ENVIRONMENTAL CORRIDOR AND OPEN SPACE
TASK FORCE AGENDA
THURSDAY, SEPTEMBER 1, 2016
7:00 PM
BOARD ROOM
MUNICIPAL BUILDING, 210 COTTONWOOD AVE.

Appoint a Chairperson Pro Tem for this meeting due to absence of Chairperson

Roll Call

1. Consideration of approval of Minutes of the July 28, 2016 Meeting

2. Introduction and review of Village GIS System – Mike Gerszewski, Operations Supervisor

3. Discussion of Individual visits to Environmental Corridors and Parks

4. Discussion of Key Themes to be included in the final deliverable (Task Force Report) and further discussion of the work plan

5. Future meeting topics and meeting schedule

    a. Meeting Topics
    b. Next meeting: October 6, 2016, 7:00pm

6. Adjourn

Mike Einweck, Public Works Director

Notice: Please note that upon reasonable notice, efforts will be made to accommodate the needs of disabled individuals through appropriate aids and services. For additional information or to request this service, contact Darlene Igl, WCPC/CMC, Village Clerk, at 262/367-2714. The Municipal Building is handicap accessible.

ENVIRONMENTAL CORRIDOR AND OPEN SPACE
TASK FORCE MINUTES
THURSDAY, JULY 28, 2016
7:00 PM
BOARD ROOM
MUNICIPAL BUILDING, 210 COTTONWOOD AVE

Roll Call – David Cox, Village Administrator and Coordinator of the Task Force started the meeting.

1. **Introduction of ECOS Task Force Members**

   David de-Courcy-Bower currently serves on the Village Joint Architectural Board/Plan Commission. His background is environmental engineering consultant. Sustainability and environmental issues are important to him and are part of what he does for his livelihood. He lives in the Village of Hartland on E. Capitol Drive.

   David Pride has lived on Penbrook Way since 2002. He was a property manager in the city for many years.

   Carol Zahorik has lived in the Village 30 years. She lives on Glenowen Drive and there is a conservancy behind her house. She is interested in nature and is a retired Milwaukee Public School teacher.

   Mike Einweck is the Director of Public Works for the Village of Hartland and has worked here for 10 years. He has a civil and environmental engineering degree.

   Tim Hallquist is Chairman of the Park Board and has been on that board for 21 years. He has lived in Hartland almost 30 years. He is also on the Joint Architectural Board/Plan Commission. He lives in the Hartridge Subdivision on Hartwood Lane.

   Courtney Marschalek lives on Nixon Avenue. Her background is education and environmental education. Primarily she is a mom, but she volunteers at Hartland North Elementary School. She and her husband got the trail system going in the Hartland North woods.

   Michelle Bonness lives just east of the Village in a house that backs up to a 60 acre conservancy. For the past 10 years, she and her neighbor have been restoring that. She loves doing the work and she has volunteered with the DNR in the Southern Kettle Moraine on every second Saturday for the past four or five years. She has learned a lot through them.

2. **Selection of Chairperson**

   The main goal of the Chairperson is to shepherd the meetings. Mike Einweck will be the primary staff person. He will get agendas together and see that proper notice is made. It is a public meeting and the State requirements for that will need to be met.

David deCourcy-Bower volunteered to be the chairperson. All were in favor.

3. Review of Resolution and purpose of Task Force

David Cox explained to the Task Force what the primary focus will be.

Paul Mozina came to the Village Board last winter and he was encouraging the Village Board to take on a more active role in the various open spaces in the Village. He was particularly interested in Penbrook Park and the significant parts of that park that have been allowed to go wild. He asked questions on how we manage our properties. Mr. Mozina encouraged the Village to more actively maintain the more passive areas of the parks. The Village Board needed more information on what that would mean to the Village. The Village has dozens if not hundreds of acres of land that it owns. The goal was to create a group of individuals who are willing to come together and evaluate the Villages open spaces, particularly ones that are owned by the Village, and try to identify insufficiencies or things that need to change and also try to identify a path to that change for the Village Board. Also, to try and identify what some of those costs might be so that the Village has the information for budgeting when it comes time to change the way we handle things.

There will be funds available if there needs to be assistance from the outside. We'll try and identify what that means, but there can be funds available.

David Cox reviewed the resolution which was used to create the task force. The goal is to be finished with the work within one year. If it takes less time that's great, if more time is needed, that can be worked out as well. The intent is to submit a written document/management plan to the Village Board that recommends the path to pursue. Ideally some targets and some sort of budget will be documented by the task force. It will then go to the staff to figure out how to work in the plan. We are looking for concise descriptions of what's going on, not a huge document. Photos may be included. We'll also want to know what the end product will look like.

There are two parts to this task – a heavy focus on Village-owned property and a secondary focus on non-village property, for example the marsh owned by the Ice Age Trail Alliance.

Carol Zahorik asked about her property. She owns 3 acres at the end of Glenowen Drive, much of it is conservancy. Her neighbor cut down trees and planted lawn grass in the conservancy so he can mow it. There are no rules for that. There should be some community education aspect. He owns the land, but he didn't know. Are there any consequences? Her house was built in 1952. The land didn't become a conservancy until the area behind her lot was developed off of Tenny Avenue. Half of her land is in the environmental corridor.

That should be a point of discussion regarding public land being one method of managing and there is private land in the conservancy areas. What are the existing ordinances? In the Comprehensive Plan there are guidelines that establish what an environmental corridor is.

The public education process is key in letting people know about what an environmental corridor is. The building inspector currently enforces the rules.

