

Management Plan for Blue Heron Lagoon Natural Area

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Introduction

The Detroit River is internationally recognized as a critically important commercial, recreational and natural resource used by millions of people. Numerous wildlife species live within, or travel through, the river. Within it, Belle Isle holds a special place. Long considered the crown jewel in Detroit's public park system, its setting is unique. Close to the city's urban center, the park is also centrally located in a flyway that supports more than three million migratory birds each year, and an important Great Lakes waterway that supports hundreds of species of fish and waterfowl. This comprehensive management and restoration plan provides a tool for stewardship of a part of Belle Isle Park, known as the Blue Heron Lagoon Natural Area. Implementation of this plan will not only provide the people of the Detroit area with attractive open space on the river but will also preserve and enhance rare and valuable wildlife habitat for their enjoyment.

The Blue Heron Lagoon Natural Area is a nine-acre site located on Belle Isle in the Detroit River (Figure 1). The site was created on fill that was brought to the island in the early 1900's from downtown Detroit. Despite its man-made origins, it contains a variety of native plant and animal species that are exemplary of unique natural communities in southeast Michigan. A plant inventory and soils investigation was completed in 2003 to provide the basis of a strategy for habitat restoration and invasive species removal.

This document contains a strategic plan for natural area restoration at the Blue Heron Lagoon Natural Area. It complements the construction plans for the Blue Heron Lagoon Restoration Project, which identify areas to install seed and plantings, and treat invasive species during 2004 and 2005. While the construction plans provide immediate enhancement of the existing natural area, the strategic plan provides guidance on how to maintain this area as a healthy, functioning ecosystem for many years in the future. The strategic plan also identifies the most sensitive areas of the site, to assist in avoiding harmful impacts due to future park improvements or over-use of the area by park visitors.

Natural Area Inventory

1. Plant Community

The site was visited on September 5 and 20, 2003 to identify plant and animal species. Observed plants were identified, and their approximate locations noted. Species that required keying were taken to SmithGroup JJR offices and identified using Voss or Gleason and Cronquist. Plant communities were mapped based on major differences in species composition (Figure 2).

Figure 1. Location Map

Figure 2. Plant Community Map

The Blue Heron Lagoon Natural Area contains wetland and upland plant communities in various stages of development. A lakeplain prairie community exists in two places on site, where conditions are relatively open (total size approximately 2.5 acres). The lakeplain prairie has high species diversity and a well-developed structure, with small plants such as ladies'-tresses (*Spiranthes* sp.) and false-foxglove (*Agalinis* sp.) growing in a matrix of native grasses (*Andropogon* sp., *Sorghastrum nutans*) and larger wildflowers (*Solidago* sp., *Asclepias* sp.). At the edges of the lakeplain prairie, a wet meadow community has developed where a leaking water pipe contributes a continuous supply of water (total size approximately 2.6 acres). The wet meadow contains shrubs and trees in addition to wetland plants and occasional prairie plants. Invasive species are concentrated in these wet areas, and the majority of this area has low species diversity and a simple community structure. The area of high ground in the center of the site contains a poorly-developed old field community dominated by weedy plants, and upland areas in the vicinity of the existing trail are a mixture of weedy native and non-native species. These areas together are referred to as the degraded upland plant community (total size approximately 3.8 acres).

The plant species that are characteristic of each community are listed in Table 1. This table contains a coefficient of conservatism for each species, which is a value ranging from 0 to 10 that indicates its degree of fidelity to undisturbed natural plant communities. A value of 1 would be given to plants that are found almost anywhere, and a value of 10 would indicate a plant that is typically restricted to high-quality natural communities (Herman et. al. 2001). The floristic quality index (FQI) for a group of species is their mean coefficient of conservatism multiplied by the square root of the number of species in that group. The FQI reflects the relative quality of groups of species from similar size areas. The degraded upland area has an FQI of 4 which indicates very low quality, and the lakeplain prairie community is relatively high-quality with an FQI of 23. The wet meadow is between these two values with an FQI of 14. The site as a whole has an FQI of 25. This is a fairly high value given the time of year in which the survey was conducted. Additional survey work would probably result in the identification of more species, which would increase the overall FQI, but would not affect the relative quality of the surveyed areas.

