

Chapter 7 – Overview

Sustaining the Portage Lakes as a multi-use resource requires actively managing the lakes, aquatic plants, and interaction with lakers' activities. Important elements include: reducing nutrients, sediment, eutrophication, other contaminants; increased understanding of lakes, plants, processes, and interaction with human activities to guide decisions and reduce impacts; working with lakers to determine priority plant management areas and approaches; monitoring change; and increasing awareness and stewardship. The management plan TAC, which has met for five years as advisers to the lake management effort, will likely continue working as a partnership, assisting the lakes management efforts with a wide variety of expertise, interests, and shared resources. However, the complex task of lakes management requires long-term, consistent, staffed and funded coordination. This chapter includes goals and recommendations for tasks, priorities, and roles.

Recommendations and Management

	Page
New Approach Needed	7-3
Overall Considerations	7-4
- Eutrophication	7-4
- Integration of Natural and Human Activities	7-5
- Need for Technical Expertise	7-5
- Need to Manage the Lakes as a System	7-6
- Funding	7-7
- Increasing Awareness, Involvement, and Stewardship	7-7
- Shared Interests and Opportunities for Collaboration	7-8
- Where to Start? First Things First and Low-Hanging Fruit	7-8
- Central Elements of the Plan	7-9
Goals - Overview	7-9
Goal 1 - Water Quality – Lakes and Shoreline	7-11
- Eutrophication	7-11
- Other Contaminants	7-13
- Objectives and Actions Table 7.1	7-15
Goal 2 – Aquatic Plant Management	7-17
- APM Program/Plan	7-17
- Objectives, and Actions Table 7.2	7-21
Goal 3 – Reduce Inputs from Watershed	7-24
- Considerations Related to Best Management Practice Use	7-24
- Objectives and Actions Table 7.3	7-27
Goal 4 – Management Structure	7-30
- Management Considerations	7-30
- Portage Lakes Partners and Participants	7-30
- Managing the Portage Lakes - Putting the Pieces Together	7-32
- Objectives and Actions Table 7.4	7-35
Goal 5 – Increasing Awareness and Stewardship	7-36
- Increasing Awareness and Involvement	7-36
- Working with Volunteers	7-38
- Working with Partners and Existing Framework	7-38
- Funding Possibilities	7-40
- Topics and Ideas	7-40
- Objectives and Actions Table 7.5	7-42
Key Considerations	7-50



7. Recommendations and Management

The Portage Lakes are a natural resource within a park, attracting thousands of residents and visitors to live, recreate, and do business on and along its waters. They are the center of a community of lakers, and businesses, providing, a community gathering place, business opportunities, an economic engine, and the front street connecting neighbors and businesses. The lakes are considered urban, as they are in a developed watershed and have been modified for flood and flow control, but their appeal is their natural beauty, fishing, swimming, and natural habitats. They are driven by natural processes.

Good water quality and habitat are essential for the long-term health of the lakes, the organisms within them, and the thousands of people who use them, and the communities that rely on them. Recently there have been some water quality improvements:

- Extension of sewers to some areas with septic systems,
- Improved outboard motors reduce oil and gas contamination of the lakes,
- Turbidity and chlorophyll levels have generally improved since the 1990s, with substantial decreases in chlorophyll, and
- There has been some improvement in phosphorus levels.

However, the lakes are eutrophic. High levels of phosphorus drive dense growth of aquatic vegetation that gets in the way of activities. Active management of the lakes is necessary to balance the uses and water quality and improve conditions in the lakes.

When Urban Lakes are Not Managed as a System



Without managing the lakes system, the balance in the Portage Lakes has shifted and will continue to do so toward eutrophication and HABs. The only way to improve conditions is to manage the problem – and lakes – as an inter-connected system. Using the wrong approach may not work or could make conditions worse.



Needed: A New Approach

Currently, individuals and organizations try to manage lake conditions or plants on their own, within the narrow focus of their experience or organizational scope. They may consult with each other, but there is no individual or organization with the staff, scope, funding, technical background, time, or resources to provide the lakes-wide perspective. There is minimal monitoring. The lakes are inter-connected systems, changes to one part affect the rest of the system. Because the aquatic plants are part of the lakes system, reflecting and affecting lake conditions, aquatic plant management must be done within the context of the lakes.



Photo Source: J. Garretson, 2021.

A piecemeal approach to plant and lake management may be ineffective at best and may cause more harm, in spurring more eutrophication, growth, transport of invasives, or HABs. Managing the lakes system must integrate the pieces.

This plan proposes a new approach for the Portage Lakes in order to sustain the lakes and their uses, systematic management of the lakes system and plants within it. Lake and aquatic plant management programs would affect activities in the lakes, on the shoreline, and in the watershed, and would involve:

- **Commitment** by lakers, organizations, and communities to balance human use and the natural lakes system, improving conditions, minimizing impacts, and considering the lakes system;
- **Increased support** for lakes management programs from the lakes community, organizations;
- **Organization(s), individual(s), or consultant(s) whose scope is the broad lakes perspective**, with adequate funding, technical background, procedures, guidelines, monitoring, and resources;
- **Coordination and collaboration** to share information, concerns, ideas, resources, perspectives;
- Inventory and monitoring of lake conditions, aquatic plants, and invasive species – baseline and changing conditions, especially after treatment measures are used;
- **Well-defined process** for developing and carrying out management plans, including monitoring conditions, identification of problem areas and priorities, selection of appropriate measures, and monitoring, which involves the lakes community;
- **Identification of priorities** for use, conservation, management, minimizing impacts, improving conditions on land and in the lakes;
- **Guidelines** for the use of best practices and programs to encourage their use; and
- **Involvement of the lakes community** in identifying problems, establishing priorities, developing feasible measures, minimizing impacts, supporting programs, building a common understanding of the lakes, stewardship. Involvement should include property owners, boaters, visitors, PLAC, local governments, agencies, lake scientists, and others interested in the lakes.

This is a big shift from the current individual, piecemeal approach. It requires increased awareness of how the lake system and activities affect each other, dedication to improve conditions by lakers and organizations, additional support, technical information, and collaboration. Similar programs are successfully used elsewhere to sustain activities and health of multi-use lakes. Such programs provide the additional benefits of predictability and accountability – residents, agencies, communities

understand what will be managed and how, what the process and timeframe are, what their roles are, and what is needed to accomplish the tasks.

This chapter presents detailed discussions and recommendations related to this new approach, including lakes management and aquatic plant management programs and activities that individuals and organizations can take to improve lake conditions. Central to this chapter and plan is the need for coordinated, systematic, well-supported management to balance uses and lake health and habitats.

Overall Considerations

Sustaining a connected chain of urban lakes as a multi-use resource is a challenge, requiring careful management.

- Lakes have complex interactions among components, from the microscopic to watershed-wide.
- Urban lakes, like the Portage Lakes, are very susceptible to eutrophication.
- As connected lakes, isolating problems, causes, management measures, and effects is difficult.
- Sustaining uses and ecosystem health requires a balanced approach, understanding and minimizing impacts, and evaluation (and re-evaluation).
- The large number of visitors each year increases potential impacts. There is a great need to need to inform people about living with a lakes system and involve them in stewardship and management.

Added to the complexities of managing connected urban lakes, are :

- Lack of knowledge about how these lakes work, and
- Lack of an administrative structure – and shared expectations - focused on managing the lakes.

The management plan identifies five goals and numerous recommendations. The considerations described below are central elements that run through the plan.

Eutrophication

Decades of development and small unsewered lots have contributed external loading of nutrients, which recycle for years as internal loading. The lakes are eutrophic, with high phosphorus levels, nuisance plant and algae growth, and occasional harmful algal blooms. As phosphorus levels continue to build up from the watershed and internal recycling, the risk increases of an ecosystem dominated by algae and HABs rather than rooted plants.

Interaction of Natural and Human Activities

The Lakes are a natural system that supports intense use. This raises the potential for impacts of the natural system and human activities on each other and conflicting priorities.

- Nearly 80 percent of the lakes' area is in the shallow littoral zone, where rooted aquatic plants grow, and where people live, boat, swim, and fish. The aquatic plants are essential to the ecology of the lakes, providing habitat, food, cover, sediment stabilization, and using the available nutrients that might otherwise spur excessive algae growth and HABs. Residents, businesses, and visitors often perceive the plant growth as a nuisance that should be removed.

However, the dense vegetation, which gets in the way of some uses, protects the lake from shifting to a dangerous, “turbid,” algae-dominated state with frequent HABs.

- Some lakeshore property owners use their own chemicals to control the aquatic growth. These add unknown toxins to water that people swim in and that is habitat for animals.
- Other lakeshore contamination sources may include discharging or nuisance HSTS, trash, geese, boat and property maintenance practices and chemicals.
- Thousands of people using the lakes can have thousands of small impacts, if lakere are not stewards as well.
- Watershed uses affect the lakes. Altered landscapes introduce sediment, nutrients, bacteria, and toxins, while intact or restored landscapes reduce inputs to the lakes.

Need for Technical Expertise

Managing lakes, especially a chain of urban, multi-use lakes, requires technical expertise, to characterize the lakes and aquatic plants, identify problems and causes, choose appropriate management measures, monitor changes, and reduce unwanted impacts in these complex, interconnected systems.

- Reducing eutrophication and managing aquatic plants requires an understanding of how lake characteristics, plants, and nutrients interact. The effects of management measures should be monitored to determine if they work. There has been limited monitoring of limnological conditions, incoming nutrients and sediment, and aquatic plants.
- The expertise of ODNR staff managing the park facilities, fisheries, and flood/flow control in the lakes is focused on their particular area of management. Managing multi-use lakes requires that a broad understanding of lake processes be applied to decisions and minimizing impacts.

Need to Manage the Lakes as a System

Sustaining the lakes and their uses requires actively managing the lakes, aquatic plants, and human activities to improve conditions, protect water quality, and accommodate uses. This requires a long-term commitment, adequate funding, staff, equipment, coordination, and resources.

There are many individuals and organizations involved in discrete elements of the lake management.

- The small ODNR Portage Lakes staff focus on the visitor experience, park facilities, docks, boat ramps. They are supervising limited dredging and plant control.
- The small ODNR Canal Lands staff that focuses on flood and flow management also harvests plants in the Portage Lakes and Mosquito Lake.
- Property owners manage the aquatic plants at their docks.
- The lakere – residents, visitors, boaters – experience the lakes directly.
- SWCD and communities – watershed focus, stormwater, erosion control.
- PLAC focuses on public information and communication about the lakes and hosts events.
- Other agencies and organizations focus on their element or individual situations.



There is no mechanism to manage and understand the lakes as a natural and human system - characterize the lakes, lake processes, concerns, management measures, and impacts. Managers and lakere address individual situations as best they can, without comprehensive guidance and, in some cases, adequate resources. A piecemeal approach, responding to immediate problems, is unlikely to

achieve the goal of sustaining the lakes as a multi-use resource. There needs to be a holistic, consistent, coordinated approach, that considers ecological and community impacts, which is focused on achieving broad goals, adequately funded and staffed.

Funding

The recommendations in this chapter involve a greater level of commitment and effort devoted to management of the lakes than is possible under the current staff and budget. Carrying out the recommendations will require additional funding, staff, and resources. There are several approaches that can be used to help supplement existing budget and staff, including:

- There may be some opportunities to share resources among partners. For example, in some creek clean-ups, local parks or communities help coordinate or provide trash pick-up and disposal services; in some projects, wastewater management agencies have assisted with sampling or lab work. The Portage Lakes TAC/partners have provided valuable technical background and support as part of their work as advisers/partners.
- Providing land for demonstration projects can allow them to proceed.
- Contractors instead of staff could complete certain tasks.
 - Certain tasks that require specialized expertise e.g., aquatic plant inventory.
 - Certain regularly occurring services, such as plant control at docks or harvesting with removal of cut material, could be provided by skilled/licensed contractors.
- Certain projects can be funded through grants, individually or as part of other projects being managed by someone else. Partners or staff would need to write grant proposals and lay the groundwork (find sites, arrange for development of plans, manage contracts, provide/seek match or other contributions). There are many funding opportunities including water quality, environmental education, recreation, community beautification, funding for public arts projects, Muskingum Watershed Conservancy District, stormwater fees. The Portage Parks manager regularly uses U.S. Coast Guard and ODNR boat registration/navigation funds for work related to docks and navigation.
- The potential for fees for coordinated aquatic plant control should be investigated.
- Certain tasks can be accomplished with volunteer helps (often supervised), if the tasks are tailored to the volunteer's level of interest, time commitment, and background. PLAC volunteers have organized events, participated in clean-ups, conducted Secchi disk monitoring, coordinated playground development. These efforts range considerably in the commitment and supervision needed. Many have been successful; some have involved more time commitment than volunteers could manage.
- Partnering with local universities can provide interesting opportunities for monitoring, outreach, and other collaboration. Students and faculty often seek research or field work opportunities. This is not a free replacement for staff time or contractors – students prefer paid internships, materials and supplies need to be purchased or replaced, students should be well-supervised by faculty or employers, so they produce high-quality results. However, partnering with local universities can provide long-term

collaboration and expertise that might not otherwise be available. There has been only minimal university involvement in the Portage Lakes so far.

The examples above would all need to be included as budget items – repeating or as a single year’s item – and there would still need to be staff (full-time or part-time) dedicated to consistent and continuous lakes management, coordination, and carrying out certain tasks.

Increasing Awareness, Involvement, and Stewardship

Thousands of visitors and residents come to the lakes and their surrounding community. It is important to raise their awareness of the lakes system, potential impacts, and management measures.

- The lakers – residents, businesses, and visitors – interact frequently with the lakes and can have a large impact on the lakes. Many organizations and communities conduct activities affecting the lakes. It is important to raise awareness and stewardship of the lakes system among residents, visitors, businesses, communities, and organizations, to improve decision-making, reduce negative impacts, improve conditions in the lakes, and protect them for future use.
- As the users of the lakes, the lakers are an important part of managing them and should participate in identifying lake conditions, concerns, priority areas, and management measures.
- Volunteers can provide valuable assistance for certain efforts. Involving volunteers raises awareness and stewardship.



Shared Interests and Opportunities for Collaboration

Collaboration increases the resources, expertise, and potential for involvement. For example:

- Properties for restoration or demonstration projects may be available on public lands. In some cases, properties can be acquired for one purpose – e.g., recreation trail or flood hazards – and be used for restoration as well.
- Opportunities for volunteer work and citizen science may appeal to a wide range of interests. Some companies or organizations seek tree-planting projects or clean-ups.
- Water quality projects related to streams or plantings can overlap with community arts or writing projects or other seemingly unrelated interests. E.g., sculptures, murals, poetry, or artwork that celebrate the importance of rivers or lakes, an urban oasis of greenery and artwork, native plants for pollinators, or public-school artwork displayed at the Cleveland airport that celebrated the Cuyahoga River.
- Flood control, wastewater management, and water quality projects often overlap and can bring in multiple funding sources.
- Groups interested in gardening and wildflowers may be interested in rain gardens.
- Audubon Cooperative Sanctuary for Golf certifies golf course that incorporate environmental planning and habitat protection.
- Lakes boat tours, restaurants, and area schools could incorporate tour information, activities, or trivia events that focus on the lakes.