4. Review of Municipal-owned Property and Various Resource Material

Dave Cox distributed copies of the Villages Outdoor Recreation Plan, which is updated every five years. It is a description primarily on active use. It's a basic description of the parks, and it also gives the Village eligibility for grants. The Centennial Park restroom project was given a $45,000 grant. The northwest park on Campus Drive (a passive park) was mentioned. Some on the task force were not familiar with it.

Links to Sections 3 and 4 of the Villages Comprehensive Land Use Plan were sent to the task force. Among other things, the plan details the current condition of the Village and where it intends to go. Section 3 describes the various objectives of the Village. Section 4 relates to cultural history and environmental aspects. There are various maps that identify soils, habitat and other things related to the environment. Let the Village know if you want these in hard copy.

If you are interested in other things, we have many files in boxes that you may have access to. We have information on our water system and water supply if you need it.

DPW Director Einweck pointed out on the Village map the Village-owned properties. He also indicated what areas belong to the Ice Age Trail. It was brought up that Hartland/Lakeside schools have some forest areas near Hartland North and also behind Hartland South.

David deCourcy-Bower stated that there are three overlays on the GIS that would be useful.

- Village of Hartland Lands with Environmental Corridor
- Other Public Lands with Environmental Corridor
- Private Lands with Environmental Corridor

There may be some small areas to tackle that would influence the neighbors to do something similar. The Village will break down the maps into sections and print them.

It was mentioned that some of the newer developments are putting storm water retention facilities underneath their parking lots.

5. Hartland's Water Supply Now and in the Future

Mr. Pride wants to add water supply and wastewater to the work of the task force. Since he moved here in 2002, water use has greatly increased. We live in a time when we share an aquifer. It is his understanding that this aquifer originates in Canada, but the "big tank" extends from Hartford to Oconomowoc, to Brookfield, to Waukesha, with Hartland in the Middle. Waukesha has some serious problems. Their people have radium going into their bodies. We

may end up with the same problem here unless we understand our environment. The number one thing people want is a safe, economical, affordable water system. Where does the wastewater go and what is done with it? Water is a significant issue and we want to be ahead of the curve. He feels the task force should understand Del-Hart and why tankers fill up with water by the DPW five times a day and water lawns on Lake Nagawicka. 70% of everything our State of Wisconsin residents drink is beneath their feet. It's potable water through municipal wells and private wells. There are 533 waste treatment plants all of which put water into the rivers. We reserve no water in this state. It needs to change. He recommended the book "Let There Be Water: Israel's Solution for a Water Starved World" by Seth Siegel.

Mr. Pride would like to get a hydrologist in the budget. He recommended Ruekert & Mielke.

DPW Director Einweck answered that the consultant Village Engineer is from Ruekert & Mielke. Ruekert & Mielke has done a number of studies of our water system. We have those on file. Five active wells serve the Village. These wells are shallow. The deepest well is 132 feet. When you have a shallow aquifer you get away from the radium issues. A lot of communities can't find shallow water, so they end up drilling 1,500 feet. That's where the radium issues come from – the very deep wells.

Mr. Pride said that he understands that the high end of our aquifer is in Hartford and our aquifer is half empty. Waukesha has those four deep wells that are down to the salts and the uranium. Is this worth paying attention to? He did not think it was sustainable to keep filling up the tanker trucks or have the splash pad water going into the Bark River. We have all these subdivisions and we shouldn't throw our water away.

Mike Einweck stated that we don't want to duplicate existing services with our planning/engineering for new development, we work closely with Del-Hart on water treatment.

Dave Pride asked about what the Village is doing for water conservation?

Mike Einweck stated that there are a number of areas the Village is working towards for water conservation. He will get that information for Mr. Pride and bring it to another meeting. The tanker trucks that are being filled are sold as part of bulk water sales. A lot of the water being sold goes to neighborhood pools.

David Pride asked if staff could bring back to this task force what is being done about sustainability. Look at the demand. Look at Lake Mead and Las Vegas. Water is piped from the lake eighty miles to Las Vegas and 40 years later the lake is dried up. In Peshtigo, there isn't enough water to keep the river up in potato country.

David deCourcy-Bower said that given the fact that the Bark River is an integral part of the environmental corridors, consideration of surface water or retention aspects of how we manage our environmental corridors and the role they play in sustaining clean water in our community is important. The Ice Age wetlands do an outstanding job cleaning up water.

Hartland does have a lot of wetlands – more than most areas. Mr. Pride suggested pumping the splash pad water to Penbrook Park.

David deCourcy-Bower suggested that perhaps at the next meeting the task force could discuss if the water system is part of the scope of what we want to tackle as part of this task force. Or do we want to focus more on the contributions on the environmental corridors to improving the water quality in the Village. Water quality is improved through maintaining and keeping these environmental corridors in good condition so that we don't get erosion runoff.

Mike Einweck stated that the Village is obligated to follow DNR regulations. Whenever you go from green land to paved land, there is increased water runoff that happens on those sites. The Village and its engineers contain the runoffs from those properties and it goes into a wet retention basin, which helps filter out the pollutants. After the pollutants are filtered out, that water overflows to a detention basin, which acts as an infiltration basin. The water that flows on the property gets cleaned and gets put back into the ground. The Village has standards for how much water has to get back into the ground.

Dave Pride said that when 200 moms take their children to the splash pad, and there are 500 children over a period of eight hours, why can't we retain that water and put it in the pond at Penbrook? Why do we need to put it in the river?

Tim Hallquist thought that water is a great topic, but that is not what this task force is about. The Village has done several studies and we don't want to duplicate that. What we are trying to tackle, the green space and the parks, is going to be hard to accomplish by itself.