2. Soil Conditions

Hand auger soil samples were collected on November 19, 2003 for the purpose of evaluating soil stratification, texture, nutrients, pH and organic matter. A SmithGroup JJR ecologist and Somat Engineering soil technicians performed the borings and recorded observations. Somat engineers evaluated soil textures and produced boring logs. SmithGroup JJR ecologists interpreted soil test results. The soil boring locations are shown in Figure 3. Soil characteristics and water levels are summarized in Table 2. Topsoil samples were sent to a soil testing laboratory on January 2, 2004, for chemical analysis of organic matter, pH, cation exchange capacity, Phosphorus, Potassium, Magnesium, and Calcium.

Soil textures and stratification are highly variable across the site, which is consistent with historical accounts of this area being created on fill dirt. Topsoil varies from 1 inch thick in parts of the lakeplain prairie to 12 inches thick in parts of the high ground in the center of the site. In general, the higher quality plant communities had thinner topsoil (1 to 4 inches) and the lower

quality plant communities had thicker topsoil (5 to 12 inches). Below the topsoil, soil textures ranged from sand to heavy clay.

Table 1. Plant Species – p. 1

Table 1. Plant Species – p. 2

Table 1. Plant Species – p. 3

Figure 3. Soil Boring Location Map

Table 2. Soil Boring Descriptions

The lakeplain prairie was generally on clay that ranged from silty to sandy, with occasional gravel or large pieces of mollusk shell at depths greater than 2 feet. In low areas of the western lakeplain prairie, the clay subsoil was so hard that it formed an impermeable barrier on which surface water was perched. In those places, the top 4 to 18 inches of soil contained water in the soil pores, and the clay was dry and hard below that level. Indian grass (*Sorghastrum nutans*) was the dominant grass in those areas. A sand lens was found at a depth of 36 inches in one soil boring on higher ground in the western lakeplain prairie, where little bluestem (*Andropogon scoparius*) was dominant.

The wet meadow was also on clay and, with the exception of several localized areas, did not exhibit an appreciable amount of organic wetland soil. An area of muck soil is present at the east end of the site in a dense stand of common reed (*Phragmites australis*), and around a small channel that provides a surface-water connection between the wet meadow and the canal on the north side of the site. The lack of organic soils is probably indicative of relatively recent inundation of the site by the water leak.

The degraded upland areas varied from heavy clay to medium sand, and contained occasional pieces of brick or coal at depths greater than 2 feet.

Topsoil throughout the site generally had 3-5% organic matter, making it suitable for plant growth. Soil pH was slightly alkaline, with a typical value between 7.3 and 7.9, similar to natural soils throughout southeast Michigan. Phosphorus (3-14 ppm) and magnesium (175-305 ppm) levels tended to be low. Potassium and Calcium levels were medium to high. Cation exchange capacity (CEC) was typically between 16.0 and 21.7 meq/100g. Soil sample number 6 had outlier values for pH (8.8), CEC (26.7) and Calcium (4,750 ppm). In general, the soils on site are suitable for native plant species selected for their tolerance to these site conditions.

3. Wildlife Habitat

The intent of the study was not to inventory wildlife, but birds and wildlife were observed during the dates of the site visits for plant inventory and soil borings. Species observed include belted kingfisher (*Ceryle alcyon*), cedar waxwing (*Bombycilla cedrorum*), green heron (*Butorides virescens*), flicker (*Colaptes auratus*), black swallowtail (*Papilio polyxenes*, caterpillar), and common garter snake (*Thamnophis sirtalis*). A large animal den, probably for a fox, was observed on the north side of the site. Previous observations of terrestrial fauna, aquatic animals and aquatic plants in the area around the site are included as Appendix A.