Where to Start? First Things First and Low Hanging Fruit

Establishing a lakes management program is a long-term effort, with many elements. Certain efforts are a high priority to get started on first. Taking the first steps on longer-term projects is a good start. Targeting these and other efforts that produce early successes, “low-hanging fruit” helps build momentum and energy while getting some good work done.

Important early steps include:

- Establish partnership, decision-making structure
- Monitoring – limnology, streams
- Aquatic plant inventory (needs funding and commitment)
- Community input to identify areas with aquatic plants – submission of geotagged photos, interactive online map, public workshops
- Community discussions about where aquatic plant management is a priority.
- Stormwater management or lakescaping demonstration projects at the State Park, with signs.
- Identify landscapes for protection/restoration

Early tasks could include starting longer-term efforts, such as:

- Characterize phosphorus cycling in lakes
- Protect/restore landscape features
- Develop a coordinated aquatic plant management program
- Identify wastewater treatment measures, support feasibility of sewer extensions
- Establish funding sources
- Investigate ways to establish aquatic plant harvest with removal
- Stormwater BMPs
- Mini-parks with community art celebrating the lakes

Outreach examples that would be good to start include:

- Lakescaping demonstrations, goose management, brochures/posters/pop-up displays at public events or for newspaper or webpage
- Plant guide to portage lakes
- Boat tour information/boat tours
- Clean-ups
- Signs at existing BMPS or conservation areas
- Develop on-line tour information about lakes
- Outreach at local businesses
- Public forums, school science fairs, etc.



Central Elements of the Plan

The following recommendations are central to all the goals of the plan and are important for sustaining the lakes and uses:



- *Long-term coordinated direction and management, including:*
 - *Decision-making process,*
 - *Adequate funding, staff and resources*
- *Manage external (watershed) factors and internal (in-lakes) factors to reduce nutrient loading, sediment disturbance, and other contamination.*
- *Manage aquatic plants to accommodate uses while protecting the water quality and habitat benefits provided by rooted aquatic plants.*
- *Adequate technical expertise and skills. Certain tasks need to be performed by specialists, (e.g., manage flow/floods, aquatic plant inventory).*
- *Inventory, sampling, monitoring of limnology, e. coli, aquatic plants, streams, watershed landscapes.*
- *Characterize and develop guidelines for reducing factors of eutrophication, minimizing impacts, on the habitat, fisheries, and ecosystem*
 - *Lake processes;*
 - *Phosphorus cycling and ecosystem; and*
 - *Effects, feasibility, and impacts of lake management measures.*
- *Increasing awareness, participation, and stewardship to better understand and protect the lakes.*

Goals - Overview

During the course of the study, the stakeholders developed five topical goals and an overall goal. This chapter presents the goals, objectives, and recommendations, in a framework of who is likely to be involved and the resources needed.

Overall Goal:

Manage the Portage Lakes as a sustainable multi-use resource, in a way that protects the natural lakes system in balance with the needs and interests of lake/watershed users, communities, and organizations.

Five goals have been identified, which are linked. Recommendations for each should be carried out in conjunction and coordination with the others.

1. *Water Quality – Lakes and Shoreline. Protect and improve the water quality of the Portage Lakes by reducing factors of eutrophication and other contaminants within the lakes and along the shoreline.*
2. *Manage Aquatic plants in a way that accommodates property owners and visitors while protecting habitat and water quality.*
3. *Water Quality – Watershed. Protect and improve the water quality of the Portage Lakes by reducing factors of eutrophication and other contaminants within the lakes and along the shoreline.*

4. *Long-term Management. Establish a long-term multi-disciplinary management program to provide technical expertise, coordinate efforts, and ensure there are adequate resources to sustain the multi-use, connected, urbanized Portage Lakes resource.*
 5. *Understanding/Stewardship. Increase understanding and stewardship by lake/watershed residents, visitors, businesses, and communities.*
- Goals 1 and 3 focus on improving water quality by reducing eutrophication and other contaminants. Improving conditions in the lakes requires addressing sources internal to the lakes as well as external, watershed-based sources. These goals involve different approaches and targets but share the same desired end result.
 - Goal 1 focuses on the lakes themselves, and will likely involve reducing release of phosphorus *within* the lakes, focusing on management of plants, sediment, and other lake characteristics.
 - Goal 3 focuses on preventing nutrients, sediment, and other contaminants from reaching the lakes *from the watershed*, using BMPs and restoration of important landscape features. The targets and approaches should be modified if necessary, as a better understanding of stream and lake conditions is developed.
 - Goal 2, which addresses a balanced approach to aquatic plant management, relates closely to in-lakes factors of eutrophication – nutrient cycling/availability, sediment stabilization, and competition with algae.
 - Goals 4 and 5 focus on establishing long-term management and increasing awareness and stewardship.

Each goal is discussed in the following individual sections. Tables 7.1-7.5, included with the discussions of each goal, present objectives, actions, recommended priority and time frame, and potential partners.

Goal 1 – Water Quality – Lakes and Shoreline

Protect and improve the water quality of the Portage Lakes by reducing factors of eutrophication and other contaminants within the lakes and along the shoreline.

Eutrophication

High nutrient levels drive dense plant growth and potentially HABs. Phosphorus builds up and is recycled in the lakes for years.

- Phosphorus and nitrogen that enter the lakes from the watershed are used – and temporarily stored - by stationary or floating photosynthesizers. During decomposition, nutrients are released into the water or stored in sediment.
- Rooted plants can take phosphorus from the water or sediment, depending on the species. Floating photosynthesizers use dissolved phosphorus and nitrogen from the water.
- Phosphorus that is stored as particles in sediment dissolves in anoxic conditions, which occur within sediment pores or at the sediment surface. It is then released and is available for growth.



As nutrient levels continue to build up, and the climate becomes warmer and wetter, there is a greater risk that the ecosystem will switch to turbid, algae-dominated state, with frequent HABs and a loss of aquatic plants.

With limited monitoring, it is difficult to specify the best approach to reduce internal loading. The Ohio EPA has developed inland lakes criteria for phosphorus, turbidity, and chlorophyll A, three linked indicators/factors of eutrophication. These values should be the target for management but could be revised with a better understanding of the Portage Lakes characteristics and nutrient dynamics.

The available data show that the lakes partially meet the inland lakes criteria. Nimisila Reservoir meets all three criteria, North Reservoir meets none, and the other lakes meet them to varying degrees. In most lakes (except North Reservoir), chlorophyll levels have been reduced almost to the state criterion, and phosphorus levels have decreased somewhat since the 1990s. **Note:** Recent research indicates that nitrogen is also a key nutrient in HAB severity and toxicity. Lakes management efforts will need to monitor for several parameters and include keeping abreast of recent research and sharing information.

Management considerations related to the inland lakes criteria include:

- *Phosphorus Inland lakes criterion 34 µg/l; the limited data shows that the lakes (except Nimisila) range from 44 to 83 µg/l.* Phosphorus levels are an indicator of eutrophication, as well as the driving force. It is essential to characterize the phosphorus levels in different areas of the lakes to determine the conditions that increase available phosphorus – e.g., plant die-offs, sediment disturbance, location in the lakes, stagnant waters. This involves monitoring streams for input and limnological conditions in various areas of the lakes – anoxic conditions can exist within sediment pore water and thin layers at the sediment surface. Determining patterns of phosphorus levels would contribute to developing a phosphorus budget and would help lake managers understand the sources in the lakes and develop management measures to reduce or minimize phosphorus release.

- *Turbidity - Inland lakes criterion Secchi disk reading 1.19 m or higher. Lakes (except Nimisila) range from 0.86 m to 1.77 m.*

Turbidity is affected by algal growth, which is driven by phosphorus. Turbidity is also affected by suspended fine sediment. Sediment disturbance can release phosphorus. By altering light penetration and water temperature, turbidity can affect fisheries, and excessive turbidity encourages algae and cyanobacteria over rooted plants. Turbidity appears to have decreased generally over the last few years, possibly due in part to zebra or quagga mussels. Increased rooted vegetation may be reducing algae and suspended sediment. Lakes that are typically high in turbidity should be monitored for chlorophyll (from algae) and suspended sediment, to determine which factor is making the lakes cloudy. Lake management practices should reduce suspended sediment, e.g., minimize unnecessary dredging, protect rooted vegetation, and reduce boat traffic in silty areas, especially at sediment sources like streams, reduce sedimentation from the watershed.

- *Chlorophyll A - Inland lakes criterion 14 µg/l, lakes (except Nimisila) range from 11.9 to 36.1 µg/l.* Chlorophyll A reflects algal growth, a result of available phosphorus. Reducing this indicator requires reducing available phosphorus and protecting and improving conditions for rooted plants. Not only do rooted plants compete with algae, they also stabilize sediment, further minimizing release of phosphorus from the sediment.

It is difficult to make more specific recommendations due to the lack of monitoring data and understanding of how the lakes systems work. A consistent, seasonal monitoring program lakewide and in the incoming streams, is an essential first step and can help track changes. Some assumptions and general recommendations can be made currently to improve lakes management. Greater understanding will allow concrete guidelines for management practices to be developed.

Recommendations – Reduce/Minimize Factors of Eutrophication:

- Seasonal monitoring of limnology throughout the lakes to characterize the lakes and changes;
- Seasonal, dry-weather and storm-flow monitoring of streams to characterize inputs to the lakes;
- Develop an understanding of nutrient cycling in the lakes (or phosphorus/nitrogen budget);
- Characterize effects of lake management/APM measures, develop guidelines for management practices to minimize phosphorus release and other negative effects;
- Protect rooted aquatic plants, to use available nutrients and stabilize sediment;
- Minimize large die-offs, e.g., widespread chemical use, early-season invasive species;
- Develop a harvest and removal program;
- Investigate other measures to reduce phosphorus, e.g., change flow or drawdown, increase aquatic plant diversity;
- Limit dredging to areas necessary for passage and water flow and minimize impacts to the ecosystem, to protect plant communities and sediment disturbance; and
- Reduce sediment and phosphorus input from the watershed.
- There should be a focused effort on understanding and managing eutrophication and dense growth in certain areas, including North Reservoir, which is the most eutrophic, Miller and Cottage Grove Lakes, and portions of Long Lake.



Other Contaminants

Reducing shoreline contaminants by increasing stewardship is a good topic for outreach – demonstration projects, workshops, lakeshore property owners’ guide, etc. Sources include:



- Geese and other animal waste – Geese favor turf near open water.
 - There are several approaches to discourage or exclude them from lakeshore properties.
 - Lakescaping with taller vegetation reduces runoff into the lakes and discourages geese, which prefer sites with clear views to the water.
- Chemicals obtained/applied without permits for aquatic plant control – Any chemical use on the water must be done with a permit. Applying chemicals acquired over the internet or at a hardware store may not work on the plants as intended and may have toxic effects on wildlife or people in the water nearby.
 - Outreach to lakeshore property owners is important.
 - Developing a coordinated approach to management of aquatic vegetation at docks may discourage property owners from applying chemicals.
- Chemicals related to boat maintenance – chemicals used to clean docks and boats can include toxins and phosphorus. When working near the water, seek alternatives for these chemicals:

- Ammonia	- Petroleum solvents (“surfactants”)
- Antibacterials and disinfectants	- Phosphates
- Butyl glycol, ethylene glycol, monobutyl	- Pthalates
- Chlorine bleach	

Property owners and boaters should seek phosphate-free and biodegradable products instead.

The U EPA Safer Choice website lists environmentally safer replacements for common chemicals. <https://www.epa.gov/saferchoice/products>

Ohio State University Sea Grant has resources for boaters and marina operators to encourage good stewardship. <https://ohioseagrant.osu.edu/clean#news>. The Clean Marinas program offers technical assistance, resources, additional marketing, and recognition for marinas that become certified Clean Marinas and help sustain their lakes. <https://ohioseagrant.osu.edu/clean>

The following sources occur throughout the watershed but have great impact because shoreline properties are directly on the lakes.

- *Vegetation waste disposed in the lakes* – compost yard waste from properties on or near the water if possible, as decaying vegetation releases phosphorus into the water.
- *Discharging or nuisance HSTS* – Increase phosphorus loading and bacteria. This should be a focus of the watershed efforts to reduce septic system/HSTS discharges into the lakes.
 - Work with wastewater MAs, communities, and Summit County Dept. of Health to determine appropriate areas for sewer extension; support sewer service extensions; determine appropriate measures to reduce discharging septic systems.
 - Swim areas near concentrations small lots and HSTS should be monitored for bacteria.

- *Erosion/runoff* – Since lakeshore properties drain directly into the lakes, there is little opportunity off-site to reduce their impact. Lakescaping, rain gardens, capturing runoff, covering exposed soil are good techniques to reduce input of contaminants into the lakes
- *Home/yard maintenance chemicals*. As elsewhere in the watershed, proper use of lawn chemicals, proper disposal of oil, washing cars on grass rather than on the driveway help reduce contaminants entering the lakes.

Recommendations to reduce contamination from the shoreline include:

- Demonstration projects and property owner workshops can help encourage people to use some of the techniques noted above. Public lands are good sites for demonstration projects, especially at high-visibility areas with signage – e.g., State Park shoreline, parking lot. Using supervised volunteers increases participation.
- Many of the topics noted above are good subjects for outreach materials such as topic-specific brochures and workshops, property-owner’s guide to living on the lakes, etc.
- Coordinating aquatic plant management at docks, combined with outreach, would reduce the perceived need for individual treatment and decrease use of inappropriate plant management.
- Work with wastewater management agencies and the department of health to identify and support programs to reduce discharging or nuisance HSTS, identify appropriate areas for sewer extension and support those efforts.
- Monitor streams and swim areas for harmful bacteria.
- Encourage marinas to achieve Clean Marina Certification
- Encourage boaters to practice good stewardship. Measures can include brochures at high-use sites, good stewardship programs, lakeshore property owners’ guidebook. Ohio Sea Grant has many outreach materials and workshops. <https://ohioseagrant.osu.edu/clean#news>
- Clean-ups to increase awareness and stewardship.



