

Sea Lamprey (*Petromyzon marinus*)



Adult
North River
New Hampshire

Oral disc

LOW RISK

1

HIGH RISK

An anadromous species native to the coastlines of eastern North America and Western Europe, the Sea Lamprey spawns and develops in fresh water before returning to the sea as a sexually immature adult to parasitize other fish. Highly valued as a source of food in many European countries, Sea Lampreys have, with few exceptions, never been viewed as anything edible in this country. A fishing guide in New York who felt compelled to try one after a client gave them rave reviews may have identified the crux of the problem when he said that eating one was easier to process on a mental and psychological level once the gruesome-looking head was cut off. Given the problems they have caused in the Great Lakes, it is a bit ironic that the anadromous populations in coastal waters are imperiled in much of their native range in both North America and Europe, where restoration efforts are underway. While there is some debate about whether or not Sea Lampreys were native to Lake Ontario, Niagara Falls blocked any further movements into the Great Lakes until the construction of the Welland Canal in 1829 provided the passageway needed to skirt this impediment. Why it took almost 100 years for them to do so is unknown, although improvements to the canal in 1919 appear to have opened the door for this invasion. First reported from Lake Erie in 1921, Sea Lampreys were firmly established throughout the Great Lakes by the end of the 1940s. More predator than parasite in the Great Lakes, 40–60% of the fish attacked by this species are either killed outright by the loss of body fluids or so weakened that they succumb to disease and infection. With a preference for Lake Trout, Walleye, ciscoes, and other large species with small scales and thin skins, Sea Lampreys soon decimated what was left of these populations in the Great Lakes, resulting in the collapse of the commercial fisheries in the 1940s and '50s. The extinction of three species of endemic deep-water ciscoes in the lakes has been blamed in part on the depredations of this parasitic lamprey. Sea Lampreys have never reached the densities in Lake Erie that are seen in the other Great Lakes, due partially to the lack of suitable spawning streams. Currently, the Grand River and Conneaut Creek in Ashtabula County offer some of the best spawning habitats in the Ohio portion of Lake Erie. Current control efforts largely rely on the use of lampricides to kill both the adults and ammocoetes, which unfortunately has negative consequences for other smooth-skinned gill breathers such as catfish, mudpuppies, and native lampreys.

FIELD ID: Adults twice the size of any other Ohio lamprey. Deep notch separates dorsal fin into two lobes. Radiating teeth on oral disc large and sharp; at least one tooth in the circumoral series two-pronged (bicuspid). Myomeres usually 65–76 (extremes 63–80). Adults boldly mottled with darker speckles or blotches prior to spawning. Ammocoetes with broadly distributed pigment on head, extending well behind eye; some dark pigment on caudal fin, radiating out from tail portion of body, with at least some pigment reaching to tip of caudal fin.

SIMILAR SPECIES: **American Brook Lamprey** (in ammocoete stage): lower average myomere count, 66–70 (extremes 63–73). Less broadly distributed pigment on the head not extending well behind eye; tail portion of body with more pigment overall, but lacking pigment on clear, thin margin of caudal fin. No other lampreys reach such a large adult size and have as much dark mottling overall. All species of *Ichthyomyzon* distinguished by undivided dorsal fin. **Least Brook Lamprey** does not co-occur with Sea Lamprey in Ohio.

HABITAT: Free-flowing tributary streams feeding into Lake Erie with sand and gravel riffles for the adults to spawn on. Ammocoetes require beds of sand and

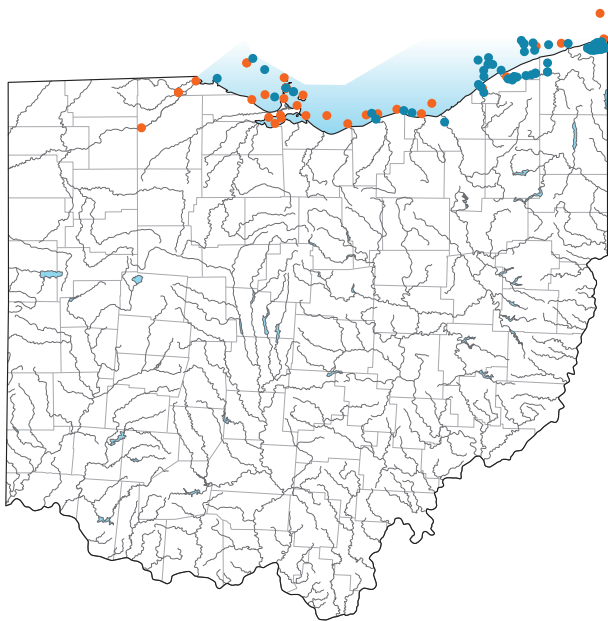
mixed organic debris free of heavy silt deposits. After transformation, sexually immature adults require access to large water bodies supporting populations of large fish to act as hosts.

ASSOCIATE SPECIES: Often attached to native Lake Trout and introduced West Coast salmonids in the Great Lakes. Ammocoetes found in habitats of Johnny, Blackside, and Eastern Sand Darter as well as Brindled Madtom. Spawning adults found with various darters and other riffle-dwelling species.

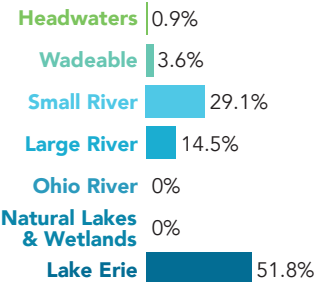
SPAWNING: Nest Builder: life cycle is identical to other species of parasitic lampreys in Ohio. After spawning on shallow riffles in the spring, post-spawning adults drift into pools and eddies, where they soon die. Large females can produce as over 300,000 eggs, although the average in one study was 230,000. Spawning in Ohio occurs in May and early June.

ABUNDANCE: 125 OSU records. 460 individuals recorded from 91 sites on 12 water bodies in 9 of 88 counties.

BEST SITES: Spawning and ammocoetes: Grand River; adults: open part of Lake Erie.



State Status	non-native
Size	ammocoetes: 7–8” adults: up to 25”
Feeding	adult: parasitic on fish ammocoete: filter feeder
Population	declining



Alewife (*Alosa pseudoharengus*)

In the history of biological invasions of the Great Lakes, the Sea Lamprey and Alewife stand as the first heavyweights to deliver the opening salvos. Like the Sea Lamprey, Alewives are an anadromous species native to coastal waters of the eastern United States, utilizing freshwater tributaries and headwater ponds and lakes as spawning sites. Using the Welland Canal to bypass Niagara Falls, Alewives were first reported from Lake Erie in 1931, ten years after the first Sea Lamprey. From there, Alewives spread quickly into the upper Great Lakes, where they were reported from Lake Huron in 1933, Lake Michigan in 1949, and Lake Superior in 1954. With few predators to control their numbers (Lake Trout and other large predatory species having been decimated by Sea Lampreys, overfishing, and changing habitat conditions), Alewives exploded in the lower Great Lakes. They reached absurd levels in Lake Michigan, where they constituted 70–90% of the total fish biomass in 1966. In a textbook example of the “boom and bust” cycle taught in most courses on population ecology, a massive die-off in the summer of 1967 killed 70% of the population in Lake Michigan and left windrows of dead fish rotting on beaches in four states. The Alewife population in Lake Erie, always more modest by comparison, declined in a less dramatic fashion after peaking in the 1970s. The shallower waters of Lake Erie may have been a controlling factor in Alewife densities, as they are sensitive to temperatures below 38°F and subject to mid-winter die-offs during the coldest winters. Planktonic feeders operating at the base of Great Lakes food chains, Alewives have been blamed for declining numbers of native planktivores, altering the food chain. With the decline of native Great Lakes sport fishes, Pacific Salmonids were introduced to control Alewives and provide a new sport fishery beginning in the 1960s. Since 1970, there have been sporadic captures of individuals in the Ohio River, but at this time, there do not appear to be any established populations. Very recently, they have also become established in Pymatuning Lake, representing the only inland reservoir population in Ohio. This is likely the result of bait-bucket introductions aided by the proximity to Lake Erie.

FIELD ID: Mouth oblique, posterior end of lower jaw not reaching to middle of eye; jaw teeth weak or inconspicuous. Dorsal fin short, 12-16 rays. Belly keeled with a single row of saw-like scales (hence common name "Sawbelly"); pelvic axillary process present. Dark spot on shoulder behind the opercle.

SIMILAR SPECIES: **Skipjack Herring:** mouth larger and less oblique with small but conspicuous teeth and strongly projecting lower jaw; posterior end of upper jaw reaching to middle of eye. Dorsal rays 16-21 vs. 12-16 in the Alewife. **Gizzard and Threadfin Shad:** distinguished by prominent post-opercular spot. Shorter, more slab-sided body. Small mouth with jaws of about equal length. Last ray of dorsal fin extended into thread-like filament.

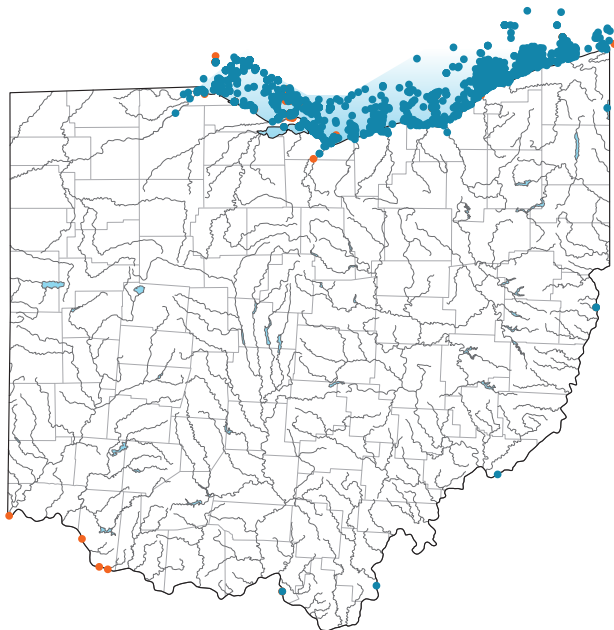
HABITAT: Open waters of lakes and large reservoirs. In the Great Lakes normally found in deep waters in winter, moving into nearshore mid-level depths in spring and fall. Adults inhabit shallower shoreline habitats during summer, while young are reported to spend their first two years in mid-level depths.

ASSOCIATE SPECIES: Gizzard Shad, Emerald Shiner, Spottail Shiner, Cisco, and other open-water species.

SPAWNING: Broadcast Spawner: spawning primarily occurs at night in shallow, near-shore waters. Single pairs swim in a tight circle near the surface while eggs and milt are released. Egg predation is heavy by both spawning and non-spawning Alewives at the height of spawning activity. Fecundity: 11–22,000 eggs per female.

ABUNDANCE: 2,116 OSU records. 410,452 individuals recorded from 1,103 sites on 16 water bodies in 13 of 88 counties.

BEST SITES: Western Basin of Lake Erie; Pymatuning Lake [Ashtabula].



State Status	non-native
Size	8–10", max. 15"
Feeding	filter feeder
Population	stable

Headwaters	0%
Wadeable	0.9%
Small River	1.3%
Large River	0.3%
Ohio River	0.7%
Natural Lakes & Wetlands	0%
Lake Erie	96.8%

Goldfish (*Carassius auratus*)



First domesticated from the Prussian Carp over 1,000 years ago in China as an ornamental fish for ponds and small containers, Goldfish are considered by some authors to be the first foreign fish introduced into North American waters, with some releases reported to have occurred as early as the late 1600s. The first published record from the public waters of Ohio was in 1888 in Hamilton County, the result of escapees from private ponds where they had been stocked. Their continued popularity as both an ornamental and a bait fish during the twentieth century, coupled with their more recent demand as a feeder fish by aquarists, has ensured a continuous source of potential introduction into Ohio's waterways. Despite this, they have never achieved the same level of abundance as their close relative and associate, the Common Carp. During his surveys in the first half of the twentieth century, M. B. Trautman found the Goldfish to be abundant only in the shallower waters of western Lake Erie and associated tributary streams like the Maumee, Portage and Sandusky Rivers, in addition to a few inland reservoirs. Lake Erie at this time represented the center of a commercial fishery that developed around this species in the United States. With little value as a food fish, however, most were sold for fertilizer. Surveys between 1980 and 2000 revealed an increasing number of occurrences in streams statewide. Goldfish populations were particularly strong in the Wabash (Mercer Co.), Great Miami, Cuyahoga (Summit Co.), and Tuscarawas (Stark Co.) Rivers. Surveys after 2000 have shown a general decline in these population centers, with the exception of Lake Erie and low-gradient tributaries in the Western Basin. Carp-Goldfish hybrids are frequently encountered and sometimes outnumber either parent in some areas of Lake Erie. Many of the fancier varieties of Goldfish sold as aquarium specimens rarely survive if placed in Ohio streams. Their bright colors, fancy fins, and the other physical deformities forced on them by breeders render them an easy meal. Those few varieties capable of surviving and reproducing in the wild often lose their bright colors in subsequent generations, reverting to the more muted colors seen in carp with only a few remaining vivid.

FIELD ID: Body deep, stout, and moderately compressed; snout pointed, mouth terminal. Barbels absent from upper jaw and snout. Scale bases lack dark spot seen in carp. Leading spines on dorsal and anal fin serrated.

SIMILAR SPECIES: **Common Carp:** 2 pairs of fleshy barbels, the larger at the corner of the upper jaw and the smaller on the upper jaw. Scale bases with dark spot. Caudal fin more deeply forked.

HABITAT: Lakes, ponds, low-gradient streams, and other lentic habitats associated with large water bodies. Often found in shallow waters in association with aquatic vegetation when present, although foraging Goldfish often increase water turbidities with their rooting actions, suppressing the growth of aquatic plants. Adults generally school near the bottom but are frequently seen near the surface, which makes them attractive additions to backyard water gardens and foraging Great Blue Herons. A species of more tropical origin, they do not do well

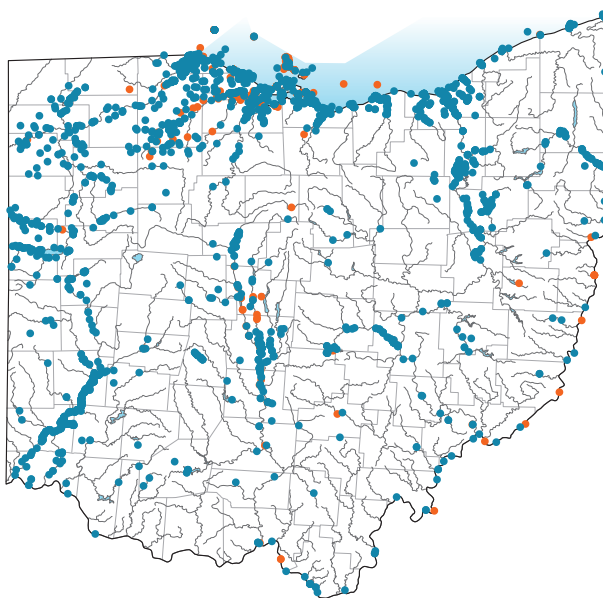
in the cooler, higher-gradient streams found in many areas of Ohio. They are more tolerant of the general types of water pollution found in Ohio than most of our native species and have become the aquatic counterpart of the guinea pig or rat in experimental research.

ASSOCIATE SPECIES: Common Carp.

SPAWNING: **Broadcast Spawner:** spawning activities may occur anytime throughout the spring and summer. Females scatter adhesive eggs over submersed aquatic plants or root masses to which they immediately stick and are subsequently fertilized by the males.

ABUNDANCE: 2,636 OSU records totaling 25,984 individuals.

BEST SITES: Lake Erie bays and harbors, or your local pet shop.



State Status	non-native
Size	8–10", Ohio record: 16"
Feeding	omnivore
Population	stable

Headwaters	12.2%
Wadeable	23.9%
Small River	20.5%
Large River	19.8%
Ohio River	1.7%
Natural Lakes & Wetlands	0.3%
Lake Erie	21.6%

Common Carp (*Cyprinus carpio*)



Originally native to eastern Asia and Europe, the Common Carp has been introduced onto every continent except Antarctica, generally wearing out its welcome in short order. Still an important menu item in parts of Eastern Europe, the Common Carp was domesticated and farmed as a source of food during the Roman era. Carp were first introduced into Ohio waters in the fall of 1879 when the U.S. Fish Commission sent the first shipments to applicants in the Cincinnati and Fremont areas. These shipments continued to applicants on a large scale until 1886 before ending in 1896. Most of the recipients of these shipments were stocking them in private ponds. To no one's great surprise, many of them soon escaped into nearby streams, where they quickly spread. In 1881, the state released carp into the Maumee River and Ten Mile Creek in hopes of providing a commercial replacement for the dwindling stocks of Walleye, Sauger, and other Lake Erie fish. As many of the native fish found in Ohio's lakes and streams were far superior in flavor, carp never really gained acceptance as a suitable food fish in this country as they did in Asia and parts of Europe. Twenty years after their initial releases, however, carp were abundant enough in western Lake Erie to support a commercial fishery. Finding limited markets in Ohio and surrounding states, much of this harvest was shipped to the East Coast and turned into gefilte fish. Common Carp are now widespread and common residents throughout Ohio's lakes and rivers. Preferring lentic conditions, they are most abundant in lakes and areas of sluggish current in the larger rivers where there is an accumulation of organic matter. They are decidedly more uncommon in clear, cold, high-gradient streams with rocky bottoms. Extremely tolerant to degraded water conditions, they flourish in streams polluted with sewage and other organic pollutants and can survive periods of low dissolved oxygen by gulping air from the surface. As omnivores sifting through bottom substrates for any type of organic matter, they can play a small role in the degradation of aquatic habitats, increasing water turbidities and uprooting aquatic plants. The brightly colored and often outrageously expensive "koi" sold as ornamental fish for garden ponds are a domesticated subspecies of Common Carp.

FIELD ID: Heavy body; large, coarse scales with dark spot at base of each scale. Two fleshy barbels on each side of upper jaw; serrated spines on front edge of dorsal and anal fins. Overall coloration bronze-gold to golden-yellow on sides; whitish-yellow belly. Partially scaled or scaleless individuals frequently observed.