David deCourcy-Bower stated that the water pipes and waste water treatment is an engineering piece. There are aspects, though, for example, what are folks doing in the vicinity of the environmental corridors to make sure that there is an awareness of private property owners that there is an impact of the runoff from their properties into the environmental corridor. He doesn't think the task force should tackle the whole water system.

The consensus was to stay with the water that affects the environmental corridors and not the entire water system. Our homework for next meeting might be to come up with five bullet points that are important.

Perhaps the task force might take a look at different ideas about the splash pad water and give a recommendation. Mike Einweck likes conservation ideas such as using rain barrels for conserving water. Waukesha County has a very good education program that this committee could use their resources as part of this committee. Mike Einweck could contact Waukesha County to see if they have representatives who might come out and talk with us.

6. Discussion of Proposed Plan for Pursuit of Task Force Work

Tim Hallquist thought that the group should take on the Village properties first, non-Village land second, and education third.

Mike Einweck thought that if we concentrate on the Village lands and come up with plans, then we use that to promote the education aspect for the other public entities and private lands.

David deCourcy-Bower would like the environmental corridor overlay so that he can identify where the Environmental Corridors are. We also need to identify areas where owners of properties are next to each other (i.e. Ice Age Trail, Village land and Waukesha County Land Conservancy). Does it make sense to have three different groups managing essentially the same area? It will help us understand who we need to be talking to about which pieces of land. He would like to receive that soon so that at the next meeting the task force could tackle the lands.

Courtney Marshalek asked if we could we find out about the management plan for the Ice Age Trail and Waukesha County Wetlands.

Dave Cox stated that the three entities are working together in that area where the lands are close together. There is a specific management plan related to the upland portions of the property. There is a plan that has been developed that we are implementing there. The plan is to have a contractor eradicate the buckthorn and garlic mustard, working toward spring to eventually do a burn through the upland portions of the marsh.

The question was asked if we could use the big machine at Penbrook to eradicate the buckthorn there. Mr. Einweck answered that is something that the task force can look at when they are visiting the parks and see if that is something they want to do.

David deCourcy-Bower mentioned that as the task force walks around, look to see where else should we implement a similar type of plan?

Mike Einweck asked the task force to think about volunteer opportunities as they are going through the parks. He always gets a lot of groups contacting him about wanting to do volunteer work in the Village. If they see something might work for a project, let staff know.

The basic idea for the task force is evaluating the green space, as a collective group come up with action plans, prioritize and then get a cost factor.

7. Future Meeting Topics and Meeting Schedule

David deCourcy-Bower asked the group how often do they want to meet? Is monthly enough? We would all want to walk through the parks and open areas soon. Monthly meetings was the consensus. We can change it later if we need to. We will have a month to visit as many areas as we can.

Thursday, September 1 was chosen as the next meeting date and meeting on the first Thursday of every month thereafter.

Dave Cox said the group will get the sectionalized maps on which we will identify Village-owned parcels.

Mike Einweck will get a substitute for himself for the meeting as he will not be able to attend.

Dave Cox and Mike Einweck will email the overlays and will have an 11" x 17" hard copy available to be picked up by the task force. David deCourcy-Bower requested not to receive a hard copy.

Adjourn

Motion (Marschalek/Hallquist) to adjourn. Carried (7-0). Meeting adjourned at 8:28 PM.

Respectfully submitted by
Recording Secretary

Lynn Meyer
Deputy Clerk

Site Assessment and Four-Year Restoration Plan for Upland Portions of the Hartland Marsh-Bark River Preserve

Waukesha County, WI

Integrated Restorations, LLC

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Site Assessment and Four-Year Restoration Plan for Upland Portions of the Hartland Marsh-Bark River Preserve

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November 2014

Suggested Citation Format:

Integrated Restorations, LLC. 2014. *Site Assessment and Four-Year Restoration Plan for Upland Portions of the Hartland Marsh-Bark River Preserve (Waukesha County, WI).*

Context

Historically, more than 6.9 million acres of Wisconsin was covered by oak savanna and open oak woodland (Curtis 1959) and Wisconsin led the Midwest in total acreage of these plant communities (WDNR 1995). Although Curtis (1959) operationally defined oak savanna as having greater than one oak tree per acre but less than 50% total tree canopy cover, the distinction between oak savanna and open oak woodland is largely subjective from a restoration and management perspective (c.f., Cottam 1949). Generally speaking, oak-dominated plant communities are characterized by 1) a preponderance of white, burr, black, red, pin, and/or Hill's oak, often with shagbark hickory as a principal subdominant species, 2) a midstory and groundlayer of fire-tolerant native shrubs and herbaceous vegetation, and 3) a history of periodic fire. At the landscape scale, topographic factors and gradients of soil characteristics and light also influence the composition of oak communities (Pruka 1994; Leach and Givnish 1998; Annen and Lyon 1999). Oak savanna and oak woodlands require a periodic stabilizing disturbance (in the form of fire) to maintain their structure and diversity; the frequency and intensity of historical fire regimes influenced the acreage of oak-dominated plant communities during any given time period, and the extent of these communities expanded and contracted in response to climatic changes that influenced fire behavior during the past 12,000 years (Anderson 1998). In the absence of fire, oak-dominated communities are quickly replaced by mesic forest or a novel mixture of non-native shrubs and fire-intolerant softwood trees.

