Appendix 3

Appendix 3.–Known past and present fish distributions in the Au Sable River system. Distributions of fishes were compiled from records located at the University of Michigan Museum of Zoology Fish Division Library, Michigan Department of Natural Resources Institute for Fisheries Research, and Michigan Department of Natural Resources Grayling Field Office. Scientific names and phylogenic order follow Robins et al. 1991. For species that are listed under Michigan's Endangered Species Act (Part 365, Endangered Species Protection, of the Natural Resource and Environmental Protection Act, Act 451 of the Public Acts of 1994), their status follows their scientific name. Categories are declining, rare, threatened, endangered, extinct, and locally extinct.

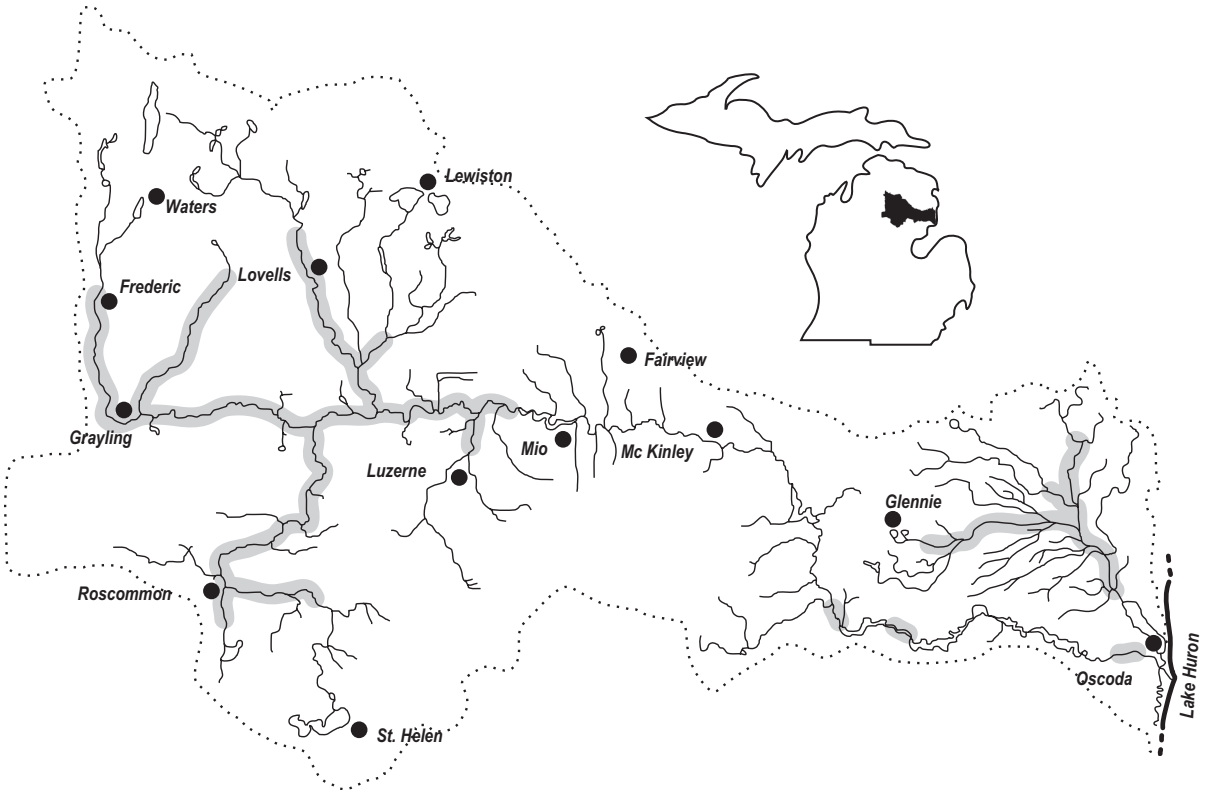
Habitat descriptions were compiled from The Fishes of Ohio (Trautman 1982), Freshwater Fishes of Canada (Scott and Crossman 1973), Fishes of Wisconsin (Becker 1983), Fishes of Missouri (Pflieger 1975), and Fishes of the Great Lakes Region (Hubbs and Lagler 1947).

Northern brook lamprey (*Ichthyomyzon fossor*)

Habitat:

feeding - young: low gradient, substrate with bars and beds of mixed sand and organic debris
- moderately warm water

spawning - clear, high gradient streams (<15 feet wide)
- riffles with sand or gravel substrate



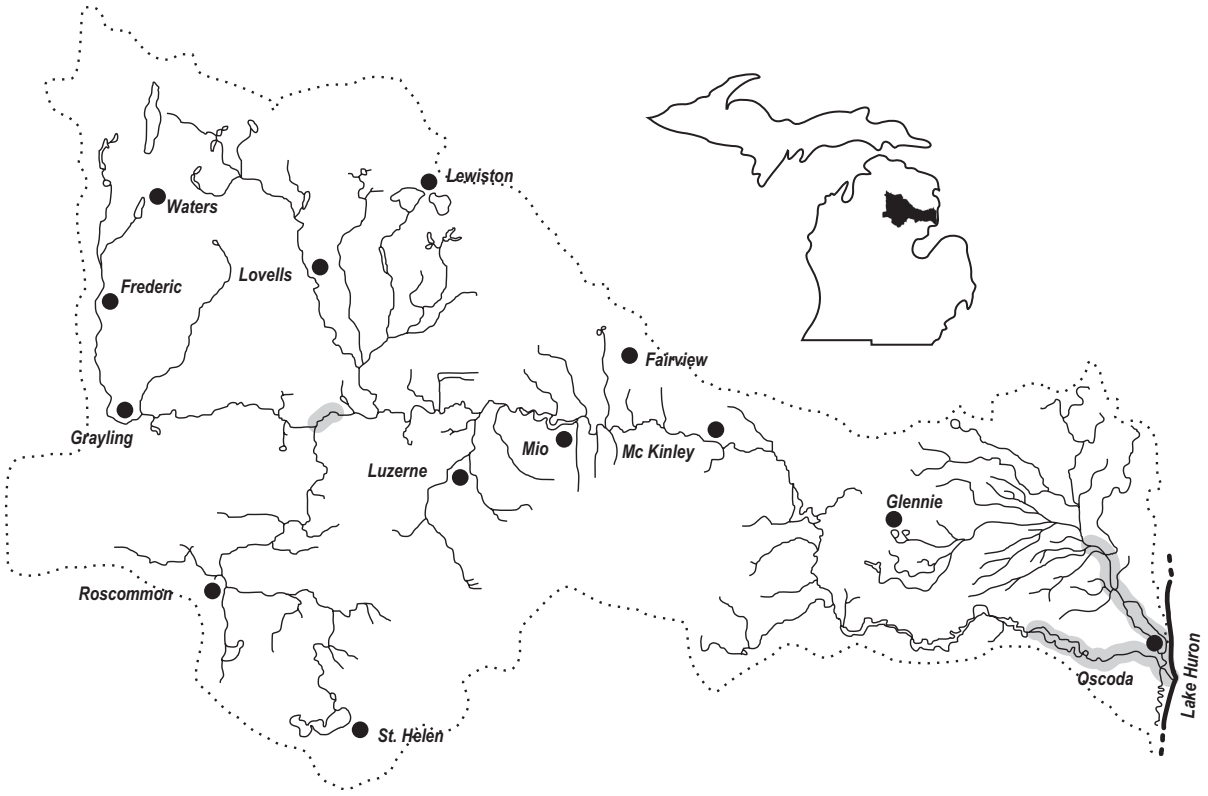
Silver lamprey (*Ichthyomyzon unicuspis*) - rare

Habitat:

feeding - young: sand, muck, or organic debris substrate
- adults: clear river water with prey species

spawning - gravel and sand substrate
- moderate gradient
- moderate size stream
- cannot tolerate silt
- no dams

winter refuge - amnocetes burrow for 4 to 7 years in mud and silt at river margins



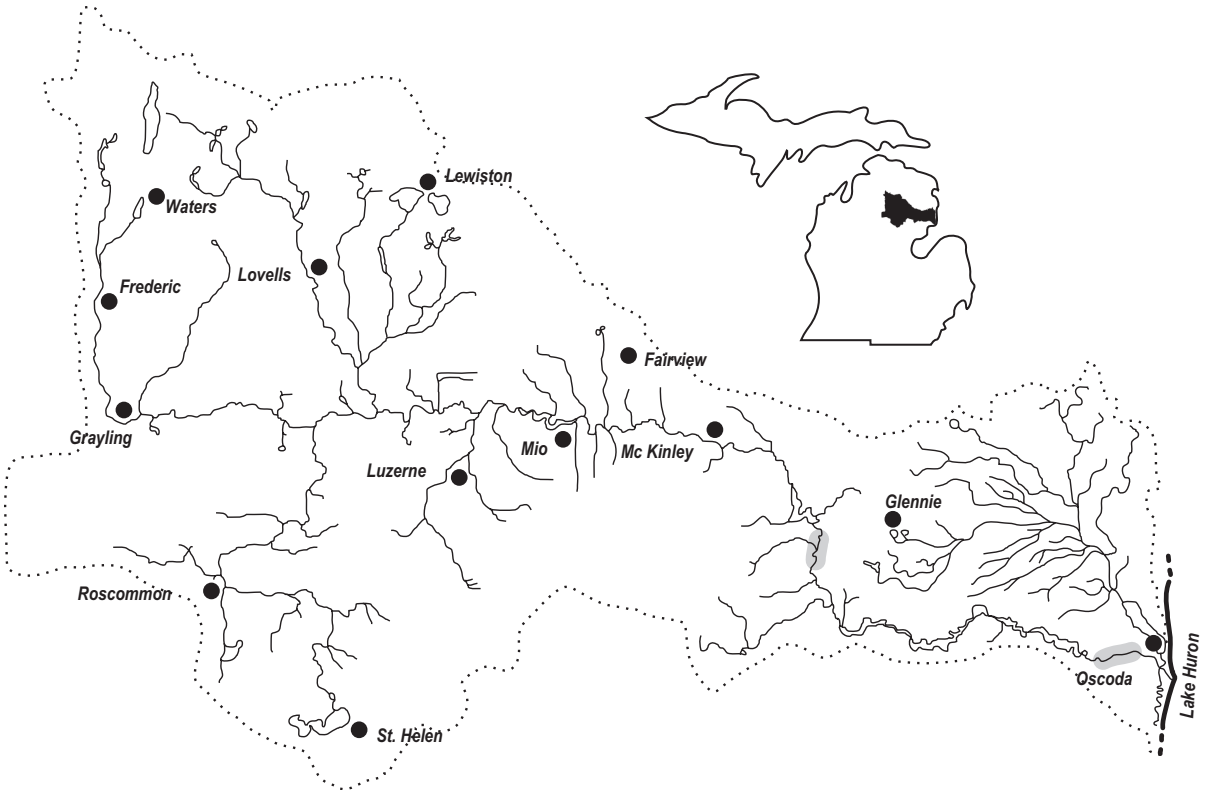
American brook lamprey (*Lampetra appendix*)

Habitat:

feeding - young: low gradient, substrate with bars and beds of mixed sand and organic debris
- clear cool stream water, sensitive to turbidity

spawning - clear, high gradient streams (>15 feet wide)
- cold water
- gravel substrate

winter refuge - sand or silt substrate for amnocoetes

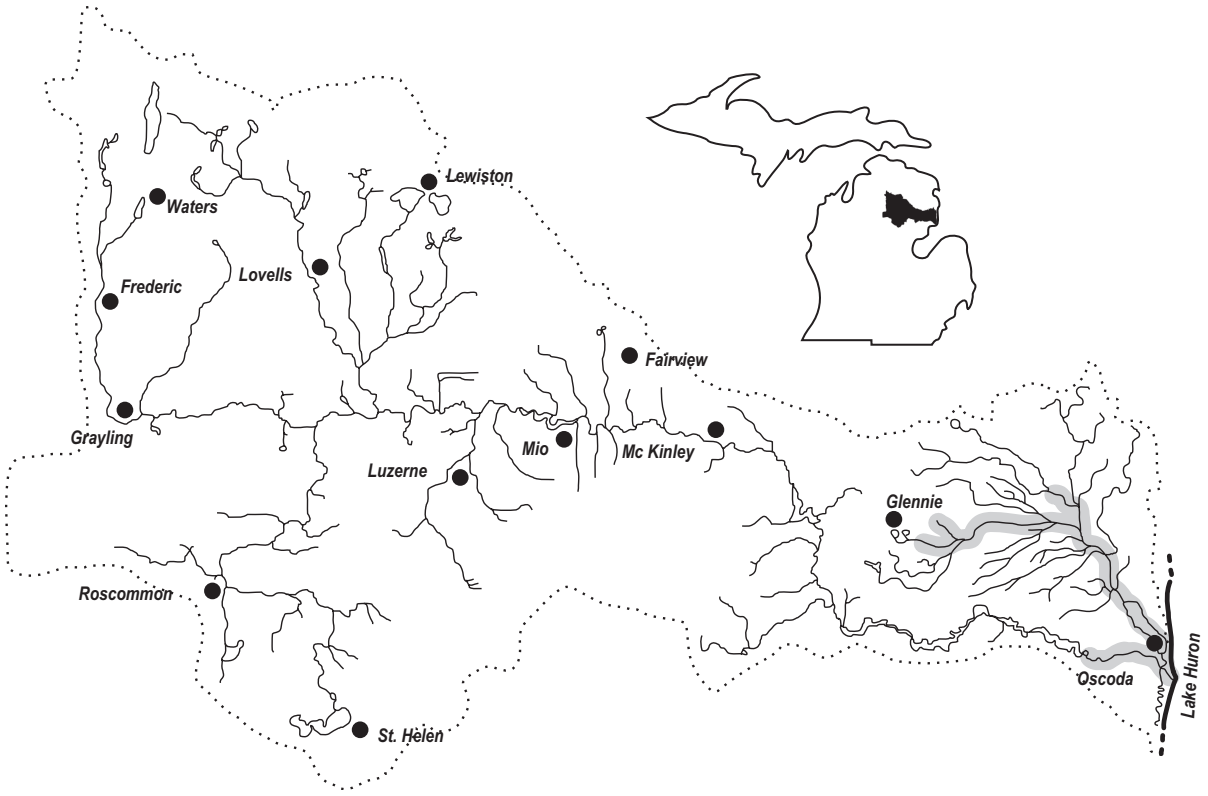


Sea lamprey (*Petromyzon marinus*)

Habitat:

feeding
- young: substrate with beds of sand mixed with organic debris
- cannot tolerate silt
- adults: clear cool water of Lake Huron

spawning
- no dams
- riffles with sand and gravel substrates

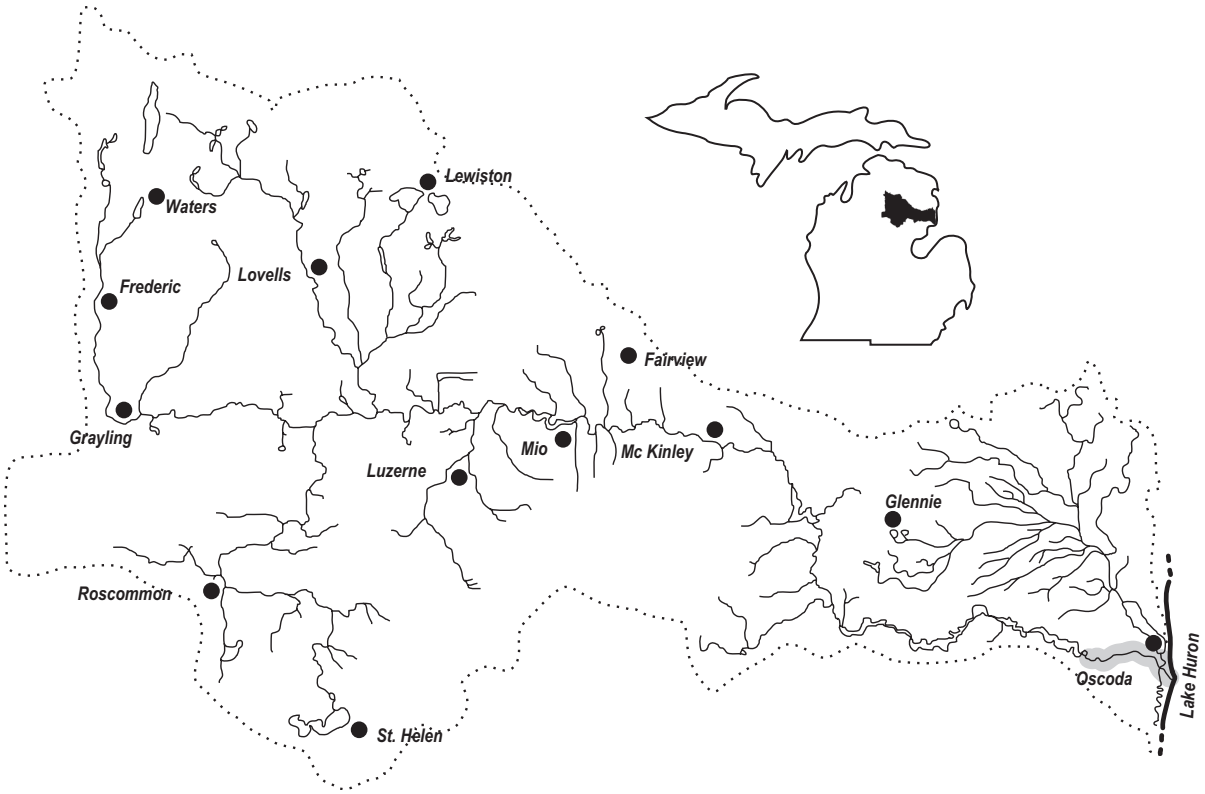


Lake sturgeon (*Acipenser fulvescens*) - threatened

Habitat:

feeding
- shoal areas of large rivers, lakes, and impoundments
- gravel, sand, rock substrates

spawning
- in or before rapids, at the base of dams in rivers
- in 2-15 feet of water
- swift current
- rocky ledges or around rocky islands in Great Lakes



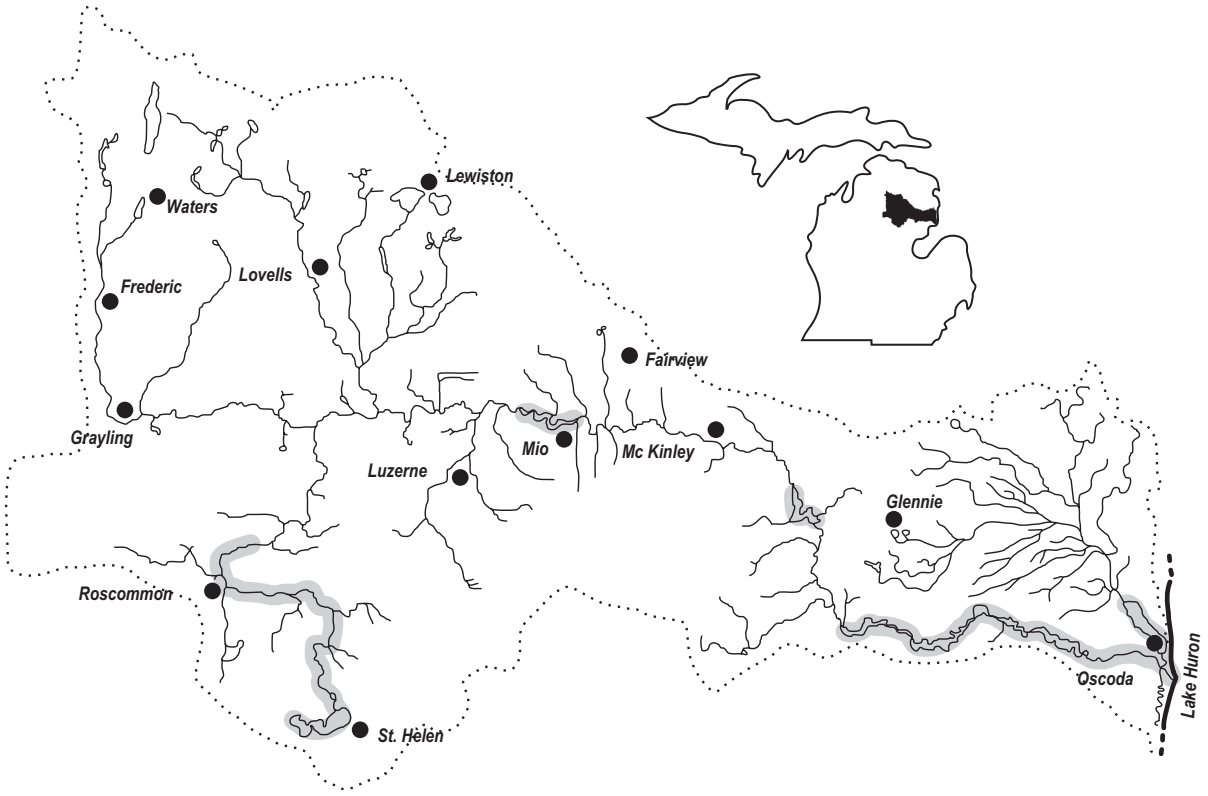
Bowfin (*Amia calva*)