SIMILAR SPECIES: **Goldfish:** upper jaw without fleshy barbels. No dark spot at base of scales. Caudal fin deeply emarginated but not forked, the lobes more rounded.

HABITAT: Warm lakes, ponds, sloughs, and low-gradient streams containing an abundance of organic matter. Tolerant to a variety of habitat conditions and substrate types but generally absent from cold waters and high-gradient streams. Generally found in turbid waters with soft bottoms.

ASSOCIATE SPECIES: Goldfish, Green Sunfish, Bluntnose Minnow, Yellow Bullhead, and other species tolerant of poor water quality and habitat.

SPAWNING: **Broadcast Spawner:** spawning occurs in and around beds of submersed aquatic plants at depths between 1–4'. Highly prolific and able to spawn multiple times in a single season. A typical female may lay up to 300,000 eggs at a time and over one million in a season. Fortunately, large numbers fall victim to bacteria, fungi, and predators both small and large.

ABUNDANCE: 16,490 OSU records. 188,575 individuals recorded at 7,056 sites on 831 water bodies in all 88 counties.

BEST SITES: Sandusky Bay and other Lake Erie bays and harbors.



Grass Carp (*Ctenopharyngodon idella*)



Native to eastern Asia, the Grass Carp (also known as the White Amur) has a long history of cultivation in China as a source of food. Only distantly related to the more familiar Common or European Carp, it is one of the largest Cyprinids to be found anywhere, with reported weights up to 100 pounds. These inhabitants of quiet waters in floodplain lakes and large turbid rivers are primarily herbivores, feeding on a variety of aquatic plants and submerged terrestrial vegetation. Capable of consuming up to three times their own weight per day, they have been widely introduced as a biological control for aquatic vegetation. Currently found in over 70 countries and 45 states, they were first imported into North America by aquaculture facilities in Alabama and Arkansas in 1963. Grass Carp frequently escaped from lakes and hatchery ponds with connections to open stream systems, and were being reported with increasing frequency in the Missouri and Mississippi rivers by the early 1970s. In an effort to prevent the establishment of reproducing populations, many states (including Ohio) required that all Grass Carp sold and liberated in private lakes or ponds must be sterile triploids. Unfortunately, not all states have this requirement, and unknown numbers of diploid fish capable of reproducing are out there (of 175 fish collected in the Lake Erie drainage between 2013 and 2018, 89 out of 119 tested were diploids). Although there are well-established populations in a number of states in the Mississippi River basin, including the Ohio River in Illinois, the bigger fear for Ohio and other Great Lakes states has always been that Grass Carp might somehow establish themselves in the Great Lakes. It was thought (hoped) that a reproductive characteristic of the Grass Carp requiring eggs to remain in suspension for two to four days in order to successfully develop and hatch might prove to be a limiting factor in those tributary streams where flow regimens are interrupted by dams. However, a successful spawning was confirmed in a Lake Erie tributary stream for the first time in 2013, when an analysis of four small individuals captured in the Sandusky River determined that they were produced through natural reproduction rather than a fish hatchery. In 2015, spawning was again confirmed in the Sandusky River when suspended eggs were collected during high-water events in June and July. Further research has also indicated reproduction in the Maumee River as well, prompting the ODNR Division of Wildlife to target these areas for control efforts. Just how pervasive this species (described by one writer as “explosive breeders and prodigious feeders”) will become in Lake Erie and its tributary streams remains to be seen. For those interested in fishing for this species, chumming with corn or bread and floating a hook baited with dough on the surface is reported to increase your odds. They are also known to take various fruits or berries as bait, including mulberry, watermelon, and tomatoes.

FIELD ID: Similar to Common Carp; body elongated, torpedo-shaped. Mouth terminal, slightly oblique; lips firm, non-fleshy. Barbels absent. Eyes at same level as mouth. Scales large, appearing cross-hatched. Dorsal fin short relative to overall length (8–10 soft rays), lacking hardened spine-like ray at leading edge. Spine also lacking from anal fin. Silvery or olive overall, darker dorsally, belly whitish; lacks golden hues of Common Carp.

SIMILAR SPECIES: **Common Carp:** upper jaw with 2 fleshy barbels on each side. Front edge of dorsal and anal fins with hardened spine-like ray with serrated edges. Dorsal fin much longer (over 16 soft rays). Overall coloration bronze to golden-yellow on back and sides; belly lighter. **Goldfish:** body shorter and more robust. Scales without cross-hatched appearance. Dorsal fin long (over 16 soft rays). Front edge of dorsal and anal fins with short, serrated, spine-like rays. Color variable; “wild” individuals brownish-olive dorsally; sides yellowish. **Silver and Bighead Carp:** large head; body long, compressed. Keel along belly with very small scales. Eyes angled downward, set below midline of body. Lower jaw protruding in both species.

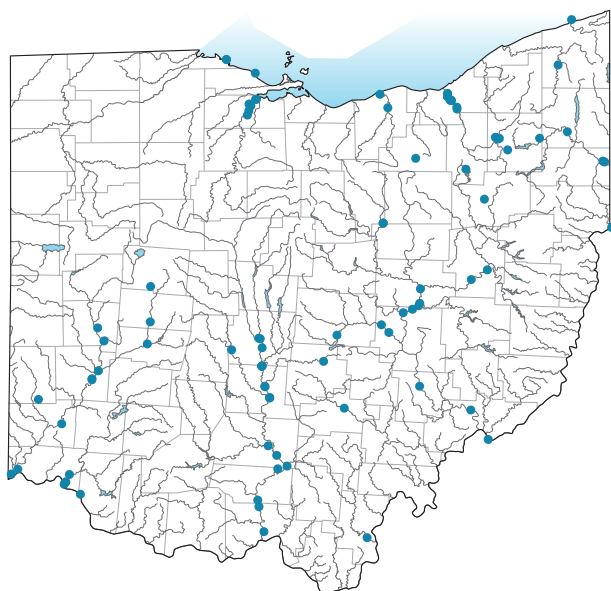
HABITAT: A variety of lentic habitats with aquatic vegetation including lakes, ponds, floodplain lakes, and other backwater habitats and pools in large, slow-moving rivers. Spawns in fast-moving rivers where currents keep the eggs in suspension until hatching. Although they are herbivores, they do not eat algae in any form (planktonic or filamentous), instead primarily feeding on rooted aquatic vegetation.

ASSOCIATE SPECIES: Common Carp, Goldfish.

SPAWNING: **Open-Water Spawner:** eggs are buoyant and must remain in suspension to successfully develop and hatch. Successful spawning requires a long enough stretch of free-flowing river to meet this requirement. Recent evidence from the Maumee and Sandusky rivers indicates the required length of suspension may not be as great as originally thought.

ABUNDANCE: 279 OSU records. 355 individuals recorded from 144 sites on 41 water bodies in 39 of 88 counties.

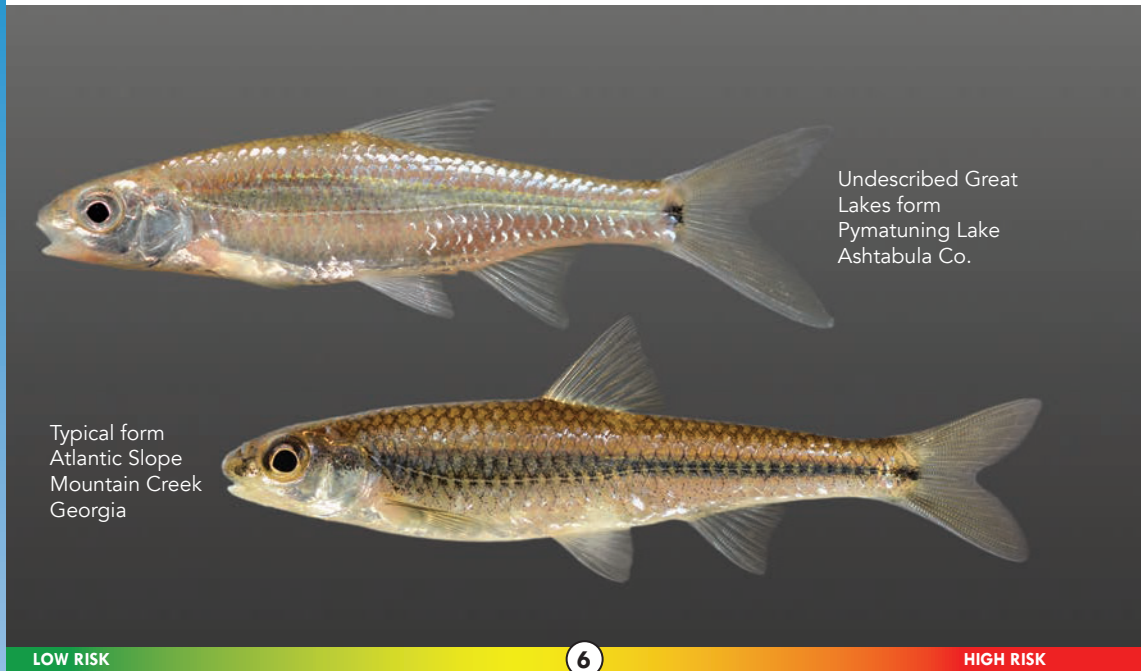
BEST SITES: Sandusky River, Fremont and Wightmans Grove [Sandusky]; widely stocked in ponds and lakes throughout the state.



State Status	non-native
Size	36–48", 30–50 lbs. up to 60", 100 lbs.
Feeding	herbivore
Population	increasing

Headwaters	1.3%
Wadeable	2.1%
Small River	14.2%
Large River	36.8%
Ohio River	1.7%
Natural Lakes & Wetlands	4.6%
Lake Erie	39.3%

Spottail Shiner (*Notropis hudsonius*)



Widely distributed along the eastern seaboard and across the northern U.S. and Canada to Alberta and the Northwest Territories, the Spottail Shiner appears in two forms. Populations in the Great Lakes basin, along with those further north and west, seem to be an undescribed form (Great Lakes Spottail Shiner, *Notropis cf. hudsonius*). These populations inhabit only the largest rivers and lakes, while populations along the Atlantic Slope can inhabit much smaller streams but still occur in larger rivers. The two forms look quite different to the trained eye. In Ohio, this species was historically found only in Lake Erie and the lower reaches of some of the larger tributary streams. Although population levels vary over time with changing conditions in the lake, Spottails are the second most abundant minnow in Lake Erie, outnumbered only by the Emerald Shiner. A mid-water inhabitant, it reached its greatest abundance in clear waters over sand and gravel substrates with depths ranging between 3 and 60 feet. M. B. Trautman noted decreases in the populations in Maumee and Sandusky bays after 1945 as a consequence of increasing water turbidities and siltation of bottom substrates. Although Trautman reported in 1981 that this species had maintained its abundance in Lake Erie, data from annual trawl surveys conducted by the Ohio Division of Wildlife hint at a sharp decline over the last 35 years. During the 1970s, counts of one and two thousand individuals in a single trawl were not uncommon, but these numbers dropped dramatically in following decades, and surveys after 2000 have rarely exceeded counts of over 100 individuals in a single trawl. The collection of three individuals from East Reservoir in Summit County in 1926 marked the first collection for the Ohio drainage. As Spottail Shiners are an important and widely used baitfish, it could be argued that this was an early bait-bucket introduction. Alternatively, they are a lake-dwelling species and may have been native to the Portage Lakes (which are natural, although very modified). Definite introductions into northeast Ohio reservoirs in recent years may be responsible for the populations seen in Mosquito Creek and the Mahoning River in Trumbull County. These introductions and others in the upper Allegheny system in New York and Pennsylvania (first documented 1974, PSU 1364) may be the source for an expanding population in the Ohio River. In the 1980s, Spottail Shiners were first recorded in the Ohio River and its tributaries, which were never part of its historical range in the Midwest. Spottails are most common between the Pennsylvania line (Columbiana Co.) and Lawrence County, but they have been found as far downstream as Clermont County in southwest Ohio.

FIELD ID: Body elongate, laterally compressed, and tall. Short head with large eye and slightly sub-terminal mouth; rounded, slightly protruding snout. Body very silvery; no lateral band. Distinctive black caudal spot; white leading edge on ventral lobe of caudal fin. Dorsal fin origin noticeably forward of center, closer to head than tail, opposite or slightly in front of origin of pelvic fins. Dorsal and anal fins falcate (concave); anal fin with 8 rays. Atlantic Slope populations more elongate, less silvery; marked with lateral band and less distinct caudal spot.

SIMILAR SPECIES: **Mississippi Silvery Minnow:** lacks caudal spot. Dorsal and anal fins not falcate. Dorsal fin origin definitively forward of pelvic fin origin. Small knob on tip of lower jaw.

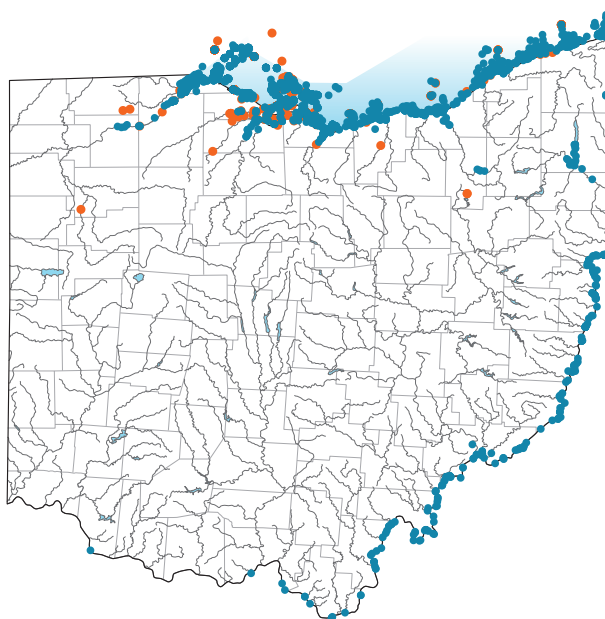
HABITAT: Large lakes and rivers with clear water and substrates composed primarily of sand and gravel. As a mid-water species, it is tolerant to a variety of substrate compositions as long as they are clean and free of clayey silt depositions. Atlantic Slope populations can be found in decidedly smaller streams, usually over sandy substrates in pools.

ASSOCIATE SPECIES: Emerald Shiner; Silver Chub.

SPAWNING: **Substrate Spawner:** spawning aggregations form over sand and gravel substrates in riffles near the junctions of small tributary streams or along shorelines. In Lake Michigan, female Spottails have been observed depositing eggs in patches of *Cladophora* algae growing on a water intake crib. In lake situations, spawning migrations are sometimes seen up tributary streams in the spring.

ABUNDANCE: 12th of 44 native cyprinids. 4,070 OSU records. 172,056 individuals have been recorded from 1,614 sites on 49 water bodies in 25 of 88 counties.

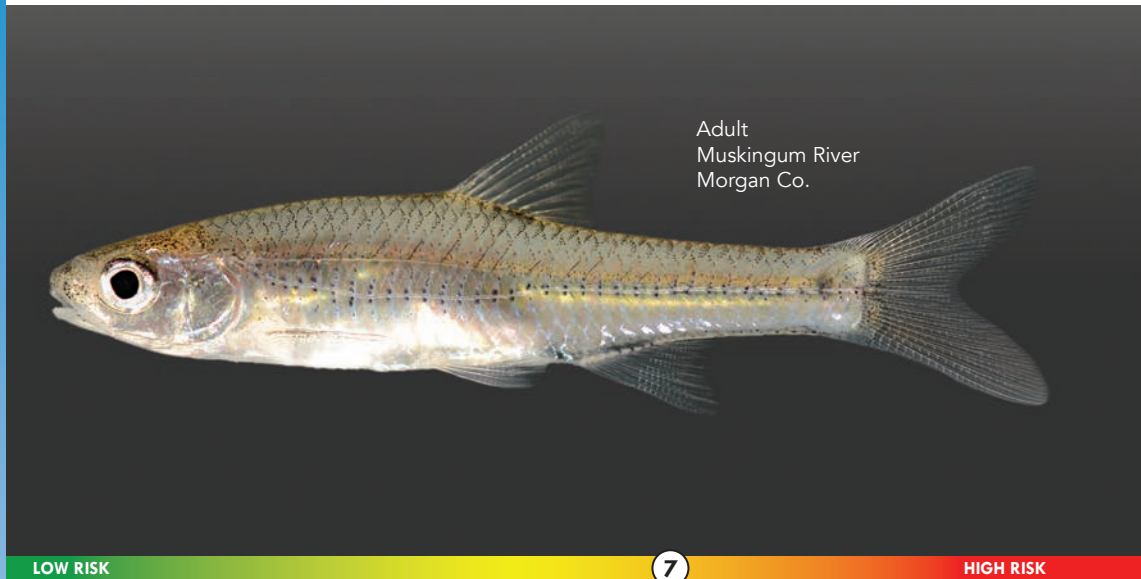
BEST SITES: Lake Erie shoreline and beaches.



State Status	none
Size	3–5", max. 6"
Feeding	insectivore
Population	Lake Erie: stable Ohio River: increasing

Headwaters	0.3%
Wadeable	2.1%
Small River	3.3%
Large River	2.6%
Ohio River	4.6%
Natural Lakes & Wetlands	0%
Lake Erie	87.0%

Ghost Shiner (*Notropis buchanani*)



Aptly named for their small size and translucent bodies, Ghost Shiners are one of Ohio's two smallest cyprinids (the other being the Pugnose Shiner), rarely reaching two inches in length. Known historically only from the Mississippi River basin and a few Gulf Coast tributaries west of the Mississippi River, they were not found in Ohio until 1930. Between 1930 and 1955, the largest populations were found in the ponded sections of the lower Muskingum River between Zanesville and Marietta. Elsewhere, it was recorded in small numbers in the Ohio River and lower sections of some of the tributary streams between Marietta and Cincinnati. Between 1955 and 1980, Ghost Shiners had seemingly disappeared from Ohio waters, with only a single collection in the Muskingum River and four collections in the Ohio River. These early collections were typically made with seines in calm, clear waters at the mouths of tributaries of the Muskingum River during high-water events. New sampling gear has now given us a better understanding of this species, and it is likely that these early collections were stray individuals of the much larger population dwelling in the depths of the main ponded sections of the Muskingum. Recent surveys using small trawls and electrofishing gear have found Ghost Shiners to be the most numerically abundant fish in the Muskingum River dam pools, with over 1,000 individuals sometimes counted in a single trawl. They are also common in the deep, murky embayments and flooded creek mouths of Ohio River tributary streams. Their relatively recent appearance in the Great Lakes drainage has been one of the more surprising range expansions of any native Ohio fish. First collected in two tributary streams of Lake St. Clair in Ontario, Canada, in the 1970s, they were recorded from a tributary of the Maumee River in Ohio in 1983. Shortly thereafter, they were collected in the Maumee, Portage, and Sandusky rivers. They are currently widely distributed and often abundant in the larger rivers of the Maumee basin. In Lake Erie, they are caught with increasing regularity in the lower sections of the larger tributaries, particularly in deep, murky shipping channels, as far east as Ashtabula County. Whether the Great Lakes population is native or introduced is up for debate. One possibility is that changing conditions in the form of increasing turbidity and dredging of tributary mouths for shipping purposes created the deeper, murkier habitats favored by this species, causing a once small, undetected population to thrive and expand. Alternatively, despite their tiny size and the great distance from another large population, the Great Lakes population could be the result of a bait-bucket introduction.