Remnant oak savanna is presently considered one of the most threatened plant community types in the Midwestern United States. In 1995, the Wisconsin DNR reported that no more than 500 acres of undisturbed, high-quality oak savanna were listed in Wisconsin's Natural Heritage Inventory, less than 0.01% of their original acreage. Most oak savanna remnants are in highly degraded condition and occur as isolated islands within a landscape that has been highly fragmented by commercialization and urban expansion. Tree and shrub encroachment in the absence of periodic fire regimes, clearing and conversion to row crop agriculture, intensive livestock grazing, and species invasions have all contributed to loss of oak savanna acreage. Leach and Givnish (1998) suggested that degraded oak savanna remnants are more prevalent that conventionally thought, and proposed three criteria for identifying highly restorable oak savanna remnants in Wisconsin: 1) presence of oaks displaying an open growth form, 2) a history of fire within the previous ten years, and 3) a groundlayer of native species from both full-sun and shaded microsites. However, to date no one has used these criteria to reassess the total acreage of oak savanna remnant in Wisconsin. Regrettably, our knowledge of the biology and ecology of historical oak savanna and open oak woodlands is less than complete; much of the original

acreage had already been degraded by the time the University of Wisconsin Plant Ecology Laboratory (PEL) first made efforts to quantify their structure and composition (as summarized in Curtis 1959). In fact, several sources suggest that the original groundlayer composition of oak savanna is largely unknown (e.g., Pruka 1994; WDNR 1995). The present rarity of remnant oak savanna and open oak woodland communities underscores the need for conservation, protection, management, and scientific investigation of these plant community types and the array of wildlife they support.

General Site Description and Location

The 178-acre Hartland Marsh-Bark River Preserve (refer to map at the end of this document) is located west of Cottonwood Drive within the Village of Hartland, T7N R18E, in Waukesha County, Wisconsin, and is also bordered by the City and Township of Delafield. The Hartland Marsh-Bark River Preserve consists of a habitat mosaic of oak savanna, open oak woodland, shrub-carr, sedge meadow, and riparian communities, all of which are in a slightly degraded but highly restorable condition. The Bark River flows through the Preserve from NE to SW, and approximately 1.5 miles of a spur and loop of the Ice Age Trail meanders through the site. Boardwalks have been installed over the wetland portions of the site to allow access to the oak savanna islands that occur on high points within the wetland. Presettlement vegetation in the area consisted of a mosaic of prairie and oak savanna, with wetland communities in the lowlands of the Bark River floodplain. The present landscape consists of remnant oak savanna-open oak woodland and wetland communities within a matrix of commercial and residential developed land.

Assessment of Restoration Potential

The beta (habitat) diversity of the Hartland Marsh-Bark River Preserve along a wetland-to-upland gradient offers an opportunity for conservation of numerous species across multiple trophic levels. The present composition and structure of native relic vegetation suggests that the Preserve has high natural area potential, and public use of these hiking trails presents the possibility to educate local residents about habitat conservation in general and the importance of oak savanna and oak woodland remnants specifically. Although the preliminary site analysis (conducted by Ann Hasselkus) did not detect the presence of any species of conservation concern, supplementary in-depth surveys might reveal the presence of at-risk species inhabiting the Preserve, particularly following implementation of restoration and management initiatives. Management action should be undertaken within the next five years to

preserve this remnant and curtail any further degradation of its structural and compositional integrity and prevent local species loss; if the present trend is allowed to continue for more than five years, species invasions and successional changes will be increasingly difficult and expensive to reverse, and will require a longer time commitment to accomplish. Fortunately, previous efforts by IATA (Ice Age Trail Alliance) and WCLC (Waukesha County Land Conservation) volunteers have already placed this site on a trajectory toward recovery, and capitalizing on these efforts can be accomplished within a three-year time period with a routine level of management intensity. The only foreseeable challenge this site poses is its urban location and obtaining permission and public acceptance of the use of prescribed fire as a management tool.

The 37 acres of oak savanna and open oak woodland remnants of the Hartland Marsh-Bark River Preserve are presently in highly recoverable condition; the majority of the mature oaks present possess an open canopy growth form, oak and hickory regeneration is occurring in all but the seedling age classes, native groundlayer sedges, grasses, and forbs are present in at least some locations, and the depth and composition of litter is conducive to application of prescribed fire. In the absence of periodic fire, this upland oak savanna and open oak woodland remnant is tracing a new trajectory toward replacement by trees and shrubs, although at present this trend is still reversible on a practical time scale. The primary immediate threat to the ecological integrity of this site arises from non-native invasive species, principally buckthorn. A variety of size classes of box elder, white mulberry, American cherry, and honeysuckle are also present throughout the uplands at lower density. Brambles are common in places, and may expand following initial management. Also present are garlic mustard, Japanese hedge parsley, with scattered Canada thistle and burdock.

Incidentally, the wetland areas are also largely in recoverable, remnant condition and display high restoration and habitat potential, although specific management recommendations for the Preserve's wetlands are not covered in this report.

Restoration Plan

Refer to the map at the end of this document; this report summarizes restoration tasks for the 37 acres of upland habitat outlined with yellow, green, and purple polygons.

A. Short-term management initiatives should focus on three general priorities:

1) Tree and shrub removal,
2) Invasive species suppression, and

3) Reintroduction of prescribed fire to the site.
4) Reintroduction of additional groundlayer species that are characteristic of presettlement oak savanna and open oak woodlands. Brian Pruka (1994) provided a list of savanna indicator species that can serve as a starting point for this effort. Additional lists of savanna groundlayer species can be found at http://oaksavannas.org/savanna-forbs.html#Packard

B. Longer-term management initiatives *THESE INITIATIVES ARE NOT COVERED IN THIS REPORT BUT WE CAN PROVIDE GUIDELINES ONCE RESTORATION REACHES THIS PHASE:*

1) Creation and installation of habitat structural elements for wildlife use (e.g., bird and bat houses, den logs, plum thickets, hazelnut, nurse logs, basking logs, hard- and softwood snags).
2) Maintenance of a habitat mosaic to maximize the Preserve's biodiversity potential and provide wildlife with habitat refuge, as most of the surrounding area will not support oak savanna and open oak woodland habitat specialists.

