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Implementing Invasive Management at The Wilma H. Schiermeier Olentangy River Wetland Research Park and Involving the Community

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Executive Summary

The Wilma H. Schiermeier Olentangy River Wetland Research Park contains a wide range of native and invasive plants. Although invasive species are gradually dominating the plant structure of the wetlands, there is no sign of invasive management being implemented or conducted currently at the park. The impact these invasives have on the wetlands and their native plants can affect habitat structure, water flow, and nutrient cycling.

The use of volunteers would be a great way to cost effectively manage invasive plant species as well as bring awareness to the research park. Management would be accomplished through mechanical removal rather than chemical, ensuring that no current ecology or research is disrupted. Participation by volunteers is likely to slow the rate of invasive growth and invasive spread in the wetlands.

In order to get the community involved, a new website tab and pamphlet will be created. These will both serve as techniques to inform the community of our management plan. The website tab and pamphlet will also serve as sources of information for community members.

Volunteers would have the opportunity to learn more about invasive management through hands-on volunteer days. These days would consist of a brief information session explaining the types of invasives existing in the wetlands and the methods for their removal, followed by on site removal of invasives. Volunteers would also be encouraged to carry out their own invasive management outside of the wetlands in their private lives.

This paper discusses the importance that community involvement has on the management of invasives at the Wilma H. Schiermeier Olentangy River Wetland Research Park.

Introduction

The Wilma H. Schiermeier Olentangy River Wetland Research Park was first constructed in 1994 and consists of two kidney shaped wetlands, an oxbow wetland, a bottomland hardwood forest, and a research facility including mesocosms. Invasive plants are currently replacing the native plant species in the OSU wetlands, resulting in a decrease in biodiversity. We hope to focus our project on increasing community awareness about the threat that invasive species pose to the wetlands. Our goal is to inform a greater number of individuals about the problem concerning invasive species and encourage individuals to take action in invasive management. This paper mainly focuses on invasive species management and involving the community. Basic information about invasive plants and the management of invasive plants is discussed to give a general view at first. Then, the use of public media as a means of information is discussed with three examples; a website tab, a pamphlet, and the use of the Great Lakes Early Detection Network (GLEDN) application. In addition, the paper discusses how individuals are affected by hands-on volunteer activities and how to execute volunteer days effectively.

Background

One of the goals for creating the wetland research park was to determine the difference in colonization of plant species over time in planted versus unplanted wetlands. After 15 years of research “[t]he two [kidney] wetlands now contain nearly the same number of plant species, and almost 100 more species than existed [when constructed]” (Caldwell, 2012). While this may be true, it is important to consider the different plant species that can be found among these 100 new species. Many of these include invasive or non-native plants.

Current Observations and Proposed Plan

In the beginning stages of development, one of the kidney wetlands was planted with native plant species while the other remained unplanted. In the planted kidney wetland, 13 native plants were introduced. Currently, nine of these species remain in the planted kidney wetland while only two of these native species can be found in the

unplanted kidney wetland (Caldwell, 2012).

Wetland manager Brent Macolley explained that cattails, phragmites, and flowering rush are present, all of which are invasive species. Invasive species are “[s]pecies or strains that rapidly increase their spatial distribution by expanding into native plant communities” (Richardson et al., 2000). Currently the OSU wetlands are not managing any invasive species and are allowing nature to take its course. Due to the aggressive nature of invasive plants, biodiversity of the wetlands is significantly decreasing. In ecosystems where non-native species are present, an average of $46.60 \pm 0.68\%$ of native plant biomass is lost (Vilà & Weiner, 2004). This indicates that native species are prevented from thriving in an environment containing invasive plant species. This paper is a proposal to change management practices at the OSU wetlands to include invasive control and to inform and involve the community in doing so.

Invasive Species Impacts

Invasive species are detrimental to ecosystems because they negatively impact habitat structure, nutrient cycling, and biodiversity (Zedler & Kercher, 2004). The pure density of invasive species present can influence habitat structure. Water-logged areas such as wetlands can be consumed by these plants and these plants can cause water flow to be restricted or completely stopped. Non-native species deplete available nutrients such as phosphorus and nitrogen in the soil, thereby creating competition for native plants. While one of the main functions of wetlands is to remove these excess nutrients from surface water, it would be more beneficial to have native plant species doing this job. Typically, the density of invasive plants is much greater due to their more aggressive nature, implying that there are greater numbers of individual invasive plants than native ones. Most importantly, biodiversity is impacted as a result of this competition for nutrients. The lack of available nutrients to native plant species either hinders or completely prevents their germination. With only invasive species dominating the specific ecosystem, other species are outcompeted. Figure 1, obtained from the article by David L. Gorchoff (2005), describes the relationship between native and invasive species diversity. When invasive species are present, native species

diversity is low. Additionally, the article states that invasion can more readily occur if the habitat is either disturbed or damaged (Gorchov, 2005). Restored or constructed wetlands, such as the OSU wetlands, are an example of a disturbed or damaged habitat. These types of wetlands have bare areas that are easily colonized by invasive species, in turn, lowering native species diversity. Removing an invasive species, such as flowering rush, may allow research opportunities on the effects of invasive management and the ecology of the Oxbow Wetland.