FIELD ID: Very small species rarely exceeding 2" long. Body deep, laterally compressed, with little to no dark pigment, resulting in translucent to milky white color. Caudal peduncle tall and long. Mouth small, subterminal. Scales on lateral line behind head 3–4 times higher than wide. Fins clear, without pigment. Dorsal and anal fins long, pointed, often falcate. Anal fin with 8 rays. Rear tips of pelvic fins reach to or beyond anal fin insertion when held against body.

SIMILAR SPECIES: **Channel Shiner:** when held against body, pelvic fin tips fall well short of anal fin insertion. Body deep but thick and robust, not laterally compressed; not translucent. Lateral line scales behind head only 2.5 times higher than wide. **Mimic Shiner:** when held against body, pelvic fin tips fall well short of anal fin insertion. Body long and slender, not laterally compressed; not translucent. Lateral line scales behind head about 3 times higher than wide. Edges of scales on back pigmented; dusky lateral band usually visible. **Sand Shiner:** prominent dark mid-dorsal stripe. Body long and slender, not laterally compressed. Snout more pointed. Anal fin with 7 rays, not 8.

HABITAT: Preferred habitats are pools, backwaters, and other areas with slack currents in larger rivers

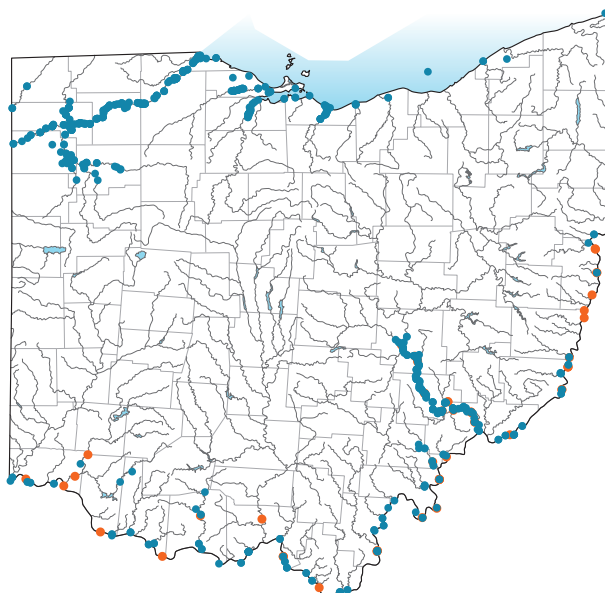
with moderate turbidities and relatively clean sand and gravel substrates. They actively avoid high light conditions, remaining in deeper waters during the day under conditions of little or no turbidity, making them difficult to capture with small seines. Divers in the Ohio River have observed them swimming along the bottom at depths of 40'. They are found in the shallows only under turbid conditions or at night.

ASSOCIATE SPECIES: Juvenile Orangespotted Sunfish; juvenile Channel Catfish; Slenderhead Darter (Ohio basin).

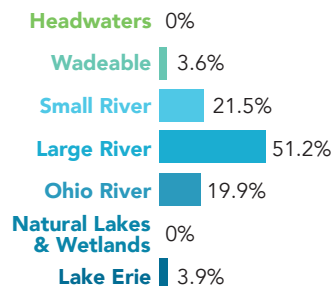
SPAWNING: **Broadcast Spawner:** has been observed spawning over silt-covered gravel and sand in areas of sluggish current. Eggs are presumably scattered over sand and gravel substrates, where they fall into the interstitial spaces prior to hatching.

ABUNDANCE: 31st of 44 native cyprinids. 561 OSU records. 16,806 individuals recorded from 337 sites on 62 water bodies in 30 of 88 counties.

BEST SITES: Maumee River from Indiana line to Lake Erie; Muskingum River from Zanesville to Ohio River.



State Status	none
Size	1.5–2", max. 2.5"
Feeding	insectivore
Population	increasing



Flathead Catfish (*Pylodictis olivaris*)



Known among Ohio fishermen as the Shovelhead in reference to its broad, flat head, the Flathead is second in size only to the Blue Catfish, with reports of specimens exceeding 100 pounds. Although local prejudices limit their desirability as a food fish in some areas, they are renowned for the superb texture and flavor of their flesh, to the extent that some fishermen on the Wisconsin River call this fish the “candy bar.” Unlike other catfish, Flatheads are not scavengers and rarely eat dead or decaying matter, so stinkbaits are not on the menu. The preferred prey items for these ambush predators are any fish unfortunate enough to get within striking distance, including other catfish. Commercial fishermen often resorted to wiring the mouths of large Flatheads shut before placing them in holding tanks in order to prevent them from eating smaller Blue Catfish in the same tank. In Ohio, Flatheads have always been common in the Ohio River below Marietta and in the lower courses of larger tributaries like the Scioto and Muskingum rivers. Though they were rare or absent in the Ohio above Marietta during surveys from 1920–55, surveys started by ORSANCO in the late 1950s show that Flatheads are now as common in the Ohio above Marietta as they are downstream. Recent surveys also show them to be widely distributed throughout the Muskingum and Scioto River systems, with smaller populations present in the lower reaches of most of the larger tributary streams between Athens and Hamilton counties. Recent records from the Mahoning system in Trumbull County indicate a population in that system. Their presence in Lake Erie was first reported in 1892 after a commercial fisherman in Lorain County pulled a large individual from one of his pound nets. It would be almost 50 years before another Flathead was reported from the lake. Between 1938 and 1955, five specimens were captured at different points in the lake, including the Huron River in Lorain County, where a population appeared to be established. In all likelihood, Flathead Catfish are not native to the Lake Erie basin and either made their way through the once-extensive canal system connecting to the Ohio River or were introduced intentionally. The Lake Erie population has been expanding in recent years, and they are now found in the lower reaches of many of the larger tributaries between Lucas and Lorain counties, with the largest expansion taking place in the Maumee system. They are found throughout the entire mainstem of the Maumee River and in three of its four major tributaries (St. Marys, Auglaize, and Tiffin rivers). Flatheads are also established in most of the larger reservoirs in the state at this time.

FIELD ID: Body long and slender; head depressed or flattened between eyes. Mouth short and wide, with diagnostic protruding lower jaw. Caudal fin squared; distinct white patch on dorsal edge. Yellow, olive, or brown overall, mottled with dark brown blotches on back and sides; belly lighter.

SIMILAR SPECIES: No other species of Ohio catfish has a protruding lower jaw and head flattened between the eyes. No other large catfish has a squared tail.

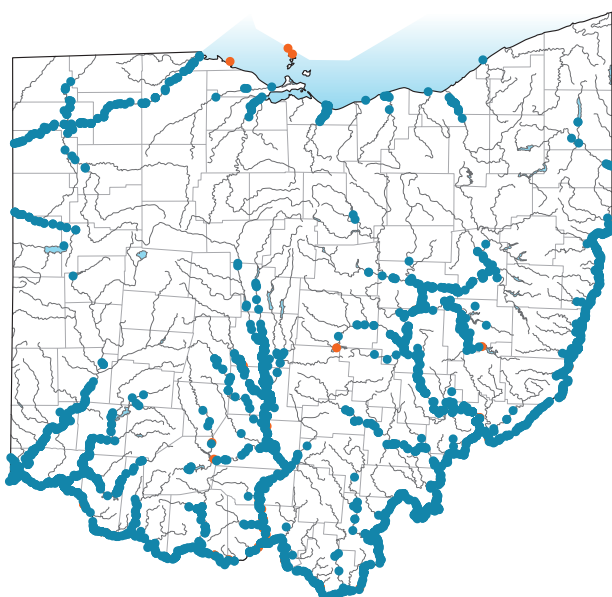
HABITAT: Large rivers, reservoirs, overflow ponds, and other lentic habitats with deep pools, sluggish currents, and cover in the form of submerged logs, log jams, or brush piles. Pools created by swirling currents below dams or adjacent to bridge abutments with trapped driftwood are favored habitats, as are hollow logs. Flatheads are pseudo-hibernators in winter, often embedding themselves into cavities and holes in waters 40–60' deep. Often found feeding on shallow riffles at night in summer. Young flatheads will often be found on rocky riffles, hiding among the rocks.

ASSOCIATE SPECIES: Channel and Blue Catfish; various Buffalofish; Freshwater Drum.

SPAWNING: **Cavity Nester:** males construct nests in dark, secluded shelters such as natural cavities, undercut banks, or near some large submerged object. Fighting is common between individuals, including spawning pairs; females are sometimes killed, particularly after spawning, if they fail to leave the nest site. Number of eggs produced varies with the size of the female, but can be as many as 100,000. Males guard the eggs, which are deposited in a compact yellow mass, continuously fanning them and moving them about until hatching.

ABUNDANCE: 4th of 12 native ictalurids. 3,188 OSU records. 9,683 individuals recorded from 1,719 sites on 117 water bodies in 58 of 88 counties.

BEST SITES: Muskingum River from Coshocton to Ohio River; Maumee River from Indiana line to Lake Erie; Scioto River from Columbus to Ohio River.



State Status	none
Size	24–40" Ohio record: 58.6", 76.5 lbs. World record: 123 lbs.
Feeding	carnivore
Population	increasing
Headwaters	0.2%
Wadeable	4.6%
Small River	18.3%
Large River	42.0%
Ohio River	34.7%
Natural Lakes & Wetlands	0%
Lake Erie	0.1%

Rainbow Smelt (*Osmerus mordax*)



Adult
Lake Superior
Wisconsin

LOW RISK

1

HIGH RISK

"Smestling:" a wrestling contest held in a ring covered with two tons of smelt, in which the outcome was determined by the contestant who could stuff the most smelt into his opponent's trunks. Such was the carnival that grew out of the phenomenon known as "smelt-mania," which reached a fever pitch on Lake Michigan in the 1930s, when twenty to thirty thousand visitors descended on Oconto and Marinette, Wisconsin, each year during the height of the spring spawning runs. Fireworks and parades three miles long added to the festivities. Native to coastal waters on the eastern seaboard, Rainbow Smelt are, like the Alewife, an anadromous species that spawns in small, freshwater tributary streams. The planting of some 16 million Rainbow Smelt into Crystal Lake (Michigan) in 1912 is credited as the source for the Great Lakes populations. First captured in Lake Michigan in 1923 and the Ontario waters of Lake Erie in 1932, the first Ohio specimens were not reported until 1936, when they were taken at various localities from the Western Basin east to the Pennsylvania line. The first Ohio spawning runs were reported in 1949 in Lake and Ashtabula counties. Smelting never reached the heights on Lake Erie that it did on Lake Michigan in the 1930s and 40s, due partly to the later establishment of the Lake Erie populations and the lower population densities. Annual numbers in Lake Erie fluctuate considerably depending on a variety of environmental conditions, with large spring die-offs occurring after the spring spawning runs in some years. Rainbow Smelt have been blamed for the declines in a number of economically important species including Yellow Perch, Lake Whitefish, Lake Trout, and Cisco, and have even been blamed for the extinction of the Blue Pike. While smelt can be highly cannibalistic, research has shown that none of these other species constitute significant food items in this species' diet. Competition with smelt for limited food resources has, however, been indicated as a contributing factor in the decline of several of these species. On the flip side, smelt are heavily preyed upon by a number of Great Lakes sportfish, including Lake Trout, Walleye, Yellow Perch, and Burbot. Rainbow Smelt fried whole are considered a delicacy. While populations have flourished in the Great Lakes, native populations along the Atlantic Seaboard have declined; victims of pollution, habitat destruction, and dams on the smaller tributary streams used for spawning.

FIELD ID: A long, slender fish with a pointed head and large mouth with teeth on tongue and jaws. Posterior end of upper jaw extending beyond posterior edge of eye; lower jaw protruding. Adipose fin present. Body silvery with blue and purple reflections on the sides (hence common name). **Breeding male:** tubercles covering head, body, and fins.

SIMILAR SPECIES: None. The combination of long, slender body, adipose fin, large mouth with teeth, lack of an axillary process, and large silvery scales serves to distinguish this species from all other Ohio fish.

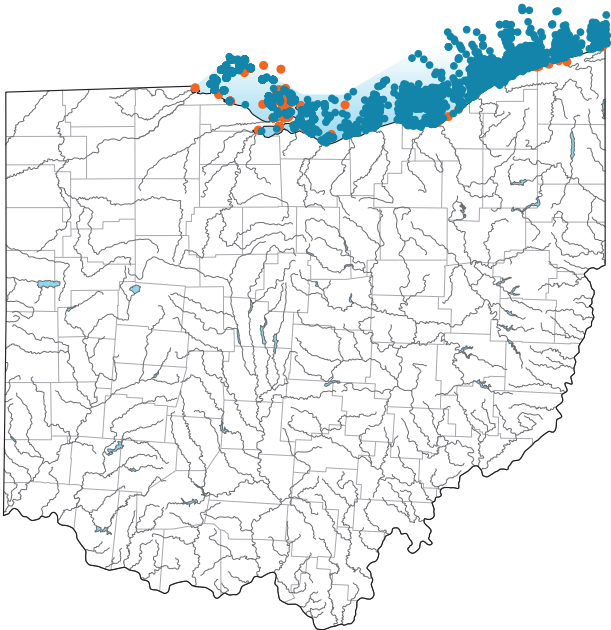
HABITAT: Favoring water temperatures between 43 and 56°F, Rainbow Smelt inhabit the deepest waters of Lake Erie at all seasons, except when spawning. Young are pelagic in nature, while adults are almost exclusively bottom dwellers, feeding on crustaceans, macroinvertebrates, and small fish.

ASSOCIATE SPECIES: Benthic species including Sculpins, Alewives, Walleye, and Lake Trout.

SPAWNING: **Substrate Spawner:** spawns at night over sand/gravel/cobble substrates in small tributary streams or on gravel deltas and reefs in lakes where currents mimic stream conditions. No more than 50 eggs are released during any one spawning session. Eggs sink to the bottom immediately after release, attaching to bottom substrates by means of a short stalk. Fecundity: 31,000 eggs per female on average.

ABUNDANCE: 6,097 OSU records. 3,305,008 individuals recorded from 3,642 sites on 6 water bodies in 8 of 88 counties.

BEST SITES: Lake Erie [Lake, Ashtabula].



State Status	non-native
Size	7–10", max. 14"
Feeding	carnivore
Population	stable

Headwaters	0%
Wadeable	0.2%
Small River	0.1%
Large River	0%
Ohio River	0%
Natural Lakes & Wetlands	0%
Lake Erie	99.7%

Brown Trout (*Salmo trutta*)



Historical references to Brown Trout, a fish native to lakes and streams throughout Europe, date to around 200 A.D., when the Roman author Aelian described one of the first artificial flies (red wool and chicken feathers) used by Macedonia fishermen on the Astraeus River to catch this species. Juliana Berners' *Treatyse of Fysshynge wyth an Angle*, published in 1496 and widely regarded as laying the foundations of recreational fishing as we know it, discusses the art of fly-fishing for Brown Trout. An adaptable species with both anadromous and freshwater forms, Brown Trout have been successfully introduced into waters around the world. One of the first shipments of eggs to the United States went to the Northville Hatchery in Michigan in 1885. By 1900, Brown Trout had been planted in the waters of 38 states and two Canadian provinces. While it is possible that some Brown Trout were included in shipments of Brook and Rainbow Trout being sent to Ohio from the Northville Hatchery in the 1880s and '90s, it was not until 1900 that Brown Trout were extensively planted into Ohio waters. While Brown Trout are more tolerant of higher water temperatures than other species of trout, most of Ohio's streams still exceed their upper thresholds in the summer, and fish planted in them soon disappeared. Only in Cold Creek at the Castalia Trout Club in Sandusky County were Brown Trout able to establish a self-sustaining population. While natural propagation was sometimes observed in other spring-fed waters, such as tributaries of the Mad River in Logan County, it was too erratic to allow for the establishment any permanent populations. Introductions of this species, usually in the form of catchable-sized adults, continue to be made by private organizations and individuals into selected waters as a way of providing a limited sport fishery. Many of these plantings are in northeastern Ohio or in spring-fed lakes and streams where cooler summer temperatures might allow for some survival and carry-over of adults into the next year. The Mad River in Logan and Champaign counties and the Clear Fork of the Mohican in Richland and Ashland counties are both stocked with Brown Trout by the Ohio Division of Wildlife, as is Clear Creek in Hocking and Fairfield counties. Feeding primarily at night on terrestrial and aquatic insects, Brown Trout have a reputation among anglers as the most difficult trout to catch. As such, they are the one trout species best able to maintain their populations under heavy fishing pressure.

FIELD ID: Typical trout-shaped body with small scales. Mouth large; sharp teeth on tongue and jaws. Small adipose fin present anterior to caudal fin. Sides dotted with orange or red spots, each surrounded by bluish ring. Dark spots often present on back, sides, and dorsal and adipose fins. Top of head and caudal fin with few or no spots.

SIMILAR SPECIES: **Brook Trout:** dorsal surfaces with heavy vermiculation. Leading edge of lower fins milk-white followed by black. **Lake Trout:** deeply forked caudal fin; heavy vermiculation on back, caudal fin, and dorsal fin. **Rainbow Trout:** dark spots on top of head and caudal fin; lacking colored spots on sides. More silvery overall, often with pinkish or reddish band on sides.