Natural Area Management

The plant communities at the Blue Heron Lagoon Natural Area can be improved as habitat for threatened plants and migratory wildlife by natural area management activities. Some management activities may be sufficient when performed once, others will need to be repeated regularly in order to have the desired effect. For this reason, regular evaluation of progress by people familiar with the ecology of the site is an important part of long-term management. The following activities are discussed in greater detail below:

- Invasive species removal
- Prescribed burning
- Addition of plant species

1. Invasive Species Descriptions

Invasive plant species are ones that were not originally from North America, and which exclude native plant species by aggressively competing for light, soil, nutrients and water. Several invasive plant species are common at the Blue Heron Lagoon Natural Area: common reed (*Phragmites australis*), glossy buckthorn (*Rhamnus frangula*), and purple loosestrife (*Lythrum salicaria*). Figure 4 contains photographs of these and several other invasive species found on site. The important biological characteristics of the dominant invasive plants on site are briefly discussed below.

Common Reed: Common reed is a coarse grass ten to fifteen feet tall that forms dense stands which exclude other plants. Reproduction of this species is chiefly vegetative. Common reed is found along the water's edge and in several isolated areas on the site, particularly wet areas. In some places, it is intermixed with desirable native plant species.

Glossy Buckthorn: Glossy buckthorn is a shrub that displaces native species by forming dense, even-aged thickets. It produces abundant berries that are readily dispersed by birds. When stems are cut or damaged by fire, they tend to re-sprout vigorously (Converse 1984). Glossy buckthorn is found throughout the site, intermixed with native plant species.

Purple Loosestrife: Purple loosestrife prefers wet areas and is readily identifiable by purple flower spikes in July. The species may form dense, monotypic stands that exclude native plants, but even small numbers may have negative effects on amphibians and other animals. Infestations of this species typically follow a pattern of maintenance at low numbers, and then dramatic population increases when conditions are optimal (Bender and Rendall 1987). Scattered individuals of purple loosestrife are found at the site in wet areas.

Other invasive species that are present in small numbers at the Blue Heron Lagoon include barberry (*Berberis* sp.), autumn olive (*Elaeagnus umbellata*), privet (*Ligustrum vulgare*), honeysuckle (*Lonicera* sp.), sweet-clover (*Melilotus alba* and *M. officinalis*), reed canary-grass (*Phalaris arundinacea*), white poplar (*Populus alba*), black jetbead (*Rhodotypos scandens*) and multiflora rose (*Rosa multiflora*). These are currently having minimal observable effects on the plant community, but could become a problem eventually. They are found interspersed with native plant species throughout the site.

2. Invasive Species Control Options and Recommended Methods

It is important for knowledgeable people to check areas for native species that must be protected prior to treating an area with herbicides. Some native plants such as ladies'-tresses may be as small as 4 inches tall and growing amongst taller plants that hide them except when they are in bloom. Other native plants such as ironweed and blazing star may be a similar color to a noxious weed such as purple loosestrife, causing them to be confused by an inexperienced observer. Examples of some of the native plants found on site are shown in Figure 5.

Research on invasive species control is an ongoing process, and the effectiveness of various methods may be influenced by site-specific circumstances. The recommended methods have been found to be reasonably reliable and safe in the type of environment found at the Blue Heron Lagoon Natural Area, although methods other than those discussed here may also be acceptable. Table 3 contains a summary of the treatment options for the invasive species found on site. Figure 6 contains a map of the target areas for treatment. Appendix B contains a description of general considerations for herbicide use. Restricted-use herbicide application in the State of Michigan can only be at the direction of a certified pesticide applicator (see Appendix B). Methods for treating the most serious problem invasives on the site are discussed in detail here.

Figure 4. Invasive Species

Figure 5. Native Species

Table 3. Control Techniques

Figure 6. Vegetation Management Areas

Common Reed

Options: Application using a Glyphosate-based herbicide labeled for use in wetlands. May be done together with burning standing dead vegetation to increase light to the ground surface. Burning alone is not expected to be an effective treatment.

Recommended Methods: Treatment using a Glyphosate-based herbicide labeled for use in wetlands is the only recommended method for common reed control. Treatment must be conducted after the tassling stage when the plant is supplying nutrients to the rhizome, usually late August through early October. The herbicide may be delivered by foliar spray in dense colonies or soaked glove for dispersed infestations. Cut stem treatment of dense stands increases herbicide effectiveness, but can be excessively time consuming. Sponge roller application to cut stems, using a painting roller, can improve efficiency. A surfactant labeled for aquatic use, such as Spreader Sticker™, is required to increase adherence of herbicide to plant material for foliar and soaked glove application methods. Re-application of herbicide for several years is often necessary. The visual response symptoms are usually slow to develop, so re-application should not occur until adequate time has passed to assess effectiveness.