Table 7.1 Objectives and Actions Goal 1 – Water Quality – Lakes/Shoreline <i>Note: These reflect ideas from various discussions. Lake partners must decide priority, details, feasibility.</i>	Objectives: <i>A. Use improved understanding of lake conditions to guide lake management decisions.</i> <i>B. Reduce phosphorus release/availability</i> <i>C. Minimize sediment disturbance</i> <i>D. Minimize bacteria risk and nutrients from septic systems.</i> <i>E. Discourage geese</i> <i>F. Increase use of Best Management Practices and appropriate property and boat maintenance at lakeshore properties to reduce input of contaminants and trash</i> <i>G. Increase awareness of the lake ecology and the value of plants</i>			
	Objectives	Priority, Time Frame (years)	What is Needed/Comments	Potential Partners/Resources
Monitoring				
Limnological sampling to characterize trophic state, and lakes conditions and processes	A	High, 1-2 years, ongoing as needed to monitor lake conditions and trophic state	Sampling protocol, Funding for lab work, dedicated sampling staff for seasonal sampling, data storage. Sampling locations/frequency may change as lakes conditions are characterized.	Partner with wastewater agencies, SWCD, OEPA, ODNR, NEFCO Could involve internship program, e.g., with university, agencies
Characterize nutrient sources within lakes	A, B	High, 2-3	Monitoring, tech support	Tech. support partners, consultant
Monitor chemistry, sediment, and bacteria in streams, during dry weather and during/after storms; compare with models	A, B, C,	High 1-2, periodically afterward	See goal 3	
Monitor swim areas	A, D	High 1, ongoing	Boat, sampling, analysis, staff	SWCD, wastewater MAs
Citizen science e.g., boat tours, schools	G	Low-Medium 2, ongoing	Equipment, leaders, water access	Boat tour operators, State Park, schools
Reduce Internal Phosphorus Loading				
Develop guidelines to minimize phosphorus and sediment release in lake/plant management	A, B, C	High, 1-4	Monitoring results. Some general recommendations can be developed early on based on known characteristics of lakes/measures	Partners/consultant
Special focus areas, e.g., North Res., Miller Lk, Cottage Gr. Lake	A, B,	High 1-4	Certain areas may need more intensive focus. Also in Goal 2.	Partners/consultant, lakers
Designate plant management zones that include conservation	A, B	High	See Goal 2	

Table 7.1 (cont'd) Objectives and Actions Goal 1 – Water Quality – Lakes/Shoreline <i>Note: These reflect ideas from various discussions. Lake partners must decide priority, details, feasibility.</i>	Objectives: <i>A. Use improved understanding of lake conditions to guide lake management decisions.</i> <i>B. Reduce phosphorus release/availability</i> <i>C. Minimize sediment disturbance</i> <i>D. Minimize bacteria risk and nutrients from septic systems.</i> <i>E. Discourage geese</i> <i>F. Increase use of Best Management Practices and appropriate property and boat maintenance at lakeshore properties to reduce input of contaminants and trash</i> <i>G. Increase awareness of the value of plants and lake ecology</i>			
	Objectives	Priority, Time Frame (years)	What is Needed/Comments	Potential Partners/Resources
Develop harvest and removal program where feasible	A, B	High	See Goal 2	
Work with partners to identify HSTS solutions	A, B, D	High	See Goal 3	
BMP Demonstration Projects				
Lakescaping demonstration projects	B, F	Medium, 2, ongoing	Public site (e.g., State Park), labor, staff, materials	SWCD, volunteers
Outreach/workshops				
Geese management	B, E, F, G	Medium, 1 ongoing	Materials, staff	SWCD
Lakescaping, rain gardens, native plants	B, E, F, G	Medium, 1 ongoing	Plants, labor	SWCD
Tree, shrub planting by volunteers	B, E, F, G	Medium, 2, ongoing	Site – e.g., State Park, plants, materials, expert leaders to direct planting. Certain seasons best.	SWCD, communities, PLAC, ODNR
HSTS maintenance	B, D, F, G		Outreach materials	
Lakeshore property owners' guidebook	B, C, D, E, F, G	High, 2-3	Funding; editing; tech support Coordinate with ODNR shoreline management plan	OEEF grant, could be published in sections/online partners, PLAC, SWCD
FAQs, webpages, brochures about lakeside property maintenance	A, B, C, D, E, F, G	High	Outreach materials Coordinate with ODNR shoreline management plan	Partners, PLAC, SWCD
Encourage Clean Marinas/ Clean Boater practices	F, G	Medium, ongoing	Outreach materials	Ohio Sea Grant resources, businesses, ODNR, PLAC
Clean-ups – boat/land	F, G	Medium, ongoing	Gloves, implements, bags, trash disposal, volunteer support, leaders	Trash bandit and other volunteers, PLAC, communities,

Goal 2 – Aquatic Plant Management (APM)

Manage aquatic vegetation in a way that accommodates uses and priorities of lakers, communities, visitors, and managers, while protecting water quality and aquatic habitat, and minimizing the spread of aquatic invasive species.

The aquatic plants in the Portage Lakes are essential to the health of the lakes, water quality, wildlife, and people using the lakes. The aquatic plants compete with HABs for nutrients, stabilize sediment, and provide valuable habitat for fish and other wildlife. However, the excessive aquatic plant growth can be a nuisance for boaters, fishermen, residents and businesses. There are some management efforts under way, but they need to be coordinated, have adequate staff, technical support, resources, and funding.

- The ODNR Portage Lakes Parks manager is contracting limited chemical control for passage in high-traffic areas and limited dredging in high-traffic areas
- Individual property owners manage aquatic vegetation at their docks, resulting in inconsistent approaches and the potential for use of inappropriate or toxic chemicals on their own.
- ODNR Canal Lands staff conduct harvesting, without removal, in addition to their duties of flood and flow management, and are requested to harvest in Mosquito Lake as well.
- APM should consider effects on phosphorus cycling, sediment disturbance, and habitat, as well as access and nuisance reduction.
- APM should address the priorities of residents, businesses, and other lakers while protecting the ecological services that the plants provide.
- Currently, APM decisions are made in response to individual situations, rather than as part of a comprehensive management program.

APM Program/Plan

Developing an APM program is an important part of managing the lakes sustainably, addressing lakers' needs while protecting habitat and water quality. A management program should:

- Be a long-term commitment, with adequate funding, staff, and necessary resources;
- Develop and maintain a shared understanding of the importance of aquatic plants, needs and priorities of users, feasibility, impacts, and the decision-making process;
- Designate management zones and measures that protect habitat and minimize/reduce eutrophication factors, the risk of HABs, other contaminants.
- Coordinate decisions and guidelines among lake scientists, lake managers, lakers, communities, and organizations to address water quality goals and potential impacts, as well as users' needs.

An APM plan document could be developed by a consultant efficiently and quickly, but the lakes partners could develop many aspects of a program or plan phases over time.



Establish a management structure - Currently, the Portage Lakes Parks Manager and small staff of Canal Lands are carrying out some APM measures, in addition to their primary responsibilities. An APM program will involve additional tasks, including coordination, obtaining and managing funds, managing contracts, harvesting with removal, and managing projects/programs. There should be adequate funding, staff, and resources to handle this new effort. The program could evolve over time.

- Some of the tasks could be performed by outside contractors.
- Lakes partners or individual organizations may be able to assist with labor, equipment, dewatering sites, technical support, coordination, or outreach.
- Additional responsibilities require additional dedicated staff, at least part-time, rather than adding it to the responsibilities of current staff.
- Funding sources may include funds for navigation, fees for plant control, external water quality improvement grants for nutrient removal, line items in organization budgets, fundraising.

Identify types and extent of plants

An aquatic plant inventory is essential, to characterize the types, amounts, locations, and seasonal characteristics of aquatic plants. This information will help determine appropriate management measures and impacts.

Subsequent monitoring is important to determine changes:

- Over time and following treatment.
- Identify new invasive species, so they may be controlled

Community observations – before and after an inventory, community observations can help identify what is there and how it changes over time. An aquatic plant inventory can provide a detailed snapshot of plants, but the people who live with the lakes are familiar with areas of dense growth, locations, changes. Involving the community in an inventory helps raise awareness of the plants and their importance, the need for setting priorities, and potential for balancing use with management zones. Fact sheets, a web page, an aquatic plants book, and training workshops could help lakereaders identify certain general types of plants and certain obvious ones. A curated, interactive webpage could be set up where people submit geotagged, dated, photos and brief comments.

Identify management priorities and zones, similar to the conceptual map in chapter 5, identifying areas for access, conservation, private dock maintenance, etc. ODNR staff are using preliminary mapping of management zones as guidance to focus harvesting efforts on certain areas while allowing others to remain undisturbed as habitat. These conceptual maps could be refined after conducting a plant inventory and evaluating priorities and potential measures.

Vegetation is closely linked phosphorus cycling and fisheries. Management zones and practices should:

- Preserve vegetation where possible,
- Minimize extensive die-offs,
- Minimize sediment disturbance,
- Address and minimize negative effects of dredged areas,
- Reduce reproduction of invasive plants by fragmentation, and
- Encourage native species over invasive ones, if possible.



Vegetation in passageways should be controlled or harvested to provide access, and others, which are providing habitat or taking up nutrients, should be left alone, e.g., outside of high-traffic areas, high-quality habitat, along wetlands, in areas with fine sediment, at the outlet of streams, along the golf course, or other nutrient/sediment sources. The plant management strategy should identify appropriate control measures and minimize negative impacts. Cut plant material should be removed and disposed of/composted on land to the extent practicable as much as possible, to remove fragments and nutrients from the lakes.

Large areas with dense vegetation, e.g., North Reservoir, Miller Lake, Long Lake Feeder, or Cottage Grove Lake may, require focused analysis. Monitoring of North Reservoir indicates it is the most eutrophic of the lakes. Note: With the release of grass carp into North Reservoir in 2020, conditions may be changing in that lake. It is important to monitor conditions over time.

Identification of priorities, management zones, and techniques should involve discussions with lakers, who will be affected by the management measures. There should be a clear understanding among lake managers, partners, and lakers of the planning process and how lakes management will be affected. Management zone maps can help increase awareness of the importance of aquatic plants and the balance of protection with accommodating uses.

Management techniques – There are several techniques that should be evaluated for different areas, based on the priorities, impacts, scale of application, costs, feasibility, and the logistics of carrying them out. It is important to consider the effects on the lake ecosystem and phosphorus budget when evaluating the technique and the scale of applying it. An aquatic plant management program will likely involve a multi-prong approach. Some specific considerations include:

- *Conservation* is the preferable technique where feasible, to protect habitat and water quality, temporarily storing phosphorus and stabilizing sediment.
- *Aquatic plant management at docks* should be coordinated, done professionally under permit, and should have a funding stream to pay for the service. Currently, individuals are responsible for their own maintenance, people may try their own remedies to address “weeds.” Developing a management program for the docks will provide a shared expectation that the weeds will be managed. This should be accompanied by outreach about the management program – what will be done, what is recommended, and what is not acceptable. Centralizing the process would allow a controlled approach to managing aquatic plants, treating dock areas systematically.
- *Chemical use* is necessary in some areas. APM should minimize extensive die-offs and avoid denuding large areas. Areas treated with chemicals should be posted with cautionary signs.
- *Dredging* should be limited to areas where it is necessary for navigation and water flow, and impacts minimized.
- *Harvesting with removal of cut material* is an important technique for the lakes, allowing managers to provide passage while retaining some of the plants for phosphorus uptake and habitat. Currently, Canal Lands staff conduct harvesting both in the Portage Lakes and at Mosquito Lake, funded with watercraft fees. Due to limited staff, time, equipment, and on-land sites, they cannot remove cut material, which can create problems with nutrient release, floating mats of vegetation, and spread of invasive plants.

Harvesting should be combined with removal of the cut material, ideally for composting. This is a large undertaking, requiring dedicated funding, skilled harvester staff, equipment, trucks, and land-based sites, but it would address nuisance aquatic plants while removing phosphorus. Partners may be able to assist with some labor or sites, existing organizations could provide dedicated staff to focus on harvesting, or the service could be contracted out. Dredge material areas may be available to store vegetation (and included animals) while it dries out. A harvesting program requires developing a new focus, additional staff, and equipment but provides a consistent approach, and helps sustain uses and water quality. It is important to determine how and where this could work in the lakes.

- *Increasing Native Plants* - It may be possible to replace tangles of invasive species with native aquatic plants, which offer better habitat, more diversity, fewer die-offs of monocultures, potentially more resilience or better phosphorus management. With connected eutrophic lakes, it may be difficult to successfully manipulate the ecosystem to this extent.
- *Reducing invasive plants* – encourage clean-drain-dry practices to reduce spread elsewhere, discourage dumping of cut material back in the water. Minimize sediment disturbance and other factors that favor invasive plants.
- *Large areas with dense growth* and intense use may require a combination of approaches to preserve some plants while allowing passage. North Reservoir and Miller Lake could be focus areas for large-scale, multi-pronged approaches.
- *Guidelines for plant management* should be developed for plant management staff/consultants. This could be part of an APM plan or a separate document developed by the partners.
- *Monitoring* is very important to determine how effective methods are and their impacts.

Recommendations:

- Inventory aquatic plants periodically as recommended in other APM programs, e.g., 5-10 years.
- Develop program for community observations program, e.g., curated interactive web map.
- Monitor aquatic plants to detect changes – community/partners, consultant, internship.
- Work with lakereaders, partners, community members to determine APM priority areas. Charrette-style workshops involve participants in identifying priorities and solutions.
- Designate management zones and approaches, considering community priorities, logistics, and impacts to phosphorus, sediment disturbance, habitat, invasive species, and ecosystem.
- Areas with high levels of eutrophication, intense use, and/or dense aquatic vegetation, may require special focus, e.g., North Reservoir, Miller Lake, Cottage Grove Lake, Long Lake Feeder.
- Develop guidelines for aquatic plant management zones, measures.
- Establish and carry out a coordinated plant control program at docks, including a funding source and outreach to lakeshore property/dock owners.
- Develop a program for harvesting and removing cut material where feasible.
- Investigate the potential for replacing invasive with native species
- Encourage use of Clean-Drain-Dry practices.
- Outreach focusing on aquatic plants, management zones, and invasive species, including maps, brochures, Portage Lakes aquatic plants guidebook.

