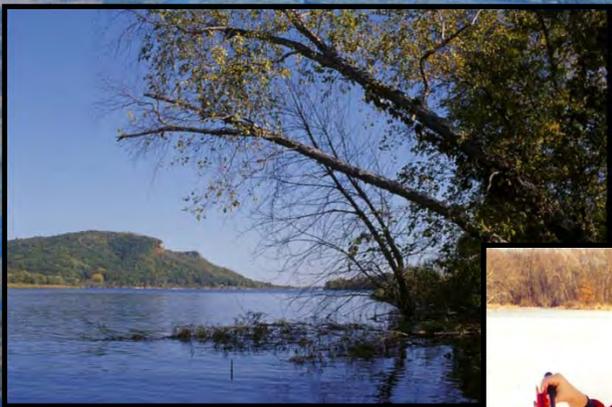


Habits and Habitats of Fishes in the Upper Mississippi River



Introduction

The Upper Mississippi River consists of 26 navigation pools that provide abundant habitat for a host of natural resources, such as fish, migratory waterfowl, non-game birds, deer, beaver, muskrats, snakes, reptiles, frogs, toads, salamanders, and many others. Of all the many different types of animals that depend on the river, fish are the most diverse with over 140 different species. The sport fishery is very diverse with at least 25 species commonly harvested. Fish species, such as walleyes, largemouth bass, bluegills, and crappies are favorites of sport anglers. Others such as common carp, buffalos, and channel catfish, are harvested by commercial anglers and end up on the tables of families all over the country. Still other fishes are important because they provide food for sport or commercial species.

The fishery resources in these waters contribute millions of dollars to the economy annually. Overall, the estimate impact of anglers and other recreational users exceeds \$1.2 billion on the Upper Mississippi River. The fisheries in the various reaches of the river of

often are adversely affected by pollution, urbanization, non-native fishes, navigation, recreational boating, fishing, dredging, and siltation. However, state and federal agencies expend considerable effort and resources to manage fisheries and restore river habitats. This pamphlet was prepared to help you better understand what fishery resources exist, what the requirements of each species are, and how man-induced changes that are proposed or might occur could affect them.



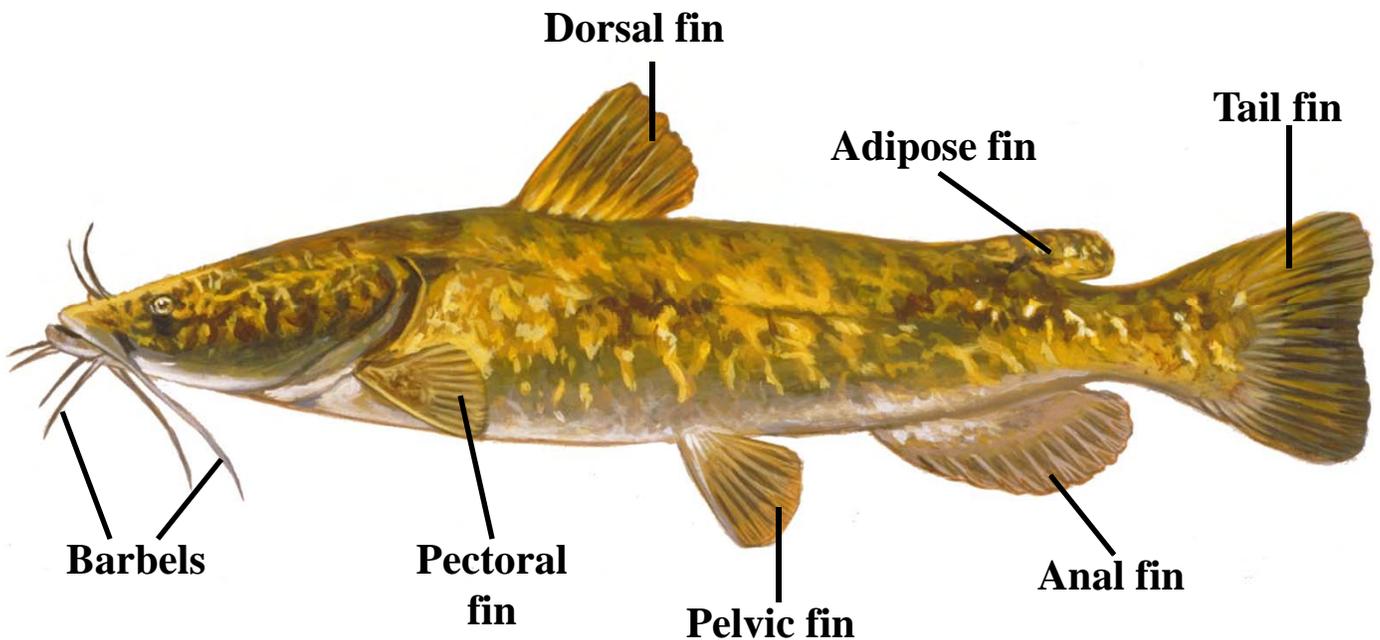
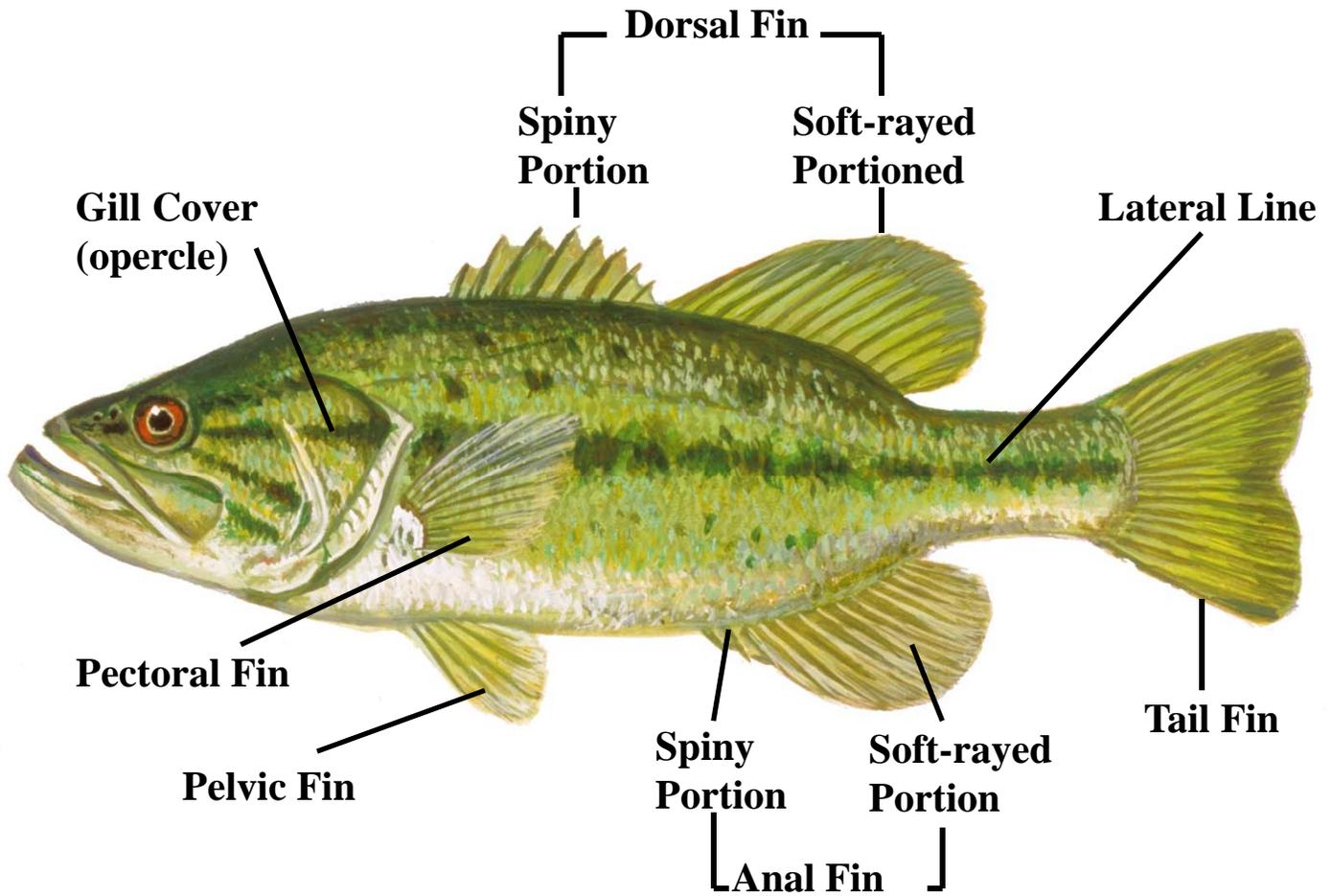
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Identifying Fishes