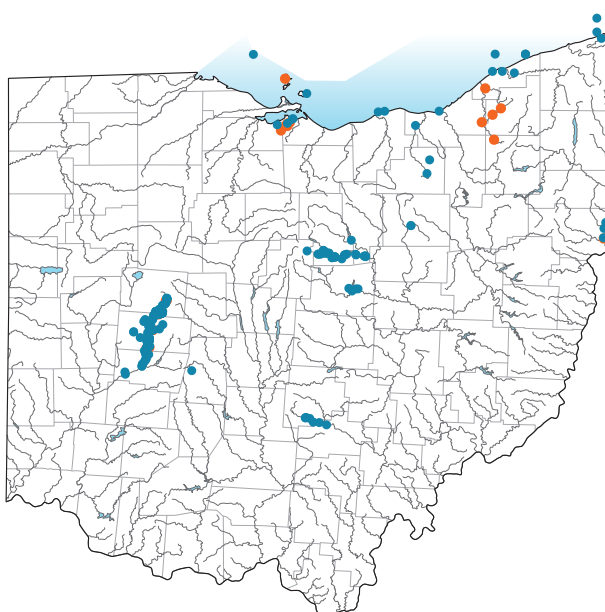
HABITAT: Lakes and streams with cold, clear waters with summer water temperatures seldom going above 65°F, although they can tolerate temperatures as high as 79°F for short periods. Most abundant in streams with a mix of riffles, pools, and structure in the form of boulders, logs, or other woody debris, rootwads, undercut banks, and overhanging vegetation, which provide cover for resting and escape.

ASSOCIATE SPECIES: Other species of trout; White Sucker, Creek Chub, and Mottled Sculpin.

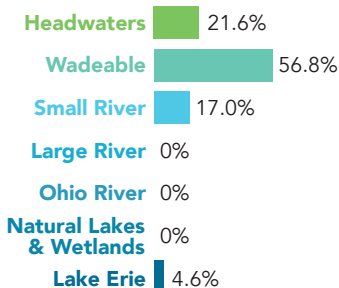
SPAWNING: Nest Builder: females excavate saucer-shaped depressions called “redds” on gravel riffles with an attending male defending the nest. After deposition of the eggs, the female covers them with gravel before both partners leave the nest. Time to hatching is dependent on temperature; at 51°F, hatching occurs in 48–52 days. Fecundity: 4,000 to 12,000 eggs per female.

ABUNDANCE: 15 OSU records. 60 individuals recorded from 14 sites on 8 water bodies in 6 of 88 counties.

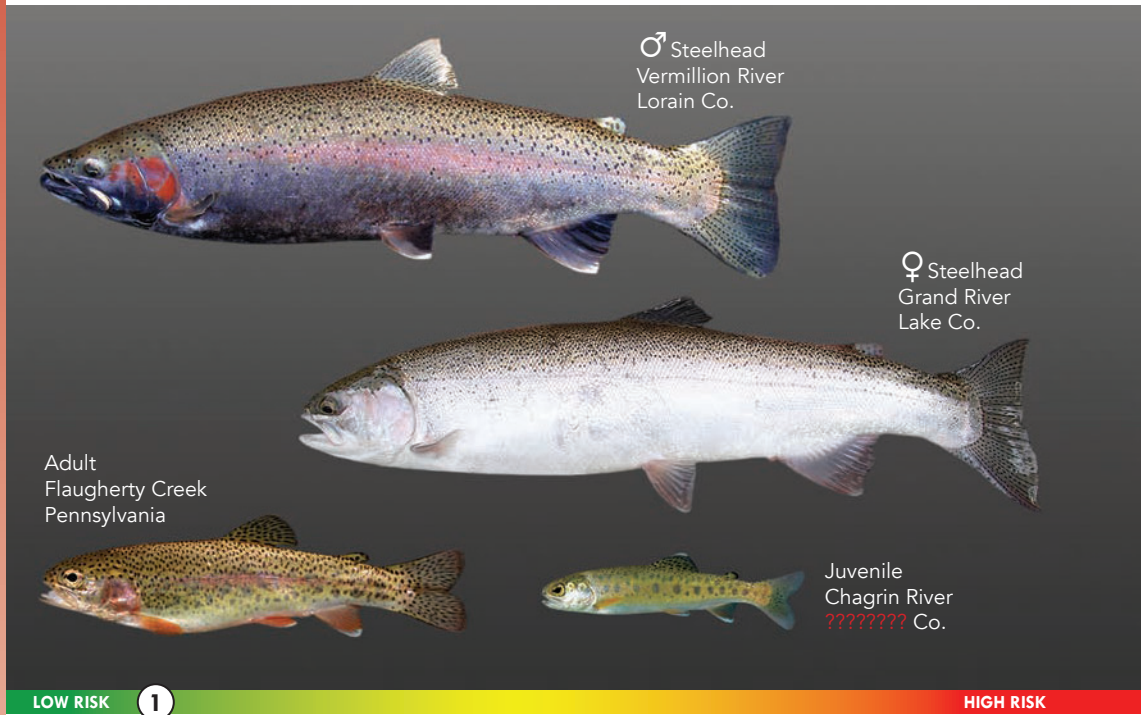
BEST SITES: Upper Chagrin drainage [Geauga].



State Status	non-native
Size	7–22" Ohio record: 27", 14.68 lbs.
Feeding	insectivore
Population	stable



Steelhead (Rainbow) Trout (*Oncorhynchus mykiss*)



A west coast native popular with fishermen everywhere, Rainbow Trout were introduced into waters across North America after the first trout hatchery opened on San Francisco Bay in 1870. The first Ohio releases occurred in 1884, when 5,200 Rainbow Trout obtained from the Northville Hatchery in Michigan were released into a tributary of the Great Miami River in Logan County. Additional releases in 1886 included the Cold Creek (now Castalia) Trout Club in Sandusky County and the Zanesfield Trout Club in Logan County. Rainbows were widely stocked into waters throughout Ohio after 1886 by governmental agencies, fishing clubs, and private citizens. With the exception of Cold Creek in Sandusky County and possibly the Mad River in Logan County, none of these plantings succeeded in establishing permanent populations. Requiring water temperatures colder than all but a few spring-fed waters can provide during an Ohio summer, most of these planted fish disappeared almost immediately. Although Rainbows are still stocked by both the state and private groups as a way of maintaining a limited “put and take” fishery, the emphasis has largely shifted towards the management of the state’s Steelhead fishery in Lake Erie. This program was initiated by Ohio in the 1970s following the rather disappointing returns on an effort to establish a salmon fishery in the lake using Coho and Chinook Salmon. Using eggs procured from strains already established in Michigan and Wisconsin, the Ohio Division of Wildlife started raising fish at the Castalia Fish Hatchery in Erie County for release into selected Lake Erie tributary streams in northeast Ohio. The program has been wildly successful. Starting with Conneaut Creek and the Grand River in Lake and Ashtabula counties, the program has since expanded to include the Vermillion, Rocky, and Chagrin Rivers in northeastern Ohio, with the Ashtabula River added to the list for 2017. Stocked in these tributaries as six- to eight-inch yearlings, young Steelheads (called “smolts”) migrate into the lake, where they spend the next two to five summers before moving back into tributary streams in the fall of the year. Although limited natural reproduction has been observed in some of these streams, spawning conditions are too marginal to maintain fishable populations. The Steelhead population in Lake Erie has grown to the point in recent years that runs are frequently seen in a number of other Lake Erie tributaries, including the Cuyahoga, Huron and Black rivers.

FIELD ID: Typical trout shape, with adipose fin and emarginated but not deeply forked caudal fin. Numerous small black spots on dorsal surfaces and dorsal, anal, and caudal fins. Sides silvery with pinkish or reddish band. Mouth and gums white. Young have 8–12 rectangular parr marks along the side. Lake Erie Steelheads: bright silver with bright pink band. Breeding males identified by hooked jaw known as a “kype.”

SIMILAR SPECIES: **Brown Trout:** few or no black spots on head and tail. Sides with many orange and red spots surrounded by bluish ring. Overall coloration more yellowish than silvery. **Brook Trout:** back and top of head with heavy vermiculation. Fins yellowish or reddish; anterior rays of pectoral, pelvic, and anal fins white. **Lake Trout:** caudal fin deeply forked. Dorsal surfaces heavily vermiculated.

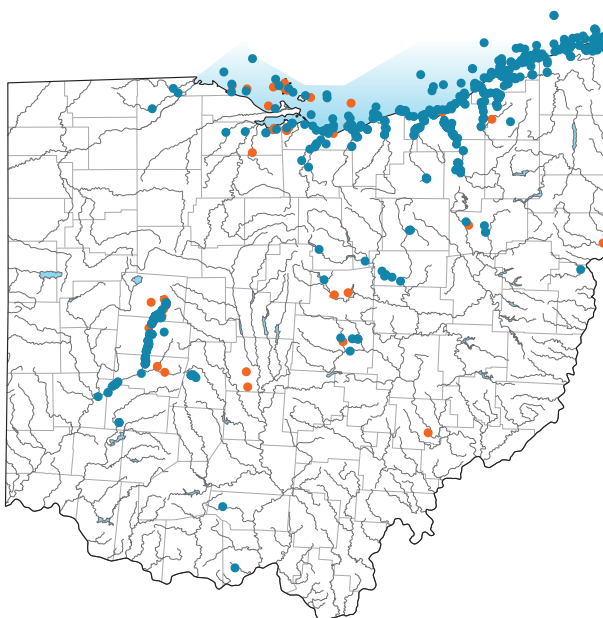
HABITAT: Streams and lakes with cold, clear waters. Optimum temperatures are between 60–70°F. They are most abundant in those streams with moderately swift currents, gravel riffles, and deep pools with undercut banks for shelter. Steelhead inhabit the deeper waters of Lake Erie during the hotter months, moving into shallower inshore waters as temperatures drop in the fall and early winter.

ASSOCIATE SPECIES: In Lake Erie, found alongside other deep, cold-water species such as Lake Whitefish and Lake Trout. They move into tributaries alongside large runs of White Sucker.

SPAWNING: Nest Guarder: females excavate shallow depressions (redds) on gravel riffles in in areas of swift currents, with both species guarding the nest. Hatching is temperature-dependent, ranging from 80 days at 40°F to 19 days at 60°F.

ABUNDANCE: 607 OSU records. 2,381 individuals recorded from 441 sites on 89 water bodies in 30 of 88 counties.

BEST SITES: Conneaut Creek and Grand River [Ashtabula, Lake].



State Status	non-native
Size	18–26", 5–10 lbs. Ohio record: 38", 21.3 lbs.
Feeding	carnivore
Population	increasing

Headwaters	13.7%
Wadeable	28.8%
Small River	23.1%
Large River	3.7%
Ohio River	0%
Natural Lakes & Wetlands	0%
Lake Erie	30.6%

Eastern Banded Killifish (*Fundulus diaphanus diaphanus*)



The eastern subspecies of the Banded Killifish is a native of Atlantic Slope drainages from South Carolina north to the Maritime Provinces of Canada and the St. Lawrence River, with populations found throughout New York and eastern Pennsylvania. Unlike the Western Banded Killifish, the Eastern Banded seems to be less dependent on aquatic vegetation and more tolerant of turbid waters, making it more adaptable to a wider array of stream environments. In the 1930s, Eastern Banded Killifish collected in the Delaware River drainage of eastern Pennsylvania were released into tributaries of the upper Ohio River in western Pennsylvania. By 1938, Eastern Banded Killifish were well established in the Beaver River system, and by 1942, they were found in the Ohio River in Beaver County, Pennsylvania, only a stone's throw from the Ohio line. The first Ohio records came in 1944 with the collection of 93 individuals at the mouth of Little Yellow Creek, Columbiana County, and 20 individuals at the mouth of Yellow Creek in Jefferson County on the Ohio River. A continuing expansion in the Ohio River now finds them as far downstream as Scioto County and in the lower reaches of tributaries like Raccoon Creek (Gallia Co.), the Hocking River (Athens Co.), and the Muskingum River (Washington Co.). There is every reason to believe that this expansion will continue. A population discovered in Clough Creek in Hamilton County in 1964, thought to have originated from a bait or aquarium release, disappeared at some point shortly thereafter. Their appearance in the Ohio waters of Lake Erie in 1975 near Ashtabula is independent of their establishment in the Ohio drainage and may be the result of expanding populations in New York, where they are common and widely distributed in Great Lakes tributary streams. Current Ohio populations in Lake Erie are confined to Ashtabula County, where they are associated primarily with the harbor areas and lower sections of the Ashtabula River and Conneaut Creek. Intergrades between the Eastern and Western Banded Killifish have been reported for both the St. Lawrence and Lake Erie drainages. Recent collections in the Pymatuning and Piedmont reservoirs, where the species appears to have established itself, are likely the result of bait-bucket releases. They have also been collected in the Mahoning River basin and may be present in reservoirs within that system as well.

FIELD ID: Body slender, rather elongate, somewhat flattened at back of head and nape; dorsal and anal fins set rather far back on body. Deep groove separates tip of upper jaw from tip of snout. Mouth small; lower jaw projecting. Dorsal fin insertion just anterior to anal fin insertion. Dorsal ray count 13–14. Usually more than 42 scales in lateral series. Vertical bands on side narrow and uniform in shape along entire side, not compressed into small dashes or fused together near caudal fin. Bars exceed 15 in total, of which 8–10 are anterior to dorsal fin. **Breeding male:** vertical bars silver-blue in color. Fins remain clear, without spots.

SIMILAR SPECIES: **Western Banded Killifish:** 12–13 dorsal rays. Lateral scale count usually fewer than 42. Vertical bands on side broader, less regular in shape, those near caudal fin often forming horizontal dashes that can be fused together. Usually fewer than 8 vertical bars in front of dorsal fin. Breeding males with yellow lower fins and distinct black spot on dorsal fin.

HABITAT: In the Ohio drainage, most often found at mouths of tributary streams or in other quiet backwaters over sand and gravel substrates in areas with some type of submersed vegetation. In Lake Erie, they are found in shallow waters near beds of submerged and emergent vegetation or schooling

in open waters over sandy substrates, where they feed on a variety of benthic macroinvertebrates and microcrustaceans. Within their native range along the East Coast, they are found in brackish water in coastal harbors and marshes.

ASSOCIATE SPECIES: Bluntnose Minnow, various sunfishes, and Western Mosquitofish.

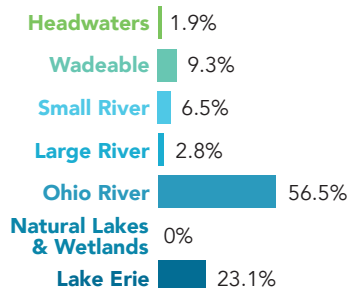
SPAWNING: **Substrate Spawner:** males are territorial, choosing a site and defending it against other males. Females lay eggs in groups of 5–10, which are attached to plants or fall onto bottom substrates. Spawning is repeated until approximately 50–100 eggs have been laid. Females may lay several clutches of eggs over the course of the summer. Peak spawning in Lake Erie usually between July 9 and July 29. Fecundity: 500–1,000 eggs per female.

ABUNDANCE: 100 OSU records. 462 individuals recorded from 87 sites on 22 water bodies in 14 of 88 counties.

BEST SITES: Conneaut Harbor [Ashtabula]; Ohio River from Pennsylvania line to lower Hocking River [Athens].



State Status	non-native aquatic invasive species
Size	2–3", max. 4"
Feeding	insectivore
Population	increasing



Northern Studfish (*Fundulus catenatus*)



This species, non-indigenous in Ohio, is one of the larger and more colorful topminnows in the eastern United States. The flamboyant colors of the breeding males leave other family members wanting by comparison. Females and non-breeding males are more cryptically colored for protection against would-be predators. Northern Studfish are widespread west of the Mississippi River throughout the Ozarks. Native populations east of the Mississippi are found in the Tennessee, Cumberland, and Green River systems. Populations in the Ohio River upstream of the Green River basin in Kentucky, including the Big Sandy, Kentucky, and Licking Rivers, are thought to have been introduced. The population in the East Fork of the White River in central Indiana, discovered by Shelby Gerking in the late 1940s, is most likely an early introduction. Popular bait fish because of their durability both in a bucket and on the hook, Northern Studfish have been introduced into a number of streams in Ohio, Kentucky, and West Virginia in recent years, where they have become established. Northern Studfish made their first appearance in Ohio waters in 1995, when several individuals were collected in Massies Creek in Greene County. The collection of 129 individuals there in 1998 settled any questions about their ability to establish breeding populations in Ohio streams, and Northern Studfish are now well established in the Little Miami. Studfish next surfaced in Pipe Creek, a small Ohio River tributary in Belmont County where a single individual was collected in 2007. Two additional individuals collected there in 2013 were preceded by the collection of two individuals in nearby Captina Creek in 2011, which strongly suggests the possibility of populations becoming established in one or both of these streams. These two streams are in close proximity to a long-established population in the Grave Creek system of West Virginia first discovered by Dan Cincotta in 1985. It is likely they simply swam across the Ohio River from Grave Creek to Pipe and Captina Creeks. Studfish were also discovered in the Sunfish Creek system in Pike County in 2011, where follow-up surveys in 2012–17 showed them to be well established in Morgans Fork and Chenoweth Fork. Most recently, they were discovered in four locations in the Little Hocking basin of Washington County in 2015 by Ohio EPA. It remains to be determined how far these populations will spread and what the interactions, if any, will be with native Ohio fish.

FIELD ID: Elongate, rather narrow body; dorsal and anal fins positioned far back on body. Caudal fin rounded. Anal and dorsal fins on males long with pointed tips; smaller and rounded on females. Short gold streak extends down center of back anterior to dorsal fin. Sides are silver or blue; reddish brown spots on side of head; brown or olive spots forming horizontal stripes on sides. **Breeding male:** sides iridescent blue with 8–10 rows of brilliant red spots. Caudal fin with orange and black terminal bands. Anal and dorsal fins with red or orange spots.

SIMILAR SPECIES: **Eastern Banded Killifish:** similar only as small young; co-occur in Pipe and Captina creeks and Little Hocking River, possibly other Ohio River tributaries and backwaters. Has vertical bars on sides rather than horizontal stripes.

