2024 Ohio River Pool Assessments

Montgomery and Newburgh Pools

ORSANCO Biological Programs
Ohio River Valley Water Sanitation Commission
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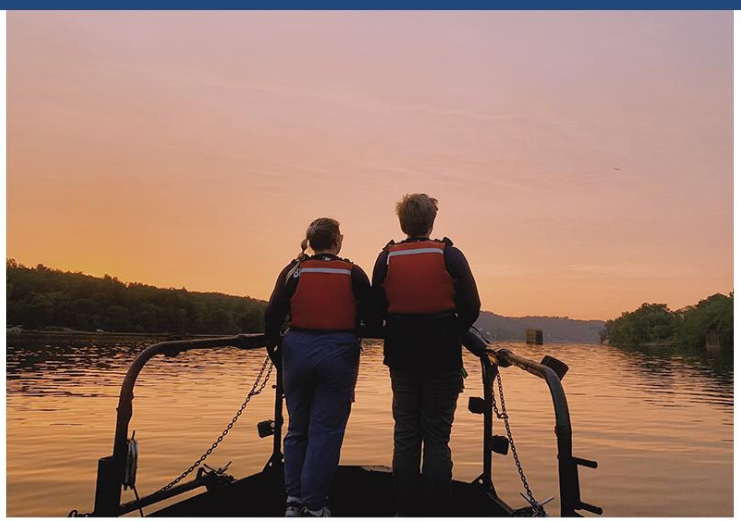

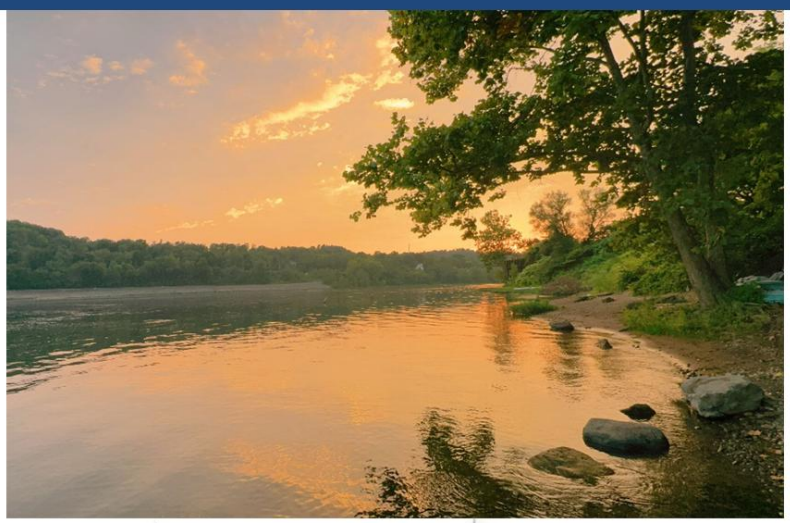

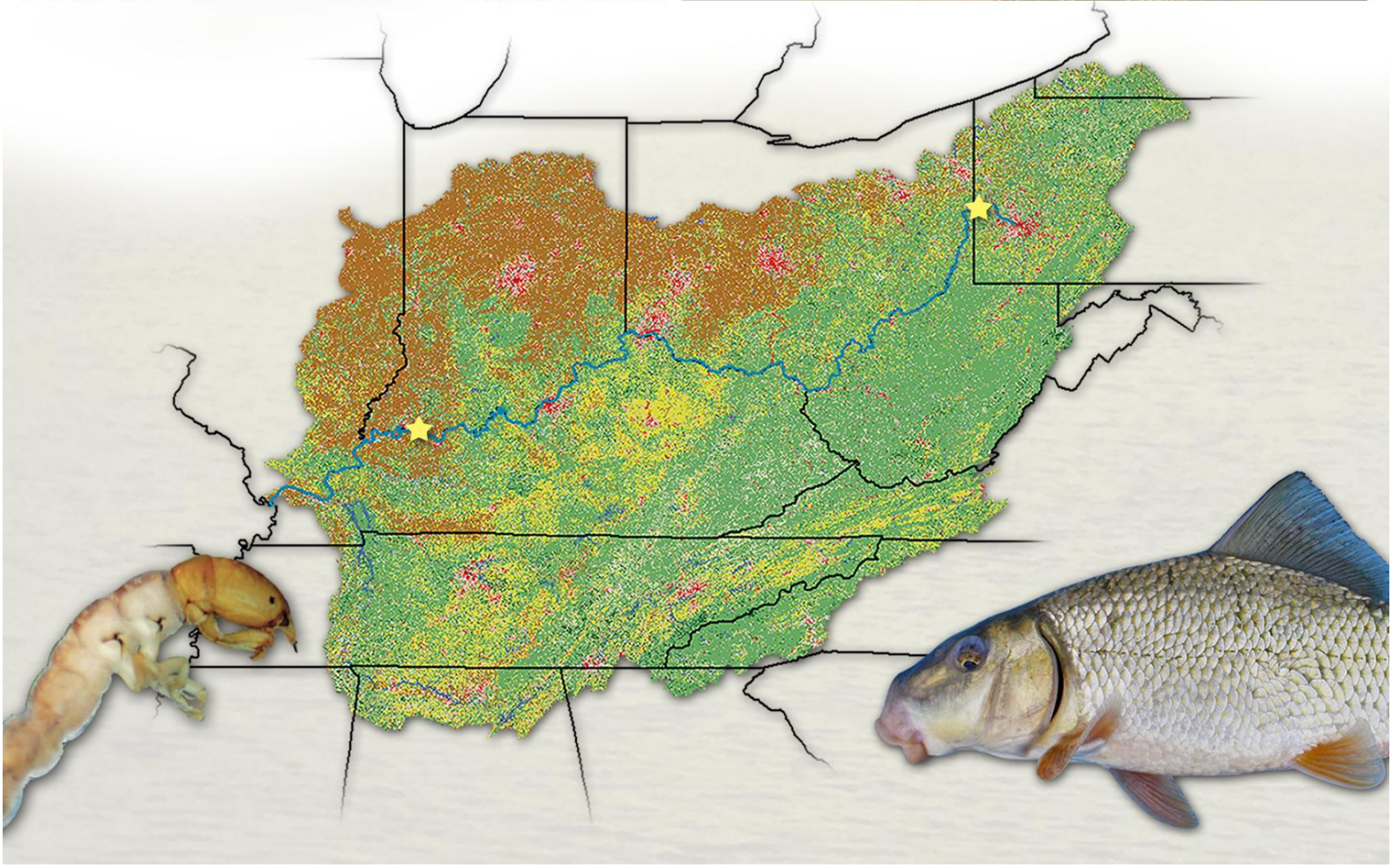

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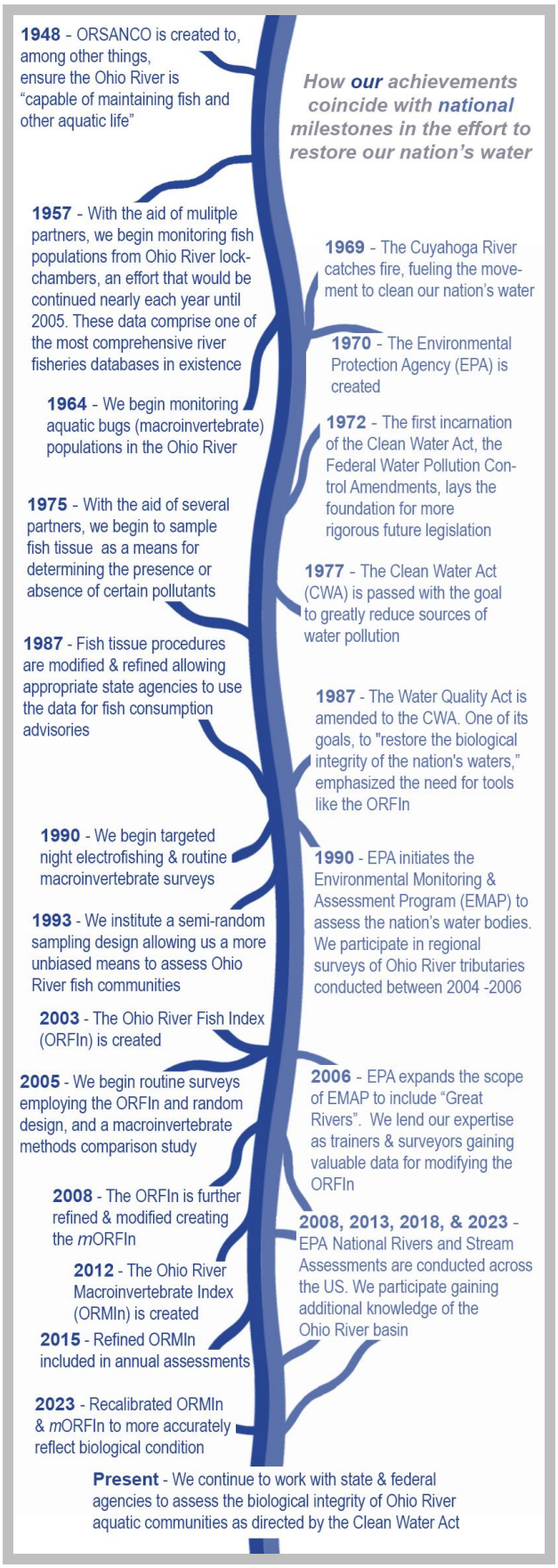
Introduction