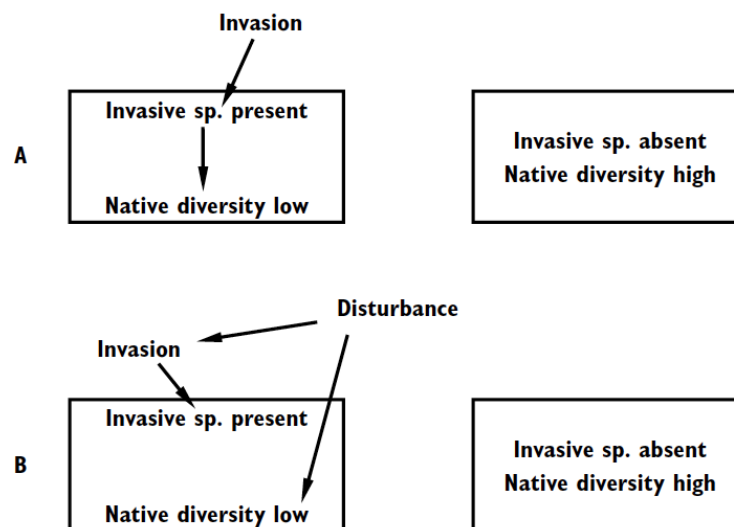


Figure 1: Relationship between native and invasive plant species and factors such as disturbance and initial lack of native species (Gorchov, 2005, p.31).

Volunteers and Invasive Management

The management of invasive species is usually a costly and time-consuming process. However, with the use of volunteer labor, projects can be completed at less expense and in a shorter period of time (Volunteers From AmeriCorps*NCCC to Spend Spring in Minnesota, 2004). The proposal to use volunteer labor will address the issue of project cost. The OSU wetlands will not need to hire staff to complete these tasks, making cost of management minimal.

Using volunteers to manage invasive species involves some challenges. Chemical management of invasive plant species requires an herbicide license in most

states, including Ohio, in order to safely and effectively apply treatments. Because we plan to focus this proposal on community efforts to manage invasives, it is best to use management techniques that do not involve chemical treatment. Considering this challenge will allow for a wider range of volunteers and take into account the safety of those volunteers. Dresner & Fischer (2013) explains that, “[i]f the management goal is removal [of an invasive species], chemical treatment may be more effective. However, if the management goal is greater public awareness about invasive plants, a targeted community-based education and stewardship approach may be effective” (Dresner & Fischer, 2013, p.444). While removal of invasive plants is a goal for this proposal, informing the community is a goal of greater value. In this case, there are many alternative methods for controlling or removing invasive plant species. Two particular methods for removing flowering rush are hand digging or stem cutting (Matthews et al., 2009). Any community member or volunteer that is properly informed can easily execute either of these methods.

As a precaution, we plan to focus our proposal only in the Oxbow Wetland. Abstaining from chemical treatment here will help to prevent interference with ongoing research at the OSU research park. While most of the research is centered at the kidney wetlands, it is important to remember that the Oxbow Wetland is still nearby. Natural flooding of the Oxbow Wetland could lead to overflow of water and, in turn, the spread of these chemicals. This proposal does not include the use of chemicals; therefore, wetlands staff and volunteers do not have to worry about complicated chemical application techniques. The chances of volunteers damaging native species or incorrectly applying herbicide are eliminated.

Proposed Volunteer Day Schedule

In order to organize a successful volunteer event, a set schedule and guidelines must be created. Based on the volunteer day described on The Wetlands Initiative’s website and tips from The Nature Conservancy, a brief orientation speech should be given to volunteers in a designated meeting area describing the goal for the day. Meeting outside of the OSU research park building would be an ideal location for this orientation speech. Following the short speech, a staff member would then lead

volunteers to the Oxbow Wetland. After arriving at the Oxbow, the staff member would then talk about more specific topics such as: how to identify flowering rush, how to successfully remove it, and how to dispose of it to minimize the spread of seeds. Following the explanation of these topics, the staff member would physically demonstrate the removal of one plant. At the end of this demonstration, the staff member should answer any questions the volunteers may have. Based on the volunteer day at The Wetlands Initiative, volunteers are then broken into “teams” with a leader. For our specific proposal, this individual would be an OSU wetlands staff member. At the end of the day both The Wetlands Initiative and The Nature Conservancy suggest presenting the amount of work completed and asking what volunteers learned from their experience at the site (The Nature Conservancy, 2014). Presenting the total amount of work completed will allow volunteers to feel that they are making a difference and to feel proud of their work.