HABITAT: Most often found in small to medium-sized streams with clear waters, where they frequent pool edges and riffles in areas of sluggish to moderate current. They prefer shallow waters, often only a couple of inches in depth, over clean sand and gravel substrates, migrating into smaller streams during the warmer months. Unlike the Blackstripe Topminnow, they spend less time feeding on surface insects and

consume more benthic organisms, including insect larvae, small snails, bivalves, and small fish. They also are often found in considerably more current than other *Fundulus* species.

ASSOCIATE SPECIES: Blackstripe Topminnow, Eastern Banded Killifish, and Central Longear Sunfish.

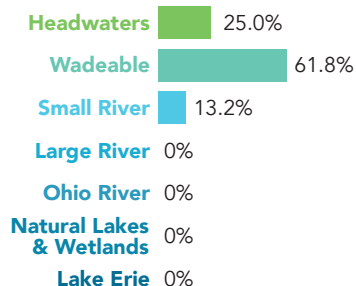
SPAWNING: **Substrate Spawner:** males establish territories over sand and gravel substrates in clear shallow pools, often along stream edges in areas with sluggish currents. Spawning occurs over an extended period, peaking in May and June, with fecundity ranging between 28 and 245 eggs. Juveniles are primarily surface feeders, switching to benthic macroinvertebrates as adults.

ABUNDANCE: 63 OSU records. 468 individuals have been recorded from 48 sites on 22 water bodies in 6 of 88 counties.

BEST SITES: Massies Creek [Greene]; Chenoweth Fork [Pike].



State Status	non-native
Size	3–6", max. 7"
Feeding	insectivore
Population	increasing



Western Mosquitofish (*Gambusia affinis*)



A species of southern waters native to the Mississippi Valley north to southern Illinois and the southwestern corner of Indiana, the Western Mosquitofish has been introduced into waters around the globe as a hoped-for means of controlling mosquito populations. A tolerance to high salinities (twice that of seawater), low oxygen levels, high water temperatures (up to 95°F), and other harsh conditions coupled with high reproductive potential has perhaps made them too successful in many situations. Small but aggressive, they have outcompeted and displaced native fish populations in many areas, including springs in the desert southwest that are home to endemic species of pupfish. They are considered noxious pests in Australia, posing a threat to native fish and frogs, with the added insult of showing no evidence that they have controlled mosquito populations or mosquito-borne diseases. Although a single female can consume hundreds of mosquito larvae in a day, they are opportunistic feeders, taking both surface insects and a variety of aquatic invertebrates and small fish. Mosquitofish were first introduced into Ohio in 1947 when individuals of both the Western and Eastern species were released into several localities in the Oak Openings Region of Lucas County. While the Eastern Mosquitofish disappeared after the first winter, the Western Mosquitofish proved more cold-hardy and survived for a number of years. While Western Mosquitofish were sometimes stocked in ponds and other water bodies, particularly in the Oak Openings in the last half of the twentieth century, they remained a rare fish in Ohio stream surveys during the 1980s and '90s, with a grand total of 21 individuals reported from sites on 7 streams. It would be an understatement to say that a population expansion has taken place in the last 15 years. They are now common and widespread in the Ohio River and many of its tributary streams in the central and eastern half of the state, particularly in the Muskingum and Scioto drainages. They are decidedly local in a few of the Lake Erie tributaries in northwest Ohio, with many of the records coming from Sandusky, Lucas, Fulton and Williams counties. They are abundant in the St. Marys River in Auglaize and Mercer counties and a surviving section of the Miami and Erie Canal in Auglaize County. Their presence may be underestimated in other areas due to their small size and the need to look for them specifically in calm backwaters adjacent to streams and rivers to detect their presence.

FIELD ID: Small, short body, flattened head; upward-slanting mouth with projecting lower jaw; rounded caudal fin. Females over 3 times larger than males with greatly distended bellies from brooding young. Males with anal fin elongated and modified into tubular shape for sperm transfer (a gonopodium). Anal fin origin in both sexes decidedly in front of dorsal fin origin. Dull gray to brown in color; black sub-ocular bar and dark spots scattered over back and sides. Scales on back and upper sides edged with dark pigment, producing cross-hatched appearance. Dorsal and caudal fins with small black spots often forming rows.

SIMILAR SPECIES: Similar native and non-native *Fundulus* species have more slender bodies with horizontal stripes or vertical bars on their sides and anal fin origin behind that of the dorsal fin; they are egg-layers and lack a gonopodium.

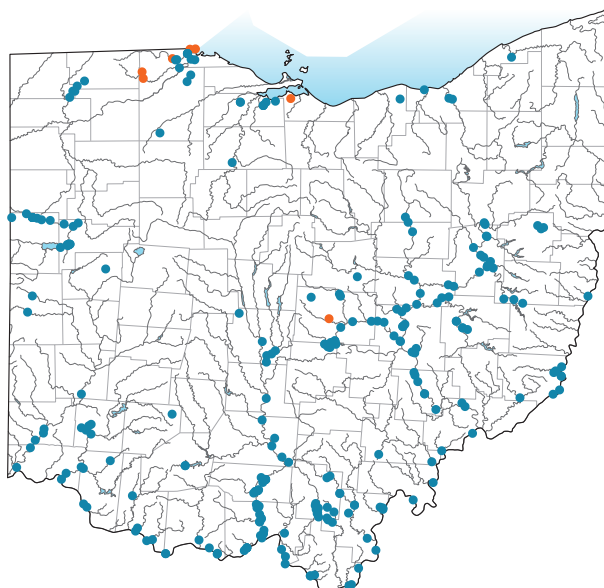
HABITAT: Shallow shorelines and backwater habitats, often where there is vegetation in creeks, rivers, ponds, ditches, and swamps. An intolerance to cold has until recently restricted their distribution in Ohio waters, with heavy mortalities occurring in cold winters. Largest populations found in calm waters sheltered from current along some of our largest rivers.

ASSOCIATE SPECIES: Blackstripe Topminnow and Eastern Banded Killifish.

SPAWNING: Live Bearer: females use stored sperm deposited by multiple males to fertilize successive groups of ova throughout the summer and fall. Males are unnecessary after mating and rapidly decrease in number as the summer progresses. If born early in the season, female mosquitofish reach sexual maturity in 21 to 28 days and produce young that same year. Gestation varies between 16 and 28 days depending on temperature. Brood size is dependent on the size of the female; number of broods produced averages around 60. Average lifespan for females is less than one year, with a maximum of 1.5 years. Male lifespans are considerably shorter.

ABUNDANCE: 258 OSU records. 3,567 individuals recorded from 242 sites on 108 water bodies in 49 of 88 counties.

BEST SITES: St. Marys River [Auglaize, Mercer]; Lower Scioto River [Pike, Scioto]; Muskingum River from Coshocton to Marietta.



State Status	non-native
Size	females: 1.8–2.3" males: 0.8–1.3"
Feeding	insectivore
Population	increasing

Headwaters	31.9%
Wadeable	24.3%
Small River	13.4%
Large River	18.5%
Ohio River	6.1%
Natural Lakes & Wetlands	5.8%
Lake Erie	0%

White Perch (*Morone americana*)



LOW RISK

1

HIGH RISK

White Perch are yet another anadromous species from the East Coast that gained access to the Great Lakes using the Erie and Welland canals. First reported in Lake Erie in 1953 off Erie, Pennsylvania, and Conneaut and Fairport, Ohio, they would not be seen again in Ohio waters until 1973, when they were caught at several locations between Lorain (Erie Co.) and Toledo (Lucas Co.). Established in all the Great Lakes by the 1980s, White Perch populations exploded in Lake Erie, with considerable consequences for populations of native sport fish. Not only did they compete for the macroinvertebrates and smaller forage fish many of the native species depended on, but White Perch are notorious spawn-eaters, feeding almost exclusively on the eggs of Walleye, White Bass, and Yellow Perch when available. At other times, they prey heavily on the young of these species, particularly White Bass and Yellow Perch. Studies on Lake Erie determined that young Yellow Perch had a significantly greater survival rate when hidden in the sediment plumes spewing out of the Maumee River compared to young exposed in clear water. Growth rates of Yellow Perch also declined as a consequence of increased competition for zooplankton. The numbers of White Bass similarly declined in the 1980s as White Perch reduced the survival of young White Bass through competition and predation. Young-of-the-year catch per hectare (about 2.5 acres) estimates from Ohio Division of Wildlife trawl surveys show that White Perch densities are often more than double those of Yellow Perch and triple those of White Bass over the last 25–30 years. Although White Perch are primarily restricted to Lake Erie and the lower sections of its larger tributaries, small populations have established themselves in recent years in the Ohio River and some of the lakes and reservoirs in Ohio, including Veterans Memorial (Hancock Co.), East Fork (Clermont Co.), Chippewa Lake (Medina Co.), Sippo Lake (Stark Co.), and Ladue Reservoir (Geauga Co.). It is assumed they made their way to these inland reservoirs by way of fishermen moving them around, and it should be pointed out that it is illegal for individuals to stock public waters without permission from the Ohio Division of Wildlife. A popular gamefish in their native coastal waters, they are regarded by some as the best of all pan fish, with the possible exception of the Yellow Perch. In describing their attributes as a sport fish in 1882, David Jordan reported that it “bites vigorously and as a mad rusher, it is not surpassed.” This is of little solace, however, to those fishermen seeking Yellow Perch on Lake Erie who can’t get away from the multitudes of small White Perch circling their bait.

FIELD ID: Body deepest in front of or at front edge of spinous dorsal fin. Silvery, lacking distinct horizontal black stripes on body. Upper and lower jaws equal in length; mouth relatively small. Soft anal rays usually 8–9, occasionally 10. First anal spine very short; second and third much longer, nearly equal in length. No tooth patch on tongue.

SIMILAR SPECIES: **White Bass:** back uniformly elevated, reaching greatest depth near divide between dorsal fins. Lower jaw projects beyond upper jaw. Anal rays usually 11–12, occasionally 10 or 13. Back and sides with distinct dark horizontal lines. Tooth patch on rear of tongue. **Striped Bass:** body more long and slender; back not elevated. Anal rays 10–12. Back and sides with distinct horizontal lines. Two parallel tooth patches on rear of tongue.

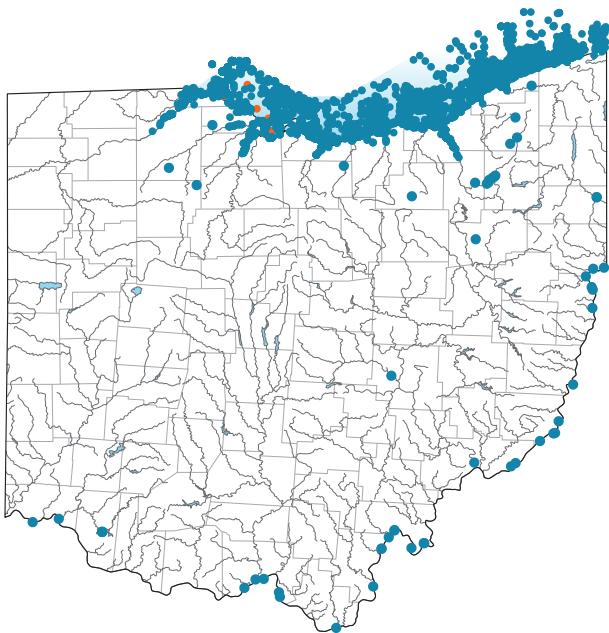
HABITAT: Adaptable to a range of lentic habitats, including lakes, reservoirs and small ponds, where they can become over-populated and stunted as a result. Their future abundance in the Ohio River is yet to be determined. In their native range, they are found in brackish waters of large bays, harbors, and tidal rivers along the east coast, often found over mud flats.

ASSOCIATE SPECIES: White Bass and Freshwater Drum.

SPAWNING: **Broadcast Spawner:** migrates up tributary streams between April and June when water temperatures reach 50–60°F. Spawning in both lakes and rivers takes place over gravel and rocky substrates. Eggs are adhesive and may hatch in as little as 30 hours or up to 6 days, depending on temperatures.

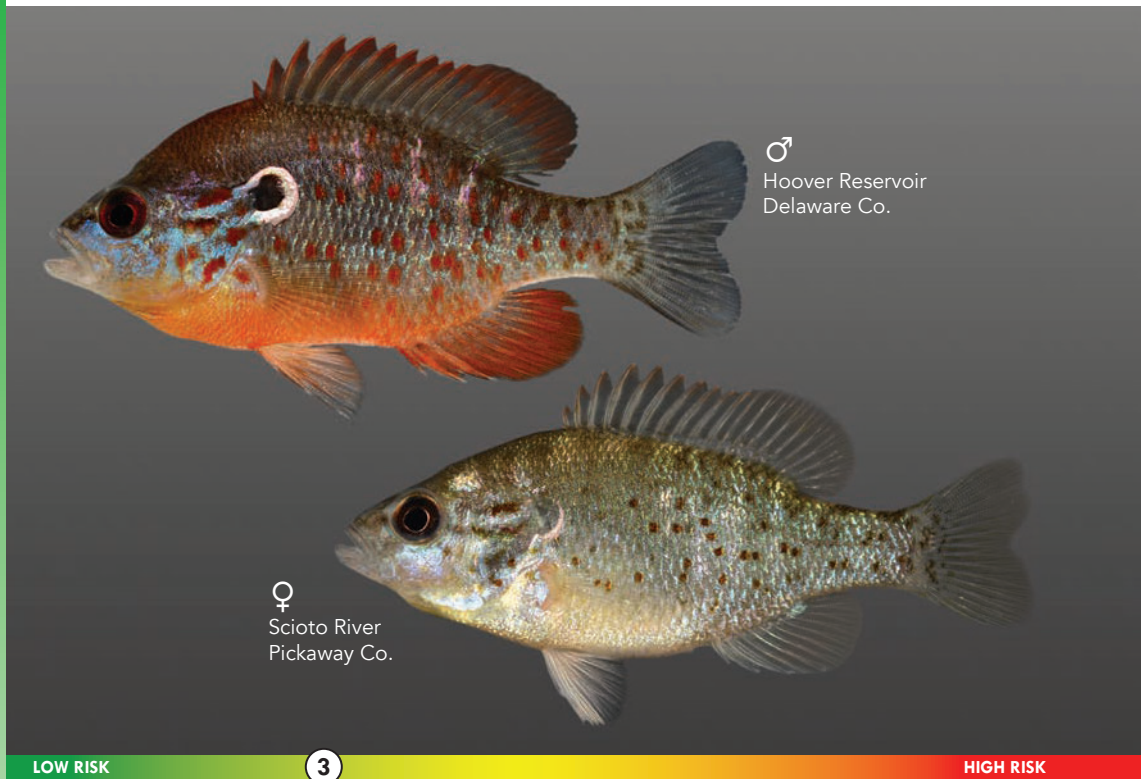
ABUNDANCE: 10,530 OSU records. 1,768,076 individuals recorded from 5,114 sites on 52 water bodies in 30 of 88 counties.

BEST SITES: Lake Erie.



State Status	non-native
Size	7–12", max. 22.5" in native range Ohio record: 14.125"
Feeding	small fish, fish eggs, and invertebrates
Population	increasing
Headwaters	0.2%
Wadeable	1.4%
Small River	4.7%
Large River	2.8%
Ohio River	0.3%
Natural Lakes & Wetlands	0%
Lake Erie	90.6%

Orangespotted Sunfish (*Lepomis humilis*)



The smallest of Ohio's sunfish and one of the most brilliantly colored, the Orangespotted Sunfish is a relative newcomer to Ohio waters. A species of creeks, small rivers, and lowland lakes in the prairies of Illinois and other more western states during the nineteenth century, they were first recorded in a tributary of the lower Wabash River (Ohio drainage) in southwest Indiana in 1889. Advancing rapidly up the Wabash River, resident populations were found in headwater tributary streams in Mercer County, Ohio, for the first time in 1920. Invading Grand Lake St. Marys shortly thereafter, Orangespotted Sunfish jumped the spillway at the eastern end of the lake in 1929 and gained access to the Maumee (Lake Erie) drainage. By 1941, the species was common in the Maumee as far downstream as Waterville in Wood County, and by 1948, it was recorded in the Portage River and other Sandusky Bay tributary streams. In the Ohio drainage, Orangespots were established in the upper Great Miami drainage by 1930, followed by appearances in the Little Miami River in 1942 and the Scioto River in central Ohio in 1945. This species has continued its eastern expansion and is now found throughout the Muskingum River watershed and in the Ohio River all the way to the Pennsylvania border. They are rare or absent elsewhere in northeastern Ohio and in the unglaciated portion of the state, where streams are typically less turbid and have cleaner substrates than those in the western half of the state. They are considerably more common and abundant in the western half of Ohio, where they may be found throughout the Scioto, Great Miami, Sandusky, and Maumee River systems. They are also common in harbors, tributary mouths, and other backwater habitats of the Western Basin of Lake Erie. With a high tolerance for turbid waters and degraded habitats that would make a Green Sunfish proud, this is one of the few species that has seemingly benefited from European settlement. As other species retreated with the onset of increasing sediment loads and pollution being carried by Ohio streams, Orangespotted Sunfish rushed in to fill the void. Often in close competition with other sunfish like Green and Longears, hybrids were common on the front lines as this species advanced eastward in western Ohio streams. They are too small to have any importance as a sport fish, but their small size and bright colors make them popular aquarium fish.

FIELD ID: Smallest Ohio sunfish species. Sides of body speckled with many red-orange (male) or brown (female and young) spots; orange or red spots surrounded by shiny blue sheen on cheeks and gill covers. Black opercle flap outlined with white. Pectoral fins short, rounded. Three anal spines. **Breeding male:** brilliantly colored with conspicuous red-orange spots, orange fins, red-orange eyes, and prominent white or purple vertical bands. Sides shiny blue; belly bright orange. Dorsal and anal fins broadly margined in orange; Pelvic fins orange and, like anal fin, often edged with black.

SIMILAR SPECIES: **Central Longear and Northern Sunfish:** wavy iridescent blue lines on cheeks and gill covers; longer opercle flap; lacking circular red-orange spots on sides. **Bluegill, Pumpkinseed, and Redear Sunfish:** pointed pectoral fins. **Green and Warmouth Sunfish:** much larger mouth.

