

Shepherd's Corner - Site Survey and Site History

Final Report

Draft: 3/30/2023

SP23 ENR 4900.01

Megan Barnes, Aaron Giganti, Cade Capper, Rachael Funk

1. Project Products

a.) *Site History* (PDF to be printed for distribution at Ecology Center -- screenshot of product)



**Shepherd's
Corner Ecology
Center**

**Restored Wetland
Site History**



**Want to learn more about
the Shepherd's Corner
Wetlands?**



SCAN ME

[https://shepherds corner.org/
category/wetland-2023/](https://shepherds corner.org/category/wetland-2023/)



LAND USE HISTORY



1985: Seven years before the founding of Shepherd's Corner, the majority of the area was dominated by row-crop agriculture.



2002: Ten years after the founding of Shepherd's Corner, the surrounding land was beginning to shift towards residential and industrial use.



2022: The majority of the land surrounding Shepherd's Corner had been developed.

WETLAND CONSTRUCTION



December 2022: A wetland footprint was proposed for construction. The site would consist of two pools separated by a prairie mound.

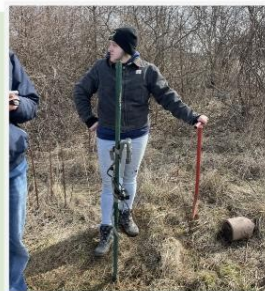


December 2022: MAD Scientist Associates, LLC broke ground on the wetland area. Within a week, the wetland footprint was complete.



December 2022: The wetlands began to fill with precipitation and drainage from surrounding water sources.

LOOKING FORWARD...



March 2023: Capstone students from Ohio State University's School of Environment and Natural Resources installed trail cameras, performed an Ohio Rapid Assessment Method for Wetlands (ORAM) and macroinvertebrate survey, and suggested areas for potential boardwalks and viewing points. In late March, the wetland area was seeded with a variety of native wetland plants.

As the wetland area develops, we hope to see a wide variety of native plants and animals colonize the site. Over time, the wetland will perform important ecosystem services, playing a role in filtering water, hosting visiting migratory birds, and providing an oasis for organisms within a developing residential area.

*The Shepherd's Corner wetlands will be growing and changing for years to come. **What are you looking forward to seeing on your next visit?***

b.) Wetland Evaluation Plan (PDF document, attached with submission)

The wetland evaluation plan includes:

1. A summary of our scoring results from the Ohio Rapid Assessment Method for Wetlands (ORAM) and macroinvertebrate Pollution Tolerance Index (PTI) performed on-site.
2. A standard operating procedure (SOP) for completing subsequent ORAM and PTI assessments in the coming years.

c.) Observation Deck Map (A QGIS map that depicts the wetland and possible observation deck)



2. Project report draft

Section 1: Background

Shepherd's Corner Ecology Center, established in 1992, is a branch of the Dominican Sisters of Peace, dedicated to environmental and spiritual learning. Centered in Blacklick, OH, Shepherd's Corner provides an oasis from the rapidly-developing residential and industrial areas of central Ohio. The site hosts a diverse variety of plants, animals, and fungi, totaling over 650 species on-site. While this biodiversity alone is impressive, the Dominican Sisters of Peace recently initiated a wetland restoration project onsite to convert historic farmland back into an ecologically stable habitat to promote increased use by wildlife. Further, the establishment of a wetland area will provide an excellent environmental education opportunity for site visitors, making room for direct interactions with an ecologically important ecosystem that has historically been viewed in a negative light (Gardner, 2011).

Shepherd's Corner Ecology Center was historically used for row-crop agriculture. Drainage tiles were installed under the soil to prevent water from accumulating at the site when in use as agricultural land. This practice follows historical land use trends of the 20th century Midwest, in which wetland ecosystems were heavily devalued in favor of increasing agriculture (Blann et al., 2009; Gardner, 2011). These tiles have since been removed to promote natural wetland hydrology. The land surrounding Shepherd's Corner was primarily agricultural until 2002, when development began for a new neighborhood to the north of the site. Since then, the land use surrounding the site has increasingly intensified, with more residential and industrial areas replacing the historic row-cropping and undeveloped lands. The increase in concrete and other impervious surfaces, into which water cannot soak, means the site will receive more runoff from rainstorms than it has historically. Therefore, the establishment of a healthy wetland will be

crucial in preserving the site in the long term.