To understand how fishes and their environment interact, identifying fishes from one another is important. Many common fishes can be identified from one another by striking differences in body form, color, fin location, mouth shape, and a host of other external characteristics. Those who are less familiar with fishes or who encounter less common species can identify individuals by using a “key” that helps users discern unique characteristics of species through a series of steps.

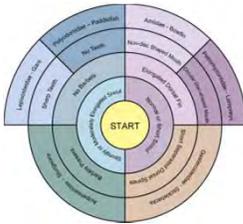
Scientists group fish that have many characteristics in common into families. For example, the walleye, sauger, yellow perch, and darters all have similar body shape, fin placement, habits, and many other features, and are therefore grouped together in the family Percidae. By choosing correctly at each level of the radial keys, “Radial Keys to the Fishes,” you will be able to identify a Upper Mississippi River fish to its correct family.

Parts of a Fish

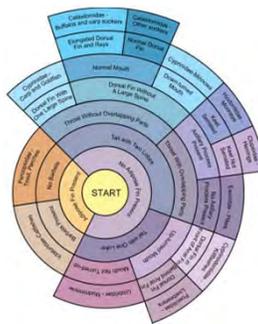


How to use a Radial Key

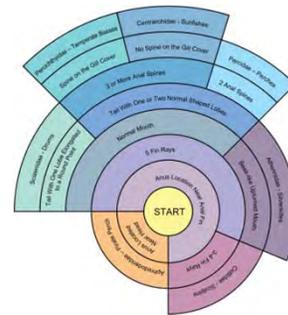
As an example of how a radial works, we identify here unusual fishes of various families, which includes species such as paddlefish, gars, and sturgeon. Look at the overall appearance of the fish to choose the proper radial key for identification. To use a radial key, start in the center choosing the characteristic that matches the fish. Then, move outward to the next layer, using only the pie-shaped wedge forward by the first choice. Continue moving outward through successive layers, narrowing the wedge, until you arrive at the outermost layer that provides the name of the fish family. Check the “Lifehistory” table for some common members of the fish family. Further information can be accessed from the list of suggested readings and internet links



Unique Fish Example:



Fish without Spines

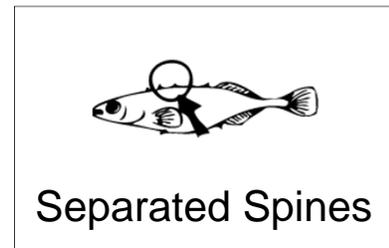
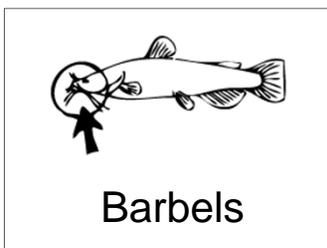
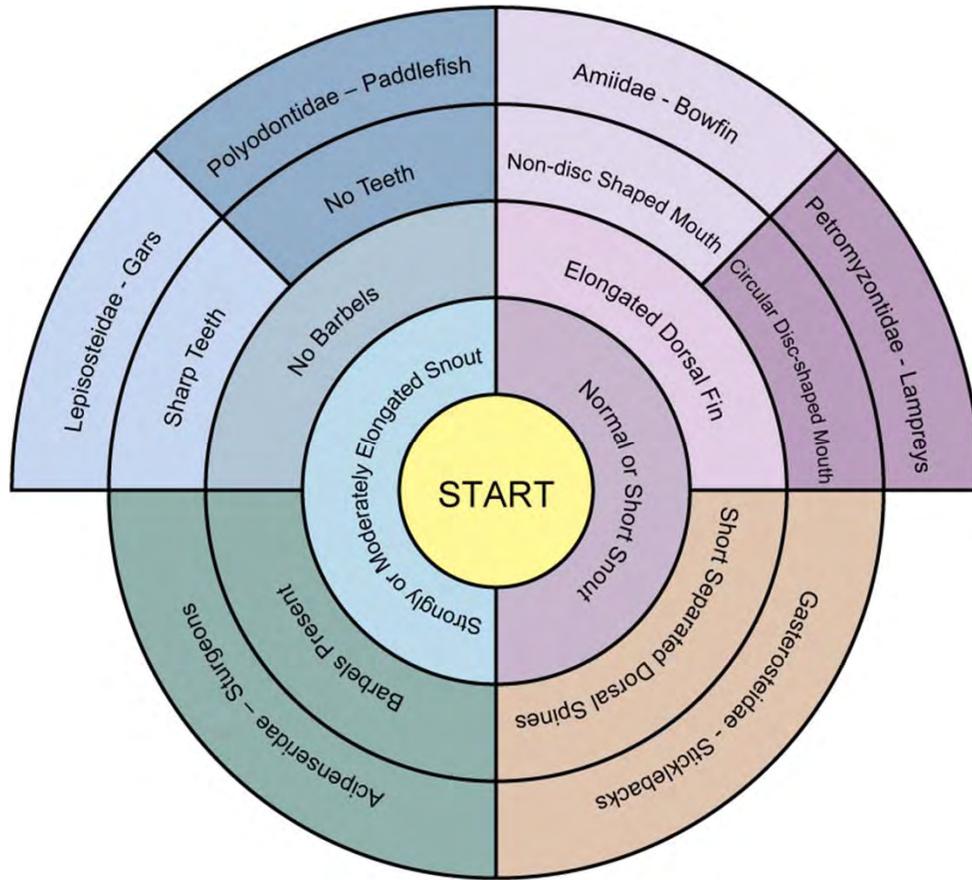


Fish With Spines

- Step 1.** Look at the overall appearance of the fish. Does the fish have odd/unique and distinguishing characteristics? Yes. Then open the “Unique Fish Radial Key.” Go to the inner most circle labeled “START.”
- Step 2.** Look at the snout of the fish. Does the fish have an normal or elongated snout? The snout is elongated. Proceed to the next level further out on the key.
- Step 3.** Look near the mouth of the fish. Does the fish have barbels? No, there are no barbels present. Proceed to the next level further out on the key.
- Step 4.** Look inside the mouth of the fish. Does the fish have sharp teeth? Yes, there are sharp teeth present. Proceed to the next level of the key further out.
- Step 5.** At the outer most level of the key is the family and common name of the fish you have just identified. The fish is in the Lepisosteidae family, otherwise known as the Gars.

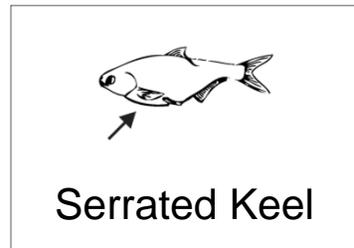
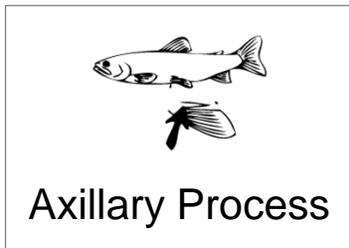
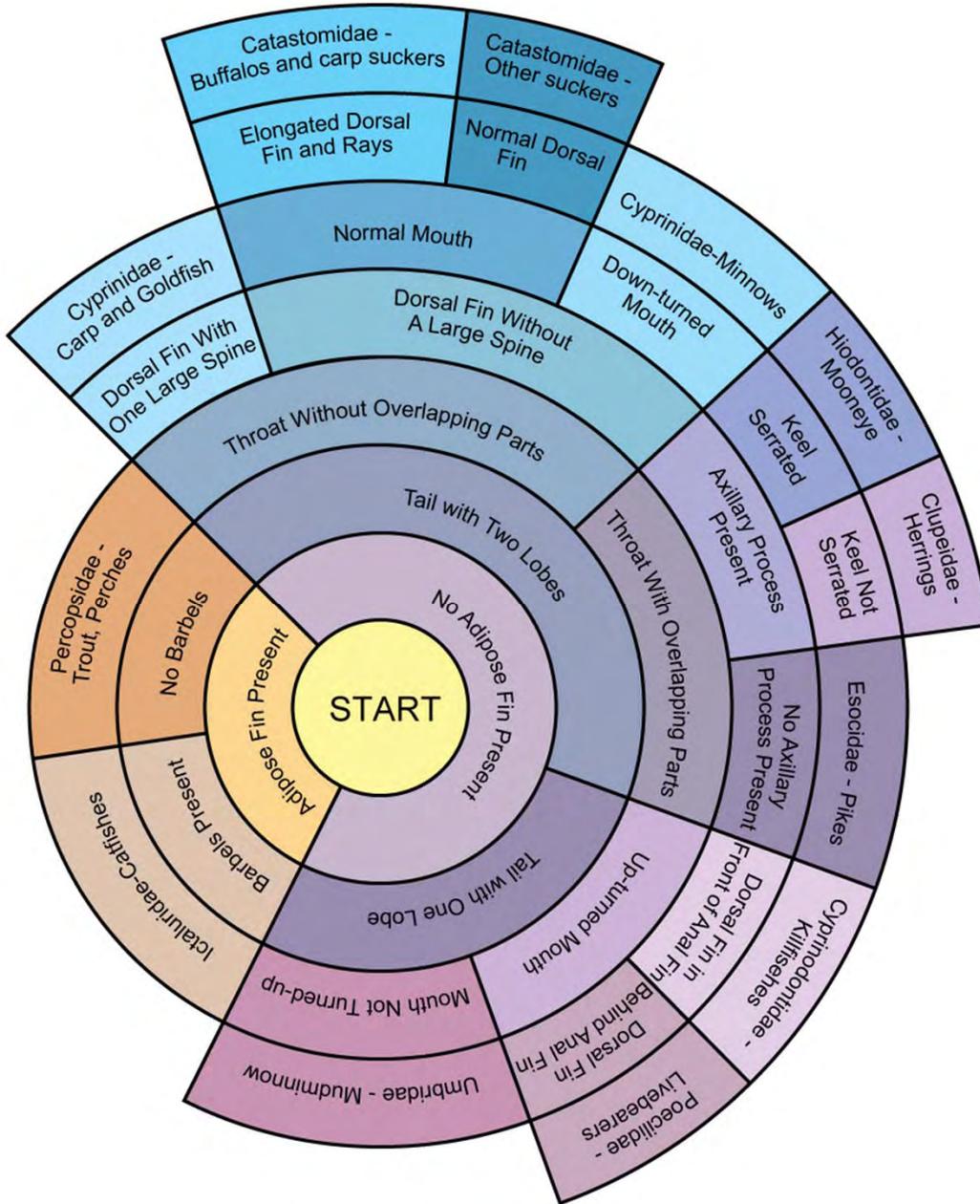
Radial Key for Unique Fishes