Based in Cincinnati, the Ohio River Valley Water Sanitation Commission (ORSANCO) is an interstate water pollution control agency created in 1948 by an act of Congress to monitor and improve the water quality of the Ohio River. A primary goal of ORSANCO programs is to work with state agencies to develop a set of pollution control standards for the Ohio River. Monitoring programs were established to develop and refine these standards. One of these programs, the ORSANCO biological program, uses fish studies to establish biological criteria (biocriteria) for the Ohio River. These biocriteria are ultimately used to provide insight into the overall health of the river ecosystem.

In 1993, ORSANCO developed and implemented a survey design that used electrofishing methods designed for the Ohio River. After years of collecting fish population data on the Ohio River, we developed the original Ohio River Fish Index (ORFIn) which was subsequently modified (*m*ORFIn). Each year we collect fish and environmental data from various sections of the Ohio River and use these data to calculate *m*ORFIn scores, which are numerical representations of the relative condition of Ohio River fish communities based on a suite of measurable attributes. The resulting scores allow us to assess the biological condition of each section of the river. The information included in these assessments is further used for regulatory, restorative, and protective efforts within the Ohio River basin.



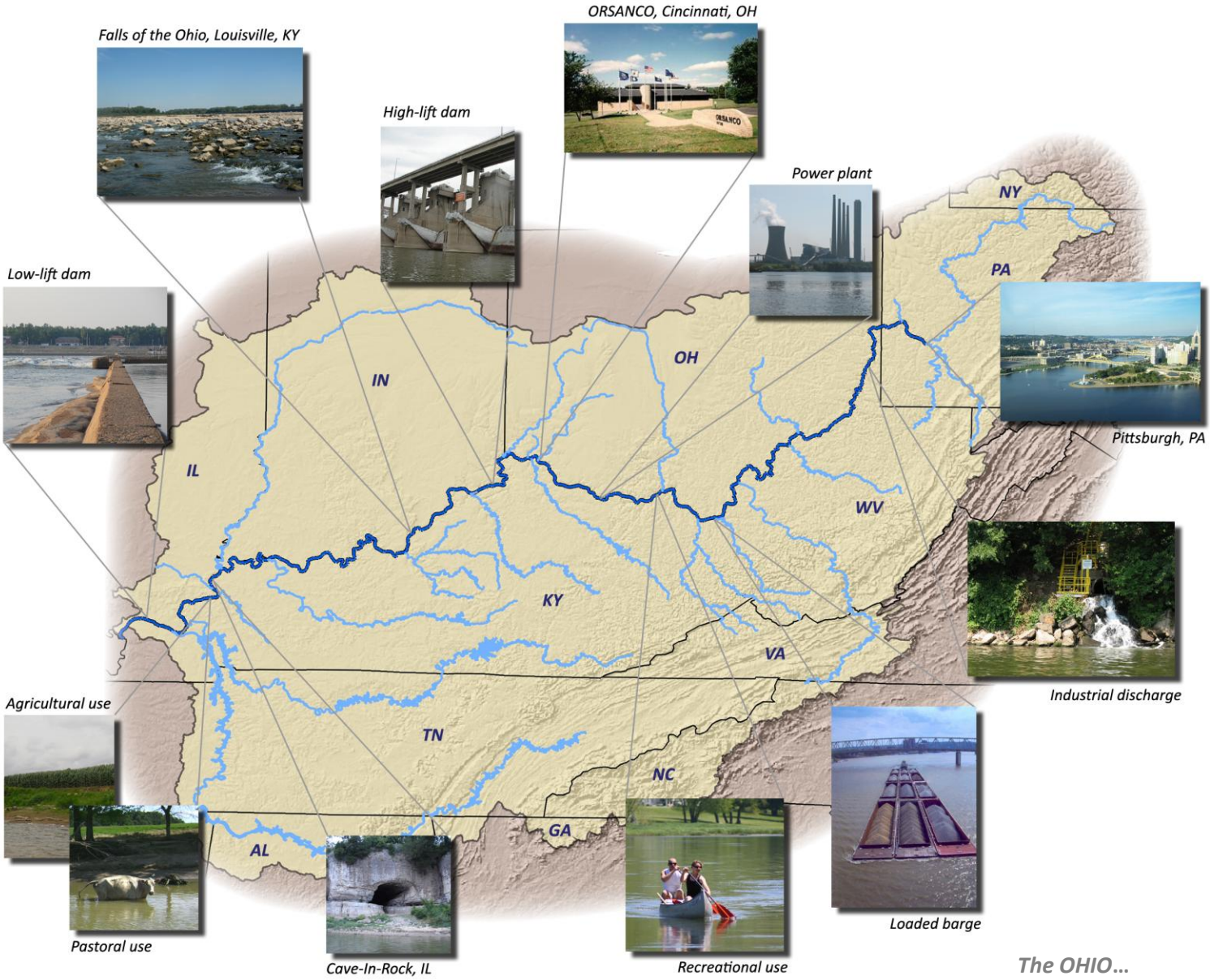
This report summarizes the 2024 Montgomery and Newburgh pool assessment survey findings.

The River

The Ohio River begins at the confluence of the Monongahela and Allegheny rivers in Pittsburgh, PA and flows 981 miles in a southwesterly direction to its confluence with the Mississippi River near Cairo, IL. The Ohio has several additional large tributaries including the: Muskingum, Scioto, Kanawha, Kentucky, Green, Wabash, Cumberland and Tennessee rivers. The Ohio River itself runs through or borders six states: Illinois, Indiana, Kentucky, Ohio, Pennsylvania, and West Virginia. The river basin (>200,000 mi^2) covers an additional eight states: New York, Maryland, Virginia, North Carolina, Tennessee, Georgia, Alabama, and Mississippi. Nineteen high-lift locks and dams maintain a nine-foot minimum depth for commercial navigation throughout the river.

Facts

- Average depth 24 ft, max depth exceeding 90 ft
- Average width ½ mi, 1 mi max (Louisville, KY)
- ~344 fish species from Ohio River *basin* (18 exotic) = 40% of known N. American species (800 species)
- ~178 fish species found in the Ohio *River* (14 exotic)
- Deciduous forests continue to dominate the basin
- Major land uses: pastures, row crops, and urban development
- Basin holds ~8% of the nation (27 million people)
- 33 drinking water intakes provide drinking water for over 5 million people along the main stem
- 589 permitted discharges to the Ohio River
- 49 power-generating facilities on the main stem
- Coal and energy products comprise 70% of the 250 million tons of cargo carried by barges each year



The OHIO…
Iroquoian for "great river"

METHODS

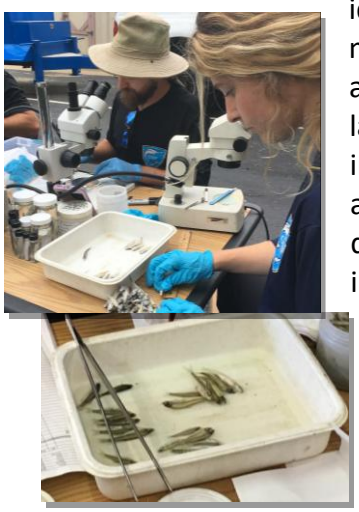
Site Selection

A random, probability-based survey design was used to select sampling site locations within each Ohio River navigational pool. The target areas of our surveys are both shorelines of each pool from the upstream dam to the downstream dam. The survey design provides coordinates for 15 sites (500m-long) in each of the selected pools. Biological and environmental data are then collected from these 15 sites and used to assess the biological condition of the pool.

