



**US Army Corps
of Engineers®**
Buffalo District

Lakefront Preserve Coastal Wetland Restoration Project City of Port Clinton Ottawa County, Ohio

2023/2024 Monitoring Report



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1. Introduction

Section 2039 of WRDA 2007 directs the Secretary of the Army to ensure that a recommended project from a feasibility study for an ecosystem restoration project (or component of a project) include monitoring to measure the performance of the ecosystem restoration and to specify any applicable adaptive management measures, if needed. Furthermore, Section 506 of WRDA 2007, as amended, authorizes monitoring to evaluate the success of projects carried out under the Great Lakes Fishery and Ecosystem Restoration Authority (GLFER). Monitoring will be initiated upon completion of the project, will continue until ecological success is determined by the LRD Commander, and may be cost shared for a period not to exceed 10 years. Ecological success will be documented through an evaluation of the outcomes predicted in the approved decision document as measured against the actual results. Once ecological success has been documented by the District Engineer, in consultation with the applicable Federal and State resource agencies, and a determination is made by the LRD Commander that ecological success has been achieved; no further monitoring will be performed by USACE.

An effective monitoring program for a project is necessary to properly assess the status and trends of applicable ecological functions that are forecast through implementation of the selected plan. Assessing status and trends includes both spatial and temporal variations. Gathered information collected will provide insight into the effectiveness of wetland restoration measures and adaptive management strategies, and indicate where goals have been met, if actions should continue, and/or whether more aggressive management is warranted.

Monitoring changes at a project site is not always a simple task. Ecosystems, by their very nature, are dynamic systems where populations of macroinvertebrates, fish, birds, and other organisms fluctuate with natural cycles. Water quality also varies, particularly as seasonal and annual weather patterns change. The task of tracking environmental changes can be difficult, and distinguishing the changes caused by human actions from natural variations can be even more difficult. This is why a focused monitoring protocol tied directly to the planning objectives needs to be followed.

This monitoring report describes the existing habitats and monitoring methods that are being utilized to assess the project's performance. By reporting on environmental changes, the results from this monitoring effort will be able to evaluate whether measurable results have been achieved and whether the intent of this coastal wetland restoration project is being met. The first year of post-construction monitoring was 2024, and annual monitoring is currently planned for the years 2025 to 2029.

1.1.Purpose and Background

This document presents the results of 2023 and 2024 vegetation monitoring surveys, wetland quality estimation, and invasive species cover estimation conducted by U.S. Army Corps of Engineers (USACE) personnel at the Port Clinton Lakeshore Preserve, Port Clinton, OH. The site is located on the shoreline of Lake Erie, approximately 1200 feet east of the Portage River (Figures 1 and 2). The purpose of the monitoring effort is to collect data that can be used to assess if restoration efforts are successfully meeting performance goals. Specifically, this data

will be compared to performance criteria related to vegetative cover, wetland quality, and invasive species cover. Floristic Quality Assessment Index (FQAI) data collection occurred October 1, 2018; June 28-29, 2023; and October 16-17, 2024 (Table 1). Ohio Rapid Assessment Method (ORAM) for wetlands data and invasive species cover estimates were collected May 23, 2013, as well as the previously mentioned FQAI collection dates (Table 1).

Table 1: Project Monitoring Timeline.

Port Clinton Monitoring Timeline									
Year	2013 (Pre- construction)	2018 (Pre- construction)	2023	2024 (Post- construction)	2025	2026	2027	2028	2029
FQAI Completed (X)		X	X	X					
ORAM Completed (X)	X	X	X	X					

**2013 and 2018 were surveys conducted prior to beginning construction. 2024 was the first survey conducted post-construction completion.*

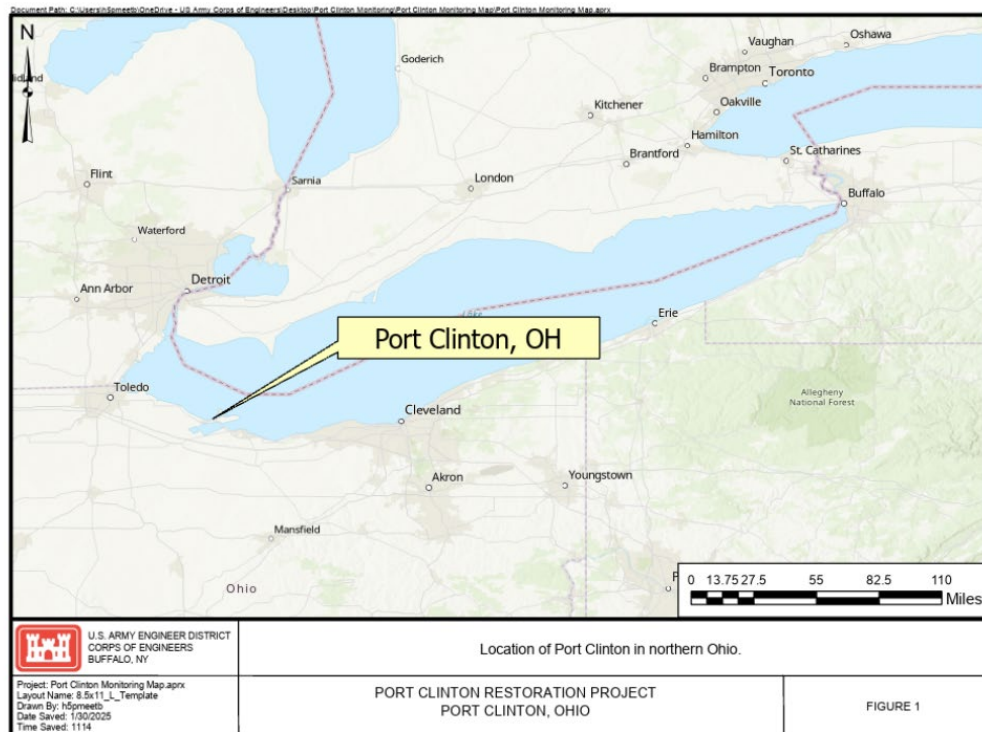


Figure 1: Location of Port Clinton in northern Ohio.



Figure 2: Location of coastal wetland restoration at Port Clinton, Ohio.

1.2. Construction Progress

Construction of the Port Clinton coastal wetland restoration project began in 2019 with the excavation of existing wetland, invasive species treatment, seeding of the wetland perimeter, and shrub planting along the western perimeter. In 2020, excavation began for the new wetland area along with another invasive species treatment. In 2021 and 2022 large scale plantings, the first dune planting, and two separate invasive species treatments were conducted. In 2023, a fifth invasive species treatment was conducted, which was the only action for that year. In 2024, the last supplemental planting along the wetland expansion area and the second dune planting was conducted with a sixth invasive species treatment. USACE efforts in the restoration project's construction concluded in 2024. Table 1 is a breakdown of construction actions during the duration of the contract.

Table 2: Breakdown of construction actions during the duration of the contract.

Year	Contract Action
2018	Award of Main Construction Contract
2019	Task Order 2 - Excavation of Existing Wetland and Invasive Species Treatment 1
2019	Task Order 3 - Seeding of Wetland Perimeter and Shrub Planting Along Western Perimeter
2020	Task Order 4 - Excavation of New Wetland and Invasive Species Treatment 2
2021	Task Order 5 - First Large Scale Planting and Invasive Species Treatment 3
2022	Task Order 6 - Second Large Scale Planting, First Dune Planting, and Invasive Species Treatment 4
2023	Task Order 7 - Invasive Species Treatment 5
2024	Task Order 8 - Wetland Expansion Supplemental Planting, Second Dune Planting, and Invasive Species Treatment 6

2. Monitoring Methods and Performance Criteria

2.1. Monitoring Methods

The quality of the plant community was assessed using the FQAI (Andreas et. Al. 2004). Data was collected by placing a 0.25 m² PVC frame on the ground at random locations along transects traversing the restored areas. The total vegetative cover was estimated, and each species was identified and recorded within each quadrat. Transects were oriented perpendicular to the shoreline of Lake Erie to adequately cover all wetland vegetation zones (emergent, scrub shrub, open water, and wet meadow). These transects were laid out prior to sampling with an effort to collect a total of at least 30 quadrats within each of the vegetation zones across the site (Figure 3). Each transect is approximately 100-200 feet long and is spaced at 150-foot intervals.



Figure 3: Location of the Port Clinton restoration monitoring area, with the survey transects used in monitoring. Transects are numbered 1 through 13, starting from West going East.

Habitat and wetland quality were assessed by applying the ORAM for wetlands, v. 5.0 developed by the Ohio Environmental Protection Agency (Mack 2001). The ORAM consists of six metrics: (1) wetland area (size); (2) upland buffers and surrounding land use; (3) hydrology; (4) habitat alteration and development; (5) special wetlands; and (6) plant communities, interspersions, and microtopography. Each metric score is calculated individually, and scores are combined to produce the total quantitative ORAM score. Scores could theoretically range between zero and 100, with low scores indicating low habitat quality and high scores indicating high habitat quality. The collected ORAM scores can be directly compared to those collected by USACE in 2013, prior to restoration efforts.

The effectiveness of invasive species control, particularly for common reed (*Phragmites australis*), at the Port Clinton restoration site is a vital component for directing the various invasive species control and management strategies over the course of the project. Monitoring of invasive species was conducted by estimating percentage of invasive vegetative coverage in the monitoring areas through the use of quadrats surveyed during the FQAI and also estimated by

conducting meander survey of the project location.

2.2. Performance Criteria

The primary purpose of this monitoring effort is to assess if the vegetative community is establishing along desired trajectories, if wetland habitat has been improved, and if efforts to reduce invasive species cover has been successful. The entire planted area was assessed by the government to determine if the performance criteria were met at the end of the 2024 growing season.

Project success will be determined by an increase in FQAI and ORAM scores from baseline conditions and a decrease in invasive vegetation ground coverage. The FQAI target for this project is a score greater than 19.6, one representative of a high quality mixed emergent marsh (Andreas et. Al. 2004). Successful wetland quality improvement would be determined by an increase in ORAM scores from the preconstruction baseline of 38 (Category 1) to 60 (high Category 2). Lastly, the successful management of invasive vegetation would be best determined by an overall decrease of percent vegetative cover to less than 10 percent.

3. Monitoring Results

3.1. Floristic Quality Assessment Index (FQAI)

3.1.1. 2018 Pre-Construction Monitoring Results

In 2018, data collection to inform the calculation of an FQAI (to include invasive species percent cover estimation) and ORAM was conducted by Buffalo District biologists. Data collection for the FQAI occurred on all 13 transects originally included by the team for monitoring and included water depths in areas that were submerged at the time of surveying (Figure 2). Water depths were not recorded in surveys post construction and therefore has not been included within this report; however, the field datasheets in Appendix 1 include all data as collected by the team. All species observed during the FQAI are represented within Table 1, which also includes the average percentage of ground coverage by the species. Over the thirteen transects, 3-4 quadrats were sampled on each transect, with a total of 48 quadrats sampled over the entire site.

Table 3: Port Clinton 2018 FQAI Community Composition

Port Clinton FQAI 2018		
Species	Common Name	Average % Coverage by Species
<i>Schedonorus arundinaceus</i> (Previously <i>Lolium arundinaceum</i>)	Tall Fescue	19.38%
<i>Phragmites australis</i>	Common Reed	19.06%
<i>Lemna minor</i>	Common Duckweed	13.54%
<i>Digitaria sanguinalis</i>	Hairy Crabgrass	7.40%
<i>Lemna trisulca</i>	Star Duckweed	5.00%
<i>Lythrum salicaria</i>	Purple Loosestrife	3.29%
<i>Azolla caroliniana</i>	Carolina Mosquitofern	2.40%
<i>Plantago lanceolata</i>	English Plantain	1.46%
<i>Polygonum pennsylvanicum</i>	Pennsylvania Smartweed	1.35%
<i>Taraxacum officinale</i>	Common Dandelion	1.33%
<i>Glechoma hederacea</i>	Ground Ivy	1.15%
<i>Prunella Vulgaris</i>	Common Selfheal	1.04%
<i>Trifolium repens</i>	White Clover	0.94%
<i>Stuckenia pectinata</i>	Sago Pondweed	0.73%
<i>Symphyotrichum lateriflorum</i>	Calico Aster	0.73%
<i>Phalaris arundinacea</i>	Reed Canarygrass	0.73%
<i>Caslystegia sepium</i>	Hedge Bindweed	0.56%
<i>Bidens bipinnata</i>	Spanish Needles	0.52%
<i>Melilotus officinalis</i> (prev. <i>Melilotus alba</i>)	White Sweet Clover	0.50%
<i>Chenopodium album</i>	Lambsquarter	0.31%
Unknown	Unknown	0.31%
<i>Convolvulus arvensis</i>	Field Bindweed	0.21%
Unknown	Moss	0.13%
<i>Viola spp.</i>	Unknown Violet	0.10%
<i>Hydrocharis morsus</i>	European Frogbit	0.10%
<i>Typha spp.</i>	Cattail	0.10%
<i>Echinochloa crus</i>	Barnyard Grass	0.04%
<i>Polygonum amphibium</i>	Water Smartweed	0.02%

**Non-native species*

Prior to construction of the project, this area's species were primarily non-native such as tall fescue (*Schedonorus arundinaceus*), common reed, and hairy crabgrass (*Digitaria sanguinalis*). Non-native species made up 50 percent of the plant species identified within this survey, with only four of ten native species identified making up more than one percent of ground coverage within the quadrats. The wetland area was predominantly bordered by maintained lawn, which provided little to no significant habitat to wildlife in the area. Fish habitat within the wetland was also non-existent, as the wetland areas were described as shallow with a maximum water depth of <0.4 meters (Appendix 1, 2018 ORAM).

