious heritage of Door County.” From the *Guide*: “Among the factors contributing to Door County’s unique and rare environments is its location as a major peninsula of the Lake Michigan coast and the effects of the dolostone bedrock on surface drainage and water chemistry. These and other factors, combined with relatively low levels of development, help to support habitats for numerous species of rare plants and animals, *some of which are found nowhere else in the state*. As notable as the county is as a site for rare species, it is also recognized for its diversity of more common and widespread species. The diversity of the local ecosystems is a result of their relatively large sizes, undisturbed nature, and connections with each other.” [emphasis added]

Just north of Crossroads, the 11,000-acre Door Peninsula Coastal Wetlands complex was recently designated a Wetland of International Importance under the Ramsar Convention, joining Everglades National Park and Chesapeake Bay Estuary as one of only 37 sites in the United States to achieve this designation. Crossroads envisions becoming part of an expanded Ramsar-designated wetland here sometime in the next two decades; the community work empowered by this project is a major step toward that goal.

The focal point of the 125-acre Crossroads preserve is the Big Creek estuary and its associated habitats. Big Creek, a navigable waterway with coastal wetlands, is important both locally and to the greater Green Bay estuary, the earth’s largest freshwater estuary. While much work has been done and some successes realized at Crossroads, ecological impairments exist – fragmentation, invasive species, and diminished native species cover and richness. These can be addressed using proven restoration methods. A patchwork of land that includes past rural and agricultural uses will be restored, reforested, diversified and reconnected.

There are two primary purposes of this project. The first is overall resilience and ecological quality through completion of an ecological restoration plan with trajectories, methods and steps, and then implementation of the plan with established monitoring and reassessment checkpoints. Improved habitats will include sedge meadow and alder thicket, northern white-cedar-dominated wet-mesic forest, mesic forest and grasslands, guided by Crossroads’ significance as a migratory bird stopover and by improving habitat for spawning fish.

The second is to record and communicate this experience and to be a contributing participant in the greater land restoration community and a model for groups working elsewhere to improve challenged lands. Crossroads' mission – to inspire environmental stewardship – and its history present a unique opportunity to expand on-the-ground restoration through community science and empowered participation. These new programs will benefit learning in the next generation and effectiveness of the restoration itself.

### **Begin with the Creek**

At Crossroads, Big Creek encompasses 25 riparian acres with 3,000 feet of stream corridor and associated wetlands from Michigan Street to the estuary at The Cove of Sturgeon Bay. Big Creek is the heart of Crossroads, both ecologically and symbolically. The creek hosts the largest remnant forest patches. The lands along the creek were also the least managed, historically, since the surrounding lands were in agriculture — this has provided Crossroads' oldest trees and oldest forest structure, but has also been a historical vector allowing ecologically invasive species to gain a foothold. It is thus a central spine of great opportunity and is the foundation for planning and restoration of all lands at Crossroads. The creek creates connection and restoration opportunities; seeds, macro-invertebrates and herpetofauna (squishy critters), habitats and breeding all take advantage of the creek and so should we as we renew our ecological resurgence for this landscape.

### **Ecological Restoration Vision**

In the long term, Crossroads at Big Creek is envisioned as a coherent landscape of healthy, diverse, and largely self-sustaining ecological communities, providing wildlife habitat for a variety of species. Through accessible trails and ongoing programs, Crossroads enables its human community of all ages to continually gain environmental literacy while participating in the restoration, care and enjoyment of the Preserve.

Beginning with Big Creek and extending through forest and meadow, the complete approach to restoration will manage a range of ecological trajectories to transform a patchwork of past rural and agricultural lands together with Big Creek into reconnected, thriving, high-quality habitat.

### **Guiding Principles**

The vision articulated above leads to a number of guiding principles. These principles apply to elements of the plan and to ongoing decision-making in implementing restoration activities. These principles are a starting point and are expected to be refined and revised as the broader ecological restoration planning proceeds.



- “Begin at the Creek” and work outward. Big Creek and its associated habitats are the most ecologically significant for wildlife using the Preserve and also serve as the primary inspiration for community members’ engagement at the Preserve. Demonstrating ecological improvement here is the backbone of the overall ecological restoration initiative.
- Also, “begin at bridges” and work upstream and downstream from there. Restoration steps will begin at trail crossings and work outward where possible, in particular at bridge crossings. This is to draw positive human attention to the work in progress, as well as ease tracking of changes.
- Think like the creek, think like wildlife, and think about people. Is a considered action good for the creek, good for spawning fish and migrating birds and macro-invertebrates, *and* is it good for engagement of the community? *And* rather than *or*.
- The historically altered patchwork of land is a valued opportunity for both learning and habitat. Here at Crossroads, logical intersections of successional meadow habitats are valued even though contiguous forest might be the more accurate reference.
- This is a highly altered landscape. Acknowledge that every restoration step and every chosen material follows best practices for restoration success – without losing our way in purity. We are a work in progress. We fix priority problems and do our best to not create new ones (especially new persisting ones), but we are always going to be a place of some ecological inconsistency.
- We acknowledge that in the context of a community of fragmented landscapes, self-sustainability of this landscape – even 120 contiguous acres – is unachievable; we aim for sustainable with modest ongoing management effort, following the first years of restoration transformations.
- Restoration steps emphasize ecological story-telling. Will this restoration step strengthen understanding of how succession works, or how a forest matures, or how waterfowl use a wetland?
- Restoration steps prioritize transformative change rather than syntax edits. Think about species function; misfits are okay for now if they contribute functionally or structurally and don’t disrupt the coherent experience or ecosystem health in significant ways.
- Define future habitat zones through soils, hydrology and existing helpful vegetation. Consider resiliency as we work with what the land’s history tells us.
- There is an easy mapping of work zone to story. This plan defines a small number of restoration work zones (stories) that define priority actions in creating future habitat. Zones are small enough to perceive, understand, and envision one’s impact on, and large enough to make

ecological sense and provide a sense of landscape scale that strengthens the ability of land stewards to respond effectively.

- The state of the land, in any spot and at any time, should itself convey the future ... let the land show its future through the ongoing restoration work. For example, mix invasive species control work simultaneously with native species in-planting work toward target community objectives. Use facilitative intermediate steps in the trajectory to provide early landscape character that hints at the eventual character, working with natural successional processes.
- Restoration is a process guided by knowledgeable land stewards. The land stewards serve as Keepers of the Place. They hold the lore of the place and develop the restoration culture. The restoration culture includes equipping and training in order to empower. The restoration culture incorporates study and monitoring while restoring. We listen to the land, adjust, and listen again. The plan's details support the restoration culture by paying attention to species and patterns at trail edges and incorporating species distinct to each zone, for intuitive recognizability. These factors are ever-present, from season to season, although they change in detail over time. The restoration culture helps enable anyone to feel they can join in at any time.
- Ecological restoration is a phase of active transformation, guided by the desired future habitats and anticipated trajectories. This restoration phase transitions to ongoing management when the restored habitat has formed enough self-sustaining and self-organizing characteristics. This transition will occur in different zones at different times, and Crossroads' land stewards identify and smooth the transition from active restoration to ongoing management as indicated.
- Trails are both habitat transects and work routes. Trails and bridges provide human access that also protects habitat. Trails provide a straightforward introduction to the place and, at the same time, an experience of exploration and individual discovery. Trails provide a human experience of the shifting, changing, growing restoration.
- Try to take no steps that are too frustrating. Restoration tasks and actions must acknowledge intersecting concerns: (a) create progress satisfying to volunteer land stewards over a season; (b) make sure steps are significant enough to cross positive tipping points in the restoration; (c) allow for creative experiments and interim failure.
- Be both fast and slow. Sometimes a contractor is engaged to chainsaw and treat big buckthorn. Sometimes we place woody debris to create microhabitat. Sometimes we plant 600 seedlings in one spring. Sometimes we hand-seed-collect one Saturday. The plan should have tasks to be implemented by a mix of contractors and community on an ongoing basis. When fast *and* slow, big *and* small happen, volunteers see leverage and reinforcement. Ecology is strengthened and stewardship is strengthened.

- Define memorable places over time and name them. A heavy horizontal branch along a trail. A patch of lobelia increasing every year as restoration proceeds. A grove of aspen we plant this year. Place-naming shifts your attention from the whole to the specific, and this builds observation skills and knowledge, improving stewardship responses to ecological conditions.
- Communicate creatively and constantly. Celebrate successes. Create a community working together. Lemonade and cookies become a habit of work days, and so does the calendar of tasks posted in the garage. Temporary “restoration in progress” signs might increase understanding of the work being done. The goal is to continually enable those actively engaged to see the land in a new way, while those not-yet-engaged are introduced to the land for the first time on an equal footing.
- We are committed to ensuring that trail crossings over Big Creek are environmentally sound. This will require our collective guardianship in service of the creek, The Cove, the larger estuary and their habitats.

***A note about Ecological Restoration Work – don’t ever stop.***

Ecological Restoration work is often connected to something else that is big, or conceptual, or maybe immovable: like a grant, or a parcel or a season or a life philosophy. It’s okay if the ecological restoration work does not fit neatly into any one model.

Ecological restoration occurs in:

Places (areas, acres, parcels, zones),

Times (years, seasons, phases); it has

Programs (events, projects, activities), and has

Stakeholders (people, organizations, funders, grantors, plants, animals).

These aspects will interact in always variable ways. This plan provides a framework for reasonable actions and effective outcomes — within which, the only important constant is the doing and the sharing.

## ***BACKGROUND AND CONDITIONS***

The development and implementation of this plan is aided by understanding the ecological and historical context of the landscape and restoration zones. Several maps are used as background including: Mapped Wetlands, General Land Office Survey map, and Soils and Topography map.

Mapped Wetlands shows the areas described by WDNR as wetland and is a useful planning aid to restoration targets. The Wisconsin Wetland Inventory (1978 and ongoing) has mapped wetlands “prepared from the analysis of high altitude imagery in conjunction with soil surveys, topographic maps, previous wetland inventories and field work.” Wetlands can be thought of as the places between the areas that are always wet (open water) and always dry (uplands). Wetlands must function in a sustained ecological way when saturated or when dry for extended periods, sometimes years. The community of plants and animals that use wetlands are adapted to these changing conditions and the restoration process must also reflect these conditions.

The General Land Office Survey map documents pre-settlement aspects of the initial conditions found at Crossroads. Although the land has experienced some dramatic alterations in the years since, the historical context is useful in understanding habitat types and their locations on the landscape. For instance, knowing that a Cedar existed in 1835 at a specific location within the area defined as “swamp” along what is now Michigan Street offers useful perspective.

The Soils and Topography Map shows the types of soils that are expected within the various zones at Crossroads. The National Cooperative Soil Survey Program (from USDA’s Natural Resources Conservation Service and other agencies) is a systematic study of the soils in a given area, classifying, mapping, and describing soils. Soils are highly correlated to restorable plant communities and should be respected when assessing any ecological trajectory or species for a given zone. Soils and topography are closely interrelated. The broad, flatter zones in the vicinity of Big Creek, for example, both upstream and downstream, support muck soils, and selection of plants that can accommodate this type of soil such as alders, sedges and dogwoods is appropriate.

### ***Vegetation and Soils***

The restoration plan and process is aided by understanding the existing (and changing) vegetative cover. In the years following the Meissner Master Plan, Crossroads undertook seasonal plant species surveys. We have combined those surveys into a Crossroads Plant Species Checklist (attached) that will be the basis of continued monitoring.

Vegetative cover and plant species of course impact wildlife, but we address that from a wildlife and habitat perspective in later chapters.

Some aspects of vegetative cover are of particular interest for the restoration plan:

i) *Invasive species that negatively impact ecological trajectory:*

Invasive species that negatively impact the local ecology should be removed or controlled. Urgency or prioritization of removal varies based on the magnitude of the disturbance, rate of change caused, age and size of infestation, density and location within the landscape. For example, some of the Phragmites (*Phragmites australis*) infestations at Crossroads are relatively young and isolated. These factors along with the aggressive nature of Phragmites make it an urgent problem to address. By contrast, Spotted Knapweed (*Centaurea spp*) if located in some areas that are scheduled for reforestation will be outcompeted when forest canopy closes, and so removing this species in this setting might be low priority.

ii) *Non-native plant species' transformative impact on local conditions of soil, light, hydrology:*

Non-native plant species may adversely impact local conditions. For example, the Norway Spruce (*Picea abies*) plantation in the Upper Reach Zone creates podzol soil (which is more acidic) and reduces light at the forest floor. This impact is dramatic and is addressed in the restoration plan, advocating a slow or measured process in shifting this community over years.

iii) *Native species that are facilitative — helpful — to the desired ecological outcome;*

For example, native shrubs can compete effectively in oldfield conditions and facilitate the development over time of forested habitat. In another example, wind-pollinated and wind-dispersed native grasses help in the faster diversification of meadows. Also, Tussock Sedge (*Carex stricta*) has the ability to expand and occupy former Reed Canary Grass (*Phalaris arundinaceae*) monocultures (and also has iconic character in defining a sedge meadow — see next point).

iv) *Native species that contribute to love of the place and to understanding of the ecological transformation.*

Hemlock is a tree that reminds people of old forest. Common milkweed is a beloved flower for supporting monarchs. Aspens are recognized as a youthful stage in woodlands. Joe Pye-weed says wetland. Juneberries are a first bloom to see in spring and are accompanied by the first noticeable insects. Species that provide these human engagement benefits are important to feature.

Throughout informal vegetation surveys across Crossroads we identified species and zones with these aspects and opportunities.

Soil types are a strong indicator for long-term restoration habitat goals. In the field of wetland delineation, wetlands are defined by the characteristics in three areas: vegetation, soils, and hydrology (which includes things like the micro-topography — is it a depression?). Of these, soils persist. A wetland might look like a cornfield today, but the soils will reveal it as a wetland. A wetland long-altered or drained and farmed or disconnected, will still leave its mark in the soil

for decades. The soils at Crossroads are a strong factor in determining viable ecological trajectories.

Existing plants can also convey possibilities. The National Wetland Plant Indicator Rating (below) is a confirming factor; even within a habitat zone like Northern Mesic Forest there can be a range of micro-conditions. Seeing a Red Oak (*Quercus rubra*) –FACU– indicates a relatively more upland setting. Therefore, these species affiliations are also useful in selecting the appropriate location on the land for various trees, shrubs and plants. A Red Oak has a better opportunity for success planted in local upland conditions than in a relatively more lowland setting. See the attached Table of Native Wisconsin Trees for a selection guide of native trees by family and wetland indicator type.

<i>Indicator status (abbreviation)</i>	<i>Ecological description (Lichvar and Minkin 2008)</i>
Obligate (OBL)	Almost always is a hydrophyte (a plant which grows only in or on water), rarely in uplands.
Facultative Wetland (FACW)	Usually is a hydrophyte but occasionally found in uplands.
Facultative (FAC)	Commonly occurs as either a hydrophyte or nonhydrophyte.
Facultative Upland (FACU)	Occasionally is a hydrophyte, but usually occurs in uplands.
Upland (UPL)	Rarely is a hydrophyte, almost always in uplands.

All of these factors influence the overall restoration target communities, intervention modes and projects to undertake, the sequencing and prioritization, and supplemental planting species choices.

**Spatial Conditions**

Big Creek and its wetland and wet-mesic forest environs are divided for convenience of reference into lineal zones along the creek (see Map: *Phase One Restoration Zones*).

*Upper Reach Zone:* Relatively flat but with micro-topographic variation, contains a complex of sedge meadow, alder thicket / shrub carr and cedar swamp. High visibility. Recent transformation of light due to ash tree die-off. High potential for near-term improvement.

*Mid Reach and Wishbone Zones:* Both of these zones are largely shaded remnant communities, of steeper slopes, with existing elements of cedar swamp and northern mesic forest. The ATC Utility Corridor bisects the creek and its tributary, disrupting the forested canopy.

*Lower Reach Zone:* This zone is flatter and with some un-canopied wet community patches that include species like Joe Pye (*Eupatorium maculatum*) in more open areas. Like the Upper Reach, it is a complex of sedge meadow, alder thicket / shrub carr, and cedar swamp, with adjacent areas whose soils indicate mesic forest as a future model. This section is without adjacent forest on the west (oldfield conditions) and on the east (Hansen Homestead area) – missing this needed forested buffer.

*The Cove Zone:* The Cove lands bounded by Sturgeon Bay are fragmented by Utah Street and South 20<sup>th</sup> Place. West of The Cove are DNR lands. The lower terrace contains emergent aquatic, sedge meadow, and alder thicket communities. The Cove is a special component of Crossroads and offers habitat varieties that are not found in other parts of the Crossroads preserve. Much of the Northeastern part is covered in fill, however other areas of the Cove have significant portions of the lands that retain their pre-settlement original soils and soil profile.

*Crossroads Campus:* The remainder of Crossroads' main campus property is a patchwork of past rural and agricultural lands — oldfield and former orchard conditions, with patches of forest of various seral stages. Some of the oldfield has been restored to a diverse meadow with prairie species (the Wild Ones meadow south of the Learning Center and the Prairie Planting near the Council Ring). Some is undergoing natural successional processes with intermediate shrubland and young aspen-birch forest (particularly between the Observatory and the Hanson Homestead area). A range of past plantings are beginning to transform oldfield conditions as well (trees in the Arboretum; trees at the southeast boundaries of Crossroads). A patch of old Norway Spruce plantation planting persists near the Upper Reach. We have keyed on the existing conditions in these zones to further delineate restoration target communities into forest guilds, and to provide detail for interventions and projects.

The swale system near the Learning Center is an altered topography designed to provide ecological benefit while managing excess rainwater from impervious surfaces. Its design connects surface flow to what is essentially a tributary to Big Creek (reconnecting the 1990s wetland scrape as well). Although there may be an issue or two with trail or underground infrastructure crossings, this system provides valuable ecological potential and wildlife habitat including herpetofauna breeding, and this plan treats it as a wetland complex to be enhanced.

*Ida Bay:* future, to be added

*Other Parcels:* future, to be added

## PLAN FRAMEWORK

People and ecological restoration are inseparable. Ecological restoration is inherently an engagement with people to enable, facilitate, study, implement, and manage ecological improvement on the lands. People amplify the ecological improvements, and the transformative changes impact people in return. Here are the ecological objectives:

### Ecological Objectives

The ecological objectives for this plan are:

1. Increase and expand connectivity of forest canopy cover, decreasing fragmentation. This is important for numerous desired wildlife, as well as reducing the edge-condition invasive species vectors.
2. Enhance native species diversity and seasonal diversity in interconnected meadows, to benefit pollinators and other insects as well as grassland birds, and to enhance native plant species dispersal. See the section on Wildlife Foci.
3. Significantly reduce invasive species in the stream's forest and wetland communities, to benefit herpetofauna, dragonflies and affiliated wildlife.
4. Reduce streambank erosion with plantings of riparian shrubs and herbaceous bank-holding native plants, and with broadening of flow through carefully encouraged large woody debris.
5. Maximize habitat provision by fostering multiple young-forest guilds in the trajectories from oldfield to forest.
6. Increase climate change resilience with diversity of habitat, diversity of structure, and diversity of native species. See Climate Resilience section.



## Engagement Approaches and Programs

The Guiding Principles elaborated earlier are here supplemented with basic Engagement Approaches to give a framework to ongoing implementation planning:

1. As the plan is described below, it *allows immediate stepwise implementations*. Projects do not require any specific sequencing beyond common sense. Prioritization of tasks can be based on availability of materials and labor, attention to weather and ground conditions and urgencies created by plant stock or conditions. Prioritization can be adjusted based on person-power availability and skills. This approach provides the implementation team and volunteers with optionality in organizing and choosing tasks.

Leaving a restoration project in an in-process state is desirable sometimes. Clues to how the project is being accomplished can be revealed by showing our work. Neatness can obscure truth. Leaving mulch plies or flags, for example, communicates to visitors that this is a work in progress, and that they could have a role in helping that progress. This practice also allows volunteers or staff to pick up right where they left off.

2. Seek to *fit programs into the plan*, rather than creating new restoration projects to fit programs. The flexibility of the plan allows this, and allows an ongoing centering focus on the overall plan. An example of this is the annual ‘Big Plant’ which helps implement the **Oldfield Pocket** tree planting projects that are within the plan.
3. *Annually plan the year’s projects* (typically December-January). With the prior years’ activities and with learning opportunities in mind, consider the following:

What projects are we ready for that maximize local benefits to the ecosystem — that can amplify what is already happening? (i.e. build on prior work. For example, when substantial invasive exotic removal has taken place, seek to inject new diversity. When a recent planting is threatened by an invasive flush, address the invasives).

What projects could benefit community science efforts, educational opportunities, or volunteer engagement? Couple a project with an educational workshop. Team a volunteer group with the planning and implementation of a project. Choose spots in restoration zones for monitoring wildlife – for example monitoring birds in the young-seral oldfield-to-forest areas to understand the value of these transitioning areas.

Make a practice of naming restoration-meeting places or planting places and using the names with staff, contractors and volunteers. The Crossroads Habitat Trails map provides a great reference. For example, on the Habitat Healers meet-up, discuss the choice of working on the “North Bridge Buckthorn” project or the “Hanson Bridge Pocket Planting” project. This will strengthen volunteer engagement and ownership and help in developing comfort with incremental steps in what can seem an overwhelming overall vision.

### ***Programs:***

Outreach and education are important for long-term sustainability of on-the-ground restoration work.

*Habitat Healers:* Continuing to strengthen the regular volunteer work days is key to the success of the overall ecological restoration effort. This plan relies on trained and engaged volunteer work crews who meet regularly and address the projects. An annual end-of-season thank-you event is supported by grant funds, as are all the tools and gear for volunteers. The Habitat Healers serves as an umbrella group for organizing the valued volunteer contributions by individual community members as well as service groups and youth groups that actively participate in the stewardship of Crossroads' lands.

*Community Science:* This is covered in the Monitoring section but mentioned here as a programmatic component key to meeting the goals of ecological restoration. Knowing the water quality differences along the stream can affect future projects. The discovery of a migrating bird population needing spring insects in key areas can affect what is planted and when. The discovery of a breeding herpetofauna population can affect methods in invasive species control as well as planting projects. The discovery of a rare species like the rusty-patch bumblebee can alter the target restoration communities or connectivity. Community scientists are a critical partner. Crossroads' naturalist leads the community science work. Crossroads welcomes and, indeed, needs the participation of community volunteers in this work.

*Writing and Teaching:* Grant funds support the writing of articles about ecological restoration and developing courses for Learning in Retirement and for school groups that help the community learn the elements of ecological health and how to approach restoration that builds health and resilience in the habitats. These programs help those already involved as well as those new to restoration ecology – who truly want to effect change, who want to be part of healing the damaged lands and waters they call home.

*Workshops:* Grant funds support planning, materials and speakers for two training workshops in each of four years, and one educational event about habitat restoration each year. These are opportunities for engaging experts to showcase parts of the ecological restoration effort at Crossroads. For example: a workshop on developing the Crossroads community's "Species of Local Conservation Interest." A training workshop on herpetofauna monitoring designed to develop an ongoing monitoring program at Crossroads. A speaker on ecological restoration at home. A workshop on methods for invasive species control. Our goal is widespread ecological literacy and advocacy.

## **Restoration Target Communities**

Maps: *Restoration Target Communities, Soil and Topography*

The Phase One assessment identified several appropriate Reference Communities for Crossroads. This plan maps those types to Target Communities on the Crossroads site plan. These represent long-term targets, particularly for the Northern Mesic Forest — this is the 100-year goal. “Target” thus represents in some cases an existing condition desirable to maintain/protect/enhance. In other cases, “target” represents the long-term aspiration for a zone currently in another condition — which has the potential to reach the target through one of several possible trajectories over time.

These Restoration Target Communities are based on the intersection of soil types; hydrology; existing dominant vegetation observed in surveys; slope/aspect; and expectation of increasingly self-sustaining habitats with trajectories toward these references.

The mapping also interacts with other factors. Some cultural features (e.g. Utility Corridor) limits our options for connected canopy. Some Target Communities (especially Northern Mesic Forest) and their accompanying trajectories represent wonderful educational and wildlife opportunities.

The exact delineated locations on the map for these communities are approximate and change with the development of the natural communities.

Indented below within these Crossroads Restoration Target Communities are associated Habitat Guilds and notes for wildlife. Further information that focuses on wildlife needs is in a following section.

1. **Sedge Meadow** (with elements of both Northern and Southern Sedge Meadow). At Crossroads most of the sedge meadows are bisected by Big Creek and are thus riparian (“relating to wetlands adjacent to rivers and streams”). The riparian sedge meadows have had the exotic reed canary grass reduced significantly in 2020, and they show a robust underlying native flora. There are a additional places: one small open wetland a distance west of Hanson Bridge; sedge meadow habitat around Hanson Bridge; the opportunity for the development of sedge meadow in upper reaches of the created swale system; and at The Cove.

### *Habitat note*

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***Clear Stream with Sedge Meadow Habitat:*** Clear water streams with gravelly bottom and sedges or grasses to host fertilized eggs. ***Wildlife Species*** using this habitat guild include White Sucker, Long-nose Sucker, Northern Pike.

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2. **Alder Thicket / Shrub Carr** (with elements of both). These spots are mapped based on landscape position and the presence of dogwood and other riparian shrubs. These places have

been overrun with primarily invasive glossy buckthorn, and so the underlying remnant conditions are not yet clear. Our goal in these communities is to increase the native shrub diversity, observe recovery from invasive species reduction, and plan additional planting projects as appropriate.

*Habitat note*

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See *Shrub Carr – Young Forest Continuum Habitat* below.

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3. **Northern Wet-Mesic Forest** aka **White Cedar Swamp**. As target communities, we divide into a gradient from Northern Wet-Mesic Forest (Riparian) to Northern Wet-Mesic Forest (Boreal-tending). Close to Big Creek, Cedars are extremely dominant. A bit away from Big Creek, we have the Boreal Remnant foot path north of the Council Ring, where diversity of both canopy and understory increases. The large area west of Hanson Bridge is a long-term opportunity to develop this kind of forest. This general forest type is based on the Angelica Loam, Solona Loam, and Omena Variant Sandy Loam soil continuum along Big Creek and its adjoining lands; these soils indicate seasonal flooding or seasonal saturation or seeps.

The riparian/wetland/forest transitions are complex; there are no distinct lines. The small open wet meadow near the Hanson Bridge, transitioning into sedge meadow south of Utah, is probably a bit of sedge meadow, a bit of shrub carr, and a bit of wet-mesic forest. The shrub-dominated zones near Michigan Street include a range of native shrubs that align more closely with shrub carr community (generally southern Wisconsin), although portions dominated by alder align with alder thicket community (generally northern Wisconsin).

*Habitat note*

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*Boreal Forest Habitat* Typically Spruce, Fir, Cedar assemblage which at Crossroads might have a cooling water effect and often with Elm, Ash, Cedar on SoA (Solona Loam) or sometimes with Elm, Ash, Cedar, Maple on OvB (Omena Variant Sandy Loam) soil.

*Wildlife Species* using this habitat include Canada Warbler (Swamp Conifer-Balsam, Alder, White Cedar), Cape May Warbler (Northern Spruce Woods), and Bald Eagle especially when isolated from people, near water and in taller conifers.

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4. **Northern Mesic Forest** aka **Northern Hardwood Forest**. This is the most common native plant community in Door County, and would have historically covered much of Crossroads. ('Mesic' means an environment with a moderate amount of moisture.) It is thus a major portion of the long-term restoration goals. Big Creek and its wetlands ecologically need a substantial forest buffer. This important target within Crossroads' restoration is discussed separately in the next section.

*Habitat note*

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*Contiguous Forest Habitat* (a large forested tract with ¼ mile or more of buffer to roads or openings) offers a significant advantage to certain species. In the Northern Mesic

Forest, Sugar Maple is dominant or co-dominant in most stands, regardless of their age or origin, historically with Eastern Hemlock and White Pine. American Beech can be a co-dominant in the counties near Lake Michigan. Other important tree species are Yellow Birch, Basswood, and — formerly — White Ash. *Wildlife Species* using this habitat guild include Wood Thrush, Least Flycatcher, Ovenbird, Red-shouldered Hawk, Northern Flying Squirrel.

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*Habitat note*

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***Shrub Carr – Young Forest Continuum Habitat:*** This is a hybrid community and may be a gradient from Shrub Carr / Alder Thicket through Shrublands (upland shrubs including Hawthorn, Juneberry, Chokecherry) to Young Forest typically Northern Mesic. This gradient is amenable to several species. It will mature slowly into a more heavily wooded forest with shrublands persisting on the edges, especially with wetlands or on muck soils. Shrub Carr are often found with Alder, Cedar, Ash on Ax (Angelica Loam) and sometimes on YaA (Yahara Fine Sandy Loam). Shrublands and Young Forest, with Oak, Maple, Birch on LoB (Longrie Loam), 7208 (Onaway-Ossubeje Fine Sandy Loam) and sometimes with Elm, Cedar, Maple, Ash on OvB (Omena Variant Sandy Loam). *Wildlife Species* using this habitat guild include Northern Shrike, Gold-Winged Warbler, Woodcock.

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*Habitat note*

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***Old Mixed Forest Habitat:*** This habitat guild is dependent on trees with a wide range of textures and ages. This is more typical in older forests. Nesting or cover is often found in larger trees, sometimes older trees or snags. The canopy cover can be variable but the stand size is often more productive if it is larger. This habitat may also have significant edges that are transitional zones between forage areas and cover areas. Often found on LoA (Longrie Loam). *Wildlife Species* using this habitat guild include Red-headed Woodpecker, Northern Long-eared Bat.

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*Habitat note*

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***Dolomite Outcrop Forest Habitat:*** The nearby Niagara Escarpment is part of a Silurian dolomite bedrock feature that underlies much of the Door Peninsula. Ecological attributes associated with the escarpment include wet and dry cliffs, talus slopes, spring seeps, thin soils, locally moderated temperature and moisture levels, ancient trees, and, in some areas, extensive forests. The Crossroads' Ida Bay property shares characteristics of these habitats. The cliffs, talus slopes, and seepages associated with the Niagara Escarpment support many unusual species, including globally rare terrestrial land snails, some of them known from no other habitats. Other significant features associated with the escarpment and its habitats include rare plant populations, unusual natural communities and species assemblages, and White Cedar trees that have reached several centuries in age. *Wildlife Species* using this habitat guild include Cherrystone Drop Snail, Terrestrial Gastropods.

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5. **Door County Meadow.** By meadow, we refer to successional old-field communities whose future trajectory would tend toward forest. Here in Door County this has no true natural community model. It is by nature a transient community, but that does not lessen its ecological importance to wildlife and its experiential importance to people. Door County has no fire-dependent ecosystems, like prairie. Historically, though, a significant number of prairie and savanna species were present in Door County. Our meadows are openings – created naturally by windfall, tree fall, exposed bedrock or happenstance of topography, or occurring unnaturally because of past land use history, including timber cutting, utility corridor right of way and agriculture. When people cleared and farmed Door County and then stopped farming, or cleared for building roads and structures, “oldfield” conditions were left. With enough native species near enough to disperse, these follow a natural successional process just like a natural-disturbance opening. The landscape supports early- and mid- successional prairie-like species and accompanying shrubs. In a natural setting the shrubland (Juniper here, mostly) sets the stage for an eventual transition back to forest.

The meadow species support large populations of insects, pollinators, and also grassland birds, herpetofauna, and small mammals that feed meadow raptors. These landscapes are enjoyed and valued by Crossroads visitors. Some places at Crossroads, like the Utility Corridor, require un-treed habitat. Thus, there is both value and requirement to sustain meadow areas by arresting or slowing their woody transition. At the same time, we can increase their ecological value by increasing species and seasonal diversity.

*Habitat note*

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***Door County Meadow Habitat: Wildlife Species*** using this habitat guild include: Rusty Patch Bumblebee, Bees, Karner Blue Butterfly (when Lupine present), Odonates, certain species of Herpetofauna. Grassland birds (experiencing great decline in Wisconsin) such as: Bobolink, Grasshopper Sparrow, Henslow’s Sparrow, Field Sparrow, Savannah Sparrow, Dickcissel, Northern Harrier, Red-headed Woodpecker, Clay-colored Sparrow and Eastern Meadowlark are also known users of the habitat guild and could become a focus for Crossroads especially at the utility corridor.

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6. **Emergent Marsh.** There is a relatively small portion of Crossroads at the Cove edge that is best described as marsh. Filled with (exotic) cattails, this habitat also currently supports a range of native herbaceous marsh plants. Already a prime bird-watching area of Crossroads, the southern Cove area provides an excellent opportunity to increase the quality of migratory and nesting bird habitat through invasive exotic species reduction and native species increase.

*Habitat note*

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***Emergent Aquatic Freshwater Marsh Habitat:*** Emergent marsh is dominated by robust emergent macrophytes, in pure stands of single species or in various mixtures. Dominants include Cattails, Bulrushes (particularly *Schoenoplectus acutus*, *S.*

*tabernaemontani*, and *Bolboschoenus fluviatilis*), Bur-reeds, Water-plantains, Arrowheads, the larger species of Spike-rush (such as *Eleocharis smallii*), and a variety of sedges. Emergent Marsh occurs at Crossroads at The Cove and on the adjacent DNR lands. Often found on Sa (Saprist oils that have water cover variation from year to year but rarely drain, 0-2 % slope). *Wildlife Species* using this habitat guild include Great Blue Heron, Great Egret, Hine's Emerald Dragonfly, many Herpetofauna, and Odonates.

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Wisconsin DNR natural community descriptions are included in the appendices for these types.

Reference Model landscapes in Door County are described by species lists attached in the appendices, for Northern Mesic Forest, for the Cedar Swamp-Wetland complex, and for Meadow.

## ***Wildlife Foci***

Broadly speaking, wildlife at Crossroads will benefit from increased habitat connectivity. This includes forests adjacent to wetlands and increased contiguous forest canopy. Details within habitat, including species and seasonal diversity, old trees/snags/cavities, fallen wood, etc., also benefit wildlife. What may be less obvious is that intermediate and gradient habitats provide benefits to groups of wildlife as well.

Current grant requirements include community science monitoring of birds, bees, herbs, and odonates. Formal monitoring includes birds and herpetofauna.

A focus on the needs of wildlife can influence vegetation restoration targets and trajectories. But which wildlife?

*A note on disturbance considerations:*

Some wildlife species, in some seasons, are particularly sensitive to disturbance from people and dogs. This includes, for example, ground-nesting forest birds, secretive marsh birds and nesting marsh birds. The Sturgeon Bay leash policy, which applies at Crossroads, is helpful in reducing potential harm. At the same time, Crossroads is a place for strengthening people's connection with nature, and wildlife observation is an important part of that. This plan recommends that Crossroads consider appropriate policies, education or notification measures, to help increase awareness and protect sensitive wildlife at key times and places. These measures may change over time as the ecological restoration progresses and community priorities and awareness changes.

### **Preliminary Species for special consideration at Crossroads**

At Crossroads, special consideration is given to species that are listed or registered with Federal and State authorities, NGOs and non-profits; USFWS (NEPA), WDNR, American Bird Conservancy, The Young Forest Project (funded by U.S. Fish and Wildlife Service's Division of Wildlife and Sport Fish Restoration (WSFR) ), Wisconsin Bird Conservation Partnership (WBCP), Cofrin Arboretum Center for Biodiversity at the University of Wisconsin-Green Bay and staff input.

Consideration is also given to:

1. Species that are named by our grantors or in grant obligations or stakeholder obligations.
2. Species that are present at and are dependent on Crossroads.
3. Species that are considered Species of Local Conservation Interest (SLCI), or desired, known and loved by people frequenting Crossroads. *“Potential Focal Species are those called out in project proposals as species to address in habitat plans, and are typically representative for the habitat outcomes desired. They often act as Umbrella Species*



*whereby the habitats proposed will support suites of species with similar requirements. Focal Species can also include Flagship Species, which are charismatic species that will also benefit from the habitat proposal and will be favorably viewed by the public.”*

Excerpted from Casper, Example Species of Local Conservation Interest Analysis for Bayview Wetland, October 10, 2016.