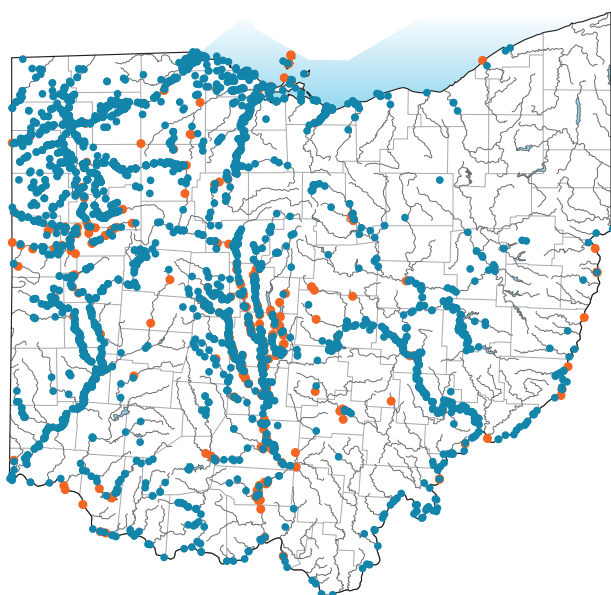
HABITAT: Reservoirs, floodplain lakes, and low- or base-gradient rivers with turbid waters and silt-covered bottoms. They avoid or are found only in small numbers in high-gradient streams or those with clear waters and clean substrates. Although they associate with aquatic vegetation when present in lakes and sluggish backwaters, they are equally at home in soft-bottomed pools of silty rivers and channelized streams.

ASSOCIATE SPECIES: Green and Bluegill Sunfish; White Crappie; Ghost Shiner.

SPAWNING: Nest Builder: nests in colonies in shallow waters 4–24" in depth on sand or gravel substrates typically covered with silt or organic debris. Nests are circular depressions similar to other sunfish species but smaller, 6–7" in diameter. Males defend a small area around the nest and are known for the grunting sounds they make during courtship. These courtship sounds are also made by other species of sunfish and are reported to be species-specific, although the frequency with which hybrids appear among the sunfish might argue otherwise. After egg deposition by the female (large females can produce upwards of 4,700 eggs), the males remain to guard the young until they are old enough to leave the nest.

ABUNDANCE: 10th of 13 native centrarchids. 3,981 OSU records. 33,058 individuals recorded from 2,218 sites on 330 water bodies in 76 of 88 counties.

BEST SITES: Maumee River, Indiana line to Maumee Bay; Sandusky River [Sandusky, Seneca]; Muskingum River, pools from Zanesville downstream to the Ohio River.



State Status	none
Size	2.5–3.5", max. 4.5"
Feeding	insectivore
Population	stable

Headwaters	5.4%
Wadeable	25.5%
Small River	30.7%
Large River	33.3%
Ohio River	2.6%
Natural Lakes & Wetlands	0.4%
Lake Erie	2.1%

Redear Sunfish (*Lepomis microlophus*)



A native of the southern states, Redear Sunfish reached the northern limits of their range in southwestern Indiana at the junction of the Wabash and Ohio rivers. Residents of lakes, ponds, oxbows, and other backwater habitats in southern rivers, they are a popular pan fish known to most southern anglers as a “shellcracker.” Similar to Pumpkinseed Sunfish, some of the pharyngeal teeth in the back of the throat are “molarized” with flattened grinding surfaces so that they can crush the shells of snails and other mollusks, their preferred prey. They can often be found in deep waters, scouring the bottom for mollusks, including the invasive Quagga and Zebra Mussels, leaving a trail of shell fragments in their wake. Redear Sunfish were first introduced into Ohio in 1931, when 14 fish were released into a private lake in Richland County. Redear Sunfish were next introduced into the eastern end of Buckeye Lake in 1935 by the Ohio Conservation Department and into Pippen Lake in Portage County in 1939. Young Redear Sunfish trapped in Pippen Lake in 1944 were then shipped to various locations around the state. Popular with fishermen and pond owners due to their large size (they are the largest of the *Lepomis* species), this species continues to be stocked in Ohio lakes and ponds. A species adapted to the warmer waters of southern lakes and streams, they are subject to winter kills in some Ohio waters. As the new fish on the block, they were sometimes at a competitive disadvantage when vying against established populations of native Bluegill, Green, and Pumpkinseed Sunfish in many Ohio lakes, frequently hybridizing with them as a consequence. Seldom found in flowing waters, the largest Ohio populations are found in lakes and reservoirs, particularly in many larger glacial lakes in northeastern Ohio. Although recent stream surveys have shown them to be widely distributed around the state, many of these records represent stray individuals or fish that have escaped from nearby reservoirs and other impoundments. The few Ohio streams that appear to support resident populations of Redear Sunfish at this time usually have a connection to one or more lakes where this species is established or represent low-gradient streams associated with larger wetland complexes like Symmes Creek in Jackson and Gallia counties. Small numbers are currently found in the Ohio River and associated backwaters, but whether this represents established populations or stray and escaped individuals coming in from impoundments in the tributary streams is not clear.

FIELD ID: Deep-bodied with long, pointed pectoral fins. Opercular flap with black spot bordered by white; adults with conspicuous red or orange spot on posterior edge (the "red ear"). Olive-green dorsally; 5–10 faint broken or blotchy vertical bars on sides; belly yellow or white. Rear bases of dorsal and anal fins lacking dark blotches. Thick, poorly defined, less brilliant blue lattice around darker brown-olive spots on sides of snout, cheeks, and gill covers. Three anal spines. **Breeding male:** red tab on opercle flap enlarged; pelvic and anal fins darken to nearly black; chest yellow with dusky overlay.

SIMILAR SPECIES: **Bluegill Sunfish:** no red spot on posterior margin of opercular flap. Dark blotch on rear base of soft dorsal and sometimes anal fin. Distinct vertical bars on back and sides. Single thick band of iridescent blue along lower edge of snout, cheeks, and gill covers. **Pumpkinseed Sunfish:** thin wavy blue lines on sides of snout, cheeks, and gill covers. Bright spots of red or orange on sides and fins. Conspicuous spots on soft dorsal fin.

HABITAT: Non-flowing waters, primarily lakes, ponds, and reservoirs in Ohio with relatively clear water and some aquatic vegetation. Often found congregating

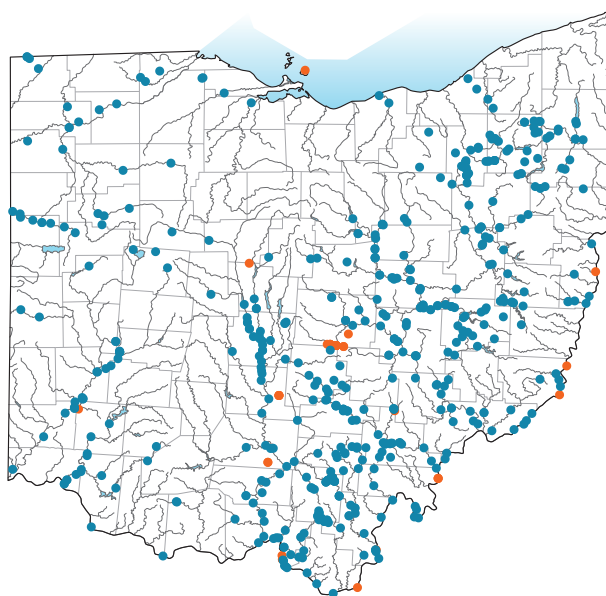
in open-water habitats and in association with stumps, logs, and other woody debris.

ASSOCIATE SPECIES: Bluegill, Pumpkinseed, and Warmouth Sunfish; Largemouth Bass; Black Crappie.

SPAWNING: **Nest Builder:** nests in colonies with males fanning out circular depressions in shallow water. Nests are closely spaced and almost touching. Males remain to guard nest and eggs until young are old enough to leave the nest. Hybrids with Bluegill are common.

ABUNDANCE: 541 OSU records. 3,285 individuals recorded from 464 sites on 192 water bodies in 75 of 88 counties.

BEST SITES: Portage Lakes [Summit]; Jackson Lake [Jackson]; Snowden Lake [Athens].



State Status	non-native
Size	8–10", max. 17", 5 lbs.
Feeding	snails, mussels, and other invertebrates
Population	stable

Headwaters	17.8%
Wadeable	28.6%
Small River	22.2%
Large River	13.1%
Ohio River	7.5%
Natural Lakes & Wetlands	10.6%
Lake Erie	0.2%

Dusky Darter (*Percina sciera*)



At one time, Dusky Darters had one of the more restricted ranges in Ohio, with only a single pre-1900 report from the Ohio River in Scioto County as confirmation. Surveys between 1920 and 1950 by M. B. Trautman found this species to be uncommon but widely distributed in the lower Scioto River and in many of its larger tributaries south of Columbus. Isolated populations were also found in Symmes and Raccoon creeks in Lawrence and Gallia counties at this time. By 1980, it appeared as though the Ohio population had been reduced to only three streams in the Scioto River system (Big Darby, Paint and Salt creeks). Surveys undertaken by a number of different agencies and investigators during the 1980s and '90s identified a wider distribution in southern Ohio, with reports from most of the larger Ohio River tributary streams between Portsmouth and Marietta. Major expansions were noted in much of the lower Scioto basin and in the Hocking River and Raccoon Creek watersheds, and disjunct populations were also identified in the upper Muskingum River at Duncan Falls, Wakatomika Creek, and the Walhonding River in Coshocton and Muskingum counties. Most surprising and unexpected, however, were the populations identified in the Maumee basin in northwest Ohio, where Dusky Darters were found in the St. Joseph and Tiffin rivers. These were the first and only reports at this time from the Lake Erie drainage for this species. It seems unlikely that these are the result of an introduction, and they are thought to simply have been overlooked in the past, when they may have been on the brink of extirpation. The discovery of this population is likely the confluence of improved water quality, more thorough sampling, and new sampling methods. Improved water quality conditions in recent years have allowed a further expansion of Ohio populations, particularly in the Maumee and upper Muskingum River basins. Other advances are seen in the upper Hocking River in Hocking County and Walnut Creek, a Scioto River tributary south of Columbus. Additionally, they have been recently found in Duck Creek and the Little Muskingum River in Washington County. With the exception of those individuals captured in the Ohio River, there has been no movement into any of the tributary streams west of the Scioto River at this time, nor does it appear likely that they can colonize the rocky, high-gradient tributaries found on the Flushing Escarpment upstream from Washington County.

FIELD ID: Dark olive dorsally with darker mottlings. Dark band across snout and opercles. Short, quadrate saddle bands across back. Blotches along lateral line usually separate, square or taller than wide in large individuals; may be fused in females or young. Base of caudal fin with three dark spots, bottom two often fused. Small spot sometimes present directly under eye, but does not form well-defined teardrop marking. Fins generally clear; some small specks of pigment on rays of dorsal and caudal fins. Typically 12–13 dorsal spines. **Breeding male:** dusky blotches on lateral line darken, forming vertical bars taller than wide. Fins become dusky. First dorsal with diffuse dusky blotch on basal portion of webbing between last several spines.

SIMILAR SPECIES: **Blackside Darter:** well-developed teardrop below eye. Single dark spot on base of caudal fin. Black blotch on webbing between and near base of first 3–4 dorsal spines. Lateral blotches typically longer than tall. **Longhead Darter:** head elongated; snout decidedly pointed. Dark band in basal portion of first dorsal fin, with second band near distal edge. Sickie-shaped teardrop under eye fused to rearmost of three spots on ventral side of head along jawline.

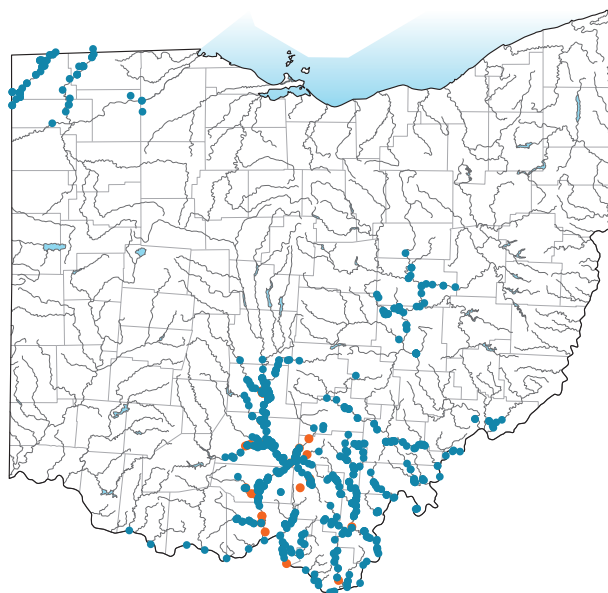
HABITAT: In Ohio, primarily found in larger rivers and streams, where they frequent areas with low to moderate currents. Typically found near submerged brush, roots, or other woody and organic debris in 2–4' of water, often over sand or gravel. In spring, frequently found on or near gravelly riffles in association with rooted aquatic vegetation or submerged woody debris.

ASSOCIATE SPECIES: Blackside Darter; Steelcolor and Spotfin Shiner.

SPAWNING: **Substrate Spawner:** adults presumably spawn on sand and gravel substrates. No nest is built, and adults depart following egg deposition.

ABUNDANCE: 15th of 26 native percids. 697 OSU records. 2,233 individuals recorded from 497 sites on 64 water bodies in 24 of 88 counties.

BEST SITES: St. Joseph River [Williams]; Salt Creek [Vinton]; Raccoon Creek [Gallia, Jackson, Vinton]; Hocking River [Athens]; Wakatomika Creek [Muskingum].



State Status	extirpated
Size	3.5–4.5", max. 5"
Feeding	insectivore
Population	increasing

Headwaters	2.4%
Wadeable	31.3%
Small River	37.3%
Large River	23.7%
Ohio River	5.3%
Natural Lakes & Wetlands	0%
Lake Erie	0%

Round Goby (*Neogobius melanostomus*)



A benthic species native to the Black and Caspian Seas, the Round Goby is believed to have been introduced into the Great Lakes through the discharge of ballast water by international cargo ships. Collected in the St. Clair River in 1990, they made their first appearances in Lake Erie off Fairport Harbor (Lake Co.) and at the mouth of Grand River (Ashtabula Co.) in 1993. By 1995, trawl surveys conducted by the Ohio Division of Wildlife off Fairport were capturing over 3,000 individuals in a single haul. Extrapolating data from trawl surveys in 2002, the Ontario Ministry of Natural Resources estimated the population then inhabiting the Western Basin of Lake Erie at approximately one billion individuals. Pugnacious and aggressive, Round Gobies have easily outcompeted (or simply eaten) native species like Northern and Great Lakes Mottled Sculpin, Brindled and Stonecat Madtom, and many darters, driving them to the brink of extirpation. Notorious egg eaters, Round Gobies are particularly hard on unguarded Smallmouth Bass nests, necessitating the closing of the Smallmouth fishery in May and June on Lake Erie, when the males are guarding eggs. Research has shown that a single Round Goby can devour as many as 4,000 bass eggs in 15 minutes. Round Gobies have a heightened sensory system for the detection of water movement, allowing them to feed in complete darkness and ensuring that no prey is safe. On a positive note, Round Gobies have become an important component in the diet of the Lake Erie watersnake, comprising about 90% of the diet of this rare species and leading to the snakes' removal from federal listing in 2011. Gobies are also preyed on by a number of sportfish in Lake Erie, including Walleye, Yellow Perch, and Largemouth and Smallmouth Bass. Recently, the Round Goby has moved into many of the lake's tributary streams, where a disc on its belly formed by fused pelvic fins acts as a suction cup to anchor it in fast currents. How far these populations may advance up Lake Erie's larger tributaries and what the consequences might be is not yet known. They have been illegally released into Hinckley Lake in Medina County and are now established there and downstream throughout the East Branch of the Rocky River. Alarming, they have been found in a small natural lake in northwestern Pennsylvania in the upper Allegheny watershed, one of the two rivers that form the Ohio River in Pittsburgh. They have also made their way south out of Lake Michigan through the Chicago Sanitary and Shipping Canal into the Des Plaines River, which is part of the Mississippi River basin. This spread could spell grave danger for many of the small bottom-dwelling fish in the Ohio River basin and is cause for great concern. This species should never be released anywhere, and those who do so can be turned in for prosecution.

FIELD ID: Head large, eyes protruding, creating frog-like appearance. Body scaled, fairly cylindrical, slightly laterally compressed near tail. Pelvic fins fused to form single suction-cup-shaped fin on ventral surface. Slight notch between two dorsal fins. Second dorsal and anal fin relatively long; caudal fin rounded. First dorsal with black spot on lower rear portion. Overall body color variable olive-green with dark blotches along sides.

SIMILAR SPECIES: **Tubenose Goby:** smaller, with tubular nostril extensions and eyes set lower on side of head. More brown than green. **Various sculpins:** scales lacking. Head flattened; two separate pelvic fins. All other native Ohio fish also lack fused, suction-cup-shaped pelvic fin.

HABITAT: In Lake Erie, they are most abundant in waters of 60' or less. Found on the bottom of open waters and along shorelines, harbors, and river mouths on rocky substrates with crevices. Often found hiding in and around crevices or perching on top of rocks. Feeds on benthic organisms including aquatic insects, mollusks, crustaceans, and eggs and young of other benthic fish including darters, sculpins, and their own species. In rivers, found in slower portions of riffles and adjacent eddies.

ASSOCIATE SPECIES: Round Gobies have replaced nearly every other bottom-dwelling fish in Lake Erie. Only Logperch Darter have been persisting alongside them.

SPAWNING: **Cavity Spawner:** Round Gobies have an extended spawning season, with females spawning multiple times between April and September. Males claim and guard prime nesting sites (crevices), often driving less dominant gobies out of a favored site. Multiple females may deposit eggs in any one nest, which the male aggressively defends until young are old enough to leave the nest. Egg clutches in a given nest can contain up to 5,000 eggs. Hatching success is high at around 95%.

ABUNDANCE: 4,921 OSU records. 294,692 individuals recorded from 3,073 sites on 52 water bodies in 10 of 88 counties.