Summary of Specific Management Objectives:

1. **Reverse buckthorn invasion.**
2. **Remove subdominant trees and additional invasive shrubs; retain native shrubs for wildlife use.**
3. **Suppress garlic mustard, Japanese hedge parsley, burdock, and Canada thistle.**
4. **Conduct spring burns in the uplands annually for 3 – 5 consecutive years.**
5. **Reestablish herbaceous vegetation in the groundlayer.**

Specific Management Objectives:

1. **Reverse buckthorn invasion.** Buckthorn is the most abundant invasive species in the oak savanna and open oak woodland remnants (Figure 1). Owing to previous management efforts that focused on buckthorn removal, a single age-class cohort of ca. four year-old buckthorns (≈ ¾ to 1-inch basal diameter) has populated much of the remnant wooded portions of the Preserve. This population probably arose following increased light penetration to the buckthorn seedbank after initial buckthorn removal, commensurate with the lack of fire to curtail shrub establishment and expansion. This cohort has begun to reach reproductive maturity (Figure 2, note the presence of black berries growing from the axils of the upper branches), is already capable of suppressing oak regeneration (the seedling and small sapling age-classes of oaks are

nearly absent), has altered the open character of oak savanna habitat (concomitantly reducing habitat suitability to many wildlife species), and has likely altered the site's ability to carry a fire in some places. ***This threat should be addressed immediately upon implementation of active management.***

Figure 1. Buckthorn invasion following initial buckthorn removal (2014).

Figure 2. Reproductively mature buckthorn producing berries (2014).

Specifications: Approximately ⅔ of the area covered by buckthorn at high density occurs on relatively flat ground and can be forestry mowed by agency staff (refer to the management timeline section of this document for specific timing windows). Mowing should be performed during the early winter months once the ground is well frozen (to limit soil disturbance) and the dense buckthorn shrubs have lost most of their leaves, enhancing visibility for the mower operator to avoid damaging equipment on the array of quartzite glacial erratics and occasional downed trees that are distributed throughout the site. Mowed areas should be foliar-treated by a contractor with a mixture of 3% (v/v) water-soluble triclopyr (Element 3A®, Garlon 3A®) and 2% (v/v) methylated seed oil-nonionic surfactant blend (MSO-NIS) during the peak of the subsequent growing season, after resprouts have achieved full leaf-out. Considering the buckthorn population is already releasing propagules, it is strongly recommended that a minimum of two mowing and three foliar treatment iterations are performed to limit subsequent buckthorn reinvasions, simultaneous with annual imposition of prescribed fire to the areas under active management (refer to the management timeline section of this document for specific timing windows). The remaining ⅓ of the buckthorn population occurs on sloping ground and will need to be manually removed by a contractor. During manual removal, freshly cut stumps should be treated with a 50% (v/v) solution of water-soluble triclopyr (Element 3A®, Garlon 3A®) or a 21% (v/v) mixture of oil-soluble triclopyr (Element 4®, Garlon 4®, or Garlon RTU®) and bark oil diluent (refer to the management timeline section of this document for specific timing windows). The southeast corner of the site (near the parking lot and chimney structure) supports larger buckthorn shrubs that should also be removed and chemically treated by a contractor to prevent the spread additional propagules throughout the remainder of the Preserve. Slash should be piled and burned by a contractor in winter when there is adequate snow cover on the ground.

2. **Remove subdominant trees and additional invasive shrubs; retain native shrubs for wildlife use.** Trees that are not characteristic of historical oak savanna and additional invasive shrubs (principally honeysuckle, barberry, white mulberry, black cherry, and box elder) have also become established in the absence of fire. These species occur at lower density than buckthorn, probably as a result of competitive interference by buckthorn, and will likely expand once buckthorn removal occurs.

   Specifications: Shrubs and tree seedlings occurring in the flat areas should be forestry mowed along with the buckthorn, while larger trees (which are interspersed throughout the uplands)

and those trees and shrubs occurring in sloped areas should be manually removed by a contractor. It is recommended that a minimum of two foliar treatments are conducted on honeysuckle and black cherry resprouts since neither is completely eradicated by a single foliar treatment (both species have a leaf anatomy that provides a measure of physical tolerance to triclopyr foliar treatments). The southeast corner of the site consists of a ca. ¾-acre stand of large trees (along with several large mature buckthorn shrubs) that are not characteristic of historical conditions and should be manually removed by a contractor. Slash should be piled and burned in winter when there is adequate snow cover on the ground. Chemical treatment recommendations and specific timing windows for this objective are the same as for buckthorn.

3. **Suppress garlic mustard, Japanese hedge parsley, burdock, and Canada thistle.**

   Specifications: Garlic mustard and Japanese hedge parsley: Scout and spot treat garlic mustard and Japanese hedge parsley plants with 0.8 grams per gallon wettable-granule metsulfuron methyl (Escort XP®) with 1% methylated seed oil-nonionic surfactant blend (specific tank mixing instructions can be found in appendix A of this document). Any small shrubs or brambles that are leafing out during this initial pass can also be treated with this mixture. Canada thistle and burdock: Scout and spot treat populations of Canada thistle and burdock with a 0.5% (v/v) mixture of clopyralid (Transline®, Stinger®) with 1% (v/v) biodegradable organic fatty acid-based sticking agent and acidifier (Induce pH®) and 1% (v/v) MSO-NIS in mid- to late June (optimally, before flowering and seed production). The sticking agent will cause the herbicide to physically adhere to treated surfaces and retard spray drift and leaf wash, thereby minimizing the risk of collateral damage to non-target species and decreasing the volume of herbicide necessary to achieve herbicide performance. Treatments should be repeated for at least three growing seasons to ensure complete eradication.