3.1.2. 2023 Monitoring Results

In 2023, data collection to inform the calculation of an FQAI (to include invasive species percent cover estimation) and ORAM was conducted by Buffalo District biologists. A total of 58 quadrats were sampled along project area, over 12 of the 13 original transects (Figure 4). Three to nine quadrats were surveyed along each transect, and were placed in areas that were representative of all habitat types along the transect. Data was not collected in areas where water was visibly deeper/turbid than would allow for plant growth.



Overall, establishment of herbaceous vegetation looked to be progressing well; however, most of the species present likely germinated from the seedbank, as only thirteen species that were a component of the seed mix, or installed as plugs were observed during surveys (Table 4). Many grass species observed could not be identified due to their immature status; this may also explain the low numbers of planted species observed.

Purple loosestrife (*Lythrum salicaria*), an aggressive invasive species, was present within the project area and occupied 4.69 percent of the average coverage within quadrats. This is a slight increase in ground coverage compared to 2018, but a 1.4 percent average cover increase may be due surveying techniques rather than in increase in the plant's presence. Surveys indicate that treatment of common reed and other invasive species has been successful at reducing the extent

of non-native species richness and coverage. The cover of these two species is significantly reduced from the pre-project condition. Though common reed was observed within the project area in 2023, its coverage had been greatly reduced to 0.29 percent.

Table 4: Port Clinton 2023 FQAI Community Composition

Port Clinton FQAI 2023		
Species	Common Name	Average % Coverage by Species
<i>Ceratophyllum demersum</i>	Coontail	14.31%
<i>Unknown</i>	Unknown Grass	6.48%
<i>Rumex maritimus</i>	Golden Dock	5.81%
<i>Stuckenia pectinata</i>	Sago Pondweed	5.60%
<i>Lythrum salicaria</i>	Purple Loosestrife	4.69%
<i>Schoenoplectus tabernaemontani</i>	Softstem Bulrush	4.60%
<i>Bidens cernua</i>	Nodding Beggartick	3.62%
<i>Eleocharis spp.</i>	Spikerush	3.03%
<i>Nelumbo lutea</i>	American Lotus	2.53%
<i>Butomus ubellatus</i>	Flowering Rush	2.38%
<i>Equisetum spp.</i>	Horsetail	2.07%
<i>Cirsium arvense</i>	Creeping Thistle	1.97%
<i>Nuphar lutea</i>	Spatterdock	1.81%
<i>Asteraceae spp.</i>	Goldenrods	1.72%
<i>Juncus effusus</i>	Smooth Bulrush	1.64%
<i>Sparganium spp.</i>	Bur-reed	1.50%
<i>Salix spp.</i>	Willow Sapling	1.47%
<i>Lemna spp.</i>	Duckweed	1.45%
<i>Potamogeton nodosus</i>	Longleaf Pondweed	1.41%
<i>Unknown</i>	Filamentous Algae	1.38%
<i>Bolboschoenus fluviatilis</i>	River Bulrush	1.29%
<i>Unknown</i>	Unknown Ground Moss	1.29%
<i>Amphicarpaea bracteata</i>	American Hogpeanut	1.21%
<i>Conzys canadensis</i>	Canadian Horseweed	1.12%
<i>Typha angustifolia</i>	Narrowleaf Cattail	1.03%
<i>Typha spp.</i>	Cattail	1.02%

**Non-native species*

Species with less than 1 percent coverage are not included in this table but can be found within appendix 2.

One issue not previously discussed or addressed by this project was the presence of carp within the restored wetlands. It is believed that the carp observed within the wetland are common carp (*Cyprinus carpio*), which are a non-native species known to inhabit warm slow-moving waters with high amounts of organic matter. It's believed that the carp first appeared during an event where Lake Erie directly connected to the wetlands after a storm event and became trapped. However, now that the carp are there they predominantly target and feed on the submerged and

emergent aquatic vegetation by uprooting the vegetation and increasing turbidity in the water. This is potentially directly leading to removal of vegetation planted as part of this project, but also indirectly making conditions less favorable for surviving aquatic plants by decreasing available light in deeper or more turbid wetland areas.

3.1.3. 2024 Monitoring Results

In 2024, data collection to inform the calculation of an FQAI (to include invasive species percent cover estimation) and ORAM was conducted by Buffalo District biologists. A total of 56 quadrats were sampled along project area, over 12 of the original 13 transects (Figure 5). Three to nine quadrats were surveyed along each transect, and were placed in areas that were representative of all habitat types along the transect. Data was not collected in areas where water was visibly deeper/turbid than would allow for plant growth.



Figure 5 : Location of the Port Clinton restoration monitoring area, with the locations of quadrats from the 2024 FQAI.

Overall, establishment of native herbaceous emergent vegetation and shrubs in the restored wetland was consistently successful and progressing well. Most quadrats surveyed had dense vegetation that provided a high percentage of ground cover even later in October when the survey was completed. Only quadrats placed in inundated or submerged areas presented ground coverage percentages <25 percent, but still contained established native submerged aquatic vegetation with some species that were previously planted as part of this project such as longleaf pondweed (*Potamogeton nodosus*). However, most of the species present in the wetland likely germinated from the seedbank, as only twelve species that were a component of the seed mix, or installed as livestakes, live fascines or plugs were observed during surveys (Table 5). Three species from the planting list were observed outside of surveys, but not included within the species counts. While the survey represented less of the planted species than were observed in 2023, of the species that were observed many included planted species not previously observed in 2023; this may indicate success in creating a diverse vegetative community, which may not be fully represented by the points collected. Many grass species observed could not be identified due to their senescence for fall; this may also explain the low numbers of planted species observed. It is important to note that it may be best in upcoming surveys to collect data earlier in the growing period, rather than later, and to potentially relocate transects to capture isolated or uncommon plants within the survey area.

The presence of invasive species such as purple loosestrife and common reed has remained minimal and appears to be affected and reduced by control methods in the area. Flowering rush (*Butomus ubellatus*) has continued to establish itself within the wetlands, though its presence was documented less in 2024 than 2023. It was noted during the survey that flowering rush appeared to be increasing coverage within the wetland compared to previous year, even though that is not directly supported or observed within the quadrats.

While not necessarily addressed by ORAM or FQAI, it was also noted and observed during the 2024 survey that the dune plantings appeared to be progressing well and expanding past their initial planted areas.

Table 5: Port Clinton 2024 FQAI Community Composition

Port Clinton FQAI 2024		
Species	Common Name	Average % Coverage by Species
<i>Rumex maritimus</i>	Golden Dock	11.79%
<i>Lemna minor</i>	Common Duckweed	6.25%
<i>Echinochloa muricata</i>	Barnyard Grass	6.18%
<i>Eleocharis erythropoda</i>	Bald Spikerush	5.05%
<i>Cyperus odoratus</i>	Fragrant Flatsedge	3.43%
<i>Typha spp.</i>	Cattail	3.09%
<i>Panicum virgatum</i>	Switchgrass	3.04%
<i>Lythrum salicaria</i>	Purple Loosestrife	2.04%
<i>Phragmites australis</i>	Common Reed	2.00%
<i>Bidens cernua</i>	Nodding Beggartick	1.77%
<i>Butomus ubellatus</i>	Flowering Rush	1.46%
<i>Carex comosa</i>	Longhair Sedge	1.43%
<i>Juncus effusus</i>	Smooth Bulrush	1.43%
<i>Unknown</i>	Unknown Grass	1.25%
<i>Setaria parviflora</i>	Bristle Grass or Knotroot Foxtail	1.07%
<i>Nuphar lutea</i>	Spatterdock	1.07%

**Non-native species*

Species with less than 1% coverage are not included in this table but can be found within appendix 2.

Common carp were spotted within the wetlands again, and it was noted that turbidity was so bad in some areas of the wetland that biologists were unable to observe submerged aquatic vegetation.

4. Conclusions

4.1.FQAI

The Floristic Quality Assessment Index (Andreas et. Al. 2004) was used to evaluate quality of the area based on the plant species present. Areas with a higher FQAI score are considered to be of higher quality than areas of lower FQAI. FQAI's were calculated using the following equation:

$$I = \sum(CC_i) / \sqrt{(N_{native})}$$

Where I equals the FQAI score, CC_i equals the coefficient of conservatism of plant species, and N_{native} equals the total number of native species occurring in the community being evaluated. This index is based on coefficients of conservation (C-scores) that are assigned to plants in a given region. A C-score of 0 indicates non-native taxa with a widened range of tolerance in

terms of environmental limits, with a score of 10 being a very specialized native plants, with narrow range of limits associated with only undisturbed habitats. C-scores in this assessment were based off the Ohio State preliminary C-score list (https://dam.assets.ohio.gov/image/upload/epa.ohio.gov/Portals/35/wetlands/Ohio_FQAI.pdf).

There are multiple variations of the FQAI equation above; however, the equation used in this report excludes non-native species and has been proven to be an excellent predictor of wetland degradation and intactness (Swink and Wilhelm 1979). Plants that could not be identified down to the species level of identification were not included in FQAI, unless it was determined that no species within that genus were documented in Ohio as being non-native. FQAI scores, as well as the sums of the coefficients of conservatism, are included within Table 5. Species specific coefficient of conservatism scores can be found within Appendix 2. Scores can be interpreted on a scale of 0 to 100, with 0 representing high degradation/human disturbance and 100 representing low degradation/human disturbance to the system.

In 2018, prior to construction, FQAI was calculated to be 6.324 (Table 7). This is representative of the vegetative community quality at that time, as it was observed that the average non-native ground coverage was 57.56 percent (Table 6). The area was highly degraded and noted as providing very little quality habitat for coastal species due to the near monoculture of common reed within many areas of the wetland. Species such as tall fescue and hairy crabgrass were able to thrive within the wetland expansion area which was maintained as lawn prior to construction. Native species richness was at its lowest recorded point, with only 10 native species identified. Meanwhile non-native species richness was at its highest with 14 non-native species identified (Table 6). Species richness does not include plants that could not be identified further than their genus, as in these cases it could not be confirmed if the observed individuals were native or non-native species.

In 2023, an FQAI score of 15.2035 was calculated (Table 7). Between 2018 and 2023, this was an increase in vegetative community quality of approximately 58 percent over the course of four years of construction. This change is apparent in the increase of native species observed within the quadrats versus non-native species observed (Table 6). In 2018, a ratio of native species to non-native species was observed at 10 to 14; however, that ratio improved within five years with an increase in native species and decrease in non-native species at a ratio of 27 to 10. It is deduced that this improvement is a direct result of restoration efforts to control invasive species while introducing native species and allowing for natural regeneration of the existing seedbank. Aside from species richness, this improvement is also reflected in the native and non-native species' average percent ground coverage (Table 6). Between 2018 and 2023, there was an increase of native coverage percentage by >24 percent and a decrease of non-native species ground coverage by >45 percent. During this time, ground cover of common reed (a species specifically targeted for removal by this project) decreased from 19.06 percent in 2018 to 0.29 percent in 2023. Although revegetation and invasive species removal efforts were still underway, it is obvious from the 2023 monitoring results that there was already a significant improvement to the quality of the vegetative community as evidenced by the FQAI and species richness/ground coverage calculations.

The 2024 monitoring was conducted five years after project construction began, and also marked

the final year of project construction. In 2024, an FQAI score of 17.5792 was calculated, an increase of 2.3757 (Table 7). This increase was likely due to an increase in native species richness which was observed between 2023 and 2024, as well as an increase in species with high coefficients of conservatism indicating a narrow range of habitat requirements (Tables 6 and 7). Since project initiation, the project site has seen an increase in vegetative community quality and decrease in invasive species coverage. This trend will likely continue as planted species further establish and the native seedbank continues to regenerate.