Use this key for any fish which has a unique characteristic which makes it look different than the general fish example.



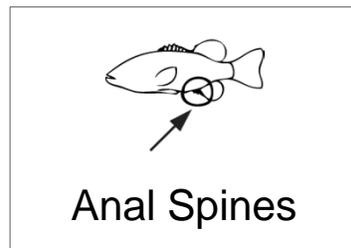
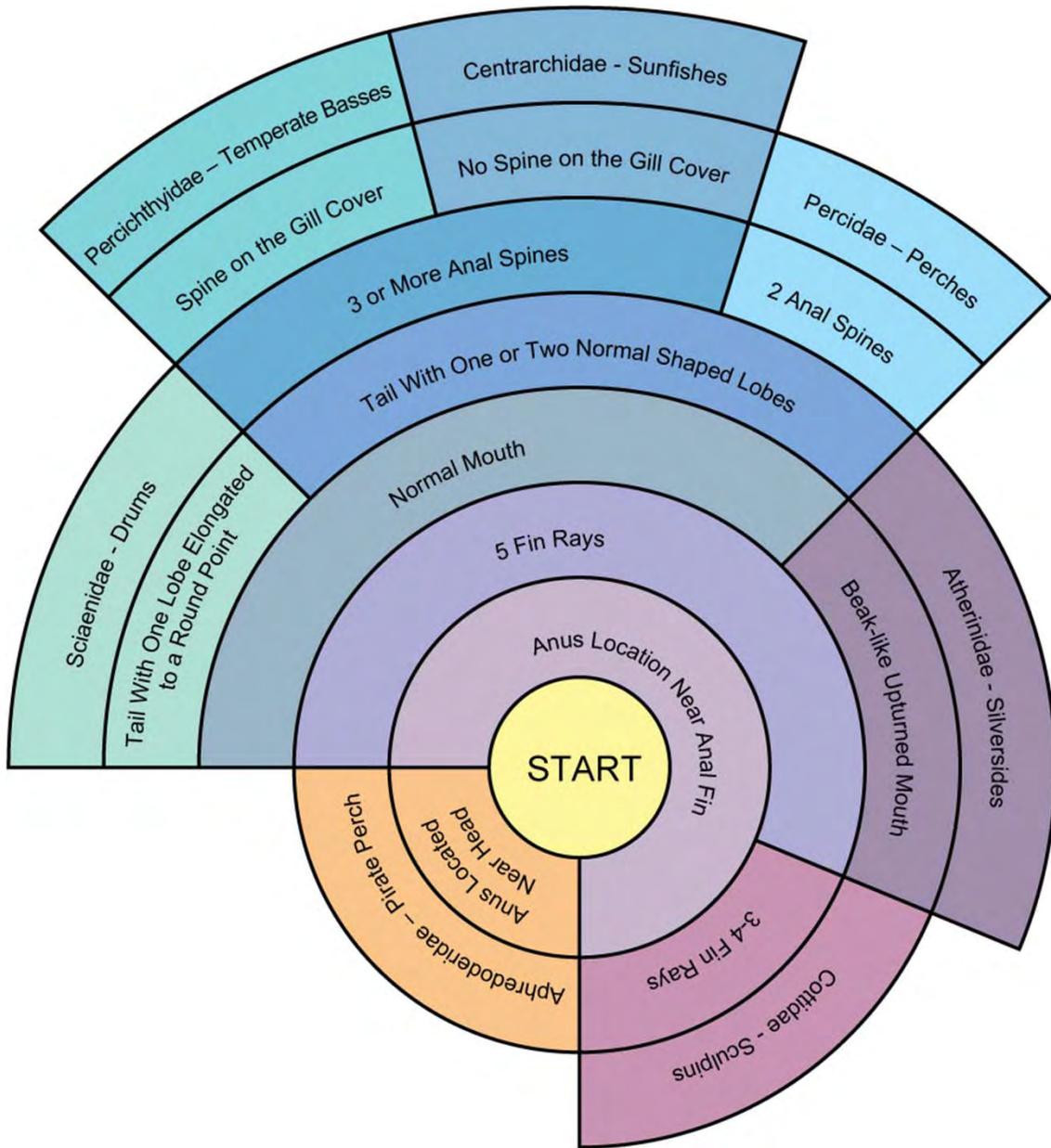
Radial Key for Fishes Without Spines

Use this key for any normal looking fish which does not have any spines.



Radial Key for Fishes With Spines

Use this key for any normal looking fish which does have spines.