Table 7.2 Objectives and Actions Managing Aquatic Plants <i>Note: These reflect ideas brought up in various discussions. Lake partners must decide priority/ feasibility.</i>	Objectives: <i>A. Improve management strategies based on increased knowledge of aquatic plants in the Portage Lakes</i> <i>B. Develop and use management zones and measures that reflect the priorities of lakers, partners, and communities, while protecting water quality and habitat and reducing eutrophication.</i> <i>C. Reduce the spread of invasive species</i> <i>D. Establish an aquatic plant management program with adequate staffing and funding.</i> <i>E. Increase awareness among residents, visitors, boaters, and businesses of the ecological importance of aquatic plants and appropriate means of control.</i>			
	Objectives	Priority, Time Frame (years)	What is Needed/Comments	Potential Partners/Resources
Monitoring				
Inventory aquatic plants	A	High, 1-3; repeat every few years	Funding, contractor	
Monitor plants	A	High		
- Develop community monitoring program	A,B	High 1-3 years, ongoing	Training, interested lakers, brochures/guide to plants, curated interactive map	NEFCO, SWCD, PLAC, ODNR
- Citizen science	A	Medium 3-5 years, ongoing	Training, dedicated volunteers, equipment, boats, coordination	SWCD, PLAC. Some training efforts may be funded through grants.
- intern	A	Part of ongoing internship?	Funding, supervision for internship	Ohio EPA, ODNR, PLAC, universities, SWCD
Monitor for invasive species	A, C	Periodically		
- volunteers			Training, guidebooks, protocol, equipment, volunteers who can devote time, coordination	External funding, SWCD
- professional			Funding, contractor	
- intern			Funding, supervision Need consistent monitoring.	Regional universities, ODNR

Table 7.2 (cont'd) Managing Aquatic Plants <i>Note: These reflect ideas brought up in various discussions. Lake partners must decide priority/ feasibility.</i>	Objectives: <i>A. Improve management strategies based on increased knowledge of aquatic plants in the Portage Lakes</i> <i>B. Develop and use management zones and measures that reflect the priorities of lakers, partners, and communities, while protecting water quality and habitat and reducing eutrophication.</i> <i>C. Reduce the spread of invasive species</i> <i>D. Establish an aquatic plant management program with adequate staffing and funding.</i> <i>E. Increase awareness among residents, visitors, boaters, and businesses of the ecological importance of aquatic plants and appropriate means of control.</i>			
	Objectives	Priority, Time Frame (years)	What is Needed/Comments	Potential Partners/Resources
Manage Plants				
Public workshop(s)/ charettes to identify APM priorities, zones	A, B, D, E	High, 1-2		ODNR, SWCD, PLAC, NEFCO, communities
Develop and use management zones to specify treatment intensity and type - harvesting/ chemical control (e.g., habitat; residential; navigation)	A, B	High, 1-3 (can be developed in phases)		ODNR, NEFCO, lake scientists, PLAC
Determine feasibility/Establish site/method for composting harvested aquatic plants	B, C	High 1-3 years	Off-loading & dewatering/ sites, possibly barge, trucks, drivers, harvester operators/ contractor	Communities, ODNR, OEPA, SWCD Grant funding for properties, some operations— boat fees, water qual. funds
Establish APM program with adequate staff & funding	A, B, D	High 1-3	Staff, funding	ODNR/PLAC
Coordinate APM at docks	A, B, D, E	High 1-3, ongoing	Funding source (e.g., fee), outreach, managing contracts	ODNR, PLAC, SWCD, partners, contractor; fee for plant control
Develop an APM plan to guide APM measures, based on the inventory and priorities	A, B, C, D, E	Medium/high 2-4 – could replace several separate tasks	Funding, contractor	Contractor, partners, PLAC
Special focus: North Res., Long Lake Feeder; Miller Lake; Cottage Grove Lake	A, B, D	High 1-4	Inventories, contractor	Partners, communities, PLAC

Table 7.2 (cont'd) Managing Aquatic Plants <i>Note: These reflect ideas brought up in various discussions. Lake partners must decide priority/ feasibility.</i>	Objectives: <i>A. Improve management strategies based on increased knowledge of aquatic plants in the Portage Lakes</i> <i>B. Develop and use management zones and measures that reflect the priorities of lakers, partners, and communities, while protecting water quality and habitat and reducing eutrophication.</i> <i>C. Reduce the spread of invasive species</i> <i>D. Establish an aquatic plant management program with adequate staffing and funding.</i> <i>E. Increase awareness among residents, visitors, boaters, and businesses of the ecological importance of aquatic plants and appropriate means of control.</i>			
	Objectives	Priority, Time Frame (years)	What is Needed/Comments	Potential Partners/Resources
Conduct demo APM projects to test out different approaches	A, B, C	Medium 2-4	Funding, contractor	Contractor, partners
Invasive Species				
Evaluate the feasibility of replacing invasive species with native species	A, B, C	3-5	Funding, contractor	SWCD (fundraising), ODNR, lake scientists
Establish clean-drain-dry stations at marinas, boat ramps	C, E		Funding, control of drainage, site	ODNR, marinas, external funding
Outreach	E			
Develop a Guide to Aquatic Plants of the Portage Lakes	A, E	High, 1-3	Funding, contractor	
Develop, make available maps/ web materials/ brochures of management zones	B, E	High, 1-3	Staff/contractor time, Reproduction costs	SWCD, ODNR, NEFCO, PLAC, communities
Awareness campaigns – aquatic plant management/invasives, Clean-Drain-Dry, lakes ecology	A, B, C, D, E	High 1-3, ongoing		PLAC, ODNR, SWCD
- Dock owners/ homeowners				
- Marinas, bait shops				
- Boat ramps				
- Homeowners Associations				
- Articles, brochures,				
Ecology of the lakes forums	B, E			PLAC, ODNR Parks, F&W, MetroParks

Goal 3 – Reduce Inputs from Watershed

Improve stream function and reduce loading of sediment, pathogens, stormwater, nutrients from the watershed



Reducing external loading involves preventing phosphorus and fine sediment from entering the lakes by using BMPs and restoring landscape elements to remove contaminants. Stream health is determined using a combination of biological indicators and stream characteristics. For lake health, it is important that stream conditions continue to be evaluated based on what they are contributing to the lakes and how the lakes respond. Reductions can be modeled based on the type of BMP or restoration measure applied, and monitoring streams should show improvements.

There is likely considerable loading coming from the watershed – land use, septic systems, and altered streams/riparian corridors. Most of the lakes are affected by one HUC-12 watershed, and the sub-watersheds within it. Long Lake is the only one affected by the Tuscarawas River, and Nimisila Reservoir, affected by its own watershed, contributes minimally to the other lakes. The characteristics of each lake should be evaluated based on the watershed and other lakes contributing to it.

- Ohio EPA has monitored the Tuscarawas, but there is little data on pollution sources within the watershed. Data is needed on bacteria contamination from septic systems in swim areas, and the constituents in streams (e.g., nutrients, sediment, bacteria, TSS). The latter is important to help understand the input of nutrients, sediment, bacteria, and other contaminants to the lakes.
- Much of the tributary riparian buffers are altered, and the streams privately owned.
- Some stream sections appear to be degraded.
- The watershed is largely developed, with imperviousness at or approaching the levels where stream degradation is likely.
- Thousands of older homes on small, unsewered lots are likely to discharge nutrients and pathogens. The “system of last resort” discharges phosphorus to the lakes. Summit DSSS is evaluating the feasibility of extending sewer service into certain areas. Wastewater management agencies, communities, and the Department of Health should continue ongoing discussions about appropriate wastewater management techniques to reduce nutrient loading.
- Swim areas, especially near areas with older homes and small lots, should be tested for bacteria.
- Boaters report that Mud Lake is silting in. Cottage Grove Creek is in a developing area, with an altered riparian buffer. Brewster Creek, flowing through a highly impervious area, has degraded channel and floodplain. Dense vegetation Cottage Grove Lake, and Miller Lake may result from inputs from the watershed. These may be good targets for evaluation, BMPs, or restoration.

Considerations Related to Best Management Practices

Function - to reduce or mitigate the effects of land use and septic systems on the natural environment:

- Increase infiltration
- Reduce or contain runoff, contaminants, or other loading
- Treat runoff

- Protect important landscapes (e.g., deep-rooted vegetation, vegetated riparian corridors, wetlands, floodplains, stream morphology)
- Restore important landscapes - Restoration of riparian buffer, stream channel, floodplain, or wetlands can reduce flooding, erosion, sedimentation, and nutrient loading. Vegetated riparian buffers can help minimize impacts from impervious landscapes.

The scale of BMPs is also important:

- Small-scale is manageable by individuals, may be scaled up to community or institutional scales
- Starting small on relatively easy projects can lead to bigger ones.
- State Park and other public sites are ideal starting points
- Larger scale may be more effective but more involved and costly

Importance of Headwaters

Many BMPs applied to the landscape are most effective when used first in the headwaters and extended along as much of the stream corridor as possible. Headwaters have less land contributing to them, and impacts are more easily addressed. Trying to fix a stream bank or floodplain further down may not be as effective, as the available land is limited, and the contribution from upstream is higher.

Location, Long-term Ownership, Stewardship, and Signage

In order for BMPs to have a long-term effect, they should be on land controlled by a single party for the long term. Individual property owners can have a great effect by planting deep-rooted native plants and installing rain gardens, but when the property changes hands, the BMP may be removed. Publicly-funded BMPs not on public lands often require an easement on the property be held by a public or non-profit conservancy organization.

BMPs in high-traffic areas are a great way to demonstrate their effectiveness and, perhaps, inspire others. It is important to have attractive signage by the BMPs, or people will not realize what they are and how the property owner is helping the watershed.

Certain land use controls protect/improve water quality by

- Protecting wetlands, buffers, stream corridors through setbacks or conservation development open space requirements
- Encouraging use of BMPs (e.g., directing roof drains to rain barrels, use of bioinfiltration)
- Reducing parking requirements in commercial/institutional developments

Partnerships - Seek partners with related interests.

- Certain agencies or organizations can offer technical support, e.g., Summit Soil and Water Conservation District, Ohio EPA, NEFCO, wastewater management agencies.
- Some wastewater management agencies have experience (and interest) in working on watershed-based water quality improvements, e.g., Summit County Department of Sanitary Sewer Services and the City of Akron.
- Community and Metro Parks and conservancies are often interested in demonstrating stewardship projects, conducting outreach, or acquiring land in high visibility, environmentally sensitive areas. The MetroParks for the three watershed counties (Summit, Stark, and Portage)

all have focused land acquisitions along stream corridors and wetlands, protecting these important landscapes, providing opportunities for passive recreation the ability to perform restoration as funding becomes available. The Cleveland Museum of Natural History owns several especially valuable wetlands in the Portage Lakes watershed. The Portage Lakes watershed is within the Muskingum Watershed Conservancy District, which provides funding for certain conservation or restoration projects.

- Organizations like Audubon, US Green Building Council, and Ohio Clean Marinas offer certifications, recognition, and in some cases, technical support for developments and private uses that incorporate “green” practices and stormwater management. Marinas, golf courses, or other businesses thus can get recognition and marketing for helping sustain the lakes.
- Interest in pollinators overlaps with stormwater management through beneficial native plants.
- Partners can include volunteer labor, e.g., tree planting, which can be very effective outreach.
- There is a great deal of overlap between certain water quality improvement projects and flood management. One may provide funding for the other. For instance, properties experiencing repeated flooding problems are sometimes acquired with Federal Emergency Management funds. Once the property is held by a public agency, e.g., a community, it can be used for water quality BMPs with additional funding. A project to provide flood storage by restoring a floodplain and stream channel has substantial water quality benefits. Water quality projects, such as stream restorations, reduce flooding.
- Recreation funding can be used for certain aspects of acquiring or improving properties.

Summary of Recommendations

- Monitor streams for inputs to the lakes.
- Monitor swim areas for bacteria near neighborhoods with small lots and septic systems.
- Demonstration projects at high visibility public sites, e.g., lakescaping, rain garden at State Park.
- Protect intact natural features that help water quality, e.g., wetlands, floodplains, buffers.
- Restore altered stream channels, floodplains, wetlands, riparian buffers.
- Review land use controls to make sure they encourage practices that reduce stormwater runoff.
- Convene discussions with Dept. of Health and wastewater management agencies to determine appropriate measures for areas with small lots and septic systems.
- Conduct outreach to build awareness and stewardship. Examples include signs at BMPs; homeowners’ guides to living on the shore; workshops about lakescaping and goose control; encourage golf courses, marinas, and businesses to become certified as “green” businesses.
- Host plantings of trees or native plants with volunteers.
- Outreach with homeowners, lakera about best management practices and HSTS maintenance.
- Work with farmers to encourage the use of cover crops and other agricultural BMPs.



Table 7.3 Objectives and Actions - Reduce Inputs from Watershed <i>Note: These reflect ideas brought up in various discussions. Lake partners need to agree on priority/ feasibility.</i>	Objectives: A. Monitor pollutant loading – streams, septic B. Reduce nutrient and sediment loading through BMPs C. Reduce nutrient and pathogen loading from septic systems D. Improve habitat, stream function, water quality by restoring important landscapes – riparian corridors, stream channels, floodplains E. Protect intact landscapes with easements/purchase F. Increase awareness and personal stewardship through outreach, engagement			
	Objectives	Priority, Time Frame (years)	What is Needed/Comments	Potential Partners/Resources
Monitoring				
Monitor water quality in streams – nutrients, chlorophyll A, TSS, bacteria, etc.	A	High 1-3, ongoing	Staff, testing equipment, protocol, maybe lab analyses	SWCD, wastewater management agencies, OEPA
Monitor swim areas for bacteria	A	High 1-3 ongoing	Boat, sampler, lab analysis of cold sample	Wastewater management agencies, volunteers, communities, interns
BMPs and Restoration				
BMP demonstration projects – rain gardens, riparian plantings, bioinfiltration, e.g., at State Park/public sites	B, F	High, 1-3, ongoing	Funding, design, materials, possibly NPS-IS documents. Include signage.	SWCD, grant funding, volunteers, public sites, e.g., parks
Identify target areas for restoration/protection	B, D, E	High, 2-4	Mapping, field work to assess areas. Restoration areas may include old dams, Cottage Gr. Creek, Brewster Cr., Wonder Lake Creek.	Communities, conservancies, SWCD. Riparian buffer maps, Summit County environmental viewer, other county GIS.
Watershed BMPs to remove nutrients, treat stormwater	B	High 1-5, ongoing	NPS-IS documents, Funding, properties	Communities, SWCD, wastewater management agencies, funding through Section 319, MWCD, stormwater. Partner with conservancies, parks Green is developing NPS-IS documents.
Develop NPS-IS documents for Brewster Cr. or other streams, coordinate with Akron/ communities	C	High, 1-3	Funding, identification of projects/critical areas	Akron, communities, SWCD