For foliar spray application, use a backpack unit with a hand-held coarse-spray nozzle, and a 1 ½ % Glyphosate-based herbicide solution.

For soaked glove application, the applicator wears a pair of nitrile gloves with an additional cotton glove on one hand over the nitrile glove. The hand with the cotton glove is first dipped into a bucket of 25-30% Glyphosate-based herbicide and then swiped along the length of the stem of each plant.

For cut stem treatment, the stem of each target plant is cut and a 25-30% Glyphosate-based herbicide solution is carefully sprayed or dripped onto the cut surface. The herbicide must be applied immediately after cutting (within 5 minutes, if the cut edge is ragged, or 10 minutes, if smooth); delays will eliminate effectiveness. A narrow-stream nozzle, sponge applicator, or foam paintbrush may be used to apply the herbicide. If using a paintbrush, a smaller container carried inside a bucket is essential to prevent splashing the herbicide onto non-target species. A sponge applicator design used by the Nature Conservancy is included in Appendix B.

Glossy Buckthorn

Options: The most effective control method for glossy buckthorn is the application of herbicides. Very small young plants (less than 1/8 inch diameter) may be killed during prescribed burning, but fire patchiness can skip some individuals.

Recommended Methods: Only cut stump herbicide treatment should be used for glossy buckthorn occurring in wetlands, using either a 50-100% Glyphosate-based herbicide solution labeled for use in wetlands (brand names EagleTM or RodeoTM) or a 50-100% Triclopyr-based herbicide solution (brand name Garlon 3ATM). The cambium layer next to the bark is the most important part of the cut stump for the herbicide to saturate. A narrow-stream nozzle, sponge applicator, or foam paintbrush may be used to apply the herbicide. Spray application is best-suited for medium to large stumps; stands of small stems require sponge or paintbrush application. If using a paintbrush, a smaller container carried inside a bucket helps to prevent splashing the herbicide onto non-target species. The herbicide must be applied immediately after cutting (within 10 minutes); delays will eliminate effectiveness. Both herbicides can be used during summer, fall, and winter, although effectiveness is greatest late in the growing season, from July through September (Solecki 1997). Re-application will be necessary if sprouting occurs from the base. Sprouts should be cut and herbicide applied.

Application during the period of bud-break and leaf expansion, from March through June, is not recommended, and will not be successful.

Another formulation of Triclopyr (Garlon 4TM) must not be used, due to its potential for leaching into the water and its toxicity to fish.

Purple Loosestrife

Options: Application of a Glyphosate-based herbicide labeled for use in wetlands is the most commonly used method for the control of purple loosestrife. Hand removal is possible for young plants (Bender and Rendall 1987), but is not effective for mature individuals due to re-sprouting from severed roots. Biological control for purple loosestrife is possible using five beetle species that have been approved for release in the United States and Canada; two leaf-feeding chrysomelids (*Galerucella californiensis* and *G. pusilla*), a root-feeding weevil (*Hylobius transversovittatus*), and two seed-feeding weevils (*Nanophyes marmoratus* and *N. brevis*) (Cornell 2003, Malecki et al. 1993). A disadvantage of using biological control agents is that several years may be required for the beetle population to reach a level at which purple loosestrife is effectively controlled; three to five years are required for *Galerucella californiensis* and *G.*

pusilla (Ragsdale et al. 2000). Another disadvantage is that a fairly large, dense stand of purple loosestrife is necessary in order to support a self-sustaining population of beetles. The Blue Heron Lagoon Natural Area is therefore not ideal for beetles, but other areas around the lagoon may be.

Recommended Methods: Treatment using a Glyphosate-based herbicide labeled for use in wetlands is the preferred method for purple loosestrife control. Herbicide application is scheduled after the period of peak bloom (usually August through September), and should be followed-up with additional spot treatments the same growing season and for several years afterwards. Herbicide may be applied as a foliar spray, or by soaked glove or cut stem treatment. Treatment with foliar spray is most appropriate for large monotypic stands. Soaked glove or cut stem treatment is most appropriate for individual plants growing amongst desirable plants. A surfactant labeled for aquatic use, such as Spreader StickerTM, is required to increase adherence of herbicide to plant material for foliar and soaked glove application methods.