Habitat:

feeding
- clear water
- abundant rooted aquatic vegetation
- low gradient streams, lakes, and impoundments
- tolerate only small amount of silt

spawning
- need vegetated water, 1 to 2 feet deep
- can spawn under logs, stumps, or bushes

winter refuge
- gravelly pockets among aquatic vegetation



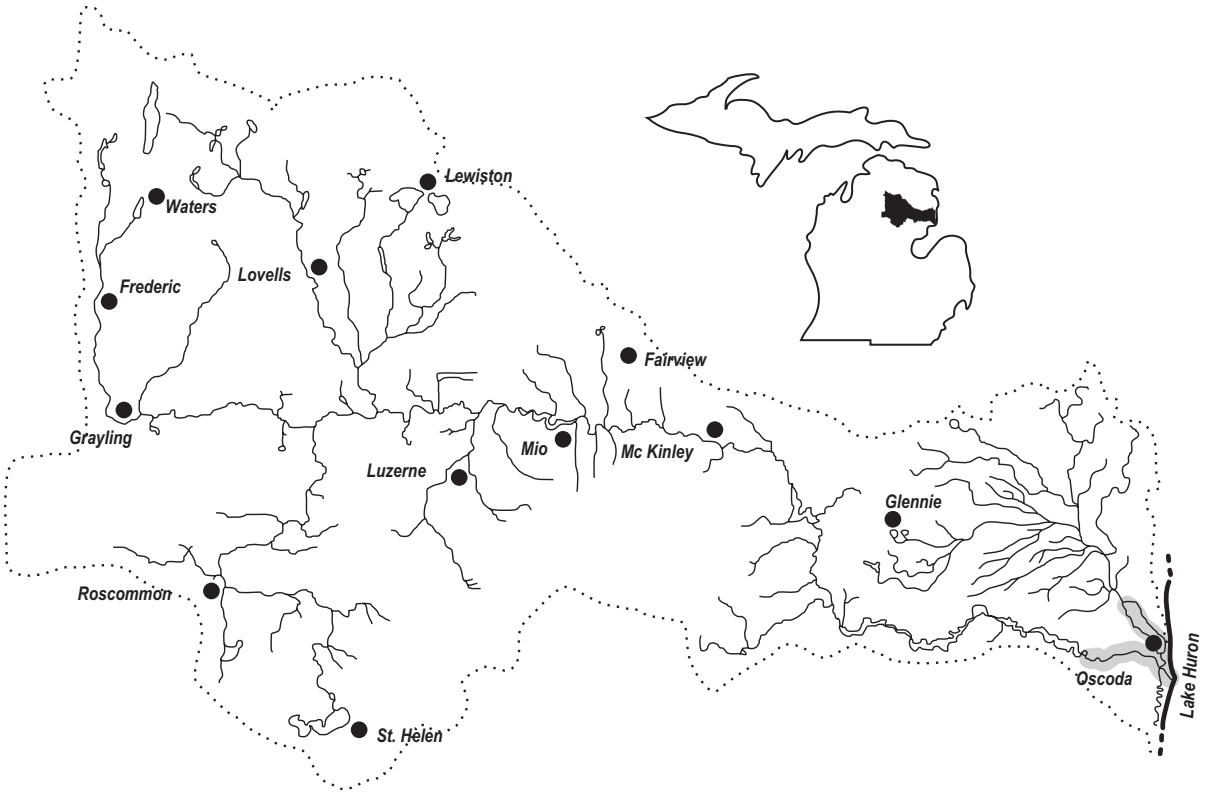
American eel (*Anguilla rostrata*)

Habitat:

feeding
- medium to large rivers and Lake Huron
- must have current
- moderately clear water
- avoid cool spring-fed streams

spawning
- catadromous
- occurs in the SW portion of the North Atlantic called the Sargasso Sea

winter refuge
- buried in muddy or silty substrate



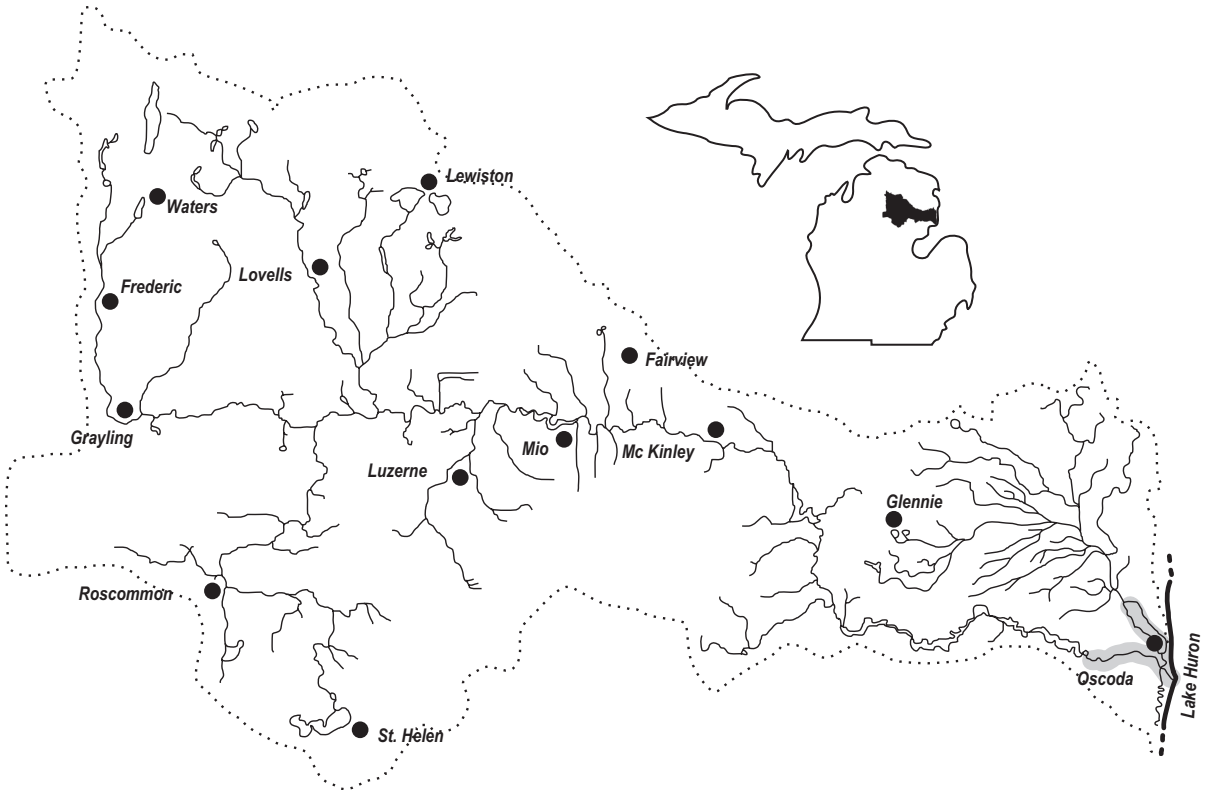
Alewife (*Alosa pseudoharengus*)

Habitat:

feeding - adults: deep water of Lake Huron
- young: shallow water of Lake Huron
- prefers warmer waters

spawning - streams or shallow beaches of lake
- sand or gravelly substrate

winter refuge - deep water

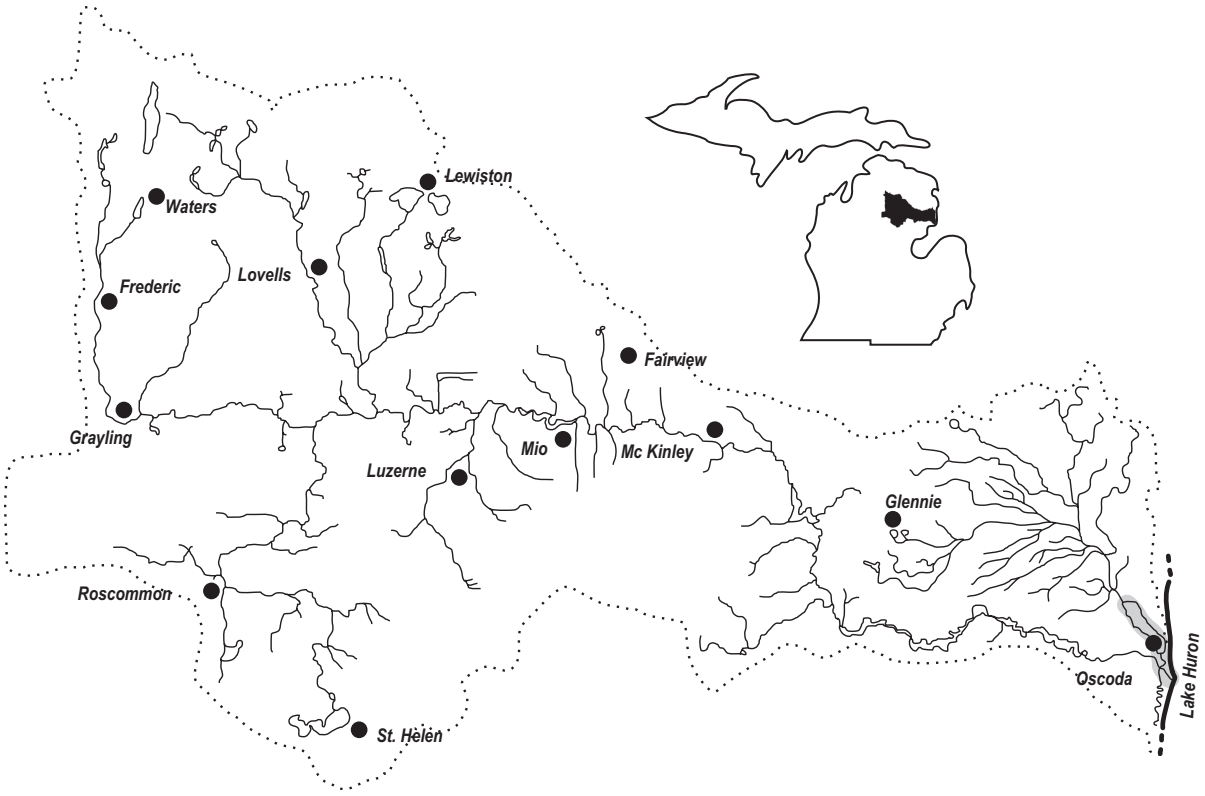


Gizzard shad (*Dorosoma cepedianum*)

Habitat:

feeding - large streams with low gradient, impoundments, and Lake Huron
- tolerant of clear and turbid water

spawning - shallow areas of ponds, lakes, and large rivers
- low gradient

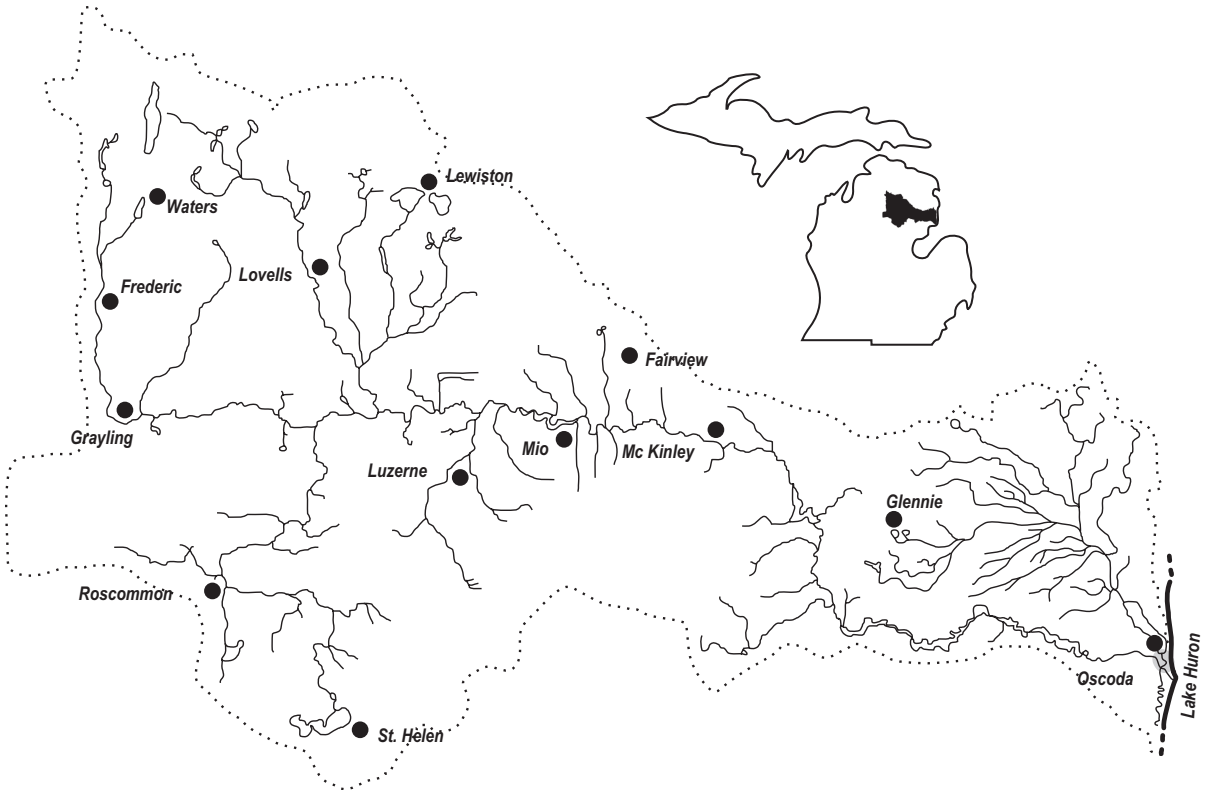


Goldfish (*Carassius auratus*)

Habitat:

feeding - vegetation
- low gradient, shallow, warm water streams, rivers, lakes, and impoundments
- tolerates some turbidity and siltation

spawning - warm, weedy shallows

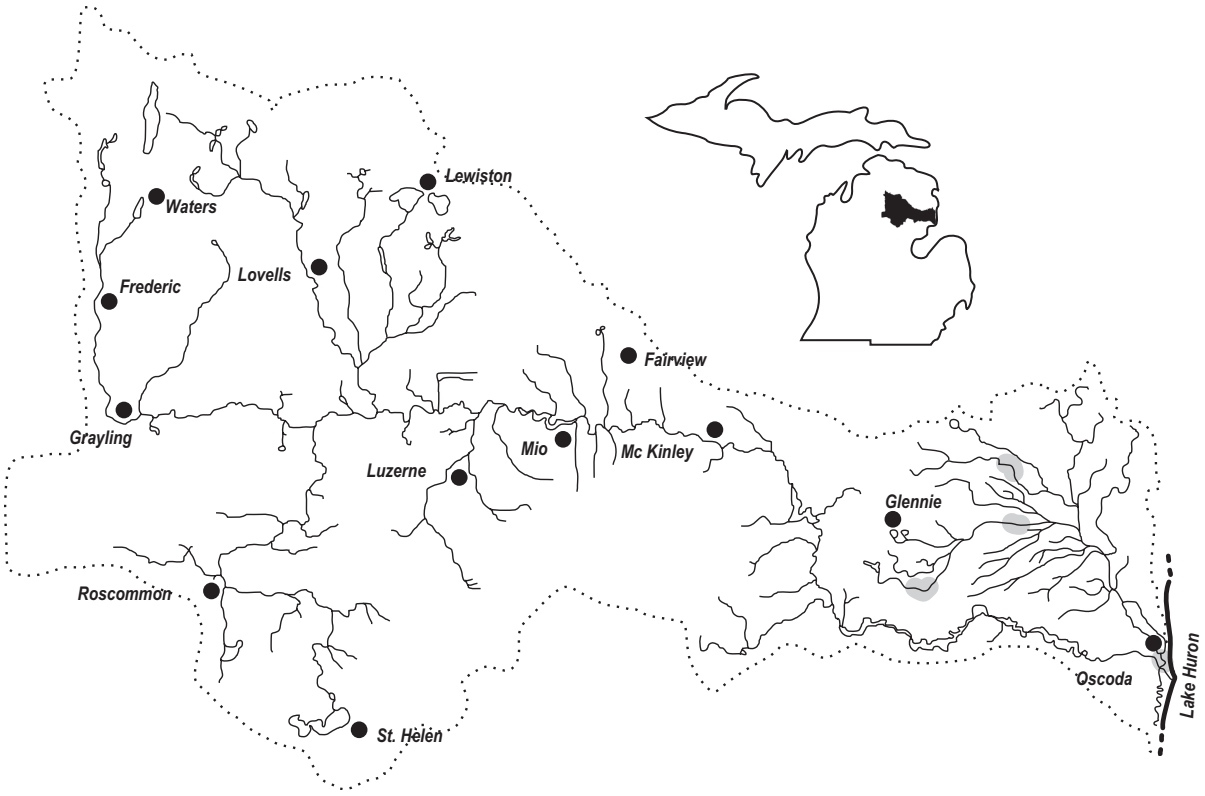


Lake chub (*Couesius plumbeus*)

Habitat:

feeding - large rivers and lakes
- over a variety of substrates

spawning - tributary streams
- rock substrate

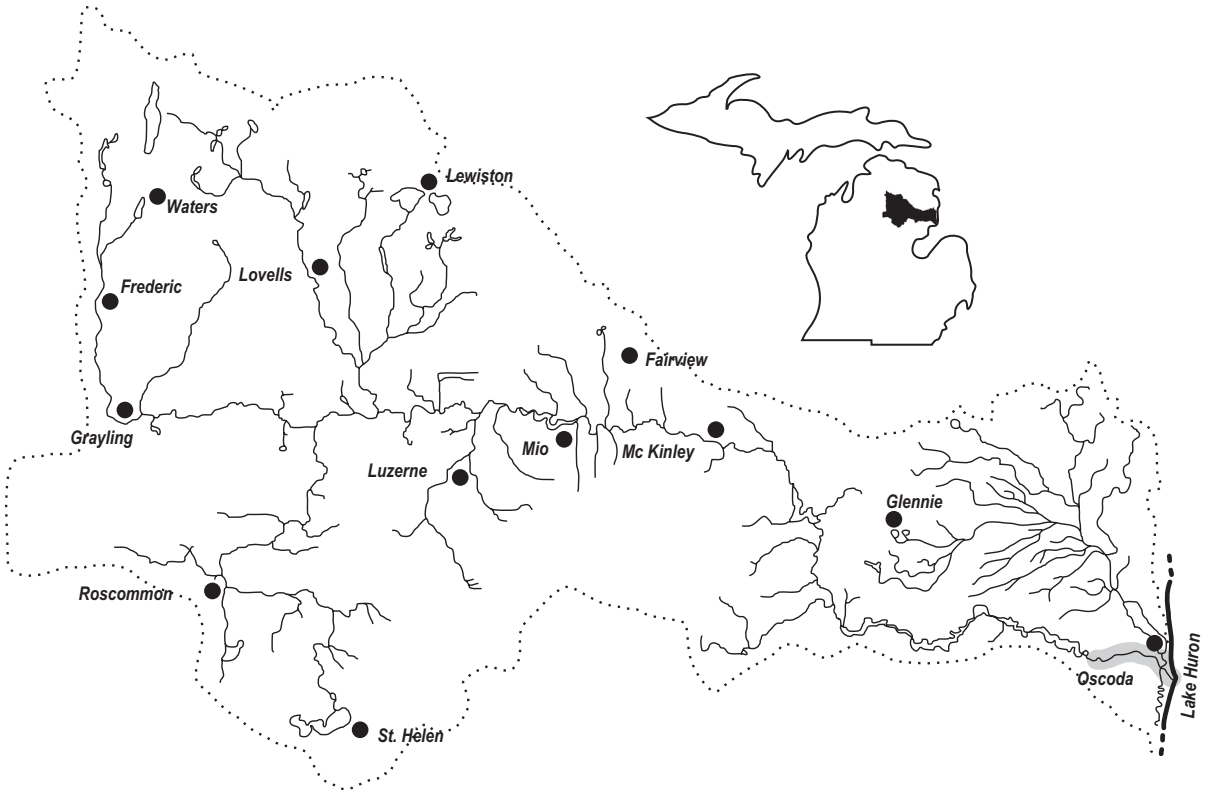


Spotfin shiner (*Cyprinella spiloptera*)

Habitat:

feeding
- clear water tolerant of turbidity and siltation
- some current
- shallow depths
- medium sized streams, lakes, and impoundments
- clear sand or gravel substrate

spawning
- swift current
- crevice spawner or on underside of submerged logs and roots