4. **Conduct spring burns annually for 3 – 5 consecutive years.** Fire is necessary to maintain the open character and species composition of oak savannas and open oak woodlands. Moreover, in terms of the long-term threat posed by the buckthorn invasion, the allelopathic metabolites released by buckthorn are sequestered by electrostatically-charged activated charcoal that results from frequent low-intensity burn events. Periodic fire is also necessary for mast production and oak and hickory regeneration. One possible response to fire management is an initial increase in the abundance of invasive species. Fire effects (litter removal and seed scarification) can affect a flush of invasive species seed banks, particularly of legumes and biennial species, although the severity of invasive outbreaks typically diminishes with time. The

optimal time to eradicate an invasive species is during the initial establishment phase of its expansion; therefore, the site should be annually scouted for the presence and distribution of invasive species, especially during the initial recovery period and after fire management events.

Specifications: The upland portions of the site should be burned annually for at least three to five consecutive years by experienced IATA and Waukesha County Land Conservation volunteers. Volunteers should also coordinate firebreak construction and maintenance activities with burn leaders (refer to the management timeline section of this document for specific timing windows).

5. **Reestablish herbaceous vegetation in the groundlayer.** Volunteers should plant plugs (live plants) and seeds of sedges, grasses, and forbs characteristic of oak savanna and open oak woodland vegetation communities. Brian Pruka (1994) provided a list of savanna indicator species that can serve as a starting point for this effort. Additional lists of savanna groundlayer species can be found at http://oaksavannas.org/savanna-forbs.html#Packard. This will additionally help to make the oak savanna and open oak woodland remnants more flammable during burns, which will in turn enhance the effects of fire management on species invasions (refer to the management timeline section of this document for specific timing windows).

Three-Year Cost Estimate

$17,000 - $23,000 ($460 – $620/acre) for items in the task plan designated to the contractor (estimate includes all expendable supplies, including herbicides and additives).

Hourly labor rate: $35/person

Hourly consulting rate: $50/consultant

Integrated Restorations, LLC and its staff are fully certified and licensed commercial pesticide applicators. Integrated Restorations, LLC carries active liability and worker's compensation insurance to protect its clients.

Management Timeline and Task Plan

This assessment and recovery plan focuses on management priorities for a 46-month time period.

Timing Window	Activity	Task Assignment
	Year 1	
October-November	Forestry mow shrubs in flat areas	*Local government agency*
November-December	Thin canopy of trees not characteristic of oak woodlands	*Contractor*
December	Burn brush piles	*Contractor*
	Year 2	
January	Burn brush piles	*Contractor*
March-April	Install firebreaks and conduct prescribed burn	*Volunteers*
April-May	Scout and spot spray GM and JHP	*Contractor*
May-June	Scout and spot spray burdock and thistle	*Contractor*
June-July	Foliar spray brush resprouts in forestry mowed areas	*Contractor*
	Foliar spray brambles (as needed)	*Contractor*
October-November	Forestry mow shrubs in flat areas	*Local government agency*
	Manually remove shrubs from sloped areas	*Contractor*
November	Scout and spot spray GM and JHP	*Contractor*
	Year 3	
March-April	Conduct second prescribed burn	*Volunteers*
April-May	Scout and spot spray GM and JHP	*Contractor*
June-July	Foliar spray brush resprouts in forestry mowed areas	*Contractor*
	Foliar spray brambles (as needed)	*Contractor*
September-October	Collect local ecotype seed for savanna understory	*Volunteers*
November	Scout and spot spray GM and JHP	*Contractor*
	Year 4	
March-April	Conduct third prescribed burn	*Volunteers*
	Interseed local ecotype seed into burned areas	*Volunteers*
April-May	Scout and spot spray GM and JHP	*Contractor*
May-June	Scout and spot spray burdock and thistle	*Contractor*
June-July	Foliar spray brush resprouts in mowed areas	*Contractor*

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Appendix A:
Tank mixing instructions for herbicides and additives listed in this report
(arranged by target species)

1. Brambles (blackberry, red raspberry, black raspberry, dewberry)

Herbicide: Element 3A® [44.4% a.i. stock solution of water-soluble triclopyr].
Rate: 0.4% (a.i.) WS triclopyr, equivalent to 1.3 fluid ounces (37.7 mL) per gallon. This produces a 1% solution by volume (1% v/v).
Solvent: Water (a conditioning agent is not required for this formulation).
Additive: Dyne-Amic® (Helena Chemical Co.) organosilicone-based methylated seed oil + nonionic surfactant.
Addition rate: 1% (v/v), equivalent to 1.3 fluid ounces (37.7 mL) per gallon.
Tank mixing sequence:

a. Add ⅔ of the desired total volume of water to tank
b. Add triclopyr
c. *q.s.* tank to desired final volume
d. Add MSO-NIS
e. Add spray pattern indicator dye
f. Replace tank lid, agitate, and apply
g. (Periodically re-agitate spray solution during application)

Coverage for optimal performance: ≥ 85% of leaf surface area.

Application Window: Late June – early July, preferably during periods of active growth and limited precipitation deficit. Brambles should be completely leafed out and actively growing.