Post Management Attitudes of Volunteers

Involving and informing the community will reduce invasive species not only in the OSU wetlands research park, but also in the surrounding areas of Columbus. By participating in volunteer days at the OSU wetlands, community members will be receiving information via pamphlets and a new tab on the improved wetlands website. These individuals will be made aware that invasive species are a problem. Many people today are not aware of the fact that invasive plant species pose the greatest threat to biodiversity (Dresner & Fischer, 2013). By gaining knowledge and first hand experience with common invasive species, community members and volunteers will be able to spread and apply their knowledge. For instance, studies performed with middle school children in a stewardship program indicated that students

[o]f this study were highly motivated and continued to both inform and inspire their families to help remove invasive species outside of school in their own communities. In addition, they informed their families and friends about the work they had done removing invasive species in local parks and took them there to show off their results (Dresner & Fischer, 2013, p.445).

This shows that individuals who participate in invasive removal will most likely spread

the information they obtain at the wetlands to other community or family members. Some volunteers might even attempt to encourage others to join them the next time they choose to volunteer with invasive species.

Not only do participants often attempt to influence others, but they are also influenced themselves. Participants in the stewardship study reported that they remove invasive ivy, a plant they had focused on during their study, wherever they see it now (Dresner & Fischer, 2013). Participants also seemed to be hopeful that they could make a difference by managing invasive species. (Dresner & Fischer, 2013). This could be helpful in the specific situation at the OSU wetlands. Once individuals are able to recognize and manage invasives in the wetlands, they will be able to manage them if they encounter them on their own land or in their ponds. Action taken in the greater Columbus area will help prevent the return of invasive species to the OSU Oxbow Wetland.

Post Management Wetlands

Finally, participation in the volunteer days will physically remove flowering rush and slow its spread. The time invested in removing the flowering rush will remove many seeds from the wetland ecosystem. After the current population of flowering rush is controlled, studies can be developed to determine the effects of invasive management on native species. With the flowering rush under control, other native plants can grow and reproduce. In this, there is a potential for new research. OSU graduate students or current scientists at the wetlands can monitor the ecological changes that occur, or do not occur, after management takes place. Native plant growth and animal populations can be monitored to assess the impacts of invasive plant management.

Getting the Public's Attention

Without community involvement, the goal of this project would be almost unattainable. A very small portion of the community at OSU is informed about the existence of the wetlands, but by promoting this project through the Internet, an interactive application (GLEDN), and pamphlets, we plan on raising awareness and getting more people involved at the wetlands. Because the Internet has become such

an important part of everyone's day-to-day lives, it would be an effective and simple way to get more community members informed about invasive plants specifically at the OSU wetlands research park. Utilizing the scrolling news section on Ohio State's main website would be an effective way to inform OSU students and faculty members of the existence of the OSU wetlands research park. The use of the general OSU webpage will create an avenue for individuals who do not already know about the OSU wetlands to become informed. Based on an annual study conducted by the ITU (International Telecommunication Union, 2014), the average percentage of Americans who use the Internet has doubled over the past decade. In 2000, only 43.08% of individuals used the Internet on a day-to-day basis, whereas in 2013, 84.20% of individuals used the Internet daily (International Telecommunication Union, 2014). Since the role of the Internet has gradually increased in society today, we can use it to reach out to community members in order to get them more involved. By using the main OSU website and the OSU wetlands website, we can reach out to members of the Ohio State and Columbus communities and successfully develop awareness about invasives at the wetlands.

Informing the Community via a Website Tab

One avenue for informing the community would be to create a new tab on the OSU wetlands website. This tab would be dedicated to informing the public about invasive species currently existing in the wetlands as well as offering volunteer day information, contact information, and a link to the GLEDN application for reporting invasives in the area. The layout of this tab would be simple yet visually pleasing. Visuals are an extremely important aspect of a webpage. Incorporating natural colors, like green and brown, are vital to the webpage's overall appearance. The use of natural colors represents and gives the audience a feeling of "tranquility, health, and reliability" (Miles, 2010). By providing those feelings, these colors would give readers a good sense of being in touch with nature while viewing the webpage. The color of the webpage, along with images of the wetlands, will make viewers feel in touch with the environment. By incorporating sharp images of the Oxbow Wetland and the plants currently existing there, we will make the readers feel the need to be at the wetlands to see and experience the ecology first-hand. These images will catch the viewers' eyes

with their vibrant colors and clear imagery. By using a natural color scheme and vivid visual aids, the page would be created in a style fit to please the readers' eyes and make them already feel connected to the wetlands.