Fish Collection

To maintain consistency across different sampling years, fish surveys are conducted between July 1st and October 31st and when water levels are within two feet of "normal flat pool". Fish are collected by a non-lethal method called boat electrofishing using an 18ft aluminum johnboat equipped with a generator and an electrofishing unit (standard equipment used by federal and state agencies). Using the electrofishing unit to regulate the output from the generator, a mild current is applied to the water with an effective range of up to 20ft. Because of our limited range, sites are fished at night along the shoreline when species are most active. This allows us to maximize the number of individuals and species captured, thus providing us with an accurate representation of the fish community at each site.

Sampling is conducted in a downstream manner for a minimum of 1800 seconds, during which all available habitats are sampled within 100ft from shore. When the fish encounter the electric field their muscles contract and they rise to the surface. The fish are then netted and placed into a live well were they remain until the entirety of the 500m zone is sampled. Each fish is measured, inspected for anomalies, and identified to lowest possible taxonomic level (e.g. species) before being returned to the water. A subsample of small fishes (i.e. less than 4cm) that cannot be confidently identified in the field (e.g. minnows) are preserved and identified in the laboratory. All collected information is reviewed and imported into a database from which fish index scores are later generated.



Native Ohio River fishes. Left: Members of the genus Lepomis. Bluegill, Redear Sunfish, Orangespotted Sunfish, Warmouth, Longear Sunfish.
Right: Members of the genus Lepisosteus. Juvenile Shortnose Gar, Longnose Gar, Spotted Gar, Shortnose Gar.

Collecting Macroinvertebrates

Macroinvertebrates (macros) are organisms that lack a true backbone and can be seen with the naked eye. They include aquatic insects, molluscs, arachnids, crustaceans and worms. They can range from large adult forms (e.g. crayfish), to very small larval forms of terrestrial insects (e.g. flies).

Two sampling methods are used to collect macros: Hester-Dendy (HD) samplers and multi-habitat kicks (MH). HD samplers are constructed of tempered masonite cardboard cut into 3-inch square plates and 1-inch square spacers. Eight large plates and 12 spacers are stacked on a metal eyebolt to provide varying degrees of space for macro colonization. Five HDs are attached, in a ring, to a concrete paver. The paver is then placed on the river bottom in 10ft of water at the downstream end of each 500m sampling site and secured to the shore. Similar to the fish, macro sampling is restricted to a defined season within each year. HDs are deployed for six weeks, beginning September 1st allowing adequate time for macro colonization. After the six week colonization period, HDs are retrieved and MH kick surveys are conducted.

A MH kick is performed by actively disturbing the substrate and then sweeping a net through the resulting cloud. This technique allows the sampler to collect macros without compromising the sample with large amounts of sediment. To further exclude sediments, the net heads are "D" shaped (i.e. have flat bottoms), which also eases the scraping of woody debris and boulders. Samplers disturb/scrape 10 linear meters of substrate at each 100m interval of a site in depths 1m or shallower. At each of these intervals, every attempt is made to sample available habitats (e.g. sand flats, woody debris, boulders, etc.) relative to the proportion of their availability. The kicks conducted at each 100m interval are then combined to represent the community present at the site.

Once the kicks are completed and the HDs have been retrieved, the samples are preserved. The HDs are disassembled in the field. The plates from the HDs and large debris from the MH samples are rinsed and drained through a 500μm sieve. The macros trapped by the sieve are then transferred to a preservative jar with 70% ethanol to be identified in a laboratory. At the lab, macros are identified to species level when possible; in all other cases the highest level of taxonomic resolution is obtained. The macro information is then reviewed and imported into a database from which index scores are generated, keeping HD and MH data separate. As ORSANCO's biological program continues to refine its assessment tools, recent analyses have revealed limitations in the use of MH samples within the context of the Ohio River Macroinvertebrate Index (ORMIn). These samples will no longer be collected for probilistic pool assessments. Moving forward these samples will only be collected at fixed station monitoring sites to capture longterm population trends.

METHODS

Characterizing Instream Habitat

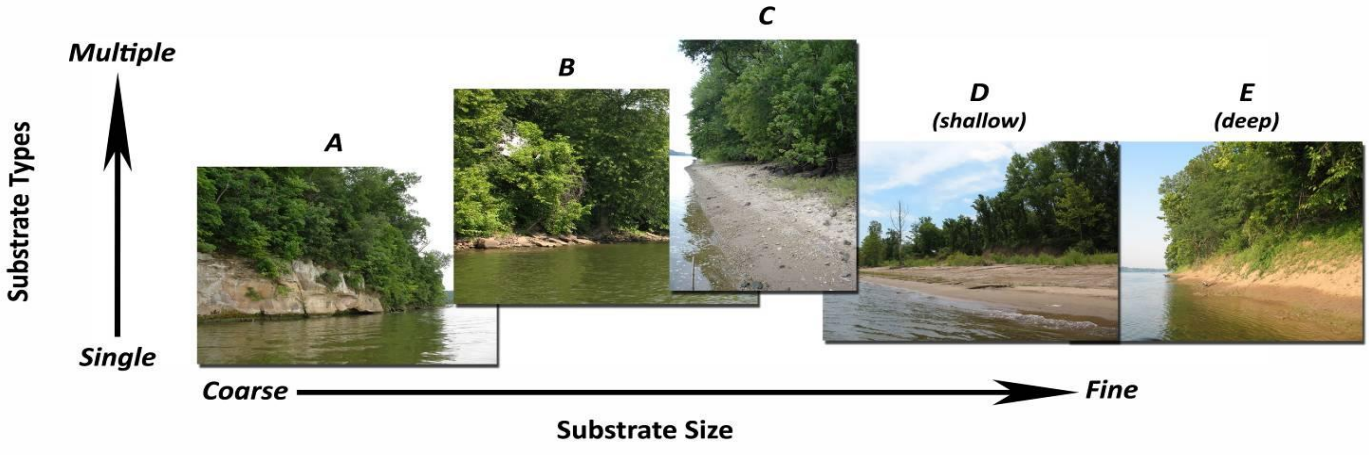
Intensive habitat surveys are conducted which include measures of woody cover, depth, prevalence of substrate types at each electrofishing site. Woody cover (e.g. submerged brush, logs, stumps) is estimated visually. More quantitative measures of depth and substrate proportions are obtained through the use of a 20' copper pole. The pole is used to probe the bottom of the river to determine exact depth and the proportions of substrate types including: boulder, cobble, gravel, sand, fines, and hardpan (clay) that occur at each site.

Because different fish species prefer different habitat types, it is important to classify the instream habitat at each of our sites to better understand *m*ORFIn score variability. Using the habitat survey data, we assign each site to one of five statistically derived habitat classes simply named: A, B, C, D and E. The five habitat classes represent a gradient from highly coarse Class A habitats with high amounts of cobble and gravel, to the predominantly sandy/fine substrates of habitat classes "D" and "E" which differ by water depth (see below).

Water Quality and Hydrology

Basic measures of water quality such as water temperature, clarity, pH, DO, and conductivity are measured at each site prior to electrofishing. Water samples may also be collected at the downstream end of each 500m zone approximately 100ft from shore to determine various water quality parameters (e.g. nutrient levels and hardness). River stage is monitored using data obtained from the U.S. Army Corps of Engineers, who also provide measures of predicted daily average flow volumes and velocities from the nearest-upstream sampling station to any particular site. These data are compiled to aid in the interpretation of the fish index results.

A look at our five habitat classes



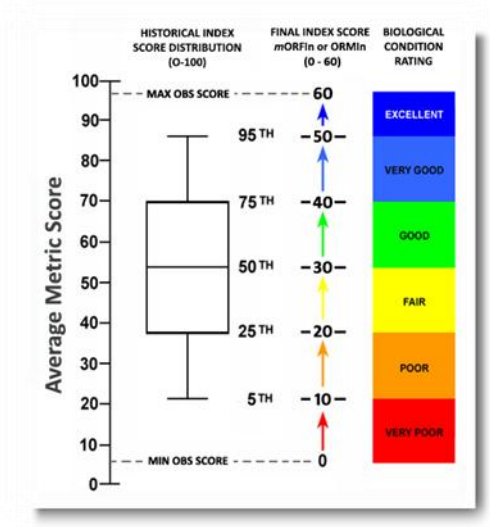
METHODS

Assessing Biological Condition

ORSANCO uses two biological indices to assess the condition of the Ohio River. The modified Ohio River Fish Index (*m*ORFIn) and the Ohio River Macroinvertebrate Index (ORMIn using HD data only) were established in 2003 and 2012, respectively. Both indices include various measures (metrics) of the fish and macro communities such as: diversity, abundance, feeding and reproductive guilds, pollution tolerance, habits, health.