If release of beetles occurs, the area of anticipated beetle expansion should be designated as a no-spray zone, to foster the establishment of a self-sustaining beetle colony. The beetles will then self-disperse to other areas within a half-mile. More information on use of beetles is available from MSU Cooperative Extension, which currently coordinates a program to provide volunteers with beetles.

The foliar spray method uses a backpack unit with a hand-held coarse-spray nozzle and a 1 ½ % Glyphosate-based herbicide solution. If the treatment is used on smaller populations, or on purple loosestrife growing with desirable plants, a narrow-stream nozzle should be used on the sprayer.

The soaked-glove and cut stem methods use a 25-30% Glyphosate-based herbicide solution as described in the previous section.

Shrub and Tree Removal

Trees such as white poplar and other shrubs should be removed using the cut-stump herbicide treatment recommended for glossy buckthorn. Shrubs and trees are targeted for removal in the lakeplain prairie areas where they compete with the prairie plants. These guidelines should be followed:

- Stumps must be left in place, because disturbing the soil encourages weeds.
- Brush piles can remain on site as habitat for wildlife.
- No machinery should be driven in the lakeplain prairie area, because soil compaction can harm the sensitive plants.
- Logs removed by hand can be placed on the edges of nature trails to encourage people to stay on the trail, or can be chipped to provide trail surfacing material.

3. Prescribed Burning

Fire historically eliminated trees and brush so prairie plants could have adequate light, and encouraged native plants to flower and produce seed. Re-creating natural fire patterns, also known as prescribed burning, helps restore natural areas. Fire can sometimes assist in control of invasive species, but it may also make conditions worse. For this reason, it is recommended that a professional be consulted to assist in conducting burns on the site, and in monitoring the response of plants after the fire. These guidelines should be followed:

- The site is ideally situated, with water surrounding it on three sides, and lawn on the fourth side, such that it will be easy to control prescribed fire. Fire preparation may need to include removing plastic debris such as chairs that people may have carried onto the site.
- Alternate spring and fall burning, if possible, with at least one full growing season in between, to stimulate the growth of both fall and spring plants, and avoid repetitive stress to either.
- Avoid burning the entire area at any one time, to increase the chances of preserving any fire-sensitive insects that may be present.
- Burn areas of common reed after they have been treated with herbicide and vegetation has died back, for the purpose of increasing light penetration to the soil surface.
- Hand-seed native species or plant shrubs densely in areas where common reed was growing in a monoculture, to increase the likelihood that native plants will become re-established after fire.
- Keep a log book that shows a map of the area burned, date of the burn, burn conditions (air temperature and relative humidity), and vegetation response (increase or decrease of invasives and desired plant species), to help in planning future burns.
- Evaluate populations of ladies'-tresses, Sullivant's milkweed and false-foxglove, every year in August and late September to check whether populations are increasing, decreasing or staying the same. This can be done with permanent monitoring points in an area where the plants are growing, marked by a metal stake at which a photo is taken every year. Skilled volunteer botanists can also perform plant counts in a 1-meter square area around each stake, to determine quantitative population changes. More information on monitoring can be found in *The Tallgrass Restoration Handbook* (Masters 1997).
- Regular prescribed burning can continue to encourage the recovery of native plant species.

4. Addition of Plant Species and Other Long-Term Management Activities

Additional natural area restoration practices are typically necessary to assist a site to achieve its full potential. Similar to other landscape areas that require regular maintenance, natural areas require a commitment to stewardship so that the threats to their health can be minimized and their best features can be maximized. In order to accomplish this, the measures discussed above may need to be repeated and other measures may need to be adopted. In addition, areas of the site may change over time, and because of this may require some additional help to re-establish a healthy plant community. In particular, the areas that are currently wet due to the leaking water main, and the areas in which white poplar will be removed are expected to undergo a transition period that may benefit from some additional management. The following measures should be considered:

- As they become available, local-genotype native lakeplain plants should be planted to increase species diversity on the site and preserve the regional gene pool. For example, rare species such as creamy wild indigo (*Baptisia leucophaea*), prairie Indian-plantain (*Cacalia plantaginea*), seedbox (*Ludwigia alternifolia*), whorled mountain-mint (*Pycnanthemum verticillatum*) and Virginia spiderwort (*Tradescantia virginiana*) could be custom-grown from seed donated by similar prairies in the area. Plants that are hard to start from seed could be grown in greenhouses and transplanted to the site. These species and others in the comprehensive list in Appendix C, and in the Michigan Natural Features Inventory lists for Lakeplain Wet-mesic Prairie and Lakeplain Oak Openings communities (Albert 1998, Cohen 2001), would be a compatible addition to the other special plants on the site.
- Ongoing invasive species treatments to keep common reed from dominating the site, particularly in areas along the shoreline that will continue to receive new seed from off-site.
- Add shrubs and trees to increase habitat for birds and butterflies, particularly in areas that are currently lawn. Species in the construction documents as well as those listed in the sources above would be a compatible addition to the site.

Possible Future Amenities

In planning future amenities such as trails, seating and waste receptacles, it is important to consider their effects on wildlife and natural area quality. Trails and high-use areas create habitat fragmentation that places stress on small mammals and songbirds, and may eventually reduce their population size. Foot traffic also brings noxious weed seeds onto the site and may disturb the soil, giving those weeds an excellent place to set down roots. There are several ways to minimize these problems:

- Keep larger trails concentrated in one part of the site.
- Provide narrow, unsurfaced footpaths for access to sensitive parts of the site, allowing quiet enjoyment that is compatible with the resident wildlife.
- Avoid placing trail surface materials in sensitive natural areas that will require equipment access to resurface the trail. Soil compaction can have serious long-term effects on natural areas.
- Avoid placing seating and waste receptacles where higher use will have negative effects.
- Preserve existing native tree and shrub cover whenever possible. A list of tagged trees 7 inches in diameter and greater is provided in Appendix D.

Selection of materials for future amenities can have an effect on natural area management options. For example, because prescribed burning is an important long-term component of the restoration strategy for this site, it would be advisable to avoid combustible materials such as wood or plastic adjacent to areas that must be burned. Limestone blocks or boulders can provide seating in these areas while enhancing the natural appearance of the site.

Volunteer Opportunities

Natural area management organizations have historically employed volunteer help for a wide variety of projects. In many cases, the benefits of volunteer natural area stewardship are largely intangible, because the biggest gain is the overall sense of satisfaction that the public takes with them after a day of volunteering. This satisfaction frequently translates into increased watchfulness over the parks, and activism to keep them looking their best.

It takes a substantial time commitment to organize volunteers and give them something useful to do. It is important to provide them with the necessary level of satisfaction to keep them active and involved. Sometimes the time spent organizing volunteers exceeds the number of hours spent by those volunteers. Nevertheless, there are labor-intensive activities that are particularly suitable for volunteer help. Possible volunteer activities at the Blue Heron Lagoon Natural Area include:

- Tree and shrub removal, and herbicide application if appropriately trained and under the direction of a certified applicator (see Appendix B).
- Vegetation monitoring to document effects of management.
- Bird, butterfly, insect and mammal surveys, to more effectively select additional plant species. Host plants for butterfly larvae can be selected based on the butterflies observed to use the site.
- Clean up litter.
- Docent-led tours explaining the restoration project to the public.

Summary

Because natural area restoration practices are different than conventional landscape management, it is important that people who are familiar with natural areas and their ecology be involved in implementation of this plan. Based on the response of the natural community to the initial round of prescribed burning and invasive species control in 2003 and 2004, appropriate restoration measures will need to be selected and implemented. This document is intended to provide a framework and source of ideas for future restoration measures at this special natural area.

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APPENDIX B. General Considerations for Herbicide Use

Herbicides are a type of pesticide that are used to control unwanted plants. The application of restricted-use herbicides has been found to be effective for the control of the invasive plants occurring at the Blue Heron Lagoon Natural Area. Ready-to-use herbicides such as the ones available at home-improvement stores are not likely to be effective for this purpose. If an employee must administer restricted-use herbicides as part of their job in the State of Michigan, then that person must pass a test to do so legally. In order to ensure that these chemicals are used safely and properly for invasive species removal, the following guidelines should be followed.