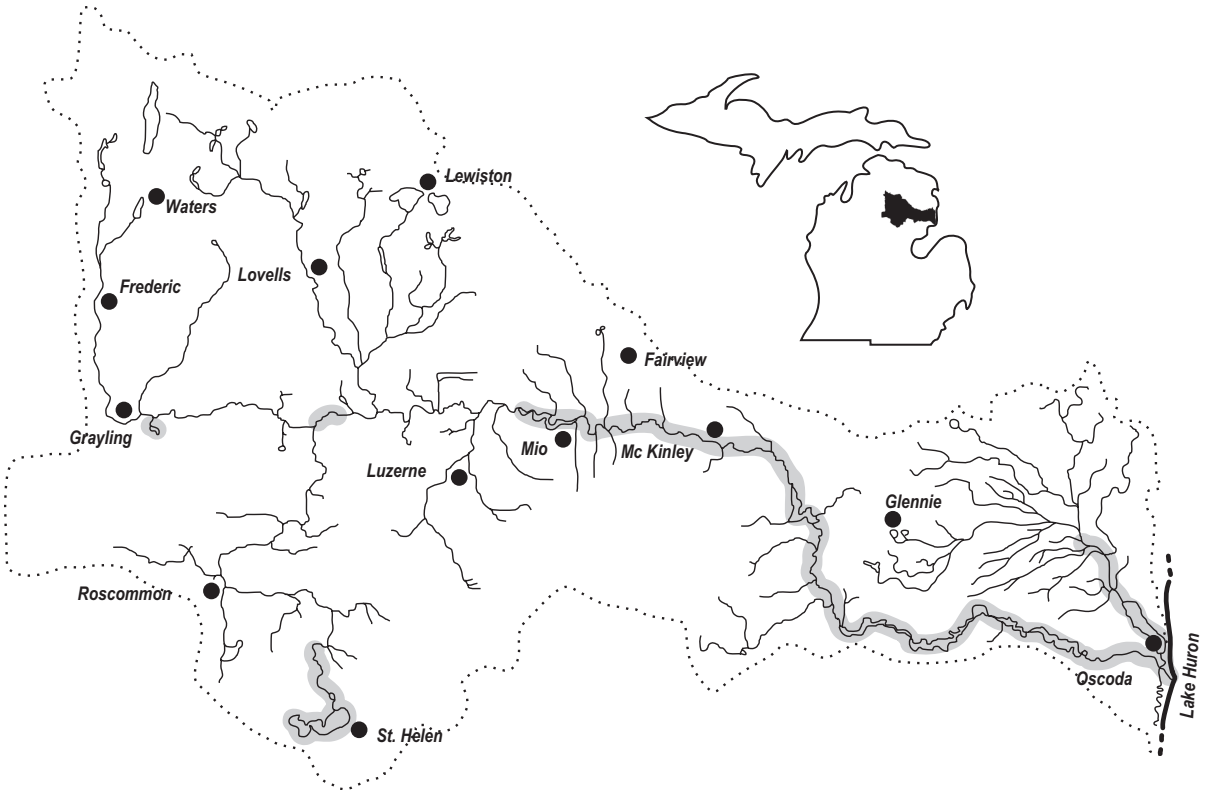


Common carp (*Cyprinus carpio*)

Habitat:

feeding - low gradient fertile streams, rivers, lakes, and impoundments
- abundance of aquatic vegetation or organic matter
- tolerant of all substrates and clear to turbid water

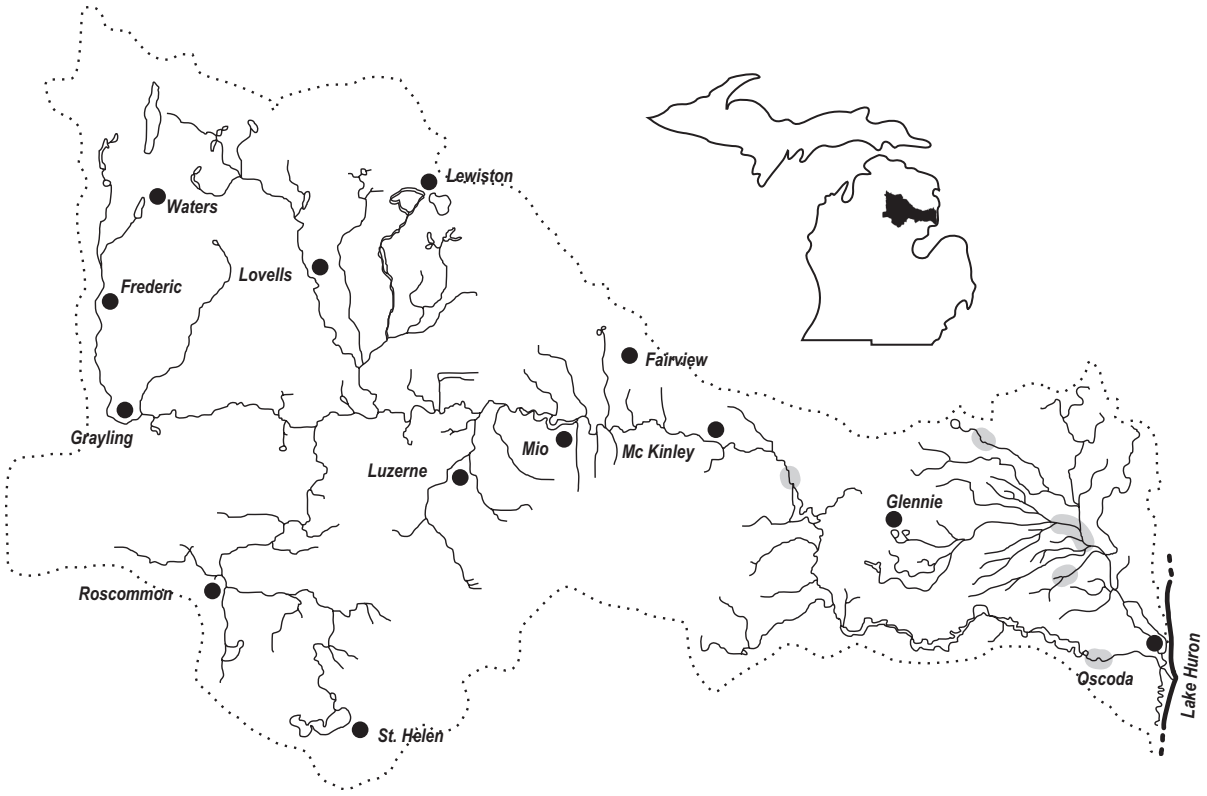
spawning - weedy or grassy shallows



Brassy minnow (*Hybognathus hankinsoni*)

Habitat:

feeding - cool acidic streams
- slow to moderate current
- sand or gravel substrate

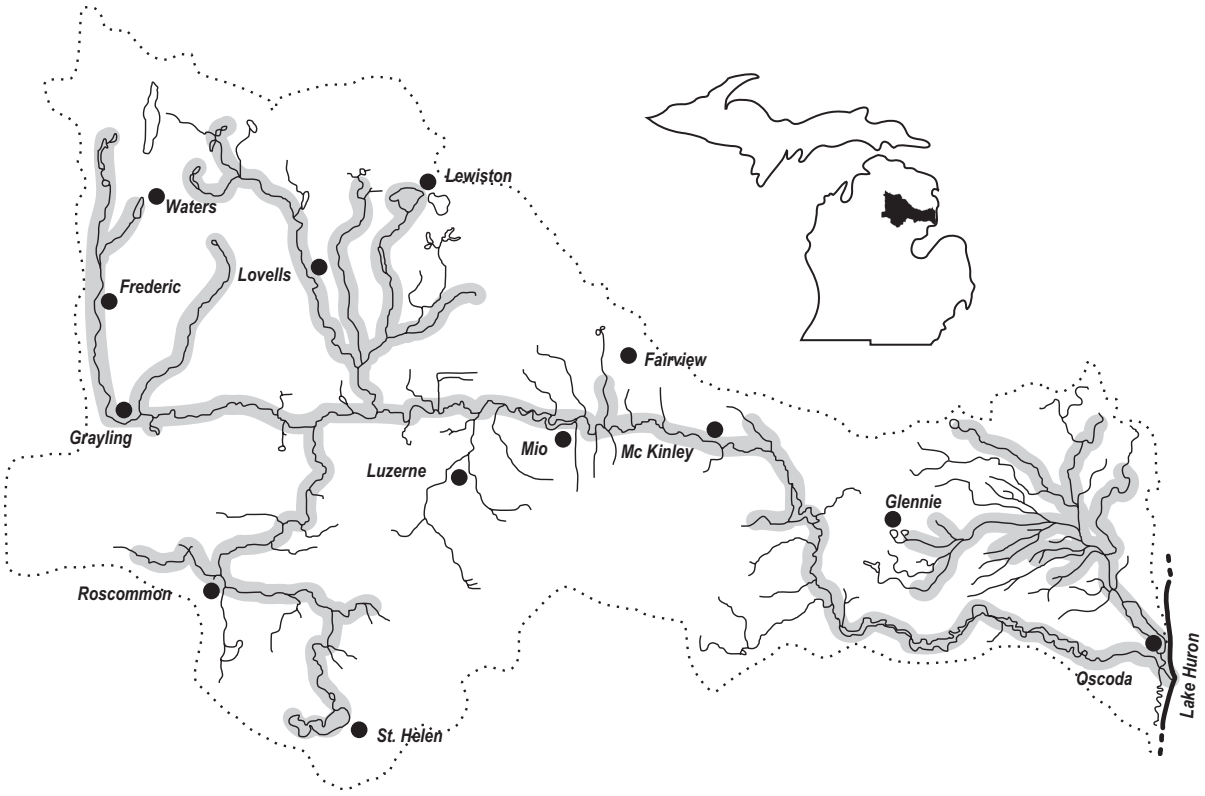


Common shiner (*Luxilus cornutus*)

Habitat:

feeding - small, clear, high-gradient streams and rivers, or shores of clear water lakes and impoundments
- gravel substrate
- can tolerate some submerged aquatic vegetation
- not very tolerant of turbidity or silted waters

spawning - gravel nests of other fish, especially those at the head of a riffle

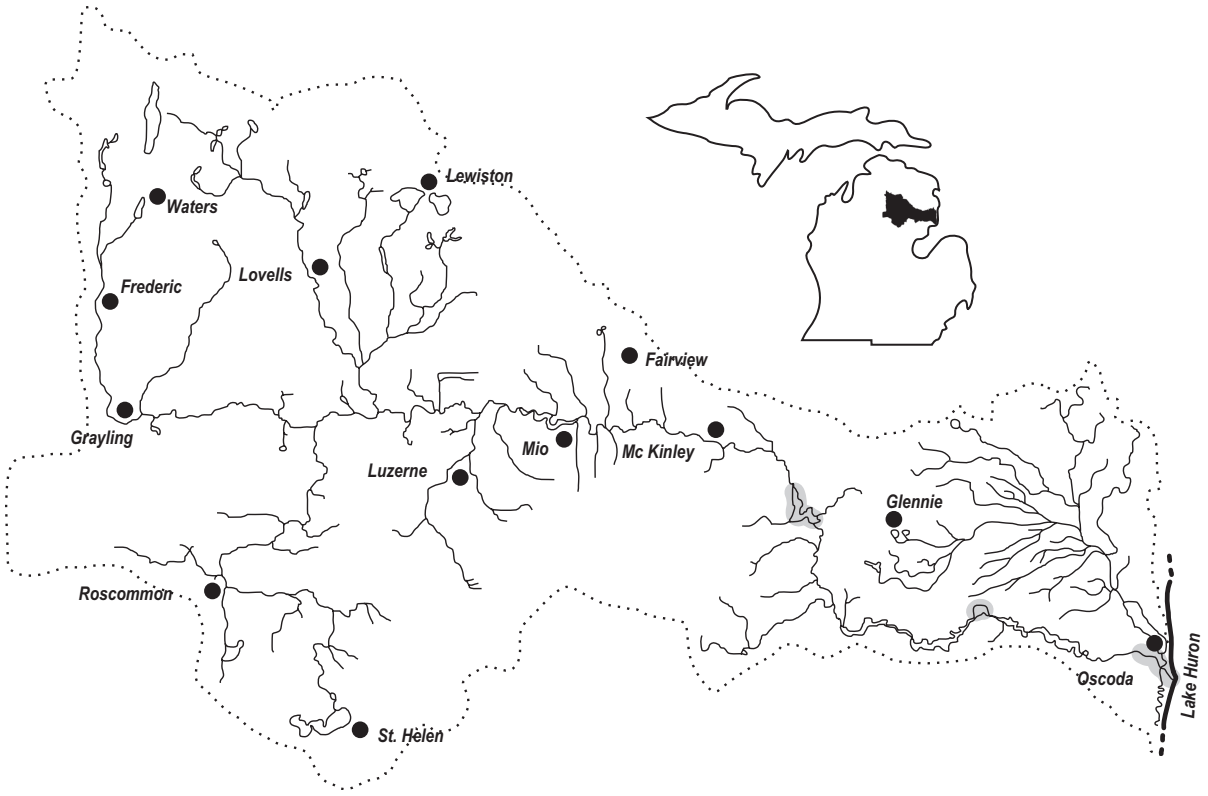


Redfin shiner (*Lythrurus umbratilis*)

Habitat:

feeding - clear, quiet warm rivers in weedy pools
- little to no current
- abundant submerged and emergent vegetation

spawning - over sand and gravel substrate in slow moving sections of streams

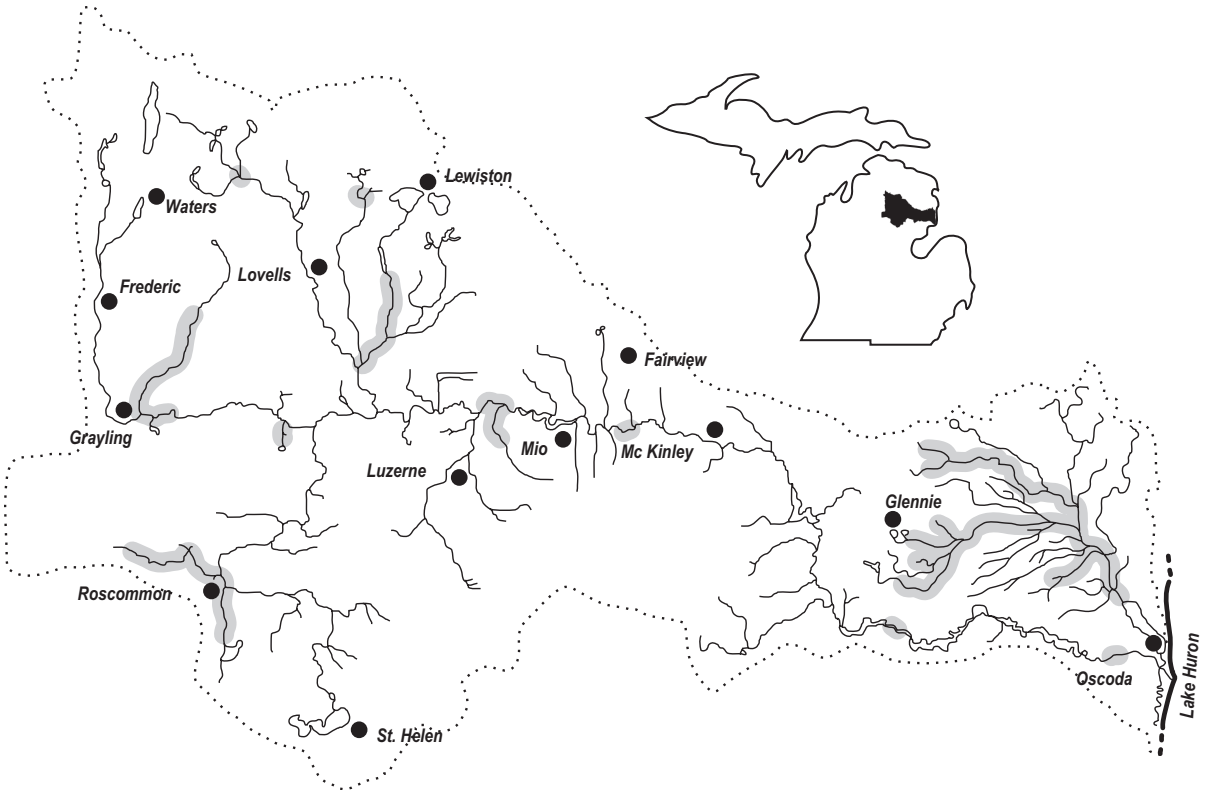


Pearl dace (*Margariscus margarita*)

Habitat:

feeding
- cool, neutral to acidic streams and lakes
- clear to slightly turbid water

spawning
- males are territorial
- clear water, 18-24 inches deep
- sand or gravel substrate
- weak to moderate current

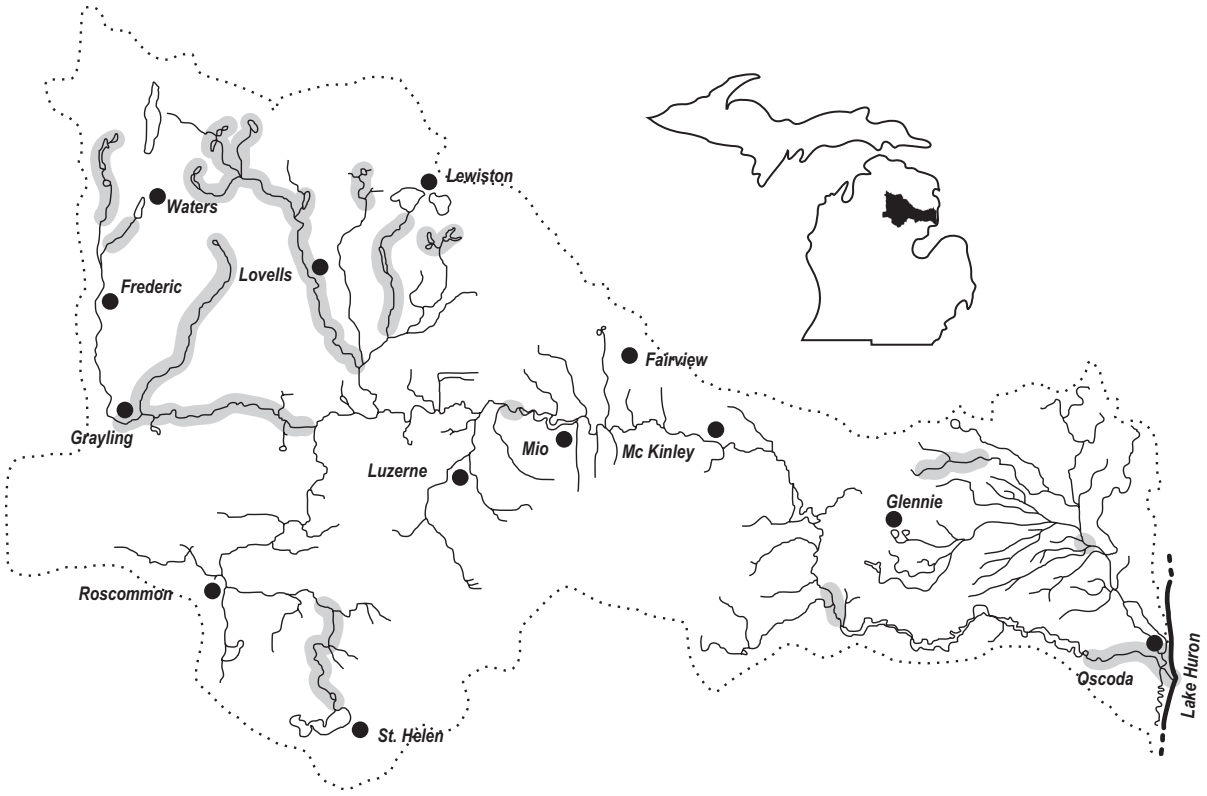


Hornyhead chub (*Nocomis biguttatus*)

Habitat:

feeding
- adults: near riffles
- young: near vegetation
- clear water, does not tolerate turbidity
- gravel substrate
- low gradient streams that are tributaries to large streams