13 metrics used to generate *m*ORFIn scores	
Fish Metric	**Definition**
Native Species	Number (No.) of species native to the Ohio River
Intolerant Species	No. of species intolerant to pollution and habitat degradation
Sucker Species	No. of sucker species (e.g. redhorse and buffalo)
Centrarchid Species	No. of black bass, sunfish, crappie species
Great River Species	No. of species primarily found in large rivers
% Piscivores	% of individuals (ind.) that consume other fish
% Invertivores	% of ind. that consume invertebrates
% Detritivores	% of ind. that consume detritus (dead plant material)
% Tolerants	% of ind. tolerant to pollution and habitat degradation
% Lithophils	% of ind. belonging to breeding groups that require clean substrates for spawning
% Non-natives	% of ind. not native to the Ohio River, including both exotics and hybrids
No. *DELT* anomalies	No. of ind. with *D*eformities, *E*rosions, *L*esions, *T*umors present
Catch per unit effort (*CPUE*)	Total abundance of ind. (minus exotics, hybrids, tolerants)
8 metrics used to generate ORMIn scores	
Macro Metric	**Definition**
No. Taxa	Number (No.) of unique taxa
EPT Taxa	No. of taxa that belong to are either the Ephemeroptera, Plecoptera, or Trichoptera orders
Predator Taxa	No. of taxa that are predators
% Collector-Gatherer Taxa	% of taxa that feed on fine particulate organic matter
% Caenids	% of individuals (ind.) that belong to the pollution tolerant *Caenidae* family of Ephemeropterans
% Odonates	% of ind. that belong to the Odonata order
% Intolerants	% of ind. intolerant to pollution and habitat degradation
% Clingers	% of ind. that cling to instream habitat

Each navigational pool is separately assessed with each index based upon the biological and environmental data collected from its 15 randomly selected sites. This involves a multi-step approach (depicted top right) that converts average metric scores (0-100) of each individual site into final index scores (0-60), based on varying expectations of the five different habitat classes. Index scores of the 15 sites are then averaged to provide an overall score and rating for the navigational pool specific to each index.



The presence of five distinct habitat classes A, B, C, D, and E, coupled with the range of habitat preferences exhibited by individual fish and macro taxa required the translation of metric scores into relative index scores. By removing the effect of habitat, index scores can then be averaged within a pool to represent the overall condition of the biological community in question.

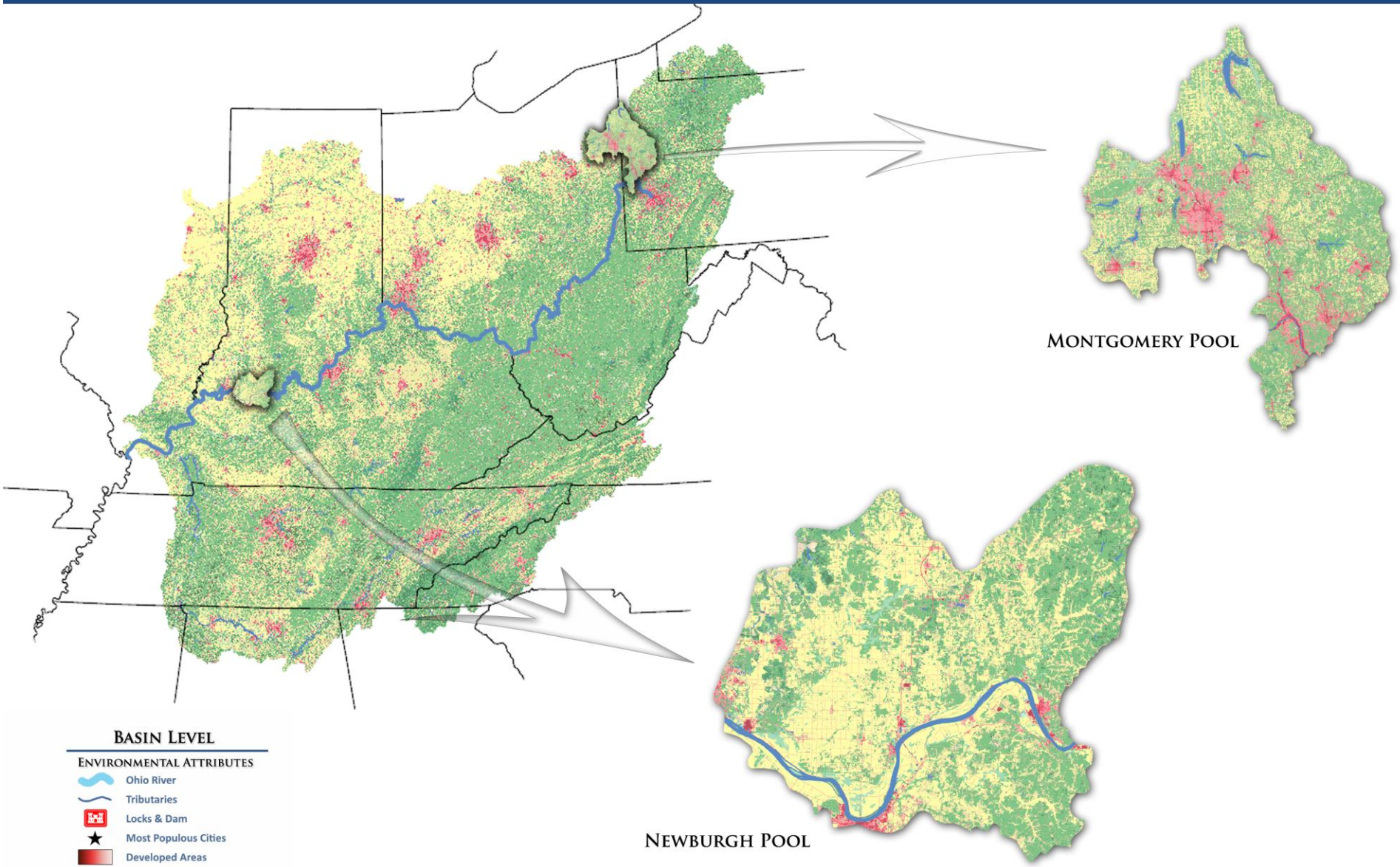
The averaged scores for both the *m*ORFIn and ORMIn are then compared to a biocriterion. The 25th percentile is the statistical threshold commonly used by regulatory agencies for establishing biocriteria. Using this threshold, our established biocriterion (i.e. a representation of healthy Ohio River fish communities) is set at an average index score of 20.0.

A pool is assessed to be in **full support** of its aquatic life-use (ALU) designation (i.e. possessing intact biological communities) if both the *m*ORFIn and ORMIn scores are greater than or equal to 20.0 (i.e. a biological rating "Fair", "Good", "Very Good", or "Excellent"). A pool is in **partial support** of its ALU designation if only one of the indices' scores greater than or equal to 20.0, while the other index score falls within 10.0 - 19.9 (i.e. a "Poor" rating). Any pool in which both indices score below a 20.0, or in which at least one index scores below 10.0 (i.e. a "Very Poor" rating), would be considered in **non-support** of its ALU designation.

For more detailed information pertaining to our programs including survey design, field methods, past & present assessment results, or biological data contact one of our staff or visit: www.orsanco.org/biological-programs

2024 Pool Survey Results

The results of the 2024 biological surveys are detailed in the following pages (relative pool locations shown below). Included are brief descriptions of the land use & hydrology, site level mORFIn & ORMIn ratings, summaries of notible catches & instream habitat, and the overall biological condition of each pool.