4. Species that are not known at Crossroads but are in need of the habitats offered by Crossroads, especially if the habitat is not easily available in other places.
5. Species that are aspirational or indicators for progress of our restoration goals at Crossroads.

This is a preliminary list for consideration and modification by Crossroads staff and stakeholders.

Use of terminology: A **guild** (or **ecological guild**) is any group of species that exploit the same resources, or that exploit different resources in related ways. When we find this within a habitat, this report chooses the term Habitat Guild to describe the habitat that is shared by a guild of two or more species. For example, the Great Blue Heron and the Great Egret both share Emergent Aquatic Marshes for fishing. They might be termed a fishing guild, and we might also say that *Emergent Aquatic Freshwater Marsh Habitat* forms a “habitat guild” at Crossroads.

The number (1, 2) in the second column indicates species ranking for possible selection as surrogates for improved habitats. Some (1) have known presence at Crossroads.

Species		Interests / Status	Habitat Guild	Habitat Needs: <u>B</u> reed, <u>F</u> eed, <u>M</u> igrate
Bald Eagle, <i>Haliaeetus leucocephalus</i>	1	Migratory (USFWS IPAC), Potential Species of Local Conservation Interest (EBird)	<i>Boreal Forest / Bay</i>	B: Fish, forests, eschews people F/M: Fish, Tall conifers
Canada Warbler, <i>Cardellina canadensis</i>		Migratory (USFWS IPAC)	<i>Contiguous Forest, Boreal Forest, Shrub Carr</i>	B: Swamp Conifer-Balsam Fir, Black Spruce, Fir-Spruce, Swamp Hardwood, Alder Thicket, White Cedar, mixed deciduous-coniferous forests.

Golden-winged Warbler, <i>Vermivora chrysoptera</i>	2	Migratory (USFWS IPAC)	<b>Shrub Carr – Young Forest Continuum</b>	B: Shrub-carr, Alder Thicket, early successional forest (esp. aspen), successional fields and pastures, utility rights-of-way, young conifer plantations, hardwood swamps, and mosaics (where two or more of these other habitat types meet). Golden-winged Warblers need a dynamic mosaic of slightly different habitats based on whether they are nesting (young forest and mature forest edge) or have fledged young (mature northern hardwoods and aspen with vertical structure).
Wood Thrush, <i>Hylocichla mustelina</i>	1	Migratory (USFWS IPAC), Potential Species of Local Conservation Interest (EBird)	<b>Contiguous Forest</b> , metric surrogate?	B: large, unfragmented tracts of hardwood forest, upland, moist forests with large trees, diverse tree communities, moderate undergrowth, and ample leaf litter.
Red-headed Woodpecker, <i>Melanerpes erythrocephalus</i>		Migratory (USFWS IPAC)	<b>Old Mixed Forest</b> , metric surrogate?	B: Oak Opening, Oak, Bottomland Hardwood, Sand Barrens, Northern Hardwood. M: Open deciduous woodland; grassland near woodland edge, any isolated mature deciduous trees.
Cape May Warbler, <i>Setophaga tigrine</i>		Migratory (USFWS IPAC)	<b>Boreal Forest</b>	B: Northern spruce woods
Least Flycatcher, <i>Empidonax minimus</i>			<b>Contiguous Forest</b> , metric surrogate?	B: Northern Hardwood, Aspen, Central Hardwood, Hemlock Hardwood, Red Pine, White Pine, Oak, Forested Ridge and Swale. Closed canopy conditions.
Red-shouldered Hawk, <i>Buteo lineatus</i>			<b>Contiguous Forest, Old Mixed Forest</b> , metric surrogate?	B: Contiguous forest. The breeding habitats of the Red-shouldered Hawk are deciduous and mixed wooded areas, often near water. Red-shouldered hawks select sites with greater tree species richness for nesting.
Eastern Whip-poor-will, <i>Antrostomus vociferus</i>		Migratory (USFWS IPAC)		B: Whip-poor-wills do not construct a traditional nest as eggs are laid directly on leaf litter. Nests require tree cover, shade, sparse ground cover, and proximity to open areas for foraging on flying insects. See: <a href="https://files.ontario.ca/environment-and-energy/species-at-risk/mnr_sar_ghd_whp_pr_wll_en.pdf">https://files.ontario.ca/environment-and-energy/species-at-risk/mnr_sar_ghd_whp_pr_wll_en.pdf</a>
Ovenbird, <i>Seiurus aurocapilla</i>	2	Potential Species of Local Conservation Interest (EBird)	<b>Contiguous Forest</b> , metric surrogate?	B: Contiguous forest, inhabits deciduous, mixed and coniferous forests and areas near streams. Spends most of its life on the forest floor.

Woodcock, <i>Scolopax minor</i>	2		<b><i>Shrub Carr – Young Forest Continuum, metric surrogate?</i></b>	B: Nests in young to mixed-age forests near feeding areas. Prefer stands of hardwoods < 20 years old. F: Feed and rest in the dense growth of brush, shrubs, and young forest. They favor alder stands and abandoned farmland, including old apple orchards where the trees have become crowded by aspens, birches, dogwood, hawthorn, and other light-loving trees and shrubs.
Great Blue Heron, <i>Ardea Herodias</i>	1	Potential Species of Local Conservation Interest (EBird)	<b><i>Emergent Aquatic Freshwater Marsh</i></b>	F: Freshwater habitats, marshes, sloughs, riverbanks, and lakes. They also forage in grasslands and ag. fields. B: Breeding birds gather in colonies or “heronries” to build stick nests high off the ground.
Great Egret, <i>Ardea alba</i>	1	Potential Species of Local Conservation Interest (EBird)	<b><i>Emergent Aquatic Freshwater Marsh</i></b>	B: During the breeding season they live in colonies in trees or shrubs with other waterbirds. Colonies are located on lakes, ponds, marshes, estuaries, impoundments, and islands. F: They hunt in marshes, swamps, streams, rivers, ponds, lakes, impoundments, lagoons, tidal flats, canals.
White Sucker, <i>Catostomus commersonii</i> and Long-nose Sucker, <i>Catostomus catostomus</i>	1	Grants mention; Shedd Aquarium work at Crossroads	<b><i>Clear Stream with Sedge Meadow, metric surrogate?</i></b>	B: White suckers spawn and breed upstream for six weeks in the spring, or early summer in northern areas. Upstream breeding usually happens at night and spawning usually lasts from April to early May. This happens shortly after ice melts from a spawning area, the length of spawning may be related to the water temperature. Male white suckers reach the spawning area earlier than females and outnumber them. White suckers do not build nests or defend a territory. The spawning area usually has quick running water and a gravelly substrate.
Northern Pike	1	Grants mention; Species of Local Conservation Interest	<b><i>Clear Stream with Sedge Meadow, metric surrogate?</i></b>	B: In late winter or early spring, adult pike migrate into shallower tributary streams, flooded grassy lowlands, or shallows of lakes to spawn in April and May when water temperatures are around 40-50 degrees. No nest is constructed. The females look for vegetation and randomly release or spread between 15,000 and 75,000 eggs which are fertilized by 1-5 males. Once the sticky eggs are released and fertilized by the males they adhere to the vegetation.

Herp species TBD (Consult with G. Casper)	1	Grants mention	<i>Emergent Aquatic Freshwater Marsh, Contiguous Forest</i> , metric surrogate?	B: Ephemeral waters /wetlands , F: Upland woods, meadow A number of physiological and behavior factors make herpetofauna good indicator species for a habitat's ecological health.
Aquatic Macro- invertebrates TBD	2	Grants mention	<i>Clear Stream with Sedge Meadow Habitat</i>	TBD
Odonates TBD		Grants mention	<i>Emergent Aquatic Freshwater Marsh Habitat</i> , possible metric surrogate	B: Clear water, mud flats F: Meadow
Hine's Emerald Dragonfly, <i>Somatochlora hineana</i>	2	Threatened/ Endangered	<i>Emergent Aquatic Freshwater Marsh Habitat</i> , possible metric surrogate	F: The Hine's emerald dragonfly lives in calcareous spring-fed marshes and sedge meadows overlaying dolomite bedrock. B: Adults males defend small breeding territories. The female lays eggs into shallow water. Later in the season or the following spring, immature dragonflies, called nymphs, hatch from the eggs.
Bumblebees TBD		Grants mention	<i>Door County Meadow Habitat</i>	
Rusty Patch Bumblebee	2	May be present (Preliminary DNR)	<i>Door County Meadow Habitat</i>	
Karner Blue Butterfly		May be present (Preliminary DNR)	<i>Door County Meadow Habitat</i>	
Bats TBD		Grants mention	<i>Old Mixed Northern Mesic Forest Habitat</i> , possible metric surrogate	
Northern Long- eared Bat, <i>Myotis septentrionalis</i>		Threatened/ Endangered	<i>Old Mixed Northern Mesic Forest Habitat</i> , possible metric surrogate	Winter Habitat: Northern long-eared bats spend winter hibernating in caves and mines, called hibernacula. Summer Habitat: During the summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities or in crevices of both live trees and snags.

Northern Flying Squirrel, <i>Glaucomys sabrinus</i>	1	May be present (DNR/NHI)	<b><i>Contiguous Forest Habitat, Boreal Forest Habitat,</i></b> possible metric surrogate	Found in areas with mostly conifers, can also be relatively abundant in deciduous and mixed coniferous/deciduous forests. Have been found in diverse areas including regions made up of spruce, fir, and mixed hemlocks, in beech maple forests, and in areas of white spruce and birch with interspersed aspen groves. Northern flying squirrels often nest in conifers 1 to 18 meters above the ground.
Dwarf Lake Iris, <i>Iris lacustris</i>	1	Threatened (USFWS IPAC); Grants mention; Small populations		Mixed light wet mesic forest, cedar, elm, sedge, over dolomite. See special report on the rescue of this species and relocation to five locations at Crossroads.
Pitcher's Thistle, <i>Cirsium pitcheri</i>		Threatened (USFWS IPAC)		
Cherrystone Drop Snail, <i>Henderson occulta</i>	2	Threatened (DNR/NHI)	<b><i>Dolomite Outcrop Forest Habitat</i></b>	Inhabitants of small areas of algific habitat or the similar cool, moist, shaded sites of cliffs where algific conditions occur without substantial talus or ice. The species is most often found on wooded alluvial-soil banks and bluffs along the Lake Michigan shore. This snail is found in the soil and leaf litter along cliffs, soil-covered ledges on cliff faces, and on talus and soil and leaf litter near the cliff base.

## Forest Restoration Guilds

### Map: Forest Restoration Guilds

Northern Mesic Forest is a big part of the long-term Crossroads restoration plan, and it's also an exciting part. From the range of existing conditions at Crossroads, there are multiple paths or trajectories to transition to Northern Mesic Forest over time. These multiple paths develop different intermediate conditions along the way. These conditions provide valuable wildlife habitat in their own right, and gradually over the intervening decades, will also provide a variety of experiences for visitors to Crossroads.

The Vegetation of Wisconsin: An Ordination of Plant Communities (John T. Curtis, 1959) has useful metrics to understand this community. Curtis studied many sites around Wisconsin in order to sort and organize landscapes into plant communities. During the explosion of ecological science in the first half of the 20th century, two ecologists, Clements and Gleason, developed theories: Clementsian, that is, a model where a plant community or ecosystem is like an organism, whole to itself (and developed into “climax” communities); and Gleasonian, that is, individual species are individualistic and the whole plant community idea is really a gradient without clear delineations. (But as George Box of UW-Madison reminds us "All models are wrong, but some are useful".) Curtis was perhaps some of both. In his book, table IV-2 on page 517 is a font of knowledge about Wisconsin's native plant communities. One metric he developed is *Index of Homogeneity* — that is, now that things are sorted into community types, how much alike is one stand of Northern Mesic Forest from another stand of Northern Mesic Forest? And the answer for this community: a fair amount, at least in terms of the prevalent species. They've all pretty much got sugar maple, hemlock, beech, basswood, ironwood, red oak; baneberry, sarsaparilla, large-leaf aster. However, the *Index of Distinctness* is another matter. The *Index of Distinctness* measures how many species in the Northern Mesic Forest have their highest prevalence in this particular forest type. This is a way of asking, then, how distinctive is a Northern Mesic Forest from other types of woodlands in its range (like boreal, wet-mesic, dry-mesic, etc.)? The answer: not so much — not many species are found in their greatest abundance in this type of forest. This is essentially saying that the Northern Mesic Forest is a bit of a transitional community (it does not have many highly distinctive species) but also that it can easily be identified as a community (it has a highly homogeneous set of species wherever you find it).

The Wisconsin DNR has an expanded explanation of this forest type, describing Young-Seral, Early-Seral, Mid-Seral, and Late-Seral variations of it. (*Seral* means intermediate stage.) *“In describing these stages, it is recognized that they exist and persist on the landscape due to a marked range of conditions... and the nature and intensity of management. Even the most basic actions of promoting natural regeneration carry the weight of this reality. In an area where the purpose is strictly forest production, the decision to rotate and replant may be relatively straightforward, but on a site managed all or in part for ecological values the prescription and stand rotation is more complex”*.

Hence, there is an opportunity for a wide range of interesting stages over the next decades, and so this plan describes several Forest Restoration Guilds. These represent different current conditions and also define a different approach, or trajectory, to developing this zone into eventual (100 years) Northern Mesic Forest. Projects in different Guilds will have different planting priorities and methods.

One Habitat Guild is the **Aspen-Birch** successional community. A good existing example of this is the southern segment of the Arboretum; also the eastern edge of the Wild Ones meadow. The fast-growing early-successional trees, that don't mind full sunlight and tolerate droughty conditions, are a useful trajectory in our efforts to soften the boundary lines of past agricultural areas.

Another Habitat Guild is the **Shrubland**. When restoring meadow to forest, the difficulty stems from grasses with fibrous root systems that will out-compete any young trees struggling to get established. Shrubs, however, facilitate this transition. Their root structure can coexist with grasses, while at the same time they begin to shade out the grasses and develop a micro condition that will be amenable to young trees. In Door County, the facilitative old-field juniper is the most common example of this. But there are a number of other possibilities, including hawthorns, hazelnuts, and more. (*"The role of plant interactions in the restoration of degraded ecosystems: a meta-analysis across life-forms and ecosystems"*, Gómez-Aparicio, Journal of Ecology 2009, describes forest re-establishment through early successional shrubland-dominated communities.)

The Shrubland trajectory supports two of our Guiding Principles: (a) Restoration steps emphasize ecological story-telling ... will this restoration step strengthen understanding of how succession works, or how a forest matures, or how waterfowl use a wetland? And (b) The state of the land, in any spot and at any time, should itself convey the future ... let the land show its future through the ongoing restoration work... Use facilitative intermediate steps in the trajectory to provide early landscape character that hints at the eventual character, working with natural successional processes.

In supporting these two Guiding Principles the Shrubland trajectory foreshadows the future in the use of a facilitative intermediate shrubland trajectory for the long-term forest targets. With shrub species distinct to the target forest type, it provides an early character that hints at that particular eventual forest and provides a very different visual and physical experience than direct meadow trajectories.

**Young Ridge:** On the east edges of Crossroads are areas on slopes where a different cohort of species is establishing, perhaps advantaged in shallow soil conditions, including Red Cedar, Red Pine and White Pine. This is an opportunity within the Arboretum for a focused sub-community of this type, adding to these plantings. In this zone, the expansion of Pin Cherry (aka Bird Cherry), already present, would add to the distinctiveness of this edge.

**Early Upland:** This is a useful strategy in areas where some Mesic Forest diversity is already beginning to establish, and directly planting species like Sugar Maple, Ironwood, and Black Cherry can boost this Early-Seral stage.

**Diverse Mesic:** Zones where White Cedar is establishing or dense nearby would support diversification into Mid-Seral by planting species like Red Oak, Basswood, Yellow Birch. Planting potted trees (with deer protection) rather than bare-root here might be considered.

**Boreal Edge and Boreal Reclaimed:** Where there are large White Spruce and other Boreal character, the slow removal of some of the exotic Norway Spruce indicates replacement plantings of trees that will already benefit from the shaded habitat, including continued planting of Hemlock, also Balsam Fir, Red Oak, White Spruce, White Pine. The existing Boreal Remnant (north of the Council Ring) is an opportunity for the northwestern segment of the Arboretum to focus on this distinctive sub-community as well.

**Lowland Buffer:** At the Cove, the substantial removal of exotic buckthorn in 2020-2021 leaves an opening for lowland tree planting, including Silver Maple, Tamarack, Cottonwood. West of Big Creek just north of Utah are wet-community-supporting soil conditions, and an existing shrub carr/sedge meadow is embedded. Here, all four Door County Poplars are envisioned: Quaking Aspen, Bigtooth Aspen, Cottonwood, and Balsam Poplar on gradients — plus Red Maple, Silver Maple.

These sub-community Guilds of the Northern Mesic Forest allow a variation in methods as well as species, including providing an opportunity for experimental comparison plantings, described in the Intervention Modes. They also provide the continuation, over decades, of the diverse habitat experience enjoyed by Crossroads hikers, students, scientists, and visitors.



## Climate Resilience

Map: *Climate Resilience*

*“[Climate] Resistance actions improve the defenses of an ecosystem against anticipated changes or directly defend the ecosystem against disturbance in order to maintain relatively unchanged conditions. Resilience actions enhance the ability of the system to bounce back from disturbance and tolerate changing environmental conditions, albeit with sometimes fluctuating populations (Holling 1973). Such actions may be most effective in systems that can already tolerate a wide range of environmental conditions and disturbance. Resilience is effective until the degree of change exceeds the ability of a system to cope, resulting in transition to another state.*

*Transition actions intentionally anticipate and accommodate change to help ecosystems adapt to changing and new conditions. Whereas resistance and resilience actions foster persistence of the current ecosystem, transition actions intentionally facilitate the transformation of the current ecosystem into a different ecosystem with clearly different characteristics. These actions may be considered appropriate in ecosystems assessed as highly vulnerable across a range of plausible future climates, such that the risk associated with resistance and resilience actions is judged to be too great” (from Shannon et al, 2019. Climate Adaptation Strategies and Approaches for Forested Watersheds and Non-Forested Wetlands. Climate Services. See: [forestadaptation.org/water](http://forestadaptation.org/water) and [/wetlands](http://forestadaptation.org/wetlands)).*

This plan also focuses on Resilience – many interventions incorporate a response to conditions expected with climate change. Some interventions may increase carbon sequestration as a climate mitigation. Responses include:

1. Big Creek resilience in flashy conditions. Upper Big Creek can make better use of its floodplain to help it be more resilient to flashiness (exacerbated with climate change and extreme rain events) and to prevent excess sediment transport. The existing topography allows it. The actions called for are low-tech, gradual introduction of large woody debris – that would typically exist – that will encourage the river to offload some of its flow into the adjoining wetlands, and allow the river to be the architect of its own flow. The removal of exotic buckthorn and reed canary grass enables this. Incremental, partial, irregular additions of woody debris should be experimented with and carefully monitored to ensure water does not back up or block the culvert, but rather fills the upper wetlands. Filling the upper wetlands with stored water should increase the size of the water buffer capacity, and slow the release of water resulting in a more consistent flow both during events and over the entire season. This will also be beneficial to the habitats in this area. This technique of moving woody debris should be done during spring flows and monitored in real time. This abiotic response is not mentioned elsewhere in the plan. It should be carried out year by year by staff and Landscapes of Place.
2. Shading the creek. Maintaining cool temperatures of the creek is an important factor in resilience. The most obvious gap, at the Utility Corridor, can be mediated by the planting of

riparian and upland shrubs in a gradient at the creek, while meeting the Utility Corridor requirements.

3. Forest buffering. The fragmented remnants of forest at Crossroads are susceptible to climate change simply because of their small size and too much edge exposure to weed vectors and environmental pressures (temperature, wind, drying). A number of the restoration steps seek to increase forest cover including outward edge expansion. Re-forestation will also eventually build carbon sequestration capacity.
4. Oldfield trajectories. In the strategies for reforestation of oldfields the plan proposes intermediate shrubland and young forest. Both of these types emphasize native species with a fairly broad spatial range to the south. Because of their range and generally wide environmental amplitude, including drought and heat tolerance, these intermediate plantings serve as a hedge-our-bets strategy, re-foresting for resilience but using adapted species that can facilitate transition strategies if the planned target communities become unreachable.
5. Meadows at Crossroads vary in quality and diversity. Low diversity areas enhanced with native deep-rooted meadow species can provide better resilience-by-diversity as well as increased carbon sequestration in the soil provided by the ongoing root decay. *“Prairie systems contain much more soil organic carbon than other ecosystems due to rooting characteristics of the vegetation that grows there... Grasslands and shrubland carbon stock make up 34% of all carbon in the U.S. Great Plains region”* (USGCRP, Second State of the Carbon Cycle Report, 2018.)

## **Cultural Zones Considerations**

Map: *Cultural Zones Considerations*

Some of the acreage of the Crossroads properties contains culturally selected restrictions that reflect historic use and types of human interactions. These areas shown on the maps include:

- Learning Center and Affiliated Structures, including Maintenance Buildings, Nursery, Council Ring, Amphitheater, Arboretum and Pavilion, Overlook, Cove Parking and Kayak Launch. (Note, bridges and boardwalks as part of the Habitat Trails are not addressed in this plan.)
- Historic Buildings/Sites, including Historic Village and Hansen Homestead
- Astronomy Center, including Support Buildings, Access Road
- Native Peoples Activity (At this time, we have evidence of Middle and Late Woodland seasonal settlements.)
- Utilities, Roads, Easements, Ahnapee State Trail
- Historical Orchards / Mixing Sites

## **General Objectives**

The cultural areas directly and indirectly serve Crossroads' mission. At the same time, viewed purely from an ecological lens, these areas can disrupt canopy and interrupt habitat; can introduce non-native species (that, even if benign, impact people's relationship to ecology); provide vectors (openings, boots, dogs) for the introduction of invasive species; chemical runoff (oil, antifreeze, salt); light spill; pesticides/herbicides; stormwater impacts; electromagnetic radiation and other impacts not yet considered.

In all of the cultural areas the negative ecological impacts can be reduced or perhaps be made benign to the overall ecological function of the property. Educational opportunities can possibly be enhanced in these areas.

Our suggestion is developing a framework or overarching "rules to live by" adopted and implemented by the Land and Facilities Committee, whose purpose is to limit or prohibit impacts to overall ecological health and possibly to provide an example of another way to treat this specific ecological situation. This includes limiting any abiotic interference (earthwork, construction, hydrology interruption), and would include actively identifying, demarcating and enforcing minimized disturbance zones for projects. It would include prohibiting introduction of any species from this point forward not native to Door County or not appropriate to the soil, hydrology or restoration plan, and the removal of invasive species found in these areas. Possible exceptions exist when a historically appropriate plant of a non-invasive nature is used to amplify the historical context that is being shown. These might include apple trees near a farm house, or

lilac shrubs at the settler’s cottage door. Any amendments or exemptions should be carefully considered and under the control of the Crossroads Lands and Facilities Committee.

### **Learning Center and Affiliated Structures**

In areas near the Learning Center and its affiliated structures, the goal should be to mimic the adjacent habitats to the greatest extent possible, provided there are no other considerations such as safety, building maintenance, cultural introduction of native species, patterns or norms.

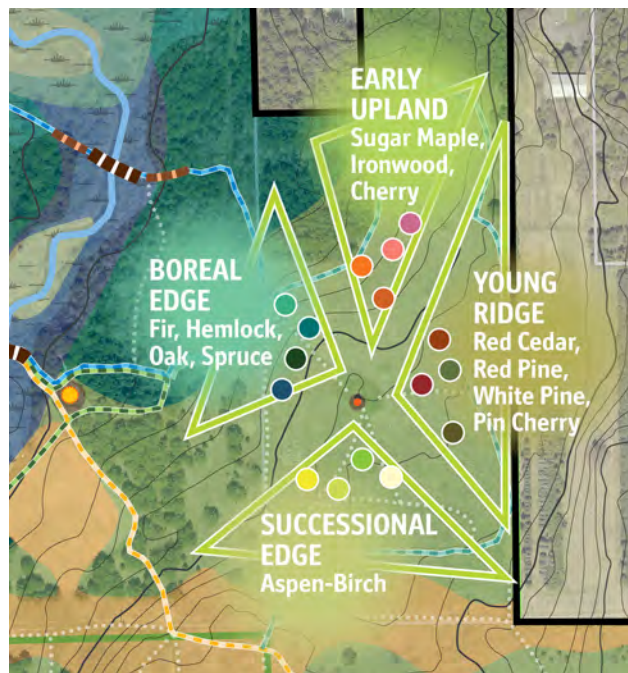
#### **Arboretum**

As discussed later in Intervention Modes and Projects, we propose further definition of the Arboretum, through additional planting, into four segments representing distinctive sub-types of forest. The arboretum is a place that can have a more intentional engagement of visitors, possibly through signage or activities in progress to show both process and outcome, enhancing educational opportunity. Because the pavilion provides a centering and gathering place, it might be an opportunity for interpretive signage that could explain these forest types and the trees,



which are all guilds within the Northern Mesic Forest type. Rather than having tags that are difficult to read from a distance, we suggest that one each of

four representative species in each of four segments have a large, uniquely colored tag, visible from a distance — specifically visible from the pavilion and its access trails. The coloring would be organized to make the segments distinctive, too. Then, within the pavilion, interpretive signage for each segment can describe the four representative species and their environment, as well as typical companion species. This information could benefit people seeking to diversify their home habitats. This is proposed as a low-key way to increase the educational opportunity of the Arboretum while not diminishing the natural areas experience.



### **Historic Buildings/Sites, including Historic Village and Hansen Homestead**

It is ecologically desirable to minimize the square footage of non-habitat zones around the buildings. Efforts can be made to minimize the expansion of these zones and prevent

encroachment beyond the existing perimeters toward the habitat areas. Habitat encroachment, even by a few feet at a time, has permanent and negative effects.

It is actually quite easy to increase the ecological function of historic vegetation by adding or replacing non-native species with native species of trees, shrubs and herbaceous plants as surrogates for their cultural equivalents. For example, a manicured lawn could be replaced with no-mow grasses with violets, or adding a wild plum (*Prunus americana*) to replace an apple tree (*Malus* sp.), or replacing a lilac shrub (*Syringa vulgaris*) with a Juneberry (*Amelanchier* sp.), or planting Wood-lily (*Lilium philadelphicum*) to replace the Orange Day-lily (*Hemerocallis fulva*). By using native plants we will attract and support locally native wildlife species, minimize the impact of our cultural encroachments, and learn along the way.

### **Astronomy Center**

All installation and maintenance of plants (trees, shrubs, herbaceous) should ensure that direct access to a line-of-sight from the existing instruments to the sky be maintained and promoted. Areas around the built Astronomy infrastructure should follow the guidelines used by the Learning Center buildings (above) which is to mimic the adjacent habitats to the greatest extent possible, provided there are no other considerations such as safety, building maintenance, a cultural introduction of native species, patterns or norms.

A 200' radius circular zone is shown on the map, skewed a bit to the south of the Astronomy Center to acknowledge the importance of open landscape to the southwest. This zone in particular shall be maintained with no trees, so as to not interfere with line of sight.

### **Native Peoples Activity**

The archaeological work being executed to gain understanding of the first stakeholders of this property in the archaeological zones should continue unencumbered. The archaeological work and access requires that no restoration activities occur which might impact the soil structure and historical layers including the planting of trees or shrubs. No structural changes that impact the soil should occur in these areas.

### **Utilities, Roads, Easements, Ahnapee State Trail**

All utility and road easements should be maintained and enforced to the minimal distance allowable under any agreements, with the goal of maximum habitat opportunity. If maintenance of any easement Right of Way is allowed to be managed by Crossroads (e.g., in the ATC Utility Corridor) then that obligation should be taken on by Crossroads. This will better ensure compliance with the needs and desires of Crossroads.

Restorations of the zones encumbered by any utility or road easements or agreements should still implement a full functioning restoration that does not violate the terms of these agreements. For

example, under the ATC Utility Corridor easement, a full floristic restoration of non-woody species should occur. This provides support for grassland birds, insects and other species or taxa requiring non-woody native plant communities.

The same is true for any road right-of-way. Crossroads should exercise every option to prevent the expansion in size, width or number of these easements, as these easements cause habitat fragmentation and have a permanent and negative impact on the ecological restoration options for this preserve. Habitat fragmentation is one of the most serious, pervasive and impactful negative impacts on the ecology of a parcel or landscape. From the Minnesota Department of Natural Resources: *“The effects of forest fragmentation are far reaching, including:*

- *Fragmentation disrupts animal travel corridors and creates barriers that isolate populations from potential breeding opportunities;*
- *Following fragmentation, habitat for forest species that favor forest interiors (such as orioles, tanagers, and wood thrushes) is lost and there is greater vulnerability to predators and nest robbers;*
- *Species that cannot easily disperse, including reptiles and amphibians, are more likely than other species to be harmed by forest fragmentation.*
- *Smaller remaining forests are more susceptible to invasive species, often resulting in a loss of species diversity;*
- *With smaller forests, there is an increase in the frequency of conflicts between people and wildlife;*
- *By losing forests, we are losing the ability to clean the air and buffer our environment from pollution.”*

Crossroads should proactively protect the Big Creek stream crossing at Utah street. The current crossing is sufficient, bottomless and minimally detrimental to the functioning of the creek. Lengthening the stream crossing or adding a culvert with a bottom would be detrimental to the ecological function of the creek.

***Wildlife Crossing:*** when road culvert replacement is necessary, the culvert should be bottomless, sufficiently sized, and should also be wide enough (perpendicular to the stream) to incorporate land areas adjacent to the creek in order to facilitate crossings of small mammals and herpetofauna. When this is achieved, land-based guide fences should be designed and incorporated to guide these animals through the culvert for safety rather than across the road. If future significant road repairs are needed along at Michigan Street, Utah street, South 20<sup>th</sup> Place or any road impacting the preserve, Crossroads should formally request an under-road culvert placement to facilitate animal movement, reduce road flooding and reduce habitat fragmentation. Animal life has variable success crossing roads, with some species completely unable to cross roads. Road culverts also help to reduce road flooding by facilitating hydric connections to added buffer lands areas. Through the prior mentioned benefits, properly designed road culverts also help to mitigate fragmentation of lands.

The Ahnapee State Trail runs north-south along the western edge of the Crossroads property. It is paved and provides for public access through an easement. This trail creates an opportunity to engage an expanded set of users and possibly host an added Crossroads trail connection to invite hiking on the Crossroads lands.

Along Utah Street, Crossroads should also consider advocating for marking or bold “zebra striping” at the crossings for the Ahnapee State Trail and the Crossroads (Cove) Habitat Trail to increase pedestrian safety and quiet traffic.

### **Historical Orchard Mixing Sites**

A significant portion of Crossroads’ oldfield habitat is former orchard. In 2008, Crossroads engaged professional soil scientists to evaluate Crossroads for potential soil contamination. The consultant noted that “large portions of Crossroads property were used as apple and cherry orchard in the late 1800s and early 1900s.” The consultant identified two separate areas of contamination associated with historical use of lead arsenate pesticides.

Two zones, totaling 17,000 SF in total, were found to have soil lead and arsenic levels exceeding Wisconsin DATCP soil standards “by several orders of magnitude”, and reported to the Department in March, 2008. The actual sizes and approximate locations of the two zones are shown on the *Cultural Zones Consideration* map.

The consultant recommended removal of soil to a depth of 1.2 feet (755 cubic yards) from these zones to off-site landfill. To date, the soil remains in situ.

This plan recommends that the two zones be physically located on the ground and demarcated, and that a practice of zero soil disturbance is followed for these areas. No digging to plant trees or shrubs shall take place in these zones. Native seed may be broadcast (including woody species) and pressed into the ground. No removal of any plants that requires soil disturbance should occur in these areas.

## *Intervention Modes*

Ecological restoration work can encompass: transformative invasive species control, landform alteration (none considered here), dealing with herbivory pressure, amending soil (none considered here), reestablishment of fire (not relevant here), correction of hydrology (none considered here), planting and seeding, and structural elements such as woody debris, brush piles and snags.

Following — and alongside — the main transformations, management and monitoring proceeds. These activities are described in a following section.

Here, we have organized transformative projects by Intervention Modes which are designed to accelerate ecological transformations and benefits.

Map: *Planting Intervention Modes*

**Soften Edges:** In-plant trees in irregular patches and intrusions, breaking up straight edges.

Crossroads' agricultural and orchard history has left vestiges of rectangular fields, which negatively impact the natural areas perception, but are also an ecological problem as they create an unnaturally dense forest edge (a wall at the edge because of trees densifying to find sun) which impacts wildlife habitat and lessens diversity. Soft edges which develop naturally are typically high-diversity ecotones. These planting projects could use bare-root tree plantings and could in some cases also include a variable thinning of trees at a dense edge. Individual herbivory protection is a lower priority in these settings.

**Oldfield and Woods Pockets:** Plant trees/shrubs in pockets, simplifying preparation, care, and perception. Because so much of Crossroads is in various oldfield conditions, wholesale reforestation is impractical. However, using (accelerating) the same facilitative successional processes that happen naturally, in patches, is a long-term effective and manageable reforestation strategy that works with nature. Because these plantings will be exposed in fields where deer and rodents roam, herbivory protection may be called for. This could include temporarily fencing around a planting pocket, or individually protecting trees. As mentioned, shrubs can compete with grassy conditions; trees often cannot. Thus, herbicide or other control of grasses at each planted tree location prior to tree planting may be appropriate.

**Arboretum Segments:** Re-focus Arboretum quadrants on distinct sub-habitats with additional tree/shrub planting and herbivory protection. Four sub-habitat types are called out for the Arboretum, building on the variation in species already establishing, with the idea of strengthening the educational opportunity. We note that the accompanying oldfield conditions at the Arboretum are fairly good, with few troublesome invasive species problems, and we recommend that only needed paths be mown. The dense cover of Dogbane (*Apocynum androsaemifolium*) is welcome, along with a number of other native species, and actually



serves to give the transitional meadow a distinctive experience compared to other oldfields at Crossroads, which is a plus. Like the **Pockets**, the Arboretum plantings in an open setting are at risk of deer and rodent browse. The same herbivory precautions, plus grass removal at planting sites, are recommended.

**Comparison Experiment Plots:** Prepare and conduct re-forestation comparison plots, using different methods including a reference plot. With a focus on restoration education, and a mind to involvement of **UW-Oshkosh** interns, other interns in training, and groups like the **Boys and Girls Club**, a science project conducted in forest restoration is proposed. This should be formally designed with comparison plots that are staked and, in some cases, have perimeter deer fencing (and a gate), depending on the experimental design. The planning, staking, details, planting, and scientific experiments or monitoring need to be formally designed with care and with the teams in mind that will be participating. Like Crossroads' other long-term science projects, this can serve as exciting work not just for the initial team, but perhaps to serve a pipeline of researchers into the future.

**Replacements:** In plantation zones as Norway Spruce is slowly removed, and where dense buckthorn is removed, in-plant native trees. We propose the slow removal of Norway Spruce of a few each winter, over time. Crossroads has already been in-planting with species like Hemlock, and we propose that this continue, with increased diversity. Norway Spruce snags or cavity trees should remain where possible. The felled Norway Spruce, if not needed for other purposes at Crossroads, can remain as fallen wood. Care should be taken in timing and selection of tree removal with regard to the potential use of these areas by Long-eared Bats. Consideration should be given to the type of soil and plant community that results from a persistent stand of trees like Norway Spruce colony found at Crossroads. Podzolization of the soil might be an opportunity for ready replacement by native conifer species consistent with this condition.