Another important visual aspect of the webpage is the overall content. Since readers tend to skim online, we would need to incorporate a simple and to-the-point description of our plan. As stated in Jennifer Kyrnin's "Top 10 Tips to a Great Web Page," "you want the contents of your page to give [the readers] what they want quickly, but provide enough detail for those who want expansion on the basics" (Kyrnin, 2013). Based on Kyrnin's tip, the webpage would require a detailed description of our plan, without getting too specific. We want to pull the readers in, rather than push them away. By using simple language and to-the-point descriptions, the simplicity of the text would pull readers in. A "Get Involved" button at the bottom of the page would direct the web browser to a volunteer sign-up form and encourage individuals to get involved with the wetlands.

As well as a description of management plans, the webpage would contain information about invasives found in the wetlands including pictures and plant identification tips. Each invasive species found in the Oxbow Wetland will have its own picture (taken of actual invasives on site), description, and removal techniques. For example, for flowering rush, there would be a detailed image of the plant showing its tall stalks and pink flowers. Below this image would be a brief description of the plant like the one in "Ecology and Management of Flowering Rush" (Jacobs, Mangold, Parkinson, Dupuis, & Rice, 2011). A description of the plant as an "aquatic plant resembling a large flat grass with emerged and fully submerged stalks containing clusters of 20 to 50 light-pink flowers at the top of the plant" could be a good example of what would be included under the image (Jacobs et al., 2011). The description would also describe the habitat in which flowering rush can be found: shorelines of freshwater lakes, rivers and streams. The section would then give a brief description on removal techniques of the plant, such as the one given in the latter article: "for hand digging to be successful, rhizome fragments will need to be diligently removed and repeated digging will probably be required" (Jacobs et al., 2011). Each image and description of the invasive species will give viewers a good sense of feeling educated about the plants and ready to take

the next step of volunteering. An example of a visually pleasing website by The Wetlands Initiative is presented in Appendix A.

Other features that the new website tab will bring to the wetlands webpage are a list of volunteer opportunities and an interactive mobile application GLEDN. This section of the website will give a list of volunteer opportunities, specifically volunteer days, as well as their corresponding dates and times. It will also be an easy way for potential volunteers to make sure they can fit volunteering into their schedule. Not only will there be a volunteer tab, but also a link to an app for reporting invasives in the individuals' area. This app was developed in October of 2012 and can be used for early detection of invasive plant or animal species. The free GLEDN app allows an individual to take a picture of a plant species, and upload it to a database to be confirmed and reported (Knebusch, 2012). Not only would this app help to aid in identification of invasive species, but also it would help the overall community in locating and reporting invasive problems.

Informing the Community via a Pamphlet

Another way to promote community involvement is with pamphlets. These pamphlets would be placed in the lobby of the OSU wetlands building and would be similar to the website in content and theme. On the cover of the pamphlet would be an informative title "Invasive Management in the Oxbow Wetland," and below the title an encouraging catch-phrase such as, "Managing invasives one volunteer at a time" would be included. The pamphlet would be divided into three pages. The first page would be the intro page where the viewer could read about our mission to clean the Oxbow Wetland and rid it of threatening invasive species. The second page of the pamphlet would give a brief description of a wetland, invasive species, and name a few of the invasives located at the wetlands as well as their removal methods. The third page of the pamphlet would include volunteer opportunities and contact information for how to get involved. On the back of the pamphlet would be the wetlands contact information such as their telephone number, address, and web address. A rough draft of this pamphlet can be referenced in Appendix B.

Volunteer Days

Lastly, we propose a plan to inform individuals through volunteer days. Volunteer days would be focused on individuals that want to learn about wetlands or invasive plant species and individuals that need to meet volunteer requirements for classes or other commitments. These days would begin with an OSU wetlands staff member explaining the removal process to volunteers. For example, one way to safely remove invasive flowering rush is the pulling and digging method. This method requires either tools such as digging forks and shovels or simply your hands (Mattrick, 2013). The facilitator would then go out with the volunteer group and show them exactly how to pull out the plants, making sure that they understand what to do. Once the staff member finishes explaining the removal process and showing the volunteers how to successfully remove the plants, the volunteers will have the opportunity to do it themselves. By directing the OSU wetlands to partner with a powerful organization such as The Nature Conservancy, successful and memorable volunteer days can be planned. The process for partnership with The Nature Conservancy requires the completion of a questionnaire that can be located in Appendix C. Questions that are asked refer to the goals and plans of the OSU wetlands. The Nature Conservancy also inquires about goals that the OSU wetlands and The Nature Conservancy itself have in common. The Nature Conservancy determines values that both OSU and The Nature Conservancy share in order to establish a successful partnership. A strong partnership could be created in this case due to the fact that The Nature Conservancy has an “unwavering commitment to collaboration enabl[ing] [them] to bring people together to find shared solutions to shared challenges, working with all who rely on – and have an impact on – nature” (The Nature Conservancy, n.d.). A partnership with The Nature Conservancy would be beneficial to the OSU wetlands because it would provide a number of volunteers that would be reliable and at a similar skill level in comparison to each other. Although this report does not provide details to assure that such a partnership can be forged, this example suggests that these possibilities exist, and we recommend that the wetland research park explore such opportunities.