Table 7.3 (cont'd) Reduce Inputs from Watershed <i>Note: These reflect ideas brought up in various discussions. Lake partners need to agree on priority/ feasibility.</i>	Objectives: A. Monitor pollutant loading – streams, septic B. Reduce nutrient and sediment loading through BMPs C. Reduce nutrient and pathogen loading from septic systems D. Improve habitat, stream function, water quality by restoring important landscapes – riparian corridors, stream channels, floodplains E. Protect intact landscapes with easements/purchase F. Increase personal stewardship through outreach, engagement			
	Objectives	Priority, Time Frame (years)	What is Needed/Comments	Potential Partners/Resources
Protect intact important landscapes with purchase/easement	E	High, ongoing	Funding, easement/land purchase	Conservation grants, FEMA, MWCD, communities, conservancies, parks
Restore altered stream channels, floodplains, wetlands, buffers.	D	2-5, ongoing	Funding; supplies; design; NPS-IS documents; public ownership of land; contractor; local match	Communities, conservancies, SWCD, ODNR, PLAC, Water quality/stormwater grants, FEMA, donations: land, materials, labor; volunteers.
Review land use regulations to make sure they encourage reducing impervious surfaces, protection of vegetation, wetlands, streams	B, D	Medium, 2-5	Access to regulations, understanding of regulations, time for review	Communities, volunteers with training
Wastewater Management				
Coordinate wastewater management discussions with DSSS, DOH to identify appropriate HSTS measures	C	High, 1-3		
Coordinate discussions with Summit DSSS, DOH and communities about which areas should be sewerred.	C	High, 1-3		
Outreach				
Install signage at BMPs, native plants	F	High, ongoing	Design, produce, install	Communities
Community planting events, cleanups	B, D, F	Medium, ongoing		
Volunteer monitoring	A, F	High, 1-3, ongoing		
Septic system maintenance outreach	C, F	High, ongoing		

Table 7.3 (cont'd) Reduce Inputs from Watershed <i>Note: These reflect ideas brought up in various discussions. Lake partners need to agree on priority/ feasibility.</i>	Objectives: A. Monitor pollutant loading – streams, septic B. Reduce nutrient and sediment loading through BMPs C. Reduce nutrient and pathogen loading from septic systems D. Improve habitat, stream function, water quality by restoring important landscapes – riparian corridors, stream channels, floodplains E. Protect intact landscapes with easements/purchase F. Increase personal stewardship through outreach, engagement			
	Objectives	Priority, Time Frame (years)	What is Needed/Comments	Potential Partners/Resources
Workshops – BMPs, lakescaping, plantings, rain gardens, easements	B, D, E, F	High	Materials, sites	SWCD, PLAC, ODNR
Outreach to homeowners assoc. about BMPs, rain gardens, etc.	B, D, F	Medium-high, 2-4		PLAC, homeowners Assoc., SWCD
Outreach to marinas, golf course encouraging industry green practices (Ohio Clean Marinas, Audubon)	B, D, F	Medium-High 2-4		PLAC, SWCD
Work with farmers to encourage the use of cover crops, etc.	B, F	High		SWCD

Goal 4 Management Structure

Develop a long-term management structure to provide direction, coordination, and support for lake management efforts.

Management Considerations

Managing a chain of urban lakes to be sustainable multi-use resources, accommodating uses, minimizing impacts, and protecting the water quality and habitat is a complex task. The process will span many years and combine technical knowledge about the lakes system with an understanding of the uses and priorities of the lakers and potential impacts. Lakes management should be a focused, long-term effort, with adequate staff, funding, and resources, rather than a task added on to existing responsibilities.

The Portage Lakes management program should include:

- Coordinated direction and management with a long-term commitment
- Decision-making process
- Understanding and sharing of technical background
- Integration of management focus areas: lakes-based, watershed, park, uses and needs/impacts
- Certain tasks need to be done by specialists (e.g., manage flow/floods, aquatic plant inventory)
- Inventory, characterize, and monitor limnology, bacteria, plants, streams, watershed landscapes
- Develop guidance for lake management measures to allow use while minimizing impacts
- Development and implementation of an aquatic plant management program
- Involvement of lakers, communities, and managers in identifying characteristics and priorities
- Staff responsible for the program
- Funding from various sources and a mechanism to manage the funding
- Raise awareness and participation among lakers, communities, and lake managers

Portage Lakes Partners and Participants

The Portage Lakes benefit from group of partners, lake managers, and lakers, who are dedicated to taking care of the lakes. Currently, many organizations and individuals are involved in individual efforts related to lake management. for a long-term, multi-disciplinary management effort, there needs to be a single, focused approach that brings the separate efforts together.

Most of these organizations described below have participated in the Portage Lakes TAC or in related discussions, and are likely to continue to work together in partnership to manage the lakes. This will allow input from and coordination with a broad set of backgrounds, interests, and capabilities. Early efforts should include identifying the partnership roles and decision-making process.

ODNR Parks and Watercraft

Portage Lakes Park The focus of the small staff at Wingfoot and Portage Lake Parks is primarily on the visitor experience, including:

- Maintaining and upgrading park facilities and coordinating contracts;
- Water-related facilities - beach, buoys, park docks;
- Shoreline activities, including permitting private docks.
- Monitoring the swim beach for bacteria and, as necessary, HABs.



- Naturalist activities at the park and elsewhere
- Currently issuing contracts for limited aquatic plant control in high travel areas
- Coordinating limited dredging in the lakes.
- The budget is zero-based and does not carry over.
- Navigation-related efforts are paid with ODNR boat registration and US Coast Guard funds

O&E Canal Lands – The small staff is primarily responsible for maintaining water level, flood control, and maintaining flow to the Lake Erie basin. They are also harvest aquatic plants in the Portage Lakes and Mosquito Lake, but they lack adequate staff, resources, and time to remove cut material from the lakes.

Division of Wildlife, Dam Safety - These divisions of ODNR have specialized responsibilities:

- Division of Wildlife stock and monitor fish and some limnological characteristics in the lakes.
- The Dam Safety division is responsible for dam inspection and repair of state-owned dams.

PLAC, a 501(c) (3) nonprofit organization consists of lakerepresentatives from the three lakes communities. PLAC is the primary public point of contact for the lakes and meets monthly. PLAC also:

- Coordinate with ODNR and other organizations
- Conduct outreach and maintain an informative website,
- coordinate fundraising and other activities on the lakes.
- PLAC members have coordinated projects, such as playgrounds in the State Park.

Ohio EPA enforces water quality requirements, including discharges to the water and wetland alteration, and provide technical and financial support for monitoring, restoration and outreach.

SWCDs focus on stormwater management, erosion control, and natural resource protection.

- Implement stormwater management requirements for MS4 communities
- Their extensive range of outreach and technical support includes:
 - Erosion control
 - Urban and Agricultural Stormwater BMPs
 - Riparian buffers, native plants, water quality
- Summit SWCD is creating an Upper Tuscarawas watershed coordinator position. Tasks already identified include:
 - Stream and limnological monitoring,
 - Outreach related to goose control, cover crops, and lakescaping
- SWCDs and watershed coordinators frequently pursue grants for water quality projects

NEFCO - coordinates regional wastewater management planning through the 208-water quality plan, maintaining wastewater treatment prescription mapping, designations, and amendments. NEFCO is actively involved in watershed management and assists communities and partners in the four-county region with related technical support.

Wastewater Management - Health Districts/Health Departments issue permits for HSTS and monitor swim areas outside the state parks. Wastewater Management Agencies are responsible for sewer service. Some partner with other organizations for restoration activities or assistance with lab analyses.

Parks - Metro Parks and other parks acquire and manage land for conservation and recreation.

- Summit Metro Parks manages Nimisila Reservoir, and Confluence, and Firestone Metro Parks.
- Parks often acquire land by streams and lakes for conservation, or passive recreation, e.g., trails.
- Parks staff conduct outreach and engagement activities and grant-writing.

Communities - Many community efforts relate to lake management, including:

- Land use controls,
- Stormwater management,
- Land acquisition,
- “Green” initiatives
- Water quality/restoration projects
- Participation in/ financial support of regional efforts,
- Grant-writing and
- Outreach.

Volunteers - Volunteers are involved in efforts including fundraising, Secchi disk monitoring, outreach, and coordinating projects. They bring a wide range of interests and capabilities. Volunteer efforts should be tailored to the skills and background needed, interest, and level of commitment.

Lakers – Residents, visitors, boaters, fishermen, businesses directly interact with the lakes. They experience aquatic plants and will be carrying out many of the lake management recommendations. Property owners manage aquatic plants by their docks on their own. Many contracts with AquaDoc, but some use their own chemicals, without permits, which may be hazardous to swimmers and wildlife.

Managing the Portage Lakes – Putting the Pieces Together

The Portage Lakes TAC/partners can contribute to many aspects of lakes management, but sustaining the lakes requires a long-term focus on lakes management and staff, resources, and responsibilities dedicated to that purpose which includes:

- Adequate funding, resources, equipment, staff
- Decision making based on balancing use with protection of the lakes system
- Technical expertise
- Participation of lakers
- Shared understanding of lakes processes and priorities
- Coordination among interests and expertise



Figure 7.1 shows many of the organizations currently and potentially involved in lakes-related activities and their roles. The colored boxes on the outside list some current roles and activities that partners are involved in on the lakes or have capabilities to perform. The white box in the center lists some important tasks and roles required for a Portage Lakes management program, and likely participants. The notations of “staff” could be responsibilities of a full or part-time lakes management staff position.

Partner involvement has provided a great contribution to developing the plan, shown in the colored boxes. As shown in the white box, partners will continue to be valuable for technical expertise, technical support, and sharing of resources, tasks, opportunities, and ideas. ODNR, PLAC, and SWCD play central roles in lakes management and will continue doing so.

Sustaining the lakes will involve increased commitment, staff, and resources. Some tasks can be done by consultants or with partner participation/contributions, but lake management requires consistent coordination, direction, and effort, which cannot be supported with current levels of staff and budget.

Figure 7.1 Portage Lakes Management Roles and Participants – Current and Potential

Tech Support/Background <ul style="list-style-type: none">- SWCD- Ohio EPA- NEFCO- Wastewater Mgmt.- Dept of Health- Lake Scientists- Volunteers- Contractors	Technical/Specialized <ul style="list-style-type: none">- ODNR Portage Lakes Pk- ODNR Canal Lands- ODNR Dams/Fish & Wildlife- OEPA- NEFCO- Wastewater/Health- Communities- Lake Scientists- Contractors	Monitor <ul style="list-style-type: none">- ODNR Portage Lakes Park- ODNR Fish & Wildlife- SWCD- OEPA- NEFCO- Metro Parks (monitor parks)- Volunteers/Lakers- Wastewater Management- Health- Contractors	Aquatic Plant Management <ul style="list-style-type: none">- ODNR – coordinate- Contractor- Property Owners/Aqua Doc
Coordinate <ul style="list-style-type: none">- ODNR Portage Lakes Park- PLAC- SWCD- NEFCO- Communities- Volunteers/Lakers	Portage Lakes Management Roles & Participants – Future/Potential <i>Decision-making.....staff?? Partners??</i> <i>Coordinate.....Partners and ?? staff??</i> <i>Tech support.....Partners, contractors, staff??</i> <i>Technical/Specialized.....Partners, contractors, staff??</i> <i>Monitor limnology, streams.....SWCD and ?? partners?? Staff??</i> <i>Phosphorus analysis, guidelines.....Partners, contractor, Staff??</i> <i>Aquatic plant inventory.....Contractor</i> <i>APM – planning, implementation....Partners, lakers, contractor? Staff?</i> <i>APM – implementation.....Partners, lakers, contractor? Staff?</i> <i>Harvest & remove.....Contractor, partners?? Staff?</i> <i>Coord. Plant Control at Docks, fee...Partners?? Staff?</i> <i>Budget item.....</i> <i>Obtain funds (grant-writing).....SWCD, partners, staff??</i> <i>Manage funds.....Partners? Staff?</i> <i>Outreach.....Partners, staff??</i> <i>BMPs.....Partners, lakers, contractor, Staff?</i>		Outreach <ul style="list-style-type: none">- ODNR Parks- ODNR Division of Wildlife- SWCD- NEFCO- Communities- Metro Parks- Volunteers/Lakers- Health District- Wastewater Management
Manage Park/Lakes Property <ul style="list-style-type: none">- ODNR Portage Lakes Park- ODNR Canal lands- ODNR dams- ODNR Division of Wildlife- Communities- Metro Parks- Property owners	Manage Funds <ul style="list-style-type: none">- ODNR Parks & Watercraft- ODNR Fish & Wildlife, dams- PLAC- SWCD- NEFCO- Communities, Metro Parks- Health Dept., Wastewater Management	Obtain Funds/Fundraising <ul style="list-style-type: none">- ODNR Parks & Watercraft- PLAC- SWCD- OEPA- NEFCO- Communities- Metro Parks- Volunteers/lakers	BMPs/Restoration <ul style="list-style-type: none">- Communities, parks- SWCD- ODNR- Property owners- Businesses, Marinas- Wastewater Mgmt.- Volunteers- Other organizations

A Portage Lakes management program will bring together various elements and participants.

- *Decision-making mechanism* for consistent long-term direction, e.g., partnership vote or staff.
- *“Staff”* –Dedicated to lakes management (full- or part-time) to work on tasks, coordinate, and provide consistent, dedicated, long-term focus on lakes management efforts, could be supplemented by contractors, partners or shared resources, or possibly volunteers.
- *Tech support, technical/specialized* – Sharing technical background on lakes ecology is crucial for management. Some tasks must be completed by technical specialists – partners or consultants.
- *Summit SWCD Watershed Coordinator/Monitoring* - Summit SWCD is expanding its lakes-management roles with a watershed coordinator position, which will likely involve coordination, grant-writing, and outreach. SWCD will monitor stream/lake conditions but may also need help.
- *Aquatic plant inventory* should be done early in the management process by a consultant.
- *APM planning* – Priority areas and recommendations could be developed by the partners, lakers, and staff, or with a consultant. Participation of stakeholders (lakers) is important.
- *APM implementation* will be conducted by field staff, either contractor(s) or dedicated lakes management staff. *Harvest and removal* of cut material is more involved than chemical use but provides greater benefit. It may require additional staff, equipment, land, resources.
- *Coordinating plant control at docks* will likely involve managing contracts and fee collection.
- *Consistent funding needed* – External funding and fees (e.g., for plant control at docks) can supplement budget items. However, supporting a staff position and other expenses will require long-term budget commitments, indicated by the blank “budget item.”
- *Obtaining and managing funds*. There are various sources of funding that can be used for specific efforts, supplementing budget items, including grants for specific projects or efforts, shared resources, fees, e.g., for plant control/stormwater, fundraising. As part of a management structure, an entity or entities need to manage the funds, with approval from staff or partners.
- *BMPs and Restoration* - As noted in Goal 3, BMPs and restoration can occur at various scales, from plantings on individual lakeshore or riparian properties to engineered bio-infiltration or other large-scale stormwater management measures. There are many potential participants, and these are important areas for outreach, identifying opportunities, and funding. Some restoration projects offer volunteer opportunities and resource sharing. Signs raise awareness.
- *Outreach*. As noted in Goal 5, there is a great need and many opportunities to raise awareness, involvement, and stewardship. Outreach combining various disciplines reaches more people.
- *Shared interests*. Identifying overlapping interests, even if seemingly unrelated, can increase the potential for sharing resources and outreach, and broaden potential involvement.