1. Application instructions on the label **must** be followed carefully.
2. The applicator must have a certified pesticide applicator license from the State of Michigan.
3. For application in areas of standing water, the license must include the category of aquatic pest control. This is strongly recommended at the Blue Heron Lagoon Natural Area because much of the site has standing water during part of the year.
4. Protect all desired species and seeded areas by utilizing appropriate application methods such as avoiding foliar spray application where desirable native plants are growing intermixed with invasives.
5. If in doubt about the location of environmentally-sensitive areas and threatened plant species, consult the site map, aerial photo, and/or Recreation Department staff.
6. If a plant's identity is in doubt, appropriate literature or a knowledgeable person should be consulted before applying herbicides.
7. If possible, apply herbicide while moving backwards, to avoid walking through contaminated areas.
8. Use the minimum effective concentration of a herbicide.
9. Wear appropriate protective clothing.

Pesticide Applicator Training

The Michigan State University Extension coordinates pesticide applicator training and certification in the State of Michigan. All persons who administer pesticides as part of their job must pass a test and obtain certification. Training manuals must be obtained from the MSU Extension office and reviewed prior to taking the test. In addition to the core training manual, the Aquatic Pest Management training manual should be reviewed. There is a fee for the manuals and for taking the tests. Care should be taken to request the appropriate tests on the application form. The exam for the Aquatic certification category should be taken at the same time as the core test. The aquatic category of certification will be necessary to apply herbicides to plants in wet areas.

For the work at the Blue Heron Lagoon, at least one person must have a Commercial Applicators certification. This person can both apply pesticides and supervise application of pesticides by others (staff members or volunteers). It may also be desirable to have a person with a Commercial

Registered Technician certification, which allows that person to apply pesticides under the direct supervision of a certified Commercial Applicator.

Volunteers do not technically require certification as long as they are performing the work under the direct supervision of a certified applicator, and are not receiving any compensation for their efforts. Other non-profit organizations frequently use volunteers to apply herbicides to invasive species in natural areas. It is advisable to utilize only adult volunteers for herbicide application, and to have a volunteer training session to ensure that proper methods will be employed and adequate care will be taken around the sensitive plants on site.

Specific Considerations for Recommended Herbicides

Considerations specific to the recommended herbicides are listed below. Additional information is available on the product labels, and in the *Weed Control Methods Handbook*, available for free download on line (Tu 2001).

Glyphosate (brand names Rodeo_{TM} or Eagle_{TM})

1. Do not spray when winds exceed 5 mph.
2. Do not spray when rains are expected within 12 hours.
3. Do not mix herbicide with water containing soil or silt, such as water from lakes or wetlands. The herbicide will bind to the soil particles, making it useless.
4. Avoid mixing herbicide with hard water, which contains calcium and magnesium ions that may bind with the herbicide, reducing its effectiveness.
5. Do not spray over standing water.
6. Spray invasive species at the correct time during the growing season for optimum effect.
7. Avoid drift of the spray to other species.
8. Mix an agriculturally-approved dye, such as Tracker_{TM}, with the herbicide to ensure full coverage and avoid unnecessary overlap.

Triclopyr (brand name Garlon 3A_{TM})

1. Do not use other formulations of Garlon.
2. Do not permit it to come into direct contact with desirable plants.
3. Do not permit spray mists containing it to drift into desirable plants.
4. Do not apply on ditches used to transport irrigation water.
5. Do not spray over standing water, snow, or ice.
6. Avoid mixing herbicide with hard water, which contains calcium and magnesium ions that may bind with the herbicide, reducing its effectiveness.
7. Carefully follow safety precautions on label, because it can cause severe irreversible eye damage.
8. Mix an agriculturally-approved dye, such as Tracker_{TM}, with the herbicide to ensure full coverage and avoid unnecessary overlap.

An herbicide applicator made out of PVC plastic pipe such as the one included in this document can help to reduce the risk of spills.