Table 6: Port Clinton FQAI Ground Cover and Species Richness

Port Clinton FQAI Ground Cover and Species Richness				
	Year	2018	2023	2024
Quadrants		48	58	56
Native Cover		24.23%	48.90%	53.75%
Non-Native Cover		57.56%	11.00%	6.73%
Native Species Richness		10	27	35
Non-Native Species Richness		14	10	10

Table 7: Port Clinton FQAI Results 2018-2024

Port Clinton Floristic Quality Assessment Index				
	Year	2018	2023	2024
Native Species Richness		10	27	35
Coefficient of Conservatism		20.00	79.00	104.00
FQAI		6.3245	15.2035	17.5792

While it is difficult to assess the success of the Port Clinton wetland restoration based on FQAI alone, relative quality can be compared by looking at similar habitats within Ohio. The Port Clinton Lakefront Preserve is classified as a mixed emergent freshwater wetland/marsh. Andreas et al., (2004) describes similar habitats that have been assessed using the FQAI procedure that range from “very disturbed mixed emergent marsh” to “good quality mixed emergent marsh” to “high quality mixed emergent marsh”; these previously assessed habitats can be used to compare the FQAI score of this project. The 2018, FQAI score of 6.3245 would correlate to that of a very disturbed mixed emergent marsh (FQAI score 6.6). However, post construction initiation in 2023 and 2024, the site’s FQAI scores of 15.2035 (2023) and 17.5792 (2024) rank the project somewhere between a good quality mixed emergent marsh (FQAI score 14.4) and a high-quality emergent marsh (FQAI score 19.6). of the Lakefront Preserve wetland is currently an example of a good quality mixed emergent marsh which is much greater use to wildlife and much closer to an undisturbed habitat than it was pre-construction; however, the site is not undisturbed or

pristine to the degree that which would be representative of high quality mixed emergent wetland marsh.

Though the project has not yet reached the performance criteria of high quality mixed emergent marsh at an FQAI score of 19.6, a significant improvement in the vegetative community quality has been achieved. An increased FQAI score since 2018 has been achieved and will likely continue through the five-year post-planting period with the continued control of invasive species. The incremental increase seen between 2023 and 2024 (FQAI increase of 2.3757) is similar to the estimated average annual increase between 2019 and 2023 (FQAI estimated average annual increase of 1.7758). If these increases were averaged over the five-year construction period it would be an increase in FQAI score of approximately 2.25 per year, which could, if continued, result in the achievement of the FQAI performance criteria goal of 19.6 by the end 2025.

4.2. Invasive Species Management

There has been a significant decrease in invasive species ground coverage in 2024 compared to the baseline coverage observed in 2018. Comparing the non-native ground coverage seen in 2018's FQAI survey (Table 6), which was recorded at 57.56 percent coverage, to 2023's FQAI survey at 11.0 percent coverage and 2024 at 6.73 percent coverage, there is a trend of decreasing invasive/non-native ground coverage. The performance objective of <10 percent coverage of invasive plant species has been met; however, continued maintenance will be required into perpetuity to meet this criteria into the future.

It is important to note the drastic decrease in presence of common reed within the project area. Common reed was previously observed in the project area making up 19.06 percent of ground coverage within quadrats in 2018. This was decreased to <1 percent in 2023, though the species has since seen an increase to 2.00 percent in 2024 (Figure 5).

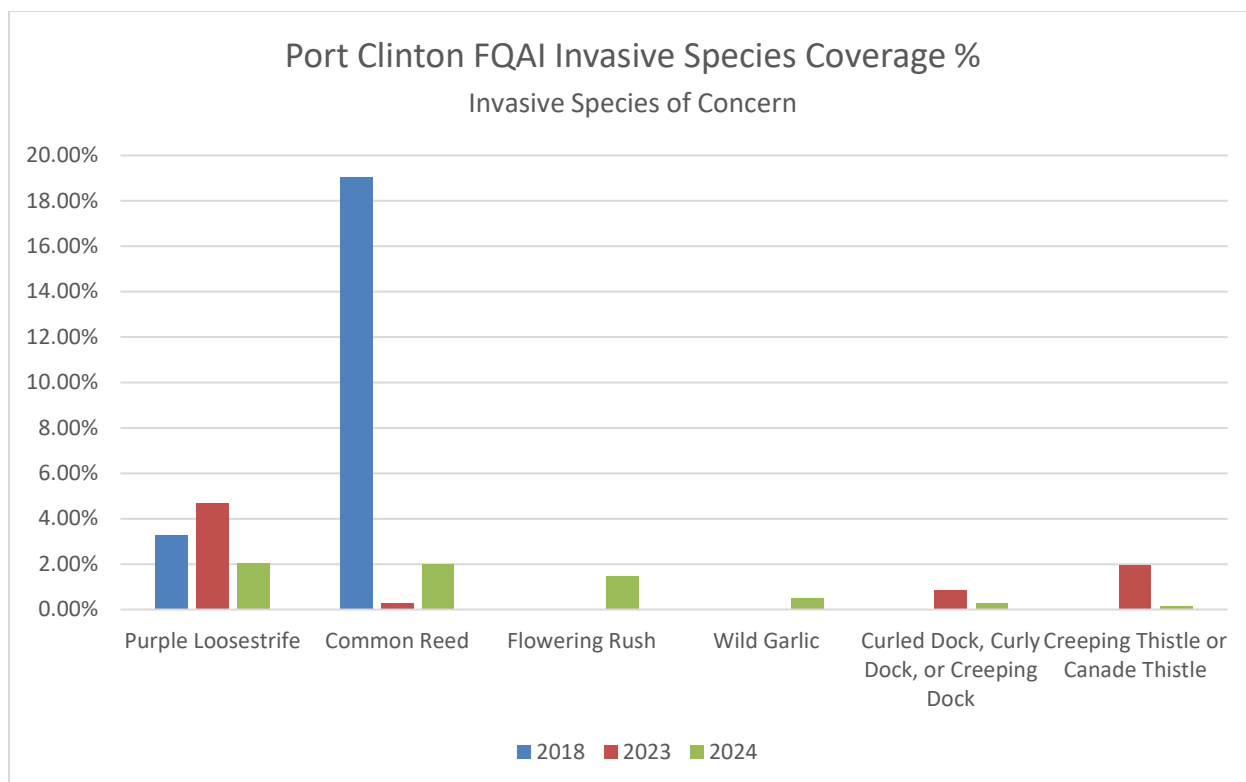


Figure 6: Port Clinton FQAI invasive species of concern ground coverage over the surveyed years (2018, 2023, and 2024).

4.3. ORAM

Successful wetland quality improvement would be determined by an increase in ORAM scores from the pre-construction baseline of 38 (Category 1) to 60 (high Category 2) an increase from the baseline score of 38 was observed in 2018, where the score increased to 39 (Table 8). However, if looking at the individually scored variables (Appendix 2, ORAM Final Scores), no significant changes can be seen within the scores and no construction had begun at this point in the project. This increase is seen from an increase in score to the habitat alteration metric, from a score of 6 in 2013 and a score of 7 in 2018, this may have been due to changes in the biologists scoring the ORAM or observations of minor improvements observed within the metric of substrate disturbance. Improvement to the wetland's ecological condition can be seen through the ORAM score of 2023, which immediately placed the project past the targeted score of 60.62 at a score of 71. Most variables saw an improvement within their scores but hydrology, habitat alteration and development, and plant communities saw the largest improvements. This is due to the project's focus on increasing the connectivity of the wetland, deepening but also increasing the complexity of the wetland, removal of disturbances such as mowing, and control/removal of invasive vegetation that dominated the wetlands. In 2024, there was further increase to the ORAM score (72), which can be attributed to the improvements to the wetlands plant communities through the development of scrub presence in the upland areas of the project area. The has project reached the goal of an improved ORAM score of 60.62; however, continued maintenance will be required into perpetuity to meet this criteria into the future.

Table 8: Port Clinton ORAM Results 2013-2024

Port Clinton Ohio Rapid Assessment Method for Wetlands				
Year	2013	2018	2023	2024
ORAM Score	38	39	71	72

Large carp were spotted by biologist swimming in both shallow and deeper areas of the wetlands during both the 2023 and 2024 surveys. This appearance in the varying water depths likely means their movement within the wetland is not likely limited to certain areas. Submerged and emergent aquatic vegetation was found with roots floating freely within the waterway in areas with high carp activity, likely pointing to the carp uprooting and disturbing vegetation planted or establishing within the wetlands. Further control methods may need to reduce carp within this wetland in order to prevent further degradation or slowing of vegetation establishment/progression.

4.4.Recommendations

Though monitoring for this project has not been completed, and will not be completed until 2029, the project has already reached or is close to reaching all success criteria set for this project. The minimum requirements for success have been reached in both invasive species management (<10% invasive species ground coverage) and ORAM scores (a score of 60.62). However, the success criteria for FQAI, a minimum score of 19.6, has not been reached yet; it is likely that the success criteria will be reached by 2026 if trends continue. The progress of this project appears to be trending in a positive direction as FQAI and ORAM scores continue to increase, and invasive species coverage decreases. One of the largest issues observed within the project area prior to construction was the high presence and domination of invasive species over native species. While this has been managed and is now reduced, it is still pertinent to maintain this control and prevent the previously observed domination within this area. If a trend of increasing invasive vegetation is observed during future monitoring, further invasive species management may be required. It may also be important to address carp populations within the project area, as the presence of the carp may hinder native species establishment while facilitating more aggressive invasive SAV or emergent vegetation such as flowering rush to establish and create a monoculture.

Monitoring will continue annually in 2025, 2026, 2027, and conclude in 2028. Changes to transect placement may be required to better capture the presence of less represented species, or to focus on areas with higher presence of emergent wetland plants while also avoiding areas that cannot be monitored with FQAI such as deep water. Efforts should also be taken by monitoring crews to observe and record species of importance or concern (specifically invasive species) outside of the quadrats, that may be missed by the survey efforts. Though the presence will not be considered in the FQAI, presence or absence of these species may affect future monitoring or management efforts.

Citations

- Andreas, Barbara K., John J. Mack, and James S. McCormac. 2004. Floristic Quality Assessment Index (FQAI) for vascular plants and mosses for the State of Ohio. Ohio Environmental Protection Agency, Division of Surface Water, Wetland Ecology Group, Columbus, Ohio. 219 p.
- Mack, John J. 2001. Ohio Rapid Assessment Method for Wetlands v. 5.0, User's Manual and Scoring Forms. Ohio EPA Technical Report WET/2001-1. Ohio Environmental Protection Agency, Division of Surface Water, 401/Wetland Ecology Unit, Columbus, Ohio.
- Swink, F. and G. Wilhelm 1979 Plants of the Chicago Region. Morton Arboretum, Lisle, Illinois. 922 p.

Appendix A Field Data Sheets

Site: <u>Wetland 1</u>	Rater(s): <u>E. Hannes Voorhees</u>	Date: <u>5/23/13</u>
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2	
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Metric 1. Wetland Area (size).

max 6 pts. subtotal

Select one size class and assign score.

- ☐ >50 acres (>20.2ha) (6 pts)
- ☐ 25 to <50 acres (10.1 to <20.2ha) (5 pts)
- ☐ 10 to <25 acres (4 to <10.1ha) (4 pts)
- ☐ 3 to <10 acres (1.2 to <4ha) (3 pts)
- ☒ 0.3 to <3 acres (0.12 to <1.2ha) (2pts)
- ☐ 0.1 to <0.3 acres (0.04 to <0.12ha) (1 pt)
- ☐ <0.1 acres (0.04ha) (0 pts)

7	
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Metric 2. Upland buffers and surrounding land use.

max 14 pts. subtotal

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- ☐ WIDE. Buffers average 50m (164ft) or more around wetland perimeter (7)
- ☒ MEDIUM. Buffers average 25m to <50m (82 to <164ft) around wetland perimeter (4)
- ☐ NARROW. Buffers average 10m to <25m (32ft to <82ft) around wetland perimeter (1)
- ☐ VERY NARROW. Buffers average <10m (<32ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- ☐ VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- ☐ LOW. Old field (>10 years), shrubland, young second growth forest. (5)
- ☒ MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field. (3)
- ☐ HIGH. Urban, industrial, open pasture, row cropping, mining, construction. (1)

23	
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Metric 3. Hydrology.

max 30 pts. subtotal

3a. Sources of Water. Score all that apply.

- ☐ High pH groundwater (5)
- ☐ Other groundwater (3)
- ☒ Precipitation (1)
- ☐ Seasonal/intermittent surface water (3)
- ☒ Perennial surface water (lake or stream) (5)

3c. Maximum water depth. Select only one and assign score.

- ☐ >0.7 (27.6in) (3)
- ☐ 0.4 to 0.7m (15.7 to 27.6in) (2)
- ☒ <0.4m (<15.7in) (1)

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- ☒ None or none apparent (12)
- ☐ Recovered (7)
- ☐ Recovering (3)
- ☐ Recent or no recovery (1)

3b. Connectivity. Score all that apply.

- ☐ 100 year floodplain (1)
- ☒ Between stream/lake and other human use (1)
- ☐ Part of wetland/upland (e.g. forest), complex (1)
- ☐ Part of riparian or upland corridor (1)

3d. Duration inundation/saturation. Score one or dbl check.