For more detailed catch, metric, and index scores visit www.orsanco.org/programs/biological-programs

Montgomery Pool (2024) - Healthy Condition

This page summarizes the 2024 fish and macroinvertebrate (macro) surveys conducted by ORSANCO biologists in the Montgomery Pool of the Ohio River. Fish are collected via non-lethal electrofishing in the summer. Macros are collected in the fall from artificial substrate samplers placed in the water in late summer. Montgomery Pool is 18.5 miles long, extending from Dashields Locks and Dam (ORM 13.2) to Montgomery Locks and Dam (ORM 31.7). The pool lies entirely within the state of Pennsylvania and the surrounding area is best described as an urban extension of Pittsburgh. This proximity to the largest metropolitan area on the river results in high volumes of industry, barge activity, and recreational boaters. Most of the pool's shorelines are modified, to some extent, with rocks/metal walls to curb shoreline erosion. Though aquatic vegetation is increasing, the most abundant aquatic habitat remains fallen timber (trees and stumps). A major tributary to this pool, the Beaver River, is also heavily influenced by industry yet is still a valuable fishery and provides ample recreational access.

Dominant Macro Groups

Midges 32.9%

Dicrotendipes sp

Snails 14.5%

Physella sp

Mussels 12.5%

Dreissena polymorpha

Mayflies 11.3%

Stenacron sp

Caddisflies 6.4%

Cyrnellus fraternus

Dominant Fish Families

Minnows 38.8%

Emerald Shiner

Sunfishes & Bass 21.8%

Bluegill

Herring and Shad 11.8%

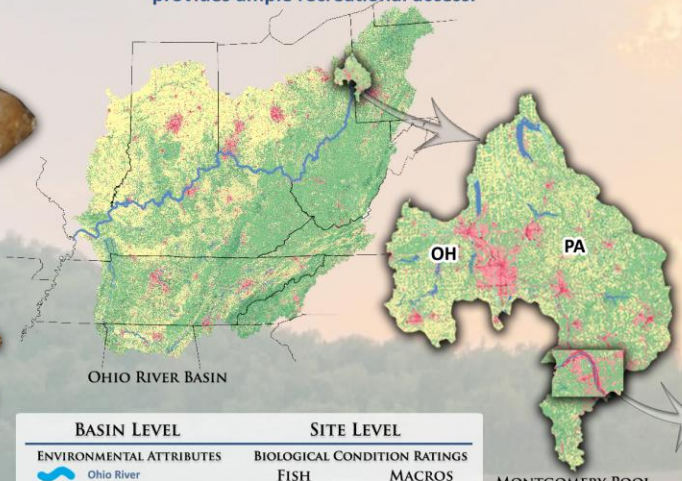
Gizzard Shad

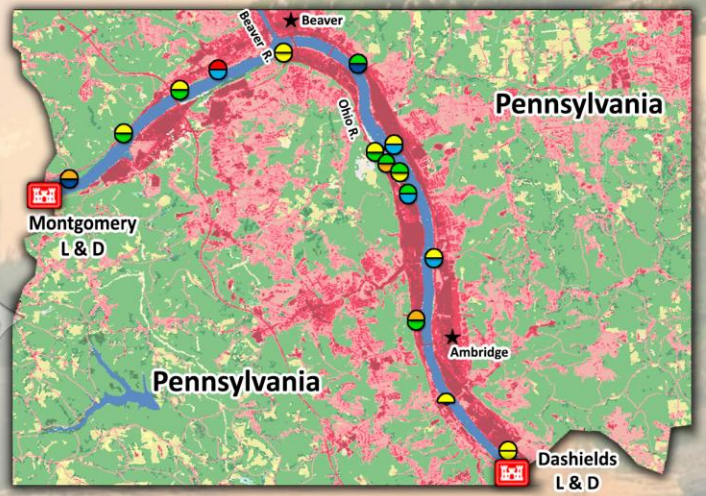
Suckers 10.3%

River Redhorse

Perches 8.8%

Logperch





Montgomery Pool

Basin Level	Site Level	
Environmental Attributes	Biological Condition Ratings	
	Fish	Macros
Ohio River	Excellent	
Tributaries	Very Good	
Locks & Dam	Good	
Most Populous Cities	Fair	
Developed Areas	Poor	
Agricultural/Pastoral Lands	Very Poor	
Natural Forests		

Aquatic Invasives Watch

Survey Summary

Electrofishing sampling took place over the last two weeks in August during the index period (July-Oct). Sampling conditions were favorable marked by normal flow and high Secchi readings, with average readings for temperature, conductivity, and disolved oxygen. Three species considered to be "irruptive species" comprised 39.4% of the total catch: Gizzard Shad (*Dorosoma cepedianum*, n=373), Channel Shiner (*Notropis wickliffi*, n=297), and Emerald Shiner (*Notropis atherinoides*, n=538). Notable catches included record catches of an Ohio species of concern (River Redhorse, *Moxostoma carinatum*, n=138). The Longhead Darter (*Percina macrocephala*), a species once thought to be extirpated in Ohio, was observed four times in 2024. The results (see above map) show that, on average, fish populations in Montgomery Pool were in 'Fair' condition. While there were not many individual species of note, a robust diversity of dragonflies/damselflies, caddisflies, and midges were consistently observed throughout the pool. This is likely associated with a substantial amount of available habitat that now exists because of the presence of the invasive species of submerged aquatic vegetation, *Hydrilla verticillata*. Macroinvertebrate results show that, on average, macro populations were in 'Good' condition.

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Newburgh Pool (2024) - Healthy Condition

This page summarizes the 2024 fish and macroinvertebrate (macro) surveys conducted by ORSANCO biologists in the Newburgh Pool of the Ohio River. Fish are collected via non-lethal electrofishing in the summer. Macros are collected in the fall from artificial substrate samplers placed in the water in late summer. Newburgh pool is 55.4 miles long, extending from Cannelton Locks and Dam (ORM 720.7) to Newburgh Locks and Dam (ORM 776.1). The pool has a gradient drop of 0.3 feet per mile and averages 2,477 feet wide and 28 feet deep. The pool flows adjacent to the states of Indiana and Kentucky. The Newburgh Pool receives water from the following tributaries: Anderson River at mile point 731.5 with a drainage area of 276 square miles, Blackford Creek at mile point 742.2 with a drainage area of 124 square miles and Little Pigeon Creek with a drainage area of 415 square miles (ORSANCO 1994). The shorelines of this pool support a modicum of aquatic vegetation in the littoral zones. Newburgh Pool lies in a portion of the Ohio River where the land use consists primarily of deciduous forest (53.9%), but also has a considerable amount of row crops.

Dominant Macro Groups

Midges 32.3%

Dicrotendipes sp

Caddisflies 23.0%

Cyrnellus fraternus

Mussels 21.4%

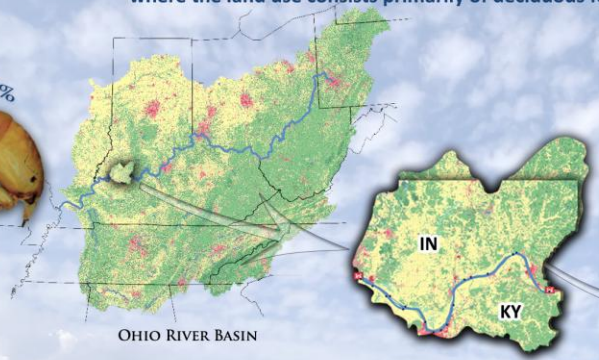
Dreissena polymorpha

Worms 7.0%

Naididae sp
Photo by Krieger and Stearns (2010)

Mayflies 5.7%

Stenacron sp



Ohio River Basin

Newburgh Pool Sub-Basin

Newburgh Pool

Basin Level	Site Level	
Environmental Attributes	Biological Condition Ratings	
	Fish	Macros
Ohio River	Excellent	
Tributaries	Very Good	
Locks & Dam	Good	
Most Populous Cities	Fair	
Developed Areas	Poor	
Agricultural/Pastoral Lands	Very Poor	
Natural Forests		

Aquatic Invasives Watch

- [x] Silver Carp
- [x] Bighead Carp
- [x] Asiatic Clams
- [x] Zebra Mussels
- [x] Marine Scuds
- [ ] Hydrilla

Dominant Fish Families

Minnows 34.7%

Emerald Shiner

Herring and Shad 28.4%

Gizzard Shad

Drum 12.2%

Freshwater Drum

Sunfishes & Bass 8.2%

Bluegill

Temperate Basses 5.3%

Morone sp.