**Meadow Swaths:** In areas with few natives and dense agricultural grasses, prepare fully by tarping or herbiciding and seed in drifts and swaths crossing trails. Seeding swaths are a practical, incremental strategy to increase the health and diversity of the meadow areas at Crossroads. The meadows presently have a great deal of variability in local quality conditions. As resources are available, these projects can be implemented over time. Informal surveys should identify zones of less quality with few natives. Ideally, swaths sweep across trails, which boosts the experiential impact of these incremental plantings. The identified zone should be staked. Substantial reduction/removal of exotic species should take place over a full year or two, using herbicide and mowing as called for. Native seed should be applied in either June or September with carrier. Note that we are not calling for removal of Wisconsin-native but Door-County-exotic prairie species which have previously been seeded or planted in these zones — with the possible exception of overly-dense single-species zones where an exotic plant is dominating (e.g. *Silphium*) and should be reduced in dominance. We tend to design these swaths in prevailing-wind orientation to take advantage of early wind-dispersed seed and to jump-start natural species patterning.

**Meadow Plug Patches:** In areas of less diversity and high visibility, plant plugs to enhance diversity and resilience, and as seed source. This is a strategy to provide early impact of change, with relatively small amount of resources/effort. There are zones, including the Cove, and including the Wild Ones meadow south of the Learning Center, where we propose an intensive plug planting near trails that is designed deliberately to maximize diversity.

**Wetland Plug Patches:** In areas of less diversity and high visibility, plant plugs to enhance diversity and resilience, and as seed source — here in the Michigan Street sedge meadow, and also the small sedge meadow near Hansen Homestead. Same reasoning as in Meadows.

**Mixed Shrub Scatters:** In utility corridor near stream crossing, plant a transect of riparian to upland shrubs, to meet utility requirements while helping shade/buffer stream. Similarly, at the Cove. These two projects are included for specific sites at Crossroads, addressing somewhat unnatural conditions — the utility corridor, and the fill at the Cove. At the utility corridor stream crossing, where trees are not allowed, a range of shrubs from water's edge to a distance from the stream can help to replace some of the cover and cooling functions of what should ideally be a forested buffer. Using the term “scatter” indicates the desire for irregular spacing and mixing of species as appropriate along a moisture and topography gradient.

**Wetland Shrub Scatters:** In Alder Thicket/Shrub Carr zones, diversify species and structure with native shrub plantings, species new to the site. Because of the immense quantity of buckthorn being removed in the historical alder thicket zones, we desire to re-plant by adding species that are not present, or present in low quantity, at Crossroads, to extend the wildlife value by diversity of timing of flowering and fruit.

## Management and Monitoring

Map: *Management and Monitoring*

### **Management (Invasive Species):**

In 2020 and continuing into 2021, the Big Creek corridor is a priority for invasive species control efforts, with ambitious goals, a large acreage, and sometimes challenging conditions for volunteers. Crossroads' interns have been assigned to this zone, and supported by Habitat Healer volunteers. Crossroads has annually received NR107 Permits for invasive species work in the wetland zones, identified on the map. Contractors have mapped and treated Phragmites zones via the Phragmites Adaptive Management Framework in the Great Lakes (PAMF); see map. Priority species have been Glossy Buckthorn (*Frangula alnus*) and Common Buckthorn (*Rhamnus cathartica*), *Phragmites australis*, and Reed Canary Grass (*Phalaris arundinacea*). See appendices for recommended Reed Canary Grass control methods and timing.

Through informal surveys in 2020 we noted some zones of concerning invasive species:

X1: Dense buckthorn

X2: Buckthorn, Norway Spruce

X3: Norway Spruce, Buckthorn

X4: A few remaining Honeysuckle — should follow up on prior work in this high quality zone

X5: Low quality oldfield with Knapweed

X6: Scots Pine and other woody invasives

X7: Exotic Watercress in parts of the stream, especially the Lower Reach (“White watercress rapidly forms dense stands that exclude native plants. It is highly threatening to natural plant communities. All detected occurrences should be eradicated.”, SEWISC.)

X8: Sweet Clover along the Ahnapee

This is a partial list. Additional known invasive species include a remnant patch of Japanese Knotweed at the Warren House; Japanese Barberry east of the Wild Ones meadow and south of the Norway Spruce plantation; Autumn Olive near the beehives; and Black Mustard in places throughout.

Invasive species control priorities, which can vary by week throughout the year, should be guided by Crossroads' land stewards who will direct interns and equip and train volunteers. Methods should follow best management practices from North American Invasive Species Management Association (NAISMA) or the Invasive Plant Association of Wisconsin, or control methods from the Midwest Invasive Plant Network database, and local advice from the Door County Invasive Species Team.

We recommend a discussion of priorities at a spring and fall meeting each year of the Land and Facilities Committee, to include current interns and Landscapes of Place. This can reset priority species and work zones for invasives.

### ***Restoration Monitoring:***

To meet grant requirements and have a record of progress, we will use simple methods to track on the ground restoration progress on an annual (fall) basis.

- Where feasible, contractors should identify with GPS the zones and times of invasive species work. (If assistance is needed to transfer to maps, Brian Forest has offered his time).
- As a simple measure of linear feet of stream restored: since there is a focus on invasive species control, we will use the NR107 permit zones each year to identify stream feet restored.
- For other invasive species focus areas: Interns and Crossroads staff should approximately outline the work zone on a Crossroads map, along with the season it is worked.
- For planting and seeding projects: Landscapes of Place, when staking the project, will map the zone of work and its area.
- Landscapes of Place will combine these metrics for annual grant reporting of progress.

*Photo Points:* Up to a dozen photo points will be established by Crossroads' staff or contractors with stakes in the field, numbered and with photo orientation noted on the stake. Seasonal photographs will be labeled and archived. (See map for representative locations.) The goal of location choice is to document change over time, in areas where invasive exotic removal is significant or large plantings are planned.

### ***Biological Monitoring:***

The following summarizes Crossroads consultants' obligations to Sustain our Great Lakes funding from 2021-2024. [UW-Oshkosh](#) and [Boys & Girls Club](#) are among Crossroads' partners for the grant work and are noted below. Other service clubs and community groups have been and continue to be important partners and might also participate in grant-related monitoring.

1. (Gary Casper of Great Lakes Ecological Services) Research / Focal Species / Reporting. The biological monitoring program at Crossroads will follow GLES methods from the Milwaukee Estuary AOC study. Year One and Year Four. This work includes a review of known rare species data for the project area that will guide adaptive habitat management by understanding what species could be feasibly recovered. Data will be collected and vetted from multiple sources such as agencies, museums, and citizen science programs. Crossroads baseline survey data will be added to the project. Expert data interpretation will then select Focal Species for monitoring project success. Focal Species can be feasibly supported by restored habitats in the project, and be feasibly monitored to provide metrics of success.

2. (Gary Casper of Great Lakes Ecological Services) Acoustic Frog Surveys and Acoustic Bird Surveys. Year One and Year Four. Each year includes a one-day site visit to place and program

four acoustic monitor stations and train monitors for additional visits each season. Each year includes Frog and Bird data analysis and reporting.

3. (Mike Grimm) Breeding Bird and Migratory Bird Point Counts. Surveys will follow SOP from Milwaukee Estuary AOC study, supplementing the acoustic bird surveys in order to detect species that do not vocalize much, and add evidence of reproductive metrics. Breeding Birds in Year One and Year Four — weekly in June (4 visits) at each of four recorder locations, 4 hrs per visit, plus detailed reports. Migratory Birds in Year One — weekly in September and October (8 visits) at 6 habitat-based locations, 4 hrs per visit, plus detailed reports.

4. (Landscapes of Place) Biotic Monitoring Management and Assistance. Landscapes of Place will provide four years of modest support including assistance with acoustic monitors in Year One and Year Four (four times per year) to set up, check them, retrieve them, and archive data. In all years, coordinate and manage all biotic monitoring programs.

5. (Landscapes of Place) Botanical Surveys. Year One and Year Four, to follow DNR FQA methodology (<https://dnr.wi.gov/topic/wetlands/methods.html>) and conduct timed meander flora surveys in the restoration zones and provide reports. Year One serves as baseline and Year Four provides our first quantitative window into responses. These botanical surveys will be conducted in three broad future habitat zones: meadow, forest, and open or semi-open wetland communities, as indicated by shading on the map.

6. (Crossroads, **UW-Oshkosh**) Community Science. Survey data will be collected and submitted to four Citizen Science programs (HerpMapper, Odonata Central, Bumblebee Watch, eBird). This may be a project that **UW-Oshkosh** interns want to take on, perhaps for odonates or bumblebees. This is also a project for **Boys & Girls Club**, particularly eBirding.

7. (Crossroads, **Boys and Girls Club**) Sucker monitoring with Shedd Aquarium. Matt Peters to lead.

8. (Crossroads, **UW-Oshkosh**) IBI / Aquatic Macroinvertebrates. M-IBI protocol for wadable streams or recommended alternative protocol. This may be a project that **UW-Oshkosh** interns want to take on.

9. (**Boys & Girls Club**) Snakeboards. Construction/painting, placement, monitoring. Although not required by the grants, this monitoring is added as particularly well-matched for **Boys & Girls Club** interests and can be taken on by them independently. The species of snakes present at Crossroads and utilizing habitat is not currently known. Landscapes of Place can provide basic instructions if needed.

The following table summarizes grant-required monitoring.

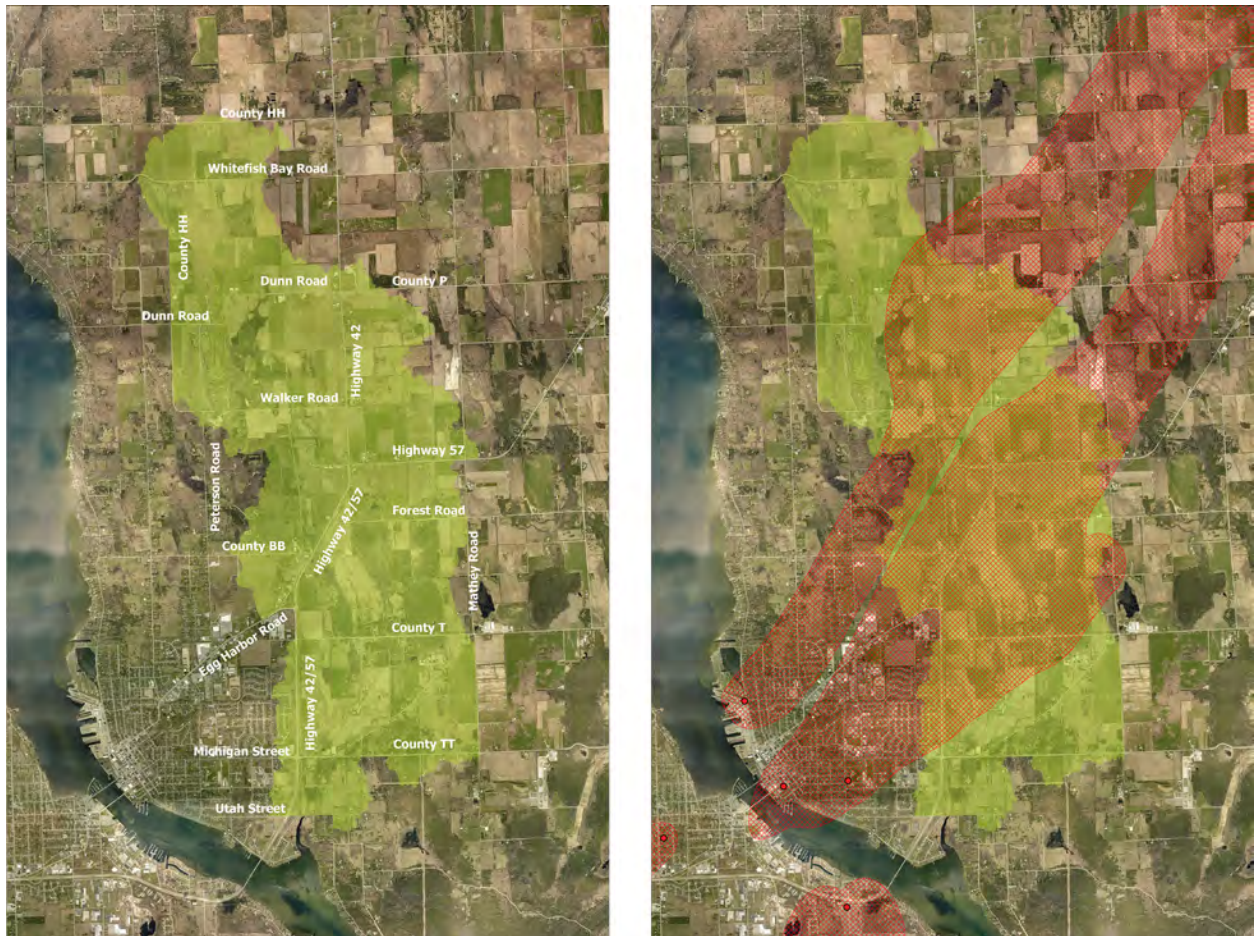
<b>Item</b>	<b>Justification</b>	<b>Metrics</b>	<b>Methods</b>
Frog, acoustic surveys	Surveys provide baseline metrics for the project areas as breeding frog habitat. The electronic recorders will be dual programmed to also survey for breeding birds.	occupancy / richness, call index value, counts	<b>Gary Casper.</b> Follow SOP from Milwaukee Estuary AOC study. Place four recorders to survey from ice-out to July 31. Candidate sites are Upper Reach Zone, headwater of Tributary Creek, confluence of Tributary Creek and Big Creek, and Cove Zone.
Bird, breeding, acoustic surveys	Surveys will provide baseline metrics for use of the project areas by breeding birds. Frog recorders will be dual programmed to also survey for breeding birds.	occupancy / richness, counts, occupancy duration	<b>Gary Casper.</b> Add early morning 10-min. samples to programming of frog recorders.
Bird, breeding, point counts	Surveys will provide baseline metrics for use of the project areas as breeding bird habitat. They will supplement the acoustic bird surveys in order to detect species that do not vocalize much, and add evidence of reproduction metrics.	Species richness, counts, evidence of reproduction	<b>Mike Grimm.</b> Follow SOP from Milwaukee Estuary AOC study, including recording evidence of breeding per the Wisc. Breeding Bird Atlas II protocol. Survey one morning each week in June (2 replicates each morning; each point receives 8 replicates). Each survey is walk-through with stops for 10-min. point counts, then repeat.
Bird, migratory surveys	These surveys will provide baseline metrics for use of the project areas as stopover habitat by migratory birds.	Species richness, counts	<b>Mike Grimm.</b> Weekly, DNR protocol at each of 6 sites from End of August – October 15. Expert birder will choose the optimal weather conditions to conduct the survey.
Botanical surveys	These surveys will provide baseline metrics for project areas pre-treatment in year 1 and followup in year 4	occupancy/ richness, % cover; FQA	<b>Landscapes of Place.</b> Follow DNR FQA methodology ( <a href="https://dnr.wi.gov/topic/wetlands/methods.html">https://dnr.wi.gov/topic/wetlands/methods.html</a> )
Community Science surveys	Survey data will be collected and submitted to four Citizen Science programs (HerpMapper, Odonata Central, Bumblebee Watch, eBird). Results will inform habitat success and management.	Species present, occupancy duration	<b>Coggin.</b> Presence-only data adds species awareness using regular field observations, cover boards and surveys

Suckers, Shedd Aquarium Surveys	Continue multi-year monitoring program, will validate water quality and viability for this species	Species present, occupancy duration	<b>Coggin.</b> Weekly surveys in March / April monitor the spring spawning migration of suckers ( <i>Catostomidae</i> )
Soil Surveys	At key restoration locations validate soils maps, soil types, wetland and impairments.	soil types and profiles	<b>Nick Haas.</b> Standard methods (ACE) using probes or holes reporting hydric conditions; soil types; soil color: hue, value, chroma; particle sizes; texture: sand, silt or clay and organics
Aquatic Macro-invertebrates (Community Science)	Important indicator of stream quality, will expand UWSP baseline.	IBI	<b>Coggin.</b> M-IBI protocol for wadable streams or recommended alternative protocol
Northern Pike (Community Science)	Key species, long-time known but not formally documented Northern Pike spawning location	occupancy duration	<b>Coggin.</b> Approved DNR/NFWF surveys methods March - May using daily checked weirs to monitor fry, data to be provided to DNR and USFWS
Research and reporting	A review of known rare species data for the project area will guide adaptive habitat management by understanding what species could be feasibly recovered. Expert data interpretation will then select Focal Species for monitoring project success. Focal Species can be feasibly supported by restored habitats in the project, and be feasibly monitored to provide metrics of success.	NA	<b>Gary Casper.</b> This will follow methods from Milwaukee Estuary AOC study to collect and vet data from multiple sources such as agencies, museums, and citizen science programs. The vetting process determines confidence levels for the data. We will then add our baseline survey data to the project, and interpret data to guide restoration and monitoring.

***Watershed Monitoring:***

For the Big Creek Watershed — expanding beyond Crossroads’ property to its watershed neighbors — a Surface Water Quality “report card” is a possible project. It could be a good match for **UW-Oshkosh** interests over the long term. This activity when shared with the stakeholder neighbors within the watershed creates a natural connection and engagement with Crossroads.

This project would provide additional foundation to the ecological restoration of Big Creek at Crossroads and a deeper understanding of the Big Creek Watershed.



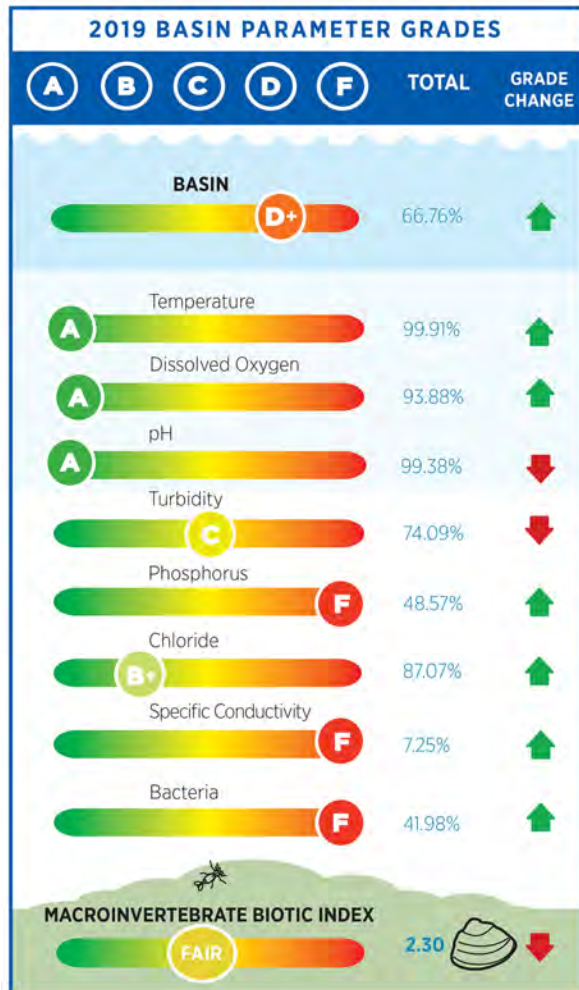
These maps show the Big Creek Watershed in green (left), and the watershed with Zone of Contribution in red from groundwater (right).

The main idea of this activity is to create a “report card” on the watershed, similar to the Milwaukee Riverkeeper report card (see below, and see Attachment with further information). This report card can be easily understood by non-technical stakeholders of Crossroads. The main metrics that should be considered include: temperature, dissolved oxygen, pH, turbidity, total phosphorus, chloride, specific conductivity bacteria, index of biotic integrity



or IBI (using an appropriate and repeatable standard) and others that might be appropriate. Given the location of an auto recycling center on the main channel of Big Creek, some types of

automotive chemical monitoring should also be considered. This might include oil, antifreeze, gasoline and transmission fluid. In addition, the potential impacts of golf course and orchard sites in the watershed and zone of contribution should be considered. Several locations that are informative should be chosen in the Big Creek watershed, knowing that much of the waterways are dry for parts of the year. Locations that are easily accessible could include the road crossings of Big Creek at Highway 42/57, Michigan Street and Utah Street. Repeated data at the same locations over a period of months and years will provide both an absolute set of parameters to assess surface water quality and a relative comparison over time.



(Left, example of Milwaukee River Basin “report card”)

## PLAN IMPLEMENTATION

### 2020 - early 2021 Work

See appendices for prior Map: *Initial Riparian Restoration Zones* and Map: *Initial Restoration Activities*. 2020 invasive species management and native species planting efforts focused on the environs of the creek.

Native tree seedling planting projects were proposed as mapped, and as described in A–F below. A reduced amount of trees were planted: 100 Quaking Aspen, 100 Red Oak, and 100 Paper Birch, within the project zones described below. This plan reworks and incorporates portions of these zones in the newly defined planting Projects.

**Upper Reach Zone:** Priority invasive species control efforts are to (a) eradicate exotic *Phragmites*; (b) reduce cover of *Phalaris* (Reed Canary Grass) by 50% in Phase One; and (c) eliminate fruiting exotic *Rhamnus* spp (Buckthorn) and *Lonicera* (shrub Honeysuckle) species in Phase One. The zone delineation skirts most of the Norway Spruce plantation; felling a few Norway Spruce per year is recommended in random patterns beginning nearest the creek. The fallen trees should be left in situ as pioneer nurse logs unless there is a need to repurpose them elsewhere at Crossroads.

Planting **A:** focused on the former straight creek channel, with White Spruce (60), Aspen (20) and Paper Birch (10).

**Mid Reach and Wishbone Zones:** Priority invasive species control efforts are to (a) eliminate fruiting exotic *Rhamnus* spp (Buckthorn) and *Lonicera* (shrub Honeysuckle) species.

Planting **B:** Cover for the creek south of the council ring should be increased, closest to the creek. This encroaches partially on the sharp-boundary meadow, but a transitional woodland planting will soften the transition while improving the forested buffer needed by the creek. Aspen (40), Black Cherry (20) and Paper Birch (30).

Planting **C:** ATC utility corridor. At the creek crossing (following culvert removal), plant Ninebark (100), a shrub that grows in a range of conditions and can provide partial shading to the creek while meeting ATC planting height restrictions.

Planting **D:** West of the creek, planting will soften the straight line edge with mesic forest species while not encroaching into the necessary open ATC corridor. Red Oak (40), White Spruce (20) and Black Cherry (20) planted in drift patterns to naturalize this transition while staying clear of the ATC corridor.

**Lower Reach Zone:** Priority invasive species control efforts are to (a) eradicate exotic *Phragmites*; (b) eliminate fruiting exotic *Rhamnus* spp (Buckthorn) and *Lonicera* (shrub

Honeysuckle) species; and (c) evaluate and adjust a control plan for invasive exotic herbaceous species in the open areas.

**E:** West of the creek is an opportunity to infill mesic forest to improve buffer for the creek. Red Oak (60), Black Cherry (40) and Paper Birch (60).

**F:** The east side of the creek in this reach is challenged ecologically by the Hanson Homestead structures and cultural and former agricultural landscapes. Aspen (40) and White Spruce (20) in an effort to again give the creek a broader buffer and a gentler interface with adjacent landscapes.

**Swale System:** Herbaceous invasive exotic species were also reduced significantly in the swale system (exotic mustards, thistles, reed canary grass, Phragmites, etc.). A plug planting project to enhance biodiversity included plugs, 100 each of Swamp Milkweed (*Asclepias incarnata*), Softstem Bulrush (*Schoenoplectus tabernaemontani*), Wool-grass (*Scirpus cyperinus*), Dark-green Bulrush (*Scirpus atrovirens*), and Water Sedge (*Carex aquatilis*), plus 100 Meadowsweet (*Spiraea alba*) shrubs.

### ***The Cove Zone:***

See Map: *Cove Restoration*

The upper portions on the Northeastern corner of the Cove comprising mostly fill have had initial restoration interventions designed by Landscapes of Place and implemented by Crossroads, Cream City Conservation and Landscapes of Place. To achieve this, more than 200 trees and shrubs were planted in 2020 to form a structured matrix of plant communities. Swales and mounds were sculpted using existing stockpiles of fill, RCG was seed-topped and seeds removed, multiple suppression cuts of the RCG were implemented and largely removed this invasive species.

One of the ecological restoration goals for this area was the establishing a series of appropriate native communities on this altered site. There is some significant latitude for the ecological restoration plan for this particular area because of the three factors: highly altered soils, altered hydrology and a high degree of community use, including the kayak launch and with a parking area. Because of all these factors, the restoration plan devised a plausible sequential experience of native Door County communities as visitors move through the site. Beginning at the east, the communities include i) northern successional mesic forest; ii) northern upland shrubland and bird sanctuary; iii) a bioswale meadow created from a required drainage swale; then west of the driving route iv) a sequence of a ridge, a bio swale, a ridge and then native sedge meadow that create the opportunity for variability in topography and species detail. This design and construction took advantage of stockpiles of fill to sculpt landscapes that will become self-sustaining, locally appropriate for local flora and fauna and interesting for visitors.

## Years One and Two (2021 and 2022)

Map: *Year One and Year Two Projects*

Note that the projects here are some of the ‘constructive’ projects, i.e. planting and seeding. ‘Management’ projects, i.e. primarily invasive species control, are discussed in the Management section.

2021 and 2022 focus on two-year grant-supported work: USFWS (Big Creek and associated wetlands) and Fund for Lake Michigan (The Cove). Projects in this period also include the first portion of SOGL projects.

The projects in this section, including some additional plant ordering in late 2021 and 2022 as described in this section, **will complete** the planting requirements for USFWS (4,000 plugs and 400 shrubs in wetlands), and for FFLM (plugs, shrubs and seed by budget funds covering 2.2 acres).

In addition, for the four-year SOGL work, the planting of 5,160 small trees and shrubs, 7,000 plugs, and seed, the 2021 and 2022 projects make progress — they will complete 1,950 trees and shrubs.

For work to complete in Years Three and Four, see following section.

This calendar proposes approximate project timing over 2021 and 2022:

<b>2021</b>	April/May/ June	<b>Project 1</b> , 175 bare-root <i>direct planting</i> . <b>Habitat Healers</b> and/or <b>Contractor/Interns</b>	Tree tubes/bamboo stakes. Drought watch. <i>Big Plant</i> .
		<b>Project 2</b> , <i>heel-in</i> 425 bare-root trees in Nursery. Staff and/or <b>Contractor/Interns</b>	Staff to separate and label group with Project #.
		<b>Project 3</b> , 175 bare-root <i>direct planting</i> . <b>Habitat Healers</b> and/or <b>Contractor/Interns</b>	Tree tubes/bamboo stakes. Drought watch. <i>Big Plant</i> .
		<b>Project 4-5-6</b> , <i>pot up</i> 375 shrubs for future planting, keep at lower Center terrace. <b>Boys &amp; Girls Club</b>	Need 2 yd topsoil on hand. Landscapes of Place will provide pots. Flag color- coded by species. Ongoing watering.

		<b>Project 7, 225 bare-root <i>direct planting</i>.</b> UW-Oshkosh Project or Habitat Healers and/or Contractor/Interns	Tree tubes/bamboo stakes. Drought watch. <i>Big Plant</i> . This could include color-coded tree labeling as described in Arboretum section and drafting of sign content by UW-Oshkosh.
		<b>Project 9-10, <i>heel-in</i></b> 515 bare-root trees in Nursery. Staff and/or Contractor/Interns	Staff to separate and label group with Project # and zone
		<b>Project 11, <i>plug planting</i></b> at Cove with Cream City Conservation in June, <b><i>seeding</i></b> by Landscapes of Place. Help from Boys & Girls Club.	Compost carrier, oats cover crop, spot herbicide treatment in May. Flagging & oversight by Landscapes of Place.
		<b>Project 12-13, <i>heel-in</i></b> 370 shrubs in Nursery. Staff and/or Contractor/Interns	Staff to separate and label group with Project # and zone
		<b>Project 14, <i>direct plant</i></b> 265 shrubs in Michigan Street wetlands and swale. Habitat Healers and/or Contractor/Interns. Seeding by Landscapes of Place.	
July/August		<b>Project 8, <i>begin planning</i></b> for Comparison Experiment Plots, Boys & Girls Club, maybe with UW-Oshkosh	May need stakes, flagging, or fencing depending on design.
September/October		<b>Project 2, <i>plant</i></b> 425 trees that are heeled-in in nursery. Habitat Healers and/or Contractor/Interns.	Flagged by Landscapes of Place. Because of budget limits, and as an area with less deer pressure?, no tree Drought watch.
		<b>Project 9-10, <i>plant</i></b> 515 trees that are heeled-in in nursery. Habitat Healers and/or Contractor/Interns.	Flagged by Landscapes of Place. No tree tubes because primarily in forested or wet areas.
		<b>Project 12-13, <i>plant</i></b> 370 shrubs that are heeled-in in nursery. Habitat Healers and/or Contractor/Interns.	Flagged by Landscapes of Place. Drought watch.

		<b>Project 14, <i>order and plant</i></b> 1000 plugs for wetland diversity. Landscapes of Place will specify and order. <b>Habitat Healers</b> and/or <b>Contractor/Interns</b> .	
<b>2022</b>	April/May/June	<b>Project 4-5-6, <i>plant</i></b> 375 shrubs that were potted up. <b>Habitat Healers</b> and/or <b>Contractor/Interns</b> .	TBD, install fence around Pocket plantings. Flagged by Landscapes of Place. Drought watch.
		<b>Project 11, <i>order and plant</i></b> additional shrubs, plugs and seed to fulfill FFLM budget requirements at Cove. <b>Cream City Conservation</b> .	
		<b>Project 14, <i>order and plant</i></b> 1500 plugs for wetland diversity. Order and plant 100 wetland shrubs for wetland diversity. Landscapes of Place will specify and order. <b>Habitat Healers</b> and/or <b>Contractor/Interns</b> .	
	September/October	<b>Project 14, <i>order and plant</i></b> 1500 plugs for wetland diversity. Landscapes of Place will specify and order. <b>Habitat Healers</b> and/or <b>Contractor/Interns</b> .	

Summary of supplies needed (Crossroads to order, all Nursery supplies Ref #53):

*Nursery Supplies Ref #53:*

At least 600 Blue-X Tree Shelters, 24", Forestry Suppliers #17012, ~\$750.

500 Bamboo Stakes, 1/2" x 5', 2 Bundles of 250, cut in half by Crossroads, Forestry Suppliers #17053, ~ \$175.

2 CY topsoil for potting.

May need stakes or deer fencing (especially for Project 8, and potentially 4-5-6 in 2022).

*Cover crop seed Ref #39b:*

2 CY super sack of Purple Cow activated compost for two years' seeding use.

100 lb oats for cover crop.

Scheduled for delivery:

1800 DNR bare-root in boxes, pick up at Sturgeon Bay DNR, mid-April (Landscapes of Place will forward notice)

550 Cold Stream Farms bare-root in boxes, shipped direct to Crossroads, after April 1 (Landscapes of Place will forward notice)

49 flats of plugs from Taylor Creek, delivered direct to Crossroads, late May (Landscapes of Place will forward notice and be on hand for unloading)

On hand:

3.94 lb native seed, Taylor Creek, Landscapes of Place

Pots for Projects 4-5-6, Landscapes of Place

General supplies needed (Crossroads):

Gloves

Boots

Tree-planting dibbles

Spades

Trowels

Small augers for plug and bare-root tree holes

5-gallon buckets

Pruners, pruning saws, loppers

Flagging tape of different colors for tree labels and for (temporarily) marking work zones

Watering tank, moveable

## **Projects:**

### **Project 1:** Soften Edge, south of Utility Corridor

Bare-root trees:

50 1-0 Black Cherry (DNR order, arriving approximately April 15)

100 SL Aspen (DNR order, arriving approximately April 15)

25 Ironwood (Cold Stream Farms, arriving after April 1)

*This plants 175 of the 5,160 SOGL required (Ref #37)*

### **Project 2:** Diversity Pocket, west of tributary

Bare-root trees:

100 SL Basswood (DNR order, arriving approximately April 15)

100 2-0 Black Cherry (DNR order, arriving approximately April 15)

100 3-0 Balsam Fir (DNR order, arriving approximately April 15)

100 2-0 Sugar Maple ((DNR order, arriving approximately April 15)

25 Muscledwood ((Cold Stream Farms, arriving after April 1)

*This plants 425 of the 5,160 SOGL required (Ref #37)*

### **Project 3:** Successional Edge Pocket, just east of Hanson Bridge

Bare-root trees:

50 1-0 Black Cherry (DNR order, arriving approximately April 15)

100 SL Aspen (DNR order, arriving approximately April 15)

25 Ironwood (Cold Stream Farms, arriving after April 1)

*This plants 175 of the 5,160 SOGL required (Ref #37)*

### **Project 4-5:** Shrubland Pockets on slopes east of Hanson Bridge

Divide the following into two Pocket planting zones.

Bare-root trees and shrubs:

50 Beaked Hazelnut (Cold Stream Farms, arriving after April 1)

75 Alleghany Serviceberry (Cold Stream Farms, arriving after April 1)

50 Staghorn Sumac (Cold Stream Farms, arriving after April 1)

*This plants 175 of the 5,160 SOGL required (Ref #37)*

### **Project 6:** Shrubland Pocket building inward at Astronomy oldfield SW corner

Bare-root shrubs:

25 Nannyberry (Cold Stream Farms, arriving after April 1)

*This plants 25 of the 5,160 SOGL required (Ref #37)*



**Project 7:** Arboretum Boreal Segment, west/northwest section of Arboretum

In 2022, Hemlock, Balsam Poplar and others should be ordered and added as part of the SOGL requirements and to diversify this area.

- 100 3-0 Balsam Fir (DNR order, arriving approximately April 15)
  - 25 Witchhazel (Cold Stream Farms, arriving after April 1)
  - 100 2-0 Sugar Maple ((DNR order, arriving approximately April 15)
- This plants 225 of the 5,160 SOGL required (Ref #37)*

**Project 8:** Comparison Experiment Plots

This project may be a long-term Boys & Girls Club project. It may work with the guidance of UW-Oshkosh interns, if that is a good match. The purpose of this is really to begin a re-forestation-from-oldfield experiment with comparative plots of different methods and a reference plot. For 2021, we recommend the planning and design take place, and initial preparation work, which will likely be different in different plots. Planting could begin in 2022 and encompass both woody and herbaceous plants, as well as seed, from SOGL grant funds.

**Project 9-10:** Replacements, in far upper reach zone east of Big Creek; and at lower Cove — where substantial buckthorn has been removed

Cove:

- 200 2-0 Silver Maple (DNR order, arriving approximately April 15)
- 100 2-0 Tamarack (DNR order, arriving approximately April 15)
- 15 Speckled Alder (Cold Stream Farms, arriving after April 1)
- 50** Silky Dogwood (DNR order, arriving approximately April 15)
- 10 American Elm (Cold Stream Farms, arriving after April 1)
- 15 Cottonwood (Cold Stream Farms, arriving after April 1)

Michigan Street:

- 100 2-0 Tamarack (DNR order, arriving approximately April 15)
- 15 American Elm (Cold Stream Farms, arriving after April 1)
- 10 Cottonwood (Cold Stream Farms, arriving after April 1)

*This plants 465 of the 5,160 SOGL required (Ref #37)  
and 50 of the 400 USFWS required (Ref #36).*

**Project 11: Meadow plugs and seed, upper zones at The Cove**

The plugs below, planted in spring 2021, comprise about 30% of the FFLM budget. We recommend in 2022 acquiring larger sized shrubs for extended planting, and another similar plug planting, to complete this project. This could include diversifying the Hidden Pond area.