Table 7.4 Management Structure <i>Note: These reflect ideas brought up in various discussions. Lake partners need to agree on priority/ feasibility.</i>	Objectives: A. <i>Manage aquatic vegetation to balance navigation, aesthetics, habitat, water quality, waterways maintenance</i> B. <i>Coordinate larger scale/long-term efforts, interagency work, outreach, and volunteers</i> C. <i>Improve management strategies based on increased knowledge of aquatic plants, water quality, limnological conditions in the Portage Lakes</i> D. <i>Obtain funding</i>			
	Objectives	Priority, Time Frame (yr.)	What is Needed/Comments	Potential Partners/Resources
Establish a partnership that meets periodically; shares resources and efforts; and provides technical support, long-term guidance, and an overall perspective of lakes activities.	A, B, C,	High; 1	Partnership, decision-making structure, funding management. One suggestion was to have PLAC convene partner meetings periodically	PLAC, Ohio EPA, Summit Metro Parks, ODNR, community representatives, etc.
Hire staff, e.g., to coordinate lakes management, e.g., lakes/ watershed coordinator	A, B, C, D	High, 1-2	Funding for position or host agency	SWCD, PLAC
Develop management structure, including staff, decision-making, funding	B, C, D	High, 1-2		
Coordinate management program, monitoring described in Goals 1-4.	A, B, C, D,	High, ongoing		
Coordinate aquatic plant control near docks	A	High, 1-3, ongoing	Coordinate contracts Outreach	PLAC, ODNR, SWCD, partners, contractor(s); plant control fee

Goal 5 Increasing Awareness and Stewardship

Increase understanding of lake ecology and the value of plants, and stewardship by lake/watershed residents, visitors, businesses

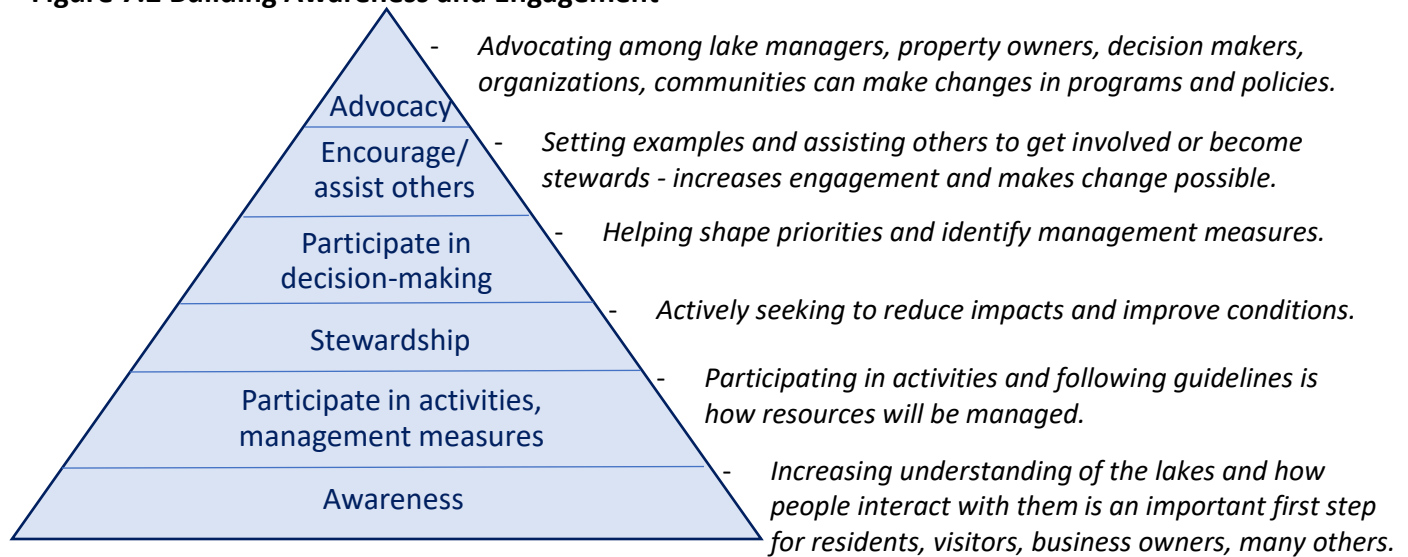
Throughout development of this plan, discussions have highlighted the need for outreach, education, and increased awareness about the lakes system and potential impacts. There are tens to hundreds of thousands of lakers, community members, and visitors, and dozens of communities, agencies/departments, and organizations that interact with the lakes. However, few people understand how the lakes work and how people and the lakes affect each other.

- Property owners and renters are in direct contact with the lakes every day. Practices like best management practices (BMPs), lakescaping, maintaining septic systems, discouraging geese, controlling runoff, and minimizing the use of harmful chemicals, can help take care of properties and the water at the same time.
- Hundreds of thousands of boaters and other visitors can have a large cumulative impact. Promoting an awareness of the fragile environment and how to minimize impacts can help increase appreciation and protection of the lakes.
- Lakers live, work, and recreate near or on the lakes and are familiar with the aquatic plants. Lakers can contribute to surveys of aquatic plants just through their observations and, ideally, geotagged photos.
- The lakers are the people who will be directly affected by APM or other lakes management decisions, and who will be carrying out many of the recommendations. Lakers should be not only educated about aquatic plants and lake ecology, but should be involved in setting APM priorities, identifying management zones and measures.

Increasing Awareness and Involvement

An important part of living with and visiting a natural system is understanding and minimizing potential impacts, protecting the integrity of the resource. Building awareness is an important first step but does not create change. Managing lakes involves many levels of engagement, including: learning about the lakes, choosing areas to protect or maintain for use, committing to carrying out a management program, stewardship to minimize impacts, and advocating for change, as shown in Figure 7.2. Outreach initiatives need to focus on building involvement, engagement in taking of the lakes at various levels.

Figure 7.2 shows how different types of outreach involve different levels of awareness and engagement, although the individual levels may differ slightly. Raising awareness reaches the most people directly, and the efforts higher up in the pyramid result in change. Increasing involvement at any level improves active management of the lakes. Ideally, many lakers would be involved in carrying out programs, setting priorities, stewardship. The lists below offer some suggestions for increasing awareness and engagement.

Figure 7.2 Building Awareness and Engagement**Building Awareness**

- Signage at BMPs, conservation areas
- Homeowners' guides to living on the lake
- Tours (boat/paddling tours, BMP, purple martin)
- Posters/brochures at boat launch ramps, marinas
- Lakes ecology book
- Trivia nights
- Workshops and forums (e.g., lakescaping)

Participation, stewardship

- Community surveys of aquatic plants
- Lakescaping/goose management demonstrations (especially with volunteers)
- Maintain septic systems
- Follow guidelines for conservation areas, management practices
- Lake events
- Clean-ups
- Planting trees, native plants along streams
- Photo competitions
- Composting
- Rain gardens, rain barrels
- Science Fair

Decision-making

- Forums – charrette-style for identifying problem areas, priorities, management measures
- Discussions with communities/MAs about wastewater treatment

Encourage/Assist Others, Leading by Example

- Become part of tour of BMPs/lakescaping
- Speak/reach out to civic groups/homeowners' associations
- Host or organize a clean-up/event
- Gather volunteers for native plant installations at State Park
- Adopt-a-spot for plantings, cleaning litter, monitor aquatic plants
- Share information about lakes, watershed, BMPs, native plants, with residents, visitors, others
- Establish a lakes arts project with schools, library, parks, communities

Advocacy

- Campaigns for lake management fees for aquatic plant control
- Contact decision-makers about need for APM program, harvesting with removal, etc.
- Work with communities, organizations to establish a lakes-centered program or visitors center
- Advocate for clean marinas projects

Working with Volunteers

The Portage Lakes experience demonstrates the range of experience with volunteers. PLAC is a volunteer group. Its members have a wide range of expertise, and some are very interested and involved. PLAC has coordinated major events such as fundraising events, XX. PLAC volunteers have initiated projects with ODNR, such as playgrounds. Volunteers lead school tours for hundreds of students at the purple martin sites. Some PLAC members take Secchi disk readings on a regular basis. PLAC volunteers have organized lake-related events at local restaurants.

On the other hand, volunteers may not have the background, sustained interest or focus needed for reliable data source data collection. A recent Secchi disk training workshop did not result in consistent data collection or participation. Volunteer efforts may wane after the volunteers leave the area or become too busy.

The use of volunteers is extremely valuable, not just for the labor and varied expertise they bring to a task, but also for the important task of raising awareness and participation. Tasks for volunteers should be assigned based on the level of commitment the volunteers are willing and able to provide, the amount of technical background and supervision needed. Plantings and assisting with rain gardens should be done with skilled supervision to make sure the plants are installed correctly. Make sure there is a commitment by staff or volunteers to do necessary follow-up work e.g., weeding, watering plants.

Working with Partners and Existing Framework

Build Collaboration, Pool Resources, Shared Interests and Opportunities

Raising awareness among so many people, including a transient audience, is a large task. Fortunately, many elements are in place, the effort can be done one step at a time, and there are great opportunities for partnerships. Building a collaborative network will allow organizations to coordinate efforts and needs, share resources, and reach larger audiences. Partnerships can help by:

- Listing events and volunteer opportunities, sharing and posting information, media, speakers;
- Maintaining and sharing mailing lists and databases;
- Coordinating events; and
- Sharing materials, supplies, equipment, expertise, speakers.
- Volunteers can help provide local match and involvement for grants, reduce project labor costs; and provide expertise, capabilities, or contacts that organizations may not have.
- Various organizations can take the lead on projects of mutual interest, with mutual assistance.

Partners should develop and maintain a contact list of interested groups and individuals, including interests, materials, expertise, capabilities, and needs for collaboration. Potential partnership opportunities include:

- PLAC already provides a forum for education and outreach and notification of events. PLAC also has an eager group of volunteers with a wide range of skills and interests, including litter pick-up, boating, monitoring, publicity, writing, photography, conservation, wildlife, the science of the lakes and water quality. PLAC members have expressed an interest in helping, provided there is an understanding of what they are trying to achieve and why.

- *Summit Soil and Water Conservation District (SWCD)* has a strong public education component in support of their work with property owners and communities on stormwater and drainage management, best management practices, erosion control, water quality, habitats, lakescaping, native species. SWCD can provide technical expertise, speakers, workshops (rain gardens, rain barrels, stream habitat and macroinvertebrates, etc.), rain garden supplies, and stacks of helpful, interesting literature that partners can pass out. SWCD also loans out interactive demonstration equipment and pre-made displays. As a long-time partner in the Portage Lakes process, they have offered assistance with databases and educational materials. A related group, Northeast Ohio Public Involvement Public Education (NEOPIPE), a regional stormwater education collaboration among SWCDs, has developed downloadable graphics.
- Ohio EPA offers technical support, monitoring, literature, funding for certain projects, and a long-time connection with the Portage Lakes management partnership.
- The lands of the State Park, Metro Parks, other parks, schools, and public/institutional lands are well-suited for demonstration projects, events and workshops, and informational signage.
- Communities, organizations, and agencies involved in stormwater management, wastewater management, and stream restoration may have opportunities and need for public engagement.
- The lakes communities and schools already have ongoing conservation/sustainability efforts.
- Enlisting businesses and civic groups (e.g., Lions Club, churches, Craftsmen Park) can provide mutual benefit, additional outreach/involvement opportunities, and additional resources.

Start Small, Build on What is Already Going On

Portage Lakes outreach efforts can start with smaller tasks and build on existing opportunities, e.g., setting up a table, display, kiosks, or activities at other events or locations. Later, partners can explore more ambitious efforts, such as a nature center or a Portage Lakes festival.

- Go where the people are – Setting up a display table/activity at events can raise the profile of the lakes and lake management. Build a collection of display materials and establish a group of event volunteers to have an ongoing presence at existing events throughout the area. Examples of existing meeting or information sites include: PLAC meetings, PLAC website, libraries, newspaper columns, fishing reports, agency websites, businesses (restaurants, marinas), libraries, boat launch sites, tours (boat tours or purple martin tours), reaching out to homeowners' associations, civic groups, campers, etc.
- Use public sites and other high-visibility areas for demonstration projects like BMPs, lakescaping, and landscaping with native plants, green infrastructure. Other installations could include lakes-related public art or benches. Informational signs are important.
- Install informational signs at existing BMPs to raise awareness (and give credit where it is due). For example, the Coventry High School uses innovative stormwater treatment measures, which provide water quality benefit, but could better help raise awareness if they had signs.
- Highlight existing BMPs through actual or on-line tours or photo galleries



Seek Projects with Multiple, Mutual Benefits

- Volunteer monitoring programs provide important data and engage people directly in the lakes.
- Tree-plantings, lakescaping, planting native plants, rain barrel and rain garden workshops help protect water quality and are rewarding ways to actively involve community members.
- On-line outreach, e.g., virtual boat tours, can raise awareness widely and also draw attention to the lakes as a recreational resource.
- Recognition of businesses and organizations using good stewardship can be good publicity for them. “Passport” programs offering a discount at local businesses for good practices serves as advertising for the businesses.

Funding Possibilities

- PLAC does some fundraising each year, and could choose to fund certain activities or could use funds or volunteer labor to provide local partnership match for larger grants.
- Funding is available for environmental education through the Ohio Environmental Education Fund, which seeks grant proposals twice per year for small projects (up to \$5,000) or larger efforts (\$50,000). *Note: OEEF funding on hold during 2020 due to budget reductions.*
- Some grants for larger projects that might be undertaken by other agencies, such as stream restoration or stormwater management, might require public involvement/outreach or local match, which can often be volunteer time. These may provide opportunities to get some good outreach projects done, signage, events, tree-planting, displays, etc.
- Local businesses may be willing to sponsor or donate to projects that improve their ties to the lakes, e.g., placemats, videos, eco-tourism maps, reusable bags, clean-ups, events, displays.