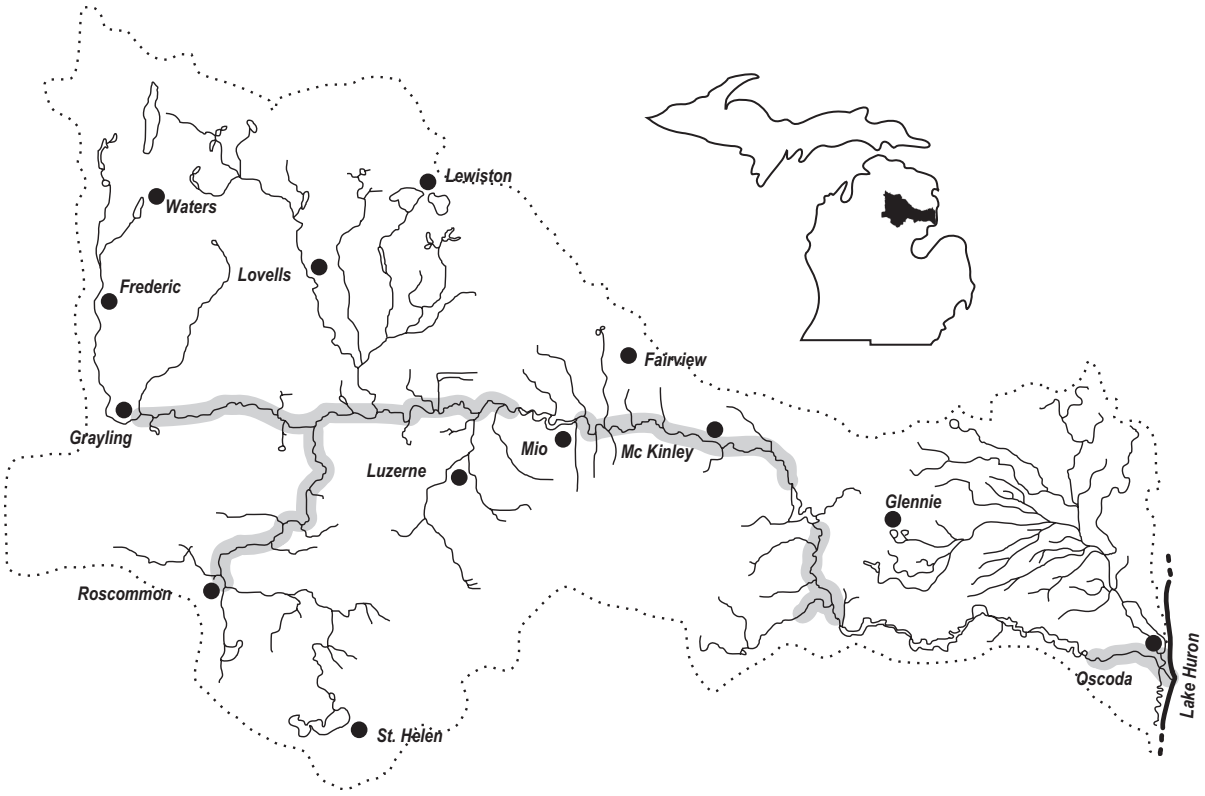
spawning
- large stones and pebbles present
- often below a riffle in shallow water
- gravel substrate



River chub (*Nocomis micropogon*)

Habitat:

feeding
- moderate to large streams
- moderate to high gradient
- gravel, boulder, or bedrock substrate
- little to no aquatic vegetation
- cannot tolerate turbidity or siltation

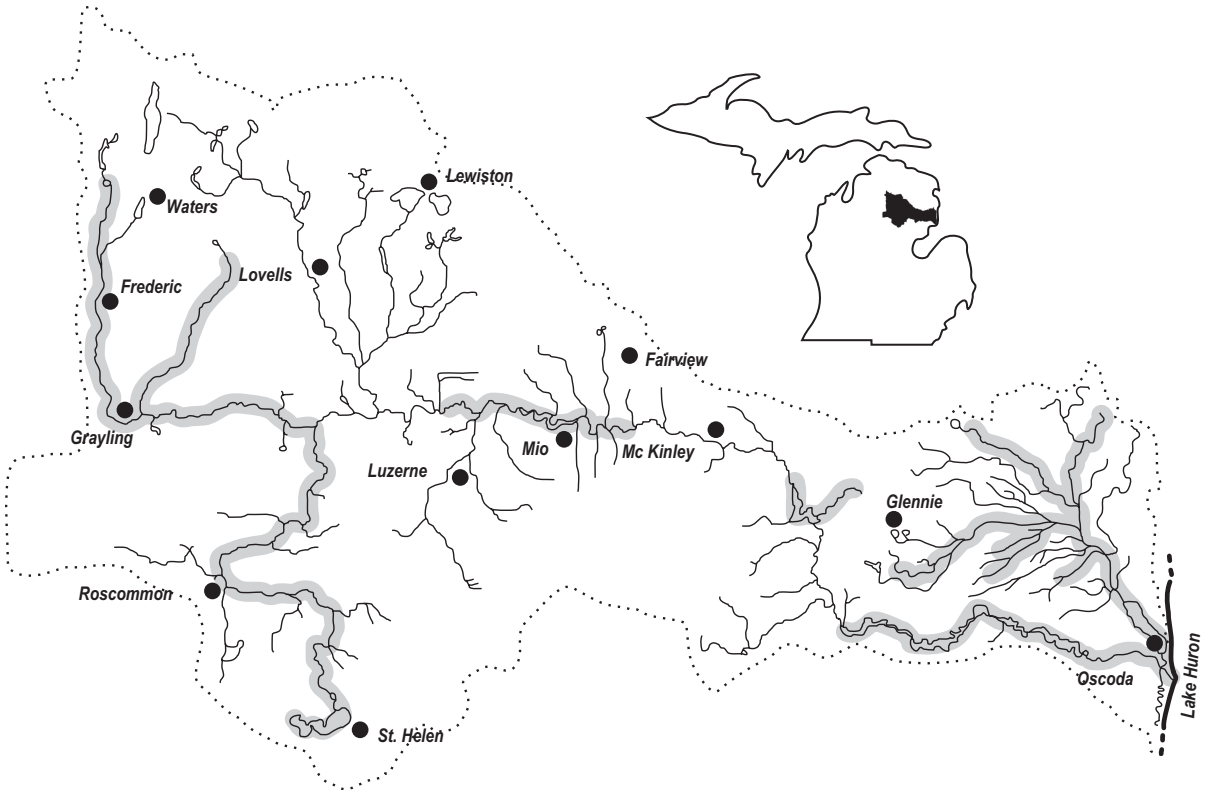


Golden shiner (*Notemigonus crysoleucas*)

Habitat:

feeding - lakes and impoundments and quiet pools of low gradient streams
- clear shallow water
- heavy vegetation

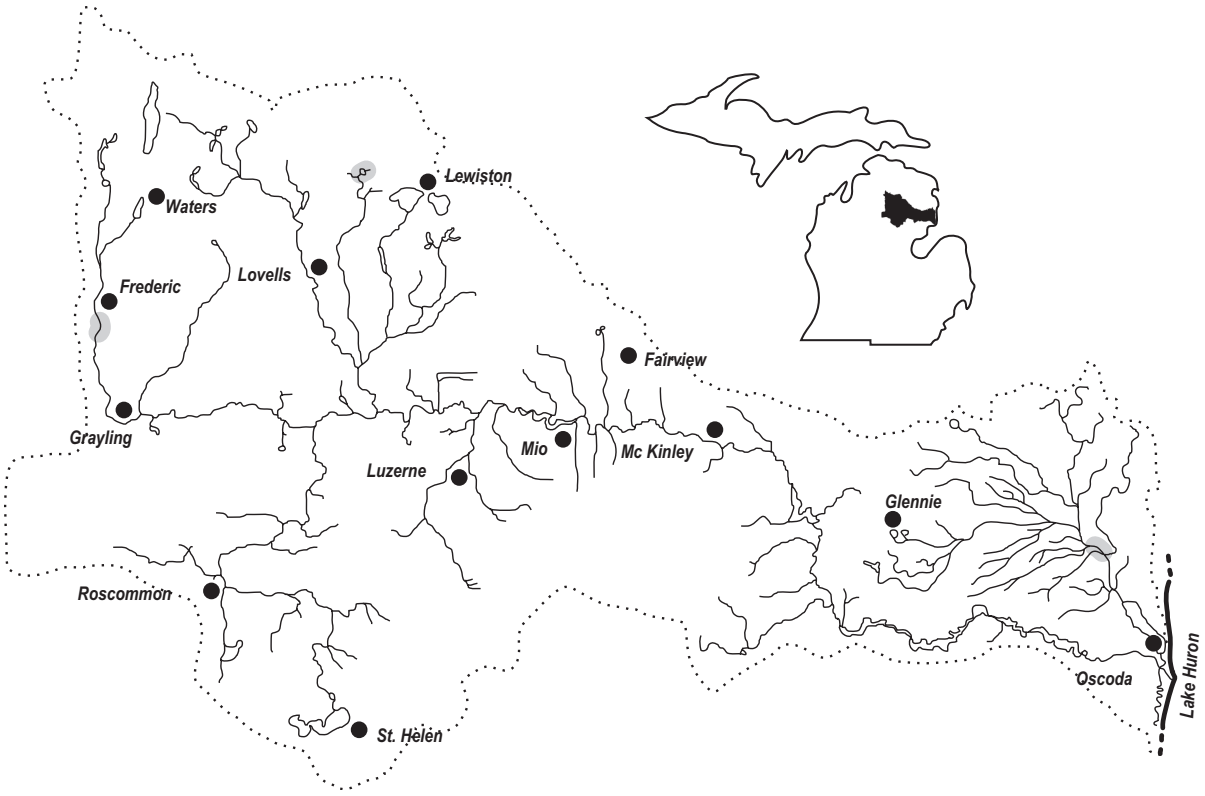
spawning - vegetation



Pugnose shiner (*Notropis anogenus*) - rare

Habitat:

feeding - very clear water of lakes, impoundments, and low-gradient streams
- aquatic vegetation
- clean sand, marl, or organic debris substrate
- extremely intolerant of turbidity

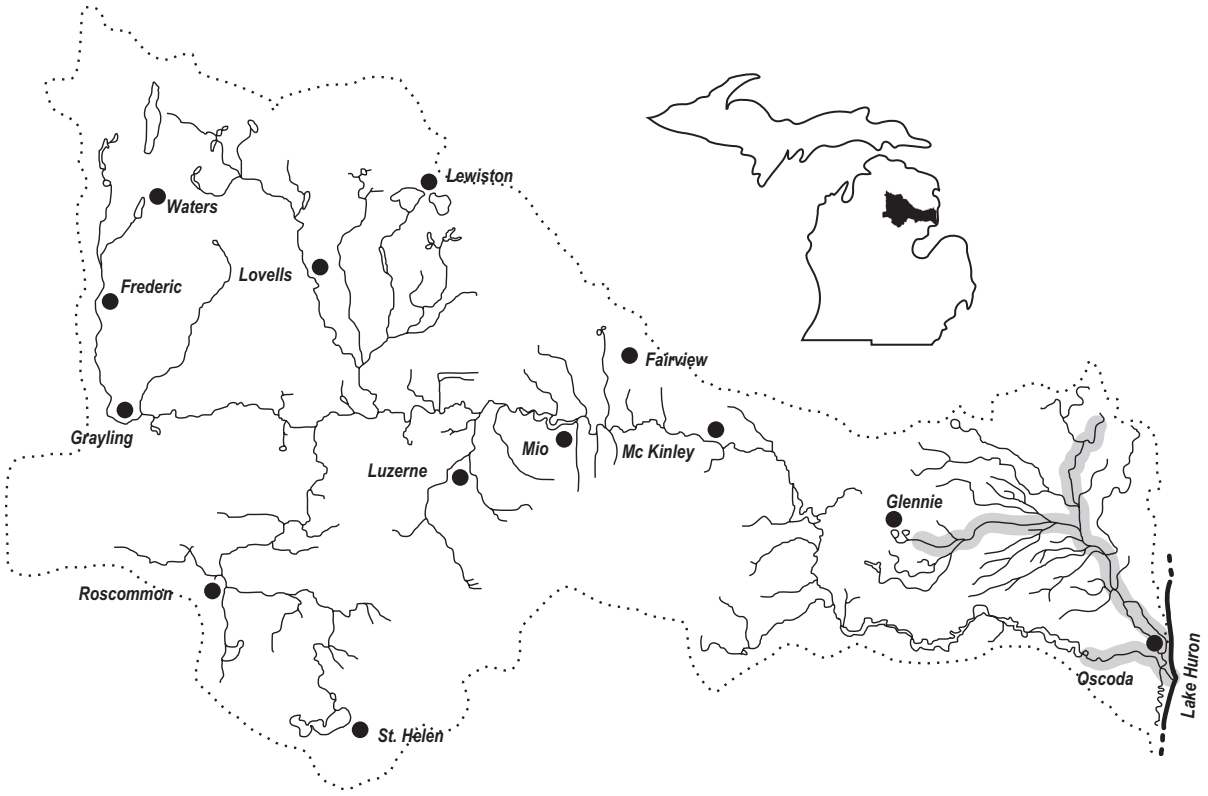


Emerald shiner (*Notropis atherinoides*)

Habitat:

feeding - open-large stream channels and lake
- low to moderate gradient
- range of turbidites and bottom types
- midwater or surface preferred, substrate of little importance
- avoids rooted vegetation

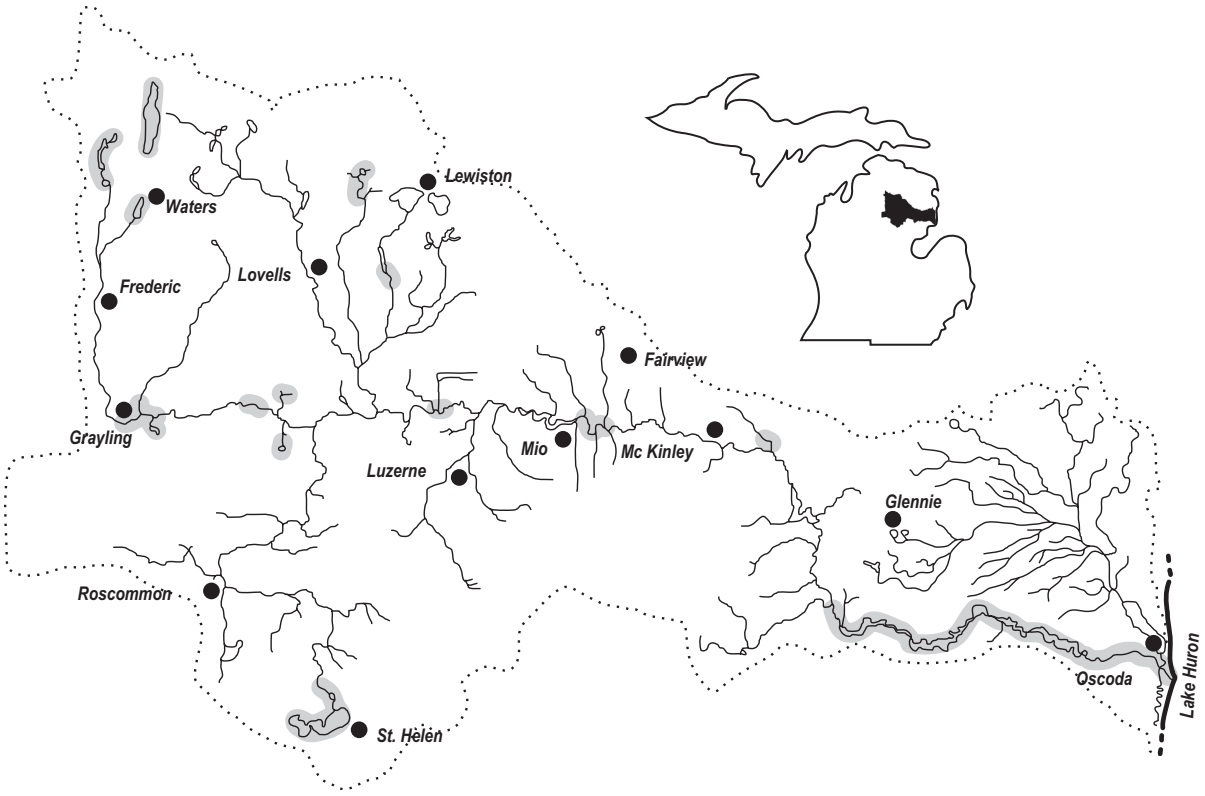
spawning - sand or firm mud substrate or gravel shoals



Blackchin shiner (*Notropis heterodon*)

Habitat:

feeding
- lakes, impoundments, and quiet pools in streams and rivers
- clear water
- clean sand, gravel, or organic debris substrate
- dense beds of submerged aquatic vegetation
- cannot tolerate turbidity, silt, or loss of aquatic vegetation

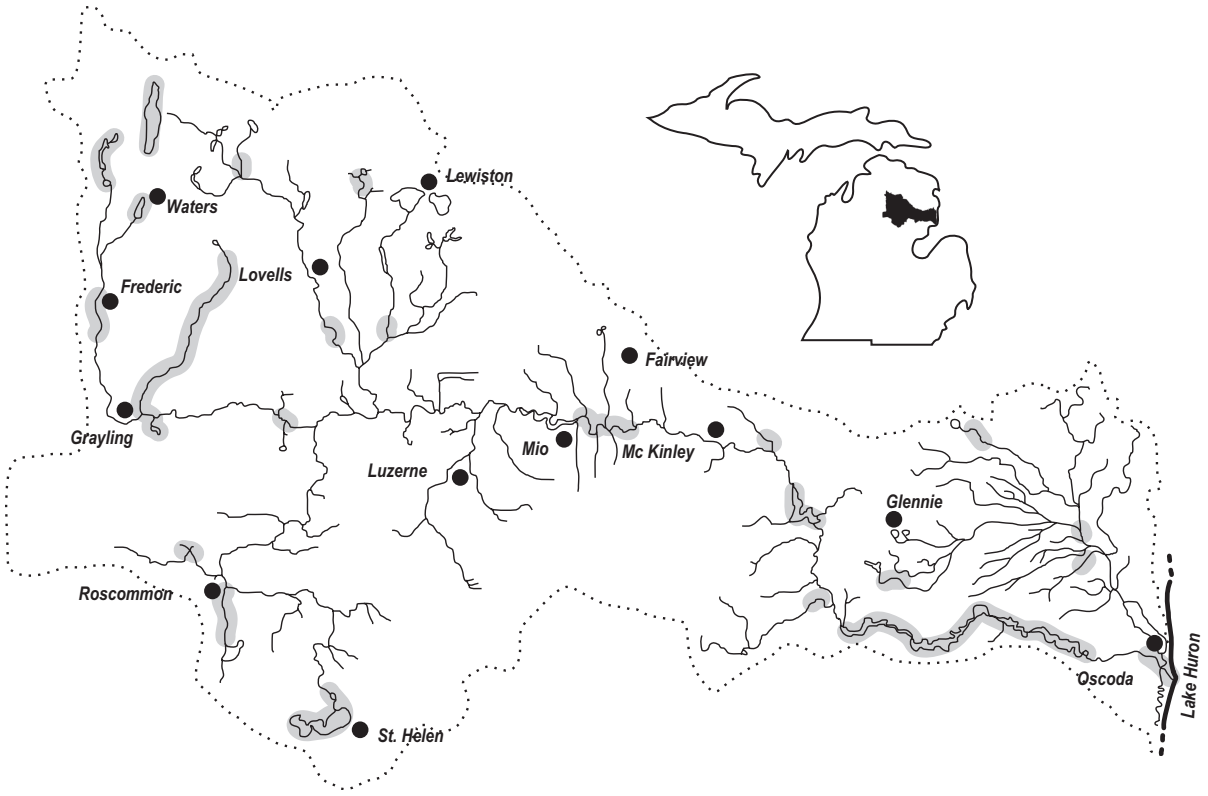


Blacknose shiner (*Notropis heterolepis*)