The seed below plus cover crop and carrier comprise about 50% of the FFLM budget. We recommend in 2022 acquiring a similar seed order for seeding an expanded area. This could include diversifying the Hidden Pond area.

In 2021: Plugs will be planted in three zones in the upper Cove, supplementing the September 2020 tree and shrub planting: Swales, Meadow, and Shrubland. Plugs will be planted through the services of Cream City Conservation in June 2021. Plugs will be delivered to Crossroads in late May in 49 flats, to be kept watered in the nursery until planting time. Landscapes of Place will flag and oversee the planting in drifts. Advance preparation will include selective herbicide of remaining Reed Canary Grass and Smooth Brome (cool-season grasses) in late May. This represents 1604 plugs. Within the specified zones, plugs will be grouped 1’ apart and with groupings of 2-3 species for maximum impact.

**Plugs:**

Swales:		Meadow:	
32	Swamp Milkweed	32	Nodding Wild Onion
32	<i>Carex stipata</i>	32	Meadow Anemone
32	<i>Carex vulpinoidea</i>	32	Coreopsis
32	Robin’s Plantain	32	Canada Wild Rye
32	Grass-leaved Goldenrod	32	Porcupine Grass
32	Dudley’s Rush	32	Vanilla Grass
32	Blue Lobelia	32	June Grass
32	Golden Ragwort	32	Rough Blazing Star
32	Obedient Plant	32	Prairie Blazing Star
32	Blue Vervain	32	Wild Bergamot
		32	Dotted Mint
		32	Stiff Goldenrod
		32	Yellow Coneflower
		32	Black-eyed Susan
		32	Brown-eyed Susan
		100	Little Bluestem
		32	Oldfield Goldenrod
		32	Showy Goldenrod
		32	Indian Grass
		32	Smooth Blue Aster
		32	New England Aster
		32	Sky-blue Aster
		32	Hoary Vervain
		32	Golden Alexanders

Seed will be combined with compost carrier (suggest getting a 2 CY super sack of Purple Cow activated compost for 2021 seeding use). After site preparation, seed will be hand-broadcast by small seed and fluffy seed groups within each zone, following plug planting. 100 lb of annual oats for cover crop.

Seed:

Swales:		Meadow:	
4 oz	<i>Carex bebbii</i>	6 oz	Nodding Wild Onion
6 oz	<i>Carex vulpinoidea</i>	2 oz	Meadow Anemone
2 oz	Cinnamon Willow Herb	2 oz	Common Milkweed
8 oz	Blue Vervain	32 oz	Canada Wild Rye
		64 oz	Slender Wheatgrass
Shrubland and Bird Sanctuary:		6 oz	Silky Wild Rye
4 oz	Showy Tick-trefoil	32 oz	Virginia Wild Rye
4 oz	Bottlebrush Grass	4 oz	Porcupine Grass
2 oz	Tall Anemone	8 oz	June Grass
		4 oz	Rough Blazing Star
		8 oz	Wild Bergamot
		2 oz	Dotted Mint
		6 oz	Leafy Satin Grass
		12 oz	Evening Primrose
		2 oz	Stiff Goldenrod
		6 oz	Yellow Coneflower
		12 oz	Brown-eyed Susan
		64 oz	Little Bluestem
		4 oz	Early Goldenrod
		2 oz	Oldfield Goldenrod
		64 oz	Indian Grass
		4 oz	Hoary Vervain
		8 oz	Golden Alexanders

**Project 12-13:** Mixed Shrubs, in two zones: the gradient near the stream at the Utility Corridor; and the gradient at the Cove supplementing the 2020 plantings.

Divide the following into the two zones, and in a gradient from lowland to upland as listed.  
Cove:

- 100 Ninebark (DNR order, arriving approximately April 15)
- 25 Fragrant Sumac (Cold Stream Farms, arriving after April 1)
- 50 Beaked Hazelnut (Cold Stream Farms, arriving after April 1)

Utility Corridor:

- 50** SL Silky Dogwood (DNR order, arriving approximately April 15)
- 10 Black Elderberry (Cold Stream Farms, arriving after April 1)
- 10 Winterberry (Cold Stream Farms, arriving after April 1)
- 100 Ninebark (Cold Stream Farms, arriving after April 1)
- 25 Fragrant Sumac (Cold Stream Farms, arriving after April 1)

*This plants 320 of the 5,160 SOGL required (Ref #37)  
and 50 of the 400 USFWS required Ref #36)*

**Project 14:** Wetland Shrubs, Plugs and Seed

This two-year project plants most of the shrubs and seed in 2021, and adds plugs and additional shrubs in late 2021 and in 2022.

A total of 4,000 plugs for wetland diversity (USFWS) can be completed over three planting seasons. Although this project is shown on the map only at the Michigan Street sedge meadow, future plantings should extend to North Bridge, to the swale system, the Hanson Bridge area, and The Cove. Plugs orders will be done by Landscapes of Place, here recommending 1000 for Fall 2021, 1500 for Spring 2022 and 1500 for Fall 2022.

Shrubs should be planted as conditions allow in late spring and early summer 2021, mixing the Elderberry and Winterberry in particular at visible locations near Michigan Street.

- 15 Speckled Alder (Cold Stream Farms, arriving after April 1)
- 200** SL Silky Dogwood (DNR order, arriving approximately April 15)
- 20 Black Elderberry (Cold Stream Farms, arriving after April 1)
- 30 Winterberry (Cold Stream Farms, arriving after April 1)

*This plants 65 of the 5,160 SOGL required (Ref #37)  
and **200** of the 400 USFWS required (Ref #36). 100 additional wetland shrubs will need to be ordered and planted in 2022 to complete the USFWS commitment.*

After site preparation, seed should be hand-broadcast by species by Landscapes of Place, in the upper reach sedge meadow, and also in the swale. No cover crop.

Seed:

Michigan Street sedge meadow, also swales			
4 oz	<i>Carex brevior</i>	2 oz	Ohio Goldenrod
4 oz	<i>Carex crinite</i>	2 oz	Riddell's Goldenrod
2 oz	<i>Carex granularis</i>	4 oz	Softstem Bulrush
5 oz	<i>Carex hystericina</i>	6 oz	Green Bulrush
4 oz	<i>Carex scoparia</i>	4 oz	Woolgrass
2 oz	<i>Carex sparganoides</i>	4 oz	Common Bur-reed
2 oz	<i>Carex stipata</i>	4 oz	Purple Meadow Rue
4 oz	Joe Pye Weed	4 oz	Ironweed
2 oz	Dudley's Rush		
2 oz	Common Rush		
2 oz	Joint Rush		

### *Years Three and Four (2023 and 2024)*

At The Cove, installation of a puncheon-style boardwalk will provides access to the pier at the south end of the cove. The boardwalk does not impact or impede hydrology. It should incorporate a jog in order to enhance visitor experience and mystery, supporting the idea of secretive marsh birds; plantings will extend to the jog to enhance the experience of mystery. This boardwalk is intended for birding (especially for secretive marsh birds), hikers, anglers, and restoration access to these more remote areas of The Cove.

Planning for ‘constructive’ projects supported by SOGL grant funding should be planned and detailed in 2021-2022, based on progress and lessons learned in 2021, and on the Interventions framework.

Remaining plantings to be completed for SOGL grant requirements in years three and four include:

Approximately 3000 trees and shrubs for habitat quality (Ref #37)

These will be addressed to the Reforestation Comparison Experiment Plots, to additional Soften Edges projects, and additional Oldfield and Woods Pocket projects.

Native Seed and cover crop seed (Ref #39) and 7000 plugs for habitat quality (Ref #38)

These will primarily implement the Meadow Plug Plantings and Meadow Swath Interventions (which are not addressed in 2021 and 2022).

#### ***Notes on Meadow Swath Interventions:***

If feasible, it would be helpful to begin preparation of one or more meadow swaths in 2021 or 2022 in anticipation of 2023 or 2024 seeding.

Because of the apparent disturbance caused by preparation, “restoration in progress” signs may be helpful.

- Swaths to be selected and flagged based on low-quality zones with low presence of native species; higher presence of weeds (especially those altering ecological succession); important to visitor experience; and facultative benefit (will this planting when mature help spread seeds and increase adjacent diversity?).
- Swath shape, width and position to be laid out so it is practical for equipment access and mowing.
- Number of swaths under preparation in any season should depend on availability of resources.
- Over many years it is envisioned that the entire area will be converted to native species dominance.

Preparation and location will greatly depend on conditions (including specific weeds) and availability of resources and budget. Generally, it is preferred to not disturb the soil by tilling, as without careful management that tends to worsen the weed problem.

The goal should be one or two seasons of preparation to substantially remove weeds prior to seeding. The soil contains weed seeds. The first effort at weed control will often give those seedbank weed seeds optimal conditions to germinate, hence multiple weed control efforts are needed. One full summer of weed control, then the subsequent April-June for cool-season weed control, is minimum desired preparation.

For conditions in the meadows at Crossroads, preparation is expected to comprise monthly mowing beginning in June followed by spot herbicide or manual weed removal. If Canada thistle is an issue, hand-removal prior to flowering is effective. If RCG is present, herbicide will be necessary. Where spotted knapweed is a problem, spring spot herbicide of the basal rosettes is effective. Following mowing/herbicide treatments, annual buckwheat can be seeded to help suppress weeds. The last mowing prior to native seeding should mow off buckwheat before it sets seed, so there will not be significant amounts of it that can suppress native seedlings. At any time, annual oats is a helpful cover crop. In the fall during prep, seeding winter wheat may be helpful.

Prescribed burns could be considered for both the preparation phase and longer-term maintenance. Burns can sometimes be used for community engagement. Burn breaks would need careful consideration. Although fire was not a part of natural communities here, it might still be a useful management tool.

Timing of seeding can be spring (June), fall (after mid-September), or winter (frozen ground, thin or no snow cover, or into snow on warmer days where it melts into snow). Fall and winter seeding have the benefit of immediate natural cold stratification, needed for germination of some species (e.g. some forbs and sedges). Fall favors cool-season prairie grasses which will germinate in the fall when seeded; seeding compositions should account for that.

As a general guideline for upland meadows, seed mix to include 1/3 *Poaceae*, 1/3 *Asteraceae*, 1/3 all other families; and approximately equal proportions by weight of non-conservative (C value 2-4), somewhat conservative (C value 5-7), and conservative (C value 8-10) native species.

Hand-broadcast with carrier is recommended, along with annual oats as cover crop for spring and fall seedings.

## *Future Years 2025 and beyond*

After an intensive four years, a collective breath of relief and feeling of accomplishment will be called for!

Substantial habitat transformation over these four years will have significantly removed invasive exotic plants, and significantly added native plants through site-specific projects. These projects have begun to develop the structure of the future forested habitats — all at different stages.

Although much of Crossroads will remain in need of transformative steps toward the long-term restoration target communities, aftercare of the work in the first four years is just as important. We must protect the progress made — preventing herbivory where practical, monitoring for weed flushes and dealing with them, doing follow-up invasive species control of plants emerging from the still-existing seedbank.

The Bradley Method ([The Bradley Method of Bush Regeneration](#), Joan Bradley 2002, Australia, Reed New Holland; described in [Project Planning for Ecological Restoration](#), Rieger, Stanley and Traynor, 2014, Island Press) describes a basic approach to aftercare in the context of invasive species, summarized as the following:

1. *Prevent deterioration of areas not experiencing invasive species infestation* — try to keep problems from starting. One example of this is the Arboretum area, whose herbaceous flora currently has few significant weed problems, but is susceptible to infestation from adjoining areas. Watch for this and try to keep problems from starting. Another example is the lower terrace flora at The Cove — do not let Reed Canary Grass or other weeds get a toehold.
2. *Improve the next best* — many of the projects in the first four years are focused on improving the ‘next best’, and have been coupled with invasive species control work. Ongoing interventions of the same kind should be an ongoing effort at Crossroads.
3. *Hold the advantage gained* — the removal of Buckthorn and Reed Canary Grass and Phragmites over the past several years is a very transformative aspect. Seedlings remain. Make sure to spend enough time preventing any seedling density from growing.
4. *Cautiously move into infested areas* — hold your edges and move into infestations when you have resources; do not over-extend with a haphazard weed approach.
5. *Make periodic surveys to assess.*

Along with aftercare, continue interventions toward the restoration target communities.

Where prior projects, both ‘management’ and ‘constructive’, have made progress, new work can seek additional completion of the habitats.

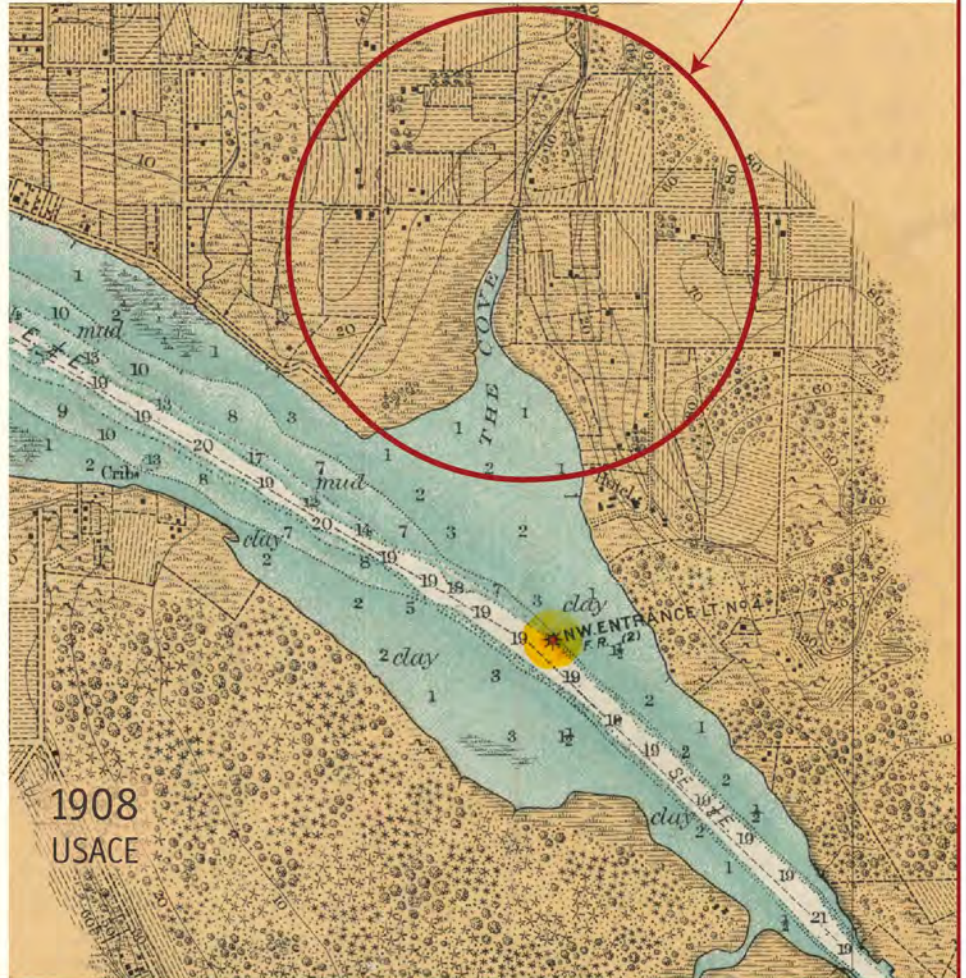
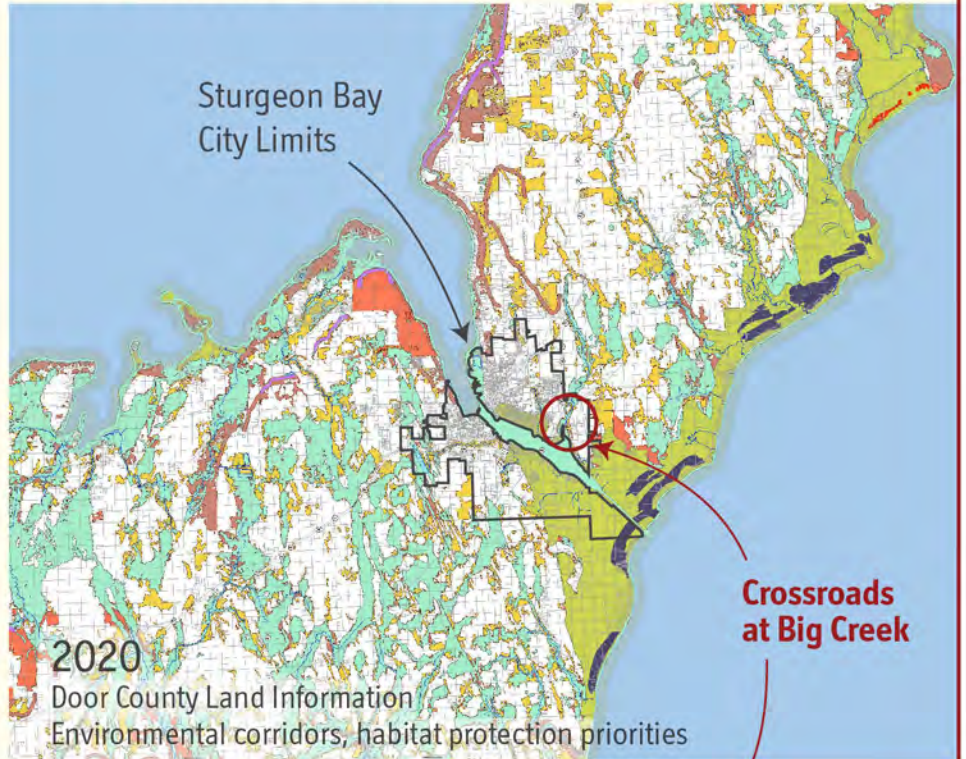
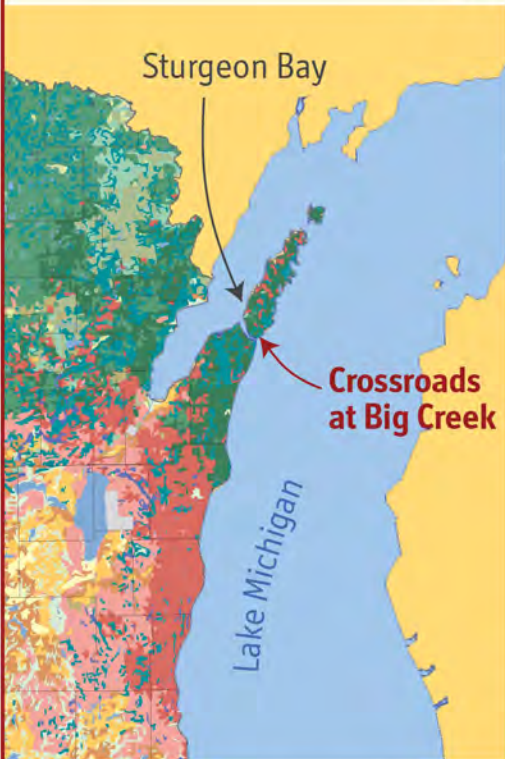


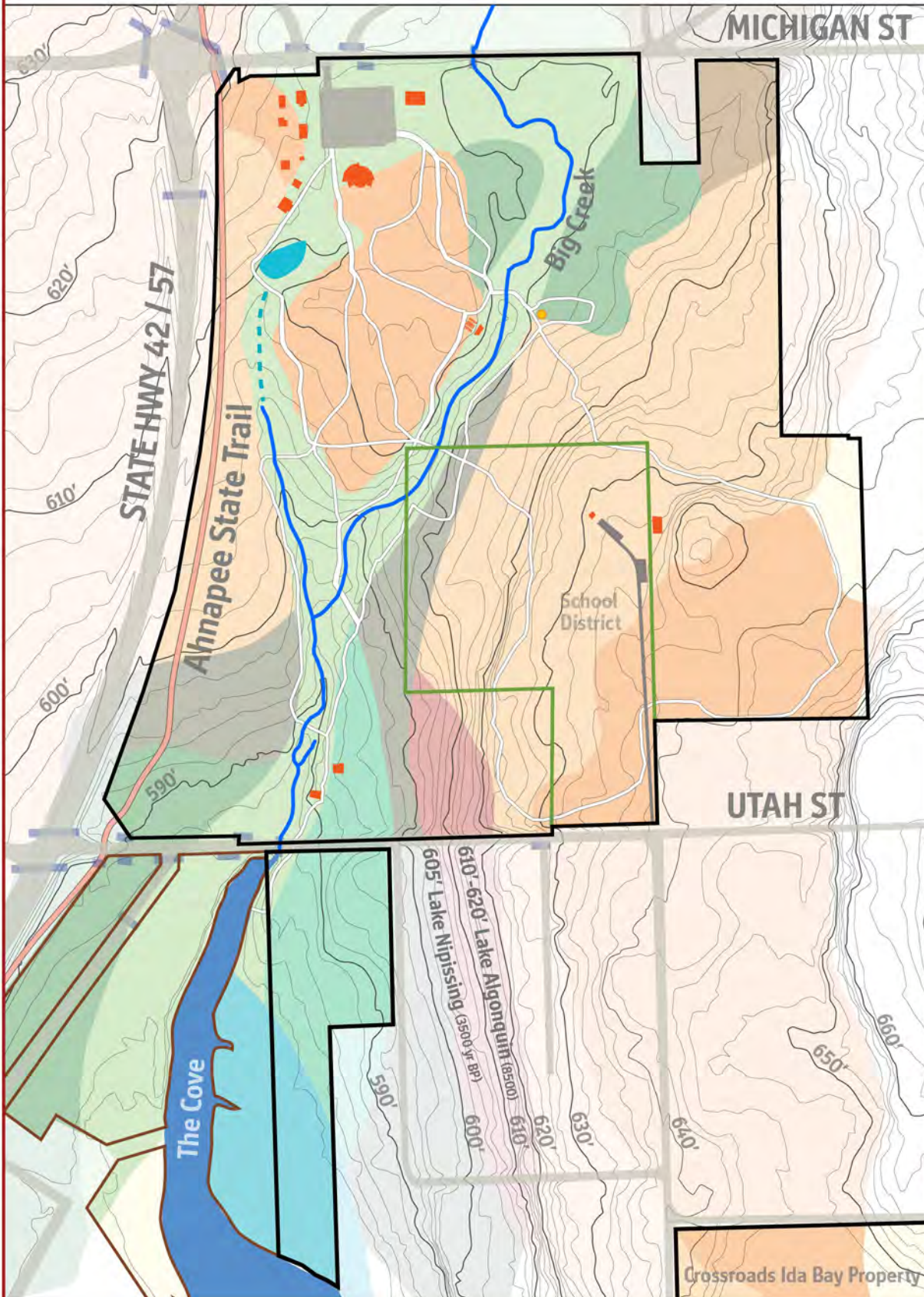
One example of this is forest herbs. In removing woody invasive species, and in planting Pockets and Softening Edges to expand forest habitat, we have not yet added herbaceous plants in the forested areas. There are two key reasons to delay this. First, many forest herbs have long-lived seed, and there is a potential native seedbank resource in the soil. Ongoing surveys may identify some native species that are able to emerge or expand on their own. This is expected particularly in areas of substantial Buckthorn removal. Second, many forest herbs require the development of woody structure and the accompanying development of soil conditions, particularly leaf litter and organic content. They require this not just for nutrients but for microhabitat conditions that allow their growth in spring prior to tree leaf-out. There is no sense attempting to introduce these plants until conditions have developed to support them. Over time, though, the re-introduction of forest herbs where missing will be an important component of working toward completeness.

Another example will happen with the completion of the biotic surveys in the fourth year. Comparison with earlier data may identify clear habitat priorities in order to directly support particular wildlife that have found their way to Crossroads.

Helpfully, Crossroads' Lands Committee and staff will be an ongoing resource to assess conditions and make plans to continue the ongoing stewardship of Crossroads habitats with the help of a steady and engaged Habitat Healers Corps.

**Big Creek Estuary in its Lake Michigan Context**





### Wetland-affiliated soil types

- Ax** Angelica loam  
Subject to frequent flooding for long periods. Alder, cedar, ash.
- SoA** Solona loam  
Occasional flooding for brief periods. Elm, ash, cedar.
- YaA** Yahara fine sandy loam  
Old glacial lake plains. Wet. Wetland wildlife habitat.
- Sa** Saprists  
Nearly level areas of muck soils covered by shallow water during most of the year.

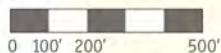
### Transitional soil types

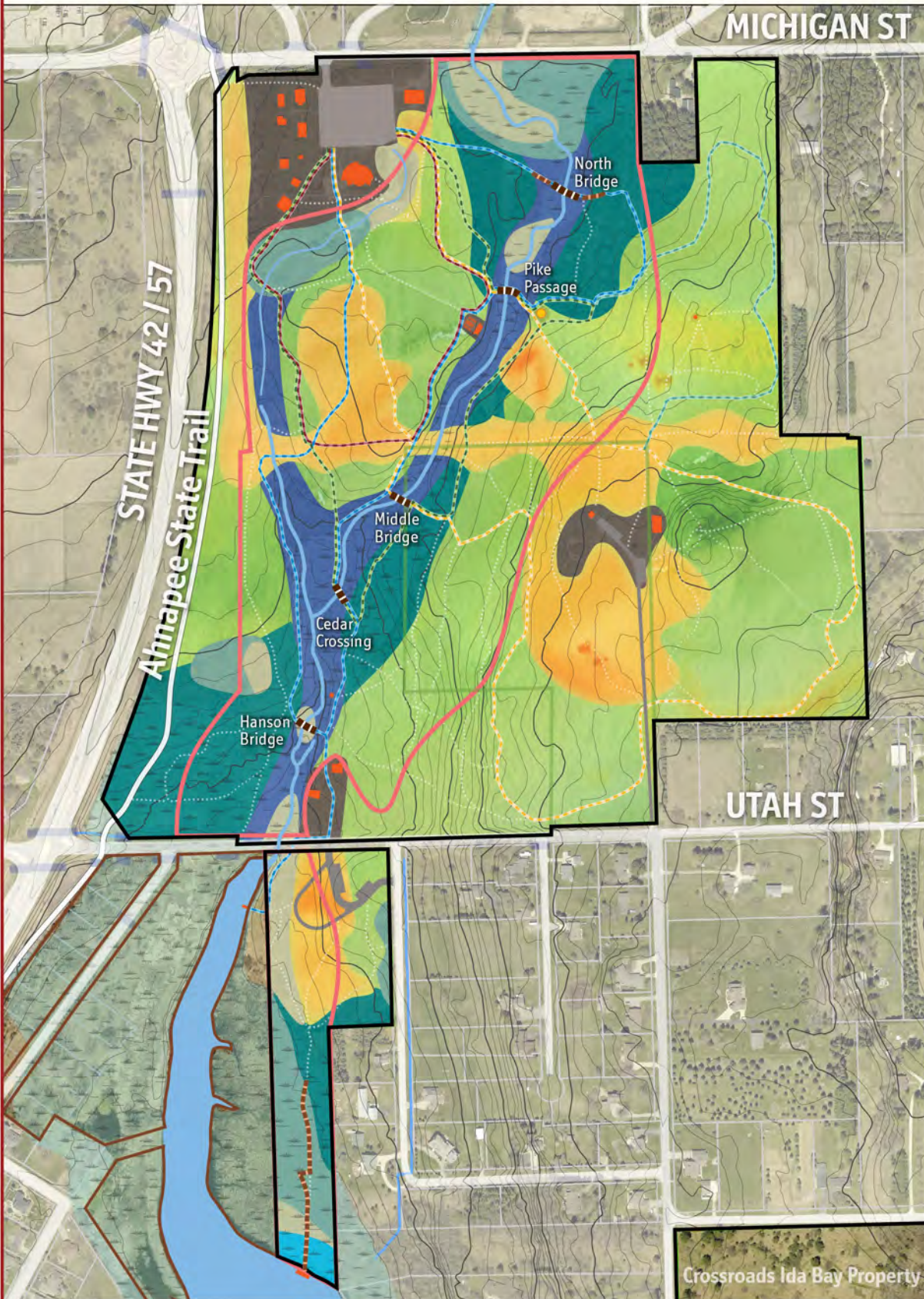
- OvB** Omena variant sandy loam  
In seepage areas. Can be seasonally saturated. Elm, white ash, cedar, sugar maple.

### Upland soil types

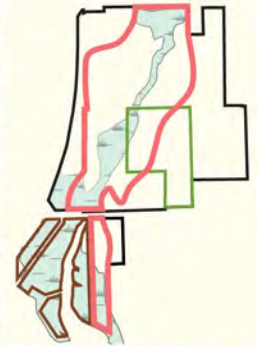
- Lo** Longrie loam B/C  
Glacial till over dolomite bedrock. Red oak, sugar maple, birch.
- 7208** Onaway-Ossineke fine sandy loam (Emmet). Glacial till. Sugar maple, red oak, white pine.
- SvC** Summerville loam  
Glacial till. Sugar maple, red oak. Northern hardwoods.
- OmB** Omena sandy loam  
Glacial till and morainic ridges. Sugar maple, red oak, beech.

Mapped culverts





- Door County Meadow
- Northern Mesic Forest
- Sedge Meadow
- Alder Thicket /Shrub Carr
- Northern Wet-Mesic Forest (Riparian)
- Northern Wet-Mesic Forest (Boreal)
- Emergent Marsh
- Cultural Areas



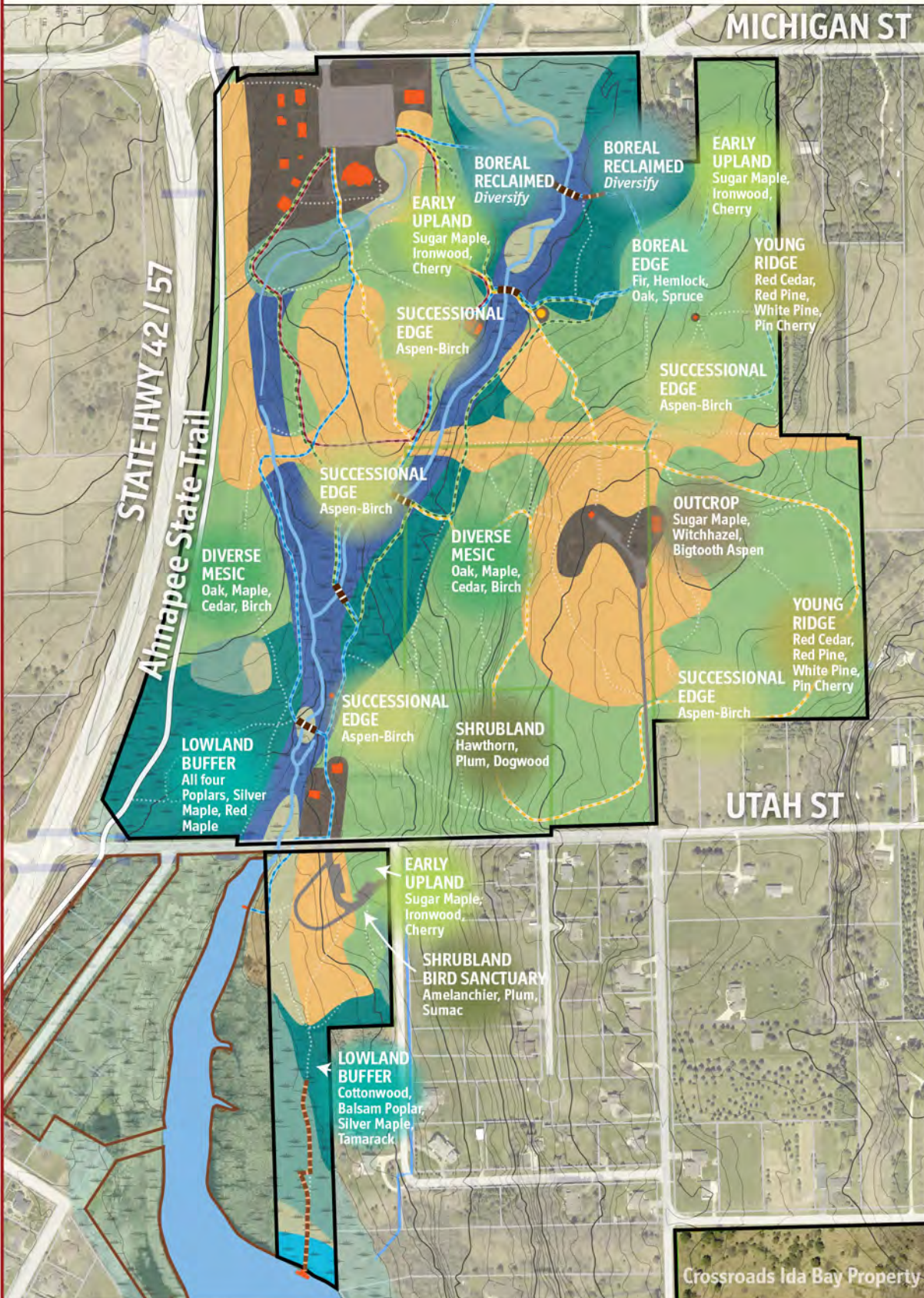
- Habitat Trails
- Bridges
- Boardwalks
- Structures

- 2021-2024 Project Area (65 acres)
- Mapped Wetlands

- 125 Acres:
- 105 Owned by Crossroads
- 20 Managed by Crossroads
- WDNR



0 100' 200' 500'



**NORTHERN MESIC FOREST**

**SHRUBLAND**

Shrubland trajectory is an effective strategy in oldfields, and provides valuable habitat over the intervening decades.

**SUCCESSIONAL EDGE**

For early seral forest communities, aspen and birch play a facilitative role in the trajectory toward forest.

**YOUNG RIDGE**

On ridges at the east, unique young woodlands of pine, red cedar, and pin cherry are already in progress.

**EARLY UPLAND**

Areas of already re-establishing woods, buffered by adjoining forest canopy, can be strengthened with diversity of species and structure.

**OUTCROP**

The high point at Crossroads is a distinctive rock outcrop; planting following IE removal should support its specialness.

**DIVERSE MESIC**

Mesic to Wet-Mesic is a transition. With adjoining forest or riparian buffers, add cedar and oak, and anticipate a developing understory flora.

**BOREAL EDGE**

Adjoining a high-quality boreal forest patch, the northwestern segment of the Arboretum will enlarge this forest.