- ☐ Semi- to permanently inundated/saturated (4)
- ☒ Regularly inundated/saturated (3)
- ☐ Seasonally inundated (2)
- ☐ Seasonally saturated in upper 30cm (12in) (1)

Check all disturbances observed

- | | |
|---|---|
| ☐ ditch | ☐ point source (nonstormwater) |
| ☐ tile | ☐ filling/grading |
| ☐ dike | ☐ road bed/RR track |
| ☐ weir | ☐ dredging |
| ☐ stormwater input | ☐ other _____ |

10	
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Metric 4. Habitat Alteration and Development.

max 20 pts. subtotal

4a. Substrate disturbance. Score one or double check and average.

- ☒ None or none apparent (4)
- ☐ Recovered (3)
- ☐ Recovering (2)
- ☐ Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- ☐ Excellent (7)
- ☐ Very good (6)
- ☐ Good (5)
- ☐ Moderately good (4)
- ☒ Fair (3)
- ☐ Poor to fair (2)
- ☐ Poor (1)

4c. Habitat alteration. Score one or double check and average.

- ☐ None or none apparent (9)
- ☐ Recovered (6)
- ☒ Recovering (3)
- ☐ Recent or no recovery (1)

Check all disturbances observed

- | | |
|---|---|
| ☒ mowing | ☐ shrub/sapling removal |
| ☐ grazing | ☐ herbaceous/aquatic bed removal |
| ☐ clearcutting | ☐ sedimentation |
| ☐ selective cutting | ☐ dredging |
| ☐ woody debris removal | ☐ farming |
| ☐ toxic pollutants | ☐ nutrient enrichment |

2	
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subtotal this page

Site:	Rater(s):	Date:
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8

subtotal this page

	10
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max 10 pts.

subtotal

Metric 5. Special Wetlands.

Check all that apply and score as indicated.

- ☐ Bog (10)
- ☐ Fen (10)
- ☐ Old growth forest (10)
- ☐ Mature forested wetland (5)
- ☒ Lake Erie coastal/tributary wetland-unrestricted hydrology (10)
- ☐ Lake Erie coastal/tributary wetland-restricted hydrology (5)
- ☐ Lake Plain Sand Prairies (Oak Openings) (10)
- ☐ Relict Wet Praires (10)
- ☐ Known occurrence state/federal threatened or endangered species (10)
- ☐ Significant migratory songbird/water fowl habitat or usage (10)
- ☐ Category 1 Wetland. See Question 1 Qualitative Rating (-10)

	-2
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max 20 pts.

subtotal

Metric 6. Plant communities, interspersions, microtopography.

6a. Wetland Vegetation Communities.

Score all present using 0 to 3 scale.

- ☐ Aquatic bed
- ☒ Emergent (1)
- ☐ Shrub
- ☐ Forest
- ☐ Mudflats
- ☐ Open water
- ☐ Other _____

6b. horizontal (plan view) Interspersion.

Select only one.

- ☐ High (5)
- ☐ Moderately high(4)
- ☐ Moderate (3)
- ☒ Moderately low (2)
- ☐ Low (1)
- ☐ None (0)

6c. Coverage of invasive plants. Refer to Table 1 ORAM long form for list. Add or deduct points for coverage

- ☒ Extensive >75% cover (-5)
- ☐ Moderate 25-75% cover (-3)
- ☐ Sparse 5-25% cover (-1)
- ☐ Nearly absent <5% cover (0)
- ☐ Absent (1)

6d. Microtopography.

Score all present using 0 to 3 scale.

- ☒ Vegetated hummocks/tussucks
- ☒ Coarse woody debris >15cm (6in)
- ☒ Standing dead >25cm (10in) dbh
- ☒ Amphibian breeding pools

Vegetation Community Cover Scale

0	Absent or comprises <0.1ha (0.2471 acres) contiguous area
1	Present and either comprises small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2	Present and either comprises significant part of wetland's vegetation and is of moderate quality or comprises a small part and is of high quality
3	Present and comprises significant part, or more, of wetland's vegetation and is of high quality

Narrative Description of Vegetation Quality

low	Low spp diversity and/or predominance of nonnative or disturbance tolerant native species
mod	Native spp are dominant component of the vegetation, although nonnative and/or disturbance tolerant native spp can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare threatened or endangered spp
high	A predominance of native species, with nonnative spp and/or disturbance tolerant native spp absent or virtually absent, and high spp diversity and often, but not always, the presence of rare, threatened, or endangered spp

Mudflat and Open Water Class Quality

0	Absent <0.1ha (0.247 acres)
1	Low 0.1 to <1ha (0.247 to 2.47 acres)
2	Moderate 1 to <4ha (2.47 to 9.88 acres)
3	High 4ha (9.88 acres) or more

Microtopography Cover Scale

0	Absent
1	Present very small amounts or if more common of marginal quality
2	Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3	Present in moderate or greater amounts and of highest quality

50

GRAND TOTAL(max 100 pts)

Site: <u>Wetland 2</u>	Rater(s): <u>E. Hennes, Voorhees</u>	Date: <u>5/23/13</u>
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max 6 pts.	3	Metric 1. Wetland Area (size).
		subtotal

Select one size class and assign score.

- ☐ >50 acres (>20.2ha) (6 pts)
- ☐ 25 to <50 acres (10.1 to <20.2ha) (5 pts)
- ☐ 10 to <25 acres (4 to <10.1ha) (4 pts)
- ☒ 3 to <10 acres (1.2 to <4ha) (3 pts)
- ☐ 0.3 to <3 acres (0.12 to <1.2ha) (2pts)
- ☐ 0.1 to <0.3 acres (0.04 to <0.12ha) (1 pt)
- ☐ <0.1 acres (0.04ha) (0 pts)

max 14 pts.	4	Metric 2. Upland buffers and surrounding land use.
		subtotal

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- ☐ WIDE. Buffers average 50m (164ft) or more around wetland perimeter (7)
- ☐ MEDIUM. Buffers average 25m to <50m (82 to <164ft) around wetland perimeter (4)
- ☒ NARROW. Buffers average 10m to <25m (32ft to <82ft) around wetland perimeter (1)
- ☐ VERY NARROW. Buffers average <10m (<32ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- ☐ VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- ☐ LOW. Old field (>10 years), shrub land, young second growth forest. (5)
- ☒ MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field. (3)
- ☐ HIGH. Urban, industrial, open pasture, row cropping, mining, construction. (1)

max 30 pts.	9	Metric 3. Hydrology.
		subtotal

3a. Sources of Water. Score all that apply.

- ☐ High pH groundwater (5)
- ☒ Other groundwater (3)
- ☒ Precipitation (1)
- ☐ Seasonal/intermittent surface water (3)
- ☐ Perennial surface water (lake or stream) (5)

3c. Maximum water depth. Select only one and assign score.

- ☐ >0.7 (27.6in) (3)
- ☐ 0.4 to 0.7m (15.7 to 27.6in) (2)
- ☒ <0.4m (<15.7in) (1)

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- ☐ None or none apparent (12)
- ☐ Recovered (7)
- ☒ Recovering (3)
- ☐ Recent or no recovery (1)

Check all disturbances observed

- ☐ ditch
- ☐ tile
- ☐ dike
- ☐ weir
- ☒ stormwater input

3b. Connectivity. Score all that apply.

- ☐ 100 year floodplain (1)
- ☒ Between stream/lake and other human use (1)
- ☐ Part of wetland/upland (e.g. forest), complex (1)
- ☐ Part of riparian or upland corridor (1)

3d. Duration inundation/saturation. Score one or dbl check.

- ☐ Semi- to permanently inundated/saturated (4)
- ☐ Regularly inundated/saturated (3)
- ☒ Seasonally inundated (2)
- ☐ Seasonally saturated in upper 30cm (12in) (1)

max 20 pts.	6	Metric 4. Habitat Alteration and Development.
		subtotal

4a. Substrate disturbance. Score one or double check and average.

- ☐ None or none apparent (4)
- ☒ Recovered (3)
- ☐ Recovering (2)
- ☐ Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- ☐ Excellent (7)
- ☐ Very good (6)
- ☐ Good (5)
- ☐ Moderately good (4)
- ☐ Fair (3)
- ☒ Poor to fair (2)
- ☐ Poor (1)

4c. Habitat alteration. Score one or double check and average.

- ☐ None or none apparent (9)
- ☐ Recovered (6)
- ☐ Recovering (3)
- ☒ Recent or no recovery (1)

Check all disturbances observed

- ☒ mowing
- ☐ grazing
- ☐ clearcutting
- ☒ selective cutting
- ☐ woody debris removal
- ☐ toxic pollutants
- ☐ shrub/sapling removal
- ☐ herbaceous/aquatic bed removal
- ☐ sedimentation
- ☐ dredging
- ☐ farming
- ☐ nutrient enrichment

22
subtotal this page

Site:	Rater(s):	Date:
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22

subtotal first page

	5
max 10 pts.	subtotal

Metric 5. Special Wetlands.

Check all that apply and score as indicated.

- ☐ Bog (10)
- ☐ Fen (10)
- ☐ Old growth forest (10)
- ☐ Mature forested wetland (5)
- ☐ Lake Erie coastal/tributary wetland-unrestricted hydrology (10)
- ☒ Lake Erie coastal/tributary wetland-restricted hydrology (5)
- ☐ Lake Plain Sand Prairies (Oak Openings) (10)
- ☐ Relict Wet Prairies (10)
- ☐ Known occurrence state/federal threatened or endangered species (10)
- ☐ Significant migratory songbird/water fowl habitat or usage (10)
- ☐ Category 1 Wetland. See Question 1 Qualitative Rating (-10)

	-1
max 20 pts.	subtotal

Metric 6. Plant communities, interspersions, microtopography.

6a. Wetland Vegetation Communities.

Score all present using 0 to 3 scale.

- ☐ Aquatic bed
- ☒ Emergent (1)
- ☐ Shrub
- ☐ Forest
- ☐ Mudflats
- ☐ Open water
- ☐ Other

6b. horizontal (plan view) Interspersion.

Select only one.

- ☐ High (5)
- ☐ Moderately high(4)
- ☐ Moderate (3)
- ☒ Moderately low (2)
- ☐ Low (1)
- ☐ None (0)

6c. Coverage of invasive plants. Refer to Table 1 ORAM long form for list. Add or deduct points for coverage

- ☒ Extensive >75% cover (-5)
- ☐ Moderate 25-75% cover (-3)
- ☐ Sparse 5-25% cover (-1)
- ☐ Nearly absent <5% cover (0)
- ☐ Absent (1)

6d. Microtopography.

Score all present using 0 to 3 scale.

- (1) ☒ Vegetated hummocks/tussucks
- ☐ Coarse woody debris >15cm (6in)
- ☐ Standing dead >25cm (10in) dbh
- ☐ Amphibian breeding pools

Vegetation Community Cover Scale

0	Absent or comprises <0.1ha (0.2471 acres) contiguous-area
1	Present and either comprises small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2	Present and either comprises significant part of wetland's vegetation and is of moderate quality or comprises a small part and is of high quality
3	Present and comprises significant part, or more, of wetland's vegetation and is of high quality

Narrative Description of Vegetation Quality

low	Low spp diversity and/or predominance of nonnative or disturbance tolerant native species
mod.	Native spp are dominant component of the vegetation, although nonnative and/or disturbance tolerant native spp can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare threatened or endangered spp
high	A predominance of native species, with nonnative spp and/or disturbance tolerant native spp absent or virtually absent, and high spp diversity and often, but not always, the presence of rare, threatened, or endangered spp

Mudflat and Open Water Class Quality

0	Absent <0.1ha (0.247 acres)
1	Low 0.1 to <1ha (0.247 to 2.47 acres)
2	Moderate 1 to <4ha (2.47 to 9.88 acres)
3	High 4ha (9.88 acres) or more

Microtopography Cover Scale

0	Absent
1	Present very small amounts or if more common of marginal quality
2	Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3	Present in moderate or greater amounts and of highest quality

26

End of Quantitative Rating. Complete Categorization Worksheets.

Site: WETLAND 1	Rater(s): K BULLER, C. CARDUS	Date: Oct 2, 2018
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2	
max 6 pts.	subtotal

Metric 1. Wetland Area (size).

Select one size class and assign score.

- ☐ >50 acres (>20.2ha) (6 pts)
- ☐ 25 to <50 acres (10.1 to <20.2ha) (5 pts)
- ☐ 10 to <25 acres (4 to <10.1ha) (4 pts)
- ☐ 3 to <10 acres (1.2 to <4ha) (3 pts)
- ☒ 0.3 to <3 acres (0.12 to <1.2ha) (2pts)
- ☐ 0.1 to <0.3 acres (0.04 to <0.12ha) (1 pt)
- ☐ <0.1 acres (0.04ha) (0 pts)

10	
max 14 pts.	subtotal

Metric 2. Upland buffers and surrounding land use.