BEST SITES: Lake Erie, islands and along rocky shorelines; Lake Erie tributaries up to the first dam along entire lake shore; Hinckley Lake; entire East Branch of the Rocky River [Medina, Cuyahoga].



State Status	non-native aquatic nuisance species
Size	4–8", max. 10"
Feeding	insectivore
Population	increasing

Headwaters	1.3%
Wadeable	3.8%
Small River	4.4%
Large River	2.2%
Ohio River	0%
Natural Lakes & Wetlands	0%
Lake Erie	88.2%

Tubenose Goby (*Proterorhinus semilunaris*)



LOW RISK

1

HIGH RISK

As if the introduction of the Round Goby wasn't enough of a threat to native fish, a second goby species arrived in Lake Erie shortly thereafter. Tubenose Gobies are smaller in size, less aggressive in character, and completely over-shadowed by their larger competitor. Like the Round Goby, Tubenose Gobies are native to the Black Sea and arrived in ballast waters on ocean freighters. They were discovered in the St. Clair River in Michigan in 1990 at the same time as the Round Goby. Unlike the Round Goby, Tubenose Gobies have been slow to expand and are currently restricted to a few areas in the western and central basins of Lake Erie, with isolated reports from Lake Huron and Lake Superior. The capture of a single individual at Port Glasgow Canada in 1997, where the species is now established, was the first report of this species in Lake Erie. Since 2000, Tubenose Gobies have been collected at several sites in the Western Basin of Lake Erie around the Catawba Peninsula, the Bass Islands, and Kelly's Island, with a small but established population currently found around South Bass and Gibraltar islands. A more concerted search around the islands in the Western Basin at this time might provide a clearer picture of their numbers and distribution in this part of the lake. Another established population occurs in Presque Isle Bay in Erie, Pennsylvania. Unlike the Round Goby, this species does not feed on Zebra and Quagga mussels, thus eliminating a source of possible competition between the two species. Although they primarily feed on aquatic insects and other macroinvertebrates, they are not above taking the larvae and fry of other species. Tubenose Gobies typically inhabit shallower waters, usually in and around vegetation, more frequently than Round Gobies, which also helps to lessen competition between the two. The Tubenose Goby is, however, a direct competitor with native species like sculpins and darters for food and for nesting sites in the form of crevices and other types of cavities.

FIELD ID: Body with scales, fairly cylindrical, slightly laterally compressed near tail. Eyes positioned high on head, but not protruding. Head somewhat flattened between eyes; two tubular nostrils projecting forward from just above upper lip. Pelvic fins fused to form single suction-cup-shaped fin on ventral surface. Two dorsal fins separated by notch; second dorsal, anal, and caudal fin striped in brown and white. Second dorsal and anal fin relatively long. Caudal fin rounded with two dark vertical bars (one on body and one on fin) at base. First dorsal with red spot on top anterior edge with dark blotch below it. Overall body color various shades of brown with darker mottling.

SIMILAR SPECIES: **Round Goby:** eyes protruding; lacks tubular nostrils. Greener body color; significantly larger adult size. **Various Sculpins:** scales lacking. Head flattened; two separate pelvic fins. All other native Ohio fish also lack pelvic fins fused into singular suction-cup-shaped fin.

HABITAT: In Lake Erie, Tubenose Gobies prefer the shallower nearshore waters less than 15' in depth in areas of sluggish currents with beds of aquatic macrophytes.

ASSOCIATE SPECIES: Round Goby, in habitat of Iowa Darter.

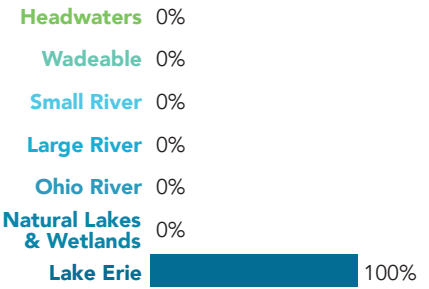
SPAWNING: **Cavity Nester:** similar to the Round Goby. Males establish and defend nesting sites under rocks and logs, guarding eggs and young until they leave the nest. Females spawn multiple times during warmer months, with multiple females often contributing to any one nest.

ABUNDANCE: 13 OSU records. 38 individuals recorded from 10 sites on Lake Erie in 2 of 88 counties.

BEST SITES: Shoreline around Put-In-Bay at South Bass Island, Lake Erie [Ottawa].



State Status	non-native aquatic nuisance species
Size	2–3", max. 4.7"
Feeding	insectivore
Population	increasing



Silver Carp (*Hypophthalmichthys molitrix*)



One of nine species of Asian carp with a long tradition in China of being raised for food and medicine, Silver Carp are one of the most important freshwater fish worldwide in total aquaculture production. These planktonic filter feeders were imported into the United States in the 1970s in an effort to control algal growth in hatchery ponds and wastewater treatment facilities. Lacking a stomach and feeding continuously, they are capable of consuming 20 to 120% of their body weight in algae and plankton every day. To no one's great surprise, Silver Carp escaped into connecting waterways, and by the late 1990s, they had become established and extremely abundant in parts of the Mississippi drainage, where they are currently found as far north as Minnesota on the Mississippi River and Ohio on the Ohio River. They are found throughout the Illinois River system and are currently approaching Lake Michigan in Chicago, where electrical barriers have been set up on the Chicago Sanitary and Ship Canal in an effort to keep them out of the Great Lakes. Lake Erie, with its warm, shallow, nutrient-rich water, offers much suitable habitat for this species. Although no individuals have yet been found there, water samples taken from the Sandusky River and Maumee and Sandusky bays in 2012 did test positive for Silver Carp DNA. Extensive efforts by the ODNR Division of Wildlife to collect a live specimen were unsuccessful, indicating that if they are present, they are in low abundance. These efficient filter feeders compete with native species dependent on plankton and other microorganisms as a source of food, including Bigmouth Buffalo, Paddlefish, freshwater mussels, and the young of many sport and forage fish. In the Ohio River basin, this species has been found as far upstream as Scioto County. There are also recent records from the lower sections of some of the larger tributaries, including the Great and Little Miami rivers in Hamilton County and Ohio Brush Creek in Adams County. Silver Carp are known for their jumping ability, often reaching heights of 8–10 feet when frightened by passing boats. Silver Carp average 20–30 pounds and are known to reach 100 pounds, and collisions between boaters and flying carp have resulted in lacerations and broken bones for all concerned. Like the Grass Carp, the eggs of Silver Carp must remain suspended for successful development and require large rivers with free-flowing waters. While these reproductive requirements may restrict populations in some areas, it does not appear to be a limiting factor in many areas. Although Silver Carp, with their mild flavor and pearly white (albeit bony) flesh, are a popular food fish in Asia, western perceptions of a bottom feeder sifting through the mud (which they are not) have proven difficult to change. Attempts to make them more appealing by calling them "Silverfins" and "Kentucky Tuna" have so far been less than successful.



Bighead Carp (*Hypophthalmichthys nobilis*)



Adult
Captive specimen

Another of the Asian carps with a long history of aquaculture in China for food and traditional medicine, Bighead Carp were first imported to the United States in the early 1970s along with Silver Carp as a means of controlling algae in wastewater treatment plants and southern hatchery ponds. Like the Silver Carp, they soon escaped into tributary streams of the Mississippi River. Evidence of natural reproduction was first reported in Missouri in 1989, with young-of-year fish documented in 1992–94 from the Missouri River, by which time they were firmly established in Illinois and Missouri. A large population developed throughout the seriously degraded Illinois River, putting Bighead Carp at the doorstep of Lake Michigan and the other Great Lakes. Responding to serious concerns about the possible effects on the economy and sport fisheries of the Great Lakes if Asian carp became established there and facing litigation from several states and Canada, the U.S. Army Corps of Engineers installed electrical barriers on the Chicago Sanitary and Ship Canal in Chicago in attempt to block the movement of carp into these waters. Additional efforts are aimed at the development of a more permanent barrier. Lake Erie would appear to offer prime habitats for these inhabitants of shallow nearshore waters and large, turbid rivers, but the three individuals caught in Lake Erie between 1995 and 2000 were not considered to be reproductively viable when examined in a lab. Although they require large, turbulent rivers with enough free-flowing waters to keep eggs and fry in suspension until they are old enough to swim, an analysis of eight American tributaries in the central and Western Basin judged that three of them met all of the necessary criteria for successful spawning, as did nine of ten tributaries on the Canadian side. Filter feeders consuming up to 40% of their weight in plankton and other microorganisms daily, Bighead Carp would compete with several native fish for food in Lake Erie,



including young Walleye, Yellow Perch, and Lake Whitefish, in addition to the young of almost every other species. There is a possibility that both Silver and Bighead Carp could become established in the Great Lakes through either inadvertent or purposeful introductions, so a unified effort is critical to prevent this from happening. In the Ohio basin, Bighead Carp shows a similar distribution to the Silver Carp. They are found in small numbers as far upstream as Lawrence County in the Ohio River, with other records from the lower sections of White Oak and Eagle creeks in Brown County and Ohio Brush Creek in Adams County. Bighead and Silver Carp are known to hybridize with each other, producing fertile offspring.

Rudd (*Scardinius erythrophthalmus*)



Native to Western Europe and central Asia, where it is a popular sport and food fish, the Rudd was originally introduced into Canada and the United States for its value as an ornamental pond fish. A large cyprinid (minnow) reaching 18–20 inches, it is identified by its sharply upturned mouth and deep, slab-sided body with bright red fins (hence the common name, which dates back to the seventeenth century). A gold-toned variety of this normally yellow-green fish known as the Golden Rudd is popular with pond keepers. It differs from our very similar and native Golden Shiner in having a scaled rather than fleshy keel, and the Rudd has a higher dorsal ray count (9–11 rather than 7–9). Rudd feed on a variety of aquatic macrophytes and filamentous algae, adding to their attractiveness in ornamental ponds. The first imports to the U.S. appear to have been sent to New York City, where an unverifiable population was reported in Central Park Lake in 1897, with a later report for 1925. In 1916, 300 specimens from the New York aquarium were transplanted into a Wisconsin lake. All of these early introductions seem to have disappeared by the 1950s. In the early 1970s, a bait dealer in Virginia began rearing Rudd as a bait fish. Its increasing popularity as bait for Striped Bass led to a dramatic increase in the production of Rudd at a number of hatcheries in Arkansas in the 1980s. This led to a second wave of introductions through a combination of bait-bucket releases, escapees from hatchery ponds, and accidental or intentional releases into other water bodies. Although they have been reported in over 20 states, they have failed to establish breeding populations in many localities. The prohibition on the transport and use of Rudd as a bait fish in many states has succeeded in slowing this recent wave of introductions. Rudd are found in the same habitats as the Golden Shiner: quiet waters in lakes and rivers with clear waters and beds of aquatic vegetation. Intergrades are found in areas inhabited by both species. There have been several records in Lake Erie bays and harbors over the past 20 years, mostly from the eastern end of the lake or the Niagara River, where they appear to be established. They also appear to be established in Presque Isle Bay in the Pennsylvania waters of Lake Erie since 2012. The first Ohio capture occurred near Marblehead in 1997. They have been captured in Sandusky Bay (2014) and Cleveland Harbor (2017). It is likely that this species is now a permanent resident of Lake Erie bays and harbors.



Whitetail Shiner (*Cyprinella galactura*)



A southern species common in the runs and riffles of small rivers, creeks, and headwater tributary streams with high gradients and gravel/cobble substrates, Whitetail Shiners are also found congregating around boulders and rocky banks in deeper pools with noticeable currents. Like other species of *Cyprinella*, they are readily identified by the dark edges on their scales, which make the scales appear diamond-shaped. Juvenile Whitetails can be easily confused with juvenile Spotfin and Steelcolor Shiners, which are native to Ohio streams. *C. galactura* is distinguished by its sub-terminal mouth, higher lateral line scale count (39–42), long, slender body, and two milk-white, somewhat triangular blotches on the caudal peduncle. Breeding males often have some red on the snout, pectoral fins, and the leading edge of the dorsal fin. They are widely distributed in the Tennessee and Cumberland River drainages in Kentucky, Tennessee, Alabama, Georgia, and Virginia. Populations in the Ohio River drainage found in the Big Sandy River (Kentucky) and the upper New River (Kanawha River) in West Virginia and Virginia are thought to be the result of introductions attributed primarily to bait-bucket releases. These introduced populations appear to be expanding in recent years, getting ever closer to Ohio. A 1992 record for a single individual captured in the Ohio River at Gallipolis Island opposite Gallia County remains the only Ohio record for this species at this time. Its proximity to Ohio in Big Sandy River, Kentucky, and New River in West Virginia keeps the door open for other individuals to stray into Ohio waters in the future.



Brassy Minnow (*Hybognathus hankinsoni*)



Brassy Minnows, identified by the brassy reflections on their sides and a dark lateral stripe extending from the tail to just behind the gill covers, are common inhabitants of small, sluggish streams with sand, gravel, or mud bottoms and much organic debris. They also inhabit boggy, tannin-stained streams and ponds, as well as overflow ponds and other backwater habitats along rivers. They are a northern species of cool waters ranging across the northern U.S. and Canada from the St. Lawrence River west across the Great Lakes and upper Mississippi and Missouri River basins to Alberta and British Columbia on the West Coast. Although present in the northern tributaries of Lake Erie in Ontario, they are absent from the southern tributaries in Pennsylvania, Ohio, and Michigan. They tolerate a wide range of pH and turbidity, as well as low levels of dissolved oxygen. Eggs are deposited on vegetation or along bottom substrates. Brassy Minnows have a relatively long lifespan for a small cyprinid, with some individuals surviving into their fifth year. They are omnivorous, feeding on a variety of plankton, algae, and aquatic invertebrates. At this time, there are no known populations in Ohio, but isolated reports from three counties since the 1980s point to some mechanism for their introduction into Ohio waters. While records from Pymatuning Reservoir in Ashtabula County and Bear Creek in Williams County are close to populations in adjacent states, the record for Duff's Fork of Deer Creek in Fayette County is harder to explain. Although they are a popular bait minnow in many parts of their range and many introductions are attributed to bait-bucket releases, it seems unlikely (though not impossible) that Ohio anglers would have this species in their bait buckets. With two records (1986 and 2009), Pymatuning Reservoir is clearly the place to watch for this species.



Telescope Shiner (*Notropis telescopus*)



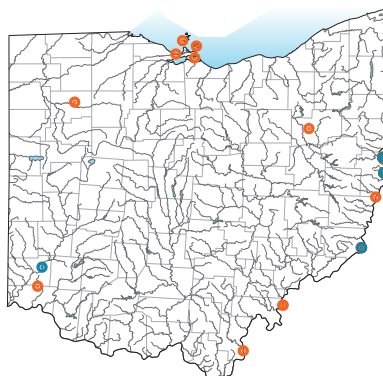
The Telescope Shiner is widely distributed in the Tennessee and Cumberland River drainages in Tennessee, Kentucky, Alabama, and Virginia. A common inhabitant of the smaller and medium-sized upland streams with swift currents and rocky substrates, they are usually found in areas of flowing water adjacent to riffles. Common in the upper New River (Kanawha) system in West Virginia and Virginia, their original status in that system is uncertain. While some authorities believe they may be native there, others believe their presence, based on the best available information, was the result of an introduction sometime in the 1950s. The first Ohio River drainage record came from Big Walker Creek in Virginia in 1958, with the first West Virginia records coming from tributaries to the East and Greenbrier rivers (Kanawha River) in 1972. Since these early introductions, the Telescope Shiner has been rapidly expanding its range in the upper James River, New River, Kanawha River, and Big Sandy River systems in West Virginia. In 1982, a single individual, most assuredly a stray, was caught in the Ohio River at Lock and Dam #27 near Rome, Ohio, in Lawrence County. More recently, another individual was taken in the Ohio River, downstream from Kyger Creek in Gallia County in 2015. If populations in the Kanawha system continue to expand, additional captures in the Ohio River would not be surprising. Telescope Shiners are similar in appearance to the Popeye Shiner, with large eyes, a dark pre-dorsal stripe, and a longitudinal line formed by pigment spots on the lateral line scales. Historically, it was considered to be a subspecies of Popeye Shiner. Telescope Shiners are distinguished from the latter by their smaller eye, 10 rather than 9 anal rays, weak pre-dorsal stripe, and the presence of longitudinal stripes on the dorsal surface, similar to the Striped Shiner.



White Catfish (*Ameiurus catus*)



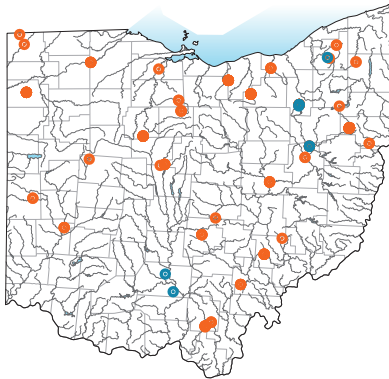
Similar in appearance to other bullheads with their chunky bodies and short, wide heads, the White Catfish is instantly recognized by its moderately forked caudal fin, which distinguishes it from all other members of the genus. Native to Atlantic and Gulf Slope drainages from New York south into Florida, they are found in brackish bays and the tidal sections of coastal rivers. They readily adapt to life in impoundments and other large lakes and have been stocked in many locations across the eastern and western U.S. with varying degrees of success. They are a popular species for stocking in pay lakes, as they bite freely during the day and are a desirable size of 12–18 inches, occasionally reaching 24 inches. During the 1940s and 50s, many tons of White Catfish were released into pay lakes around the state, including Sippo Lake near Canton and Springdale Lake near Cincinnati. The first releases into the public waters of Ohio occurred in 1939, when 2,500 pounds of White Catfish were released into Sandusky Bay. Additional fish escaped into Lake Erie in subsequent years from holding cars and pens belonging to the Riley Fish Company located at the mouth of the Portage River. Although fishermen reported catching an occasional fish thought to be this species in the Western Basin of Lake Erie during the 1950s, White Catfish failed to become established in the lake and none have been reported there in the last 50+ years. It was a different story in the Ohio River adjacent to Belmont and Jefferson counties, where rotenone sampling in the lock chambers turned up large numbers of adults and young in the years between 1968 and 1980. A high count of 324 individuals was recorded at the lock chambers for the Pike Island Locks and Dam in Belmont County in 1975. White Catfish were last recorded in the Ohio River at the New Cumberland Locks and Dam in Jefferson County in 1980, and it appears that the small population present in the upper Ohio River at that time has died out. A single individual captured in the Great Miami River in Butler County in 1995 is the last Ohio record and likely represents an escapee from a private pond or pay lake. White Catfish spawn in a similar manner to other bullheads.