**NORTHERN WET-MESIC FOREST**

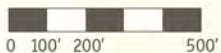
**BOREAL RECLAIMED**

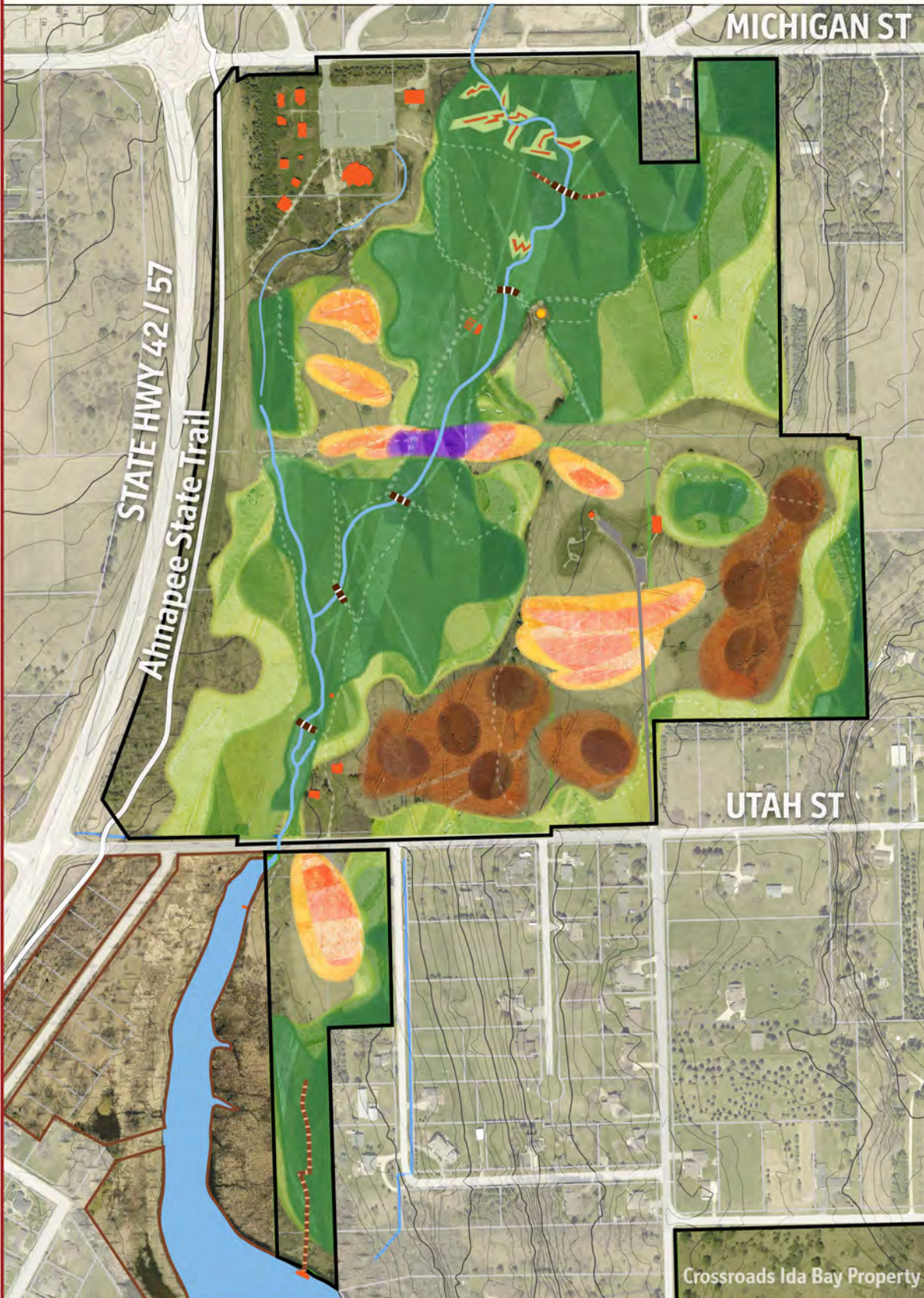
Norway Spruce plantations will see a portion of these exotic trees incrementally removed in winter, protecting habitat snags with cavities, supplemented with diversity plantings.

**LOWLAND BUFFER**

The Lower Reach Zone is missing its forest. Currently mostly an oldfield, this area is an opportunity for wet-mesic forest comparison plantings.

The Lower Cove is being significantly altered by removal of dominating buckthorn, and needs re-planting with species to thrive in varying water levels.





**1. Strengthen Big Creek's Floodplain Connection**



Incrementally add large woody debris, messy and irregular, encouraging flow into flood terraces. Monitor in real time.

**2. Shade the Creek**



The Utility Corridor creates a gap in the creek's forest canopy. Mitigate this with a gradient of riparian to upland shrubs.

**3. Buffer Forests**



A number of restoration steps work to increase forest cover, gradually expanding outward to reconnect and reduce edges and fragmentation. Eventually this also sequesters carbon.

**4. Use Widely Adapted Species**

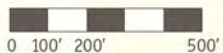


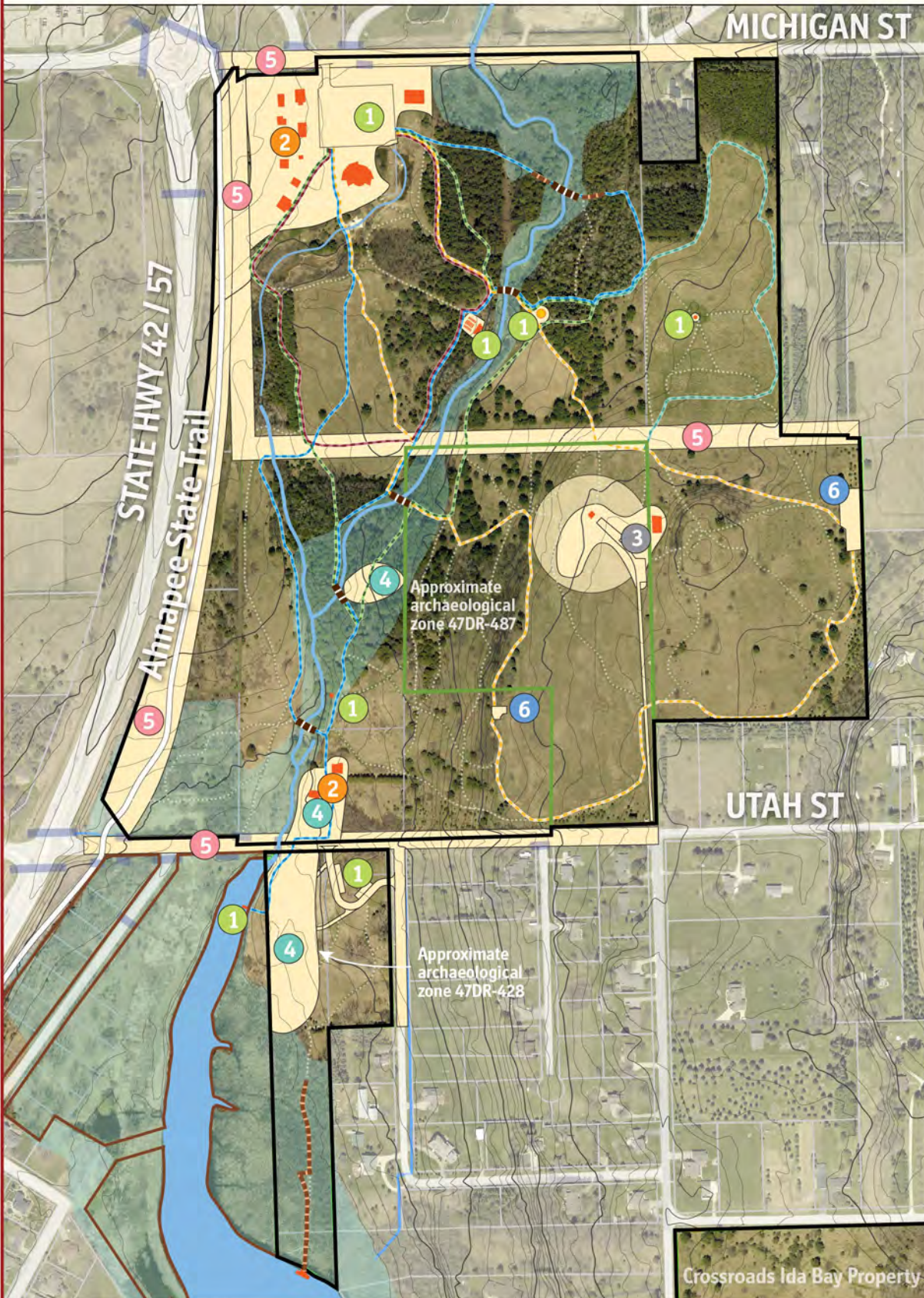
Oldfield reforestation strategies with intermediate shrubland stages will use many species with natural ranges to the south and wide environmental amplitudes; species that can facilitate climate transitions if necessary.

**5. Build Meadow Soils with Species Diversification**



Meadow soils are important for carbon storage when diverse with deep-rooted plants. Diversification will increase this capacity.





- 1** Learning Center and Affiliated Structures  
Maintenance Area  
Nursery  
Council Ring  
Amphitheater  
Arboretum/Pavilion  
Overlook  
Kayak Launch
- 2** Historic Buildings/Sites  
Historic Village  
Hanson Homestead
- 3** Astronomy Center
- 4** Native Peoples Activity
- 5** Utilities, Roads, Easements, Trail  
Utility Corridors  
Utah Street  
Michigan Street  
South 20th Place  
Ahnapee State Trail
- 6** Orchard Mix Sites  
Approx. locations



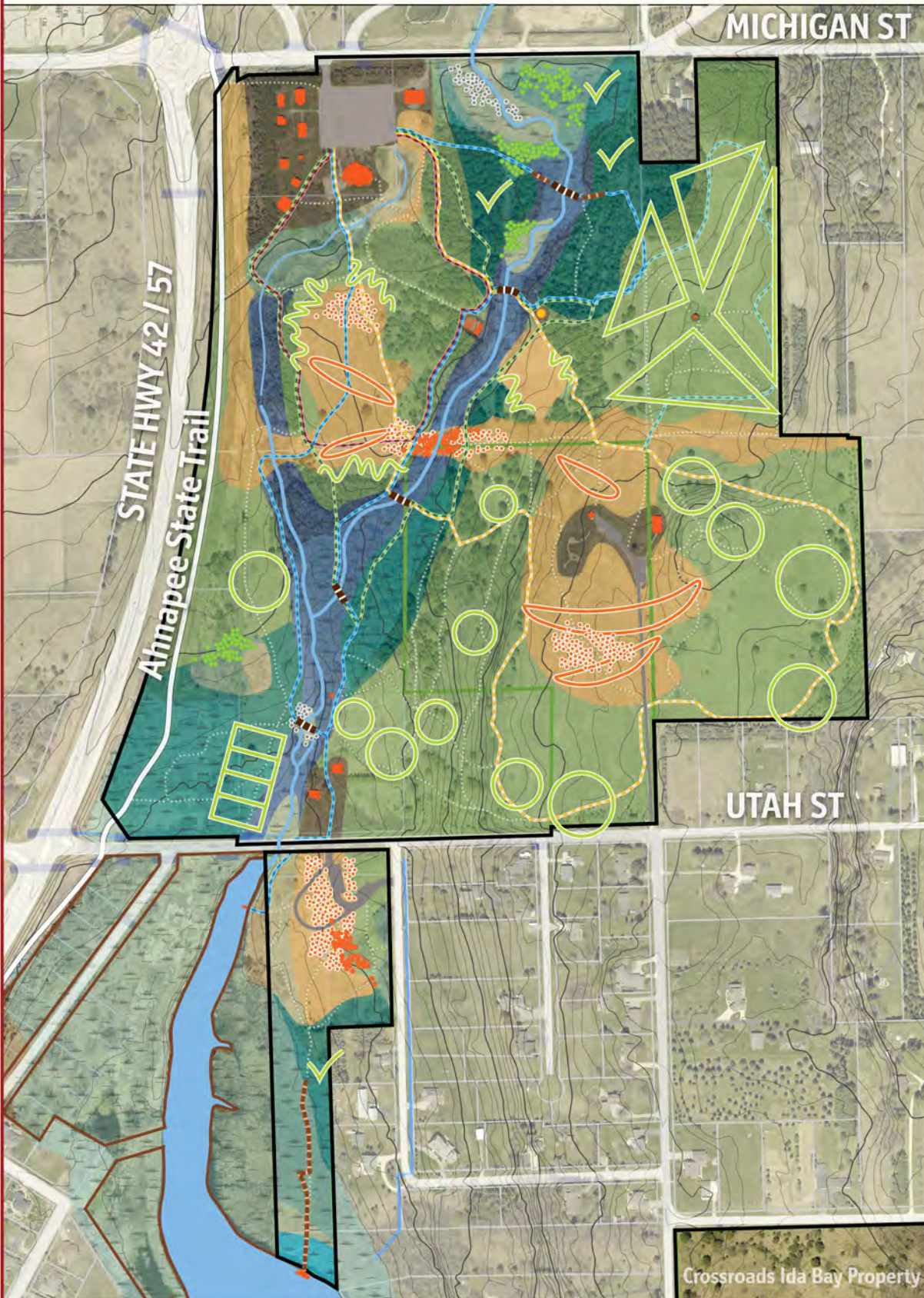
- Habitat Trails
- Bridges
- Boardwalks
- Structures

Mapped Wetlands

- 125 Acres:
- 105 Owned by Crossroads
- 20 Managed by Crossroads
- WDNR



0 100' 200' 500'



## FOREST INTERVENTIONS

SOFTEN EDGES  
In-plant trees in irregular patches and intrusions, breaking up straight edges

OLDFIELD AND WOODS POCKETS  
Plant trees/shrubs in pockets, simplifying preparation, care, and perception

ARBORETUM SEGMENTS  
Re-focus Arboretum quadrants on distinct sub-habitats with additional tree/shrub planting and herbivory protection

COMPARISON EXPERIMENT PLOTS  
Prepare and conduct re-forestation comparison plots, using different methods including a reference plot

REPLACEMENTS  
In plantation zones as Norway Spruce is slowly removed, and where dense buckthorn is removed, in-plant native trees

## MEADOW INTERVENTIONS

MEADOW SWATHS  
In areas with few natives, prepare fully and seed in drifts and swaths crossing trails

MEADOW PLUG PATCHES  
In areas of less diversity and high visibility, plant plugs to enhance diversity and resilience, and as seed source

WETLAND PLUG PATCHES  
Same in sedge meadow, and also to small meadow near Hanson Bridge

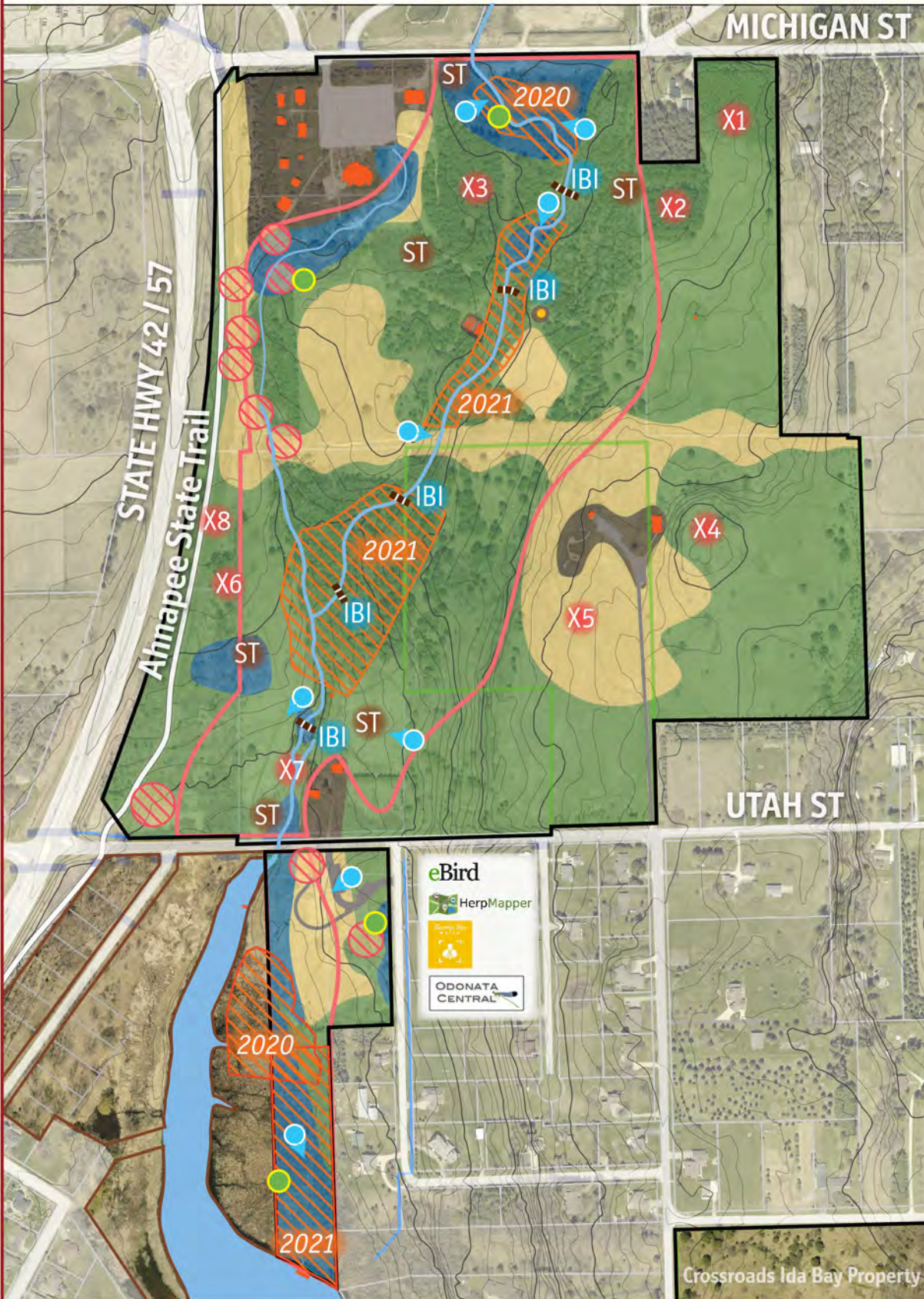
MIXED SHRUB SCATTERS  
In utility corridor near stream crossing, plant a transect of riparian to upland shrubs, to meet utility requirements while helping shade/buffer stream

WETLAND SHRUB SCATTERS  
In Alder Thicket / Shrub Carr zones, diversify species and structure with native shrub plantings, species new to site



0 100' 200' 500'





## MANAGEMENT

**2021** Wetland Invasive Exotic Cut-Stump

NR107 Permit Zones for Buckthorn in stream corridor identify work priorities

Phragmites

PAMF-Tracked Phragmites patches to control

**X1** Selected Other Invasive Exotic

Selected other known invasive patches are shown. Seasonal surveys will further identify. Priorities regularly discussed with land management team

## TESTING AND MONITORING

**ST** Soil Test Questions

In addition to overall soil analysis, these spots will address specific questions to guide restoration

Acoustic Monitors

Four acoustic monitors will record and evaluate bird and frog calls (Preliminary locations, to be adjusted)

Photo Points

Repeat photo points to be established and staked, with seasonal photos recorded

Stream Corridor Restored

NR107 permit zones plus coverage estimate will measure Stream Feet restored

Meadow and Forest Restored

Meadow and Forest Restored by area will be measured by staked project zones for planting or upland invasive species

Vegetation Survey

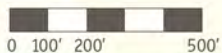
Timed Meander Surveys will cover three overall zone types and record using Crossroads plant species checklist

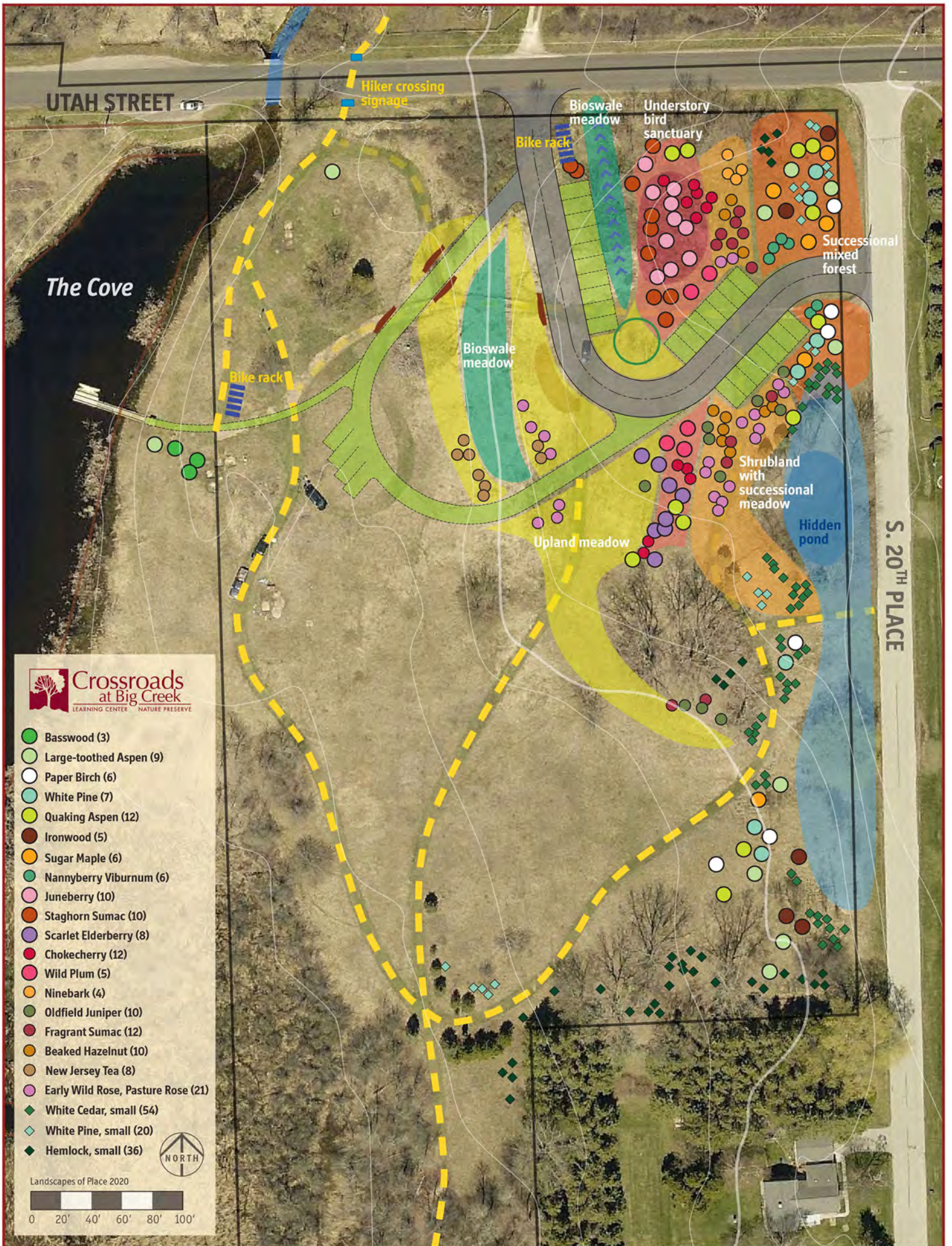
Stream Index of Biotic Integrity

At each bridge, Stream IBI will be recorded following protocol

Community Science

Naturalist will lead community members in recording bird, herpetofauna, bumblebee and dragonfly sightings



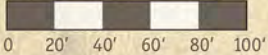


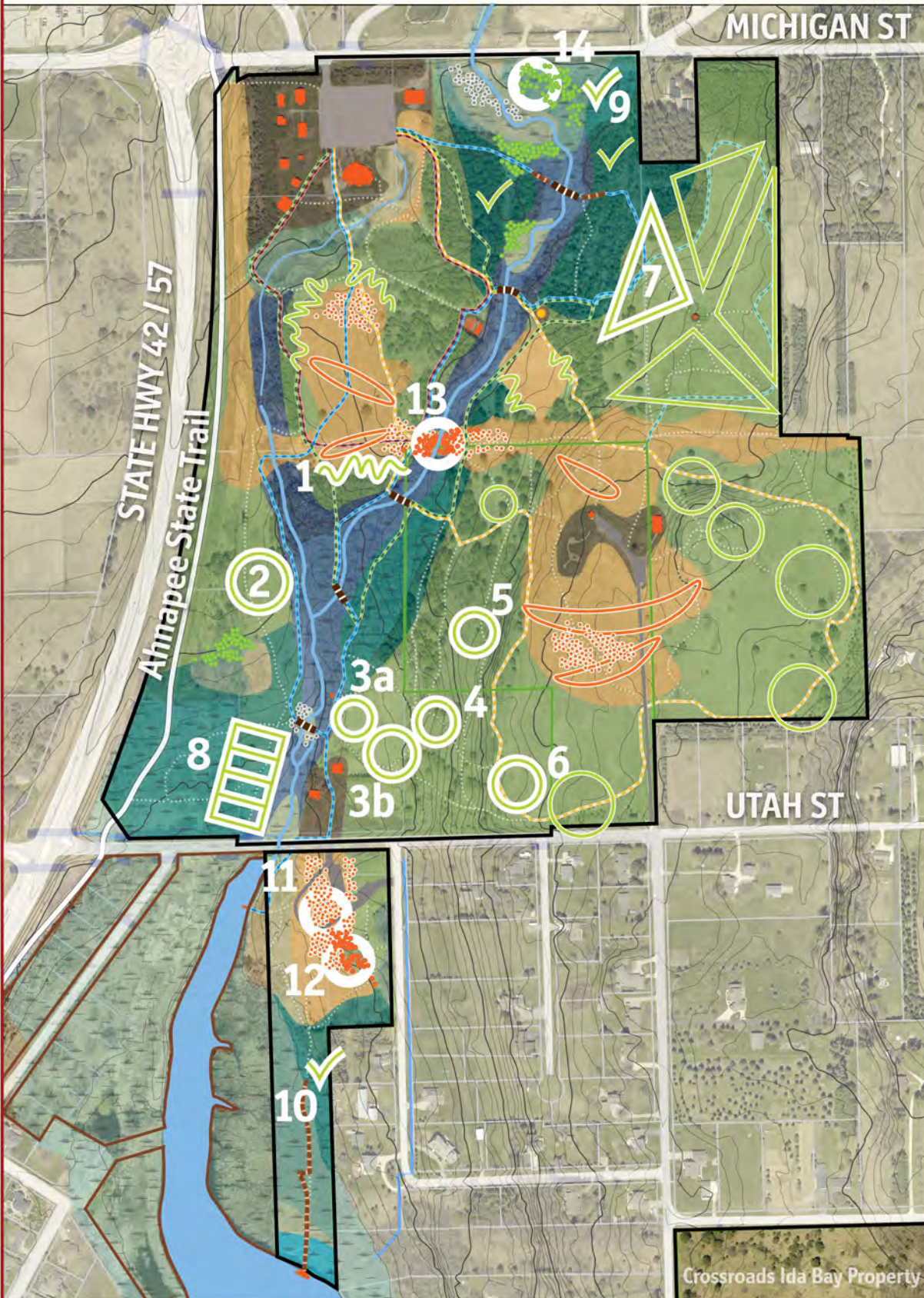
**Crossroads at Big Creek**  
LEARNING CENTER NATURE PRESERVE

- Basswood (3)
- Large-toothed Aspen (9)
- Paper Birch (6)
- White Pine (7)
- Quaking Aspen (12)
- Ironwood (5)
- Sugar Maple (6)
- Nannyberry Viburnum (6)
- Juneberry (10)
- Staghorn Sumac (10)
- Scarlet Elderberry (8)
- Chokecherry (12)
- Wild Plum (5)
- Ninebark (4)
- Oldfield Juniper (10)
- Fragrant Sumac (12)
- Beaked Hazelnut (10)
- New Jersey Tea (8)
- Early Wild Rose, Pasture Rose (21)
- ◆ White Cedar, small (54)
- ◆ White Pine, small (20)
- ◆ Hemlock, small (36)



Landscapes of Place 2020



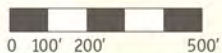


**FOREST INTERVENTIONS**

-  **1 Soften edge** with Aspen, Ironwood, Black Cherry
-  **2 Diversity Pocket** with Sugar Maple, Basswood, Black Cherry, Balsam Fir, Musclemwood, Witchhazel
- 3 Successional Edge Pocket** with Aspen, Ironwood, Black Cherry
- 4-5 Shrubland Pocket** with Serviceberry, Sumac, Beaked Hazelnut
- 6 Shrubland Pocket** of Serviceberry, Nannyberry
-  **7 Arboretum Boreal Segment:** Balsam Fir, Hemlock, Balsam Poplar
-  **8 Comparison Experiment Plots:** Begin design, planning and development of re-forestation method comparison plots
-  **9 Replacements:** Elm, Cottonwood, Tamarack
- 10 Replacements:** Silver Maple, Elm, Cottonwood, Tamarack, Speckled Alder

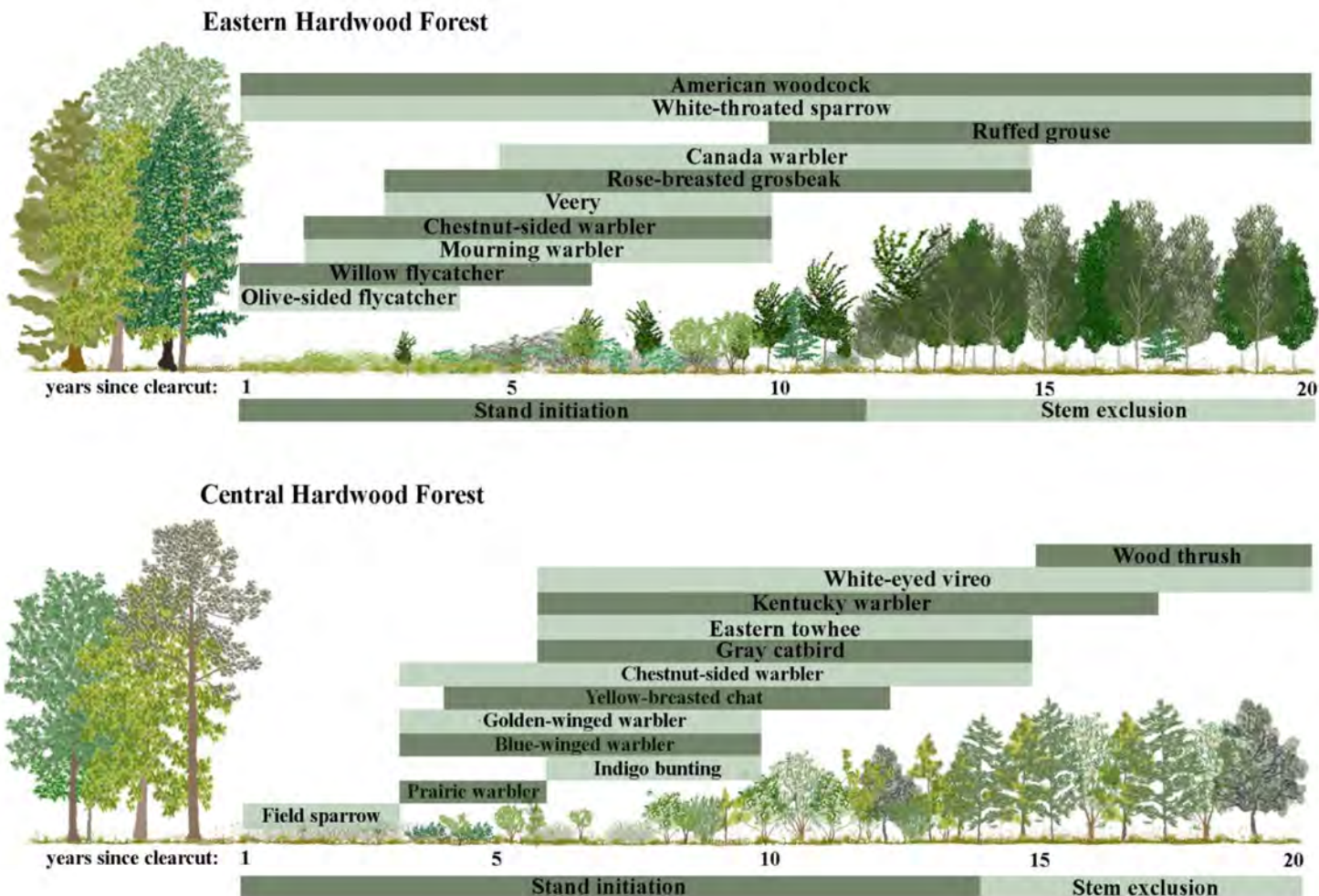
**MEADOW INTERVENTIONS**

-  **11 Meadow Plugs:** Supplementing 2020 project; add native seed
-  **12 Mixed Shrubs:** Adding to 2020 project; Beaked Hazelnut, Sumac
-  **13 Mixed Shrubs:** Silky Dogwood near stream; Fragrant Sumac
-  **14 Wetland Shrubs, Plugs and Seed:** Diversity: Winterberry, Black Elderberry, Speckled Alder, Silky Dogwood. Add wetland herbaceous spp in adjacent open areas.



Six species mentioned here are known at Crossroads:

## Bird use of regenerating vegetation after a clearcut in Eastern and Central Hardwood Forests

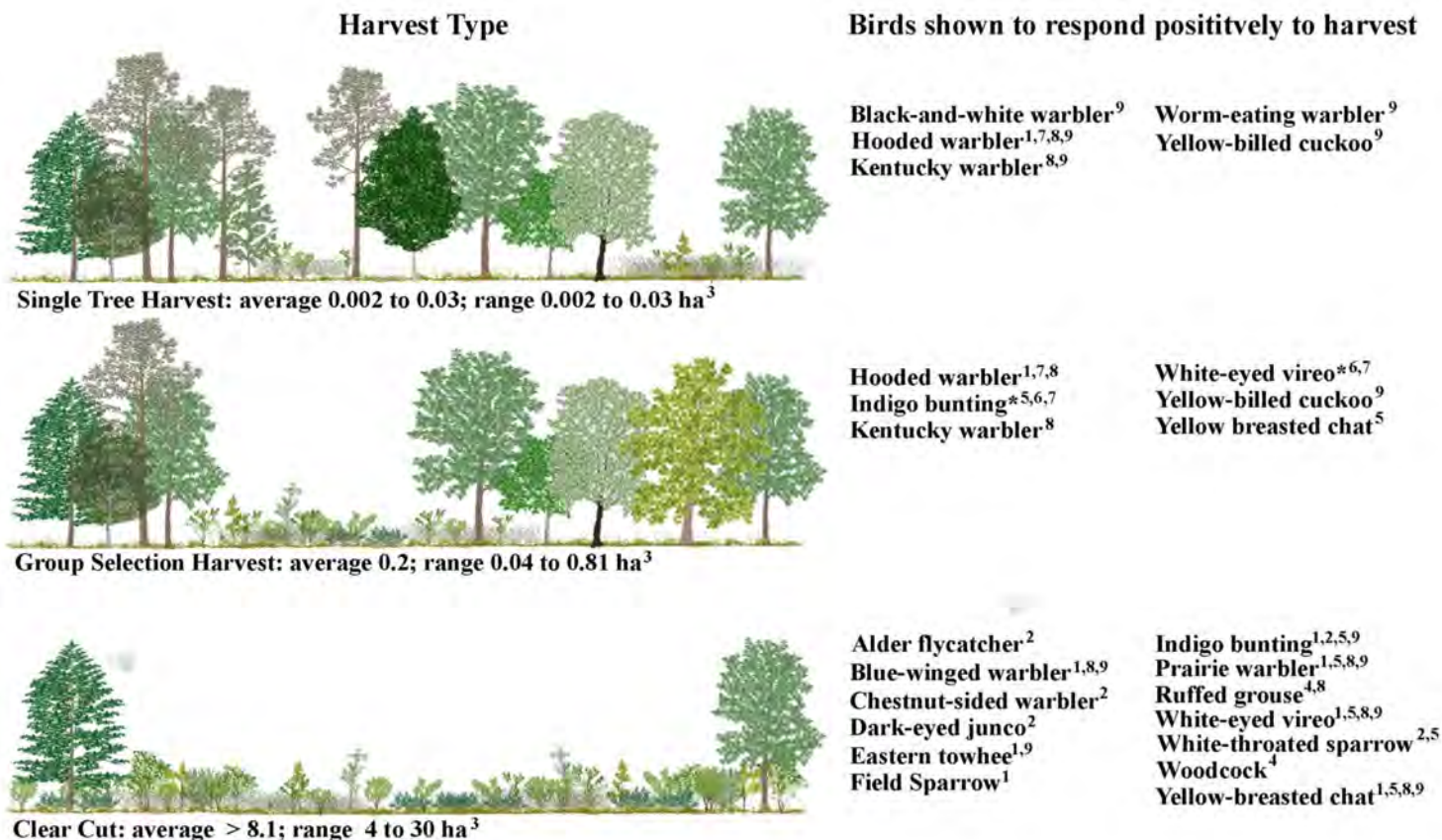


Different species of birds will breed in a site after a clearcut at varying stages of vegetation regeneration. Herbaceous plants, shrubs, vines and tree saplings grow rapidly during the stand initiation period following the harvest. Many bird species begin nesting in the site at this stage because of the dense woody and zerbaceous understory that provides cover and nesting substrate. Once the saplings begin forming a closed canopy during stem exclusion, the woody understory decreases, and some species stop nesting in the site. (Oliver & Larson, 1996; Thompson et al. 1996; DeGraaf & Yamasaki, 2003).