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- ☒ WIDE. Buffers average 50m (164ft) or more around wetland perimeter (7)
- ☐ MEDIUM. Buffers average 25m to <50m (82 to <164ft) around wetland perimeter (4)
- ☐ NARROW. Buffers average 10m to <25m (32ft to <82ft) around wetland perimeter (1)
- ☐ VERY NARROW. Buffers average <10m (<32ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- ☐ VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- ☐ LOW. Old field (>10 years), shrubland, young second growth forest. (5)
- ☒ MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field. (3)
- ☐ HIGH. Urban, industrial, open pasture, row cropping, mining, construction. (1)

23	
max 30 pts.	subtotal

Metric 3. Hydrology.

3a. Sources of Water. Score all that apply.

- ☐ High pH groundwater (5)
- ☒ Other groundwater (3)
- ☒ Precipitation (1)
- ☒ Seasonal/Intermittent surface water (3)
- ☐ Perennial surface water (lake or stream) (5)

3c. Maximum water depth. Select only one and assign score.

- ☐ >0.7 (27.6in) (3)
- ☐ 0.4 to 0.7m (15.7 to 27.6in) (2)
- ☒ <0.4m (<15.7in) (1)

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- ☒ None or none apparent (12)
- ☐ Recovered (7)
- ☐ Recovering (3)
- ☐ Recent or no recovery (1)

3b. Connectivity. Score all that apply.

- ☒ 100 year floodplain (1)
- ☒ Between stream/lake and other human use (1)
- ☐ Part of wetland/upland (e.g. forest), complex (1)
- ☐ Part of riparian or upland corridor (1)

3d. Duration inundation/saturation. Score one or dbl check.

- ☐ Semi- to permanently inundated/saturated (4)
- ☐ Regularly inundated/saturated (3)
- ☐ Seasonally inundated (2)
- ☒ Seasonally saturated in upper 30cm (12in) (1)

Check all disturbances observed

- | | |
|---|---|
| ☐ ditch | ☐ point source (nonstormwater) |
| ☐ tile | ☐ filling/grading |
| ☐ dike | ☐ road bed/RR track |
| ☐ weir | ☐ dredging |
| ☐ stormwater input | ☐ other _____ |

4	
max 20 pts.	subtotal

Metric 4. Habitat Alteration and Development.

4a. Substrate disturbance. Score one or double check and average.

- ☐ None or none apparent (4)
- ☐ Recovered (3)
- ☐ Recovering (2)
- ☒ Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- ☐ Excellent (7)
- ☐ Very good (6)
- ☐ Good (5)
- ☐ Moderately good (4)
- ☐ Fair (3)
- ☒ Poor to fair (2)
- ☐ Poor (1)

4c. Habitat alteration. Score one or double check and average.

- ☐ None or none apparent (9)
- ☐ Recovered (6)
- ☐ Recovering (3)
- ☒ Recent or no recovery (1)

Check all disturbances observed

- | | |
|---|---|
| ☒ mowing | ☐ shrub/sapling removal |
| ☐ grazing | ☐ herbaceous/aquatic bed removal |
| ☐ clearcutting | ☐ sedimentation |
| ☐ selective cutting | ☐ dredging |
| ☐ woody debris removal | ☐ farming |
| ☐ toxic pollutants | ☐ nutrient enrichment |

39
subtotal this page

Site: <u>WETLAND 1</u>	Rater(s): <u>K. Buckler, C. Cordus</u>	Date: <u>2 Oct 2018</u>
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8

subtotal this page

10	
max 10 pts.	subtotal

Metric 5. Special Wetlands.

Check all that apply and score as indicated.

- ☐ Bog (10)
- ☐ Fen (10)
- ☐ Old growth forest (10)
- ☐ Mature forested wetland (5)
- ☒ Lake Erie coastal/tributary wetland-unrestricted hydrology (10)
- ☐ Lake Erie coastal/tributary wetland-restricted hydrology (5)
- ☐ Lake Plain Sand Prairies (Oak Openings) (10)
- ☐ Relict Wet Praires (10)
- ☐ Known occurrence state/federal threatened or endangered species (10)
- ☐ Significant migratory songbird/water fowl habitat or usage (10)
- ☐ Category 1 Wetland. See Question 1 Qualitative Rating (-10)

-2	
max 20 pts.	subtotal

Metric 6. Plant communities, interspersions, microtopography.

6a. Wetland Vegetation Communities.

Score all present using 0 to 3 scale.

- ☐ Aquatic bed
- ☒ Emergent
- ☐ Shrub
- ☐ Forest
- ☐ Mudflats
- ☐ Open water
- ☐ Other _____

6b. horizontal (plan view) Interspersion.

Select only one.

- ☐ High (5)
- ☐ Moderately high(4)
- ☐ Moderate (3)
- ☐ Moderately low (2)
- ☒ Low (1)
- ☐ None (0)

6c. Coverage of invasive plants. Refer to Table 1 ORAM long form for list. Add or deduct points for coverage

- ☒ Extensive >75% cover (-5)
- ☐ Moderate 25-75% cover (-3)
- ☐ Sparse 5-25% cover (-1)
- ☐ Nearly absent <5% cover (0)
- ☐ Absent (1)

6d. Microtopography.

Score all present using 0 to 3 scale.

- ☒ Vegetated hummocks/tussocks
- ☐ Coarse woody debris >15cm (6in)
- ☐ Standing dead >25cm (10in) dbh
- ☐ Amphibian breeding pools

Vegetation Community Cover Scale

0	Absent or comprises <0.1ha (0.2471 acres) contiguous area
1	Present and either comprises small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2	Present and either comprises significant part of wetland's vegetation and is of moderate quality or comprises a small part and is of high quality
3	Present and comprises significant part, or more, of wetland's vegetation and is of high quality

Narrative Description of Vegetation Quality

low	Low spp diversity and/or predominance of nonnative or disturbance tolerant native species
mod	Native spp are dominant component of the vegetation, although nonnative and/or disturbance tolerant native spp can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare threatened or endangered spp
high	A predominance of native species, with nonnative spp and/or disturbance tolerant native spp absent or virtually absent, and high spp diversity and often, but not always, the presence of rare, threatened, or endangered spp

Mudflat and Open Water Class Quality

0	Absent <0.1ha (0.247 acres)
1	Low 0.1 to <1ha (0.247 to 2.47 acres)
2	Moderate 1 to <4ha (2.47 to 9.88 acres)
3	High 4ha (9.88 acres) or more

Microtopography Cover Scale

0	Absent
1	Present very small amounts or if more common of marginal quality
2	Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3	Present in moderate or greater amounts and of highest quality

47	GRAND TOTAL(max 100 pts)
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Site: <u>WETLAND 2</u>	Rater(s): <u>K. Becker C. Cardus</u>	Date: <u>2 Oct 2018</u>
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3	
max 6 pts.	subtotal

Metric 1. Wetland Area (size).

Select one size class and assign score.

- ☐ >50 acres (>20.2ha) (6 pts)
- ☐ 25 to <50 acres (10.1 to <20.2ha) (5 pts)
- ☐ 10 to <25 acres (4 to <10.1ha) (4 pts)
- ☒ 3 to <10 acres (1.2 to <4ha) (3 pts)
- ☐ 0.3 to <3 acres (0.12 to <1.2ha) (2pts)
- ☐ 0.1 to <0.3 acres (0.04 to <0.12ha) (1 pt)
- ☐ <0.1 acres (0.04ha) (0 pts)

7	
max 14 pts.	subtotal

Metric 2. Upland buffers and surrounding land use.

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- ☐ WIDE. Buffers average 50m (164ft) or more around wetland perimeter (7)
- ☒ MEDIUM. Buffers average 25m to <50m (82 to <164ft) around wetland perimeter (4)
- ☐ NARROW. Buffers average 10m to <25m (32ft to <82ft) around wetland perimeter (1)
- ☐ VERY NARROW. Buffers average <10m (<32ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- ☐ VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- ☐ LOW. Old field (>10 years), shrubland, young second growth forest. (5)
- ☒ MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field. (3)
- ☐ HIGH. Urban, industrial, open pasture, row cropping, mining, construction. (1)

21	
max 30 pts.	subtotal

Metric 3. Hydrology.

3a. Sources of Water. Score all that apply.

- ☐ High pH groundwater (5)
- ☒ Other groundwater (3)
- ☒ Precipitation (1)
- ☐ Seasonal/Intermittent surface water (3)
- ☐ Perennial surface water (lake or stream) (5)

3c. Maximum water depth. Select only one and assign score.

- ☐ >0.7 (27.6in) (3)
- ☒ 0.4 to 0.7m (15.7 to 27.6in) (2)
- ☐ <0.4m (<15.7in) (1)

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- ☒ None or none apparent (12)
- ☐ Recovered (7)
- ☐ Recovering (3)
- ☐ Recent or no recovery (1)

3b. Connectivity. Score all that apply.

- ☒ 100 year floodplain (1)
- ☐ Between stream/lake and other human use (1)
- ☐ Part of wetland/upland (e.g. forest), complex (1)
- ☐ Part of riparian or upland corridor (1)

3d. Duration inundation/saturation. Score one or dbl check.

- ☐ Semi- to permanently inundated/saturated (4)
- ☐ Regularly inundated/saturated (3)
- ☒ Seasonally inundated (2)
- ☐ Seasonally saturated in upper 30cm (12in) (1)

Check all disturbances observed	
☐ ditch ☐ tile ☐ dike ☐ weir ☐ stormwater input	☐ point source (nonstormwater) ☐ filling/grading ☐ road bed/RR track ☐ dredging ☐ other _____

7	
max 20 pts.	subtotal

Metric 4. Habitat Alteration and Development.

4a. Substrate disturbance. Score one or double check and average.

- ☒ None or none apparent (4)
- ☐ Recovered (3)
- ☐ Recovering (2)
- ☐ Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- ☐ Excellent (7)
- ☐ Very good (6)
- ☐ Good (5)
- ☐ Moderately good (4)
- ☐ Fair (3)
- ☒ Poor to fair (2)
- ☐ Poor (1)

4c. Habitat alteration. Score one or double check and average.

- ☐ None or none apparent (9)
- ☐ Recovered (6)
- ☐ Recovering (3)
- ☒ Recent or no recovery (1)

Check all disturbances observed	
☒ mowing ☐ grazing ☐ clearcutting ☐ selective cutting ☐ woody debris removal ☐ toxic pollutants	☐ shrub/sapling removal ☐ herbaceous/aquatic bed removal ☐ sedimentation ☐ dredging ☐ farming ☐ nutrient enrichment

38
subtotal this page

Site:	Rater(s):	Date:
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3

subtotal this page

5	
max 10 pts.	subtotal

Metric 5. Special Wetlands.

Check all that apply and score as indicated.

- ☐ Bog (10)
- ☐ Fen (10)
- ☐ Old growth forest (10)
- ☐ Mature forested wetland (5)
- ☐ Lake Erie coastal/tributary wetland-unrestricted hydrology (10)
- ☒ Lake Erie coastal/tributary wetland-restricted hydrology (5)
- ☐ Lake Plain Sand Prairies (Oak Openings) (10)
- ☐ Relict Wet Prairies (10)
- ☐ Known occurrence state/federal threatened or endangered species (10)
- ☐ Significant migratory songbird/water fowl habitat or usage (10)
- ☐ Category 1 Wetland. See Question 1 Qualitative Rating (-10)

-2	
max 20 pts.	subtotal

Metric 6. Plant communities, interspersions, microtopography.

6a. Wetland Vegetation Communities.

Score all present using 0 to 3 scale.

- ☐ Aquatic bed
- ☒ Emergent
- ☐ Shrub
- ☐ Forest
- ☐ Mudflats
- ☐ Open water
- ☐ Other _____

6b. horizontal (plan view) Interspersion.

Select only one.

- ☐ High (5)
- ☐ Moderately high(4)
- ☐ Moderate (3)
- ☐ Moderately low (2)
- ☒ Low (1)
- ☐ None (0)

6c. Coverage of invasive plants. Refer to Table 1 ORAM long form for list. Add or deduct points for coverage

- ☒ Extensive >75% cover (-5)
- ☐ Moderate 25-75% cover (-3)
- ☐ Sparse 5-25% cover (-1)
- ☐ Nearly absent <5% cover (0)
- ☐ Absent (1)

6d. Microtopography.

Score all present using 0 to 3 scale.