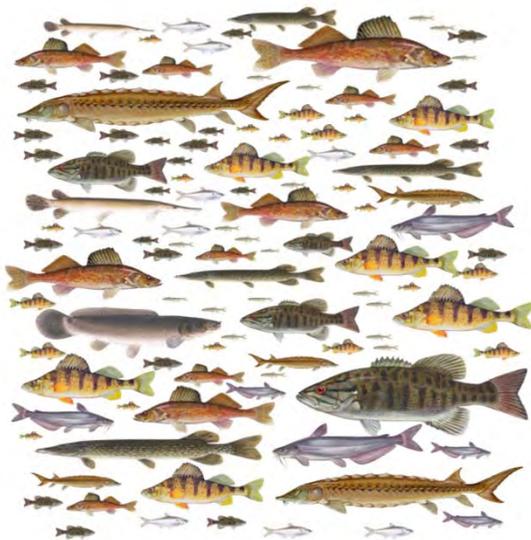


Habits and Habitats of Fishes

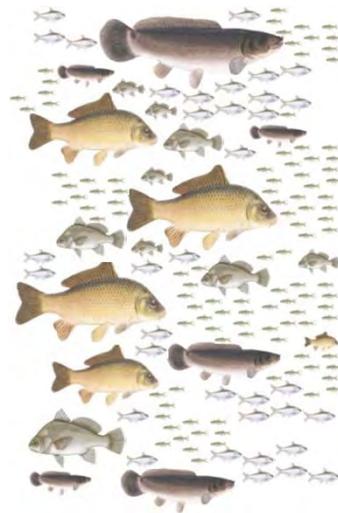
Fish interact with their environment in complex ways. To avoid direct competition for food and space in the Mississippi River, different species have become specialized during millions of years of evolution. Fish separate themselves by the types of habitats they live and reproduce in, the types of food they eat, and even in the seasonal or daily periods during which they use a given habitat.

Understanding the requirements that different fish species need to complete their life cycle helps us to understand how they have been affected by past changes to the river such as construction of dams, which largely were built in 1930's. It is also a necessary step before we can anticipate the future effects of proposed development or changes (hydropower units, barge traffic, dredging, pollution, etc.) on the habitats of adult fish, spawning and nursery areas, or food sources for fishes in all stages of their lives. Resource managers use this information to manage and restore habitat, and develop regulations that promote sustainable fish populations and communities.

High Diversity



Low Diversity



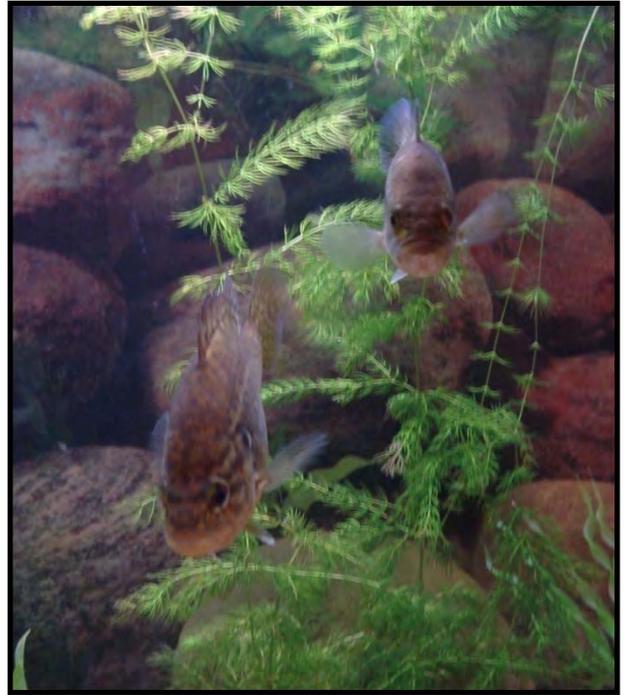
Historically, the river has undergone many changes caused by the building of dams, removal of tree snags, pollution, and urbanization, as well as natural phenomena. Changes in the type, amount and, quality of habitats available for fish can reduce the diversity of fish present, in other words, not just the total number of fish but the number different fish species in a given area. Careful management practices, rules, and regulations are used to ensure the healthiest possible river conditions for fish, humans, and other wildlife.

Habits

Fish can be grouped together into “guilds” based on their shared feeding strategies or reproductive tendencies. Guilds are a useful way of understanding how fish interact with their environment in the Mississippi River. Species grouped together in a guild might be expected to respond to some changes in the river environment in a similar way. For example, river management decisions such as dredging, building structures, and altering fishing regulations, have consequences on fish populations. Fish guilds are a way of assessing those consequences on a broader scale. On a smaller scale the life history characteristics of specific fish species are important to understanding exactly how each species interacts with the riverine environment.

Feeding

Fishes feed on a variety of food items, depending on where they live, their behavior, and the size and shape of the mouth. These adaptations enable some fishes to feed on small, microscopic organisms, and others to eat large prey. For, example, suckers (family Catostomidae) have a small toothless mouth on the lower side of the head that allows them to suck aquatic insects and other food off the bottom. However, a predator like the northern pike (family Esocidae) has a large mouth, with many teeth, at the front of the head. This mouth type and streamlined body helps the northern pike catch other fish. Knowing the food that different fish species eat reveals important information about their life-style, and their position in the fish community and in the food chain. Food habits give biologists insights into where a fish species lives and how best to manage it to ensure a productive fishery.



General Feeding Types

Types of feeding behavior can be described by three general terms. An **omnivore** eats any available food item, including insects, other fish, plants, seeds, and algae. A **piscivore** is adapted to eat mostly other fish. **Planktivores** feed on small microscopic food organisms floating in the water.

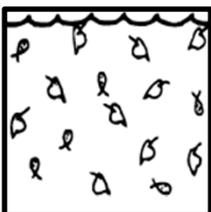
Specific Food Items

These three general groups are further divided into the following six categories, which describe more specifically the items of food eaten by adult fish.



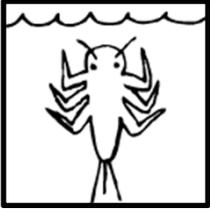
Bottom feeders are effective vacuum cleaners that take their food from bottom sediment, rocks, plants, logs, and water. They locate their food by touch, taste, and sight. Some of the items eaten are aquatic insects, small snails, clams, algae, and microscopic animals.

Surface feeders commonly eat flying insects at the water's surface. These insects include immature aquatic stages that are changing to the flying adult stage, as well as land insects that fall into the water.