Topics and Ideas

Priority Topics and Audiences

Discussions with focus groups, PLAC members, partners, and others identified important topics for raising awareness and engagement, generally focusing on lake ecology, potential impacts, and minimizing impacts. These important topics are examples of the “why” of outreach, including:

- Lake ecology and water quality
- Property owner/renter FAQs, and appropriate property management (e.g., compost waste, reduce runoff, nutrients, bacteria and other inputs to the lakes, role of ODNR)
- Increase use of BMPs, native vegetation, lakescaping, tree plantings, restoring important landscapes (watershed, lakeshore)
- Navigating the agencies (for property owners, renters)
- Aquatic plants -general ecology, importance, learning to live with them, management program
- Helping set priorities for APM
- Property owner/renter - safe control of aquatic plants, use of chemicals
- Wastewater: Septic system problems and maintenance, tying into sewer service
- Reduce geese



- Reduce trash around the lakes and entering the lakes
- Invasive plants

Target audiences:

- Lakes homeowners/property owners, renters
- Boaters, fishermen
- Visitors
- Businesses
- Watershed residents, businesses, communities



Ideas for Outreach, Education, Engagement

Table 7.5 lists many ideas that have arisen in discussions during development of this plan, along with comments about resources needed and potential partners. The approaches vary widely in message, targeted group, media, need for resources. Most can be adapted to on-line presentation, which would take advantage of existing websites (PLAC or others) and increase exposure of the lakes as a resource and destination. Partners should choose a message and audience to focus on and medium or approach that seems appealing, collaborating with others to share resources and audiences. When new materials are developed (e.g., handouts, activities, video tours) they should be made available to others and other media (e.g., putting fact sheets and videos on-line). These are representative ideas, there is plenty of room for other ideas help raise awareness of the lakes system, impacts, and best practices.

Note: Table 7.5 does not reference a watershed coordinator, but If one were hired to focus on the Portage Lakes, even part-time, some of their responsibilities would likely be coordinating priority initiatives, grant-writing, outreach. Summit SWCD has funding from ODNR for a watershed coordinator for areas within Summit County, who is currently focusing on supporting NPS-IS efforts in multiple watersheds, conducting QHEI assessments. There is not currently a watershed coordinator specifically for the Portage Lakes.

Virtual/Remote Presence and Activities

This plan is being written during a period of COVID-19 quarantine, remote meetings and events, at-home activities. The activities suggested can and should be adapted to new ways of conducting events, including maintaining social distance and relying on internet-based and other remotely accessible communication and events. The new stronger reliance on on-line activities can and should be applied to many of the actions listed in Table 7.6 and other opportunities, depending on the creativity of the organizers. Creating online materials and events is also a good way to advertise the lakes as a recreational and natural resource and prepare visitors for the special opportunities and expectations of spending time at the lakes.

Table 7.5 Objectives and Ideas Outreach/Education/Engagement <i>Note: These reflect ideas from various discussions. Lake partners must decide priority/ feasibility.</i>	Objectives: 1 Increase understanding of the lakes, how to minimize impacts, live with lakes 2 Increase engagement (active participation) and/or ecotourism 3 increase use of BMPs, property management, septic system management 4 Monitor lake or plants 5 Reduce spread of invasive species 6 Manage aquatic plants effectively and safely for water quality, swimmers, wildlife 7 Water quality, litter removal, watershed management, discourage geese		V/R - Virtual/remote event/series or resource possible
	Objectives; target audience	What is Needed/Comments	Potential Partners/Resources
Prepare for Additional Outreach			
Build and maintain a network of volunteers, speakers, and partner organizations	1, 2, 3, 4, 5, 6, 7 residents, visitors, businesses, schools, agencies	Centralized, coordinated contact lists of interests, capabilities, availability, willingness to volunteer, resources, expertise, needs for volunteers, materials, speakers, funding, etc.	PLAC, Summit SWCD, wastewater treatment operators, communities, parks
Build a collection of display materials, equipment	1, 2, 3, 4, 5, 6, 7 residents, visitors, schools	Volunteers, handouts, brochures, displays (photos, maps), display board, Table, banner? Canopy? There are many handouts available from SWCD, other partners, online materials. SWCD has equipment like enviroscape to lend.	PLAC Summit SWCD, ODNR, communities, local businesses, NEFCO (maps and materials developed for Portage Lakes or watershed outreach.)
Printed, Viewable, or On-line Materials			
Virtual tours, activities, reference materials, see below specific activities.	1, 2, 3, 6, 7 Target: residents, visitors, interested viewers, students, businesses, etc.	Coordinated labor to develop and film tours of lakes, BMPs, activities, etc. Labor and/or commercial production for video.	PLAC, Summit SWCD, boaters, volunteers, students, OEEF - V/R
Lake residents'/property owners' handbook	Obj. 1, 2, 3, 7; Target: property owners, renters. Includes navigating agencies, docks, ODNR lake management, septic systems, chemicals, lakescaping, aquatic plants, native plants, property maintenance, reducing geese and inputs to lakes	Coordinated labor to compile or outside contractor, printing costs Could be put on-line	PLAC, Ohio EPA, Summit SWCD Resources: PLAC, OEEF - V/R

Table 7.5 (cont'd) Outreach/Education/Engagement Ideas	Objectives: 1 Increase understanding of the lakes, how to minimize impacts, live with lakes 2 Increase engagement (active participation) and/or ecotourism 3 increase use of BMPs, property management, septic system management 4 Monitor lake or plants 5 Reduce spread of invasive species 6 Manage aquatic plants effectively and safely for water quality, swimmers, wildlife 7 Water quality, litter removal, watershed management, discourage geese		V/R - Virtual/remote event/series or resource possible
	Objectives; target audience	What is Needed/Comments	Potential Partners/Resources
Printed, Viewable, or On-line Materials, cont'd			
Aquatic plant identification book and lakes ecology	Obj. 1, 2, 5, 6, 7; Target: everyone	Outside contractor with expertise Good photos	PLAC, Ohio EPA, OEEF V/R
Eco-tourism informative maps – could include plant management zones	Obj. 1, 2, 4 Target: visitors, everyone	Coordinated labor to compile; graphics and printing costs, or outside contractor Could be put on-line, could use QR codes	PLAC, marinas, boat clubs, stores, Craftsmen Park, libraries V/R
Web/Facebook/newspaper articles/FAQs/photo galleries/Kids' activities	Obj: 1, 2, 3, 4, 5, 6, 7 Any topic related to lake ecology, aquatic plants, living with the lakes, problem-solving, Best Management Practices, septic systems, etc. Increase engagement, ecotourism, understanding of lake ecosystem, how to minimize impacts; Target: residents, visitors, everyone	Articles by knowledgeable partners Dedication and medium to create an ongoing series (e.g., PLAC web page, local newspaper, agency newsletters)	Ohio EPA, Summit SWCD, ODNR, volunteers, other agencies, schools V/R
Lakes tour guide –materials (stops, text) highlighting lakes ecology for tour boats or boaters	Obj. 1, 2 Target: residents and visitors	Coordinated, dedicated labor, with some technical expertise to compile, or outside contractor. Could be put on-line	PLAC, residents, volunteers, tour boat operators V/R
PL video (marinas, boat tours)	Obj. 1 Target: visitors, boaters	Professional production, could be put on-line	V/R

Table 7.5 (cont'd) Outreach/Education/Engagement Ideas <i>Note: These reflect ideas brought up in various discussions. Lake partners must decide priority/feasibility.</i>	Objectives: 1 Increase understanding of the lakes, how to minimize impacts, live with lakes 2 Increase engagement (active participation) and/or ecotourism 3 increase use of BMPs, property management, septic system management 4 Monitor lake or plants 5 Reduce spread of invasive species 6 Manage aquatic plants effectively and safely for water quality, swimmers, wildlife 7 Water quality, litter removal, watershed management, discourage geese		V/R - Virtual/remote event/series or resource possible
	Objectives; target audience	What is Needed/Comments	Potential Partners/Resources
Lake based placemats with facts, activities, highlights, could have QR code	Obj. 1, 2, 7 Visitors, restaurant patrons	Coordinated labor to compile lake facts/stories/photos and design the placemats; funding to print. Could be online.	PLAC, volunteers, restaurants. V/R – could be available as .pdfs
Handbooks/brochures for boaters and visitors at marinas, or ODNR kiosks – aquatic plant zones, lake ecology, stewardship.	Obj. 1, 2, 5, 6, 7 Target: visitors, everyone primarily boaters and fishermen	Coordinated labor to compile, or outside contractor, local photos Could be on-line Could have QR code.	PLAC, ODNR, Marinas, Ohio EPA, OEEF V/R
Engagement/outreach/Events On-site, Virtual/Remote/On-line			
Community survey aquatic plants	Obj. 1, 2, 4, 5, 6 Target residents, frequent visitors, businesses.	Request for geotagged photos, observations of aquatic plants. Could use interactive map for input.	PLAC, residents, boaters, marinas, other visitors, NEFCO, on-line map
Lakes re-usable bags	Obj. 1 Target visitors, residents. Can be used as to thank volunteers.	Coordinated labor to compile, design. Printing costs.	PLAC, local businesses
Neighborhood ambassadors/ speaker series, BMP/ lakescaping/rain garden/rain barrel/native plant workshops	Obj. 1, 3, 6, 7 Target: residents	Dedicated and coordinated volunteers with outreach materials, contact info for questions Materials, facilitator, assembly, site for BMP workshops. Could be on-line via internet.	Homeowners Associations, PLAC, SWCD; V/R
Lakes-based events e.g., at restaurants, library, lakes, etc.	Obj. 1, 2, 3, 5, 6 visitors and residents	Venue, knowledgeable volunteers to curate trivia questions, lead discussions, activities, outside or agency speakers, photographers, etc. Could be virtual with internet access.	SWCD, Ohio EPA, other speakers, local restaurants, library, schools. V/R

Table 7.5 (cont'd) Outreach/Education/Engagement Ideas <i>Note: These reflect ideas brought up in various discussions. Lake partners must decide priority/feasibility.</i>	Objectives: 1 Increase understanding of the lakes, how to minimize impacts, live with lakes 2 Increase engagement (active participation) and/or ecotourism 3 increase use of BMPs, property management, septic system management 4 Monitor lake or plants 5 Reduce spread of invasive species 6 Manage aquatic plants effectively and safely for water quality, swimmers, wildlife 7 Water quality, litter removal, watershed management, discourage geese		V/R - Virtual/remote event/series or resource possible
	Objectives; target audience	What is Needed/Comments	Potential Partners/Resources
Engagement/outreach/Events On-site, Virtual/Remote/On-line (cont'd)			
Public art projects, photo contests, and displays involving the community (children, HS students, adults) ranging from art displays to permanent art.	Obj. 1, 2, 7. These could be installed at/in local businesses, adding to eco-tourism and awareness. Target – residents and visitors of all ages, schools.	Coordinator and venue(s)for art display. Possibly external funding if it is permanent art. E.g., Some watershed groups fund installations along a stream course. These become part of eco-tourism trails. Could be on-line event or become part of on-line tour. (e.g., students submit drawings)	Local schools, library, PLAC, parks, businesses, Summit Metro Parks, ODNR, Summit SWCD, OEEF, sponsors, paid “bricks.” Some foundations fund public art installations. V/R
Engage with schools, summer camps, Craftsmen camp–monitoring, tours, eco-projects, visits, WET curricula, teacher education workshops, nature info/activities.	Obj. 1, 2, 7, 4. Target – children of the lakes (residents and visitors), teachers, camp visitors	Volunteers with programs or activities coordination with groups, possibly boats or parking for volunteers or participants. Materials/supplies. Could be online with internet access and materials available.	Volunteers, Summit SWCD, Summit Metro Parks, PLAC, ODNR, Craftsmen Camp - V/R
Lake-based science fairs – could be displayed publicly, e.g., library or science fair night at school.	Obj. 1, 2, 7. Target – students, parents, visitors. Could be community/watershed wide.	Coordination with schools and other venues, science fair judges, etc. Could have virtual showing.	PLAC, schools, ODNR, libraries, local businesses - V/R
Nature-cam	Obj. 1, 2, 4 Target: residents, visitors, students, boaters, distant viewers, fishermen, marinas, etc.	Outdoor web-cam, maintenance, platform to upload images. V/R	Parks, Cleveland Museum of Natural History, schools - V/R
Periodic lakes discussion groups (e.g., at local restaurants)	Obj. 1, 2, 3, 6,7 Target: residents, businesses, visitors.	Venue, coordination. Events could be in-person or remote, with internet meetings.	PLAC, businesses, SWCD, Ohio EPA etc. V/R

Table 7.5 (cont'd) Outreach/Education/Engagement Ideas <i>Note: These reflect ideas brought up in various discussions. Lake partners must decide priority/ feasibility.</i>	Objectives: 1 Increase understanding of the lakes, how to minimize impacts, live with lakes 2 Increase engagement (active participation) and/or ecotourism 3 increase use of BMPs, property management, septic system management 4 Monitor lake or plants 5 Reduce spread of invasive species 6 Manage aquatic plants effectively and safely for water quality, swimmers, wildlife 7 Water quality, litter removal, watershed management, discourage geese		V/R – Virtual/remote event/series or resource possible
	Objectives; target audience	What is Needed/Comments	Potential Partners/Resources
Engagement/outreach/Events On-site, Virtual/Remote/On-line			
Coordinating with Ohio DNR District 3 office and Summit Metro Parks to offer and list educational events	Obj. 1, 2, ?4. Target: visitors, residents, children	Speakers/events, venue, coordination. List can be online. Events could be in person or remote, if recorded or broadcast on internet.	PLAC, ODNR, Summit Metro Parks, Summit SWCD, schools, local communities, etc. V/R
Lake Stewards Program, Gallery - online	Obj. 1, 2, 3 Target: residents, visitors, business patrons.	On-line platform, coordination – criteria, recognize individuals/groups for stewardship.	PLAC, Summit SWCD, local communities, businesses V/R
Stewardship passport/discount program	Obj. 1,2,7 Target: residents, visitors, businesses, civic groups. Passport stamps, discounts for stewardship. Promotes businesses.	Coordination, discounts with businesses, identify activities to get “passport” stamps. Could be watershed-wide. Program criteria and passport form could be on-line.	PLAC, local businesses, parks, communities, Summit SWCD - V/R
Green Business certificate/logo Work with watershed businesses to encourage patrons to dispose of trash properly.	Obj. 1, 2, 3, 7 Target: businesses. Audubon, Ohio Clean Marinas, LEED certify golf courses, marinas, etc. using eco-friendly practices.	Coordination with businesses, development of recognition program. Can create good publicity for businesses. Criteria and award recipients could be on-line, in Lake Stewards’ Gallery.	PLAC, Summit SWCD, businesses, other resources. Lakes Stewards gallery could be online. V/R
Tours and awards - of Best Management Practices, rain gardens, lakescaping, stream restoration– virtual or on-site	1, 2, 3, 7 Target: residents, businesses, communities	Identify examples, coordinate with owners. On-site tour requires transportation and facilitator(s) – each person drive or use bus; on-line or video/ power-point, requires photos and information on each stop; or field trip guide, with permission, directions to each site. Can be on-line.	Summit SWCD, communities, regional stormwater programs, other interested groups. V/R