To promote increased understanding of the restored wetland area, we have created [1] a site history document succinctly summarizing the site's history, from pre-establishment of Shepherd's Corner Ecology Center, to the end of our Capstone work, [2] a wetland evaluation plan to understand the baseline condition of the wetland area and to allow volunteers and site coordinators to periodically re-evaluate the site as it matures, and [3] a map outlining potential suggestions for observation deck construction to be used as a supporting figure when applying for construction grants.

Section 2: Products

Site History

In line with goals proposed by the Shepherd's Corner Ecology Center team, a site history pamphlet was created using historic aerials, drone imagery from site construction, and photos taken by the Capstone team. This pamphlet succinctly summarizes important points in the history of the wetland, emphasizing the history of land use in Blacklick, Ohio. This document may be used to educate visitors on the development of the wetland, connecting them with the site on a deeper level and promoting future visitations as the site develops. This product can also be used as supporting documentation when creating presentations or proposals for future site development.

Wetland Evaluation Plan - Site Surveys

An initial survey of the whole Shepherd's Corner Ecology Center site was performed in 2015 with funding from the Columbus Foundation. To build upon this survey and to monitor use

of the wetland site, we completed several surveys on the restored wetlands and surrounding areas--including an already established vernal pool that we looked to as a small-scale model of wetland function--to check for the presence of terrestrial vertebrates and aquatic macroinvertebrates and assess the baseline site quality in the early stages of wetland community development. While a multitude of species are known to be present throughout the Ecology Center, wildlife data on a finer scale can give us a clearer picture of how the wetland area is being used over time. Thus far, several common mammal and bird species have been sighted in the wetland area.

We performed an assessment of wetland quality using the Ohio Rapid Assessment Method for Wetlands (ORAM) (Mack, 2001) and a macroinvertebrate survey based on methods utilized by the Environmental Protection Agency and the Macroinvertebrate Community or Pollution Tolerance Index (PTI) used in the Minnesota Wetland Health Evaluation Program. These assessments allowed us to determine the overall categorization and health of the wetland without the requirement of specialized tools. By studying the macroinvertebrates present in the vernal pool, we developed a better understanding of what organisms may be present in the wetland area once the land has had time to recover. With the results of the ORAM and macroinvertebrate survey, we hope to establish both a baseline for future wetland health assessments and a starting point for development of wetland management plans in the future.

In conjunction with the ORAM assessment, the wetlands and vernal pool were both analyzed via dip net collection for invertebrate presence both as part of the site analysis for present species and also as an indirect indicator of wetland and water quality. Dip nets were used to disturb the sediment below the water, and when the water and sediment were rinsed from the net, we were left with a sample of invertebrates. Several species were collected for further

identification; this information will be provided as part of the site survey deliverables.

Two stationary trail cameras were erected near the restored wetlands and a stationary camera trap was placed near the vernal pool in an attempt to detect smaller vertebrates that would not be captured by upright trail cameras. Species detected were likely heavily affected by the weather from February to April, including several days of snow throughout March. Cold weather potentially affected the documented presence or absence of some amphibians and reptiles. SD capture cards were collected from the cameras twice - once on March 13 2023, and once in April 2023 at the end of the project - and photos were analyzed for captured species. Findings will be provided as a deliverable to the team at Shepherd's Corner following our final camera check.

The final products for our surveys will include both our own scores, as well as the standard operating procedures (SOPs) for completing future surveys. This will allow site managers to compare future scores with a "baseline" score in early wetland development. Careful documentation of repeated surveys will allow the Shepherd's Corner team to clearly track and understand the establishment of the wetlands over time, and access to plain-language SOPs will allow visiting student groups and volunteers to participate in these surveys and become engaged in hands-on explorations of wetland ecology.

Observation Deck Map

An aerial map of the wetland was created in QGIS using an image obtained from Google Earth. The Google Earth image was not updated to include the wetlands, so the border of each wetland was traced on the image using Avenza, a geospatial mapping tool. Using the tools available in QGIS, the potential viewing dock area was defined in relation to the wetlands. No

dimensions or structural plans have been provided for the dock to allow for dimensions to be established by the Shepherd's Corner team to best suit their needs once the vegetation around the wetland has fully grown.