Gilbart, Meghan. 2012. Under Cover: Wildlife of Shrublands and Young Forest. Wildlife Management Institute. Cabot VT. 87 p. Available at: <https://youngforest.org/resource/under-cover-wildlife-shrublands-and-young-forest>

Eleven species mentioned here are known at Crossroads:

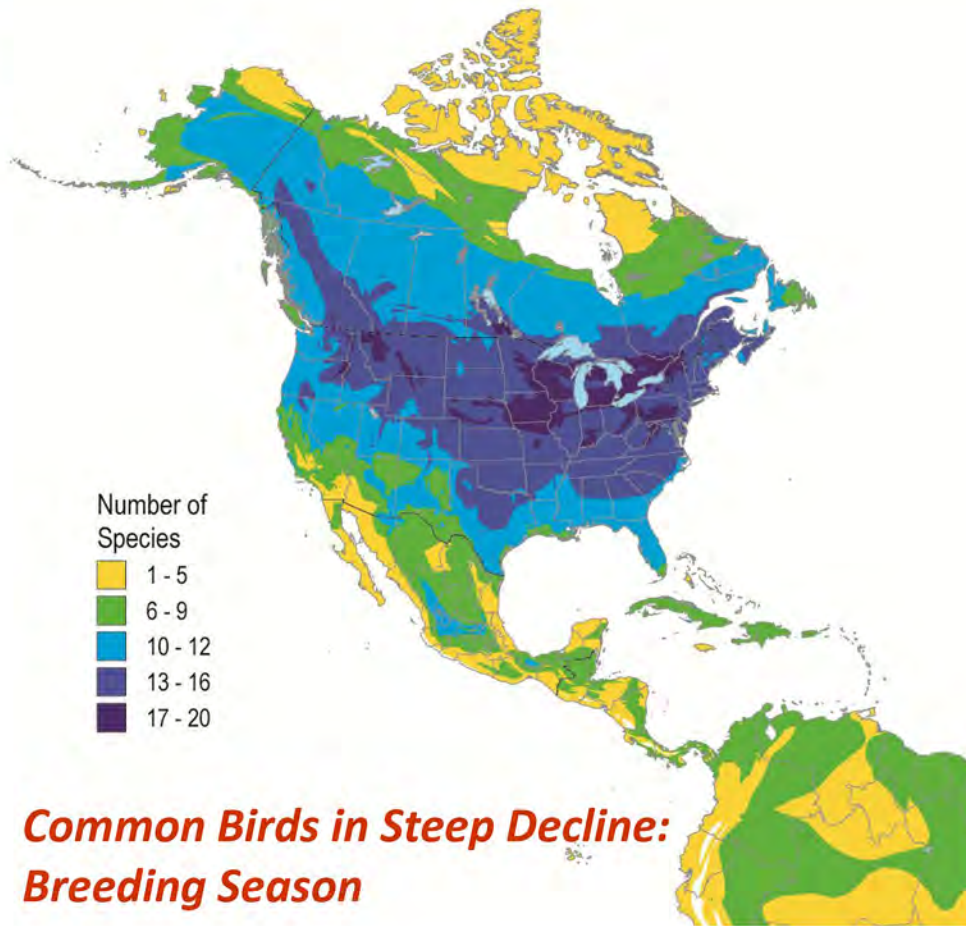
## Bird species respond differently to harvest type



Clear cut: Typically between 4 and 30 ha

Single tree cuts in mature forests create small openings and cause minimal disturbance to the mature bird community, but promote low levels of vegetation regeneration. Group selection cuts create much larger openings that promote greater regeneration of early successional vegetation while maintaining much of the mature forest. Clearcuts create large openings that encourage dense vegetation growth, providing habitat for many early successional species.

Only birds profiled here were used in the figure; several other birds respond positively to harvests, including mature forest species and birds not designated as a SGCN. (Thompson et al. 1996; Annand & Thompson, 1997; Thompson & Dessecker, 1997; Robinson & Robinson, 1999; Costello et al. 2000; Dessecker & McAuley, 2001; Moorman, 2001; DeGraaf & Yamasaki, 2003; Gram et al. 2003)



Six species mentioned on this list are known at Crossroads:

### Wisconsin's Young Forest Bird Species of Greatest Conservation Need

 <p>American Woodcock</p> <p>Bell's Vireo</p> <p>Black-billed Cuckoo</p> <p>Black-throated Blue Warbler</p> <p>Brown Thrasher</p> <p>Canada Warbler</p>  <p>Field Sparrow</p> <p>Golden-winged Warbler</p> <p>Hooded Warbler</p> <p>Kentucky Warbler</p> <p>Kirtland's Warbler</p> <p>Long-eared Owl</p>	 <p>Nashville Warbler</p> <p>Northern Bobwhite</p> <p>Olive-sided Flycatcher</p> <p>Rusty Blackbird</p> <p>Sharp-tailed Grouse</p> <p>Spruce Grouse</p> <p>Veery</p> <p>Whip-poor-will</p> <p>Willow Flycatcher</p> <p>Wood Thrush</p> <p>Worm-eating Warbler</p> <p>Yellow-billed Cuckoo</p>
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# FORESTS YOUNG AND OLD

A Two-Way Street  
for Breeding Bird Habitat



Landscapes with a mosaic of young and mature forest offer habitat for different birds at different stages. For example, Golden-winged Warblers nest in young forest but move their fledglings to older forest to feed on insects before their first migration. Meanwhile, Wood Thrushes nest in mature forest and move their fledglings to younger forest to feast on berries and fruits. *Graphic by Bartels Science Illustrator Phillip Krzeminski*

From: <https://www.allaboutbirds.org/news/old-growth-is-great-but-heres-why-we-need-new-growth-forests-too/>.

## From WDNR NHI

### Data for Township 27N, Range 26E

The following is a list of species and natural features on the Natural Heritage Working List that have been documented for T27N, R26E. Bald eagles are not represented, and [sensitive species](#) have been removed, where applicable, including cave bats. The data presented here **should not** be used for screening or reviewing a proposed land development or land management project for potential impacts to endangered resources. Learn about other methods for obtaining data, including project-specific data [here](#).

Click on the table headings to sort the table, and click on a heading again to change the sort order. Each species or community on the list has been documented in at least one location (but possibly many locations) within the township. The scientific names link to pages with more information about each species or feature. Also, these data were last updated on **April 19, 2019**, so there may be more recent county records not reflected here. [Return to the township tool](#).

<a href="#">Scientific Name</a>	<a href="#">Common Name</a>	<a href="#">WI Status</a>	<a href="#">Federal Status</a>	<a href="#">Group</a>
<a href="#">Acris blanchardi</a>	Blanchard's Cricket Frog	END		Frog~
<a href="#">Amerorchis rotundifolia</a>	Round-leaved Orchis	THR		Plant~
<a href="#">Anticlea elegans ssp. glaucus</a>	White Camas	SC		Plant
<a href="#">Asplenium trichomanes</a>	Maidenhair Spleenwort	SC		Plant
<a href="#">Boreal rich fen</a>	Boreal Rich Fen	NA		Community~
<a href="#">Botrychium campestre</a>	Prairie Dunewort	END		Plant
<a href="#">Botrychium lunaria</a>	Common Moonwort	END		Plant
<a href="#">Botrychium pallidum</a>	Pale Moonwort	SC		Plant~
<a href="#">Botrychium spathulatum</a>	Spoon-leaf Moonwort	SC		Plant
<a href="#">Cakile edentula var. lacustris</a>	American Sea-rocket	SC		Plant
<a href="#">Calamovilfa longifolia var. magna</a>	Sand Reedgrass	THR		Plant
<a href="#">Carex livida</a>	Livid Sedge	SC		Plant~
<a href="#">Charadrius melodus</a>	Piping Plover	END	LE	Bird~
<a href="#">Cirsium pitcheri</a>	Pitcher's Thistle	THR	LT	Plant
<a href="#">Coreopsis lanceolata</a>	Sand Coreopsis	SC		Plant
<a href="#">Eleocharis quinqueflora</a>	Few-flowered Spike-rush	SC		Plant~



Click on the table headings to sort the table, and click on a heading again to change the sort order. Each species or community on the list has been documented in at least one location (but possibly many locations) within the township. The scientific names link to pages with more information about each species or feature. Also, these data were last updated on **April 19, 2019**, so there may be more recent county records not reflected here. [Return to the township tool](#).

<a href="#">Scientific Name</a>	<b>Common Name</b>	<a href="#">WI Status</a>	<a href="#">Federal Status</a>	<a href="#">Group</a>
<a href="#">Elymus lanceolatus ssp. psammophilus</a>	Thickspike	THR		Plant
<a href="#">Euphorbia polygonifolia</a>	Seaside Spurge	SC		Plant
<a href="#">Glaucomys sabrinus</a>	Northern Flying Squirrel	SC/P		Mammal
<a href="#">Great lakes beach</a>	Great Lakes Beach	NA		Community~
<a href="#">Great lakes dune</a>	Great Lakes Dune	NA		Community~
<a href="#">Great lakes ridge and swale</a>	Great Lakes Ridge and Swale	NA		Community~
<a href="#">Hendersonia occulta</a>	Cherrystone Drop	THR		Snail
<a href="#">Iris lacustris</a>	Dwarf Lake Iris	THR	LT	Plant~
<a href="#">Migratory Bird Concentration Site</a>	Migratory Bird Concentration Site	SC		Other~
<a href="#">Northern mesic forest</a>	Northern Mesic Forest	NA		Community
<a href="#">Northern wet-mesic forest</a>	Northern Wet-mesic Forest	NA		Community~
<a href="#">Platanthera hookeri</a>	Hooker's Orchid	SC		Plant
<a href="#">Rhynchospora fusca</a>	Brown Beak-rush	SC		Plant~
<a href="#">Solidago simplex var. gillmanii</a>	Dune Goldenrod	THR		Plant
<a href="#">Somatochlora hineana</a>	Hine's Emerald	END	LE	Dragonfly~
<a href="#">Striatura ferrea</a>	Black Striate	SC/N		Snail
<a href="#">Trichophorum cespitosum</a>	Tufted Bulrush	THR		Plant~
<a href="#">Triglochin palustris</a>	Slender Bog Arrow-grass	SC		Plant~
<a href="#">Viola rostrata</a>	Long-spurred Violet	SC		Plant

# eBird Field Checklist

## Crossroads at Big Creek Preserve

Door, Wisconsin, US

ebird.org/hotspot/L5997539

124 species (+11 other taxa) - Year-round, All years

Date: \_\_\_\_\_

Start time: \_\_\_\_\_

Duration: \_\_\_\_\_

Distance: \_\_\_\_\_

Party size: \_\_\_\_\_

Notes: \_\_\_\_\_

This checklist is generated with data from eBird (ebird.org), a global database of bird sightings from birders like you. If you enjoy this checklist, please consider contributing your sightings to eBird. It is 100% free to take part, and your observations will help support birders, researchers, and conservationists worldwide.

Go to ebird.org to learn more!

### Waterfowl

- Cackling Goose
- Canada Goose
- Tundra Swan
- Wood Duck
- Blue-winged Teal
- Gadwall
- American Wigeon
- Mallard
- Mallard (Domestic type)
- Green-winged Teal
- Redhead
- Ring-necked Duck
- Greater Scaup
- Lesser Scaup
- Bufflehead
- Common Goldeneye
- Common/Barrow's Goldeneye
- Hooded Merganser
- Common Merganser
- Red-breasted Merganser
- Ruddy Duck
- duck sp.

### Grouse, Quail, and Allies

- Ruffed Grouse
- Wild Turkey

### Grebes

- Pied-billed Grebe

### Pigeons and Doves

- Rock Pigeon
- Mourning Dove

### Cuckoos

- Black-billed Cuckoo

### Nightjars

- Common Nighthawk

### Swifts

- Chimney Swift

### Hummingbirds

- Ruby-throated Hummingbird

### Rails, Gallinules, and Allies

- American Coot

### Cranes

- Sandhill Crane

### Shorebirds

- Killdeer
- Solitary Sandpiper

### Gulls, Terns, and Skimmers

- Ring-billed Gull
- Herring Gull
- gull sp.
- Caspian Tern

### Cormorants and Anhingas

- Double-crested Cormorant

### Pelicans

- American White Pelican

### Hérons, Ibis, and Allies

- Great Blue Heron
- Great Egret
- Green Heron

### Vultures, Hawks, and Allies

- Turkey Vulture
- Osprey
- Cooper's Hawk
- Bald Eagle
- Broad-winged Hawk
- Red-tailed Hawk
- Rough-legged Hawk
- hawk sp.

### Owls

- Great Horned Owl

### Kingfishers

- Belted Kingfisher

### Woodpeckers

- Yellow-bellied Sapsucker
- Red-bellied Woodpecker
- Downy Woodpecker
- Hairy Woodpecker
- Pileated Woodpecker
- Northern Flicker
- woodpecker sp.

### Falcons and Caracaras

- American Kestrel
- Merlin
- Peregrine Falcon
- falcon sp.

### Tyrant Flycatchers: Pewees, Kingbirds, and Allies

- Eastern Wood-Pewee
- Yellow-bellied Flycatcher
- Eastern Phoebe
- Great Crested Flycatcher
- Eastern Kingbird

### Vireos

- Blue-headed Vireo
- Red-eyed Vireo
- vireo sp.

### Jays, Magpies, Crows, and Ravens

- Blue Jay
- American Crow
- Common Raven
- crow/raven sp.

### Tits, Chickadees, and Titmice

- Black-capped Chickadee

### Martins and Swallows

- Northern Rough-winged Swallow
- Tree Swallow
- Barn Swallow
- swallow sp.

### Kinglets

- Golden-crowned Kinglet
- Ruby-crowned Kinglet

### Nuthatches

- Red-breasted Nuthatch
- White-breasted Nuthatch

### Treecreepers

- Brown Creeper

### Wrens

- House Wren
- Winter Wren

### Starlings and Mynas

- European Starling

### Catbirds, Mockingbirds, and Thrashers

- Gray Catbird
- Brown Thrasher

### Thrushes

- Eastern Bluebird
- Veery
- Hermit Thrush
- Catharus sp.
- Wood Thrush
- American Robin

### Waxwings

- Cedar Waxwing

### Finches, Euphonias, and Allies

- House Finch
- Purple Finch
- Common Redpoll
- Pine Siskin
- American Goldfinch

### Longspurs and Snow Buntings

- Snow Bunting

### New World Sparrows

- Chipping Sparrow
- Field Sparrow
- American Tree Sparrow
- Dark-eyed Junco
- White-crowned Sparrow
- White-throated Sparrow
- Song Sparrow
- Swamp Sparrow
- Eastern Towhee

### Blackbirds

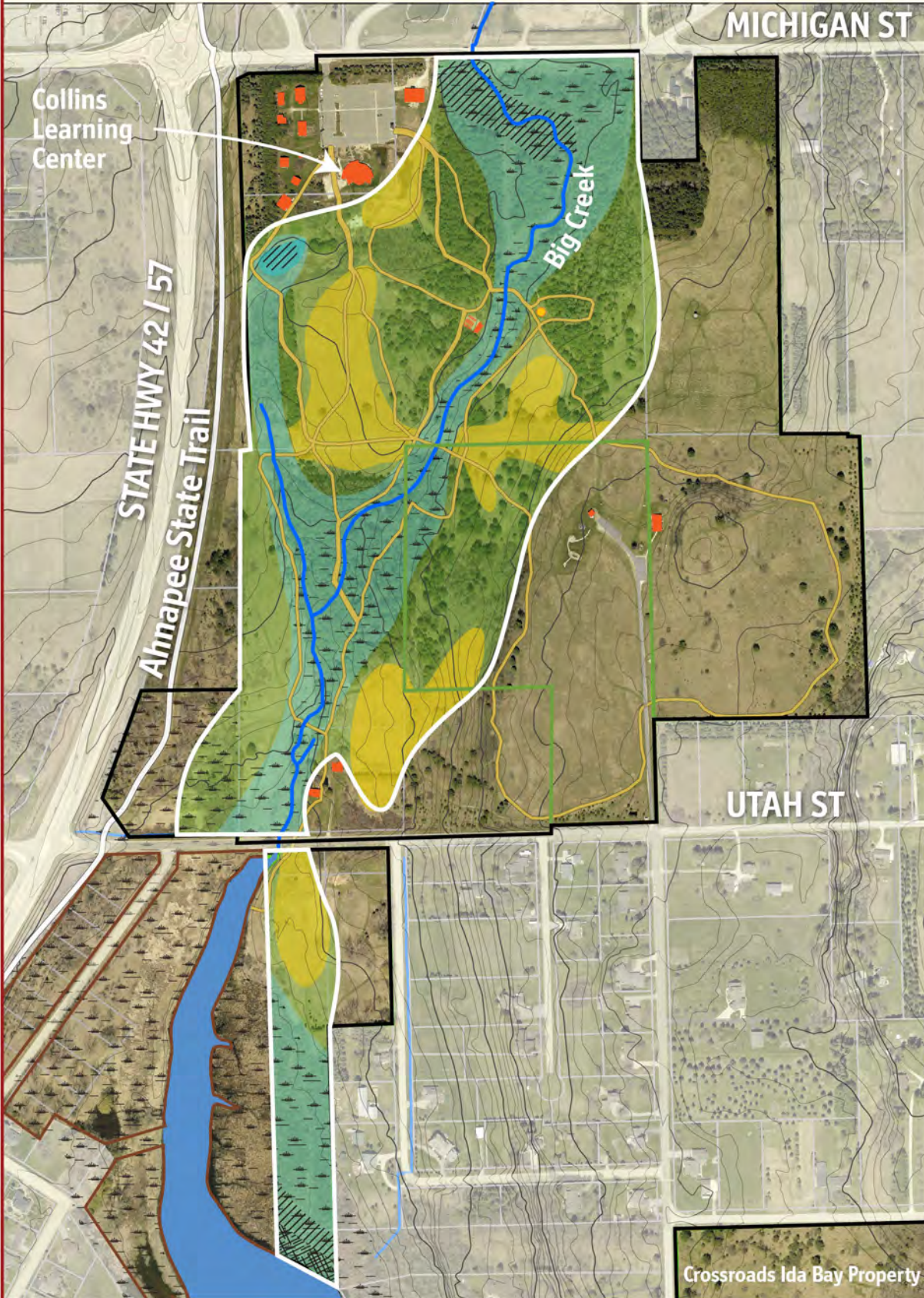
- Eastern Meadowlark
- Baltimore Oriole
- Red-winged Blackbird
- Brown-headed Cowbird
- Common Grackle

### Wood-Warblers

- Ovenbird
- Northern Waterthrush
- Blue-winged Warbler
- Black-and-white Warbler
- Nashville Warbler
- Common Yellowthroat
- American Redstart
- Bay-breasted Warbler
- Yellow Warbler
- Palm Warbler
- Yellow-rumped Warbler
- Black-throated Green Warbler

### Cardinals, Grosbeaks, and Allies

- Scarlet Tanager
- Northern Cardinal
- Rose-breasted Grosbeak
- Indigo Bunting



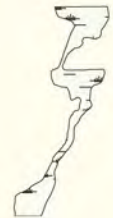
65 Acres  
Project Area

25 Acres  
Wetlands

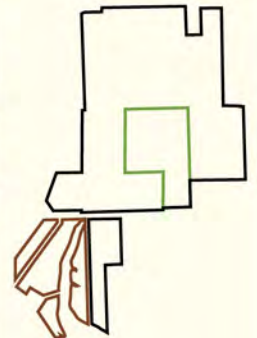
- 10% Shallow Marsh
- 2% Deep Marsh
- 4% Stream Bed
- 84% Forested Swamp

28 Acres  
Forest

12 Acres  
Meadow



Mapped  
Wetlands

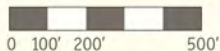
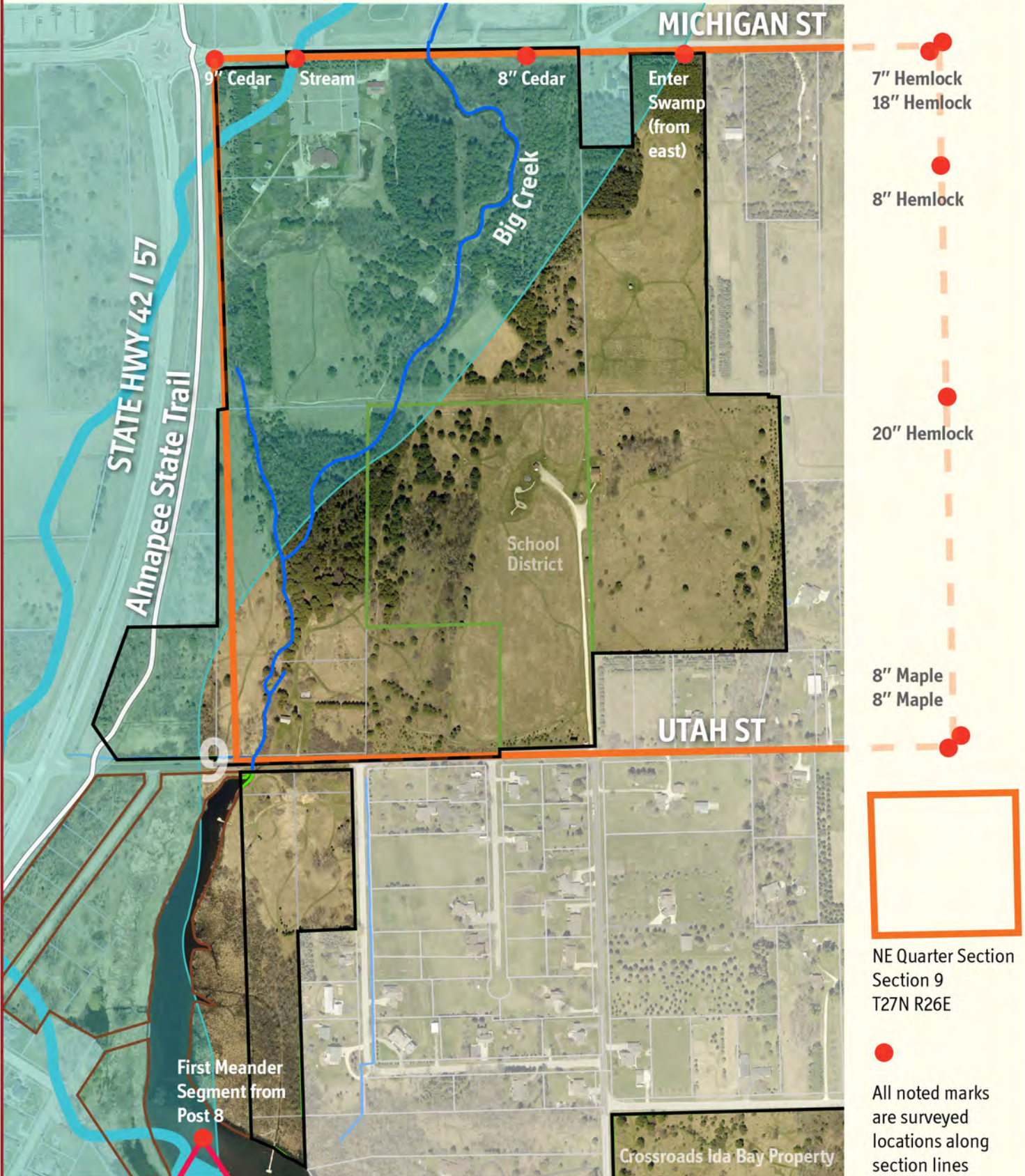


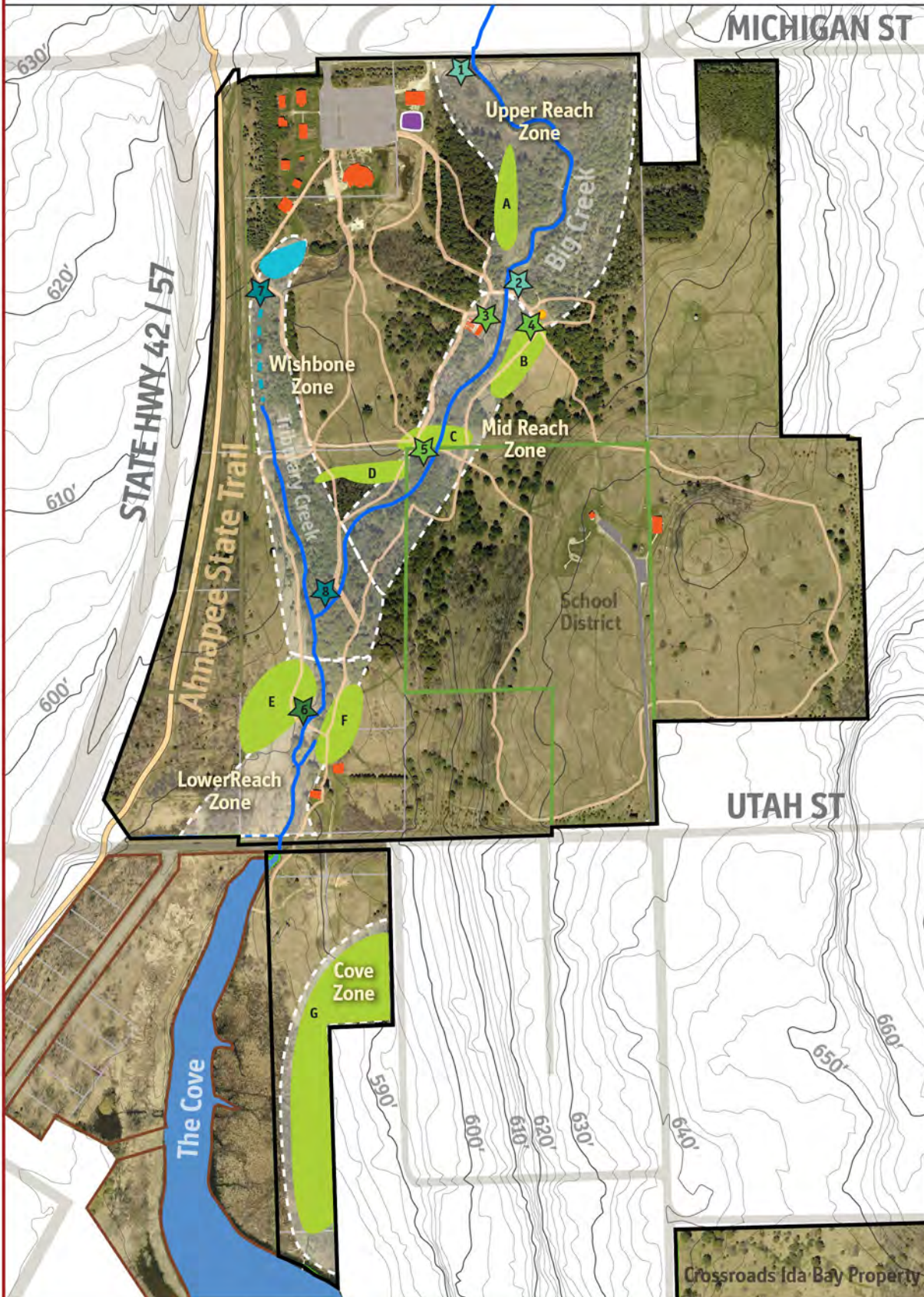
125 Acres:  
105 Owned by  
Crossroads  
20 Managed by  
Crossroads

WDNR



0 100' 200' 500'





### Work Zones Meeting Spots

#### Upper Reach Zone

- 1 Start at Michigan Street
- 2 Start at North Bridge

#### Mid Reach Zone

- 3 Start at Amphitheater
- 4 Start at Council Ring
- 5 Start at Utility Crossing

#### Lower Reach Zone

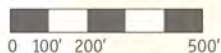
- 6 Start at Hanson Bridge

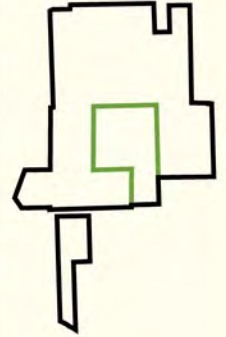
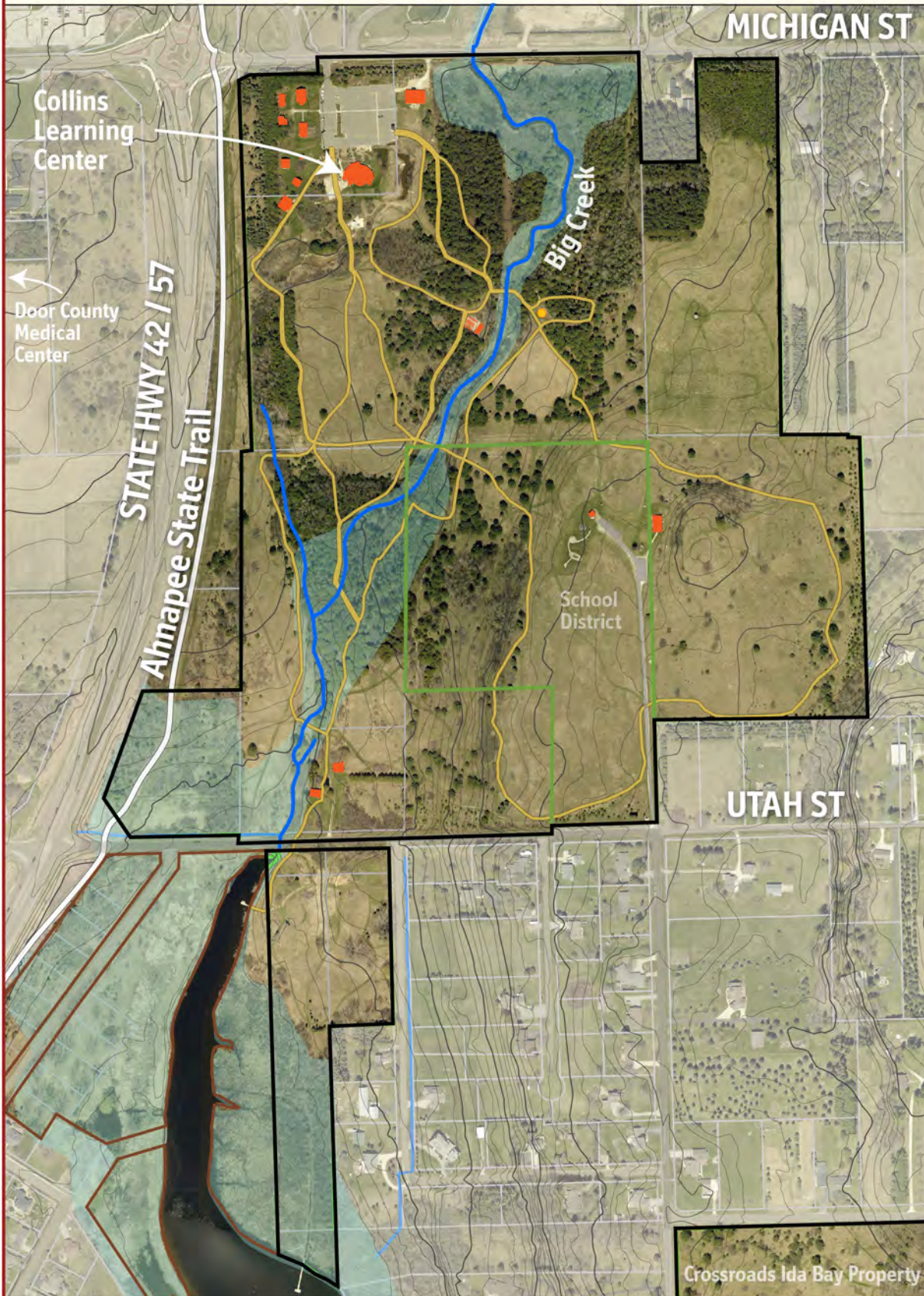
#### Wishbone Zone

- 7 Start at Hauser Pond
- 8 Start at Cedar Crossing Bridge

### Seedling Planting

- A** White Spruce (60)  
Aspen (20)  
Paper Birch (10)
- B** Aspen (40)  
Black Cherry (20)  
Paper Birch (30)
- C** Ninebark (100)
- D** Red Oak (40)  
White Spruce (20)  
Black Cherry (40)
- E** Red Oak (60)  
Black Cherry (40)  
Paper Birch (60)
- F** River Birch (100)  
Aspen (40)  
White Spruce (20)
- G** Silver Maple (100)
- Proposed Nursery**





125 Acres:  
105 Owned by  
Crossroads  
20 Managed by  
Crossroads  
under long-term  
agreement with  
School District



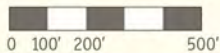
Owned by WDNR



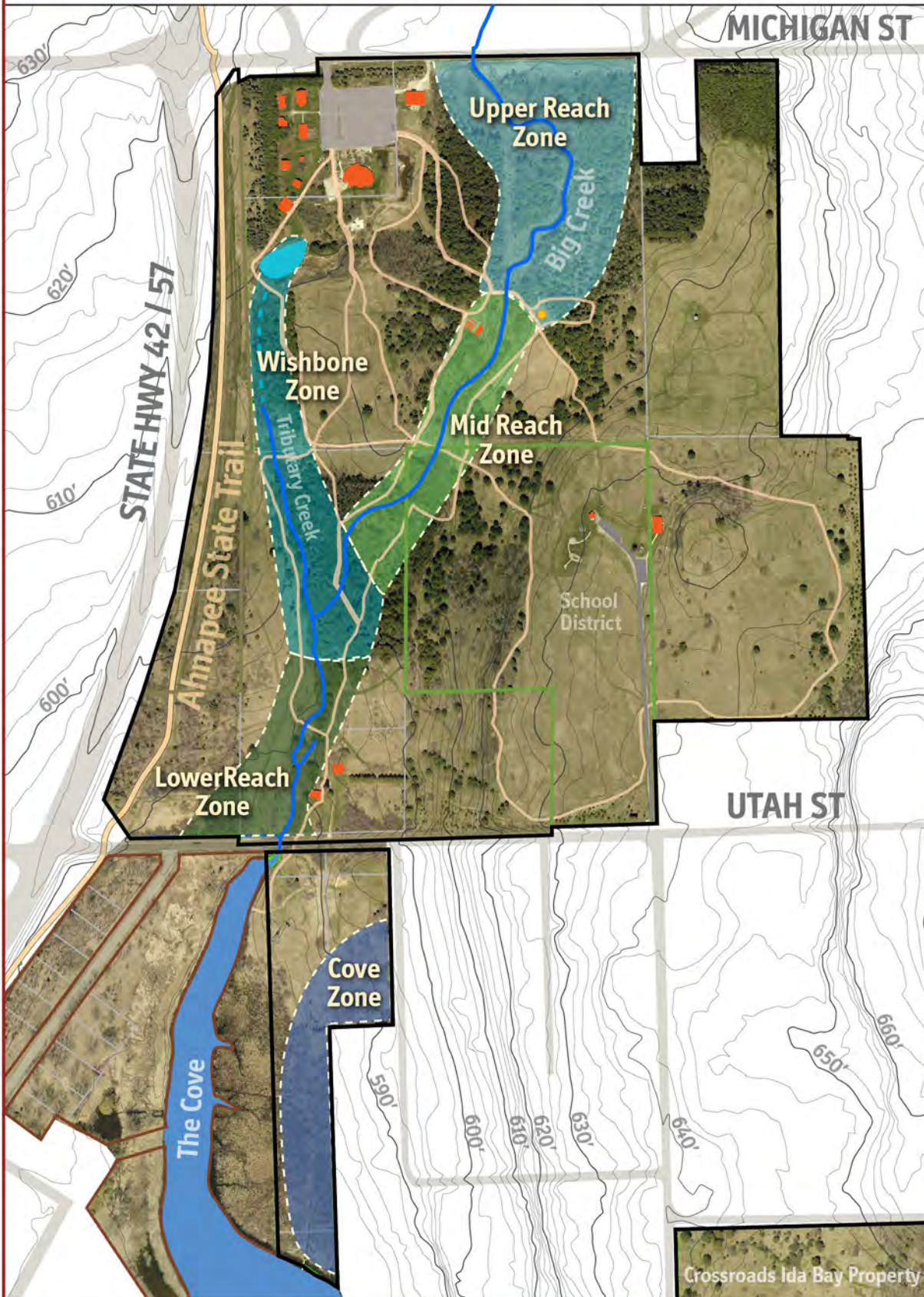
Crossroads  
Public Trails



Mapped  
Wetlands



Crossroads Ida Bay Property



**Upper Reach Zone**

10 acres. Vision: a complex of sedge meadow, alder thicket / shrub carr, and cedar swamp. A priority because of high visibility, recent ash die-off, and high potential for near-term improvement.