- ☐ Vegetated hummocks/tussocks
- ☒ Coarse woody debris >15cm (6in)
- ☐ Standing dead >25cm (10in) dbh
- ☐ Amphibian breeding pools

Vegetation Community Cover Scale

0	Absent or comprises <0.1ha (0.2471 acres) contiguous area
1	Present and either comprises small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2	Present and either comprises significant part of wetland's vegetation and is of moderate quality or comprises a small part and is of high quality
3	Present and comprises significant part, or more, of wetland's vegetation and is of high quality

Narrative Description of Vegetation Quality

low	Low spp diversity and/or predominance of nonnative or disturbance tolerant native species
mod	Native spp are dominant component of the vegetation, although nonnative and/or disturbance tolerant native spp can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare threatened or endangered spp
high	A predominance of native species, with nonnative spp and/or disturbance tolerant native spp absent or virtually absent, and high spp diversity and often, but not always, the presence of rare, threatened, or endangered spp

Mudflat and Open Water Class Quality

0	Absent <0.1ha (0.247 acres)
1	Low 0.1 to <1ha (0.247 to 2.47 acres)
2	Moderate 1 to <4ha (2.47 to 9.88 acres)
3	High 4ha (9.88 acres) or more

Microtopography Cover Scale

0	Absent
1	Present very small amounts or if more common of marginal quality
2	Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3	Present in moderate or greater amounts and of highest quality

41

GRAND TOTAL(max 100 pts)

Site: Holland 2 Rater(s): KB, CC, EH Date: June 29, 2023

3	
max 6 pts.	subtotal

Metric 1. Wetland Area (size).

Select one size class and assign score.

- ☐ >50 acres (>20.2ha) (6 pts)
- ☐ 25 to <50 acres (10.1 to <20.2ha) (5 pts)
- ☐ 10 to <25 acres (4 to <10.1ha) (4 pts)
- ☒ 3 to <10 acres (1.2 to <4ha) (3 pts)
- ☐ 0.3 to <3 acres (0.12 to <1.2ha) (2pts)
- ☐ 0.1 to <0.3 acres (0.04 to <0.12ha) (1 pt)
- ☐ <0.1 acres (0.04ha) (0 pts)

7	
max 14 pts.	subtotal

Metric 2. Upland buffers and surrounding land use.

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- ☐ WIDE. Buffers average 50m (164ft) or more around wetland perimeter (7)
- ☒ MEDIUM. Buffers average 25m to <50m (82 to <164ft) around wetland perimeter (4)
- ☐ NARROW. Buffers average 10m to <25m (32ft to <82ft) around wetland perimeter (1)
- ☐ VERY NARROW. Buffers average <10m (<32ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- ☐ VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- ☒ LOW. Old field (>10 years), shrub land, young second growth forest. (5)
- ☐ MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field. (3)
- ☐ HIGH. Urban, industrial, open pasture, row cropping, mining, construction. (1)

30	
max 30 pts.	subtotal

Metric 3. Hydrology.

3a. Sources of Water. Score all that apply.

- ☒ High pH groundwater (5)
- ☒ Other groundwater (3)
- ☒ Precipitation (1)
- ☒ Seasonal/Intermittent surface water (3)
- ☒ Perennial surface water (lake or stream) (5)

3c. Maximum water depth. Select only one and assign score.

- ☐ >0.7 (27.6in) (3)
- ☒ 0.4 to 0.7m (15.7 to 27.6in) (2)
- ☐ <0.4m (<15.7in) (1)

3b. Connectivity. Score all that apply.

- ☒ 100 year floodplain (1)
- ☒ Between stream/lake and other human use (1)
- ☒ Part of wetland/upland (e.g. forest), complex (1)
- ☐ Part of riparian or upland corridor (1)

3d. Duration inundation/saturation. Score one or dbl check.

- ☒ Semi- to permanently inundated/saturated (4)
- ☐ Regularly inundated/saturated (3)
- ☐ Seasonally inundated (2)
- ☐ Seasonally saturated in upper 30cm (12in) (1)

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- ☒ None or none apparent (12)
- ☐ Recovered (7)
- ☐ Recovering (3)
- ☐ Recent or no recovery (1)

Check all disturbances observed	
☐ ditch ☐ tile ☐ dike ☐ weir ☐ stormwater input	☐ point source (nonstormwater) ☐ filling/grading ☐ road bed/RR track ☐ dredging ☐ other _____

12	
max 20 pts.	subtotal

Metric 4. Habitat Alteration and Development.

4a. Substrate disturbance. Score one or double check and average.

- ☒ None or none apparent (4)
- ☐ Recovered (3)
- ☐ Recovering (2)
- ☐ Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- ☐ Excellent (7)
- ☐ Very good (6)
- ☒ Good (5)
- ☐ Moderately good (4)
- ☐ Fair (3)
- ☐ Poor to fair (2)
- ☐ Poor (1)

4c. Habitat alteration. Score one or double check and average.

- ☐ None or none apparent (9)
- ☐ Recovered (6)
- ☒ Recovering (3)
- ☐ Recent or no recovery (1)

Check all disturbances observed	
☒ mowing ☒ grazing <u>CARP</u> ☐ clearcutting ☐ selective cutting ☐ woody debris removal ☐ toxic pollutants	☐ shrub/sapling removal ☐ herbaceous/aquatic bed removal ☐ sedimentation ☐ dredging ☐ farming ☐ nutrient enrichment

52

subtotal this page

last revised 1 February 2001 jjm

Site:	Rater(s):	Date:
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52

subtotal first page

10

62

max 10 pts.

subtotal

Metric 5. Special Wetlands.

Check all that apply and score as indicated.

- ☐ Bog (10)
- ☐ Fen (10)
- ☐ Old growth forest (10)
- ☐ Mature forested wetland (5)
- ☒ Lake Erie coastal/tributary wetland-unrestricted hydrology (10)
- ☐ Lake Erie coastal/tributary wetland-restricted hydrology (5)
- ☐ Lake Plain Sand Prairies (Oak Openings) (10)
- ☐ Relict Wet Prairies (10)
- ☐ Known occurrence state/federal threatened or endangered species (10)
- ☐ Significant migratory songbird/water fowl habitat or usage (10)
- ☐ Category 1 Wetland. See Question 1 Qualitative Rating (-10)

9

71

max 20 pts.

subtotal

Metric 6. Plant communities, interspersions, microtopography.

6a. Wetland Vegetation Communities.

Score all present using 0 to 3 scale.

- ☒ Aquatic bed 1
- ☒ Emergent 2
- ☐ Shrub
- ☐ Forest
- ☐ Mudflats
- ☒ Open water 1
- ☐ Other

6b. horizontal (plan view) Interspersion.

Select only one.

- ☒ High (5)
- ☐ Moderately high(4)
- ☐ Moderate (3)
- ☐ Moderately low (2)
- ☐ Low (1)
- ☐ None (0)

6c. Coverage of invasive plants. Refer to Table 1 ORAM long form for list. Add or deduct points for coverage

- ☐ Extensive >75% cover (-5)
- ☐ Moderate 25-75% cover (-3)
- ☒ Sparse 5-25% cover (-1)
- ☐ Nearly absent <5% cover (0)
- ☐ Absent (1)

6d. Microtopography.

Score all present using 0 to 3 scale.

- ☐ Vegetated hummocks/tussocks
- ☒ Coarse woody debris >15cm (6in)
- ☐ Standing dead >25cm (10in) dbh
- ☐ Amphibian breeding pools

Vegetation Community Cover Scale

0	Absent or comprises <0.1ha (0.2471 acres) contiguous area
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low	Low spp diversity and/or predominance of nonnative or disturbance tolerant native species
mod	Native spp are dominant component of the vegetation, although nonnative and/or disturbance tolerant native spp can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare threatened or endangered spp
high	A predominance of native species, with nonnative spp and/or disturbance tolerant native spp absent or virtually absent, and high spp diversity and often, but not always, the presence of rare, threatened, or endangered spp

Mudflat and Open Water Class Quality

0	Absent <0.1ha (0.247 acres)
1	Low 0.1 to <1ha (0.247 to 2.47 acres)
2	Moderate 1 to <4ha (2.47 to 9.88 acres)
3	High 4ha (9.88 acres) or more

Microtopography Cover Scale

0	Absent
1	Present very small amounts or if more common of marginal quality
2	Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3	Present in moderate or greater amounts and of highest quality

Estimating about 10% invasive spp coverage over entire pool area.

71

End of Quantitative Rating. Complete Categorization Worksheets.

ORAM Summary Worksheet

		circle answer or insert score	Result
Narrative Rating	Question 1. Critical Habitat	YES NO	If yes, Category 3.
	Question 2. Threatened or Endangered Species	YES NO	If yes, Category 3.
	Question 3. High Quality Natural Wetland	YES NO	If yes, Category 3.
	Question 4. Significant bird habitat	YES NO	If yes, Category 3.
	Question 5. Category 1 Wetlands	YES NO	If yes, Category 1.
	Question 6. Bogs	YES NO	If yes, Category 3.
	Question 7. Fens	YES NO	If yes, Category 3.
	Question 8a. Old Growth Forest	YES NO	If yes, Category 3.
	Question 8b. Mature Forested Wetland	YES NO	If yes, evaluate for Category 3; may also be 1 or 2.
	Question 9b. Lake Erie Wetlands - Restricted	YES NO	If yes, evaluate for Category 3; may also be 1 or 2.
	Question 9d. Lake Erie Wetlands - Unrestricted with native plants	YES NO	If yes, Category 3
	Question 9e. Lake Erie Wetlands - Unrestricted with invasive plants	YES NO	If yes, evaluate for Category 3; may also be 1 or 2.
	Question 10. Oak Openings	YES NO	If yes, Category 3
Question 11. Relict Wet Prairies	YES NO	If yes, evaluate for Category 3; may also be 1 or 2.	
Quantitative Rating	Metric 1. Size	3	
	Metric 2. Buffers and surrounding land use	7	
	Metric 3. Hydrology	30	
	Metric 4. Habitat	12	
	Metric 5. Special Wetland Communities	10	
	Metric 6. Plant communities, interspersion, microtopography	9	
	TOTAL SCORE	71	Category based on score breakpoints

Complete Wetland Categorization Worksheet.

Wetland Categorization Worksheet

Choices	Circle one		Evaluation of Categorization Result of ORAM
Did you answer "Yes" to any of the following questions: Narrative Rating Nos. 2, 3, 4, 6, 7, 8a, 9d, 10	YES Wetland is categorized as a Category 3 wetland	NO	Is quantitative rating score <i>less</i> than the Category 2 scoring threshold (<i>excluding</i> gray zone)? If yes, reevaluate the category of the wetland using the narrative criteria in OAC Rule 3745-1-54(C) and biological and/or functional assessments to determine if the wetland has been over-categorized by the ORAM
Did you answer "Yes" to any of the following questions: Narrative Rating Nos. 1, 8b, 9b, 9c, 11	YES Wetland should be evaluated for possible Category 3 status	NO	Evaluate the wetland using the 1) narrative criteria in OAC Rule 3745-1-54(C) and 2) the quantitative rating score. If the wetland is determined to be a Category 3 wetland using either of these, it should be categorized as a Category 3 wetland. Detailed biological and/or functional assessments may also be used to determine the wetland's category.
Did you answer "Yes" to Narrative Rating No. 5	YES Wetland is categorized as a Category 1 wetland	NO	Is quantitative rating score <i>greater</i> than the Category 2 scoring threshold (<i>including</i> any gray zone)? If yes, reevaluate the category of the wetland using the narrative criteria in OAC Rule 3745-1-54(C) and biological and/or functional assessments to determine if the wetland has been under-categorized by the ORAM
Does the quantitative score fall within the scoring range of a Category 1, 2, or 3 wetland?	YES Wetland is assigned to the appropriate category based on the scoring range	NO	If the score of the wetland is located within the scoring range for a particular category, the wetland should be assigned to that category. In all instances however, the narrative criteria described in OAC Rule 3745-1-54(C) can be used to clarify or change a categorization based on a quantitative score.
Does the quantitative score fall with the "gray zone" for Category 1 or 2 or Category 2 or 3 wetlands?	YES Wetland is assigned to the higher of the two categories or assigned to a category based on detailed assessments and the narrative criteria	NO	Rater has the option of assigning the wetland to the higher of the two categories or to assign a category based on the results of a nonrapid wetland assessment method, e.g. functional assessment, biological assessment, etc, and a consideration of the narrative criteria in OAC rule 3745-1-54(C).
Does the wetland otherwise exhibit <i>moderate OR superior</i> hydrologic OR habitat, OR recreational functions AND the wetland was <i>not</i> categorized as a Category 2 wetland (in the case of moderate functions) or a Category 3 wetland (in the case of superior functions) by this method?	YES Wetland was undercategorized by this method. A written justification for recategorization should be provided on Background Information Form	NO Wetland is assigned to category as determined by the ORAM.	A wetland may be undercategorized using this method, but still exhibit one or more superior functions, e.g. a wetland's biotic communities may be degraded by human activities, but the wetland may still exhibit superior hydrologic functions because of its type, landscape position, size, local or regional significance, etc. In this circumstance, the narrative criteria in OAC Rule 3745-1-54(C)(2) and (3) are controlling, and the under-categorization should be corrected. A written justification with supporting reasons or information for this determination should be provided.

Final Category

Choose one	Category 1	Category 2	Category 3
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End of Ohio Rapid Assessment Method for Wetlands.

Site: <u>PC Wetland 2</u>	Rater(s): <u>EH, CC, EB</u>	Date: <u>10/17/24</u>
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<u>3</u>	
max 6 pts.	subtotal

Metric 1. Wetland Area (size).