Survey Summary

Electrofishing sampling occurred under ideal sampling conditions during the third week of July during normal flow conditions. Notable observations over the last three assessment cycles included consistent catches of Sauger (*Sander canadensis*). Declines in catfish (*Ictalurus punctatus* and *Pylodictis olivaris*) populations were observed, as well as a decline in cyprinid diversity and abundance. Two species of concern, Black Buffalo (*Ictiobus niger*; n=5) listed in the state of KY, and River Redhorse (*Moxostoma carinatum*; n=1) listed in the state of IN, were observed in these surveys. Independent biological indices were used to apply numeric values to important components of fish and macroinvertebrate assemblages and to assess their relative statuses. The results (see above map) show that, on average, fish populations in Newburgh Pool were in 'Good' condition. Despite Newburgh Pool's lack of complex macroinvertebrate habitat, high diversities of caddisflies and midges were observed throughout the pool. Macroinvertebrate results show that, on average, macro populations were in 'Good' condition.

Pool Substrate Composition

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CONCLUSIONS

Pool Surveys

The fish assessment portion of the 2024 pool surveys was successfully completed during the normal sampling timeframe. Fish sampling took place from July 15th-18th (Newburgh) and August 19th-28th (Montgomery). Electrofishing surveys took place under normal stage and flow conditions. Conditions allowed for adequate sampling of fish and macroinvertebrates during the respective index periods. The macroinvertebrate sampling for both pools was completed between August 28th-Oct. 16th. Newburgh Pool was assessed as *meeting* its aquatic life-use designation for both fish and macroinvertebrates (i.e. containing healthy fish and macroinvertebrate communities). Montgomery Pool was assessed as meeting its aquatic life-use designation for fish, and macroinvertebrates as well.

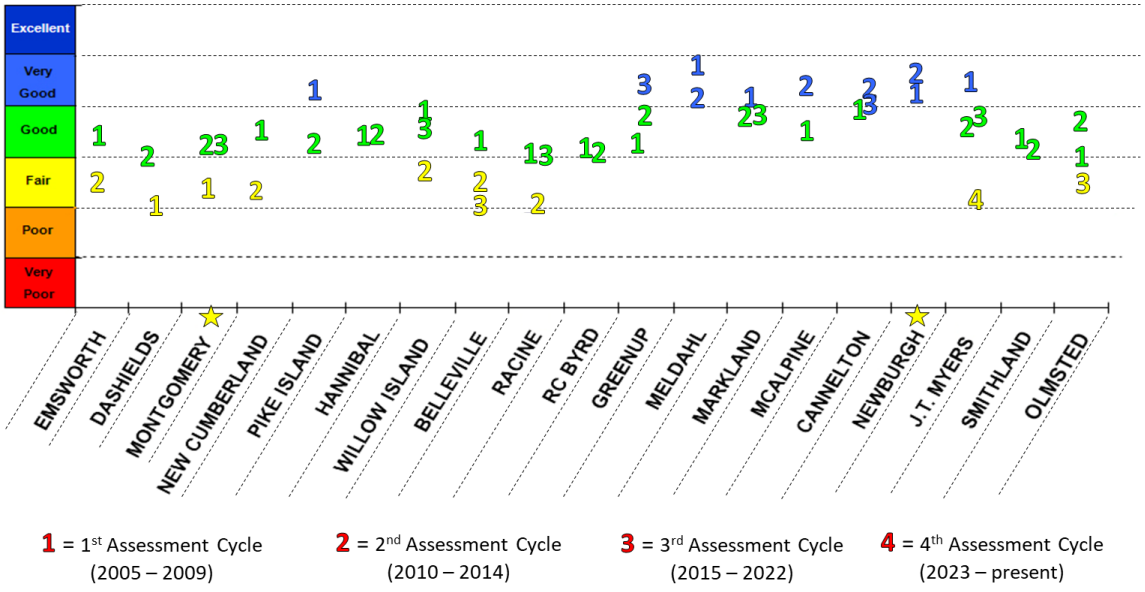
Assessment Comparisons

2023 was the first year of the 4th assessment cycle. All three cycles revealed the majority of the river to be in 'Good' condition, even though some pools changed in condition rating between surveys. The 2022 surveys concluded the third cycle, which enhances our ability to detect riverwide patterns. Some of the index and species variability observed across pools may be due in part to variations in natural distributions, instream habitat, invasive species distributions, and annual variations in flow, weather, and water quality.

Present vs. Past Assessments

The focus of ORSANCO's biological assessments is to determine whether each pool is in full support, partial support or non support of its ALU. To aid in interpretation, we assign one of six ratings (e.g. from "Very Poor" to "Excellent") to the pools based on the relative condition of their fish communities. Shifts between years in these condition ratings may be due to variations in environmental factors other than water quality. By examining these factors (e.g. invasive species, flows, etc.) and their effects on *m*ORFIn metrics, we attempt to provide defensible explanations for the differences in final condition ratings observed between assessments.

Sunset over Newburgh Pool, Ohio River, 2024.



1 = 1st Assessment Cycle (2005 – 2009)

2 = 2nd Assessment Cycle (2010 – 2014)

3 = 3rd Assessment Cycle (2015 – 2022)

4 = 4th Assessment Cycle (2023 – present)

CONCLUSIONS

Montgomery Pool

(Fish = FAIR, Macros =GOOD)

Variable	2010	2015	2024
Environmental Factors			
Avg. seasonal flow	**Normal**	**High**	**Normal**
Avg. Conductivity (us/cm)	475.1	267.1	354
Avg. Secchi Depth (inches)	55.5	31.4	79.6
Avg. CPUE Score	**41.2**	**10.2**	**20.6**
Avg. Sucker Score	**61.0**	**78.6**	**43.6**
Quillback	15	5	1
Northern Hogsucker	9	5	1
Avg. % Piscivore Score	**36.6**	**33.3**	**23.1**
Sauger	74	88	20
Smallmouth Bass	132	119	81
White Bass	27	6	2
Avg. GrRiver Score	**33.3**	**24.4**	**4.4**
Channel Darter	2	0	0
Mooneye	5	20	1
Silver Chub	29	0	0
Avg. Simple Lithophil Score	**52.6**	**54.7**	**32.2**
Silver Redhorse	85	138	8
Sauger	74	88	20
Avg. % Invertevore Score	**43.7**	**48.8**	**58.8**
Golden Redhorse	184	108	18
Avg. mORFIn Score	**32.9**	**32.3**	**25.6**
Fish Condition Rating	**Good**	**Good**	**Fair**

Montgomery Pool's fish community was assessed to be in "Fair" condition in 2024, exhibiting a downgrade in condition rating from the past two assessments. The 15 randomly drawn sites were distributed fairly evenly throughout the 18.5 mile long pool. Minor changes in abiotic water quality parameters were observed over the last three assessments with the highest Secchi depth observations this year. Visability into the water column was better than previously observed

The fish community has demonstrated shifts in species composition over the past three assessments. Gizzard Shad abundance has decreased substantially over the past two assessments. In 2010, Gizzard Shad represented 65.8% of the fish community with 96% of these individuals being comprised of juveniles (size class 1-3); in 2015, 1.0% of the observed fishes were Gizzard Shad with 88% being mature individuals (size classes 6-9); and in 2024 Gizzard Shad represented 12.2% of the sampled fishes with 100% of those individuals being juveniles (size class 1-2). High occurrence of juvenile Gizzard Shad is an example of an "irruptive species", which is not uncommon to observe with schooling fishes during a successful recruitment year, however it is a demonstration of how CPUE Score can be impacted or skewed. The CPUE Score was highly variable from one assessment to the next. However, once the number of individual fish surpasses the 95th percentile (n=666.99) at any given site, additional fish have a diminishing impact on the CPUE score. This helps to prevent irruptive species from skewing assessment results.

The % Simple Lithophil Score showed steady decline over the past three assessments. The relative abundance of the predominant families in this breeding guild (Catostomidae and Percidae) remained evenly distributed among species in 2024 as opposed to being dominated by only a few taxa. This was may be partially due to the shifts in substrate composition known to be inhospitable to simple Lithophils. Declines in boulder, cobble, and gravel substrates, and an approximate 10% increase in fine sediments were observed throughout the pool relative to last assessment.