A Day at the OSU Wetland Research Park

Volunteers can participate in simple invasive management tasks during events, such as work trips, in order to learn new things as well as enjoy themselves. For example, people involved in work trips for more than 20 years recalled their experience about cutting, dragging and burning invasive species. These volunteers all felt that the work trip was a great experience and that they all enjoyed working in nature. One volunteer, Katryn Renard mentioned, "It gives me a sense of belonging to the land and a respect for the beauty of Ohio" (Taft, Speck, & Strayer, 2002-2003, p.2). A one-day experience is short enough so that it provides volunteers with some basic information on invasive management without being overwhelming. Green Up Day and Earth Day may be two days on which more people would be willing to do some volunteer work. Both days have the same purpose, to make individuals aware of the importance of environment-friendly activities.

Managing invasive plant species can be considered as one of these activities. It can make people aware of native plants and the importance of biodiversity. "A good plan developed by knowledgeable people will ensure that volunteer time is used to manage plants in the highest priority areas" (Taft, Speck, & Strayer, 2002-2003, p.2). At first, volunteers can learn basic knowledge about invasive species and their management plans through a short information session. They can learn how to differentiate target invasive plants from native species. Organizers can also explain how volunteers can use the proper tools to remove these invasives via a sample demonstration. In our specific example, OSU wetlands staff could demonstrate the removal of one flowering rush plant and describe what they are doing as they are doing it. A supervisor would be required to be present near each group to ensure safety for these volunteers. Because time is limited, volunteers gain basic knowledge of invasive management and experience simple management work. The volunteer day allows a greater number of people to realize the importance of invasive plant species and their management.

A Workshop Method

A workshop format can be used in the informational section of the volunteer day. The workshop would include a basic introduction about invasive plants. “Basic concepts, such as native, exotic and invasive plants, and the problems caused by these species were explained, some examples...[d]escribing the key characteristics for identification, the region of origin, the problems caused in the exotic range and their impacts on native biodiversity” (Reis, Marchante, Freitas, & Marchante, 2013, p.694). The workshop can also inform people with a list of simple actions that they can take for successful invasive management. In the article “Public Perception of Invasive Plant Species,” a study was performed that separated students into two groups of 12 students. Students completed three activities relating to invasive management. The first activity addressed competition between native and invasive plants, the next activity was about control of invasive plants, and the final activity was about learning how to recognize some of the worst invasive plant species. “A year later, a questionnaire was provided to the students to evaluate the efficacy of the workshop based on the knowledge retained” (Reis, Marchante, Freitas, & Marchante, 2013, p.694). While our information session will not be as interactive as this, we can incorporate similar details when introducing the volunteers to the wetlands. This information could be useful in providing the most important concepts that will be easily retained by community members.

Long-term Work Involving the Community Using EBIPM

After participating in volunteer days at the OSU wetlands, community members are encouraged to create their own plan to manage invasive species outside of the wetlands. Management techniques learned during the volunteer day can carry over to managing invasives in private ponds or on private property. The Sheley, Smith, and Vasquez (2010) article, “Applying Ecologically Invasive-plant Management,” presents five steps as guidance for the Ecologically Based Invasive-Plant Management (EBIPM) with a case study. The case study is used to demonstrate how the five steps of this long-term management plan can be followed. Each individual can follow instructions to determine their own management plans for invasive species on their own properties. Because this method aligns with the mission of The Nature Conservancy that has been

previously stated, it would be a good avenue for introducing similar interests of individuals in the community, OSU, and The Nature Conservancy. For this reason, it would be acceptable for questions regarding the long-term private management of invasives to be directed to The Nature Conservancy. The case study indicates that about 66% weed management was successful in managing invasive plants. These authors feel that the EBIPM method can help to plan and execute future management plans.