Select one size class and assign score.

- ☐ >50 acres (>20.2ha) (6 pts)
- ☐ 25 to <50 acres (10.1 to <20.2ha) (5 pts)
- ☐ 10 to <25 acres (4 to <10.1ha) (4 pts)
- ☒ 3 to <10 acres (1.2 to <4ha) (3 pts)
- ☐ 0.3 to <3 acres (0.12 to <1.2ha) (2pts)
- ☐ 0.1 to <0.3 acres (0.04 to <0.12ha) (1 pt)
- ☐ <0.1 acres (0.04ha) (0 pts)

<u>47</u>	
max 14 pts.	subtotal

Metric 2. Upland buffers and surrounding land use.

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- ☐ WIDE. Buffers average 50m (164ft) or more around wetland perimeter (7)
- ☒ MEDIUM. Buffers average 25m to <50m (82 to <164ft) around wetland perimeter (4)
- ☐ NARROW. Buffers average 10m to <25m (32ft to <82ft) around wetland perimeter (1)
- ☐ VERY NARROW. Buffers average <10m (<32ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- ☐ VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- ☐ LOW. Old field (>10 years), shrub land, young second growth forest. (5)
- ☒ MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field. (3)
- ☐ HIGH. Urban, industrial, open pasture, row cropping, mining, construction. (1)

<u>30</u>	
max 30 pts.	subtotal

Metric 3. Hydrology.

3a. Sources of Water. Score all that apply.

- ☐ High pH groundwater (5)
- ☒ Other groundwater (3)
- ☒ Precipitation (1)
- ☐ Seasonal/Intermittent surface water (3)
- ☒ Perennial surface water (lake or stream) (5)

3c. Maximum water depth. Select only one and assign score.

- ☐ >0.7 (27.6in) (3)
- ☒ 0.4 to 0.7m (15.7 to 27.6in) (2)
- ☐ <0.4m (<15.7in) (1)

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- ☒ None or none apparent (12)
- ☐ Recovered (7)
- ☐ Recovering (3)
- ☐ Recent or no recovery (1)

3b. Connectivity. Score all that apply.

- ☒ 100 year floodplain (1)
- ☒ Between stream/lake and other human use (1)
- ☒ Part of wetland/upland (e.g. forest), complex (1)
- ☐ Part of riparian or upland corridor (1)

3d. Duration inundation/saturation. Score one or dbl check.

- ☒ Semi- to permanently inundated/saturated (4)
- ☐ Regularly inundated/saturated (3)
- ☐ Seasonally inundated (2)
- ☐ Seasonally saturated in upper 30cm (12in) (1)

Check all disturbances observed	
☐ ditch ☐ tile ☐ dike ☐ weir ☐ stormwater input	☐ point source (nonstormwater) ☐ filling/grading ☐ road bed/RR track ☐ dredging ☐ other _____

<u>12</u>	
max 20 pts.	subtotal

Metric 4. Habitat Alteration and Development.

4a. Substrate disturbance. Score one or double check and average.

- ☒ None or none apparent (4)
- ☐ Recovered (3)
- ☐ Recovering (2)
- ☐ Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- ☐ Excellent (7)
- ☐ Very good (6)
- ☒ Good (5)
- ☐ Moderately good (4)
- ☐ Fair (3)
- ☐ Poor to fair (2)
- ☐ Poor (1)

4c. Habitat alteration. Score one or double check and average.

- ☐ None or none apparent (9)
- ☐ Recovered (6)
- ☒ Recovering (3)
- ☐ Recent or no recovery (1)

Check all disturbances observed	
☒ mowing ☒ grazing ☐ clearcutting ☐ selective cutting ☐ woody debris removal ☐ toxic pollutants	☐ shrub/sapling removal ☐ herbaceous/aquatic bed removal ☐ sedimentation ☐ dredging ☐ farming ☐ nutrient enrichment

<u>52</u>
subtotal this page

last revised 1 February 2001 jjm

Site:	Rater(s):	Date:
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52

subtotal first page

10	62
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max 10 pts. subtotal

Metric 5. Special Wetlands.

Check all that apply and score as indicated.

- ☐ Bog (10)
- ☐ Fen (10)
- ☐ Old growth forest (10)
- ☐ Mature forested wetland (5)
- ☒ Lake Erie coastal/tributary wetland-unrestricted hydrology (10)
- ☐ Lake Erie coastal/tributary wetland-restricted hydrology (5)
- ☐ Lake Plain Sand Prairies (Oak Openings) (10)
- ☐ Relict Wet Prairies (10)
- ☐ Known occurrence state/federal threatened or endangered species (10)
- ☐ Significant migratory songbird/water fowl habitat or usage (10)
- ☐ Category 1 Wetland. See Question 1 Qualitative Rating (-10)

10	72
----	----

max 20 pts. subtotal

Metric 6. Plant communities, interspersions, microtopography.

6a. Wetland Vegetation Communities.

Score all present using 0 to 3 scale.

- ☒ Aquatic bed 1
- ☒ Emergent 2
- ☒ Shrub 1
- ☐ Forest
- ☐ Mudflats
- ☒ Open water 1
- ☐ Other _____

6b. horizontal (plan view) Interspersion.

Select only one.

- ☒ High (5)
- ☐ Moderately high(4)
- ☐ Moderate (3)
- ☐ Moderately low (2)
- ☐ Low (1)
- ☐ None (0)

6c. Coverage of invasive plants. Refer to Table 1 ORAM long form for list. Add or deduct points for coverage

- ☐ Extensive >75% cover (-5)
- ☐ Moderate 25-75% cover (-3)
- ☒ Sparse 5-25% cover (-1)
- ☐ Nearly absent <5% cover (0)
- ☐ Absent (1)

6d. Microtopography.

Score all present using 0 to 3 scale.

- ☐ Vegetated hummocks/tussocks
- ☒ Coarse woody debris >15cm (6in)
- ☐ Standing dead >25cm (10in) dbh
- ☐ Amphibian breeding pools

Vegetation Community Cover Scale

0	Absent or comprises <0.1ha (0.2471 acres) contiguous area
1	Present and either comprises small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2	Present and either comprises significant part of wetland's vegetation and is of moderate quality or comprises a small part and is of high quality
3	Present and comprises significant part, or more, of wetland's vegetation and is of high quality

Narrative Description of Vegetation Quality

low	Low spp diversity and/or predominance of nonnative or disturbance tolerant native species
mod	Native spp are dominant component of the vegetation, although nonnative and/or disturbance tolerant native spp can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare threatened or endangered spp
high	A predominance of native species, with nonnative spp and/or disturbance tolerant native spp absent or virtually absent, and high spp diversity and often, but not always, the presence of rare, threatened, or endangered spp

Mudflat and Open Water Class Quality

0	Absent <0.1ha (0.247 acres)
1	Low 0.1 to <1ha (0.247 to 2.47 acres)
2	Moderate 1 to <4ha (2.47 to 9.88 acres)
3	High 4ha (9.88 acres) or more

Microtopography Cover Scale

0	Absent
1	Present very small amounts or if more common of marginal quality
2	Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3	Present in moderate or greater amounts and of highest quality

72

End of Quantitative Rating. Complete Categorization Worksheets.

ORAM Summary Worksheet

		circle answer or insert score	Result
Narrative Rating	Question 1. Critical Habitat	YES NO	If yes, Category 3.
	Question 2. Threatened or Endangered Species	YES NO	If yes, Category 3.
	Question 3. High Quality Natural Wetland	YES NO	If yes, Category 3.
	Question 4. Significant bird habitat	YES NO	If yes, Category 3.
	Question 5. Category 1 Wetlands	YES NO	If yes, Category 1.
	Question 6. Bogs	YES NO	If yes, Category 3.
	Question 7. Fens	YES NO	If yes, Category 3.
	Question 8a. Old Growth Forest	YES NO	If yes, Category 3.
	Question 8b. Mature Forested Wetland	YES NO	If yes, evaluate for Category 3; may also be 1 or 2.
	Question 9b. Lake Erie Wetlands - Restricted	YES NO	If yes, evaluate for Category 3; may also be 1 or 2.
	Question 9d. Lake Erie Wetlands – Unrestricted with native plants	YES NO	If yes, Category 3
	Question 9e. Lake Erie Wetlands - Unrestricted with invasive plants	YES NO	If yes, evaluate for Category 3; may also be 1 or 2.
	Question 10. Oak Openings	YES NO	If yes, Category 3
Question 11. Relict Wet Prairies	YES NO	If yes, evaluate for Category 3; may also be 1 or 2.	
Quantitative Rating	Metric 1. Size	3	
	Metric 2. Buffers and surrounding land use	7	
	Metric 3. Hydrology	30	
	Metric 4. Habitat	12	
	Metric 5. Special Wetland Communities	10	
	Metric 6. Plant communities, interspersion, microtopography	10	
	TOTAL SCORE	72	Category based on score breakpoints

Complete Wetland Categorization Worksheet.

Wetland Categorization Worksheet

Choices	Circle one		Evaluation of Categorization Result of ORAM
Did you answer "Yes" to any of the following questions: Narrative Rating Nos. 2, 3, 4, 6, 7, 8a, 9d, 10	YES Wetland is categorized as a Category 3 wetland	NO	Is quantitative rating score <i>less</i> than the Category 2 scoring threshold (<i>excluding</i> gray zone)? If yes, reevaluate the category of the wetland using the narrative criteria in OAC Rule 3745-1-54(C) and biological and/or functional assessments to determine if the wetland has been over-categorized by the ORAM
Did you answer "Yes" to any of the following questions: Narrative Rating Nos. 1, 8b, 9b, 9e, 11	YES Wetland should be evaluated for possible Category 3 status	NO	Evaluate the wetland using the 1) narrative criteria in OAC Rule 3745-1-54(C) and 2) the quantitative rating score. If the wetland is determined to be a Category 3 wetland using either of these, it should be categorized as a Category 3 wetland. Detailed biological and/or functional assessments may also be used to determine the wetland's category.
Did you answer "Yes" to Narrative Rating No. 5	YES Wetland is categorized as a Category 1 wetland	NO	Is quantitative rating score <i>greater</i> than the Category 2 scoring threshold (<i>including</i> any gray zone)? If yes, reevaluate the category of the wetland using the narrative criteria in OAC Rule 3745-1-54(C) and biological and/or functional assessments to determine if the wetland has been under-categorized by the ORAM
Does the quantitative score fall within the scoring range of a Category 1, 2, or 3 wetland?	YES Wetland is assigned to the appropriate category based on the scoring range	NO	If the score of the wetland is located within the scoring range for a particular category, the wetland should be assigned to that category. In all instances however, the narrative criteria described in OAC Rule 3745-1-54(C) can be used to clarify or change a categorization based on a quantitative score.
Does the quantitative score fall with the "gray zone" for Category 1 or 2 or Category 2 or 3 wetlands?	YES Wetland is assigned to the higher of the two categories or assigned to a category based on detailed assessments and the narrative criteria	NO	Rater has the option of assigning the wetland to the higher of the two categories or to assign a category based on the results of a nonrapid wetland assessment method, e.g. functional assessment, biological assessment, etc, and a consideration of the narrative criteria in OAC rule 3745-1-54(C).
Does the wetland otherwise exhibit <i>moderate</i> OR <i>superior</i> hydrologic OR habitat, OR recreational functions AND the wetland was <i>not</i> categorized as a Category 2 wetland (in the case of moderate functions) or a Category 3 wetland (in the case of superior functions) by this method?	YES Wetland was undercategorized by this method. A written justification for recategorization should be provided on Background Information Form	NO Wetland is assigned to category as determined by the ORAM.	A wetland may be undercategorized using this method, but still exhibit one or more superior functions, e.g. a wetland's biotic communities may be degraded by human activities, but the wetland may still exhibit superior hydrologic functions because of its type, landscape position, size, local or regional significance, etc. In this circumstance, the narrative criteria in OAC Rule 3745-1-54(C)(2) and (3) are controlling, and the under-categorization should be corrected. A written justification with supporting reasons or information for this determination should be provided.

Final Category

Choose one	Category 1	Category 2	Category 3
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End of Ohio Rapid Assessment Method for Wetlands.

Note :- Carp activity still causing turbid conditions

- Limited open water viewing to ID submerged species
- Flowering Rush increasing coverage in new wetland
- Duckplantings doing well!

"Invasive species coverage 15 to 20% total.