Filter feeders sieve small microscopic animals (zooplankton) or small microscopic plants (phytoplankton) living in the water. These small organisms are common in the river and provide an easy food source for fishes equipped to collect them.

Habits and Habitats of Fishes in the Upper Mississippi River



Small prey opportunistic feeders frequently eat any small animals that are easily captured; these commonly include immature stages of aquatic insects, such as stoneflies, mayflies, dragonflies, damselflies, and flies. Other organisms in the diet include scuds, crayfish, water fleas, and small fish.

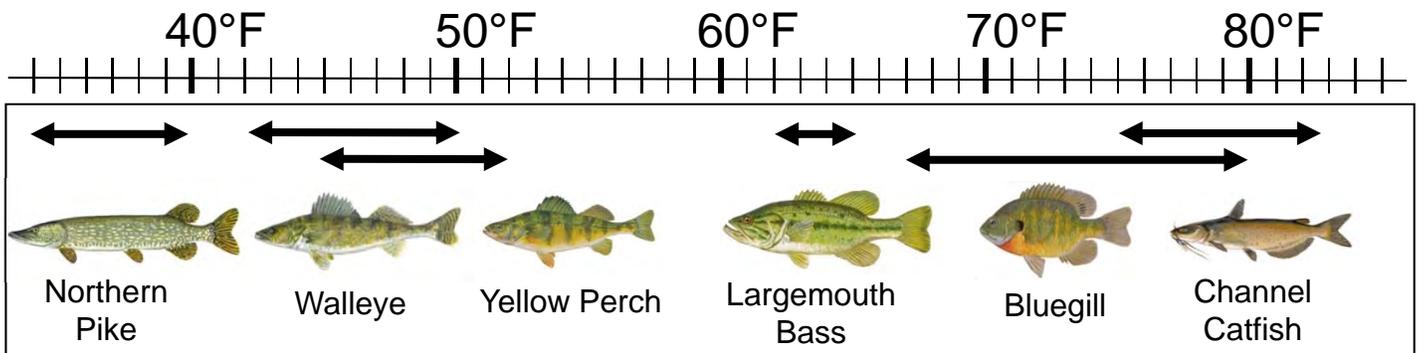
Large prey opportunistic feeders eat a variety of crayfish, mature and immature aquatic insects, fish, and microscopic animals. These food items tend to be larger than those eaten by small-prey feeders.



Piscivore or fish eaters rely primarily on small fish for food. Small quantities of insects, crayfish, worms, and clams may also be eaten. Predators have variety of special adaptations that allow them to capture smaller fish, such as sharp teeth, a large mouth, and a streamlined body form.

Spawning Temperatures

Fish species of the Upper Mississippi River have definite spawning seasons. Their spawning is timed to produce young when environmental conditions are favorable for them and food is available. Differences in water temperature, current, and water levels make it possible for many species to use the same breeding grounds at different times of the year. The timing of fish reproduction is triggered by several factors; the most important are water temperature and length of the day (hours of daylight). Fish that spawn in early spring, such as walleye, sauger, and northern pike, spawn at low temperatures. Late spring spawners include longnose gar, shorthead redhorse, and white bass. Bluegills, crappies, minnows, and shiners generally spawn in late spring or early summer. The eggs and young need warm water to survive and develop.



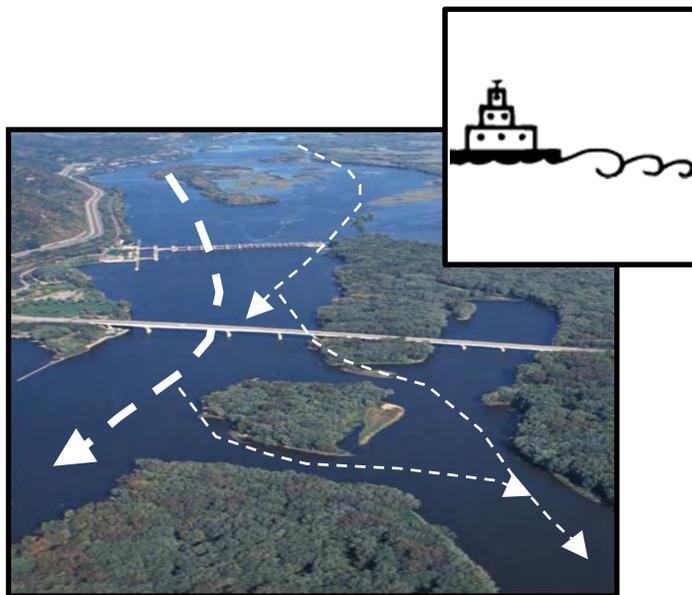
The range of spawning temperatures of six common fish species inhabiting the Upper Mississippi River. Each fish's range is indicated by the arrows located above the fishes. Spawning does not occur at a single specific temperatures but over a range of temperatures that varies greatly between species. Spawning temperature often overlaps among species. Spawning temperature is just one of many characteristics which makes up the life history of different each fish species.

Habitats

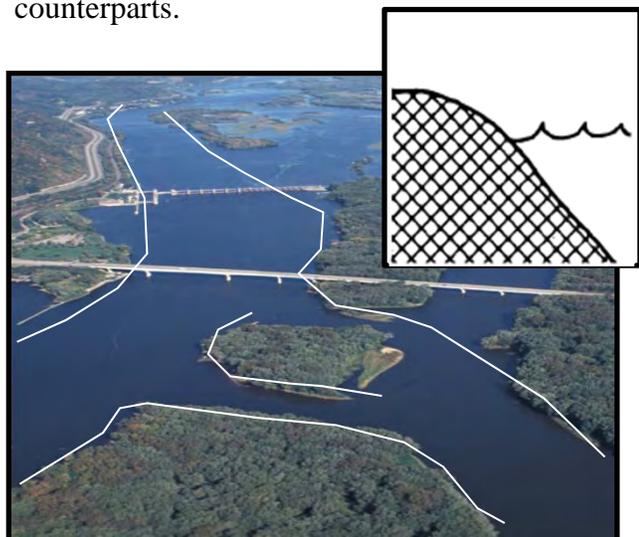
The Upper Mississippi River is made up of a wide variety of habitats linked to together, allowing for a diverse array of fish species to live in one area. Fish species generally prefer and are adapted to specific natural settings called habitats. Aquatic habitats are a combination of many characteristics, including water current, clarity of water, water depth, numbers and types of aquatic plants, the nature of bottom materials or substrate, and soil types. Members of the sunfish family (for example, bluegill, rock bass, largemouth bass, and crappies) generally prefer quiet waters. In contrast, most members of the perch family (walleye, sauger, logperch, and darters) often live in flowing water with more current.