Section 3: Recommendations

Site History

Information about the site will be made available as a printed brochure so that visitors may take one with them after leaving the site. This will help keep the site information in visitors' minds after they leave. It may also be helpful to put this information on the signs that will be placed around the wetland. This will allow visitors to connect what they see in real life to the history of the site, providing context about its current conditions. Finally, posting the site history on the Shepherd's corner website would be beneficial to people who are interested in visiting the ecology center but want more information before they do so.

While the site history will be up-to-date as of the end of our Capstone project, the document should be considered a "living history" of the site. The living community within the wetland is an intrinsic piece of the site's history, and further updates to documentation about the wetland should make efforts to emphasize the importance of living organisms.

Site Survey

Surveys done on the ground for terrestrial vertebrates and aquatic invertebrates are easily replicable following the procedures laid out in the delivered 'Site Survey Materials' product. Surveys should be done at least annually to both keep an up-to-date record of present species and to indirectly monitor the health of the wetland by the presence or absence of certain indicator

species. The Wetland Evaluation Plan will be presented in a format that students (approximately ages 12+) visiting the ecology center can understand and use to participate in the surveying process. This will provide the staff with an opportunity to teach visiting students how to conduct a wetland survey using methods similar to the ORAM method in a format that is more easily understood by younger children. Details of how to perform the site survey (for terrestrial vertebrates and aquatic invertebrates) will be provided for ease of repetition in the future.

Construction Suggestions

The map indicating suggestions for viewing deck construction should be deployed as a supporting figure when seeking funding for future construction at the Shepherd's Corner wetlands. The map provides a useful visual aid that can help potential investors/donors understand the wetlands' layout and access points, and can therefore be utilized to make the wetlands more accessible to the visiting public.

To support the utilization of this product, the staff of Shepherd's Corner should include this map when applying for funding to build an observation deck to show potential donors/investors that there is already a plan in place for the construction, it is just a matter of securing funding to move forward with the project.

Works Cited

Blann, K. L., Anderson, J. L., Sands, G. R., & Vondracek, B. (2009). Effects of agricultural drainage on aquatic ecosystems: a review. *Taylor & Francis Online* 39:11, 909-1001.

<https://doi.org/10.1080/10643380801977966>.

Gardner, R.C. (2011). The ebb and flow of public perceptions of wetlands. In *Lawyers, Swamps, and Money*. (pp. 5-13). Island Press. doi: 10.5822/978-1-61091-025-5_1.

Mack, J. 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. <http://www.epa.state.oh.us/dsw/401/>

Wetland Evaluation Plan for Shepherd's Corner

I.) Standard Operating Procedure

A.) Abbreviated Rapid Wetland Assessment (ORAM)

The Ohio Rapid Assessment Method (ORAM) is a standardized procedure for quickly and easily evaluating the overall health and quality of wetlands in Ohio. It is based on metrics of ecological quality, including vegetation communities, water sources, and wildlife habitat. Scores include categories 1-3, with category 3 assigned to the highest quality wetlands. This procedure can be completed multiple times over time to track the ecological succession or progress of a wetland.

An ORAM was conducted on each of three wetlands at the Shepherd's Corner Ecology Center: a vernal pool and two newly created wetlands. The vernal pool was assigned a score of Category 2, and both newly created wetlands were assigned scores of Category 1. These wetlands are likely to improve in quality as vegetation colonizes the site. However, some aspects, such as water sources and wetland size, are not likely to change. In order to obtain quantitative metrics on the ecological succession of the wetlands at Shepherd's Corner, we developed an abbreviated version of the ORAM that includes the metrics that are likely to change over time and excludes those that will remain static. We recommend that this abbreviated ORAM be performed annually for the best data quality.

Abbreviated Ohio Rapid Assessment Method

1. Vegetation

Observe and take note of the plants that are growing in and around the wetland. Note also whether they are native to Ohio or if they are invasive. A tool such as Seek (available on smartphone app stores) may be helpful for those unfamiliar with plant identification.