Table 7.5 (cont'd) Outreach/Education/Engagement Ideas <i>Note: These reflect ideas brought up in various discussions. Lake partners must decide priority/ feasibility.</i>	Objectives: 1 Increase understanding of the lakes, how to minimize impacts, live with lakes 2 Increase engagement (active participation) and/or ecotourism 3 increase use of BMPs, property management, septic system management 4 Monitor lake or plants 5 Reduce spread of invasive species 6 Manage aquatic plants effectively and safely for water quality, swimmers, wildlife 7 Water quality, litter removal, watershed management, discourage geese		V/R – Virtual/remote event/series or resource possible
	Objectives; target audience	What is Needed/Comments	Potential Partners/Resources
Engagement/outreach/Events On-site, Virtual/Remote/On-line (cont'd)			
Volunteer Monitoring – lake chemistry, secchi disk, stream sediment, stream habitat, etc.	Obj. 1,2,4, 7 Target: residents, students, boaters, long-term volunteers	Coordination, equipment, training, dedicated volunteers who will go out regularly, data forms/storage (SWCD). Funding for or donated analyses. (If lab analysis needed, coordinate with lab/Ohio EPA/ wastewater treatment plants for lab work to monitor water quality.)	Summit SWCD, PLAC, schools, volunteers, ODNR, Ohio EPA, CLAMS, wastewater treatment plants.
Volunteer Monitoring – invasive plants	Obj. 1, 2, 4, 5, 6 Target: residents, boaters, long-time volunteers	Coordination, training, guidebooks, equipment, data plots, collection, database. Similar programs have been done elsewhere. Could be part of a demonstration project for testing different treatment of invasive plants.	Ohio EPA, contractors, funding Training – V/R
Occasional free boat tours to raise awareness of lakes within communities/watershed.	Obj. 1, 2, 4,7. Target: decision-makers, visitors and residents	Donations/funding for the cost of the tour. Could be paired with tour materials, speaker, etc. Video of tour could be put on-line.	Tour boat operator, volunteers, local businesses. Reach out to watershed/ lakes communities.
Boat/paddle group eco-trips – explore, monitor, litter cleanup	Obj. 1, 2, 4,7 Target: visitors and residents	Trip coordination. Could be part of eco-tourism. If monitoring, need equipment and trained leader, data collection. Could be on-line tour, with video cams and website.	PLAC, volunteers, parks, communities, scout groups, school groups. V/R

Table 7.5 (cont'd) Outreach/Education/Engagement Ideas <i>Note: These reflect ideas brought up in various discussions. Lake partners must decide priority/ feasibility.</i>	Objectives: 1 Increase understanding of the lakes, how to minimize impacts, live with lakes 2 Increase engagement (active participation) and/or ecotourism 3 increase use of BMPs, property management, septic system management 4 Monitor lake or plants 5 Reduce spread of invasive species 6 Manage aquatic plants effectively and safely for water quality, swimmers, wildlife 7 Water quality, litter removal, watershed management, discourage geese		V/R – Virtual/remote event/series or resource possible
	Objectives; target audience	What is Needed/Comments	Potential Partners/Resources
Engagement/outreach/Events On-site, Virtual/Remote/On-line (cont'd)			
Adopt-a-spot on the water, similar to adopt a spot on the highways	2, 3, 7 Target: residents, boaters	Program to encourage groups to periodically clean up or beautify areas around the lakes. Beautification should be done with SWCD input – using native plants, protecting habitat.	ODNR, Parks, communities, PLAC
Litter pick-ups, trash bandit crew. Work with watershed businesses to encourage disposing of trash properly.	2,3,7 Target: residents, visitors, businesses	Coordination, trash pick-up materials, safety guidelines. Individual cleanups program - encourage visitors and residents to pick up a bagful. Could be tied to passport program.	PLAC, volunteers, ODNR, parks, communities, interest groups, scouts, high school, etc.
Tree-planting, lakescaping, beautification planting days with native plants, rain garden or rain barrel – Installation and site-specific or demonstration workshops	Obj 1, 2, 3, 7 Target: lake/ watershed residents, visitors, agencies, parks, concerned citizens. Can link with community/watershed water quality/restoration efforts.	Site needing vegetation, trees/plants, materials, expertise, instructions in planting/making rain garden, labor to maintain, signage. Rain gardens/ rain barrels are great installations at high traffic public sites (similar to high school and Metro Park). Best educational value with signage.	PLAC, communities, SWCD, parks, ODNR, schools, organizations doing restoration, public private funding, agencies, businesses. I-tree to assess canopy. V/R workshop.
Signage program for BMPs	Obj. 1, 2, 3, 7 Target: residents, communities, businesses, parks	Design and funding for signs, installation.	SWCD, communities, OEEF. Counties/park districts/ communities could produce signs. Volunteers could install.
Tags for trees (value of trees)	Obj. 1, 2, 3, 6, 7	Sites, identify trees for signage, determine \$ value of benefits, installation. Watershed-community wide. Tree tag templates at: https://www.unri.org/news/treetags042019/	Parks, communities, SWCD, PLAC, schools, scout groups. I-tree software; business owners, USDA Urban Natural Forests Institute

Table 7.5 (cont'd) Outreach/Education/Engagement Ideas <i>Note: These reflect ideas from various discussions. Lake partners must decide priority/feasibility.</i>	Objectives: 1 Increase understanding of the lakes, how to minimize impacts, live with lakes 2 Increase engagement (active participation) and/or ecotourism 3 increase use of BMPs, property management, septic system management 4 Monitor lake or plants 5 Reduce spread of invasive species 6 Manage aquatic plants effectively and safely for water quality, swimmers, wildlife 7 Water quality, litter removal, watershed management, discourage geese		V/R – Virtual/remote event/series or resource possible
	Objectives; target audience	What is Needed/Comments	Potential Partners/Resources
Displays/Signage			
Watershed/lakes wayfinding signs, Natural Habitat signs, park installations	Obj. 1, 2, 6, 7	Design, funding for signs, installation. Can be installed throughout watershed – “you are here”, water goes downhill, context, part of trails and parks. Could be part of lake or regional eco-tours with qr codes. Could be paired with public art.	SWCD, ODNR, parks, OEEF, communities. Park districts/ counties/ communities could produce signs. Volunteer groups could install.
Nature kiosks/popup displays at high visitation areas, events (e.g., library, marinas, Metro Parks, State Park, boat ramps)	Obj. 1, 2, 3, 5, 6, 7	Need: kiosks/displays, information, brochures, maps. Setting up at events requires volunteers, portable displays, through SWCD. Permanent kiosks would require materials, installation.	ODNR, parks, communities, Summit SWCD, sponsors.
Facilities			
Clean-drain-dry stations at boat launches	Obj. 1, 5 Target: boaters	Sites, power-wash or waterless stations, funding for establishing station, operation, maintenance, waste/water disposal. Purpose: to prevent spread of invasive species to other lakes.	Marinas, ODNR
Nature Center/Visitor Center	Obj. 1, 2, 6, 7 Target – visitors, schoolchildren, residents, business patrons.	Long-term capital project, initial steps could be smaller, pop-up facilities. Needed – site, design, facilities, parking, access. Could be lakes welcome and nature center. Could be initially part of existing facility, e.g., ODNR, library room. Could have info, displays, reading materials, photos, community activities, public art.	Community, parks, civic groups. Fundraising, donations, sponsors. Summit SWCD and other information sources.

Key Considerations

Sustaining the Portage Lakes as a multi-use resource is a challenge, requiring careful management.

- The urban eutrophic lakes support dense plant growth and intense use by lakers and visitors. The plants are important to lake health, habitat, water quality, but impede uses.
- Reducing phosphorus, sediment disturbance, and other contaminants from both the watershed and lakes/lakeshore are important for improving water quality. Isolating problems, causes, management measures, and effects is difficult in connected lakes.
- It is essential to characterize and monitor internal and external loading, nutrient cycling, and interactions of lake processes and people.
- Aquatic plant management/lakes management should be managed in a coordinated way that protect water quality and habitat while accommodating uses.
- It is important to involve lakers in determining APM priorities and measures, as they are most affected by lake conditions and management.
- Sustaining a balance between use and ecosystem health requires careful management, consideration of impacts, and evaluation (and re-evaluation).
- The large number of visitors each year increases potential impacts and need to raise awareness of the lakes system and foster stewardship.
- Managing the lakes will require coordination, consistent direction, technical expertise, involvement of lakers, and more resources than are currently available. The partners, representing varied interests, can coordinate and share expertise, insights, and resources to assist with lakes management. However, sustaining the lakes over time will require dedicated funding and staff, and long-term decision mechanism, as well.

Summary of Goals and Recommendations

The overall goal is to manage the Portage Lakes as a sustainable multi-use resource, in a way that protects the natural lakes system in balance with the needs and interests of lake/watershed users, community, and organizations. Five topical goals have been identified, which are linked.

Recommendations for each should be carried out in conjunction and coordination with the others.

1. **Water Quality – Lakes and Shoreline.** Protect and improve the water quality of the Portage Lakes by reducing factors of eutrophication and other contaminants within the lakes and along the shoreline.
2. **Manage Aquatic Plants** in a way that accommodates property owners and visitors while protecting habitat and water quality.
3. **Water Quality – Watershed.** Protect and improve the water quality of the Portage Lakes by reducing factors of eutrophication and other contaminants within the lakes and along the shoreline.
4. **Long-term Management.** Establish a long-term multi-disciplinary management program to provide technical expertise, coordinate efforts, and ensure there are adequate resources to sustain the multi-use, connected, urbanized Portage Lakes resource.
5. **Understanding/Stewardship.** Increase understanding and stewardship by lake/watershed residents, visitors, businesses, and communities.

As shown in Table 7.6, the recommendations include characterizing the lakes, plants, and streams; developing guidelines for APM and lake management; creating a management structure; establishing an APM program; and raising awareness/stewardship.

Table 7.6 Summary of Recommendations

Goal	Recommendation	Time Frame (yr.)
Use Improved Knowledge of Lakes to Guide Decisions		
1	Seasonally monitor limnology throughout lakes	1, ongoing
1, 3	Monitor incoming streams for phosphorus, sediment, bacteria	1, ongoing
1, 3	Characterize phosphorus sources in the lakes	2-3
2, 4, 5	Community survey/monitoring of aquatic plants – interactive website with map	1, ongoing
1, 2	Aquatic Plant Inventory	1-3
1,2	Monitor aquatic plants to detect change	periodically
1, 2	Monitor bacteria in streams, at swim areas during summer, after storms if possible	1-2, ongoing
Reduce Nutrients/Sediment, Other Contaminants in Lakes and from Shoreline		
1	Develop phosphorus, sediment reduction guidelines for lake/plant management	1-4
1, 2, 4	Protect rooted aquatic plants where feasible as part of lake management activities	ongoing
1, 2	Develop a harvest and removal program for aquatic plants where feasible	2-4
1, 2, 3, 5	Encourage participation in programs, e.g., Audubon golf course, Clean Marinas, Clean Boater, and LEED certification to reduce contaminants through BMPS/design	1-5, ongoing
1, 5	Workshops/demonstration projects to discourage geese	1-2, ongoing
1, 2, 3, 5	Lakescaping demonstration projects, workshops	1-2, ongoing
Manage Aquatic Plants to accommodate users' needs while protecting water quality and habitat		
1, 2, 4, 5	Hold charrette style public workshops to identify priorities for APM and conservation	1-2
1, 2, 4	Develop comparison of lakes management/APM - benefits, costs, impacts, logistics	1-2
1, 2,4, 5	Develop and carry out coordinated APM program for docks, outreach	1-2, ongoing
1,3	Investigate ways to reduce invasive species, increase native species	3-5
1, 2	Special focus: North Reservoir, Miller Lk, Cottage Grove Lk, Long Lake Feeder	1-4, ongoing
Reduce Contaminants from the Watershed		
1, 3	Work with wastewater management agencies, communities, and Departments of Health to identify appropriate solutions for discharging HSTS, including sewer service	1-2, periodically afterward
1, 3, 5	Demonstration project(s) at park/public site – BMPs, native plants, lakescaping, etc.	2-4, ongoing
1, 3, 4	Identify areas for restoration or protection (stream channels, wetlands, buffers)	2-4
3	Develop NPS-IS documents for areas not already addressed (e.g., Brewster)	2-4
1, 3	Stormwater/stream projects to reduce sediment, phosphorus	1-2, ongoing
1, 3, 4, 5	Review land use measures to make sure they encourage BMPs	2-4
1, 3, 5	Outreach HSTS maintenance	1-2, ongoing
3, 5	Outreach to farmers – cover crops, easements, buffers, etc.	
1, 2, 3, 5	Outreach to become “green” certified e.g., Clean Marinas, Audubon Sanctuary, LEED	2-4
Management – Goals 1, 2, 3, 4, 5		
	Establish partnership to coordinate and share technical information, direction	1
	Establish full- or part-time staff position for lakes management	1-2
	Establish management structure with funding, decision-making mechanism	1-2
Outreach		
1, 3, 5	Signage at BMPs	2-4
1, 2, 3, 5	Articles, brochures about living with the lakes, BMPs, HSTS maintenance	1, ongoing
1, 2, 3, 5	Volunteer opportunities - Clean-ups, planting trees, rain gardens, monitor, etc.	1-2, ongoing
1,2, 5	Guidebook to Portage Lakes Plants and Ecology	1-2
1, 2, 3, 5	Displays, brochures for kiosks, events – aquatic plants, lake ecology, stewardship, etc.	Ongoing
1, 2, 3, 5	BMP outreach – property owners, agricultural	Ongoing
1, 2, 3, 5	Lakes-centered events, kiosks, tours, tour information, other as noted in Goal 5	1-4, ongoing

Goals: 1 – Water quality lakes/shore 2 – Plants 3 – Watershed 4 – Manage 5 - Outreach

Priorities for Getting Started

Tasks to start working on soon include foundational work and items that could generate early success, including:

- Establish a partnership to provide coordination, guidance, share resources
- Establish a management structure with staff, funding, resources, decision-making
- Inventory and monitoring of limnology, streams, aquatic plants
- Work with lakereaders to identify APM needs, priorities, APM zones and management measures – could include community surveys/submissions of geotagged photos and observations
- Characterize phosphorus sources in the lakes
- Develop coordinated APM at docks, including a fee structure
- Develop guidelines for lake/aquatic plant management measures that allow use of the lakes and minimize phosphorus release and sediment disturbance and protect habitat and ecosystem
- Start the process for developing a harvest and removal program
- Outreach, including goose management, lakescaping, lake ecosystem, aquatic plants, clean-ups

