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City of Middleton- Orchid Heights Ponds Water Hyacinth and Water Lettuce Emergency Control Project

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I. Introduction

In late August of 2010, a large infestation of two southern aquatic invasive species, water hyacinth (*Eichhornia crassipes*) and water lettuce (*Pistia stratiotes*), was observed within the North and South Detention Ponds in Orchid Heights Park, Middleton, WI. Some of the water lettuce plants had escaped into the riparian marsh of the Pheasant Branch Creek through the overflow weirs of the ponds. These plants are not winter-winter hardy and would likely die with the first frost; however, the seeds of such plants may be capable of surviving the winter in the groundwater springs of the Pheasant Branch Creek. As this invasion potentially threatened the Pheasant Branch Conservancy, a 500 + acre wetland complex that is regionally important for its recreational value, biological diversity within an urban setting, and supply of groundwater to Lake Mendota, the infestation was controlled. The purpose of this report is to describe the circumstances of the infestation, the measures used to control the plants, and describe steps that will be taken to prevent future infestations.

II. Background Information

Project Area

The project area consists of two detention ponds adjacent the Pheasant Branch Conservancy in the City of Middleton (see Appendix 1, Figure 1). The North Pond is 1.9 acres in size and located in parts of the SW $\frac{1}{4}$ of the SW $\frac{1}{4}$ of Section 31 in Township 8 North, Range 9 East, and the NW $\frac{1}{4}$ of the NW $\frac{1}{4}$ of Section 6 in Township 7 North, Range 9 East. The South Pond is 1.6 acres in size and is located within the NW $\frac{1}{4}$ of the NW $\frac{1}{4}$ of Section 6 in Township 7 North, Range 9 East.

The detention basins receive water from shallow, intermittent drainage swales that originate in the subdivision located north and east of the ponds (see Appendix 1, Figure 2). Surface runoff from the subdivisions flows into the North Pond, then through an underground pipe to the South Pond. Both ponds have concrete weir structures on the west side connecting them to the riparian wetland complex adjacent to Pheasant Branch Creek, which ultimately flows into Lake Mendota. The concrete weir in the North Pond allows flood waters to empty into an isolated pocket of marsh, whereas the South Pond weir empties into a drainageway that likely developed after the ponds were constructed. This drainageway is generally 2-3 feet wide in the eastern end, but diminishes and branches as it flows westerly into a cattail-dominated area of the marsh. A defined channel of the drainageway (observed on aerial photographs) extends approximately 350 feet into the marsh, but has yet to reach Pheasant Branch Creek.

Timing and Extent of Infestation

Local resident, Guerdon Coombs, noted the presence of a few plants of each of these species within the ponds in 2008, and reported this observation to Theodore Cochrane at the UW Madison herbarium. Mr. Coombs did not recall observing them in 2009. In early August of 2010, Susan Graham of the DNR observed a small infestation of the plants in the North Pond. By late August, however, the infestation had exploded according to Mr. Coombs and Susan Graham. The Middleton Conservancy Lands Committee was made aware of this problem at a CLC meeting held on September 1, 2010.

Thompson & Associates measured the extent of the infestation on September 8, 2010. Of the two species, water lettuce had the greatest cover (see Appendix 1, Figure 3). Within the North Pond, the infestation covered approximately 0.64 acres of the 1.9 acre pond (approximately 1/3 of the total surface area). Within the 0.64 acre area, water lettuce consumed approximately 90% of the surface area, and water hyacinth consumed approximately 2% (the remaining 8% was open water). In the South Pond, the infestation covered approximately 0.37 acres of the 1.6 acre pond (approximately 20% of the total surface area), although the density of plants within this area was far less (approximately 50% for water lettuce and less than 1% for water hyacinth). Water lettuce was the only species that had escaped both the north and south weirs. A small infestation was found within the Pheasant Branch Marsh just beyond both weirs, and scattered plants were found up to 100 feet west of the southern weir. Finally, a small cluster of water lettuce plants was found in a small wetland depression located east of the North Pond.

Biological Characteristics of Water Lettuce and Water Hyacinth

Water Lettuce is a perennial floating plant that looks like a small floating head of lettuce. It was first observed within Florida in the late 1700's; though experts disagree as to whether the plant is native to the southern US or to South America, the plant is not native to northern US states such as Wisconsin. Water hyacinth is also a perennial floating plant. This plant has showy lavender flowers and rounded, leathery leaves attached to spongy and often bulbous stalks. It is native to Brazil. Both plant species are believed to

have been introduced in the ballast water of ships. Besides direct introduction by water, the plants may also be moved around by attaching to boats and animals such as muskrats or water birds.