- a. If any federally endangered plant species are found, the wetland is automatically assigned a score of category 3.
- b. If the vegetation communities are significant in size (greater than ~50% cover of the wetland) and are primarily (greater than ~75%) comprised of native, disturbance-intolerant species, the wetland is

automatically assigned a score of category 3.

- c. Complete the following scoring checks:
 - i. Wetland vegetation communities - assign each a score of 0-3, where 0 is absent or nearly absent and 3 is comprises a significant part of the wetland's vegetation
 1. Aquatic bed - vegetation under the water: _____
 2. Emergent - vegetation in the water that emerges above the surface: _____
 3. Shrub - small, young trees, brush, bushes, and low vegetation: _____
 4. Forest - tall full-growth trees creating an overhead canopy: _____
 5. Mudflats - vegetation growing in mud pits: _____
 6. Open water - vegetation growing in deep water far from the shore: _____
 - ii. Horizontal interspersion - this is a measure of how many different vegetative habitats there are and how evenly they are distributed in the wetland. Assign a score of 0-5, where 0 is none and 5 is high: _____
 - iii. Coverage of invasive plants - assign a score of 1 to -5, where 1 means invasive plants are absent and -5 means invasive plants comprise more than 75% of the vegetation: _____
 - iv. Microtopography - assign a score of 0-3, where 0 is absent and 3 is present in moderate amounts and of high quality:
 1. Vegetated hummocks/tussocks: _____
 2. Coarse woody debris - fallen logs and similar features: _____
 3. Standing dead trees: _____
 4. Amphibian breeding pools - note if amphibians such as frogs or salamanders are observed to be reproducing in the wetlands (presence of eggs): _____

2. Wildlife habitat

Observe the wildlife that occurs in and around the wetland. This can include

birds, macroinvertebrates, amphibians, and other wildlife. It can also include evidence of wildlife, including footprints, fur or feathers, and scat.

- a. Assign a score of 1-4 to the substrate disturbance, with 1 being recent or no recovery to the substrate (soil) in the wetland and 3 being completely recovered (a score of 4 means no disturbance at all, but these soils were disturbed during the wetland construction so this site will not obtain this score). ____
 - b. Assign the habitat development of the site a score of 1-7, with 1 being “Poor” habitat quality and 7 being “Excellent” habitat quality: ____
 - c. Note any disturbances to the habitat, such as mowing, removal of woody vegetation, pollutants or sedimentation, or farming, and assign a score of 1-9 according to how well the habitat has recovered from the disturbance, where 1 is recent disturbance with no recovery and 9 is no apparent disturbance: ____
3. Scoring - add up the scores from the previous two sections, then add the following according to which wetland you are assessing: 11 for the north constructed wetland, 14 for the south constructed wetland, or 20 for the vernal pool. These scores include the metrics of the wetlands that are not likely to change significantly from year to year: wetland area, surrounding land use, hydrology, and special wetlands. These base scores were calculated from ORAMs performed by SENR Capstone in Spring 2023. Then assign a category to the wetland according to the total score, using the following breakpoints:
- a. 0-34: Category 1
 - b. 35-64: Category 2
 - c. 65+: Category 3

B.) Macroinvertebrate Survey:

Macroinvertebrates are organisms that lack a backbone and can be seen without a microscope or magnifying glass. Some species can survive in “dirty” water, while other species can only survive in “clean” water. The general quality of a body of water can be determined by sampling organisms from the water and identifying if any species found prefer cleaner waters. If pollution-intolerant organisms are found, this is an indicator that the body of water is relatively “clean.”

To complete a macroinvertebrate survey, some materials are required. These include:

3. a dip net with a fine enough mesh to catch any potential macroinvertebrates (we suggest 500 microns/#35 mesh size)
4. a sampling tray
5. waders (not necessary, but helpful for sampling in deeper water)

Procedure for sampling for macroinvertebrates:























- 1.) Use the dip net to probe for inverts in the water. Generally a good strategy is to probe the sediment of the wetland, moving the net in a figure 8 motion to create a “current” to capture any invertebrates within the disturbed sediment, then bring the net out of the water, letting the water drain out of the net.
- 2.) Remove any larger rocks and examine them closely for any clinging invertebrates before discarding, and dump the contents of the net into a sampling tray for easy viewing. You can sort through the sediment and plant debris and look for anything that’s wiggling.
- 3.) You can do this as many times as you like; a general recommendation is around 10-15 passes with the dip net. It is best to sample a variety of habitats (open water, near vegetation, bank, etc) and a variety of water depths.