General Habitats

The **channels** of the Upper Mississippi River are areas of open water where current always exists. The **main channel** is the portion of the river in which large boats and commercial barges operate and is maintained at a minimum depth of nine feet and minimum width of 400 feet. Fish habitat in many portions of the main channel is limited due to continued disturbance by commercial and recreational vessels. The figure at right shows the main channel using the heavy line and the side channels with a lighter line.

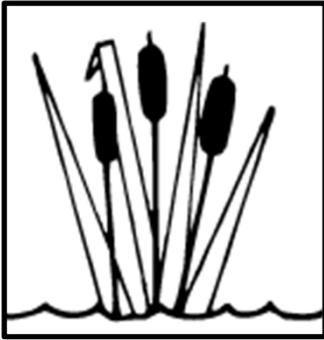


Secondary channels are larger side channels of the Mississippi where commercial navigation does not occur. They can vary in width from less than 100 to more than 500 feet wide. Water depths and sediment type are variable making these channels similar in appearance and function to their pre-dam counterparts.



The **channel border** is the zone of river where flowing channels meet land. The main channel border is often defined as the zone of river between the 9-foot navigation channel and the main river bank or islands. Main channel border habitats are buffer zones between heavy traffic in the main channel and habitats close to land. Wing dams, closing dams and rip-rap influence currents in the main channel border habitat. The bottom is mostly sand. Secondary channels also have a channel border, but it can be more difficult to define. The channel border in secondary channels often has variable substrates with undercut banks, fallen trees and aquatic vegetation providing cover for fish.

Habits and Habitats of Fishes in the Upper Mississippi River



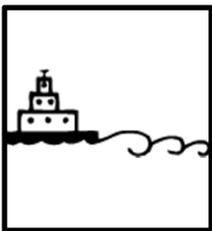
Backwater areas include loops of old channels or lakes formed by natural and man-made dams. The bottom commonly consists of a layer of mud or silt two or more feet thick. The water has little or no current. Aquatic plants are abundant and may extend out of the water or be submerged. Backwater areas also include “stump fields” that contain the remains of flooded stands of trees. The circled areas indicate backwaters in the top right figure.



Spawning Habitats

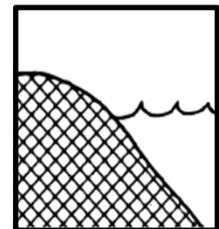
The eggs and young (larvae) of fish are adapted to survive in certain regions. Fish spawn in areas with certain features that help to meet the needs of their eggs and larvae. One important factor for survival is oxygen. Adult fish absorb oxygen from water through their gills but fish eggs and young are sensitive to low oxygen in the surrounding water. Some species are adapted to living in low concentrations of oxygen and their young can live in protected backwater areas with muddy or silty bottoms and little current.

We have divided the spawning areas of the river into the same categories as general habitats, however, many adult fish live in one habitat and spawn in another.



River channel: Fish that spawn in the channels of the Upper Mississippi River release and scatter their buoyant eggs, relying on the current to disperse them. Because these fish scatter their eggs and do not protect or hide them, eggs must be released in large numbers to ensure survival of a few. Dissolved oxygen concentrations are usually high in the river channels.

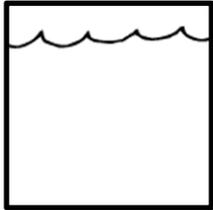
Channel border: Fish that spawn in the border region of the main channel and secondary channels release eggs that require some current to disperse the eggs or young. Channel border habitats also provide high oxygen concentrations.



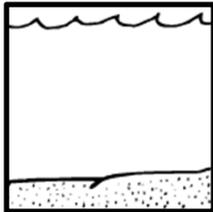
Backwaters: Many different types of fish spawn in the backwaters of the Upper Mississippi River because many habitat types are available there. The eggs and larvae may be hidden in rocks or among aquatic plants. They may also be guarded by the male parent. Oxygen concentrations occasionally become low in these areas.

Spawning Substrates

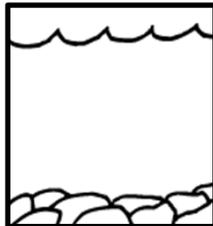
Selection of a more specific bottom type within a general spawning habitat is critical for successful reproduction and depends on the characteristics of the eggs and larvae of each species. To avoid having their eggs or young eaten by predators, some fish species hide them. The young of such species often develop within a protected area among rocks, gravel, logs, or vegetation. Some fish scatter eggs in open water. The eggs are then dispersed by current to areas where some will escape predators and survive. Such species produce relatively large numbers of eggs to offset the losses due to predation. Other fish tend to produce fewer eggs, but increase chances of survival by clearing a nesting area before spawning and remaining to guard their eggs and larvae.



Open water: Fish that spawn in open water have no specific substrate requirements. Their buoyant eggs are scattered and dispersed by the current.



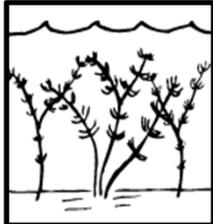
Sand, roots over sand: Eggs are scattered on sand or roots overhanging sand. Young are adapted to swift water currents and do not avoid light. These species often spawn in the channel border areas.



Rocks, gravel, mussel beds and flowing waters: Eggs are deposited on rocks, gravel, or freshwater mussel beds. Water currents carry the buoyant eggs or young fish away from the spawning site. These species may spawn in the channels, channel border, or in backwaters where rocks and current are available.



Rocks, gravel, and limited flow: Eggs are deposited on rock, rubble, or gravel, but mostly in backwater areas. Some species deposit their eggs on cleaned areas of rocks, in prepared pit nests in gravel, or in undercut banks. These species build pit nests, and the males often guard the young.