Both plants can quickly form large dense mats. Water hyacinth grows faster than any other plant that has been tested and can double its population in 6 days! Dense mats of either or both species can clog waterways for boaters, reduce oxygen levels in water for fish (by blocking the air-water interface where oxygen is dissolved from the air into water), outcompete native plants (either by pushing or crushing them, or by shading them), and alter animal habitat by limiting access to the water or by eliminating native plants that the animals rely on for food or shelter.

Neither invasive species is winter hardy and prefers growing temperatures in the 70s or 80s (degrees F) range. The minimum growth temperature for both species is in the low 50s. Seeds of water lettuce, however, have survived prolonged experimental periods in water that is 39°F (the temperature of water under ice), and also for a few weeks in ice at 23°F. According to Dr. William Haller of the Center for Aquatic and Invasive Plants at the University of Florida (IFAS (<http://plants.ifas.ufl.edu>): “We have water lettuce overwintering in warm springs in Idaho. Both plants [water lettuce and water hyacinth] produce prolific numbers of seeds and a drought or dry period stimulates them to germinate.” Dr. Haller felt the key for the survival of these species in colder climates was groundwater springs, where the water does not freeze.

Project Objectives

- Remove water hyacinth and water lettuce from both ponds and the marsh prior to seed set, thereby limiting their capacity to persist.
- Deposit samples of the plants at the University of Wisconsin Herbarium.
- Assess techniques for removal and share learned knowledge with DNR, IPAW, and other organizations concerned with invasive species removal.
- In order to prevent future accidental or deliberate introductions, educate local residents about the invasive species and the threats such introductions can have on the Pheasant Branch ecosystem.
- Outline 2011 monitoring and management efforts to identify and curb future infestations.

III. Results

Participants and Funding

A cooperative partnership was formed to control the invasive plants. This partnership was composed of Darren Marsh from Dane County; the City of Middleton Conservancy Lands Committee; the Oak Hill Correctional Facility Work Crew; Susan Graham, Lake Management Coordinator from DNR; Kelly Kearns, Invasive Plant Program Manager from DNR; local resident Guerdon Coombs, Friends of Pheasant Branch; Mark Sullivan, Alderman of District 8, and Thompson and Associates Wetland Services. Funding was provided by the DNR Early Detection Aquatic Invasive Grant, and City of Middleton (emergency funding requested by the Conservancy Lands Committee). Dane County, DNR, and the City provided equipment for the removal. DNR and the Friends of Pheasant Branch provided volunteers, and the Oak Hill Correctional Facility provided their 6-man work crew.

Work Hours

The invasive plants were removed from the ponds and marsh over five days: September 8, 14, 15, 16, and 24, 2010. In all, the removal took **243 person hours** to accomplish. Below is a summary of the work that was performed on each day.

September 8, 2010: 15 person hours

Thompson & Associates manually removed water lettuce from the marsh and worked with Dennis (Dino) Hellebrand (City of Middleton) to devise a strategy for removal. Mr. Hellebrand also found and coordinated equipment and trucks for the removal.

September 14, 2010: 111.5 person hours

Eighteen people from the City of Middleton, Oak Hill Correctional Facility, DNR, Friends of Pheasant Branch, and Thompson and Associates worked to remove the invasive plants from the ponds. Dane County provided the weed conveyor belt and a 3-ton truck.

September 15, 2010: 73 person hours

Thirteen people from the City of Middleton, Oak Hill Correctional Facility, DNR, Friends of Pheasant Branch, and Thompson and Associates worked to remove the invasive plants from the ponds. Dane County provided the weed conveyor belt and a 3-ton truck.

September 16, 2010: 36 person hours

Mr. Hellebrand and the Oak Hill Work Crew removed the remaining plants that had been deposited on the sides of the ponds, and hauled them to the compost facility.

September 24, 2010: 3 person hours

Alice Thompson walked both pond perimeters and removed a number of remaining stray plants.

Volume Removed

The volume of plants removed on September 14 & 15, 2010 was **864 cu ft**. This is approximately equivalent to filling a standard 10' x 10' room (with 8' ceiling) up with plants.