Uptake: Element 3A® is rainfast in 4 hours. Addition of 2% (v/v) Dyne-Amic® to the mixture quadruples the rate of uptake, decreasing the rainfast period to 1 hour. Triclopyr is mildly decomposed by UV light.

Posting Requirement: The Restricted Entry Interval (REI) of Element 3A® is 48 hours.

2. Buckthorn, honeysuckle, white mulberry, and black cherry resprouts

Herbicide: Element 3A® [44.4% a.i. stock solution of water-soluble triclopyr].
Rate: 1.3% (a.i.) WS triclopyr, equivalent to 3.8 fluid ounces (112 mL) per gallon. This produces a 3% solution by volume (3% v/v).
Solvent: Water (a conditioning agent is not required for this formulation).
Additive(s): Dyne-Amic® organosilicone-based methylated seed oil + nonionic surfactant, Induce pH® sticking agent. Both adjuvants are manufactured and distributed by Helena Chemical Company.
Addition rate(s): Dyne-Amic—2% (v/v), equivalent to 2.6 fluid ounces (75.4 mL) per gallon; Induce—0.5% (v/v), equivalent to 0.65 fluid ounces (19 mL) per gallon.

Tank mixing sequence:

a. Add ⅔ of the desired total volume of water to tank
b. Add triclopyr
c. *q.s.* tank to desired final volume
d. Add MSO-NIS and sticking agent
e. Add spray pattern indicator dye
f. Replace tank lid, agitate, and apply
g. (Periodically re-agitate spray solution during application)

Coverage for optimal performance: ≥ 95% of leaf surface area.

Uptake: Element 3A® is rainfast in 4 hours. Addition of 2% (v/v) Dyne-Amic® to the mixture quadruples the rate of uptake, decreasing the rainfast period to 1 hour. Triclopyr is mildly decomposed by UV light.

Height of target vegetation: ≤ 2½ feet tall (herbicide efficacy diminishes at heights greater than this).

Application Window: Late June – Late July, preferably during periods of active growth and limited precipitation deficit. Resprouts should be completely leafed out and actively growing.

Posting Requirement: The Restricted Entry Interval (REI) of Element 3A® is 48 hours.

3. Canada thistle and burdock

Herbicide: Transline®, Stinger® [40.9% a.i. stock solution of water-soluble clopyralid].
Rate: 0.2% (a.i.) WS clopyralid, equivalent to 0.5 fluid ounces per gallon. This produces a 0.4% solution by volume (0.4% v/v).
Solvent: Water (a conditioning agent is not required for this formulation).
Additive(s): Dyne-Amic® organosilicone-based methylated seed oil + nonionic surfactant, Induce pH® sticking agent.
Addition rate(s): Dyne-Amic—1% (v/v), equivalent to 1.3 fluid ounces (37.7 mL) per gallon; Induce—0.5% (v/v), equivalent to 0.65 fluid ounces (19 mL) per gallon.
Tank mixing sequence:

a. Add ⅔ of the desired total volume of water to tank
b. Add clopyralid to tank and triple rinse measuring container.
c. *q.s.* tank to desired final volume
d. Add MSO-NIS and sticking agent
e. Add spray pattern indicator dye
f. Replace tank lid, agitate, and apply
g. This herbicide is infinitely soluble in water; it is therefore not necessary to periodically re-agitate spray solution during application.

Coverage for optimal performance: Approximately 50% of leaf surface area; if target species are flowering, herbicide should also be applied to flowering portions of the plant.

Uptake: Transline® and Stinger® are rainfast in about 15 minutes (the active molecule is small enough to be transported through plasmodesmata channels between adjacent plant cell walls and does not require phloem loading).

Growth stage of target vegetation: Prior to seed development (herbicide efficacy diminishes when these species are treated post-anthesis).

Application Window: Late May – mid-June, optimally prior to flowering.

Posting Requirement: The Restricted Entry Interval (REI) of Transline® and Stinger® is 12 hours.

4. Garlic mustard and Japanese hedge parsley (first or second-year plants)

Herbicide: Escort XP® [60% a.i. stock solution of metsulfuron methyl wettable granules].
Rate: 0.4% (a.i.) metsulfuron methyl, equivalent to 0.8 grams per gallon. This produces a 0.6% solution by weight (0.6% w/v)
Solvent: Water (an alkalinity agent such as ammonium hydroxide is required for this formulation).
Additive(s): Dyne-Amic® organosilicone-based methylated seed oil + nonionic surfactant, Induce pH® sticking agent. Both adjuvants are manufactured and distributed by Helena Chemical Company.
Addition rate(s): Dyne-Amic—1% (v/v), equivalent to 1.3 fluid ounces (37.7 mL) per gallon;
Induce—0.5% (v/v), equivalent to 0.65 fluid ounces (19 mL) per gallon.
Tank mixing sequence:

h. Add ⅔ of the desired total volume of water to tank
i. Add 1 cup (8 fluid ounces) household cleaning ammonia to increase tank solvent pH
j. Add 8 grams of metsulfuron methyl WG per gallon to sealable jar and agitate until all granules have dissolved.
k. Empty contents of sealable jar into tank and triple rinse, adding rinsate to tank.
l. *q.s.* tank to desired final volume
m. Add MSO-NIS and sticking agent
n. Add spray pattern indicator dye
o. Replace tank lid, agitate, and apply
p. (Periodically re-agitate spray solution during application)

➔ DO NOT use a non-ionic surfactant containing acetic acid or any similar chemical derivatives with metsulfuron methyl, as these mixtures are chemically incompatible and will result in diminished herbicide performance.

Coverage for optimal performance: ≥ 85% of leaf surface area.