CUT-STUMP HERBICIDE APPLICATOR

designed by Jack McGowan-Stinski, Michigan Chapter, The Nature Conservancy

PARTS

- 1 – 1 inch diameter PVC threaded male cap
 - 1 – 1 inch diameter PVC threaded female cap
 - 1 – ¾ inch diameter PVC cap, unthreaded
 - 1 – 1 inch diameter PVC threaded female coupling
 - 3 – 1 inch diameter PVC threaded male coupling
 - 1 – 1 inch diameter PVC 45° elbow coupling, unthreaded
 - 1 – 1 inch diameter PVC threaded ball valve
 - 1 – 1 inch diameter PVC pipe (12 to 15 inches)
 - 2 – 1 inch diameter PVC pipe pieces, approximately 1 inch long
 - 4 – 1 ¼ inch diameter rubber lavatory gaskets
- heavy duty sponge (2 x 4 x 1 ½ inches)
PVC cement
PVC pipe cutters or hacksaw
Drill, 1/16 inch bit, ¾ inch bit
Ruler
Scissors

ASSEMBLY INSTRUCTIONS

Cement threaded male coupling onto one end of a length of PVC pipe (12 to 15 inch length suggested). Cement the threaded female coupling onto the other end of the pipe (reservoir). Additional PVC sections can be thread together to make a longer handle or reservoir when needed. Slip one rubber gasket over a threaded male cap and attach it to the threaded female end of reservoir. Slip one rubber gasket over threaded male end of reservoir, and attach one end of a threaded ball valve. The rubber gaskets will allow the sections of applicator to be tightened together snugly so that no herbicide will leak out around coarse PVC threads.

To make the “drip holes” for herbicide, cut off the bottom of the ¾ inch diameter PVC cap so that a flat disk remains. File disk until it fits snugly into the unthreaded 1 inch diameter PVC 45° elbow coupling. A ridge inside the elbow will keep the disk centered. Use a 1/16 inch drill bit to make two holes near the center of the disk. Cement the disk inside one end of the elbow coupling.

Using the 1 inch diameter PVC pipe pieces (1 inch length or less), cement 1 inch diameter threaded male couplings onto each end of the elbow. Slip rubber gaskets over each threaded male coupling. The end of the completed elbow without the drip holes disk attaches to the other end of the ball valve.

Drill a $\frac{3}{4}$ inch hole into the end of the 1 inch diameter PVC threaded female cap. The sponge tip twists into this $\frac{3}{4}$ inch hole, and this cap is then threaded onto the end of the elbow with the drip holes disk.

The sponge tip, which is roughly 1 inch diameter by 1 $\frac{1}{2}$ inch length, can be cut with scissors, or a 1 inch diameter metal pipe section that is sharpened on one end can be used to rapidly cut out numerous sponge tips. Wet the sponge tip before twisting it into threaded female cap with the $\frac{3}{4}$ inch hole. Allow $\frac{1}{4}$ to $\frac{1}{2}$ inch of sponge to extend out of tube to treat stump tops.

TO USE

With ball valve in the “OFF” or “CLOSED” position, pour the herbicide mix into the reservoir and close it with the threaded male cap (the top of applicator). Open the ball valve then slightly open the threaded male cap to allow air into the reservoir. Once the sponge tip begins to saturate, tighten the threaded male cap and close the ball valve. When the sponge is saturated, only a light touch to a cut-stump is needed. Open the ball valve when more herbicide is needed in the sponge tip.

HELPFUL HINTS

- During colder weather the ball valve may have to be left open to allow enough herbicide to saturate the sponge. Drip holes also can be made larger if faster herbicide flow is desired.
- Do not allow left-over herbicide mix to remain in the reservoir in extreme temperatures.
- Always clear drip holes of any residue before using the applicator again. A paper clip works well for cleaning out residues.
- When the sponge becomes worn, replace it (recommended after every work day at a minimum).
- When using the applicator during freezing conditions, duct tape a disposable chemical hand warmer around the section with the drip hole disk to reduce the chance of drip holes freezing shut.
- Use an herbicide dye to check for leaks, monitor applications, and identify any exposure to the person using the applicator.

Weed Control Methods Handbook, The Nature Conservancy, Tu *et al.*, version April 2001