**Mid Reach Zone**

5.3 acres. Vision: steeper slopes, remnant forest, and a straightforward trajectory toward healthy cedar swamp and northern mesic forest. Opportunities for planting to extend forested buffer.

**Lower Reach Zone**

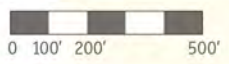
4.2 acres. Vision: a complex of sedge meadow, alder thicket / shrub carr, and cedar swamp, with adjacent mesic forest. Open areas transitioning gracefully into sedge meadow in the Cove Zone.

**Wishbone Zone**

6.5 acres. Vision: steeper slopes, remnant forest, and a straightforward trajectory toward healthy cedar swamp and northern mesic forest.

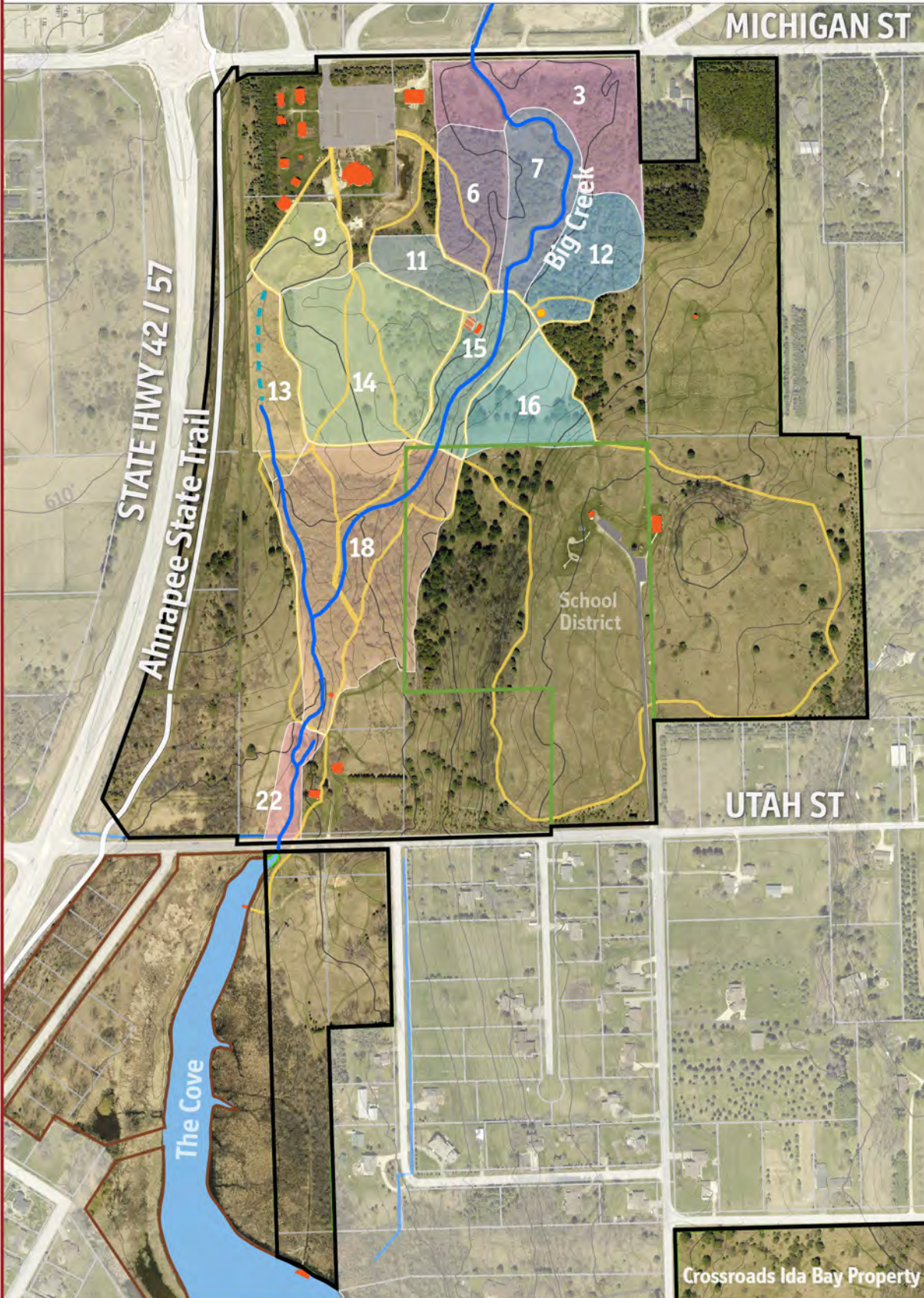
**Cove Zone**

4.7 acres. Vision: substantial removal of invasive buckthorn, and a trajectory toward a gradient of mesic forest to lowland forest and alder thicket.



# Vegetation Suvery Zones

Per Meissner Master Plan and 2011/2014 surveys  
Zones within or adjacent to riparian corridor



125 Acres:  
105 Owned by Crossroads  
20 Managed by Crossroads under long-term agreement with School District



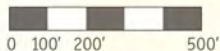
Owned by WDNR



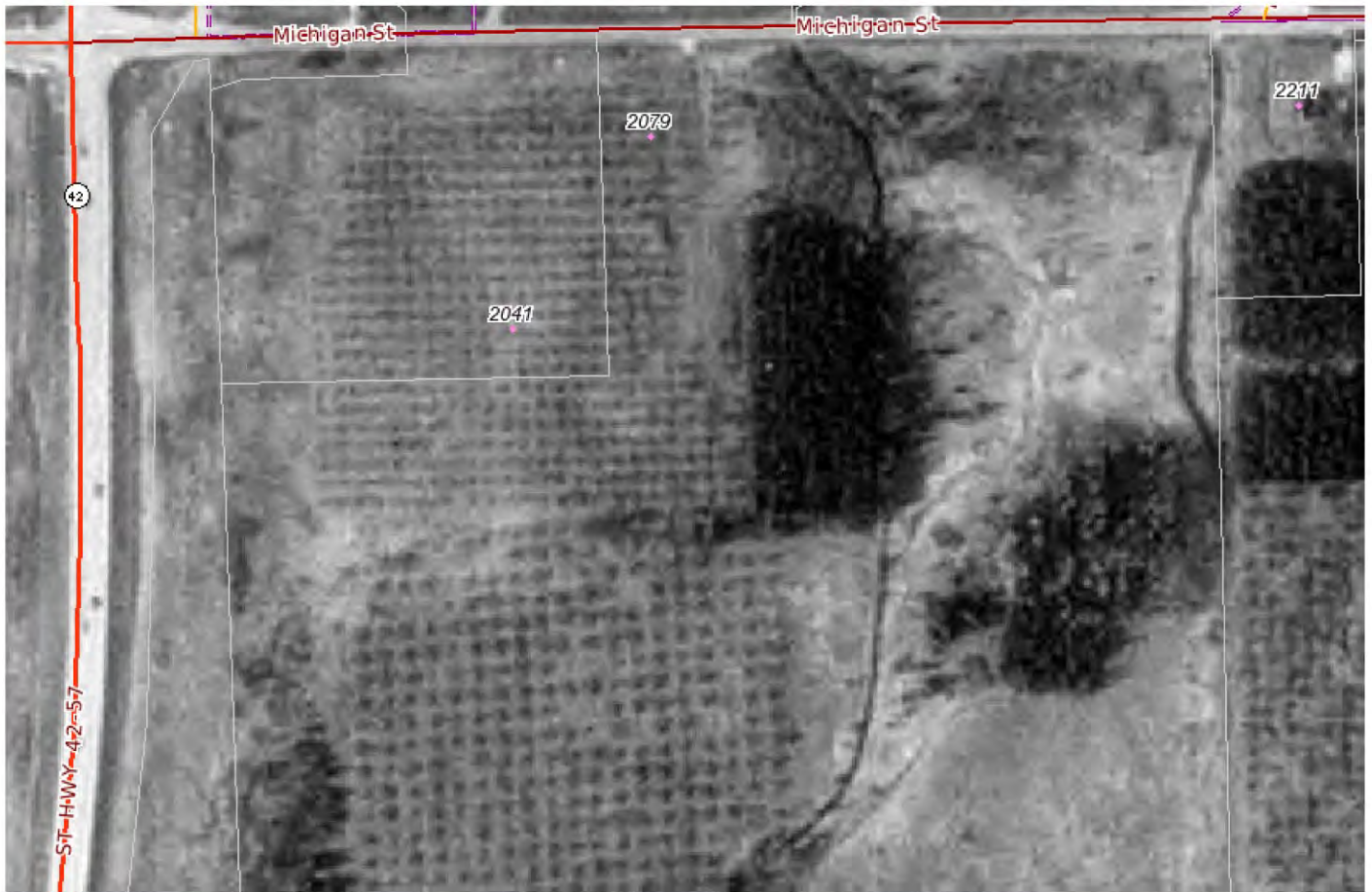
Crossroads Public Trails



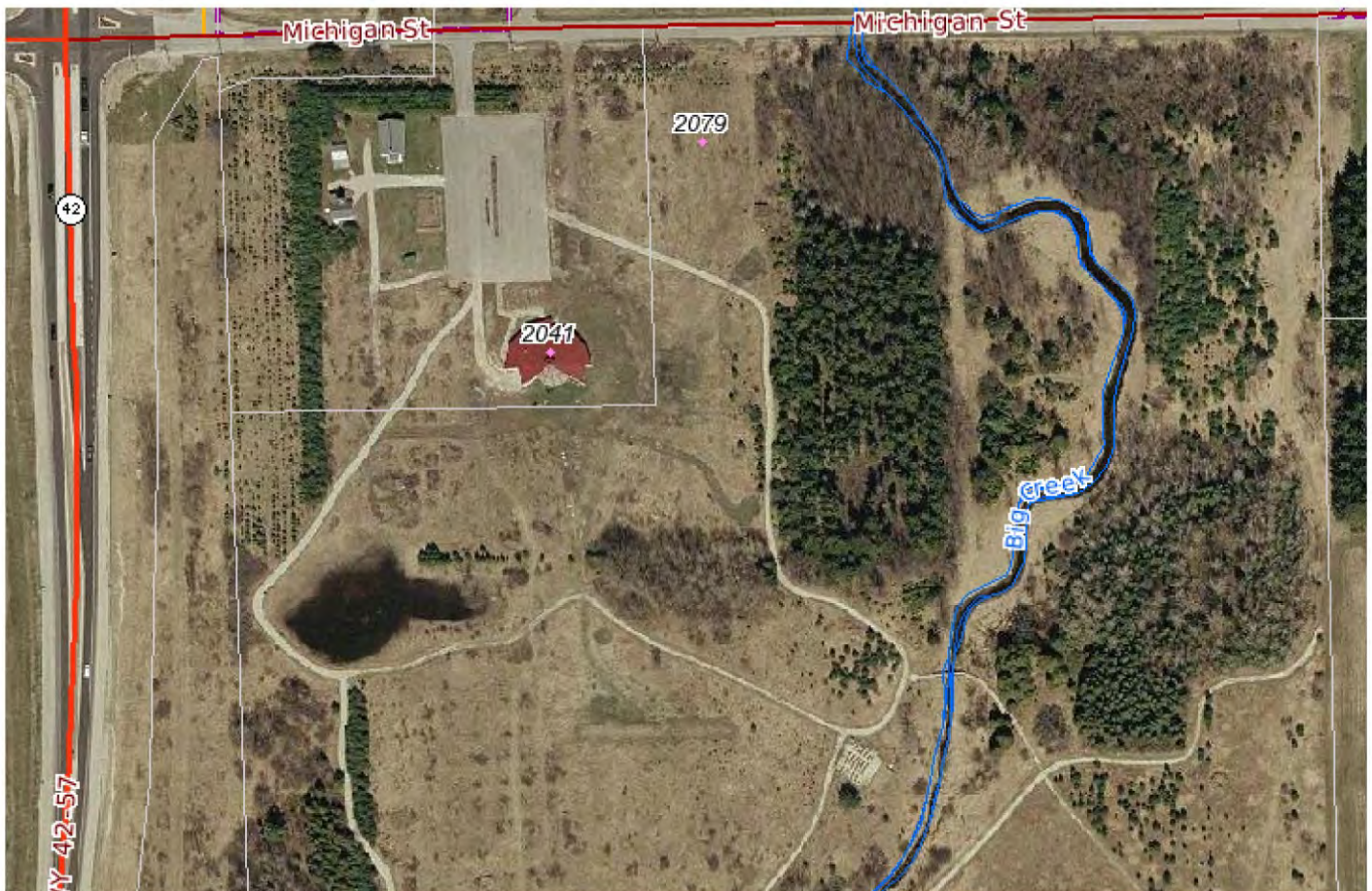
Vegetation Survey Zones







1992 digital orthophoto (provided by USFWS)



2002 digital orthophoto (provided by USFWS), showing result of stream re-meander project (1998) and bermed wetland depression area (1994)

## Appendix

Reference Wisconsin DNR natural community descriptions are provided here as links:

<a href="#"><u>Northern Wet-Mesic Forest (White Cedar Swamp)</u></a>	<h3><b>Northern Wet-mesic Forest (“White-cedar Swamp”) (Global Rank G3?; State Rank S3S4)</b></h3> <hr/> <p><b>Overview: Distribution, Abundance, Environmental Setting, Ecological Processes</b></p> <p>Northern Wet-mesic Forest is a minerotrophic coniferous wetland community that is widely distributed and common in some parts of Wisconsin north of the Tension Zone. Northern white-cedar is the dominant tree, and the type is often referred to by the vernacular name “cedar swamp.” The dominant cedars may achieve great girth and age, though they don’t become particularly tall (heights of 45 to 60 feet are typical for mature trees). Northern white-cedar may reproduce by seed or by layering and is able to continue growing following windthrow because the downed trunk is enveloped by mosses and lateral branches oriented away from the ground surface continue growing vertically.</p>
<a href="#"><u>Northern Sedge Meadow</u></a>	<h3><b>Northern Sedge Meadow (Global Rank G4; State S3)</b></h3> <hr/> <p><b>Overview: Distribution, Abundance, Environmental Setting, Ecological Processes</b></p> <p>Northern Sedge Meadow is a minerotrophic wetland community dominated by graminoid herbs that occurs most commonly on glaciated terrain north of the Tension Zone. Sedge meadows occur on lakeshores, along the margins of low-gradient rivers and streams, and in shallow depressions in ground moraine. Along larger rivers with complex floodplains, sedge meadows sometimes fill abandoned channel meanders (oxbows), and near the Great Lakes they are often part of the wetland mosaic of coastal estuaries. Sedge meadows commonly form discrete patches, or distinct zones, between wetter natural communities such as marshes and somewhat drier areas capable of supporting woody wetland vegetation such as shrub swamps, lowland hardwood forests, or stands of swamp conifers.</p>
<a href="#"><u>Southern Sedge Meadow</u></a>	<h3><b>Southern Sedge Meadow (Global Rank G4?; State S3)</b></h3> <hr/> <p><b>Overview: Distribution, Abundance, Environmental Setting, Ecological Processes</b></p> <p>Southern Sedge Meadow is an herb-dominated, minerotrophic wetland community that is most abundant south of the Tension Zone. Outliers are scattered across northern Wisconsin, but there the community is uncommon and of limited extent and supports fewer plant species of mostly southern distribution. Wisconsin’s larger occurrences are situated in poorly drained glaciated terrain, especially on landforms such as till plain, lake plain, and outwash. Sedge Meadows are often associated with lake and stream margins.</p>

Shrub-carr

## Shrub-carr (Global Rank G5; State Rank S4)

### Overview: Distribution, Abundance, Environmental Setting, Ecological Processes

Shrub-carr is a minerotrophic, saturated to seasonally inundated wetland community dominated by tall deciduous shrubs such as dogwoods (*Cornus* spp.) and willows (*Salix* spp.). Soils are neutral or slightly calcareous mucks or azonal peats. Upslope, Shrub-carr may be bordered by or grade into various wet forest communities; downslope, the perennial shrubs give way to herbaceous wetlands such as low prairie, sedge meadow, or marsh.

Alder Thicket

## Alder Thicket (Global Rank G4; State Rank S4)

### Overview: Distribution, Abundance, Environmental Setting, Ecological Processes

Alder Thicket is a minerotrophic wetland community dominated by the tall shrub speckled (or "tag") alder (*Alnus incana*). The community is widespread and common throughout the glaciated portions of northern Wisconsin, where it occurs on lake and stream margins, and in basins experiencing lateral movement of oxygenated and nutrient-enhanced groundwater.

Northern Mesic Forest

## Northern Mesic Forest (Global Rank G4; State S4)

### Overview: Distribution, Abundance, Environmental Setting, Ecological Processes

Northern Mesic Forest was historically Wisconsin's most abundant natural community by far, providing the vegetative context within which many of the state's lakes, rivers, streams and less extensive natural communities were embedded. Vast areas of Wisconsin north of the Tension Zone, estimated at roughly 11,750,000 acres by Curtis (1959) and Finley (1976), or about 33% of the land area of the state (almost 63% of northern Wisconsin), were covered by mesic forests composed of eastern hemlock, sugar maple, yellow birch, and American basswood.

**Working List****Door County Wetland / Cedar Swamp species / Landscapes of Place / 2019**

<b>type</b>	<b>Genus species</b>	<b>Common Name</b>	<b>Wetland Indicator</b>	<b>C</b>
Grass/Sedge/Rush	<i>Alopecurus aequalis</i>	Short-awned foxtail	OBL	4
Grass/Sedge/Rush	<i>Bolboschoenus fluviatilis</i>	River bulrush	OBL	6
Grass/Sedge/Rush	<i>Calamagrostis canadensis</i>	Blue joint grass	OBL	5
Grass/Sedge/Rush	<i>Carex aquatilis</i>	Water sedge	OBL	7
Grass/Sedge/Rush	<i>Carex aurea</i>	elk sedge, golden fruited se	FACW+	5
Grass/Sedge/Rush	<i>Carex comosa</i>	Bristly sedge	OBL	5
Grass/Sedge/Rush	<i>Carex cryptolepis</i>	small yellow sedge	OBL	8
Grass/Sedge/Rush	<i>Carex diandra</i>		OBL	9
Grass/Sedge/Rush	<i>Carex disperma</i>		OBL	10
Grass/Sedge/Rush	<i>Carex granularis</i>	limestone meadow sedge	FACW	3
Grass/Sedge/Rush	<i>Carex hystericina</i>	Porcupine sedge	OBL	3
Grass/Sedge/Rush	<i>Carex interior</i>	Interior Sedge	OBL	7
Grass/Sedge/Rush	<i>Carex intumescens</i>	Shining Bur sedge	FACW	5
Grass/Sedge/Rush	<i>Carex lacustris</i>	Common lake sedge	OBL	6
Grass/Sedge/Rush	<i>Carex lasiocarpa</i>		OBL	9
Grass/Sedge/Rush	<i>Carex lupulina</i>		OBL	6
Grass/Sedge/Rush	<i>Carex pedunculata</i>	long-stalk sedge	OBL	7
Grass/Sedge/Rush	<i>Carex pseudocyperus</i>	cypress-like sedge	OBL	8
Grass/Sedge/Rush	<i>Carex sartwellii</i>	Running Marsh Sedge	FACW+	7
Grass/Sedge/Rush	<i>Carex stipata</i>	Common Fox sedge	OBL	2
Grass/Sedge/Rush	<i>Carex stricta</i>	Tussock sedge	OBL	7
Grass/Sedge/Rush	<i>Carex tenara</i>	Marsh straw sedge	FAC+	4
Grass/Sedge/Rush	<i>Carex trisperma</i>	Three-fruited sedge	OBL	9
Grass/Sedge/Rush	<i>Carex vulpinoidea</i>	Fox sedge	OBL	2
Grass/Sedge/Rush	<i>Eleocharis acicularis</i>	Needle spike-rush	OBL	5
Grass/Sedge/Rush	<i>Eleocharis palustris</i>	common spike-rush	OBL	6
Grass/Sedge/Rush	<i>Glyceria borealis</i>	Northern manna grass	OBL	8
Grass/Sedge/Rush	<i>Glyceria septentrionalis</i>	floating manna grass	OBL	8
Grass/Sedge/Rush	<i>Glyceria striata</i>	fowl manna grass	OBL	4
Grass/Sedge/Rush	<i>Juncus alpinoarticulatus</i>	Northern green rush	OBL	6
Grass/Sedge/Rush	<i>Schoenoplectus acutus</i>	hard-stem bulrush	OBL	6
Grass/Sedge/Rush	<i>Sparganium angustifolium</i>	Narrow-leaved burr read	OBL	9
Forb	<i>Aralia nudicaulis</i>	Wild sarsaparilla	FACU	6
Forb	<i>Aralia racemosa</i>	Spikenard	FACU	7
Forb	<i>Arisaema triphyllum</i>	Jack-in-the-pulpit	FACW-	5
Forb	<i>Asclepias incarnata</i>	Swamp Milkweed	OBL	5
Forb	<i>Aster boreale</i>	Northern bog aster	OBL	10
Forb	<i>Bidens cernua</i>	Nodding burr-marigold	OBL	4
Forb	<i>Bidens connata</i>	Purple-stem beggar-ticks	OBL	6
Forb	<i>Bidens frondosa</i>	Beggar-ticks	FACW	1
Forb	<i>Caltha palustris</i>	Marsh marigold	OBL	6

<b>Working List</b>				
<b>Door County Wetland / Cedar Swamp species / Landscapes of Place / 2019</b>				
Forb	<i>Campanula aparinoides</i>	Marsh bellflower	OBL	7
Forb	<i>Chelone glabra</i>	Turtlehead	OBL	7
Forb	<i>Clintonia borealis</i>	Blue-bead-lily	FAC+	7
Forb	<i>Comarum palustre</i>	marsh cinquefoil	OBL maybe	8
Forb	<i>Coptis trifolia</i>	Goldthread	FACW	8
Forb	<i>Cypripedium parviflorum var. mak</i>	Small yellow lady-slipper		9
Forb	<i>Eupatorium perfoliatum</i>	Common boneset	OBL maybe	6
Forb	<i>Eupatorium purpureum</i>	Purple joe-pye weed	OBL maybe	6
Forb	<i>Euthamia graminifolia</i>	Grass-Leaved Goldenrod		4
Forb	<i>Geum rivale</i>	Purple Avens		8
Forb	<i>Hypericum pyramidatum</i>	Great St. John's wort		6
Forb	<i>Impatiens capensis</i>	Jewelweed	OBL maybe	2
Forb	<i>Iris lacustris</i>	Dwarf Lake Iris	FAC	9
Forb	<i>Iris versicolor</i>	Blue flag	OBL	5
Forb	<i>Lemna minor</i>	Small Duckweed	OBL	4
Forb	<i>Linnaea borealis</i>	Twin flower		9
Forb	<i>Liparis loeselii</i>	Green Twayblade		7
Forb	<i>Ludwigia palustris</i>	Marsh purslane	OBL maybe	4
Forb	<i>Lycopus americanus</i>	Water-Horehound	OBL	4
Forb	<i>Lysimachia ciliata</i>	Fringed loosestrife	OBL maybe	5
Forb	<i>Lysimachia thyrsoflora</i>	Swamp loosestrife	OBL	7
Forb	<i>Maianthemum canadense</i>	Canada Mayflower	FAC	5
Forb	<i>Maianthemum stellatum</i>	Starry false Solomon's seal	FAC-	5
Forb	<i>Mentha arvensis</i>	Wild Mint		3
Forb	<i>Mimulus ringens</i>	Monkey Flower	OBL	6
Forb	<i>Mitella diphylla</i>	Two-leaved mitrewort		8
Forb	<i>Mitella nuda</i>	naked miterwort, small bish	FACW	9
Forb	<i>Petasites frigidus</i>	Northern sweet-colt's-foot	FACW	7
Forb	<i>Polygala paucifolia</i>	Gaywings		7
Forb	<i>Polygonum amphibium</i>	Water smartweed	OBL	5
Forb	<i>Potentilla anserina</i>	Silver-weed		
Forb	<i>Ranunculus sceleratus</i>	Cursed crowfoot	OBL	3
Forb	<i>Ranunculus aquatilis</i>	white water crowfoot	OBL	8
Forb	<i>Ranunculus flabellaris</i>	Yellow water crowfoot	OBL	8
Forb	<i>Ranunculus hispidus</i>	Swamp buttercup	FACW	5
Forb	<i>Ranunculus recurvatus</i>	Hooked Buttercup	FACW	5
Forb	<i>Rubus pubescens</i>	Dwarf Red Raspberry		7
Forb	<i>Scutellaria galericulata</i>	Marsh skullcap	OBL	5
Forb	<i>Scutellaria laeriflora</i>	Mad-dog skull cap	OBL	5
Forb	<i>Sium suave</i>	water-parsnip	OBL maybe	5
Forb	<i>Symphotrichum lateriflorum</i>	Calico aster	FACW-	3
Forb	<i>Thalictrum dasycarpum</i>	Tall meadow-rue		
Forb	<i>Trientalis borealis</i>	Starflower		7

<b>Working List</b>				
<b>Door County Wetland / Cedar Swamp species / Landscapes of Place / 2019</b>				
Forb	<i>Trillium grandiflorum</i>	Large Flowered Trillium		6
Forb	<i>Typha latifolia</i>	Broad-leaved cattail	OBL	1
Forb	<i>Veronica americana</i>	American speedwell	OBL	9
Forb	<i>Veronica scutellata</i>	Marsh speedwell	OBL	5
Forb	<i>Viola cucullata</i>	Blue marsh violet		7
Forb	<i>Viola pubescens</i>	Yellow violet		5
Fern	<i>Cystopteris bulbifera</i>	Bulblet fern	FACW-	8
Fern	<i>Gymnocarpium dryopteris</i>	Oak Fern		7
Fern	<i>Matteuccia struthiopteris</i>	Ostrich fern	FACW	5
Fern	<i>Onoclea sensibilis</i>	Sensitive fern		5
Fern	<i>Osmunda cinnamomea</i>	Cinnamon fern	FACW	7
Fern	<i>Osmunda regalis</i>	Royal fern	OBL	7
Fern Ally	<i>Equisetum arvense</i>	Common horsetail	FAC	1
Fern Ally	<i>Equisetum scirpoides</i>	Dwarf scouring rush	FAC	7
Fern Ally	<i>Equisetum variegatum</i>	Variegated horsetail	FACW	7
Shrub	<i>Alnus incana</i> subsp. <i>rugosa</i>	Swamp alder	OBL	4
Shrub	<i>Cornus amomum</i>	Silky dogwood	FACW	4
Shrub	<i>Cornus stolonifera</i>	Red osier dogwood	FACW	3
Shrub	<i>Rhamnus alnifolia</i>	Alder leaved buckthorn	OBL	8
Shrub	<i>Rubus parviflorus</i>	Thimbleberry		7
Shrub	<i>Salix bebbiana</i>	Beaked willow, Bebb's willow	FACW	7
Shrub	<i>Salix candida</i>	Sage Willow	OBL	10
Shrub	<i>Salix discolor</i>	Pussy willow	FACW	2
Shrub	<i>Salix lucida</i>	Shining willow		5
Shrub	<i>Viburnum opulus</i> var. <i>trilobum</i>	Highbush cranberry		6
Tree	<i>Abies balsamea</i>	Balsam fir	FACW	5
Tree	<i>Acer negundo</i>	Boxelder	FACW-	0
Tree	<i>Acer saccharinum</i>	Silver Maple	FACW	2
Tree	<i>Betula alleghaniensis</i>	Yellow Birch		7
Tree	<i>Fraxinus nigra</i>	Black ash	FACW	8
Tree	<i>Fraxinus pennsylvanica</i>	Green ash		2
Tree	<i>Larix laricina</i>	Tamarack	FACW	8
Tree	<i>Picea glauca</i>	White spruce		7
Tree	<i>Picea mariana</i>	Black spruce	FACW	8
Tree	<i>Populus balsamifera</i>	Balsam poplar	FACW	4
Tree	<i>Populus deltoides</i>	Cottonwood		2
Tree	<i>Salix nigra</i>	Black willow		4
Tree	<i>Thuja occidentalis</i>	white cedar		9
Tree	<i>Tsuga canadensis</i>	Hemlock		8
Tree	<i>Ulmus americana</i>	American elm		3
Tree	<i>Ulmus rubra</i>	Slippery elm		4
Vine	<i>Vitis riparia</i>	Grape		2

<b>Working List</b>				
<b>Door County Northern Mesic Forest species / Landscapes of Place / 2019</b>				
<b>type</b>	<b>Genus species</b>	<b>Common Name</b>	<b>Wetland Indicator</b>	<b>C</b>
Grass/Sedge/Rush	<i>Carex aurea</i>	Elk sedge, Golden-fruited sedge	FACW+	5
Grass/Sedge/Rush	<i>Carex blanda</i>	Wood sedge	FAC	3
Grass/Sedge/Rush	<i>Carex eburnea</i>	Bristle-leaf sedge	FACU-	8
Grass/Sedge/Rush	<i>Carex gracillima</i>	Graceful Sedge	FACU	5
Grass/Sedge/Rush	<i>Carex pensylvanica</i>	Penn sedge	-	3
Grass/Sedge/Rush	<i>Carex sartwellii</i>	Running Marsh Sedge	FACW+	7
Grass/Sedge/Rush	<i>Elymus hystrix</i>	Bottlebrush grass	-	6
Grass/Sedge/Rush	<i>Juncus tenuis</i>	Path rush		1
Forb	<i>Actaea pachypoda</i>	White baneberry	-	6
Forb	<i>Actaea rubra</i>	Red baneberry	-	7
Forb	<i>Allium tricoccum</i>	Wild leek	FACU+	6
Forb	<i>Amphicarpa bracteata</i>	Hog peanut	FAC	5
Forb	<i>Anemone acutiloba</i>	Sharp-lobed hepatica	-	7
Forb	<i>Anemone quinquefolia</i>	Wood anemone	FAC	6
Forb	<i>Aquilegia canadensis</i>	Columbine	FAC-	5
Forb	<i>Aralia nudicaulis</i>	Wild sarsaparilla	FACU	6
Forb	<i>Aralia racemosa</i>	Spikenard	FACU	7
Forb	<i>Arisaema triphyllum</i>	Jack-in-the-pulpit	FACW-	5
Forb	<i>Asclepias exaltata</i>	Poke milkweed	UPL	7
Forb	<i>Aster cordifolius</i>	Common blue wood aster		6
Forb	<i>Aster macrophyllus</i>	Largeleaf aster		4
Forb	<i>Circaea alpina</i>	Alpine Enchanter's Nightshade		7
Forb	<i>Circaea lutetiana</i>	Enchanter's Nightshade		2
Forb	<i>Clintonia borealis</i>	Blue-bead-lily	FAC+	7
Forb	<i>Comandra umbellata</i>	Bastard-toadflax		6
Forb	<i>Corallorhiza maculata</i>	Spotted coralroot		7
Forb	<i>Corallorhiza striata</i>	Striped coralroot		9
Forb	<i>Corallorhiza trifida</i>	Early coralroot		7
Forb	<i>Cryptotaenia canadensis</i>	Canadian Honewort		4
Forb	<i>Cynoglossum boreale</i>	Northern wild comfrey		8
Forb	<i>Cypripedium arietinum</i>	Ram's Head Lady-slipper		10
Forb	<i>Cypripedium parviflorum var. makinoi</i>	Small yellow lady-slipper		9
Forb	<i>Cypripedium parviflorum var. pubescens</i>	Large yellow lady-slipper		9
Forb	<i>Desmodium glutinosum</i>	Pointed tick-trefoil		6
Forb	<i>Epifagus virginiana</i>	Beechdrops		9
Forb	<i>Erythronium albidum</i>	Trout Lily, White		7
Forb	<i>Fragaria virginiana</i>	Wild Strawberry		1
Forb	<i>Galium lanceolatum</i>	Lance leaved wild licorice		7
Forb	<i>Galium triflorum</i>	Sweet-scented bedstraw		5
Forb	<i>Geranium maculatum</i>	Geranium		4
Forb	<i>Geranium robertianum</i>	Herb robert		2
Forb	<i>Hackelia virginiana</i>	Stickseed		3

Working List				
Door County Northern Mesic Forest species / Landscapes of Place / 2019				
Forb	<i>Hypericum pyramidatum</i>	Great St. John's wort		6
Forb	<i>Lathyrus venosus</i>	Forest pea		6
Forb	<i>Lilium philadelphicum</i>	Wood lilly		9
Forb	<i>Linnaea borealis</i>	Twin flower		9
Forb	<i>Maianthemum canadense</i>	Canada Mayflower	FAC	5
Forb	<i>Maianthemum racemosum</i>	False Solomon's seal	FACU	5
Forb	<i>Maianthemum stellatum</i>	Starry false Solomon's seal	FAC-	5
Forb	<i>Mitchella repens</i>	Partridgeberry	FACU+	6
Forb	<i>Mitella diphylla</i>	Two-leaved mitrewort		8
Forb	<i>Mitella nuda</i>	Naked miterwort, Bishop's-ca	FACW	9
Forb	<i>Monotropa uniflora</i>	Indian-pipe		5
Forb	<i>Osmorhiza claytonii</i>	Hairy Sweet Cicely	FACU-	5
Forb	<i>Oxalis stricta</i>	Wood sorrel		0
Forb	<i>Pedicularis canadensis</i>	Swamp Lousewort, Wood-bet	FACU	8
Forb	<i>Platanthera hookeri</i>	Hooker's Orchid		9
Forb	<i>Polygala paucifolia</i>	Gaywings		7
Forb	<i>Polygonatum biflorum</i>	Solomon's seal		4
Forb	<i>Polygonatum pubescens</i>	Downy Solomon's-seal		6
Forb	<i>Prenanthes alba</i>	Lion's Foot		5
Forb	<i>Pyrola chlorantha</i>	Green-Flowered Shin-Leaf		7
Forb	<i>Ranunculus recurvatus</i>	Hooked Buttercup	FACW	5
Forb	<i>Sanguinaria canadensis</i>	Bloodroot		6
Forb	<i>Sanicula gregaria</i>	Clustered snakeroot		3
Forb	<i>Sanicula marilandica</i>	Black snakeroot		5
Forb	<i>Smilax ecirrhata</i>	upright carrion-flower		5
Forb	<i>Solidago flexicaulis</i>	Zigzag goldenrod		6
Forb	<i>Streptopus roseus</i>	Twisted-stalk	FAC	7
Forb	<i>Thalictrum dioicum</i>	Early meadow-rue		7
Forb	<i>Trientalis borealis</i>	Starflower		7
Forb	<i>Trillium grandiflorum</i>	Large Flowered Trillium		6
Forb	<i>Triosteum aurantiacum</i>	Orange fruited Horse gentian		5
Forb	<i>Uvularia grandiflora</i>	Bellwort		7
Forb	<i>Viola blanda</i>	Sweet White Violet		5
Forb	<i>Viola cucullata</i>	Blue marsh violet		7
Forb	<i>Viola pubescens</i>	Yellow violet		5
Forb	<i>Viola sororia</i>	Common blue violet		3
Fern	<i>Adiantum pedatum</i>	Maidenhair fern	FAC-	7
Fern	<i>Athyrium filix-femina</i>	Lady Fern		5
Fern	<i>Botrychium virginianum</i>	Rattlesnake fern		6
Fern	<i>Cystopteris bulbifera</i>	Bulblet fern	FACW-	8
Fern	<i>Cystopteris protrusa</i>	Fragile fern		6
Fern	<i>Dryopteris cristata</i>	Crested wood fern		7
Fern	<i>Dryopteris intermedia</i>	Spiney woodfern		7
Fern	<i>Gymnocarpium dryopteris</i>	Oak Fern		7