Growth stage of target vegetation: Prior to seed development (herbicide efficacy diminishes when second-year biennials are treated post-anthesis).

Application Window: Two windows are available for treating these biennials: April – early May and late October – early November. When employing autumn applications, be sure that native non-target species have senesced (typically occurs shortly after the first hard frost of the season).

Posting Requirement: The Restricted Entry Interval (REI) of Escort XP® and MSM 90® is 4 hours.

5. Trees and shrubs (manual removal followed by cut stump herbicide application)

Herbicide: Element 3A® [44.4% a.i. stock solution of water-soluble triclopyr] or Element 4® [Element 4 is sold as a ready-to-use (RTU) formulation].
Rate: 22% (a.i.) WS triclopyr, equivalent to 64 fluid ounces per gallon. This produces a 50% solution by volume (50% v/v).
Solvent: Water or windshield antifreeze if applying at air temperatures lower than 32°F (a conditioning agent is not required for this formulation).
Additive(s): Spray pattern indicator dye (any color). Surfactants are not necessary for this type of cut stump treatment.
Addition rate(s): To desired marking color.
Tank mixing sequence:

a. Add ⅔ of the desired total volume of solvent to tank
b. Add triclopyr
c. *q.s.* tank to desired final volume
d. Add spray pattern indicator dye
e. Replace cap, agitate and dispense into small capacity compression sprayer

Coverage for optimal performance: 360° of outer cambium of cut stump.

Uptake: Element 3A® is rainfast in 4 hours.

Size of target vegetation: Irrelevant as long as herbicide is applied to the entire circumference of the cut stump's outer cambium.

Application Window: September – March for most species, preferably during periods of low sap flow.

Posting Requirement: The Restricted Entry Interval (REI) of Element 3A® is 48 hours. The REI of Element 4® is 12 hours.

Additional Considerations

Safety: Always wear recommended PPE from the herbicide and additive labels. **NEVER MIX UNDILUTED ADDITIVES WITH UNDILUTED HERBICIDES, particularly acidifiers with acidic herbicide formulations!**

Equipment Maintenance: With extended exposure, triclopyr is corrosive to brass and mildly corrosive to aluminum. It is also capable of physically degrading rubber seals, gaskets, and pump impellors. To extend the useful life of spray equipment, it is advisable to thoroughly flush and neutralize tanks and all sprayer components daily.

Application Conditions: If applying during morning hours when dew is present on leaf surfaces or on days when air temperatures exceed 80°F, increase addition rate of Induce or Induce pH to 1% (v/v), equivalent to 1.3 fluid ounces (37.7 mL) per gallon. It is not advisable to apply triclopyr at air temperatures exceeding 90°F or during a prolonged drought when leaves of target plants appear wilted or chlorotic at their margins. Under these conditions, target plants are quasi-dormant and herbicide uptake and translocation will be diminished. It is best to apply following a summer rainfall event when possible. It is not advisable to apply metsulfuron methyl at air temperatures below 20°F.

Target Plant Resurgence: When treating most buckthorn resprouts and all honeysuckle plants, anticipate the need for follow up applications for a minimum of two consecutive growing seasons. Buckthorn resprouts have stored carbohydrate reserves in their rhizome systems for regrowth, and honeysuckle leaves have a thick waxy cuticle that only allow herbicide uptake in non-lethal quantities, regardless of the additive system employed to enhance uptake. Follow-up applications are usually only necessary in heavily-infested bramble patches. Additionally, annual prescribed burns are recommended between applications to flush out the seed bank and burn off dead plant material, and also to expose obstacles (e.g. rock outcroppings) that can damage spray equipment and open up the native seed bank to light (assuming it has survived the invasion). Moreover, activated carbon resulting from annual burns has a slightly positive electrostatic charge that can sequester negatively-charged allelopathic inhibitors produced by buckthorn.

Shelf life: Stock solutions of the herbicides mentioned here are stable for 2 years if not subjected to freeze-thaw cycles. Mixtures of herbicide with MSOs are generally only stable for ≤ 72 hours. Therefore, it is recommended that applicators only mix as much herbicide as they plan on applying within a given day.

BMPs for use near assets and non-target species: Survey, locate, and flag all desirable or at-risk plants prior to applying herbicide. Using a reciprocating saw, remove the bottom from a plastic 5-gallon bucket. Place the bucket atop non-target species and spray around the outside of the bucket, directing spray as low as possible. To reduce the potential for herbicide drift, add Induce pH at a higher rate of 3 – 4% (v/v), equivalent to 3.8 – 5 fluid ounces (112 – 150 mL) per gallon.

Technical Notes: Dyne-Amic® is an organosilicone-based methylated seed oil-nonionic surfactant blend. MSOs dissolve leaf cuticles to enhance passive herbicide uptake by the target plant, and nonionic surfactants enable applied herbicide to spread evenly over a treated surface. Organosilicone-based additives have the additional advantages of lubricating sprayer components while resisting physical breakdown through pump-shear degradation, they render mixtures less vulnerable to chemical decomposition from UV light, and they don't dry as quickly on treated surfaces compared to inorganic silicone-based adjuvants. In addition, Dyne-Amic® is molecular-filtered and will not gel with insoluble calcium precipitates often present in mix water and jam nozzle filters when applied at air temperatures exceeding 80°F. Induce pH® is a blend of acidifiers, nonionic surfactants, and free fatty acids that function as sticking (drift control) agents. Mixtures containing this additive physically adhere to treated surfaces, and resist runoff from rewashing and evaporation of herbicides from leaf surfaces.

IATA's Hartland Marsh