Habitat:

feeding - clear lakes, impoundments, and pools of small, clear, low-gradient streams
- aquatic vegetation
- clean sand, gravel, marl, muck, peat, or organic debris substrate
- cannot tolerate much turbidity, much siltation, or loss of aquatic vegetation

spawning - sandy substrate

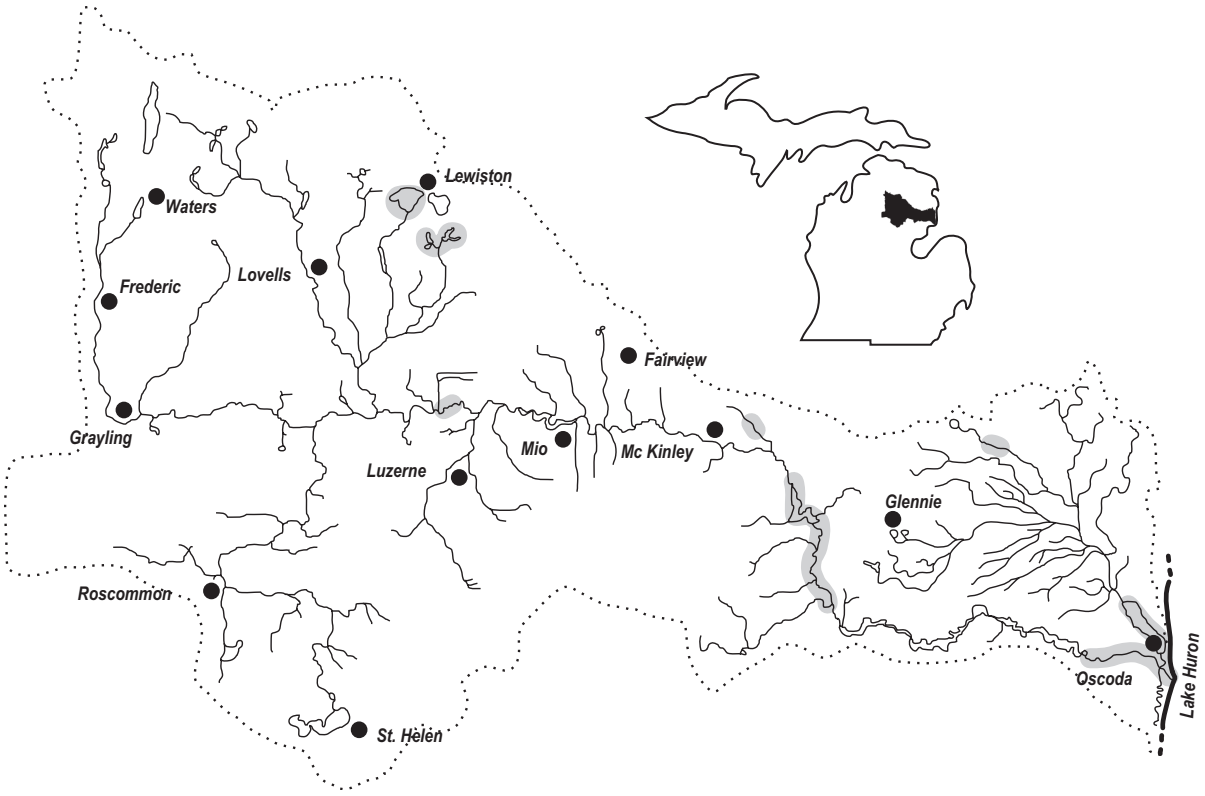


Spottail shiner (*Notropis hudsonius*)

Habitat:

feeding
- large rivers, lakes, and impoundments
- firm sand and gravel substrate
- low current
- sparse to moderate vegetation
- avoids turbidity

spawning
- over sandy shoals or gravelly riffles
- near the mouths of small streams

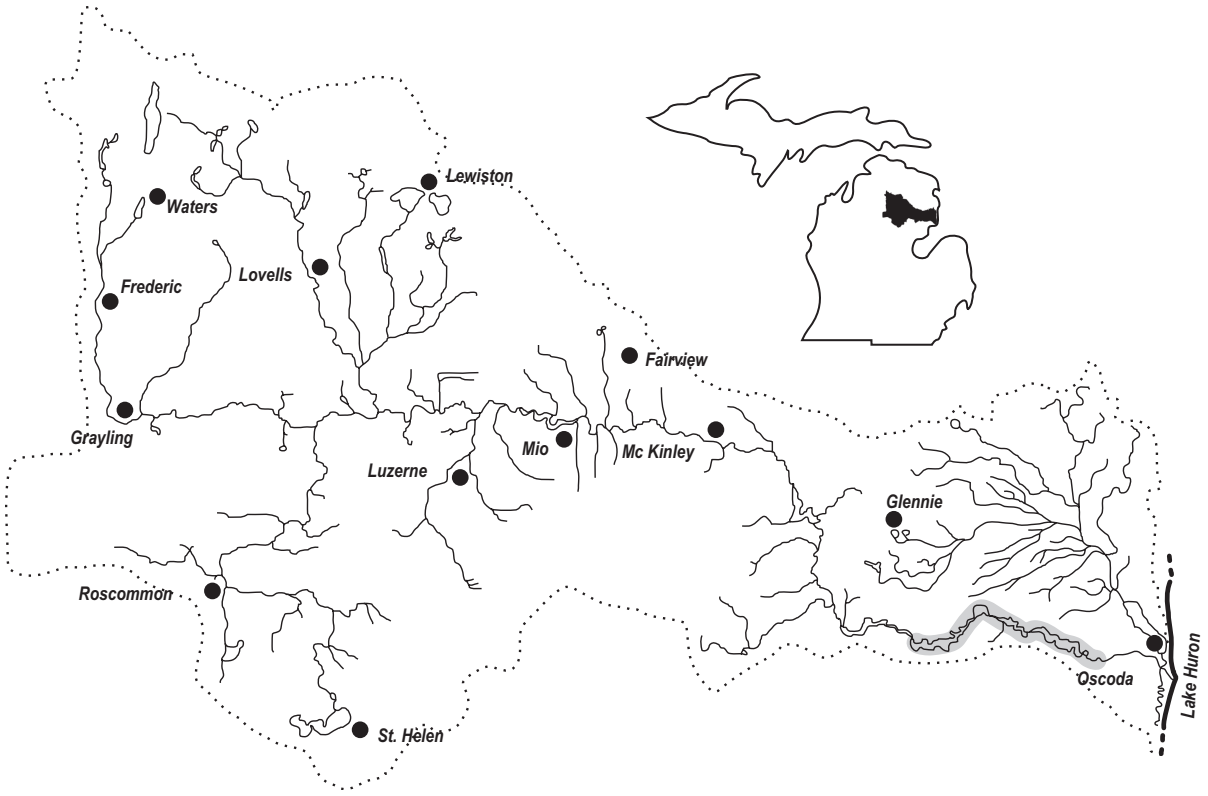


Rosyface shiner (*Notropis rubellus*)

Habitat:

feeding
- moderate sized streams
- moderate to high gradient
- gravel or sand substrate; intolerant of silt substrate
- clear water; intolerant of turbidity

spawning
- on nests of horneyhead chub, chesnut lamprey, and redhorses
- sandy-gravel, gravel or bedrock substrate
- shallow high gradient water

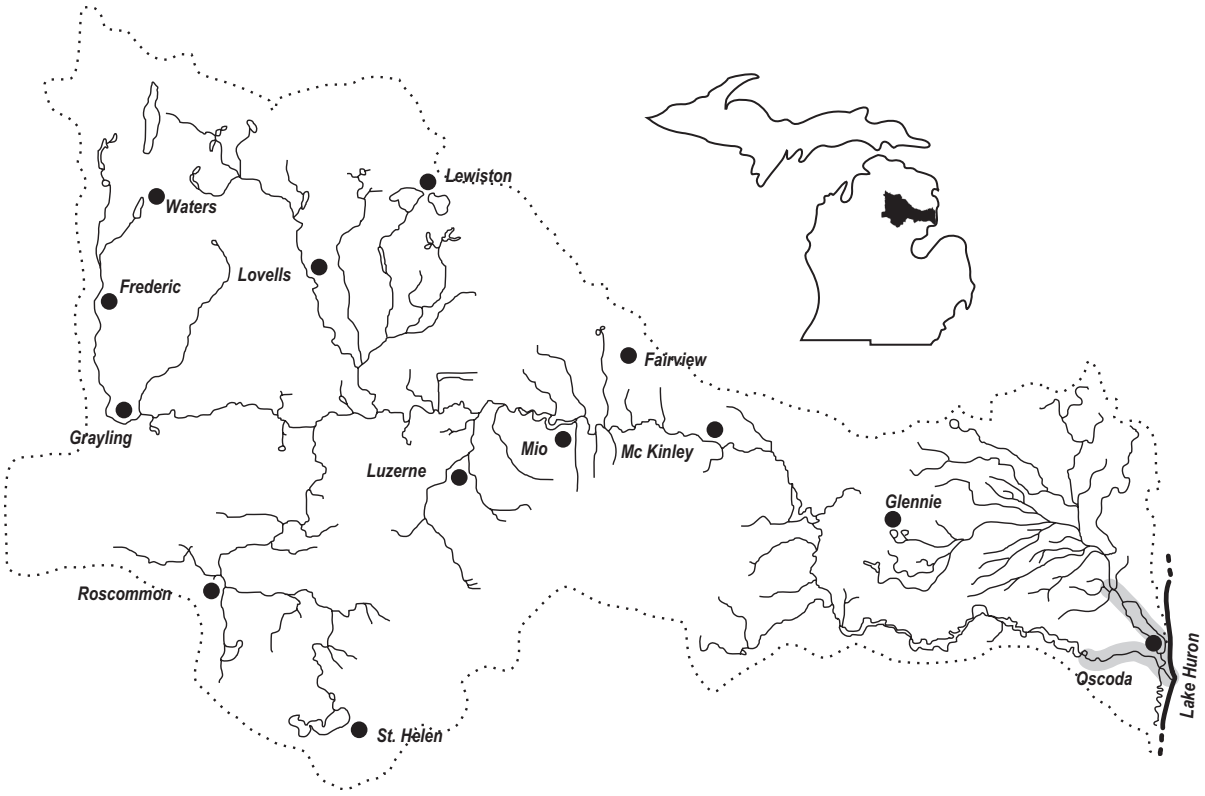


Sand shiner (*Notropis stramineus*)

Habitat:

feeding
- sand and gravel substrate
- shallow pools in medium size streams, lakes, and impoundments
- clear water and low gradient
- rooted aquatic vegetation preferred
- tolerant of some inorganic pollutants provided substrate is not covered

spawning
- clean gravel or sand substrate

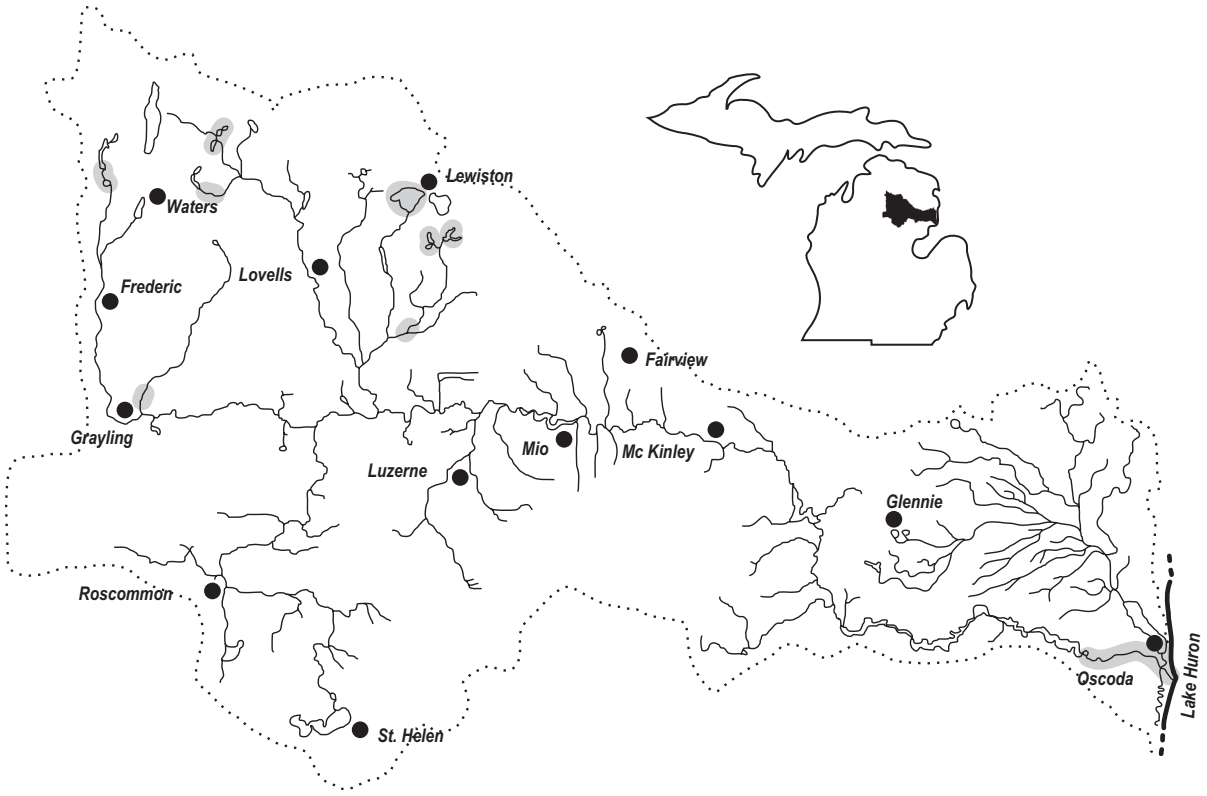


Mimic shiner (*Notropis volucellus*)

Habitat:

feeding - pools and backwater of streams, moderately weedy lakes and impoundments
- quiet or still water
- clear shallow water

spawning - aquatic vegetation necessary

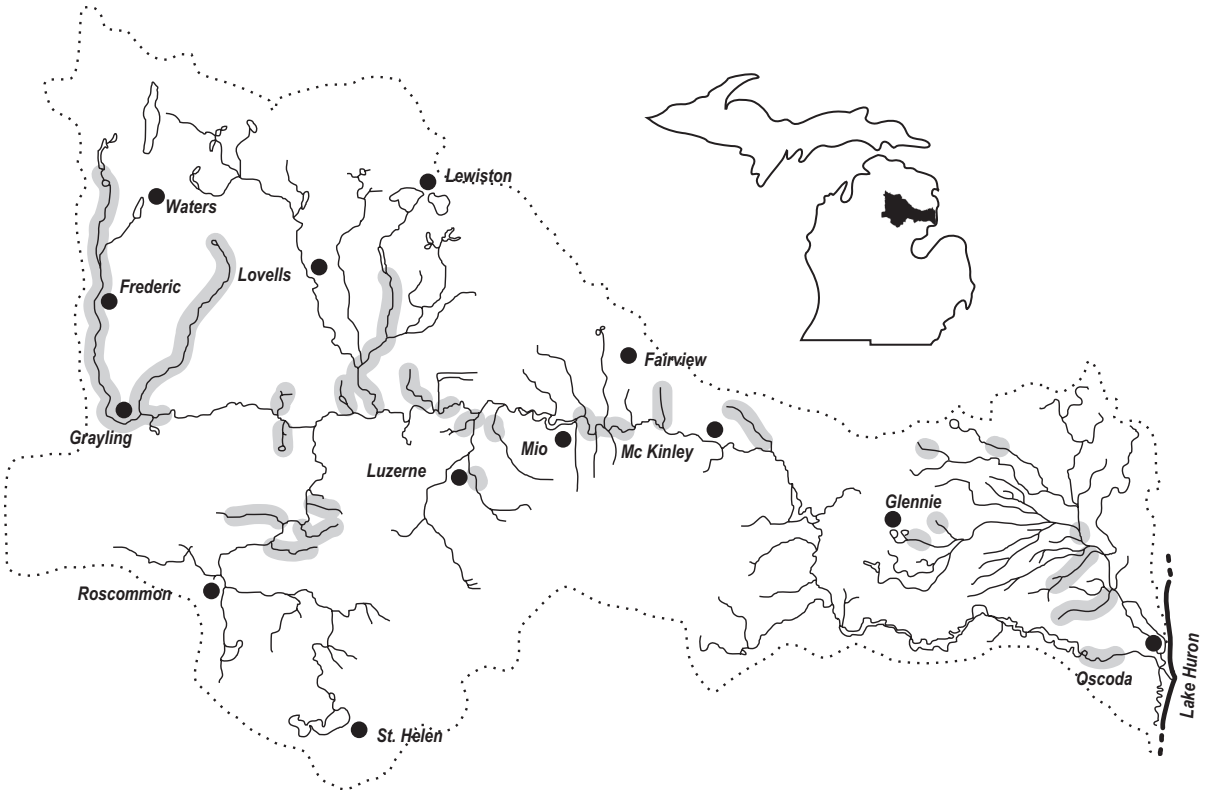


Northern redbelly dace (*Phoxinus eos*)

Habitat:

feeding - slow current
- in boggy lakes and streams
- detritus or silt substrate
- clear to slightly turbid water

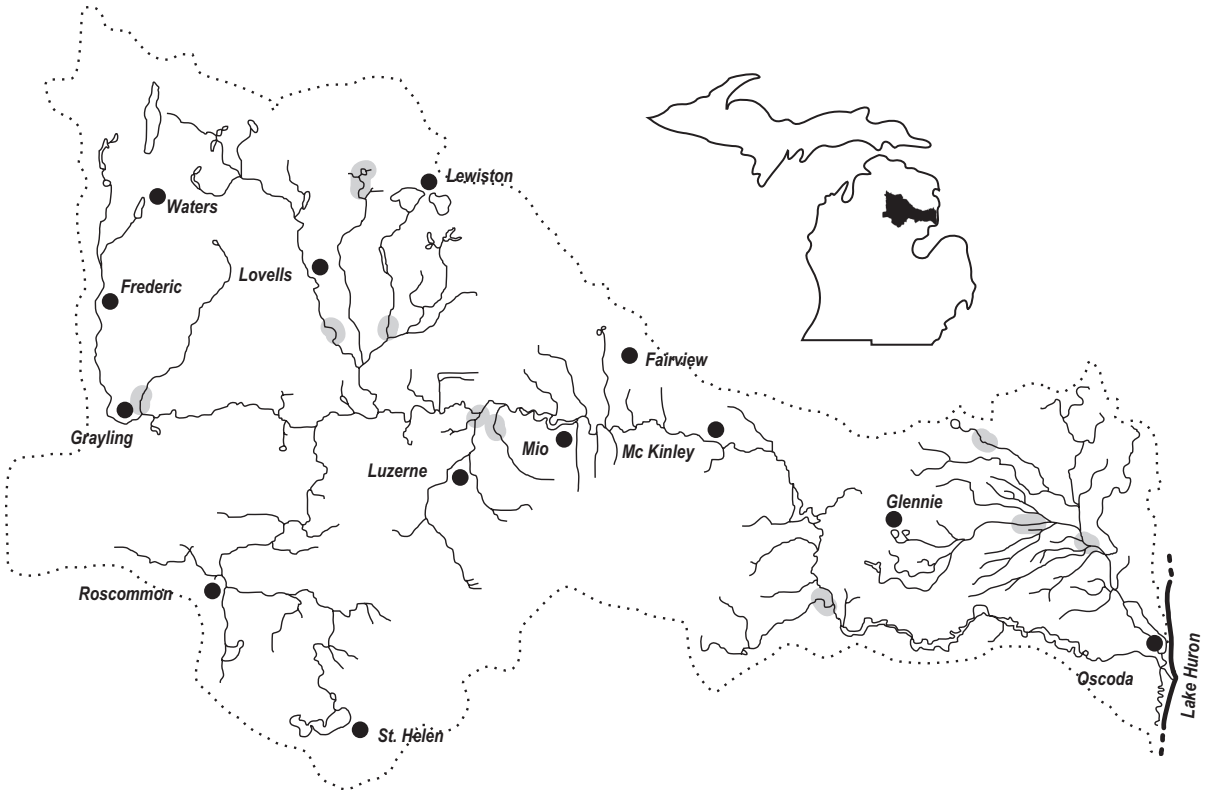
spawning - filamentous algae needed for egg deposition



Finescale dace (*Phoxinus neogaeus*)

Habitat:

feeding - cool bog lakes and streams
- neutral to slightly acidic waters
- various substrates

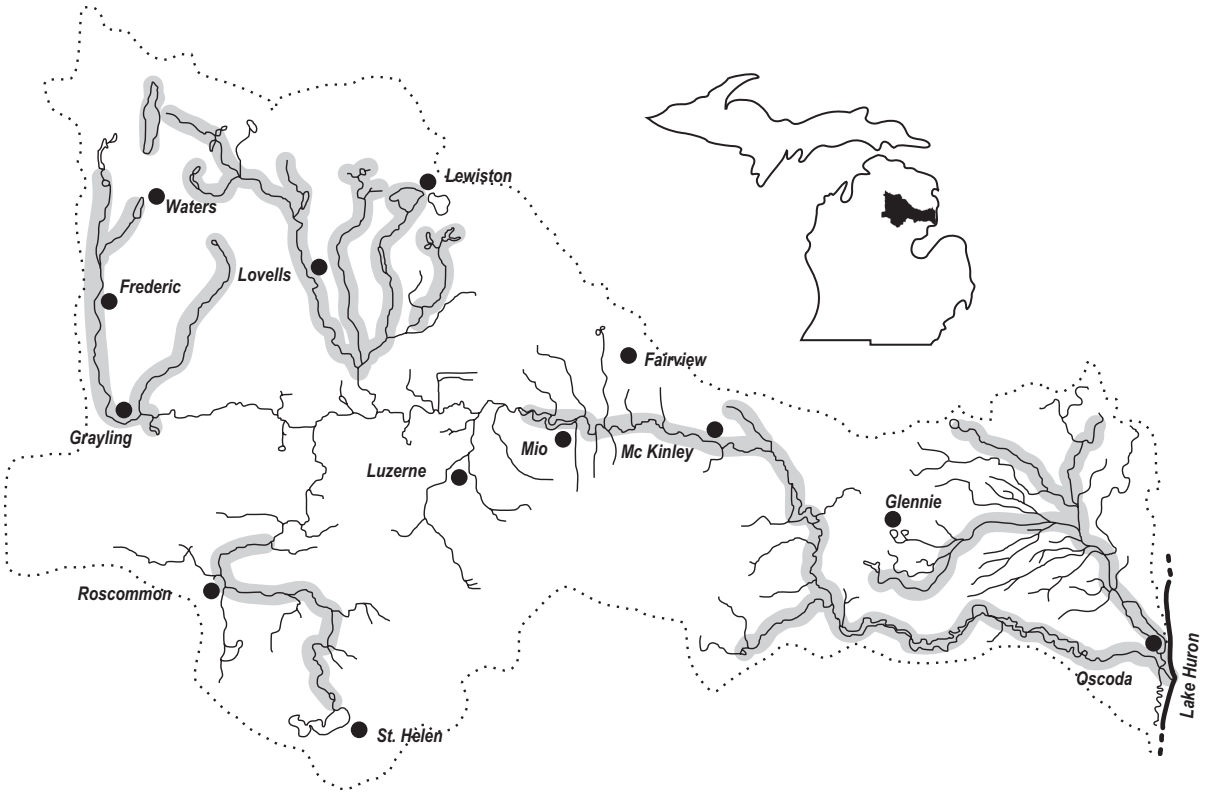


Bluntnose minnow (*Pimephales notatus*)