Working List				
Door County Northern Mesic Forest species / Landscapes of Place / 2019				
Fern	<i>Matteuccia struthiopteris</i>	Ostrich fern	FACW	5
Fern	<i>Onoclea sensibilis</i>	Sensitive fern		5
Fern	<i>Polypodium virginianum</i>	Common polypody, Rock-cap fern		9
Fern	<i>Pteridium aquilinum</i>	Bracken fern		2
Fern Ally	<i>Diphasiastrum complanatum</i>	Running cedar		7
Fern Ally	<i>Equisetum scirpoides</i>	Dwarf scouring rush	FAC	7
Fern Ally	<i>Huperzia lucidula</i>	Shining club moss		7
Fern Ally	<i>Lycopodium clavatum</i>	Running pine		6
Fern Ally	<i>Spinulum annotinum</i>	Bristly club-moss	FAC	7
Shrub	<i>Apocynum androsaemifolium</i>	Dogbane	-	5
Shrub	<i>Ceanothus americanus</i>	New Jersey Tea	UPL	9
Shrub	<i>Cornus canadensis</i>	Bunchberry	FAC	7
Shrub	<i>Corylus americana</i>	American Hazelnut		5
Shrub	<i>Corylus cornuta</i>	Beaked Hazelnut		5
Shrub	<i>Diervilla lonicera</i>	Northern bush honeysuckle		6
Shrub	<i>Dirca palustris</i>	Leatherwood		9
Shrub	<i>Juniperus communis</i>	Oldfield juniper		3
Shrub	<i>Prunus virginiana</i>	Chokecherry		3
Shrub	<i>Ribes americanum</i>	American black currant		4
Shrub	<i>Ribes cynosbati</i>	Prickly wild gooseberry		3
Shrub	<i>Rubus parviflorus</i>	Thimbleberry		7
Shrub	<i>Shepherdia canadensis</i>	Russet buffalo-berry		7
Shrub	<i>Symphoricarpos albus</i>	Snowberry		7
Shrub	<i>Taxus canadensis</i>	Canada yew		10
Shrub	<i>Viburnum acerifolium</i>	Maple-leaved viburnum		7
Shrub	<i>Viburnum lentago</i>	Nannyberry		4
Shrub	<i>Viburnum rafinesquianum</i>	Downy Arrowwood		7
Tree	<i>Abies balsamea</i>	Balsam fir	FACW	5
Tree	<i>Acer negundo</i>	Boxelder	FACW-	0
Tree	<i>Acer rubra</i>	Red Maple	-	5
Tree	<i>Acer saccharum</i>	Sugar maple	FACU	5
Tree	<i>Acer spicatum</i>	Mountain Maple	FACU	6
Tree	<i>Amelanchier laevis</i>	Amelanchier	-	6
Tree	<i>Betula alleghaniensis</i>	Yellow Birch		7
Tree	<i>Betula papyrifera</i>	Paper Birch	FACU+	3
Tree	<i>Carpinus caroliniana</i>	Musclewood	FAC	6
Tree	<i>Cornus alternifolia</i>	Alternate-leaved dogwood		7
Tree	<i>Cornus rugosa</i>	Round-leaved dogwood		7
Tree	<i>Fagus grandifolia</i>	American beech		8
Tree	<i>Fraxinus pennsylvanica</i>	Green ash		2
Tree	<i>Hamamelis virginiana</i>	Witchhazel		7
Tree	<i>Ostrya virginiana</i>	Ironwood		5
Tree	<i>Picea glauca</i>	White spruce		7
Tree	<i>Pinus resinosa</i>	Red pine		7

<b>Working List</b>				
<b>Door County Northern Mesic Forest species / Landscapes of Place / 2019</b>				
Tree	<i>Pinus strobus</i>	White pine		5
Tree	<i>Populus grandidentata</i>	Large tooth aspen		3
Tree	<i>Populus tremuloides</i>	Quaking aspen		2
Tree	<i>Prunus serotina</i>	Black cherry		3
Tree	<i>Quercus rubra</i>	Red oak		5
Tree	<i>Thuja occidentalis</i>	American white cedar		9
Tree	<i>Tilia americana</i>	Basswood		5
Tree	<i>Tsuga canadensis</i>	Hemlock		8
Tree	<i>Ulmus americana</i>	American elm		3
Tree	<i>Ulmus rubra</i>	Slippery elm		4
Vine	<i>Celastrus scandens</i>	American Bittersweet	<i>FACU*</i>	3
Vine	<i>Parthenocissus quinquefolia</i>	Virginia creeper		5
Vine	<i>Vitis riparia</i>	Grape		2

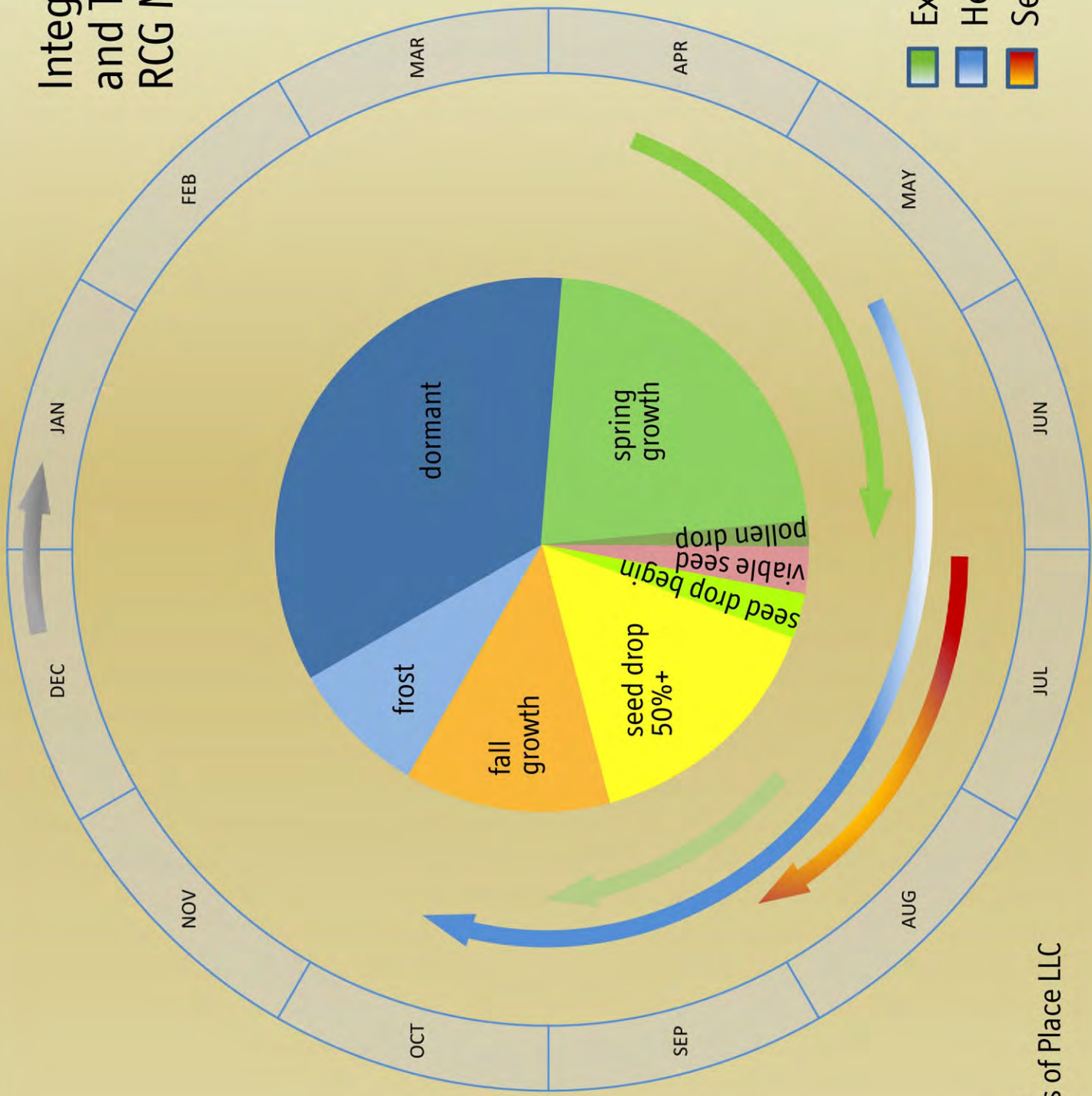
## Working List

### Door County Meadow species / Aten / Landscapes of Place / 2019

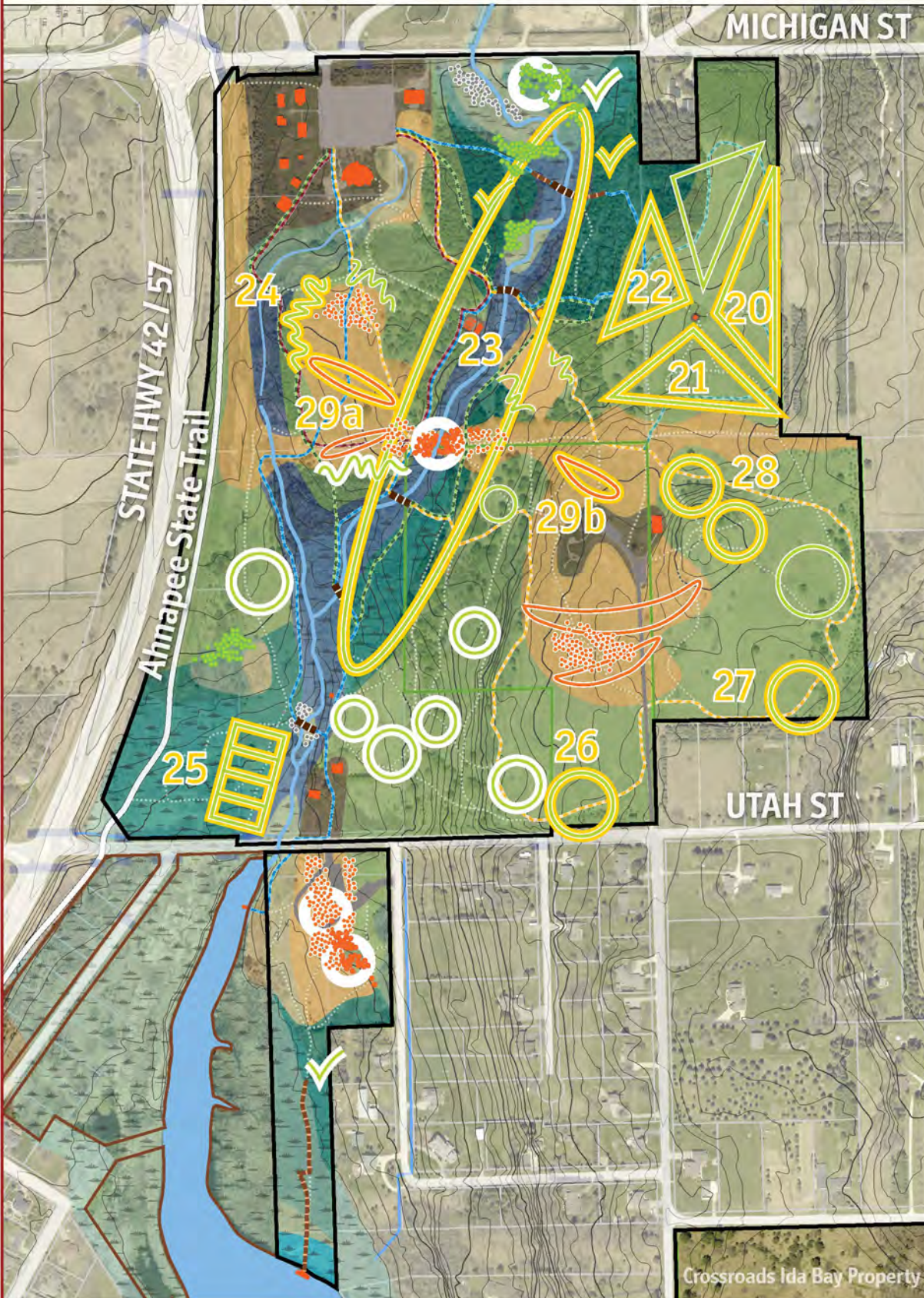
	<b>Latin Name</b>	<b>Common Name</b>	<b>Wetland Indicator</b>	<b>C</b>
grass/sedge	<i>Bromus kalmii</i>	Kalm's Brome	FAC	8
grass/sedge	<i>Danthonia spicata</i>	Poverty Oat Grass		4
grass/sedge	<i>Elymus trachycaulus</i>	Slender Wheat Grass		4
grass/sedge	<i>Elymus virginicus</i>	Virginia Wild Rye		6
grass/sedge	<i>Juncus tenuis</i>	Path Rush	FAC	3
grass/sedge	<i>Muhlenbergia mexicana</i>	Leafy Satin Grass	FACW	3
grass/sedge	<i>Schizachyrium scoparium</i>	Little Bluestem		
grass/sedge	<i>Stipa spartea</i>	Porcupine Grass		9
forb	<i>Anaphalis margaritacea</i>	Pearly Everlasting		3
forb	<i>Anemone cylindrica</i>	Thimbleweed		6
forb	<i>Anemone virginiana</i>	Tall Thimbleweed		5
forb	<i>Antennaria neglecta</i>	Field Pussytoes		
forb	<i>Antennaria plantaginifolia</i>	Plantain-leaved Pussytoes		
forb	<i>Aquilegia canadensis</i>	Wild Columbine	FAC-	5
forb	<i>Asclepias syriaca</i>	Common Milkweed		1
forb	<i>Asclepias tuberosa</i>	Butterfly Milkweed		6
forb	<i>Asclepias verticillata</i>	Whorled Milkweed		2
forb	<i>Astragalus canadensis</i>	Canadian Milkvech	FAC+	8
forb	<i>Comandra umbellata</i>	Bastard-toadflax	FACU	6
forb	<i>Coreopsis lanceolata</i>	Coreopsis	FACU	8
forb	<i>Doellingeria umbellata</i>	Flat-topped Aster	FACW	6
forb	<i>Epilobium angustifolium</i>	Great Willow-herb	FAC	3
forb	<i>Erigeron strigosus</i>	Daisy Fleabane		
forb	<i>Fragaria virginiana</i>	Wild Strawberry	FAC-	1
forb	<i>Hieracium umbellatum</i>	Narrow-leaved Hawkweed		5
forb	<i>Monarda fistulosa</i>	Wild Bergamot	FACU	3
forb	<i>Monarda punctata</i>	Dotted Horsemint	UPL	3
forb	<i>Oenothera biennis</i>	Common Evening Primrose	FACU	1
forb	<i>Packera paupercula</i>	Northern Meadow Groundsel	FAC+	4
forb	<i>Pedicularis canadensis</i>	Wood Betony	FACU+	8
forb	<i>Potentilla arguta</i>	Prairie Cinqufoil	FACU+	7
forb	<i>Ratibida pinnata</i>	Yellow Coneflower		4
forb	<i>Rudbeckia hirta</i>	Black-eyed Susan	FACU	4
forb	<i>Rudbeckia triloba</i>	Brown-eyed Susan	FAC-	4
forb	<i>Solidago juncea</i>	Early Goldenrod		4
forb	<i>Solidago nemoralis</i>	Old-field Goldenrod		
forb	<i>Solidago rigida</i>	Stiff Goldenrod	FACU-	5
forb	<i>Symphyotrichum ciliolatus</i>	Northern Heart-leaved Aster		4

forb	<i>Symphyotrichum ericoides</i>	Heath Aster	<i>FACU-</i>	4
forb	<i>Symphyotrichum laeve</i>	Smooth Blue Aster		6
forb	<i>Symphyotrichum lateriflorum</i>	Calico Aster	<i>FACW-</i>	
forb	<i>Symphyotrichum novae-angliae</i>	New England Aster	<i>FACW</i>	3
forb	<i>Symphyotrichum oolentangiensis</i>	Sky-blue Aster		5
forb	<i>Symphyotrichum urophyllum</i>	Arrow-leaved Aster		4
forb	<i>Synphiotrichum pilosum</i>	Hairy Aster		
forb	<i>Taenidia integerrima</i>	Yellow Pimpernel		7
forb	<i>Verbena hastata</i>	Blue Vervain	<i>FACW+</i>	3
forb	<i>Zizia aurea</i>	Golden Alexanders	<i>FAC+</i>	7
fern	<i>Pteridium aquilinum</i>	Bracken Fern	<i>FACU</i>	2
shrub	<i>Ceanothus americanus</i>	New Jersey Tea		9
shrub	<i>Juniperus communis</i>	Old-field Juniper		3
shrub	<i>Physocarpus opulifolius</i>	Ninebark	<i>FACW-</i>	6
shrub	<i>Rhus aromatica</i>	Fragrant Sumac		10
shrub	<i>Rhus hirta</i>	Staghorn Sumac		2
shrub	<i>Ribes cynosbati</i>	Gooseberry		3
shrub	<i>Rosa blanda</i>	Early Wild Rose	<i>FACU</i>	4
shrub	<i>Rosa carolina</i>	Carolina Rose	<i>FACU-</i>	4
shrub/tree	<i>Hawthorn spp</i>	Hawthorn		

# Integrated and Timed RCG Measures





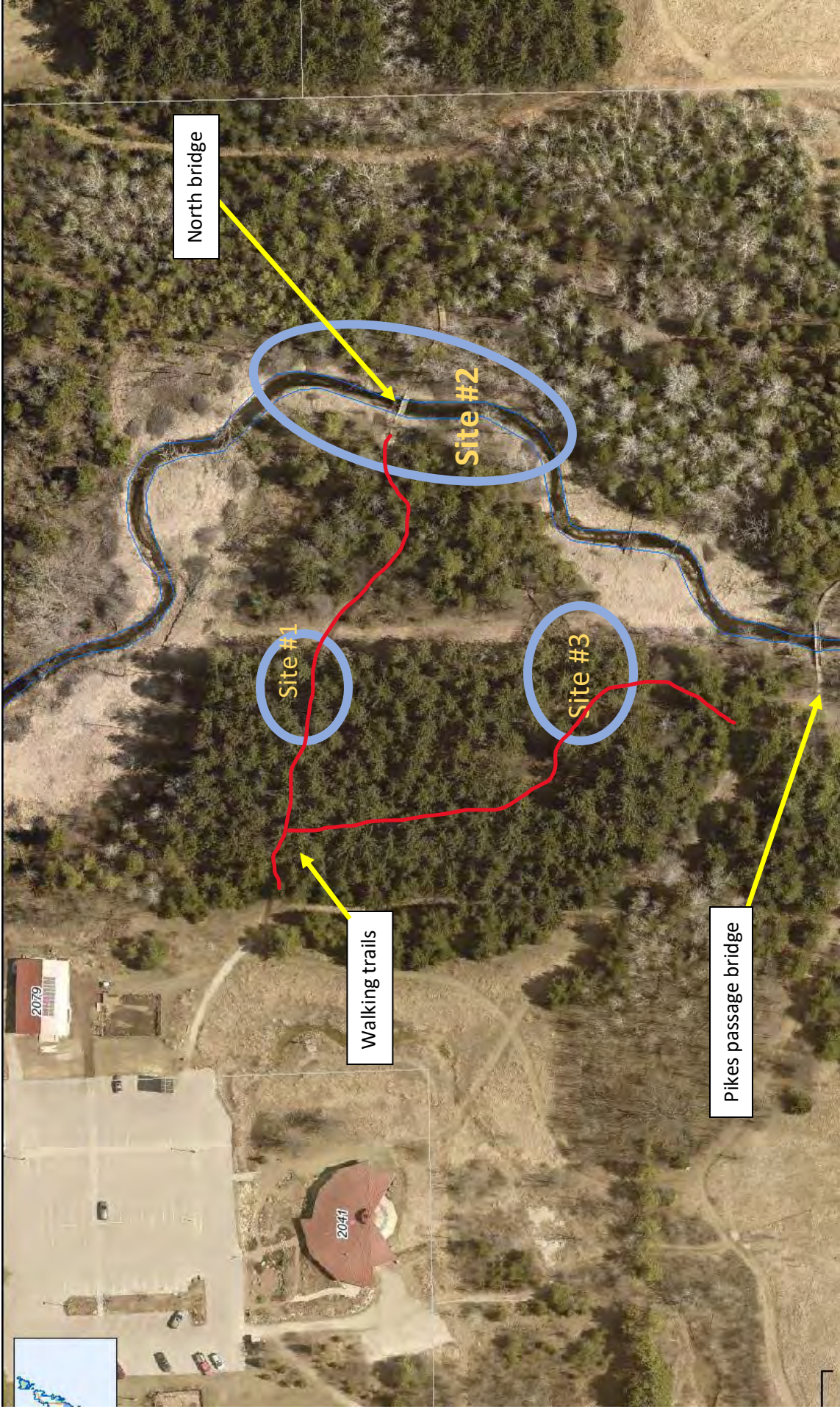


**FOREST INTERVENTIONS**

-  **1 Soften edge** with Aspen, Ironwood, Black Cherry
-  **2 Diversity Pocket** with Sugar Maple, Basswood, Black Cherry, Balsam Fir, Musclemwood, Witchhazel
- 3 Successional Edge Pocket** with Aspen, Ironwood, Black Cherry
- 4-5 Shrubland Pocket** with Serviceberry, Sumac, Beaked Hazelnut
- 6 Shrubland Pocket** of Serviceberry, Nannyberry
-  **7 Arboretum Boreal Segment:** Balsam Fir, Hemlock, Balsam Poplar
-  **8 Comparison Experiment Plots:** Begin design, planning and development of re-forestation method comparison plots
-  **9 Replacements:** Elm, Cottonwood, Tamarack
- 10 Replacements:** Silver Maple, Elm, Cottonwood, Tamarack, Speckled Alder

**MEADOW INTERVENTIONS**

-  **11 Meadow Plugs:** Supplementing 2020 project; add native seed
-  **12 Mixed Shrubs:** Adding to 2020 project; Beaked Hazelnut, Sumac
- 13 Mixed Shrubs:** Silky Dogwood near stream; Fragrant Sumac
-  **14 Wetland Shrubs, Plugs and Seed:** Diversity: Winterberry, Black Elderberry, Speckled Alder, Silky Dogwood. Add wetland herbaceous spp in adjacent open areas.

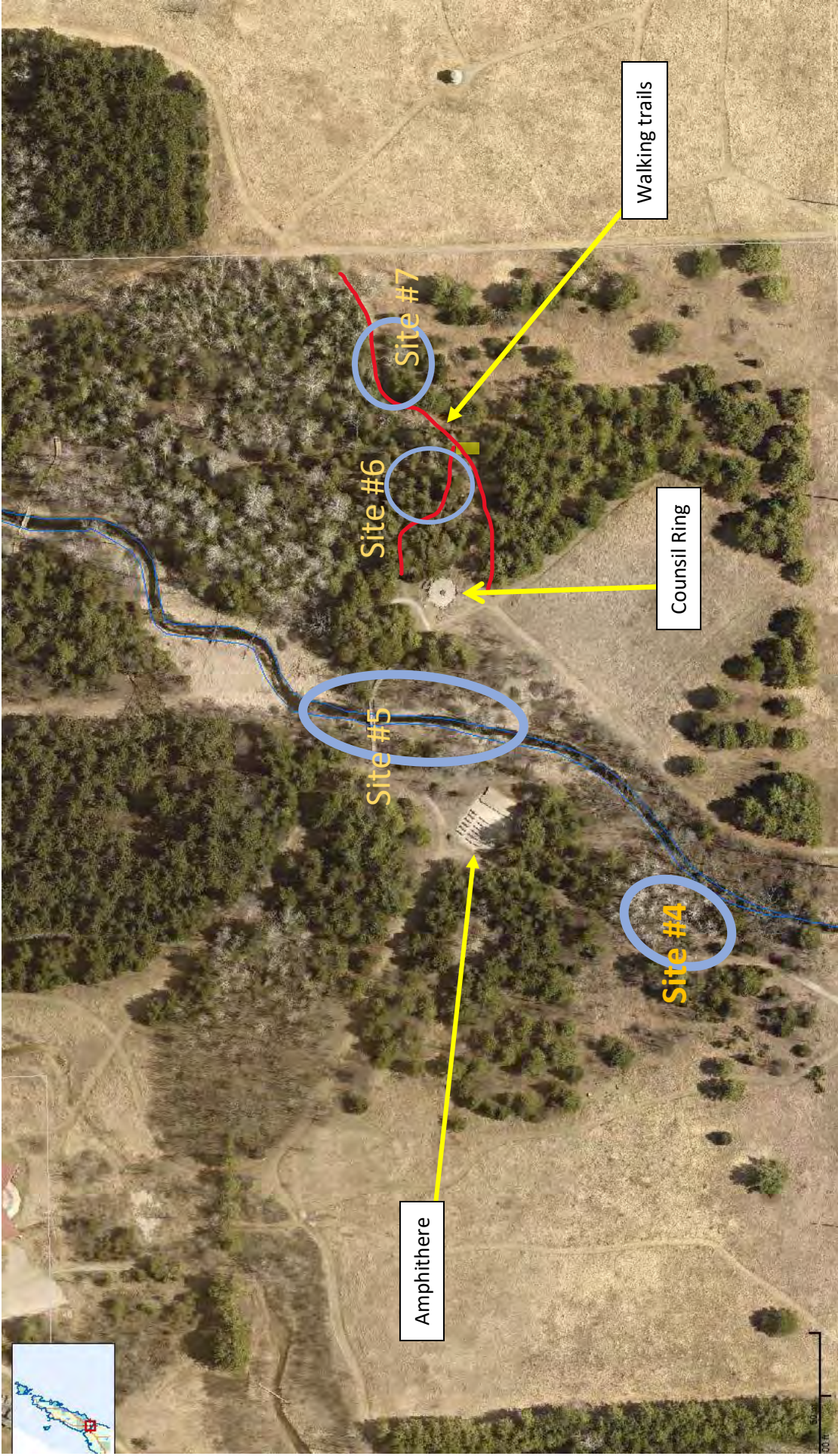


Site #23 - 1 - Wood fern

Site #23 - 2 - Elderberry, cranberry

Site #23 - 3 - Snowberry



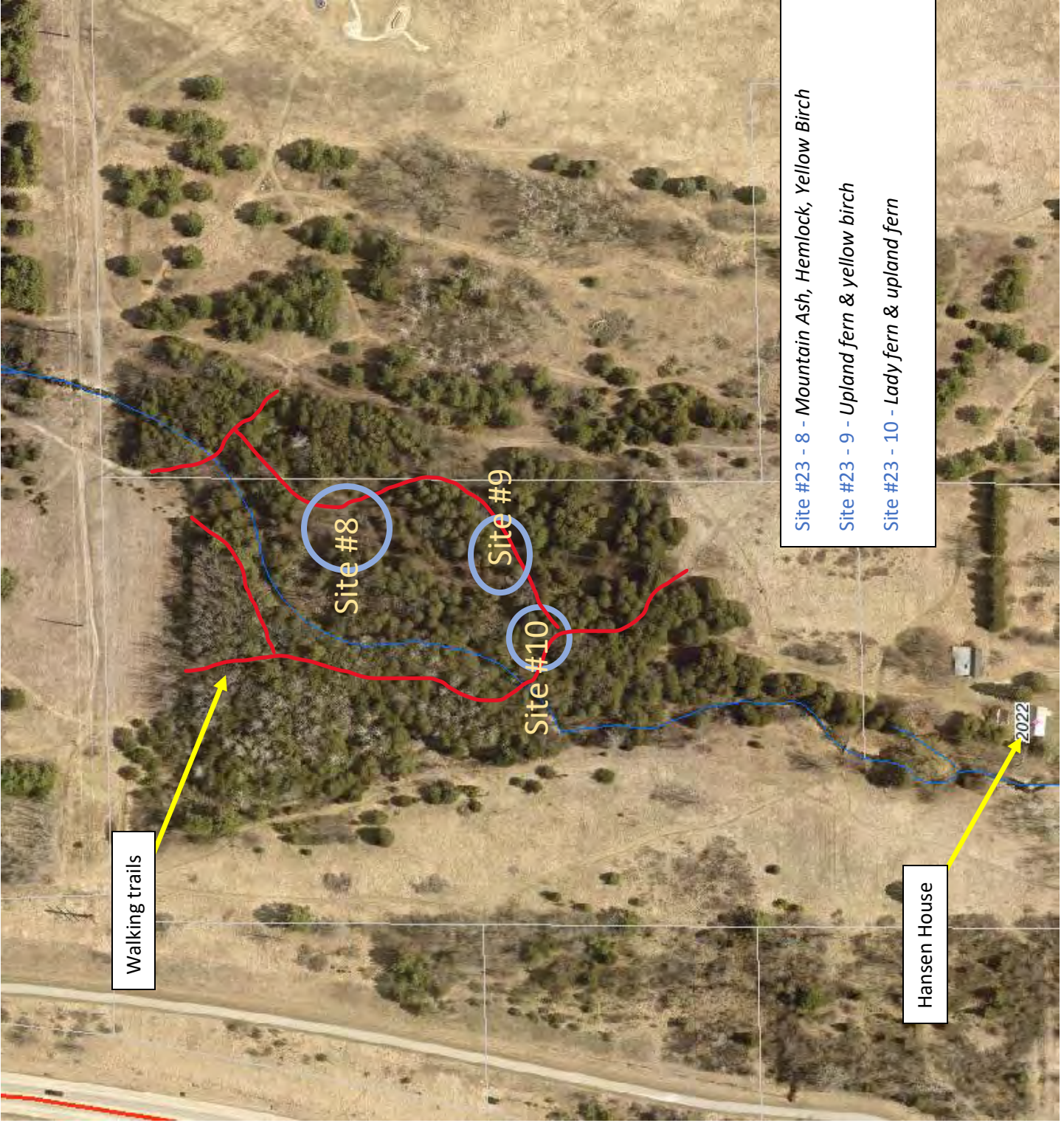


Site #23 - 4 - *Upland ferns*

Site #23 - 5 - *Wetland ferns, shrubs & silver maples*

Site #23 - 6 - *Yellow birch, Hemlock, Mountain Ash,*

*Beech* Site #23 - 7 - *Maiden hair & wood fern*



Walking trails

Hansen House

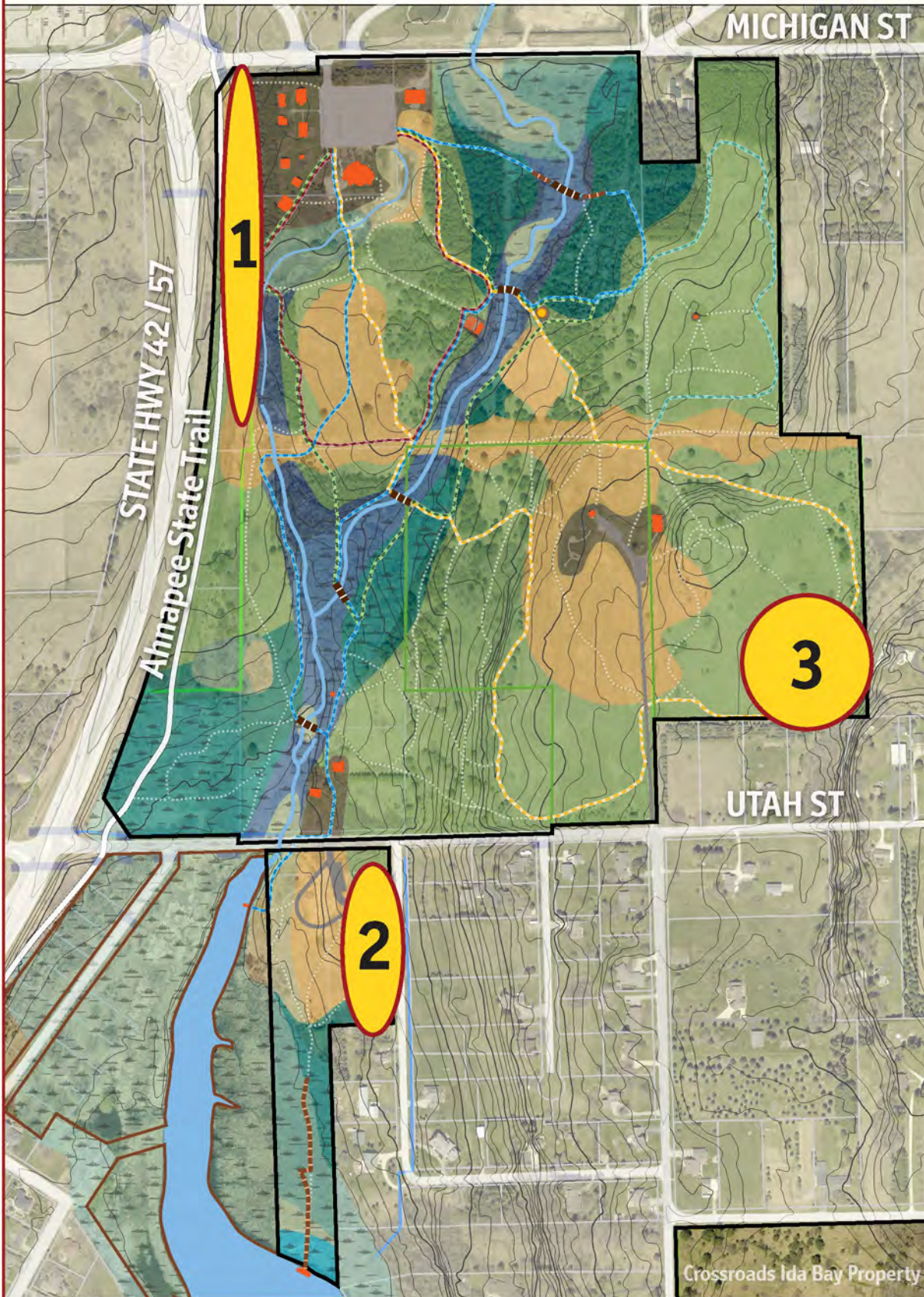
2022

Site #8

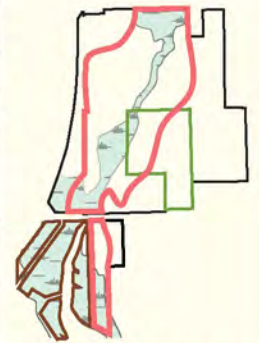
Site #9

Site #10

Site #23 - 8 - Mountain Ash, Hemlock, Yellow Birch  
Site #23 - 9 - Upland fern & yellow birch  
Site #23 - 10 - Lady fern & upland fern



- Door County Meadow
- Northern Mesic Forest
- Sedge Meadow
- Alder Thicket /Shrub Carr
- Northern Wet-Mesic Forest (Riparian)
- Northern Wet-Mesic Forest (Boreal)
- Emergent Marsh
- Cultural Areas



- Habitat Trails
- Bridges
- Structures
- 2021-2024 Project Area (65 acres)
- Mapped Wetlands

125 Acres:  
105 Owned by Crossroads  
20 Managed by Crossroads  
 WDNR



0 100' 200' 500'