Historical river conditions on the Ohio River lacked vegetation, however submerged aquatic vegetation (SAV) is well established in the Montgomery pool presently. SAV has been steadily increasing in the upper half of the Ohio River. The most abundant species was the invasive species, *Hydrilla verticillata*, which was present at all 15 sites. Native species of SAV were also observed in higher abundances, specifically Eelgrass, Najas spp, and Waterstargrass. It is speculated that this shift in available fish habitat has served as a safe haven for young of year centrarchids such as Bluegill, Smallmouth Bass, and Micropterus sp (individuals too small to be identified beyond genus).

CONCLUSIONS

Newburgh Pool

(Fish = GOOD, Macros = GOOD)

Variable	2012	2017	2024
Environmental Factors			
Avg. seasonal flow	**Low**	**High**	**Normal**
Avg. Conductivity (us/cm)	502.5	377.7	449.3
Avg. Secchi Depth (inches)	34.4	24.7	48.2
CPUE Score	**74.8**	**21.1**	**33.2**
Avg. % Tol Score	**92.4**	**84.2**	**79.3**
Green Sunfish	3	2	6
Silver Carp	0	0	7
Avg. Simple Lithophil Score	**11.7**	**28.6**	**29.8**
Saugeye	11	19	21
Smallmouth Redhorse	1	7	22
Silver Redhorse	1	1	5
Avg. GrRiver Score	**73.3**	**46.7**	**47.9**
Paddlefish	1	0	0
Shortnose Gar	7	4	3
Silver Chub	21	10	9
Avg. Intolerant Score	**55.2**	**47.5**	**40.4**
Channel Shiner	464	416	200
Smallmouth Bass	21	5	5
Avg. Species Score	**73.2**	**50.8**	**47.8**
Avg. number of native species per site	18	11	15
Avg. mORFIn Score	**46.0**	**33.6**	**33.7**
Fish Condition Rating	**Very Good**	**Good**	**Good**

The Newburgh Pool exhibited a large decrease in *m*ORFIn score from 2012 to 2017 and remained stable from 2017 to 2024. The pool was assessed to be in "Good" condition in 2024. The 15 randomly drawn sites were not evenly distributed throughout the 55.4 mile long pool. The upper third of the pool contained 2 sites and the lower two-thirds of the pool contained 13 sites. The two highest scoring sites were located on the right descending bank near one another in the lower third of the of the pool.

Abiotic water quality parameters did not seem to have an effect on the assessment, and little change occurred over the three assessments. Water and air temperatures were hot during the week that the fish assessment was performed (average water temperature was 29.7° C; daytime air temperature highs were in the 90's F). This was an exceptional year for water clarity during the index period. Secchi readings were significantly higher than in previous years. Beaver activity was common during fish sampling activities. Fishing was paused frequently throughout the week to allow beavers to safely exit the sampling area. Despite the decline in overall *m*ORFIn score from 2012 to the past two assessments, there are two fish metrics that increased over the past three assessments:

Percent Lithophil Score and Average DELT (Deformities, Erosions, Lesions, and Tumors) Score. Throughout the last three assessments there has been an increasing presence of Simple Lithophils. Simple Lithophils are an important group of fish species in regard to IBI development because most species tend to be positive indicators of stream health. Simple lithophils need clean cobble and gravel substrates in order to spawn successfully. Fine sediments have been increasing, while boulder, gravel, and cobble substrates have been decreasing on the Ohio River. Notable collections within this group are the reappearance of River Redhorse (n=1) and Logperch (n=4) in the Newburg Pool. Observations of DELT anomalies are an important indicator of fish health. Fish collected in 2024 exhibited fewer DELT anomalies than in previous surveys of Newburgh Pool.

Fish metrics that have decreased over the past three assessments are as follows: Average of Species Score, Average of Great River Score, Average of Intolerant, Percent of Intolerant Score. Species Score was primarily impacted by lower collections of native species. The Great River Score decreased because there was a rare collection of a paddlefish in 2012 and also fewer observations of more commonly encountered "great river species" such as Shortnose Gar and Silver Chub.

The number of fish surveyed decreased drastically from 2012 compared to the past two assessments (n=14,201; n=1,429; n=2,523); this coupled with the presence of tolerant and exotic species, which are not included in the CPUE score, caused the the Average CPUE score to decrease from 2012 as well (74.8, 21.1, and 33.2, respectively).

CONCLUSIONS

Macroinvertebrates

As per ORSANCO's Biological Assessment protocol, a minimum of 15 fish samples and/or 10 macro samples are required to be collected in each pool in order to derive a viable assessment. The ten macro samples must be deep Hester-Dendy samples (HDD). Although multihabitat kick samples (MH) are collected they can only be used to provide a means of scoring single visit sites, such as fixed stations. These MH samples must contain at least 200 individuals to be used for assessment purposes. Minimum sample number criteria (15 fish and 10 macro respectively) are standardized and necessary to ensure comparability between assessments.

An Adult Burrowing Mayfly (*Hexagenia limbata*).

Montgomery Pool

Macroinvertebrate collections in the Pool met the minimum number of samples with 14 HDD samplers recovered at the end of the colonization period. The Ohio River Macroinvertebrate Index (ORMIn) indicates that the macroinvertebrate community in Montgomery Pool is in "Good" condition, with an average ORMIn score of 37.2. The macroinvertebrate community was characterized by a healthy balance of functional feeding groups, in terms of both diversity and abundance. A robust diversity of Odonates, Trichopterans, and Chironomids were consistently observed throughout the pool. Montgomery Pool demonstrated above average species richness, with 74 unique taxa present. Dipteran larvae (n=2,763) comprised 32.9% of the community, containing individuals from 27 different genera.

Seasonal biologists retrieve a Hester Dendy sampler at the end of the colonization period.

Newburgh Pool

Macroinvertebrate collections in the Newburgh Pool met the minimum number of samples with 14 HDD samplers recovered at the end of the colonization period. The Ohio River Macroinvertebrate Index (ORMIn) indicates that the macroinvertebrate community in Newburgh Pool is in "Good" condition, with an average ORMIn score of 31.9. The HDDs were deployed during normal summer stage and retreived after the colonization period was complete.

Look for our mobile 2,200 gallon educational aquarium displays at festivals and events along the Ohio River filled with fishes from local areas.

To request a "Life Below the Waterline" display at your event, contact Rob Tewes (rtewes@orsanco.org) for pricing and scheduling

Life Below the Waterline

River-wide Catch Comparison (data from most recent survey year shown)

Group	Species (common name)	Emsworth '18	Dashields '21	**Montgomery '24**	New Cumberland '23	Pike Island '18	Hannibal '21	Willow Island '16	Belleville '22	Racine '15	Robert C. Byrd '19	Greenup '16	Meldahl '17	Markland '21	McAlpine '21	Cannelton '23	**Newburgh '24**	John T. Myers '15	Smithland '19	Olmsted '22	Open Water '22
GAR	Longnose Gar	18	16	**11**	9	54	54	34	39	64	19	42	59	31	21	22	**7**	16	30	140	28
	Spotted Gar																**2**		11		
	Shortnose Gar												1				**3**	12	27	81	43
SHAD	Skipjack Herring							2							1	10	**12**	5	2	1	
	Gizzard Shad	6	11	**388**	3995	37	24	154	1034	147	54	158	591	616	312	117	**797**	650	395	117	28
	Threadfin Shad																**12**		14	48	8
CARP	Common Carp	12	25	**21**	29	16	11	11	12	3	2	7	13	15	3	1	**2**	8	13	5	15
	Grass Carp													1	1						1
	Silver Carp														1	31	**8**	15	12	10	7
	Bighead Carp																				1
	Goldfish										1					1		1			
	Carp x Goldfish																				
MINNOW	Cyprinidae sp.																				
	Golden Shiner													1	1						1
	Striped Shiner			**9**			1						11								
	Spottail Shiner			**93**				11		4		2									
	Spotfin Shiner	76	81	**75**	90	61	60	295	41	127	60	52	19	8	18	16	**38**	112	2		
	Notropis sp.										1										
	Emerald Shiner	238	748	**544**	265	75	376	1085	278	1208	206	221	423	133	185	189	**684**	102	508	4	2
	Silverband Shiner																				
	Sand Shiner				1	70															
	Channel Shiner	1071	1423	**300**	116	484	391	1173	318	733	917	2017	872	685	145	194	**226**	255	261	4	
	River Shiner	1					1					16	69	47	94	62	**43**	104	57	3	1
	Shoal Chub																				
	Silver Chub	1									22	11	38	44	55	25	**11**	10	51	2	
	Streamline Chub	6	4	**58**		5															
	River Chub			**1**																	
	Gravel Chub																				
	Creek Chub											1									
	Central Stoneroller			**18**		2		9					1			3					
	Mississippi Silvery																		728	1	
	Suckermouth Minnow																				