Habitat:

feeding
- quiet pools and backwaters of medium to large streams, lakes, and impoundments
- clear warm water
- some aquatic vegetation
- firm substrates
- tolerates all gradients, turbidity, organic and inorganic pollutants

spawning
- eggs deposited on the underside of flat stones or objects
- nests in sand or gravel substrate

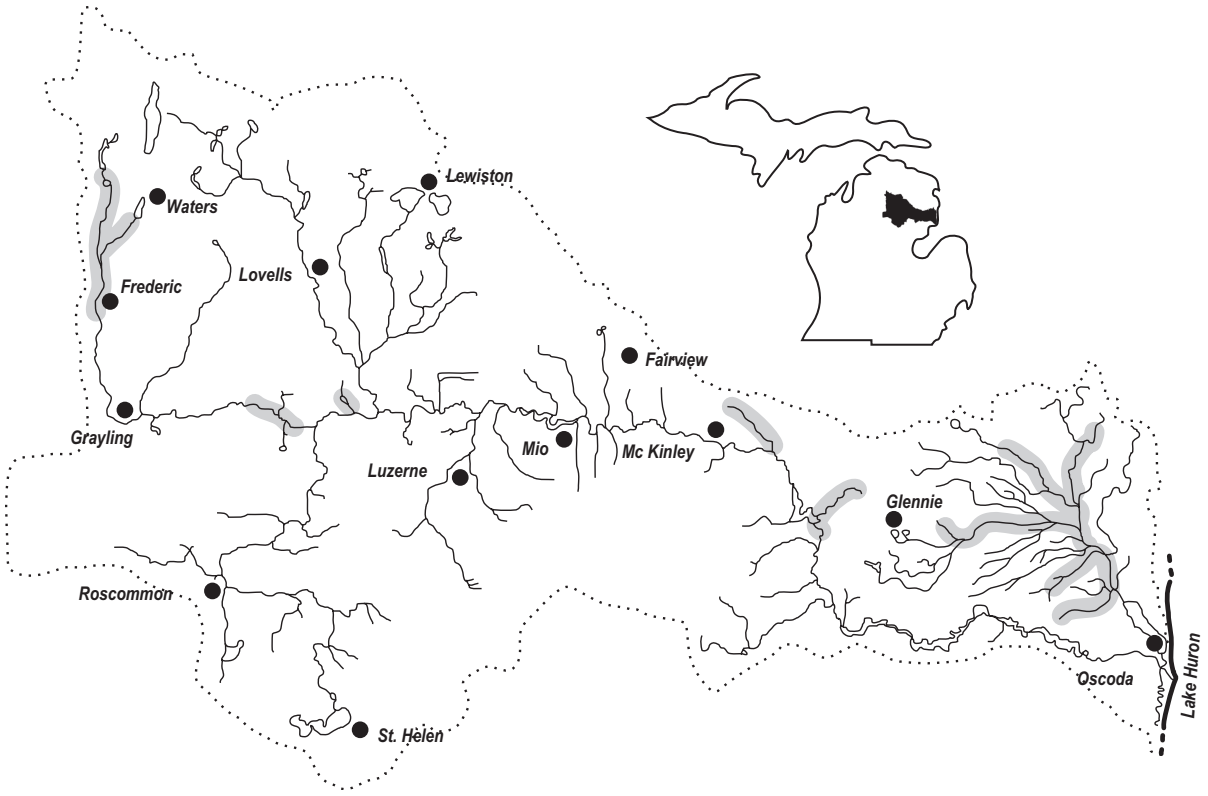


Fathead minnow (*Pimephales promelas*)

Habitat:

feeding - pools of small streams, lakes, and impoundments
- tolerant of turbidity, high temperatures, and low oxygen

spawning - on underside of objects in water 2 to 3 feet deep
- prefer sand, marl, or gravel substrate



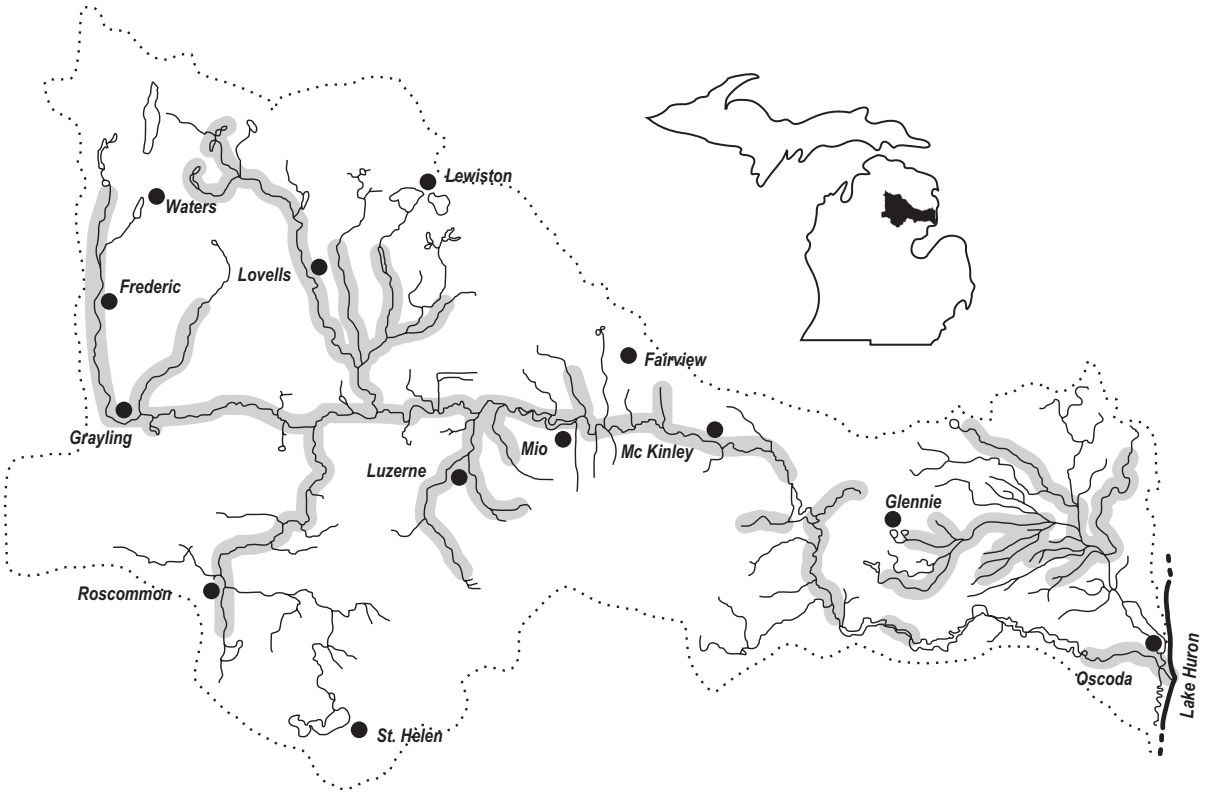
Blacknose dace (*Rhinichthys atratulus*)

Habitat:

feeding - moderate to high gradient streams
- sand and gravel substrate
- clear cool water in pools with deep holes and undercut banks
- does not tolerate turbidity and silt well

spawning - riffles with gravel substrate and fast current

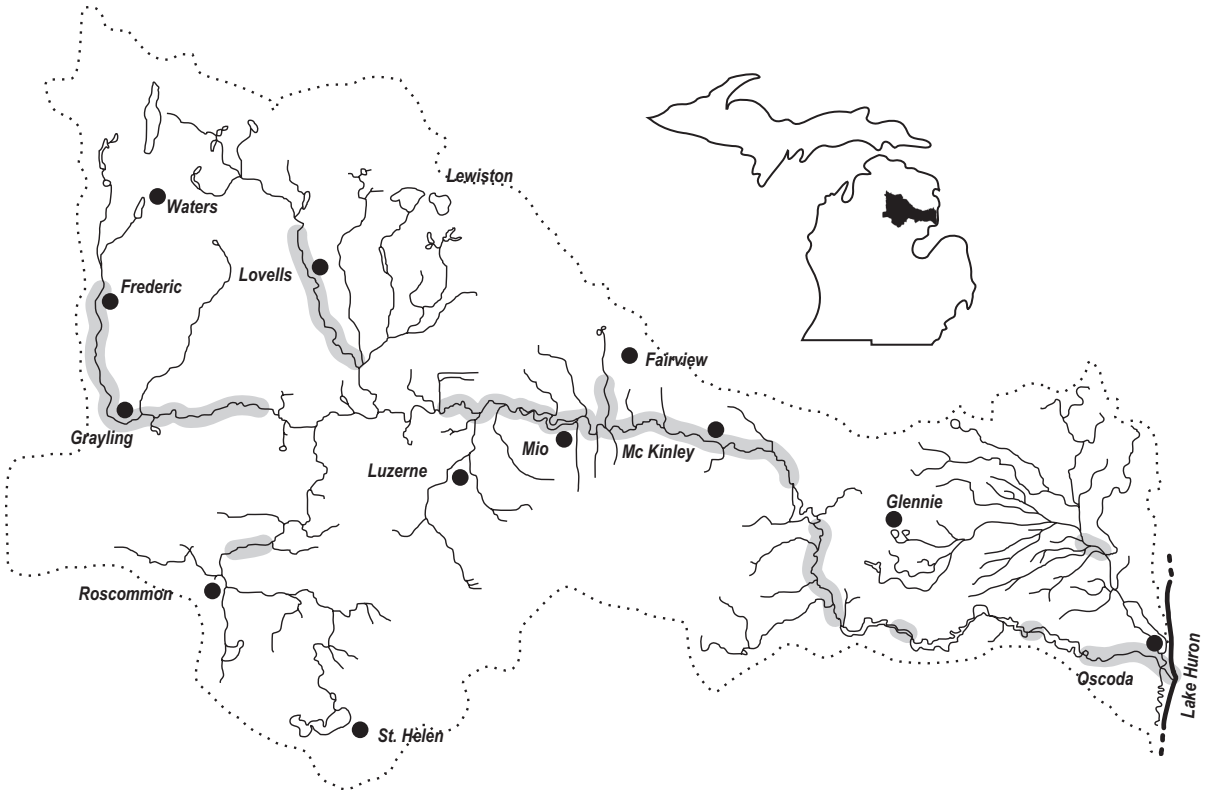
winter refuge - larger waters



Longnose dace (*Rhinichthys cataractae*)

Habitat:

feeding - lakes and streams
- high gradient
- gravel or boulder substrate



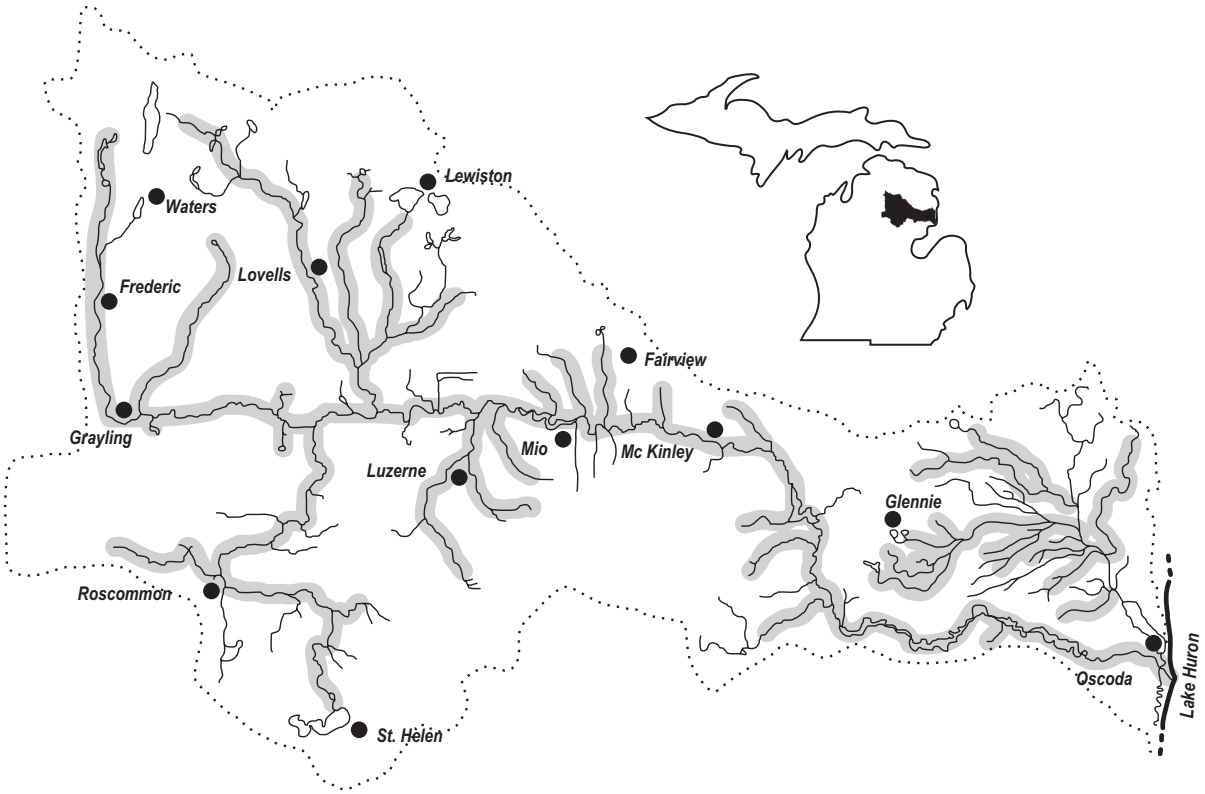
Creek chub (*Semotilus atromaculatus*)

Habitat:

feeding - streams, rivers, or shore waters of lakes and impoundments
- can tolerate intermittent flows
- tolerates moderate turbidity

spawning - gravel nests
- low current

winter refuge - deeper pools and runs

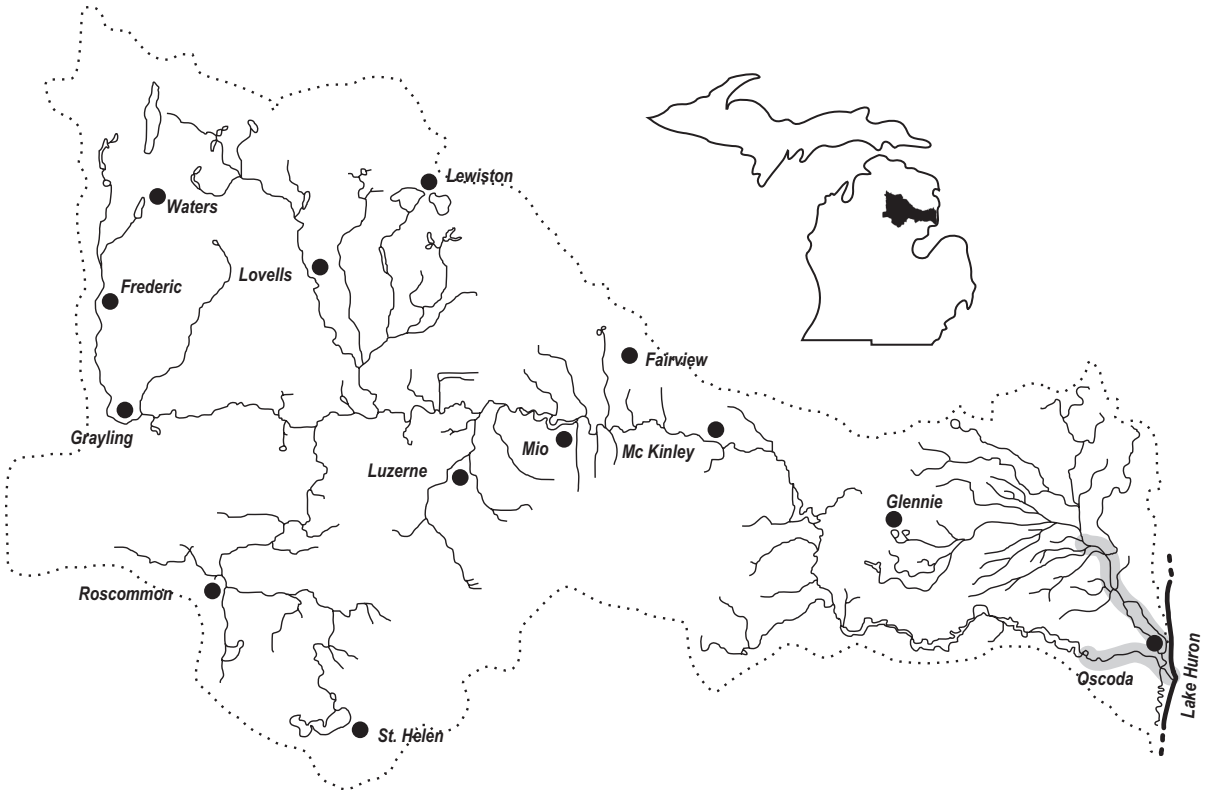


Longnose sucker (*Catostomus catostomus*)

Habitat:

feeding - clear, cold rivers and lakes

spawning - in streams or lake shallows
- current
- gravel substrate

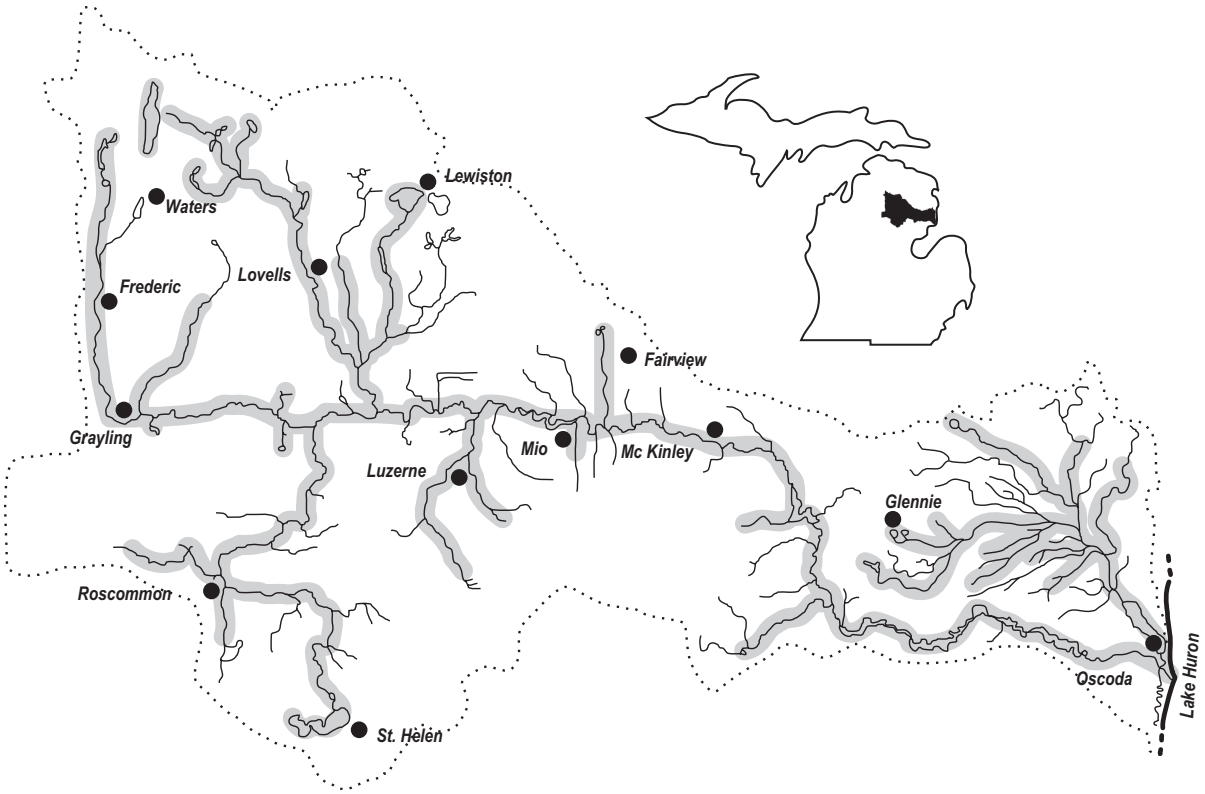


White sucker (*Catostomus commersoni*)