Herbarium submittal

Several water lettuce plants of varying growth stages (including flowering) and one flowering water hyacinth clump were delivered to the University of Wisconsin herbarium by a volunteer. The location information as well as photographs and map documenting the extent of the infestation were sent via email.

Equipment

Below is a list of equipment that was used to remove the plants, as well as an indication as to whether or not the equipment was found to be helpful.

| Equipment | Usefulness |
|--|--|
| Large Aquatic Conveyor | Critical to Project Success |
| 8-Ton and 1-Ton Truck | Critical to Project Success (larger truck preferred) |
| Swimming Pool Lane Booms | Very Helpful (Critical in calm conditions) |
| 13" x 13" Bait Net (Ed Cumings, Inc. AG-1 series) | Very Helpful |
| Kayak, Canoes | Critical to Project Success |
| Metal garden rake | Not Helpful for Removal from Water |
| Pitch Forks | Very Helpful |
| Hip Waders | Very Helpful |
| 5-Gallon Pails | Very Helpful |

Methods

At the time of the removal, both water hyacinth and water lettuce were flowering. No fruits or seeds, however, were observed. Because the plants are not winter hardy and will die with the first few frosts, we chose to focus our removal efforts on plants that were flowering, and that could potentially produce seed if we had a warm fall. All water hyacinth plants were removed. All water lettuce plants that were observed in the marsh were removed. Water lettuce plants that were larger than a quarter in size were deemed the plants most likely to be flowering, and were therefore removed from the pond areas. Smaller plants were left behind, unless they were easily accessible.

A variety of methods were used to remove the plants. Below is a description of the methods that were used in each infestation area.

Small Infestations: *Pheasant Branch Marsh, fringe of the South Pond, and small wetland located east of the North Pond*

Small infestations of plants were manually removed using nets, rakes, and/or bare hands and were either collected in 5-gallon pails or boats (which were emptied into large trucks), or were piled onto the upper bank of the ponds, where they would shrivel up and die within a few days. A small river kayak was also used to access and collect scattered plants in the center of the South Pond.

A 10- to 15-foot length of silt fencing was placed against the weir on the inside of the ponds, in order to block additional plants from escaping into the marsh.

Large Infestation: *North Pond*

Kayaks and canoes were used to break up the dense mat of floating plants and push them toward the center of the pond where the wind could catch them and push them toward a large conveyor. When winds were calm, swimming pool booms were used to corral the floating mats and pull or push them to the conveyor. The Oak Hill Work Crew then used pitch forks to lift the plants into the conveyor, which transported the plants into large trucks. The plants were then hauled to the City of Middleton Composting Facility and dumped.

A fringe of scattered plants remained after the removal of the large mats. Most of these plants were either stuck to the mud just above the water line on the edge of the pond, or were tangled in overhanging vegetation on the edge of the pond. These plants were removed using the methods described above for the South Pond.

Lessons Learned

- We originally intended to net the plants out of the ponds using the Oak Hill Work Crew. We realized quickly that this was clearly unworkable due to the large infestation in the North Pond. The Dane County Aquatic Conveyor was critical to the quick and efficient cleanup of the infestation.
- The plant roots weave together to form dense mats. The mats are immobile unless broken up into smaller patches. Long kayaks or canoes worked well to break through the mat with the narrow tip of the boat, and then to push the plants toward the center of the pond (using the long sides of the boat, which were parallel to the pond edge).
- When winds were calm, several lengths of swimming pool lane booms were used to corral the plants and bring them toward the conveyor. The boom was attached to the end of a canoe, and the canoe then maneuvered around the outer edge of a mat of plants (as close to the shore as we could get). The corralled plants were then pulled and pushed toward the conveyor. **Note that the plants were very heavy and not easily maneuvered.** We needed two strong men in the front canoe to pull the booms through the mats. Once the booms were around the

plants, it took several boats pushing from behind and several people pulling the booms along the shoreline to bring the booms in. We were able to hook either end of the booms to the conveyor so that the crew lifting the plants into the conveyor could contain the plants while they worked, as well as tighten the loop around the plants as needed to concentrate the plants into their work area.