First Step of Ecologically Based Invasive-Plant Management

The first step involves completing a health assessment of the ecosystem. “A completed Rangeland Health Assessment provides valuable information for indicating current rangeland conditions” (Sheley et al., 2010, p.609). This step is used to collect information to make appropriate decisions for management options. The assessment for rangeland is one example to identify the basic information, which can be used for wetland assessment. It could be altered to become a framework in order to determine the health of a wetland ecosystem. For the community members, this would be considered an informational section where members would learn about the invasive species in the wetland before interacting with them

Second Step of Ecologically Based Invasive-Plant Management

The second step of the EBIPM is to ‘Identify Causes of Invasion and Associated Processes.’ In this step, community members or volunteers can use assessment information to identify some primary factors that allow invasive species to thrive. Then, they can create an accurate plan to prevent these factors. “The aim is to alter the key processes in a particular ecological site to influence each “cause of succession” to direct vegetation dynamics on a desired trajectory” (Sheley et al., 2010, p.611). This step determines the cause of invasive encroachment. There are many reasons that explain why invasive plants are replacing native species, and certain reasons may require various treatment methods. If volunteers have any questions regarding this, they may contact the OSU wetlands for advice or guidance based on management practices currently implemented at the Oxbow Wetland. If further information is required, volunteers may attempt to reach out to The Nature Conservancy. After choosing

ecological processes as factors of causation, strategies and tools can be developed to hinder invasion by these non-native species. Community members can get a deeper view of the variables that increase the likelihood of invasion.

Third Step of Ecologically Based Invasive-Plant Management

The third step is 'Use Principles to Guide Decision Making.' Ecological principles have been synthesized from existing scientific literature to provide direction for management (James et al, 2010). With the development of ecological principles, community members can have strong, science-based knowledge to evaluate the potential effectiveness of any techniques and processes for decision making for invasive management on their private lands. General principles or rules need to be understood and learned to make any further decisions. Considering the OSU wetlands, volunteers may learn some previously successful and effective methods and the benefits and drawbacks of these methods to make their own design on their private properties.

Fourth Step of Ecologically Based Invasive-Plant Management

The fourth step is 'Choose Appropriate Tools and Strategies Based on Principles'. "There is a critical link between the ecological processes in disrepair and the choice of management tools and strategies" (Sheley et al., 2010, p. 611). In this step, community members can learn the different methods of invasive management and gain knowledge as to which technique is suitable for each solution. The author reminds us that "each process is associated with a corresponding principle, and each principle is associated with a corresponding management action" (Sheley et al., 2010, p. 611). This indicates that there is at least one method that people can use to manage flowering rush. Not every method that volunteers choose can be successfully implemented. Each method will have its limitations and volunteers who are not very specialized in invasive management may not know of these. Volunteers can, therefore, ask experts from The Nature Conservancy for help to choose the easiest and most probable method for management of a specific invasive species.

Final Step of Ecologically Based Invasive-Plant Management

The last step is 'Design and Test the Program with the Use of Adaptive Management.' Although EBIPM can provide methods for management plans with predictable outcomes, the actual effectiveness of these management methods is still uncertain. Adaptive management is used to avoid this problem; individuals are encouraged to "operate in the face of uncertainty and learn by doing, which involves using actual management to test different management alternatives and expand our knowledge about a system" (Sheley et al., 2010, p. 611). During this step, community members can gain much more knowledge by testing management alternatives.

The last step explains how to apply these ideas. The author suggests that thoughtfully selecting among response variables, which is the best to test for effectiveness of management, can make data available for further decision-making. He also recommends that people try other simple adaptive-management experiments that perform tests with "only a few alternatives against control plot with replications" (Sheley et al., 2010, p. 612). The author finally concludes that evaluating the data as a whole and the steps of EBIPM with stronger knowledge of invasive species will increase "[c]onfidence that the management strategy developed in the process is the best alternative for the site, and a management program that is scientifically valid and easy to defend" (Sheley et al., 2010, p. 612). This shows the benefit the EBIPM can bring to community members when they are involved in learning and participating in management outside of their volunteer day experience. The EBIPM may be a way for volunteers and community members to participate in invasive management long term.

Discussion

The research in our proposal suggests that community information and involvement are key aspects of effectively managing invasive plant species in the Oxbow Wetland. While there are social, economic, and environmental implications for this project, the benefits outweigh the costs. Social implications might involve wetlands staff or scientists performing research at the kidney wetlands. To avoid conflict with these individuals, our proposal focuses volunteer work only at the Oxbow Wetland. To combat the issue of foot traffic and noise in the lobby while obtaining pamphlets or

information, volunteers will only be present for a small period of time before they are led to the Oxbow Wetland. Environmental implications might include the change in ecosystem structure once flowering rush is removed. A new plant community may emerge and a new type of habitat could emerge that could potentially attract new animal species to the wetlands. Action will be taken as needed if problems arise. Economic implications include a cost for supplies and materials for the volunteers. The materials necessary, however, are practical and useful to the wetlands staff, not only the volunteers. Pamphlets might be the most expensive component of our plan due to the fact that they must be printed on paper with colored ink. Printing on recycled paper and using efficient printing methods can easily combat the issue of price. Some aspects of the proposal may seem costly; however, by using volunteer labor we hope that the cost of our plan and invasive management can be greatly reduced.