Habitat:

feeding - streams, rivers, lakes, and impoundments
- can inhabit highly turbid and polluted waters

spawning - quiet gravelly shallow areas of streams



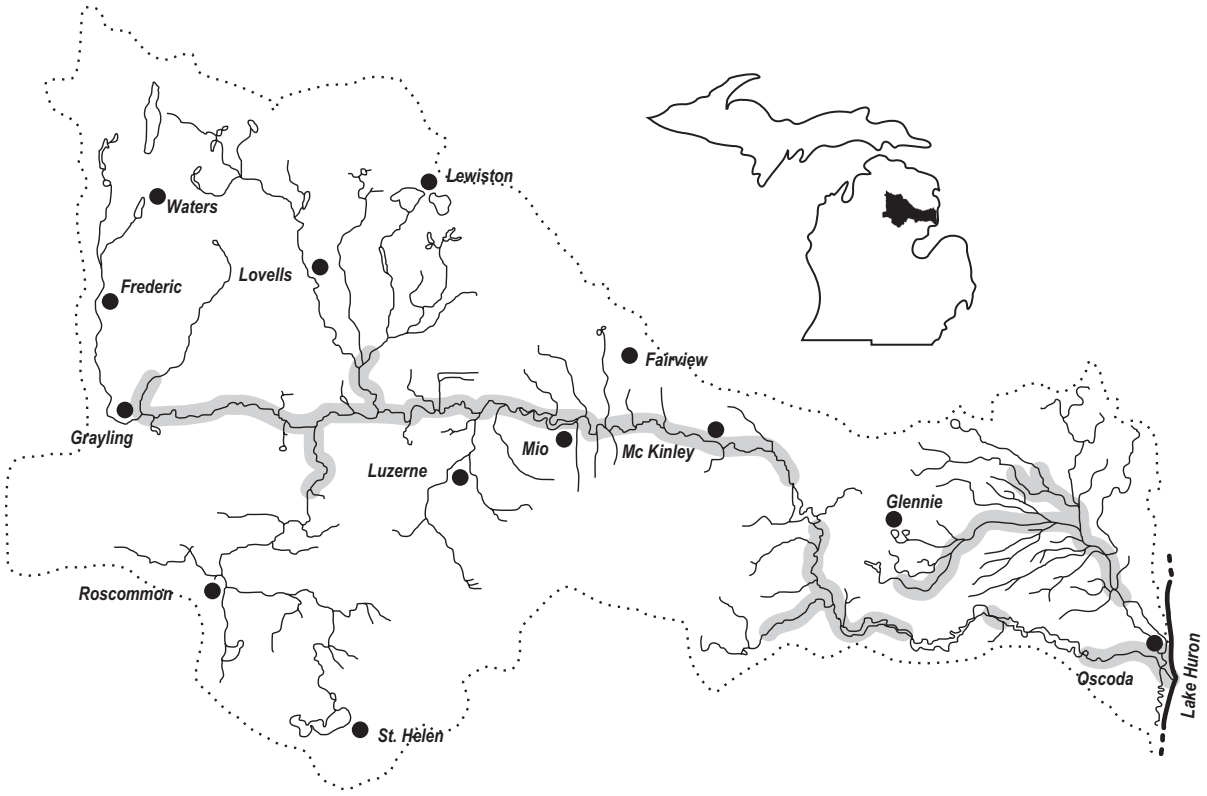
Northern hog sucker (*Hypentelium nigricans*)

Habitat:

feeding
- gravel or rubble substrate
- riffles and adjacent pools of warm shallow streams
- clear water
- doesn't like turbidity or siltation
- avoids profuse amounts of aquatic vegetation

spawning
- riffles
- shallow gravel substrate
- high gradient

winter refuge
- deeper quieter pools

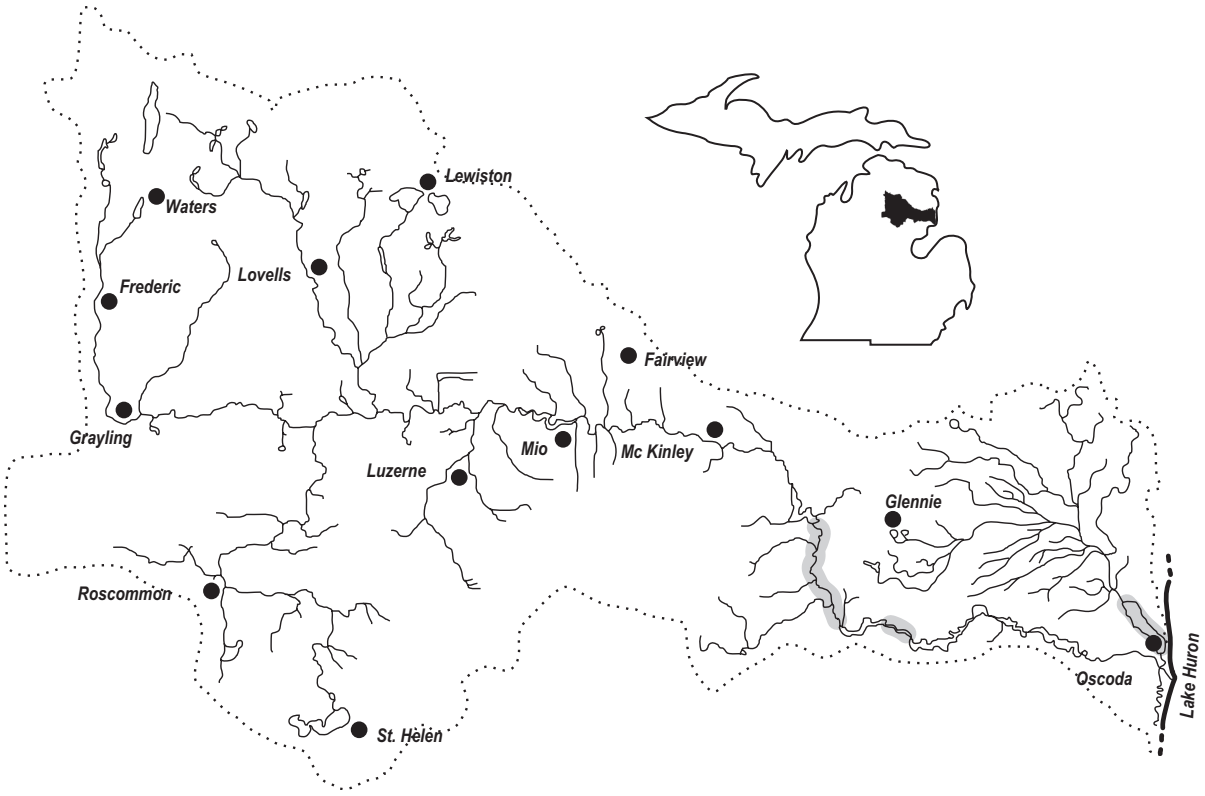


Silver redhorse (*Moxostoma anisurum*)

Habitat:

feeding
- streams, rivers, lakes, and impoundments
- low current
- pollution and turbidity intolerant

spawning
- swift current in rivers, do not spawn in tributaries
- males territorial
- gravel to rubble substrate



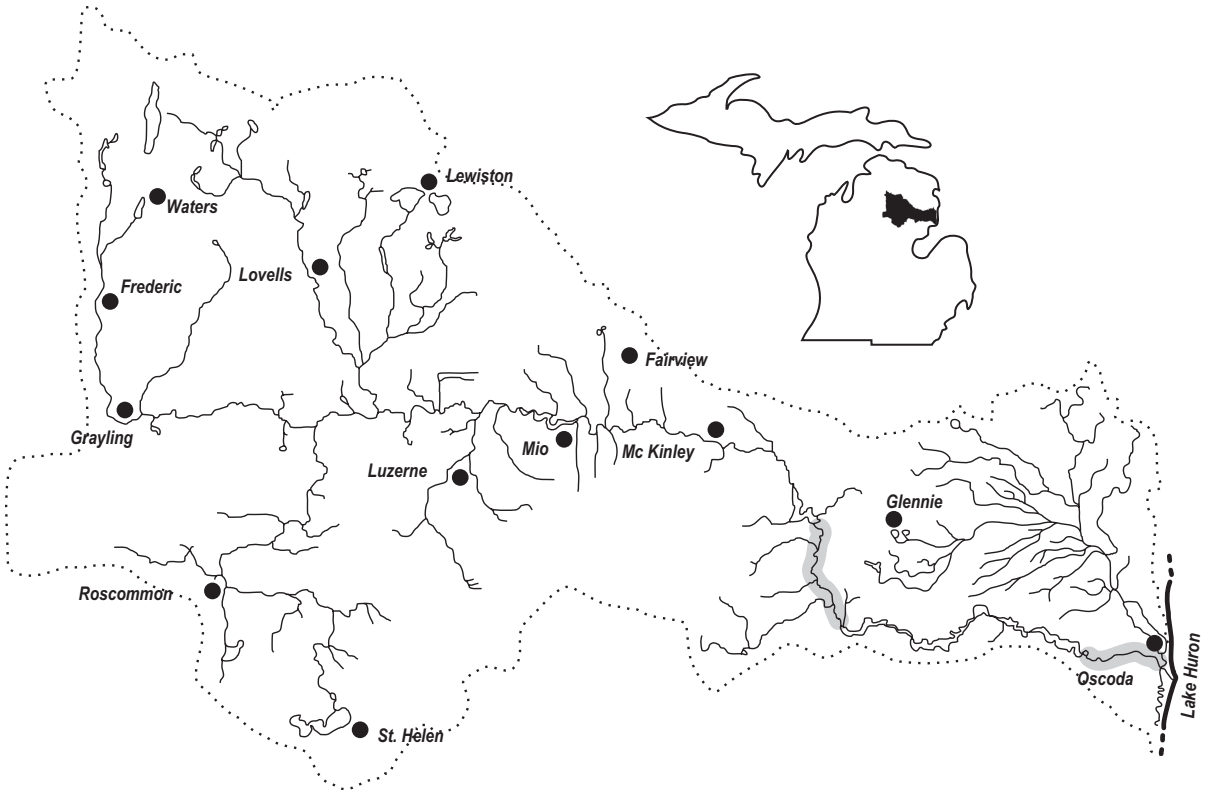
Golden redhorse (*Moxostoma erythrurum*)

Habitat:

feeding - warm medium gradient streams and rivers
- clear riffly streams
- medium size streams and rivers
- tolerates some turbidity and silt

spawning - shallow gravelly riffles

winter refuge - larger streams

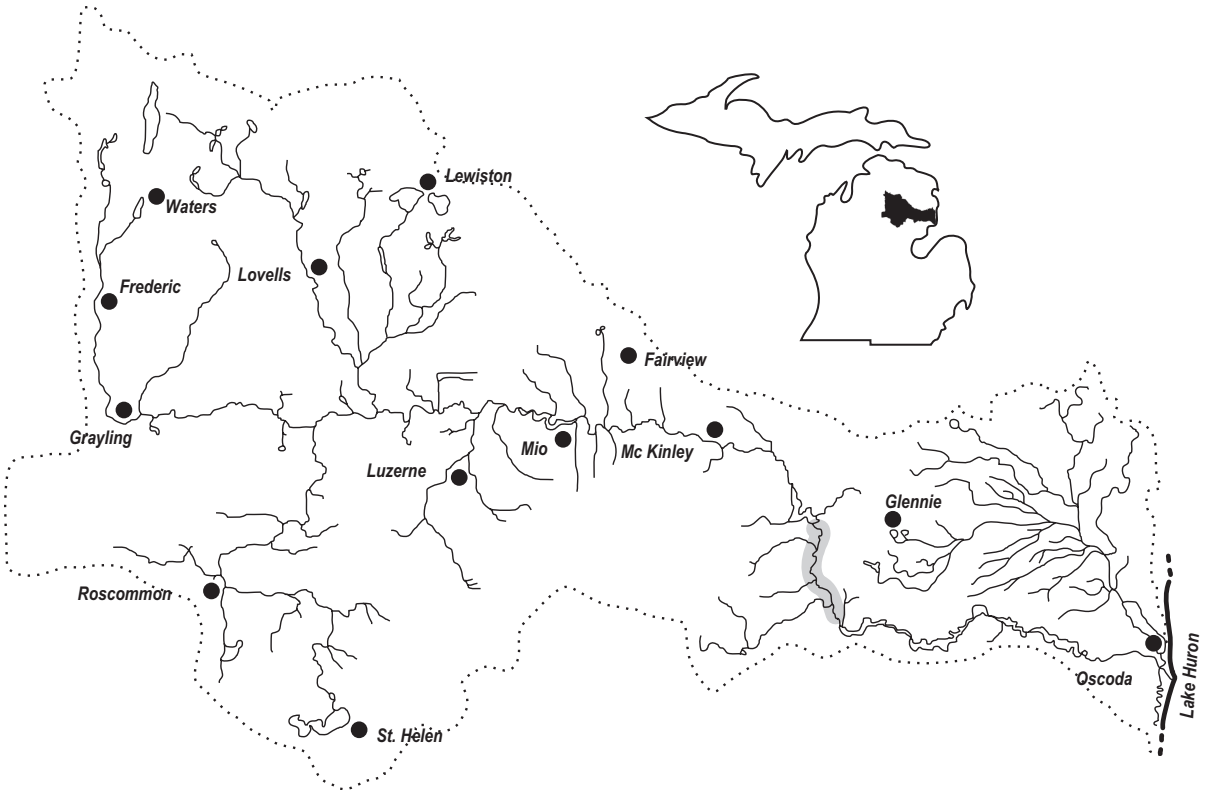


Shorthead redhorse (*Moxostoma macrolepidotum*)

Habitat:

feeding - downstream sections of large rivers, lakes, and impoundments
- rocky substrates
- swift water near riffles
- clear to slightly turbid water

spawning - gravelly riffles in smaller feeder streams

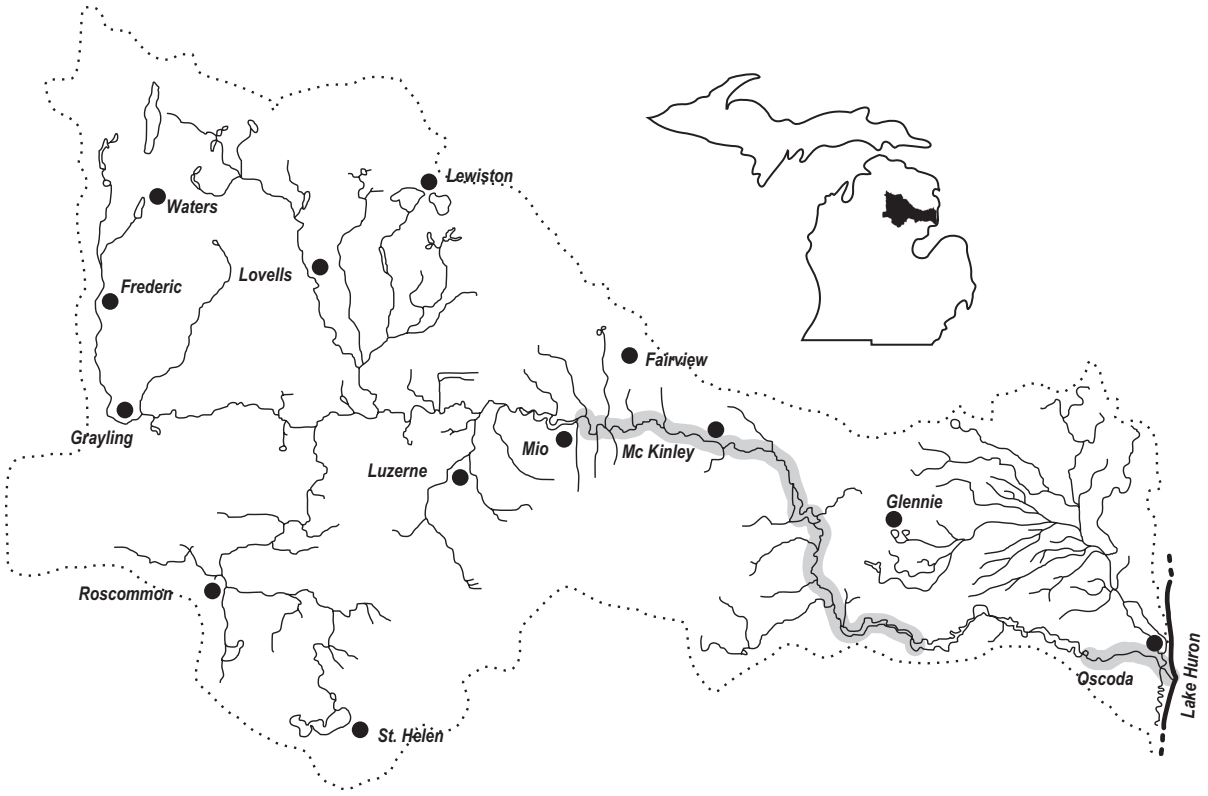


Greater redhorse (*Moxostoma valenciennesi*)

Habitat:

feeding - large clear streams
- clean sand, gravel, or boulder substrate
- intolerant of excessive turbidity and chemical pollutants

spawning - moderately rapid current

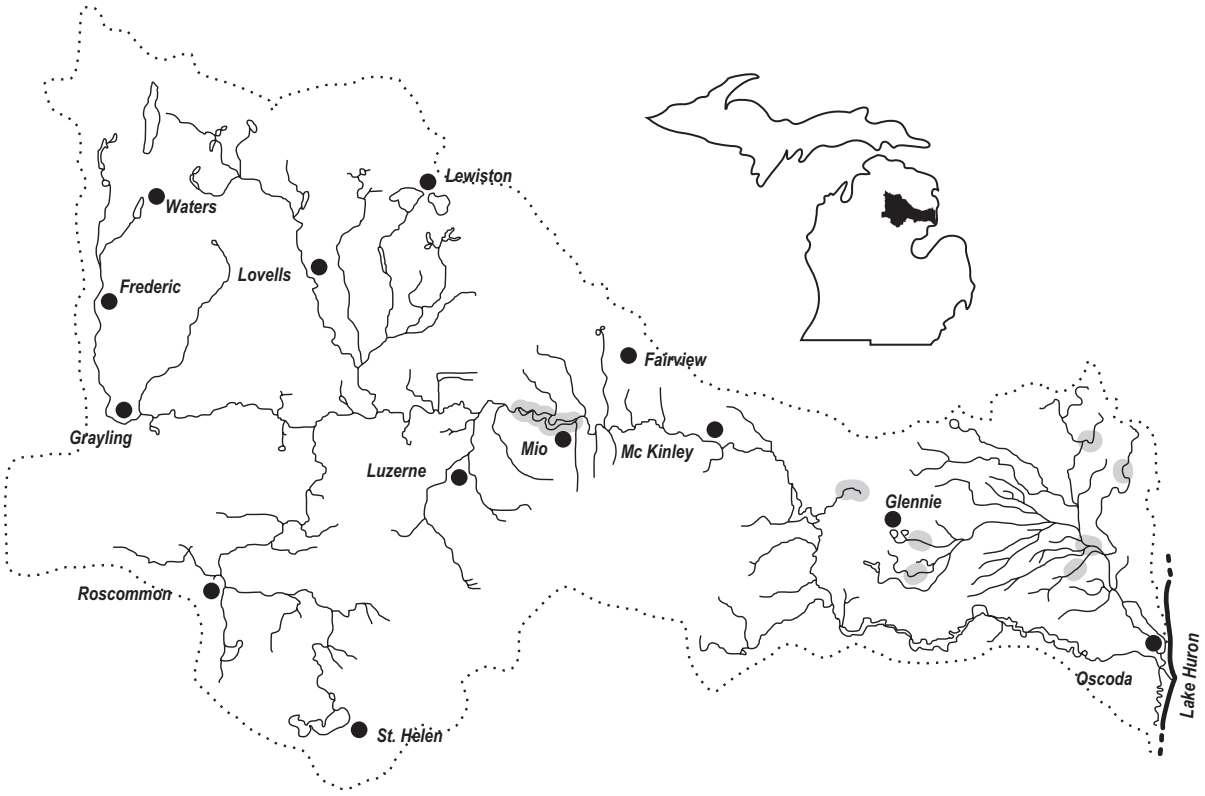


Black bullhead (*Ameiurus melas*)

Habitat:

feeding - turbid water
- silt bottom
- low gradient small to medium streams, pools, and headwaters of large rivers; also in lakes and impoundments
- can tolerate very warm water and very low dissolved oxygen

spawning - nest in moderate to heavy vegetation or woody debris and under overhanging banks