Chain Pickerel (*Esox niger*)



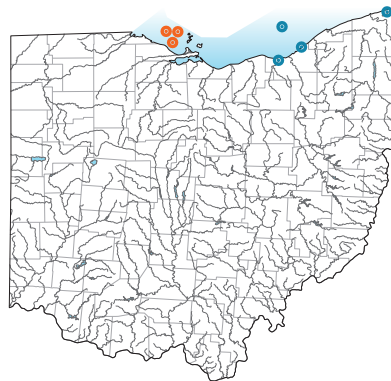
Looking somewhat like a Grass Pickerel when young, complete with the dark teardrop, fully scaled cheeks and opercles, and barred sides, adults are distinguished by the distinctive longitudinal chain-like reticulations on their sides that give them their common name. They also have no spots on the fins. Smaller than the Northern Pike or Muskellunge, adults average 12–25 inches in length, but may reach 30 inches on rare occasions. Native to Atlantic and Gulf Coast drainages, Chain Pickerel range north in the Mississippi Valley to western Kentucky and Tennessee in the Cumberland and Tennessee River drainages. They are also widely distributed in Lake Ontario tributary streams in Pennsylvania and New York. They were first introduced into Ohio waters in 1935, when 700 adults were released into Long Lake in Summit County. Although stocking in Long Lake continued until 1982, it appears that they failed to become established there. Between 1935 and 1982, Chain Pickerel were stocked in over three dozen water bodies in 27 counties. Despite this widespread and long-standing effort, these plantings failed to establish permanent populations. Chain Pickerel were last recorded from North Reservoir at Akron in 1985. While it is reasonable to assume that this species no longer occurs in Ohio, it is possible that one could still turn up. Recently (according to Douglas Fischer of PAFBC), the species has been spreading in the Monongahela and Allegheny Rivers of the upper Ohio River basin in western Pennsylvania. Along with changing conditions that would favor Grass Pickerel and other pikes in the upper Ohio River along the eastern edge of Ohio, this would make its presence there a reasonable possibility. Like other members of the family, this species inhabits quiet waters in lakes and streams with clear waters, beds of aquatic macrophytes, and woody debris.



Pink Salmon (*Oncorhynchus gorbuscha*)



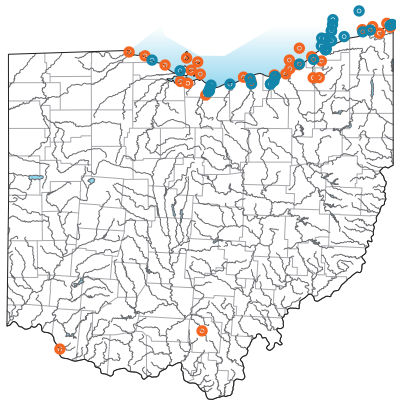
It is somewhat ironic that the only self-sustaining species of salmon introduced into the Great Lakes was the result of an "accidental" introduction. Pink Salmon were inadvertently introduced into Lake Superior in 1956, when the Ontario Department of Lands and Forest "discarded" about 21,000 excess fingerlings into a sewer that drained into the Current River at a hatchery on Thunder Bay. Another 100 adults were also reported to have escaped into Thunder Bay that same year while being transferred from the hatchery to a seaplane. The capture of pre-spawning adults in the Minnesota waters of Lake Superior in 1959 provided the first evidence of natural reproduction in the lake. By 1969, Pink Salmon had spread into northern Lake Huron and into Lake Michigan by 1973. By 1979, their range had expanded to include Lake Erie and Lake Ontario, where their presence was first detected when spawning adults were observed in tributary streams. Small numbers currently spawn in the lower few miles of some of the tributaries on the eastern end of Lake Erie. Known as the Humpback Salmon in the Pacific Northwest due to the large hump that develops on the back of breeding males, they are one of the smallest members of the family, averaging 2–7 pounds in the Great Lakes. They have relatively short lifespans, with most fish spawning and dying in their second year and only a few surviving to spawn in their third year. Spawning occurs in mid- to late September and is usually completed by the first week or so in October. Females excavate nests called "redds," which are fiercely guarded by the males. Eggs, buried in the gravel by the females following deposition, hatch between late December and late February, with the larvae remaining in the nest until April or early May. Not all spawning fish return to their natal stream, and new spawning populations are established by individuals wandering into new tributaries. Breeding adults are dark green on the back with pink or red sides (hence the common name). In Lake Erie, they feed extensively on two other exotic species, Alewife and Rainbow Smelt.



Coho Salmon (*Oncorhynchus kisutch*)



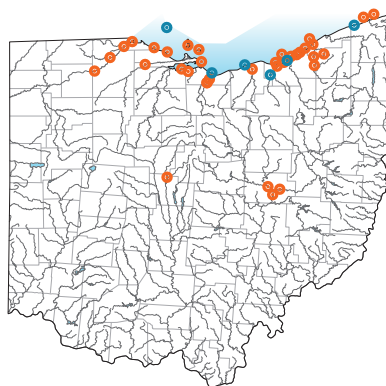
Coho Salmon are native to the North Pacific Ocean, where they may be found along coastlines from Russia and Japan and across the Bering Sea to Alaska and south to California. An anadromous species breeding in coastal tributaries, pelagic nonbreeders are known as Silver Salmon in reference to their silvery sides. While Coho may have been stocked inadvertently in Lake Erie in 1873 with early plantings of Chinook Salmon, Ohio is credited with the first releases in the Great Lakes in 1933, when 50,000 Coho along with 130,000 Chinook Salmon fingerlings raised at the Castalia Trout Club were released into Sandusky Bay and western Lake Erie. Although a few three- to five-pound individuals were reportedly caught, this effort was considered unsuccessful. After the collapse of many of the native sportfish stocks in Lake Erie in the 1950s, Coho and Chinook salmon were once again planted in Lake Erie in an effort to establish a new sport fishery. Between 1968 and 1970, the State of Ohio planted more than half a million fry and fingerlings into the lake, followed by several hundred thousand additional fish in the years that followed. While these releases had some success in Lake Erie, releases of Coho in Lake Michigan and Lake Huron were even more successful. With natural reproduction limited, the salmon fisheries on Lake Erie and the other Great Lakes are maintained only with annual plantings of fingerlings. Ohio no longer plants Coho in Lake Erie, although an occasional individual representing strays from populations in one of the upper lakes is sometimes caught.



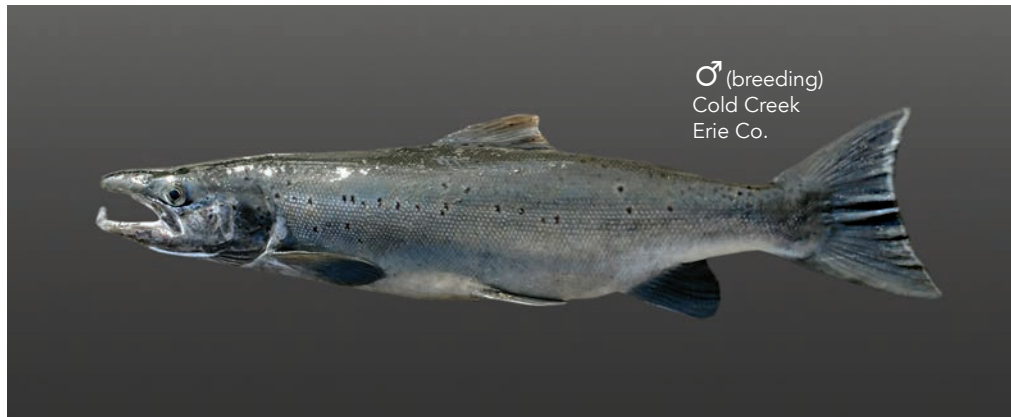
Chinook (King) Salmon (*Oncorhynchus tshawytscha*)



Chinooks are native to the North Pacific Ocean, where they may be found along coastlines from Russia and Japan and across the Bering Sea to Alaska and south to California. The state fish of Alaska, where they are called the King Salmon, they can attain weights approaching 130 pounds in native waters, but rarely exceed 30 pounds where introduced. An anadromous species spawning in coastal tributaries on the west coast, the first Ohio releases occurred between 1875 and 1877, when Chinooks were planted in both the Lake Erie and Ohio River drainages. Although Chinooks were frequently taken in some of the Lake Erie tributary streams for a few years after these releases, fish planted in Ohio drainage streams were never seen again. Although small numbers of Chinooks were occasionally planted in Lake Erie in the years after 1890, it wasn't until the 1930s that another serious attempt to establish a population was made with the release of 130,000 fingerlings. While fishermen reported a few captures, this attempt was also judged a failure by all concerned. After the collapse of many of the native sportfish stocks in Lake Erie in the 1950s, Coho and Chinook Salmon were once again planted in Lake Erie in an effort to establish a new sport fishery. Between 1968 and 1970, the State of Ohio planted more than half a million fry and fingerlings into the lake, followed by several hundred thousand additional fish in the years that followed. While these releases had some success in Lake Erie, releases of Chinooks and Coho in Lake Michigan and Lake Huron were even more successful. With natural reproduction limited, the salmon fisheries on Lake Erie and the other Great Lakes are maintained only with annual plantings of fingerlings. Ohio no longer plants Chinooks or any other salmon in Lake Erie, although an occasional individual representing a stray from populations in one of the upper lakes is sometimes caught.



Atlantic Salmon (*Salmo salar*)



Atlantic Salmon are the only salmon native to any of the Great Lakes; however, they are not native to Lake Erie or the rest of the Great Lakes above Niagara Falls. Their native range includes Lake Ontario, the Atlantic coast from New York northward, around the Arctic Circle, and south into Portugal in Europe. Unfortunately, the only native Great Lakes salmon was extirpated from Lake Ontario in the late 1800s. In similar fashion to the various West Coast salmonids, Atlantic Salmon have been liberated in the Great Lakes, including Lake Erie, since the late 1800s. These stocking attempts largely failed. More recently, they were stocked in Michigan in 1972, when some 20,000 young were released in the Boyne and Au Sable rivers. They continue to be stocked in Michigan, and a run occurs in the St. Marys River from Lake Huron and Georgian Bay. A recent effort to reestablish them to their native range in Lake Ontario has also showed some promise, but only time will tell if it turns into long-term success. In 2017, several Atlantic Salmon were captured in Lake Erie tributaries in Ohio, Michigan, and Pennsylvania. The capture of a single individual by an angler from Cold Creek on November 21, 2017, is the only known modern-day capture of this species in Ohio. This fish had a clipped adipose fin, indicating that in all likelihood, it is a stocked fish that wandered south from Michigan waters.



Threespine Stickleback (*Gasterosteus aculeatus*)



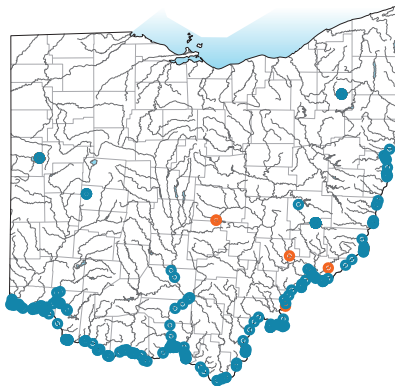
Circumpolar in their distribution with the exception of the north coasts of Siberia and Alaska and the arctic islands of Canada, Threespine Sticklebacks are found along the west coast of North America south to southern California and along the East Coast south to Chesapeake Bay. Represented by both salt- and freshwater forms, they inhabit a range of lentic habitats, including ditches, ponds, lakes, sluggish rivers, and other habitats with emergent vegetation. A high degree of morphological plasticity exists not only between freshwater and anadromous forms, but also between many of the freshwater populations, making them the subject of much study. Three subspecies are currently recognized, but a taxonomist could have a field day with this species. Saltwater forms are distinguished by the presence of 30–40 lateral bony plates (vs. 0–12 for freshwater forms) on each side of the body and a well-developed pelvic girdle. Freshwater forms exhibit two main types: a limnetic form identified by its slender body, long snout, and large eye inhabiting oligotrophic lakes, where it feeds on the surface and inhabits the upper water column; and a benthic form identified by a deep body, small eye, and wide, terminal mouth, feeding on benthic organisms in shallow eutrophic lakes and the littoral zone of deeper lakes. Threespine Sticklebacks are native to the Lake Ontario basin below Niagara Falls. They were first reported above the Falls from Lake Huron in 1980. The origins of this introduction are unclear. Some believe that this species used the Nipissing Canal to gain access from the Ottawa River into the upper Great Lakes, while others believe it may have been the result of a bait-bucket introduction or ballast water release from cargo ships. Regardless of the source, this species spread throughout the Great Lakes over the next 30 years and is now established in all the upper lakes. The recent discovery of three previously unidentified specimens collected in Maumee Bay in 1977 housed in the OSU Museum's fish collection are the first records for Lake Erie and the upper Great Lakes. Single individuals have since been taken in or near Maumee Bay in 1990, 1993, and 1994. There is also a 1993 collection from Otter Creek, a tributary to Maumee Bay in Lucas County. No further records have been found in recent years and the status of this species in Ohio waters of Lake Erie is unknown. They differ from the Ohio-native Brook Stickleback in having only three dorsal spines, as opposed to four to six.



Striped Bass (*Morone saxatilis*)



Known as the Rockfish in native waters along the Atlantic Coast, Striped Bass are an anadromous species that have been widely introduced into inland waters for recreational and sport-fishing purposes. They are identified by 7–9 distinct, usually unbroken stripes running lengthwise along the back and sides with multiple stripes reaching the base of the tail, as opposed to only one stripe in the very similar White Bass. Striped Bass are also more long and slender in profile than White Bass, and are further identified by the presence of two parallel tooth patches on the base of the tongue, while White Bass have only a single tooth patch. Young Striped Bass have dark vertical bars similar to the parr marks seen on young salmonids, best viewed from above. The largest member of the temperate bass family Moronidae, they typically weigh in at 8–40 pounds when mature, but can exceed 100 pounds and 5 feet in length. Spawning individuals in reservoirs and other landlocked lakes migrate up tributary streams to spawn, but with few exceptions are rarely successful. Kentucky currently has an active stocking program, releasing Striped Bass into the Ohio River and inland reservoirs on an annual basis. Individuals from these plantings are commonly found upstream in the Ohio River as far as the Meldahl Pool between Clermont and Scioto counties in Ohio. They also can be found on occasion in the lower portion of the Scioto, Little Miami, and Great Miami rivers. Until 2011, the Ohio Division of Wildlife stocked several inland reservoirs including West Branch, Kiser, and Senecaville lakes. The Ohio Division of Wildlife has discontinued this program in favor of the more successful (at least in Ohio) stocking of Striped × White Bass hybrids.

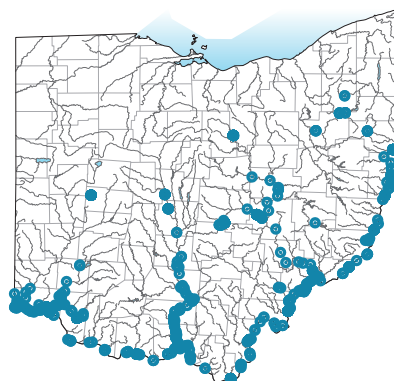


Hybrid Striped × White Bass (*Morone saxatilis* × *chrysops*)



Adult
Muskingum River
Coshocton Co.

Hybrid Striped × White Bass, or “Wipers,” are stocked by the Ohio Division of Wildlife in inland reservoirs in the Ohio River basin, the Muskingum River, and the Ohio River in order to create recreational fisheries. These are more tolerant of warmer waters than the Striped Bass, resulting in higher growth and survival rates in Ohio waters. They are intermediate in appearance to either parent species. The sides are usually marked with more numerous and more prominent horizontal stripes than a White Bass, but they are often broken, unlike those of a Striped Bass. Usually, more than one of these stripes reaches the tail, like a Striped Bass. The tooth patch normally consists of two patches that are closer together than those of a Striped Bass and sometimes fuse together along the center of the tongue. Young have vertical bars (similar to parr marks on young salmonids) on their sides, best viewed from above, like those of a young Striped Bass. They reach an intermediate size, averaging 16–24 inches long and 2–8 pounds, with a 31.75 inch fish weighing over 18 pounds presently holding the state record. Inland reservoirs currently being stocked by the Ohio Division of Wildlife include Griggs, Dale Walborn, Guilford, Buckeye, Charles Mill, Dillon, East Fork, Kiser, and O’Shaughnessy lakes, along with the Muskingum and Ohio rivers.



Saugeye (*Sander canadensis* × *vitreus*)



A hybrid formed by crossing a male Sauger and a female Walleye, the Saugeye has proven to be highly adaptable to life in turbid reservoirs deficient in structure and not conducive to either parent. Exhibiting hybrid vigor, they are preferred for their faster growth rates, higher tolerances for a range of habitat conditions, easier management in hatchery situations, and popularity with Ohio's anglers. Saugeye were first stocked in the late 1970s following the disappointing returns achieved with Walleye in Ohio reservoirs in the 1960s and '70s. These initial plantings proved to be highly successful, and over 350 million Saugeye have since been stocked in over 95 lakes and reservoirs throughout Ohio. Intermediate in appearance between a Sauger and a Walleye, they are distinguished by the smeared and inconsistent spotting on the first dorsal fin. The dark patches present on the sides of a Saugeye are smaller than those on a Sauger, and the white tips on the anal fin and lower lobe of the caudal fin are less prominent than those of a Walleye. Unlike most hybrids, a small percentage of Saugeyes are fertile and can successfully backcross with either parent. It has been estimated that in natural conditions where both species inhabit the same waters, hybrids can make up 2–3% of the population. Some natural hybrids likely occur in the Ohio River, but those captured in the rest of the state undoubtedly are stocked fish. Saugeye have a tendency to wander, with many captures occurring downstream of stocked reservoirs. Tailwaters below dams can often be excellent fishing places for these stocked fish.