Conclusion

Invasive species heavily impact various ecosystems. With the lack of public awareness and involvement, the problem is only worsening. By involving the community with invasive management in the Oxbow Wetland, we would not only be improving the wetland itself, but we would be increasing awareness about the growing problem of invasive plant species. Information about invasive plant species and suggested volunteer methods for their control are discussed in this paper. The community must be properly informed and involved in invasive management. We hope to achieve this goal by using a new website tab, GLEDN application, an informational pamphlet, and volunteer days at the Wilma H. Schiermeier Olentangy River Wetland Research Park.

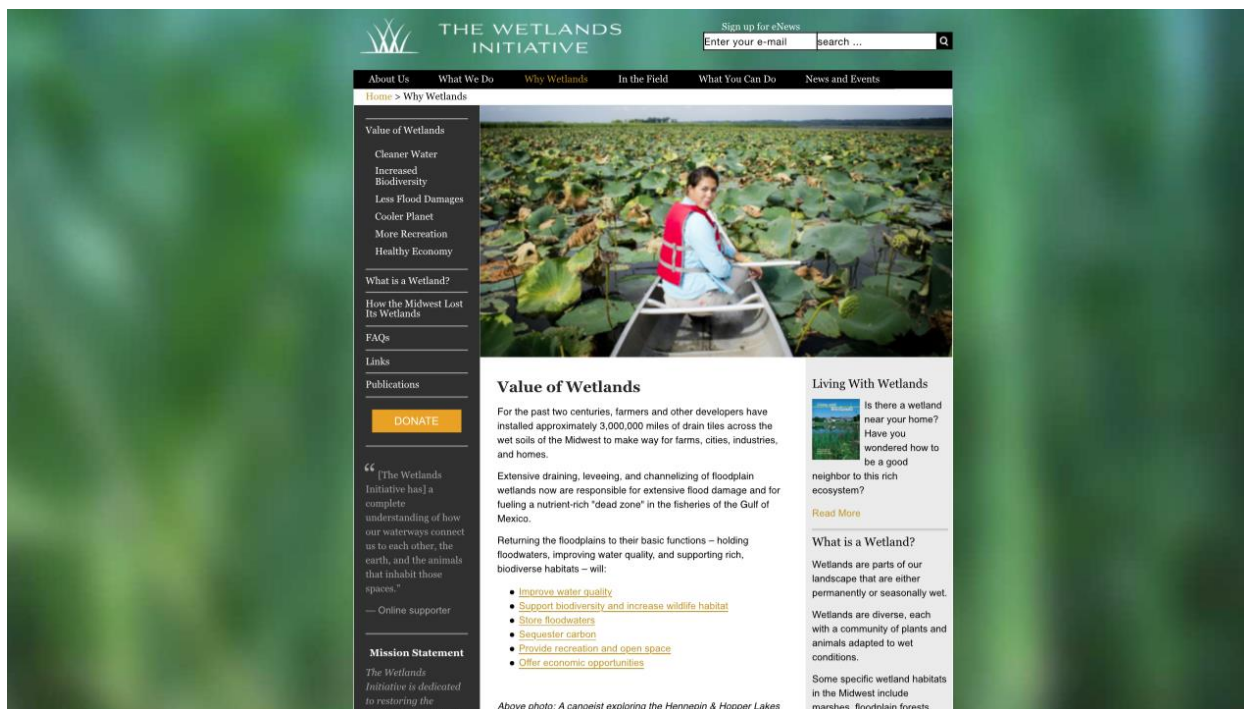
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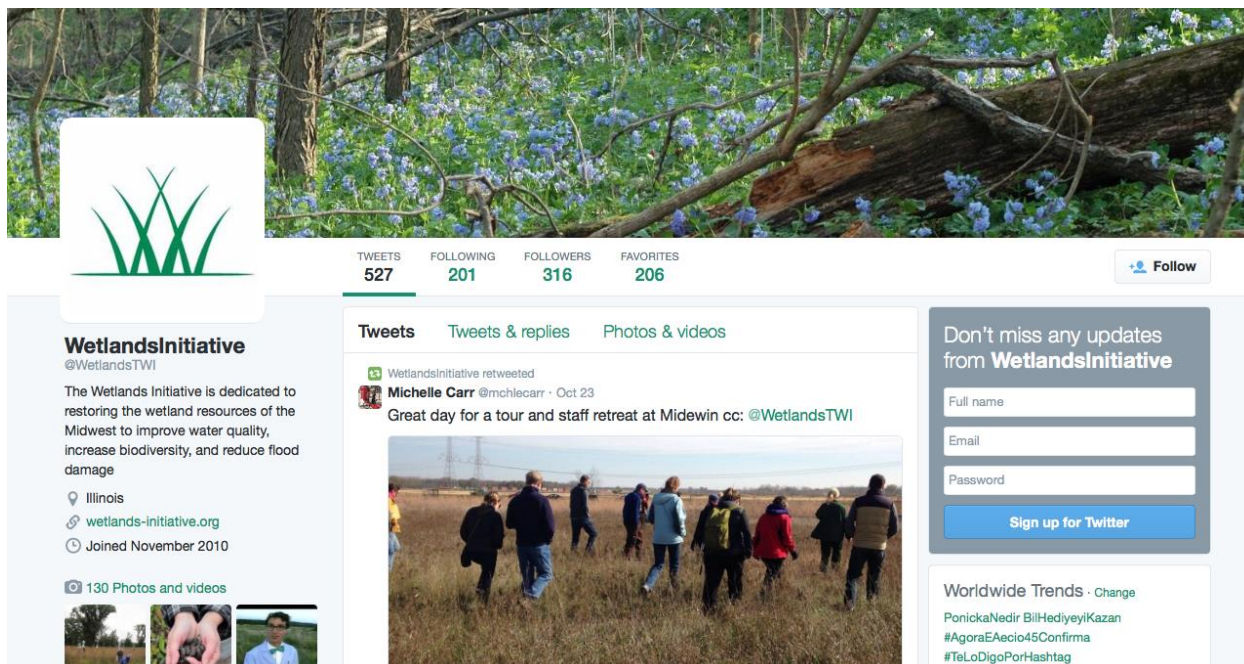
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Appendix A:

Example of Visually Pleasing Websites Provided By The Wetlands Initiative



The Wetlands Initiative Twitter Page



Appendix B: Example of Invasive Pamphlet



Get Involved!

For more information on invasives at the wetlands and opportunities on how to get involved visit www.senr.osu.edu/research/schiermeier-olentangy-river-wetland-research-park/invasive-management



Invasive Management at the Oxbow Wetland

Managing Invasives one volunteer at a time.



**The Wilma H. Schiermeier
Olentangy River Wetland
Research Park**

352 W ~~Dodds~~ St.
Heffner Building
Columbus OH, 43202


**The Wilma H.
Schiermeier Olentangy
River Wetland**

TEL: (614) 292-9774

Appendix B (Continued):

Our Mission

The OSU Wetlands consist of three specific wetlands: two kidney wetlands and the Oxbow Wetland. Currently none of the OSU Wetlands are being managed for invasive species. With the help of volunteers and wetland facilitators, we plan on changing the course of invasives at the Oxbow Wetland and returning the natural ecology of the area.




WHAT CAN YOU DO?

The Flowering Rush is just one of several plants that needs to be managed at the OSU Wetlands. With your help, together we can ride the Oxbow Wetlands of problematic invasive species and promote growth of native plants. Feel free to get involved with us and learn more about how you can make a difference environmentally at OSU and in your community. Together we successfully manage invasives.



See back for involvement opportunities



FLOWERING RUSH

One example of a plant that can be removed in the Oxbow Wetland is the Flowering Rush. This specific plant is most visible when in bloom, in July and August.

As pictured above, the Flowering Rush has triangular leaves and round, pink, umbrella-like flowers when in bloom. It can grow in water up to 20 feet deep if submerged.

Flowering Rush inhabits bodies of water such as lake shores, slow moving waterways and wetlands. They prevent population establishment and growth of native plants by surrounding them and causing a change in water flow.

Appendix C: Nature Conservancy Questionnaire for Partnership

Marketing Partnerships Questionnaire

- 1 Name and address of company/organization:
- 2 Contact person and info (name, title, phone, email):
- 3 Please summarize your company history including years in business and annual revenue.
- 4 Please provide a summary of the proposed idea for the partnership.
- 5 Who is your target market?
- 6 What are your distribution outlets? How/where would the product/service be sold?
- 7 What are your advertising and media plans for the promotion?
- 8 What is the business objective of this collaboration?
- 9 How does your proposed partnership align with the mission of The Nature Conservancy?
- 10 What is the projected revenue for your company related to this partnership?
- 11 What is the projected revenue for The Nature Conservancy through this partnership?
- 12 What is the minimum financial commitment to The Nature Conservancy?
- 13 What is the time length for the promotion and the projected launch date? Do you see this as a one-time project or a multi-year partnership?
- 14 What is your company's environmental responsibility policy?
- 15 What are your expectations from The Nature Conservancy? Would you seek to use our name and logo in marketing materials?
- 16 Has the proposed opportunity been approved by your company's management team including marketing leadership and/or any chief environmental officer?
- 17 Are you also exploring relationships with other nonprofit environmental groups?

Please describe any other previous major nonprofit affiliations.