Appendix B Excel Data Sheets

Coefficient of Conservatism=	20.00
Number of Native Species=	10
Index=	6.32455532

[illegible]

Coefficient of Conservatism ^a	103.00
Number of Native Species ^a	20
Index ^a	17.49857760

Port Clinton FQAI 2018		
Species	Common Name	Average % Coverage by Species
<i>Schedonorus arundinaceus</i> (Previously <i>Lolium arundinaceum</i>)	Tall Fescue	19.38%
<i>Poaegrum canadense</i>	Common Reed	18.80%
<i>Lemna minor</i>	Common Duckweed	13.54%
<i>Digitaria sanguinalis</i>	Hairy Galbanum	7.40%
<i>Lemna trisulca</i>	Star Duckweed	5.00%
<i>Lythrum salicaria</i>	Purple Loosestrife	3.39%
<i>Asella caroliniana</i>	Carolina Moundflower	2.40%
<i>Plantago lanceolata</i>	English Plantain	1.40%
<i>Polygonum pennsylvanicum</i>	Pennsylvanian Smartweed	1.35%
<i>Taraxacum officinale</i>	Common Dandelion	1.33%
<i>Glechoma hederacea</i>	Ground Ivy	1.15%
<i>Plantago Virginica</i>	Common Selfheal	1.04%
<i>Trifolium repens</i>	White Clover	0.94%
<i>Suaeda pectinata</i>	Sage Pondweed	0.73%
<i>Symphoricarion latifolium</i>	Calico Aster	0.73%
<i>Phalaris arundinacea</i>	Reed Canarygrass	0.72%
<i>Caulostegia repens</i>	Hedge Bindweed	0.56%
<i>Bidens bipinnata</i>	Spanish Needles	0.52%
<i>Melilotus officinalis</i> (prev. <i>Melilotus alba</i>)	White Sweet Clover	0.50%
<i>Chenopodium album</i>	Lambquarters	0.31%
<i>Urtica</i>	Unknown	0.31%
<i>Convolvulus arvensis</i>	Field Bindweed	0.21%
<i>Urtica</i>	Moss	0.13%
<i>Viola</i> spp.	Unknown Violet	0.10%
<i>Hydracharia morosa</i>	European Frogbit	0.10%
<i>Typha</i> spp.	Cattail	0.10%
<i>Echinochloa crus</i>	Barnyard Grass	0.04%
<i>Polygonum amphibium</i>	Water Smartweed	0.02%

*Non-native species

Port Clinton FQAI 2023		
Species	Common Name	Average % Coverage by Species
<i>Ceratophyllum demersum</i>	Cornell	14.31%
<i>Urtica</i>	Unknown Grass	6.48%
<i>Rumex maritimus</i>	Golden Dock	5.81%
<i>Stuckenia pectinata</i>	Sage Pondweed	5.60%
<i>Lythrum salicaria</i>	Purple Loosestrife	4.60%
<i>Scheuchzeria palustrum</i>	Softstem Bulrush	4.60%
<i>Bidens cernua</i>	Nodding Beggarick	3.62%
<i>Glechoma</i> spp.	Spharish	3.01%
<i>Najas</i> spp.	American Lotus	2.53%
<i>Bidens cernua</i>	Flowering Rush	2.58%
<i>Equisetum</i> spp.	Horsetail	2.07%
<i>Cirsium arvense</i>	Creeping Thistle or Canada Thistle	1.97%
<i>Najas</i> spp.	Spotteddock	1.81%
<i>Urtica</i> spp.	Goldenrods	1.72%
<i>Juncus effusus</i>	Soft Rush or Common Rush or Smooth Bulrush	1.64%
<i>Sagittaria</i> spp.	Blue-stem	1.50%
<i>Salix</i> spp.	Willow Sapling	1.47%
<i>Lemna</i> spp.	Duckweed	1.45%
<i>Potamogeton nodosus</i>	Longleaf Pondweed	1.41%
<i>Urtica</i>	Flattened Algae	1.38%
<i>Bolboschoenus flavifolius</i>	River Bulrush	1.29%
<i>Urtica</i>	Unknown Ground Moss	1.29%
<i>Amphicarpus bracteatus</i>	American Hogweed	1.21%
<i>Carex canadensis</i>	Canadian Horeweed	1.12%
<i>Typha angustifolia</i>	Narrowleaf Cattail	1.03%
<i>Typha</i> spp.	Cattail	1.02%
<i>Verberna hastata</i>	Blue Vervain or Swamp Verbena	0.98%
<i>Fabaceae</i> spp.	Chlor	0.86%
<i>Rumex crispus</i>	Curled Dock, Curly Dock, or Creeping Dock	0.86%
<i>Epilobium</i> spp.	Willowbush	0.69%
<i>Juncus compressus</i>	Roundleaf Rush	0.60%
<i>Calamagrostis canadensis</i>	Blue Joint Grass	0.43%
<i>Scheuchzeria palustris</i>	Hardstem Bulrush	0.36%
<i>Ricciocarpus natans</i>	Fringed Liverwort or Fringed Heartwort	0.34%
<i>Potamogeton nodosus</i>	Pickersbush	0.33%
<i>Urtica</i> spp.	Common Reed	0.29%
<i>Polygonum amphibium</i>	Water Smartweed	0.29%
<i>Phalaris</i> spp.	Canarygrass (Phalaris)	0.26%
<i>Ranunculus repens</i>	Creeping Crowfoot or Creeping Buttercup (Listed on survey as "Buttercup")	0.26%
<i>Scirpus atrovirens</i>	Green Bulrush	0.19%
<i>Populus deltoides</i>	Eastern Cottonwood	0.19%
<i>Salix nigra</i>	Black Willow	0.17%
<i>Urtica subcordatum</i>	American Water Plantain	0.14%
<i>Rorippa ciliolata</i>	Creeping Yellowcress	0.10%
<i>Carex comosa</i>	Longhair Sedge	0.09%
<i>Melilotus officinalis</i> (prev. <i>Melilotus alba</i>)	White Sweet Clover	0.09%
<i>Sagittaria cuneata</i>	Aroundleaf Arrowhead	0.09%
<i>Lepidium</i> spp.	Peppercress	0.07%
<i>Acer rubrum</i>	Red Maple	0.02%
<i>Lycopus</i> spp.	Bugleweed	0.02%
<i>Phalaris arundinacea</i>	Reed Canarygrass	0.02%
<i>Trifolium repens</i> spp.	Mayweed	0.02%

*Non-native species

Port Clinton FQAI 2024		
Species	Common Name	Average % Coverage by Species
<i>Rumex maritimus</i>	Golden Dock	11.79%
<i>Lemna minor</i>	Common Duckweed	6.25%
<i>Echinochloa muricata</i>	Barnyard Grass	6.18%
<i>Elychuris erythropoda</i>	Bald Spikeweed (Listed on survey as "Bald Rush")	5.05%
<i>Cyperus odoratus</i>	Fragrant Flatsedge	3.43%
<i>Typha</i> spp.	Cattail	3.09%
<i>Panicum virgatum</i>	Switchgrass	3.04%
<i>Lythrum salicaria</i>	Purple Loosestrife	2.04%
<i>Phragmites australis</i>	Common Reed	2.00%
<i>Bidens cernua</i>	Nodding Beggarick	1.77%
<i>Bidens cernua</i>	Flowering Rush	1.46%
<i>Carex comosa</i>	Longhair Sedge	1.43%
<i>Juncus effusus</i>	Soft Rush or Common Rush or Smooth Bulrush	1.43%
<i>Urtica</i>	Unknown Grass	1.25%
<i>Scirpus perfoliatus</i>	Bristle Grass or Knotroot Foxtail	1.07%
<i>Najas</i> spp.	Spotteddock	1.07%
<i>Ceratophyllum demersum</i>	Cornell	0.93%
<i>Salicornia depressa</i>	Picklesweed or Virginia Gussowort	0.91%
<i>Scheuchzeria palustris</i>	Softstem Bulrush	0.80%
<i>Polygonum amphibium</i>	Water Smartweed	0.52%
<i>Urtica</i>	Wild Garlic	0.50%
<i>Verberna hastata</i>	Blue Vervain or Swamp Verbena	0.45%
<i>Strophostyles helvola</i>	Trailing Furry Bean (Listed on survey as "Wild Bean")	0.39%
<i>Cyperus erythrorhizus</i>	Redroot Flatsedge	0.36%
<i>Sagittaria cuneata</i>	Aroundleaf Arrowhead	0.30%
<i>Asteraceae</i> spp.	Goldenrods	0.27%
<i>Scheuchzeria palustris</i>	Common Threesquare (Bulrush)	0.27%
<i>Acorus calamus</i>	Sweetflag Iris	0.27%
<i>Lycopus americanus</i>	American Water Horehound	0.27%
<i>Rumex crispus</i>	Curled Dock or Curly Dock	0.27%
<i>Ricciocarpus natans</i>	Fringed Liverwort or Fringed Heartwort	0.20%
<i>Sagittaria latifolia</i>	Broadleaf Arrowhead	0.20%
<i>Cirsium arvense</i>	Creeping Thistle or Canada Thistle	0.18%
<i>Cyperus bipartitus</i>	Shining Flatsedge or Slender Flatsedge	0.11%
<i>Galatris orbiculatus</i>	Oriental Bittersweet	0.09%
<i>Urtica</i> spp.	Swamp Rosemallow	0.09%
<i>Urtica</i> spp.	American Lotus	0.09%
<i>Polygonum lapathifolium</i>	Pale Smartweed or Curlytop Knotweed	0.09%
<i>Populus deltoides</i>	Eastern Cottonwood	0.09%
<i>Rosa multiflora</i>	Multiflora Rose	0.09%
<i>Symphoricarion panicum</i>	Bristly Aster (Listed on survey as "Aster")	0.09%
<i>Urtica strumarium</i>	Rough Cocklebur	0.09%
<i>Cenchrus ciliaris</i>	Common Foxtail Plantain	0.07%
<i>Bolboschoenus flavifolius</i>	River Bulrush	0.04%
<i>Juncus torreyi</i>	Torrey's Rush	0.04%
<i>Ranunculus repens</i>	Creeping Crowfoot (Listed on survey as "Common Water Crowfoot")	0.04%
<i>Acer</i> spp.	Maple Sapling	0.02%
<i>Cyperus</i> spp.	Flatsedge	0.02%
<i>Equisetum</i> spp.	Pine Bane	0.02%
<i>Lactuca scariola</i>	Prickly Lettuce	0.02%
<i>Pickera glabella</i>	Butterweed	0.02%

*Non-native species

Port Clinton FQAI Ground Cover and Species Richness				
	Year	2018	2023	2024
Quadrants		48	58	56
Native Cover		24.23%	48.90%	53.75%
Non-Native Cover		57.56%	11.00%	6.73%
Native Species Richness		10	27	35
Non-Native Species Richness		14	10	10

Port Clinton Floristic Quality Assessment Index				
	Year	2018	2023	2024
Native Species Richness		10	27	35
Coefficient of Conservation		20.00	79.00	103.00
FQAI		6.32455532	15.20355709	17.4101776

Port Clinton Ohio Rapid Assessment Method for Wetlands

Year	2013	2018	2023	2024
ORAM Score	28.99	35.53	71	72

Year	2013	2018	2023	2024
Wetland Area	3	3	3	3
Upland Buffers and Surrounding Land Use	4	4	7	7
Hydrology	21	21	30	30
Habitat Alteration and Development	6	7	12	12
Special Wetlands	5	5	10	10
Plant Communities	-1	-1	9	10
ORAM Score	38	39	71	72

Appendix C Site Photos



Photograph 1: Pre-construction photo of Phragmites infestation within the existing wetland (looking south towards East Perry Street) (2013)



Photograph 2: Pre-construction photo of Phragmites infestation along the beach between Lake Erie and the existing wetland (looking east from Waterworks Park) (2013)



Photograph 3: Pre-construction photo of Phragmites infestation within the existing wetland (looking east from Waterworks Park) (2013)



Photograph 4: Pre-construction photo of Phragmites infestation within the existing wetland (2018)



Photograph 5: Construction photo within the existing wetland (looking west towards East Perry Street and Waterworks Park) (2019).



Photograph 6: Construction photo within the existing wetland (looking west towards Waterworks Park) (2019).



Photograph 7: Construction photo within the existing wetland (looking west towards Waterworks Park) (2019).



Photograph 8: Construction photo within the wetland extension (looking west towards the existing wetland and Waterworks Park) (2020).



Photograph 9: Post-construction invasive species treatment (looking east from Waterworks Park) (2022).



Photograph 10: Post-construction planting of native vegetation (looking east from Waterworks Park) (2022).



Photograph 11: Post-construction planting of native vegetation (looking west towards East Perry Street and Waterworks Park) (2022).



Photograph 12: Post-construction planting of native dune vegetation (looking south towards East Perry Street) (2022)



Photograph 13: Post-construction (looking east from Waterworks Park) (2023).



Photograph 14: Post-construction (looking north from East Perry Street) (2023).



Photograph 15: Post-construction (looking east from Waterworks Park) (2023).



Photograph 16: Post-construction (looking north from East Perry Street) (2024).



Photograph 17: Post-construction USACE biologist conducting FQAI survey using quadrats (2024).



Photograph 18: Post-construction planted dunes (Looking east from Lake Erie Shoreline) (2024).



Photograph 19: Post-construction (Looking south-southeast from Lake Erie shoreline) (2024).