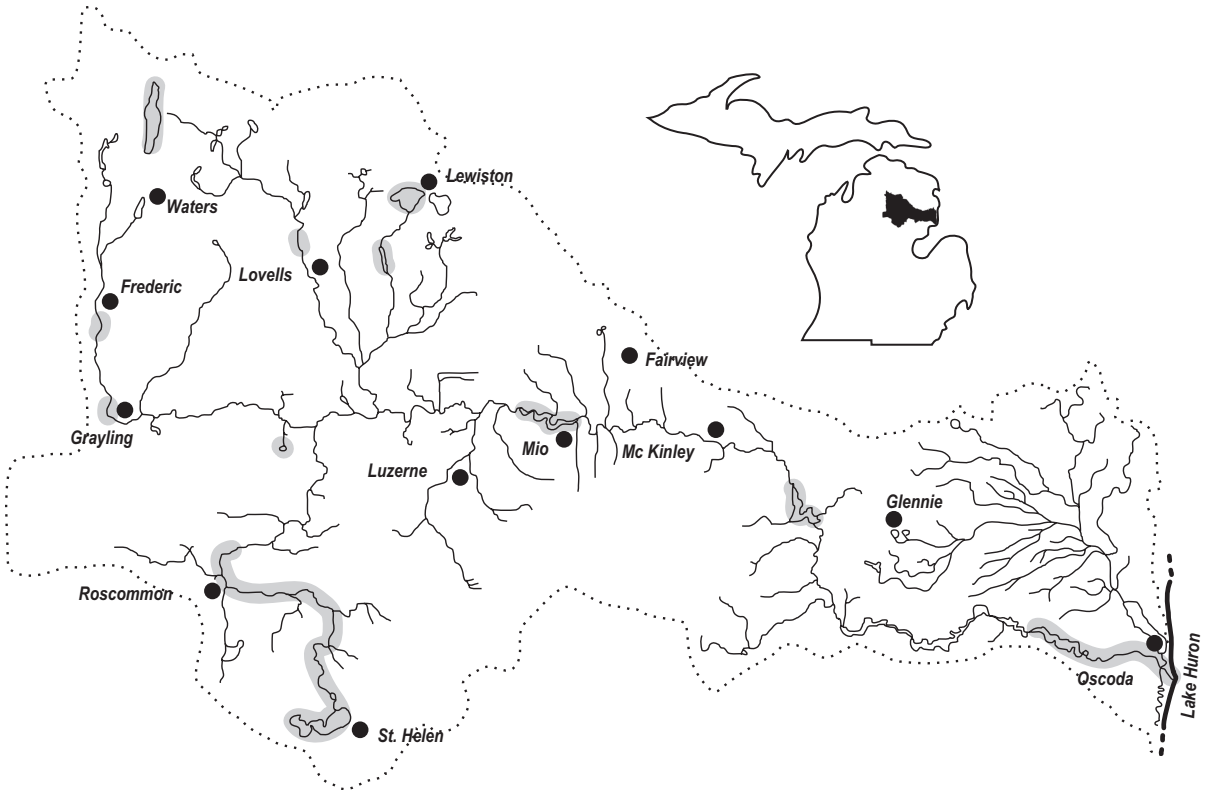


Yellow bullhead (*Ameiurus natalis*)

Habitat:

feeding - clear flowing water
- heavy vegetation
- low gradient streams, lakes, and impoundments
- tolerant of low oxygen

spawning - nest under a stream bank or near stones or stumps



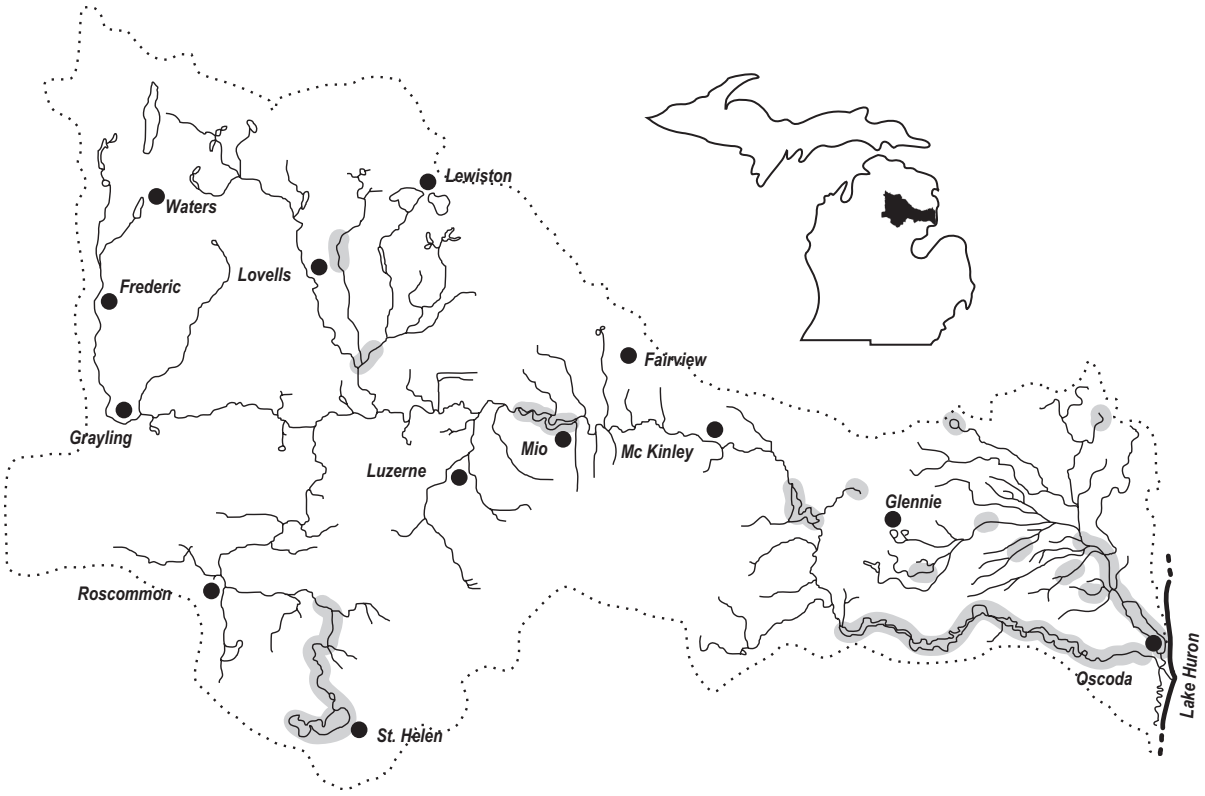
Brown bullhead (*Ameiurus nebulosus*)

Habitat:

feeding
- larger streams and rivers, lakes and impoundments
- clear cool water with little clayey silt
- moderate amounts of aquatic vegetation
- sand, gravel, or muck substrate
- not tolerant of turbid water
- tolerant of warm water and low oxygen

spawning
- nest in mud or sand substrate among rooted aquatic vegetation usually near a stump, tree, or rock

winter refuge
- in muddy bottoms

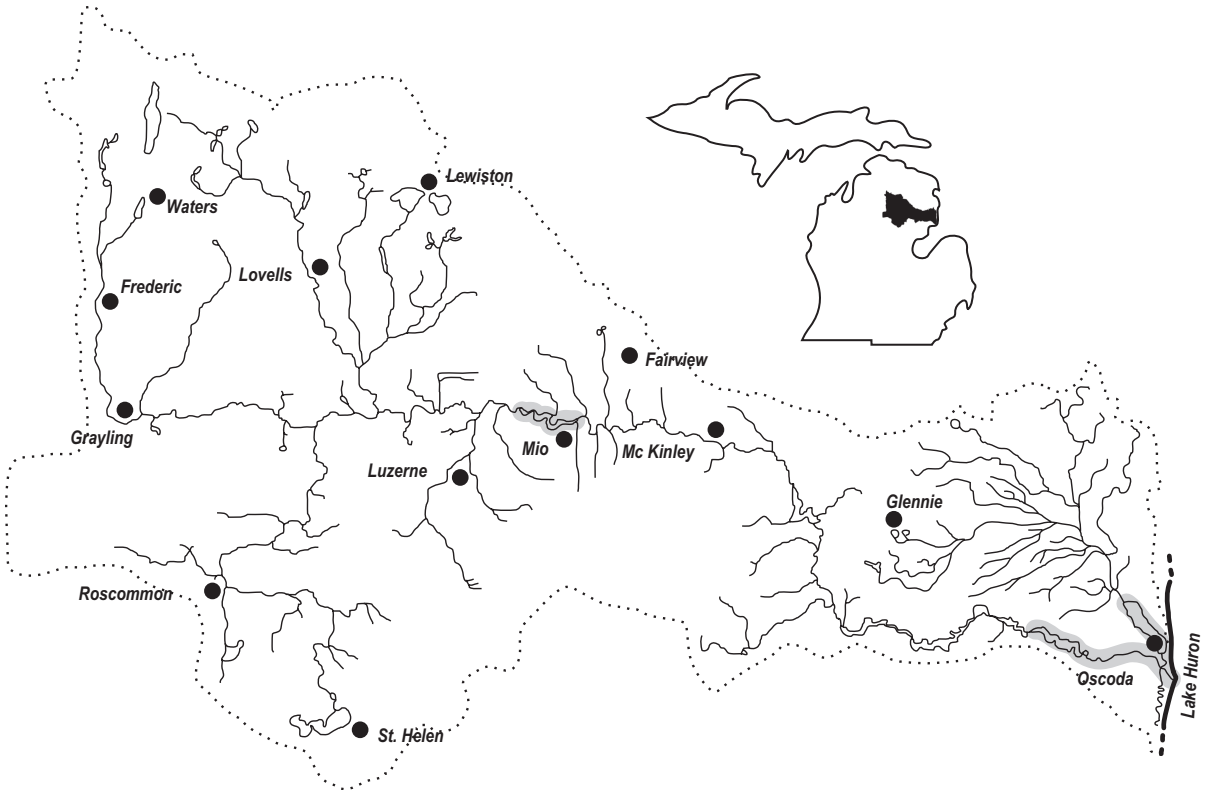


Channel catfish (*Ictalurus punctatus*)

Habitat:

feeding - moderately-clear, deeper waters of rivers, lakes, and impoundments
- sand, gravel, or rubble substrate
- low to moderate gradient

spawning - secluded semi-dark areas such as holes, under banks, log jams, or rocks

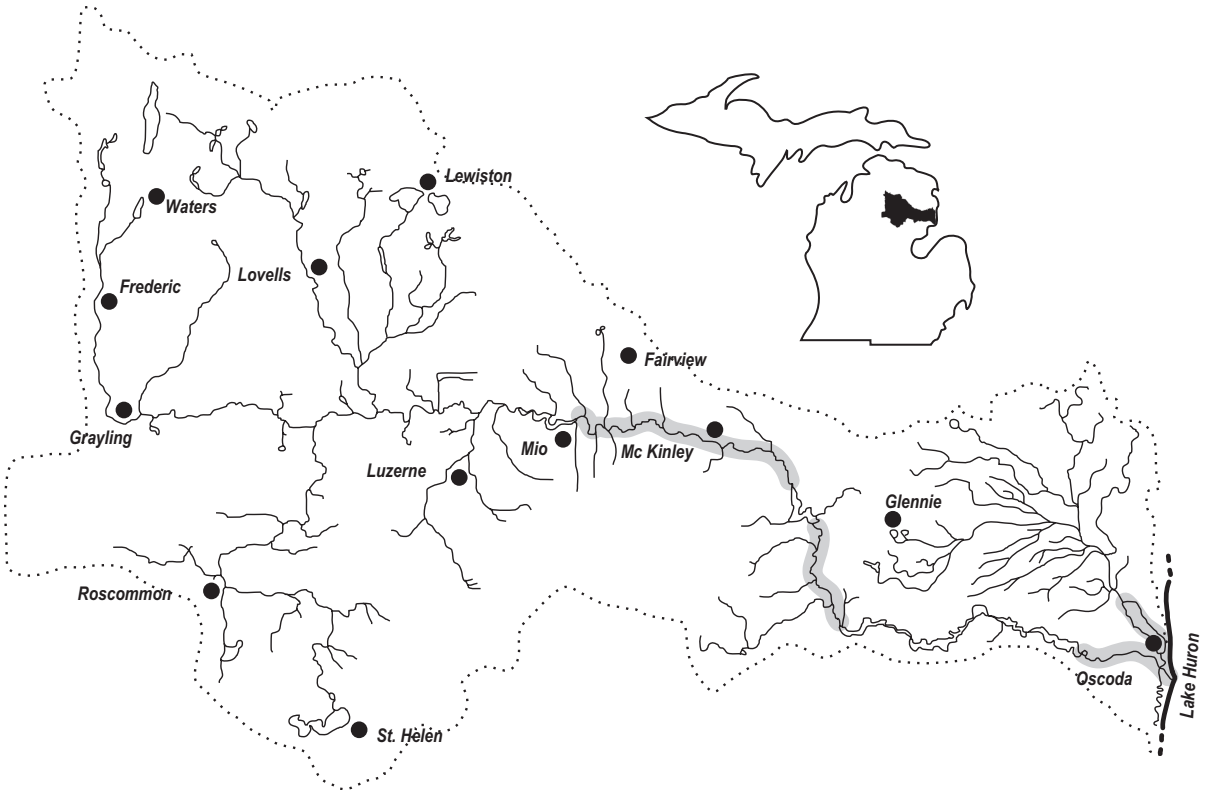


Stonecat (*Noturus flavus*)

Habitat:

feeding
- consistent low to moderate gradient flowing water
- rocky riffles of larger streams and smaller rivers
- not tolerant of silt
- tolerant of low oxygen and pollution

spawning
- eggs deposited beneath stones
- shallow rocky areas of streams or lakes

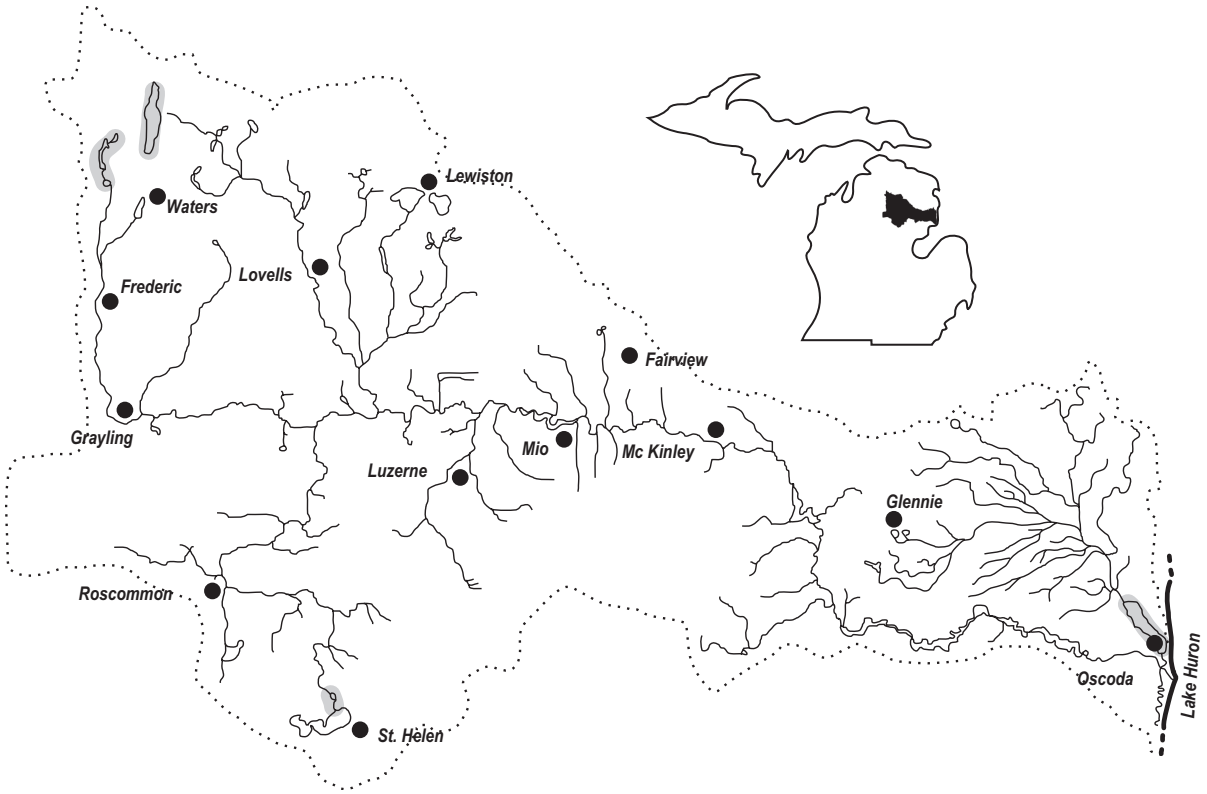


Tadpole madtom (*Noturus gyrinus*)

Habitat:

feeding - vegetative cover in low-moderate current waters
- muddy substrate with extensive vegetation
- clear waters of streams, rivers, and lakes

spawning - mostly in rivers, sometimes shallows of lakes
- nests in dark cavities (ex: beneath boards, logs, crayfish burrows)

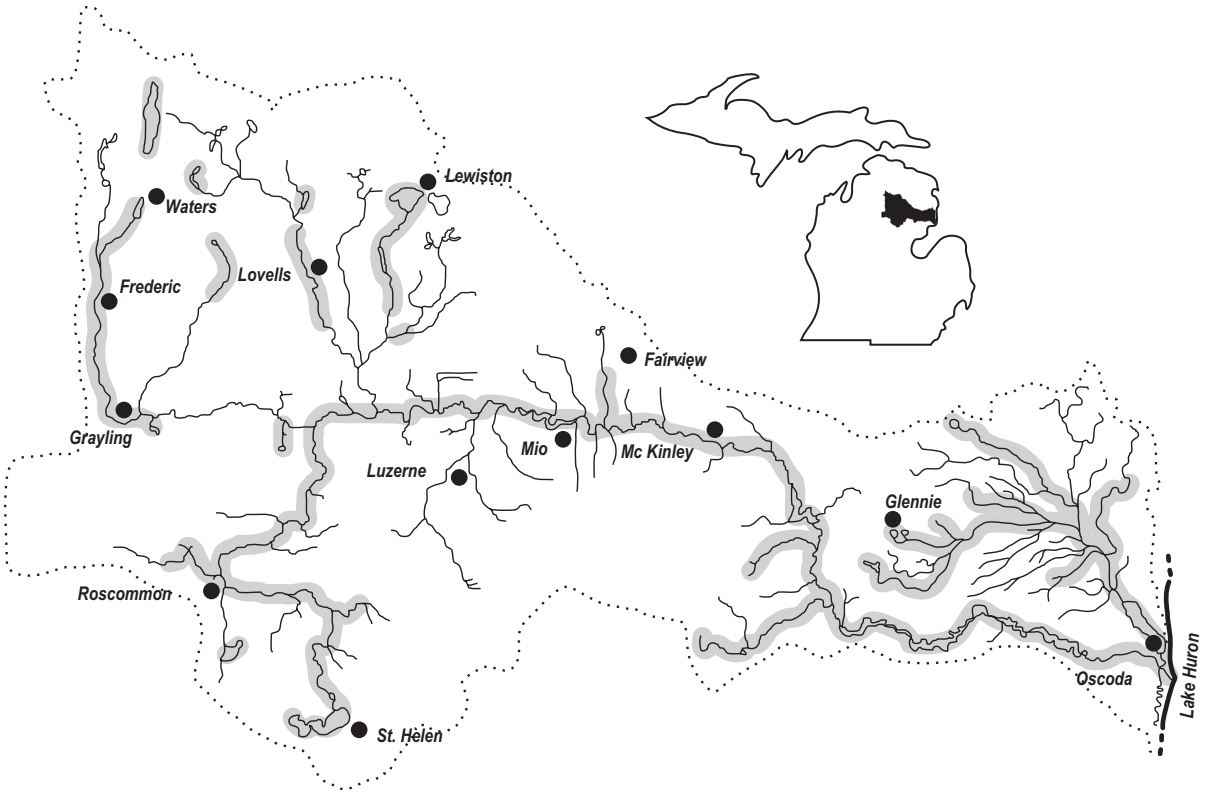


Northern pike (*Esox lucius*)

Habitat:

feeding - cool to moderately warm streams, rivers, lakes, and impoundments
- vegetation in slow to moderate current

spawning - submerged vegetation with slow current in shallow water



Tiger muskellunge (*Esox masquinongy* x *E. lucius*)

Habitat:

feeding - intermediate between muskellunge and northern pike

spawning - hybrid species; muskellunge x northern pike
- occasionally produced in wild, but most often from hatcheries
- males are sterile, females may be fertile