Draw a checkmark next to every taxa that is present. Add the total number of taxa represented, and multiply by the weighting factor listed below. The sum of these weighted scores will give the system's Pollution Tolerance Index (PTI).

	Very Tolerant		Moderately Tolerant		Moderately Intolerant		Very Intolerant
—	Aquatic Worms	—	Leeches	—	Damselfly Nymphs	—	Stonefly Larvae
—	Lunged Snails	—	Flatworms	—	Dragonfly Nymphs	—	Mayfly Larvae
—	Blood Midge Larvae	—	Midge Larvae	—	Scuds	—	Caddisfly Larvae
—	Rat-tailed Maggots	—	Black Fly Larvae	—	Crayfish	—	Riffle Beetles
				—	Aquatic Sowbugs	—	Dobsonfly Larvae
				—	Crane Fly Larvae	—	Right-handed (gilled) snails
				—	Clams / Mussels	—	Water Pennies
# of taxa:		# of taxa:		# of taxa:		# of taxa:	
x1:		x2:		x3:		x4:	

POLLUTION TOLERANCE INDEX RATING: _____

<u>PTI Ratings</u>	
Excellent	23 or more
Good	17-22
Fair	11-16
Poor	10 or less

Very Tolerant	Moderately Tolerant	Moderately Intolerant	Very Intolerant
<p>Aquatic Worms</p> 	<p>Leeches</p> 	<p>Damselfly Nymphs</p> 	<p>Stonefly Larvae</p> 
<p>Lunged (Left-handed) Snails</p> 	<p>Flatworms</p> 	<p>Dragonfly Nymphs</p> 	<p>Mayfly Larvae</p> 
<p>Blood (Red) Midge Larvae</p> 	<p>Midge Larvae</p> 	<p>Scuds</p> 	<p>Caddisfly Larvae</p> 
<p>Rat-tailed Maggots</p> 	<p>Black Soldier Fly Larvae</p> 	<p>Crayfish</p> 	<p>Riffle Beetles</p> 
		<p>Aquatic Sowbugs</p> 	<p>Dobsonfly Larvae</p> 
		<p>Crane Fly Larvae</p> 	<p>Gilled (Right-handed) Snails</p> 
		<p>Clams / Mussels</p> 	<p>Water Pennies</p> 

II.) Baseline Scoring

Because the wetlands are still a young system, and were unplanted during initial surveys, we hope that PTI and ORAM scores will increase over time. Therefore, we have included our scoring from the first wetland surveys, performed in Spring of 2023, to serve as a baseline against which to compare future results.

A.) ORAM Scoring

	Vernal Pool	North Wetland	South Wetland
Wetland Area	1	1	1
Upland buffers and surrounding land use	2	1	1
Hydrology	17	9	12
Habitat Alteration and Development	12	3	3
Special Wetlands	0	0	0
Plant Communities, interspersions, microtopography	4	1	1
Total score	36	15	18
Final Category	2	1	1

B.) Macroinvertebrate Survey

	Very Tolerant		Moderately Tolerant		Moderately Intolerant		Very Intolerant
—	Aquatic Worms	✓	Leeches	✓	Damselfly Nymphs	—	Stonefly Larvae
—	Lunged Snails	—	Flatworms	✓	Dragonfly Nymphs	✓	Mayfly Larvae
—	Blood Midge Larvae	✓	Midge Larvae	✓	Scuds	✓	Caddisfly Larvae
—	Rat-tailed Maggots	—	Black Fly Larvae	—	Crayfish	—	Riffle Beetles
—	Left-handed (Pouch) Snails	—		—	Aquatic Sowbugs	—	Dobsonfly Larvae
—		—		—	Crane-fly Larvae	—	Right-handed (gilled) snails
—		—		✓	Clams / Mussels	—	Water Pennies
# of taxa: 0		# of taxa: 2		# of taxa: 4		# of taxa: 2	
x1: 0		x2: 4		x3: 12		x4: 8	

POLLUTION TOLERANCE INDEX RATING: 24