- When pulling or pushing plant mats or booms, the boats were best maneuvered (at least by the weaker members of the work crew) by using the paddles to push against the bottom of the pond, rather than paddling. The booms were most easily moved by people wading in the water; however, the pond bottom was only consolidated along the outer edges, making wading in the center areas of the pond dangerous and impossible (too silty).
- Electric motor boats might help in other situations (larger water bodies) or it might be possible to use 4-wheelers on the edge of a pond to pull booms across.
- The plant roots held mats of plants together, but only loosely. If the mats were pulled or pushed too fast, the mats would break up and individual clumps would slip away.
- At the end of the work day, the booms were used to secure the remaining mats of plant so that a shift in wind would not push the plants back into areas we had cleared out. The booms were secured to posts holding nesting boxes or to vegetation on the shore.
- **The booms, conveyor belt, and many strong workers that we had were key to the rapid removal of the large plant mats from the North Pond.**
- Individual plants were tangled in the thick reed canary and rice cut grass hanging in the water, or stuck in the mud on the eroded bank or in crevices under eroded, overhanging banks. The square-headed nets were useful in swishing water onto the eroded bank or into the grass leaves to wash plants off so they could be netted. The nets were also very useful in reaching plants below an eroded, overhanging bank (by bringing the net up from under the water into the crevice).
- Bare hands were needed to pull small individual plants off of the muddy banks, from muskrat holes, or from tangled grass leaves, when they could not be washed off. Because rice cut grass was prevalent along the shore edge, gloves would have been helpful to protect workers hands.
- The hardest area to manually remove plants was from the dense sandbar willow stand at the northeast end of the North Pond. If we had to repeat this task another year, we would seriously consider cutting the willows out of the system to allow for more efficient removal.
- As rain was not predicted to occur for several days after the plant removal, we felt secure that plants that were thrown on the banks would dry up and die before a rainstorm could potentially wash them back into the ponds. Had rainstorms been predicted, we would have taken all of the plants to the compost facility or carried them further upslope where they could not wash back into the ponds.

- Subsequent monitoring of the site was necessary because later rainstorms had freed plants that had been tucked into holes in the banks, and also plants that had been within the pipe connecting the North and South Ponds. In addition, it is likely that some of the plants had been submerged during our initial removal effort, and did not pop up until several days later. A week after the main removal effort, several water lettuce plants, including large flowering individuals, were found along the perimeter of each pond, and removed.

IV. Project Deliverables

- Removal of invasive water lettuce and water hyacinth from the North and South Ponds, the small wetland basin east of the North Pond at Orchid Heights and Pheasant Branch Marsh. **Accomplished from September 8-24, 2010.**
- Return in 2011 to document any overwintering plants and plan removal. **Scheduled for May and July of 2011. Any plants will be immediately removed in order to prevent a large infestation from occurring.**
- Report to DNR and interested parties about this infestation, removal efforts, and future management plans. **This report will be sent to DNR and the City of Middleton. Information has already been submitted to the University of Wisconsin Herbarium. Alice Thompson will submit a proposal to discuss the removal at the 2011 Wisconsin Wetlands Association Conference and this report will be sent to the Invasive Plant Association of Wisconsin.**
- Generate local press coverage of this potential threat. **Accomplished in Middleton Times newspaper, front page article dated September 30, 2010.**
- Educate Middleton citizens not to stock the ponds with plants and to be on the lookout for these invasives. **We will produce educational materials that can be posted in the park and be distributed to local groups. This work will occur during the 2010-2011 winter, in cooperation with local groups and DNR.**

V. Summary

This project was an emergency response to an unprecedented invasion of two southern aquatic species, water lettuce and water hyacinth, that exploded in growth within two detention ponds in the City of Middleton and escaped into the Pheasant Branch Marsh, which ultimately drains into Lake Mendota. Due to the invasive nature of these plants and the possibility that the plants may overwinter as seeds in a groundwater system such as the Pheasant Branch Marsh, we made the decision to remove the plants in September 2010 and monitor the ponds in 2011. Approximately 900 cu ft of plants were removed from the ponds and marsh, involving 18 people and 243 person work hours.

The source of this infestation is unclear. However, as these invasive aquatic species can rapidly explode in growth and cover, and have shown that they can easily enter the Pheasant Branch Marsh from the detention ponds, their introduction poses a very real

ecological threat to the Pheasant Branch Marsh and Lake Mendota ecosystems. It is our estimation that educating local citizens of this threat will likely be the best method for protecting these ecosystems from future introductions. In addition to follow-up monitoring, our efforts will be focused on preparing educational materials and discussing this removal effort with local groups.

VI. Resources

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APPENDICES:

1. Figures

- Figure 1. Location Map
- Figure 2. Water Flow Through Ponds
- Figure 3. Extent of Infestation

2. Photographs