River-wide Catch Comparison (data from most recent survey year shown)

Group	Species (common name)	Emsworth '18	Dashields '21	**Montgomery '24**	New Cumberland '23	Pike Island '18	Hannibal '21	Willow Island '16	Belleville '22	Racine '15	Robert C. Byrd '19	Greenup '16	Meldahl '17	Markland '21	McAlpine '21	Cannelton '23	**Newburgh '24**	John T. Myers '15	Smithland '19	Olmsted '22	Open Water '22
	Bluntnose Minnow	10	47	**156**	29	33	61	227	6	12	2	2	3	4		1		9	1		
	Bullhead Minnow						3	12	2		4	17	14	11	1	14	**3**	24	13	4	
	Silverjaw Minnow								1								**1**				
SUCKER	Ictiobinae sp.																				
	Ictiobus sp.																				
	Smallmouth Buffalo	22	43	**23**	9	42	14	26	7	33	18	19	45	24	9	6	**12**	32	66	17	22
	Bigmouth Buffalo											1			1	2		4	2	1	1
	Black Buffalo	5	20		7	13	1	3	1		8	3	14	21	9	2	**6**	2	5	9	19
	Carpiodes sp.						2									5	**9**				
	Quillback	2	11	**1**	7	3	10	9	5	3		3	28	41	10	6	**18**	7	23		
	River Carpsucker	4	43	**39**	14	5	8	18	58	20	38	38	151	181	92	174	**37**	187	73	81	29
	Highfin Carpsucker		1	**3**			3		4	8	1	6	6	8	1	1		3		1	
	Northern Hog Sucker	7	8	**1**	2	4	1	8		5	1	1		1	5						
	Moxostoma sp.																				
	Shorthead Redhorse																		9		1
	Smallmouth Redhorse	48	216	**59**	12	27	62	41	19	11	17	38	114	46	17	62	**35**				
	Silver Redhorse	131	189	**23**	52	26	118	42	8	16	4	39	31	26	7	6	**6**				
	River Redhorse	12	10	**151**	6	5		1	1	2		25	4	6	1	14	**1**				
	Black Redhorse	5		**4**	8	4		6													
	Golden Redhorse	34	177	**36**	224	116	439	219	30	56	11	124	112	65	31	28	**6**	8	4		
	Spotted Sucker							13		1		2	1	1							
	White Sucker				1		2														
CATFISH	Yellow Bullhead																				
	Brown Bullhead																				
	Northern Madtom																				
	Blue Catfish																	1	3	3	2
	Channel Catfish	9	16	**29**	8	45	59	35	49	52	73	61	98	107	58	59	**40**	106	423	35	11
	Flathead Catfish	8	7	**8**	12	10	12	22	17	24	25	29	26	39	24	22	**15**	20	11	13	3
SUNFISH	Lepomis sp.																				
	Warmouth													1							
	Rock Bass	31	28	**12**	173	35	14	11	2												
	Bluegill	20	105	**458**	45	138	129	540	60	220	35	205	73	490	154	115	**71**	65	45	8	4

River-wide Catch Comparison (data from most recent survey year shown)

Group	Species (common name)	Emsworth '18	Dashields '21	Montgomery '24	New Cumberland '23	Pike Island '18	Hannibal '21	Willow Island '16	Belleville '22	Racine '15	Robert C. Byrd '19	Greenup '16	Meldahl '17	Markland '21	McAlpine '21	Cannelton '23	Newburgh '24	John T. Myers '15	Smithland '19	Olmsted '22	Open Water '22
	Green Sunfish	3	2		23	2	3	1	1	4	10	2	2	9	6	1	**8**	1	2		1
	Pumpkinseed		1	**1**	19	6	1	14	5	2											
	Orangespotted Sunfish		1				17	197		5		5	13	76		1	**3**	6	2		2
	Longear Sunfish					20	173	18	4	13	6	15	17	134	88	56	**64**	137	7	8	5
SUNFISH	Redear Sunfish			**2**				2	3	2		4	2	13	3	20	**3**	1	5		
SUNFISH	Lepomis Hybrid					1									1						
SUNFISH	Bluegill X Longear																				
SUNFISH	Bluegill X Green									1											
SUNFISH	Longear X Green																				
TEMPERATE BASS	Morone sp.			**89**	42	1		49	32	8	35	35	25	140	36	34	**148**	72	15	138	2
TEMPERATE BASS	White Perch																				
TEMPERATE BASS	Striped Bass												3								
TEMPERATE BASS	White Bass	3	10	**3**	1		27	4	10	1	13	16	59	95	41	7	**6**	13	125	11	5
TEMPERATE BASS	Yellow Bass															1			12	2	5
TEMPERATE BASS	Hybrid Striped Bass				9		6		1	1	17	6	16	13	7	9		2	9	19	
BLACK BASS	Micropterus sp.	2		**108**		3		5			1		21	2			**4**	14			
BLACK BASS	Smallmouth Bass	229	177	**134**	301	169	58	198	31	41	50	24	55	65	20	13	**6**	2	1	5	
BLACK BASS	Largemouth Bass	3			5	17		20	15	19	1	18	6	19	20	5	**21**	2			
BLACK BASS	Spotted Bass	7	17	**3**	12	25	18	46	32	17	16	59	46	120	74	64	**55**	133	15		1
DARTER	Johnny Darter				1																
DARTER	Greenside Darter					1								1							
DARTER	Variegate Darter																				
DARTER	Rainbow Darter		1	**2**				1						1							
DARTER	Fantail Darter																				
DARTER	Bluebreast Darter																				
DARTER	Banded Darter																				
DARTER	Dusky Darter																		1		
DARTER	Channel Darter							1				1									
DARTER	Blackside Darter																				
DARTER	Slenderhead Darter																				
DARTER	River Darter			**2**																	
DARTER	Logperch	59	91	**222**	190	35	85	73	7	9	4	16	4	14	1	4	**4**	2	3	1	

River-wide Catch Comparison (data from most recent survey year shown)

Group	Species (common name)	Emsworth '18	Dashields '21	Montgomery '24	New Cumberland '23	Pike Island '18	Hannibal '21	Willow Island '16	Belleville '22	Racine '15	Robert C. Byrd '19	Greenup '16	Meldahl '17	Markland '21	McAlpine '21	Cannelton '23	Newburgh '24	John T. Myers '15	Smithland '19	Olmsted '22	Open Water '22
PERCH	Yellow Perch	1		**21**		9	1	7			1			1							
	Walleye	26	19		44	9	5	1	1	1			1		12	2		5			
	Saugeye		16	**9**	6	1	12		1	25	5		14	78	152	637	**22**	4	33	7	
	Sauger	13	85	**30**	59	31	76	73	21	15	42	194	58	58	8	59	**67**	225	38	10	2
MISC.	Silver Lamprey	1	1									1									1
	Ohio Lamprey																				
MISCELLANEOUS	Goldeye																	10	5		2
	Mooneye	2		**1**	2	3		2	2		2	2		2	12	3	**9**	1		1	
	Paddlefish													1		1					
	Northern Pike	1																			
	Muskellunge	4		**1**																	
	White Crappie							1	1	2		6	2	3	1		**1**	7	1		1
	Black Crappie	1					1	4		6	2	6	10	1	2	1	**1**	7	1	1	2
	Inland Silverside																			1	
	Brook Silverside		1	**15**	1			1			1							1	1		
	Atlantic Needlefish																				
	Trout-Perch	9	22			14	3		1												
	Banded Killifish				29	1	16	14													
	Western Mosquitofish																	1			
	Bowfin				1																
	Freshwater Drum	17	20	**101**	8	8	44	16	70	36	285	116	158	151	86	450	**368**	114	656	576	53
Total No. of Individuals		**2158**	**3693**	**3265**	**5867**	**1666**	**2402**	**4755**	**2230**	**2957**	**2010**	**3666**	**3329**	**3650**	**1827**	**2556**	**2895**	**2518**	**3721**	**1368**	**309**
Total No. of Species		**41**	**37**	**43**	**41**	**43**	**42**	**49**	**40**	**40**	**39**	**45**	**45**	**49**	**45**	**47**	**44**	**47**	**46**	**35**	**33**