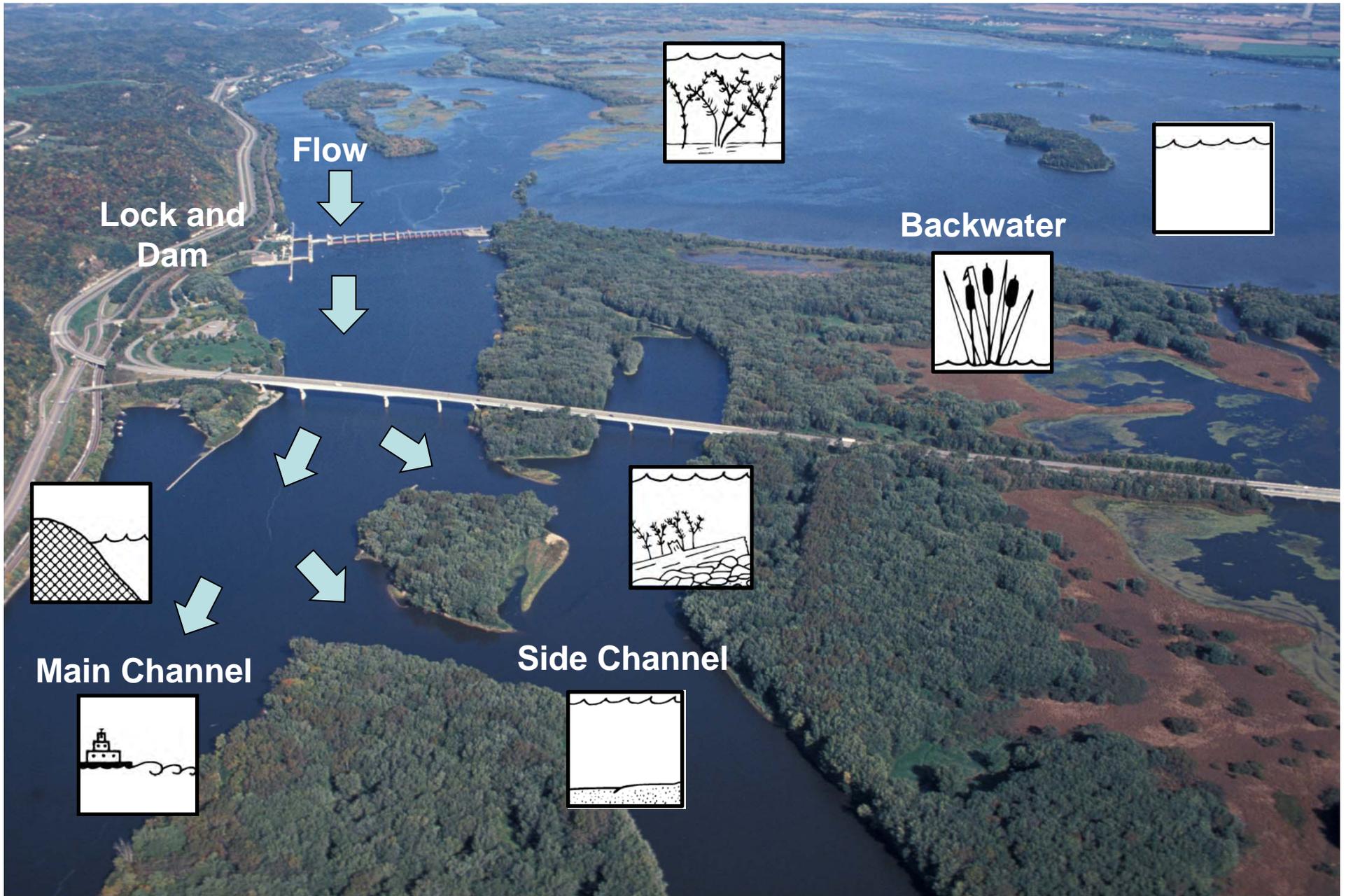
Submerged aquatic plants: Eggs are deposited primarily on submerged aquatic plants, but logs, gravel, or rocks may also be used. The eggs have a sticky coating and adhere to the objects on which they are deposited. The young fish avoid light, hiding among rocks or plants, until they are well-developed.



Shrubs and logs: Eggs are scattered on submerged aquatic plants, flooded shrubs, logs, or branches. The eggs are sticky so they adhere and do not fall to the bottom. The larval fish develop among the plants but do not avoid light.



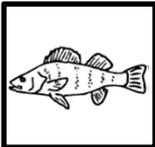
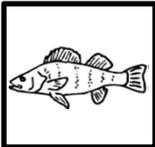
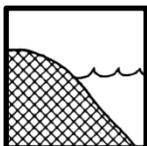
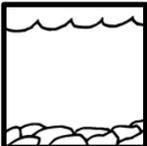
Habits and Habitats of Fishes in the Upper Mississippi River



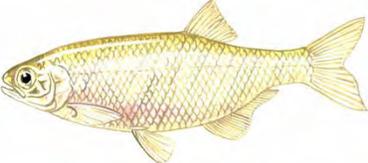
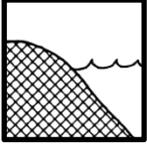
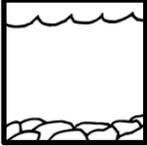
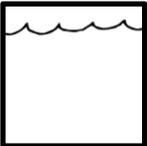
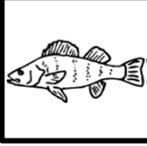
The Upper Mississippi River contains many different habitats for fishes, including channel border areas and backwaters. Fish tend to live in specific types of habitats, but each type of habitat may be found in a number of different locations throughout the river.

Life History Characteristics

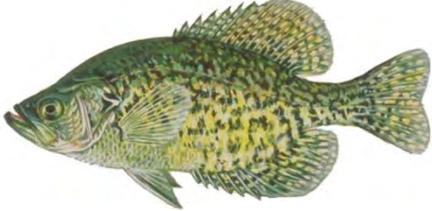
According to Becker, G. C. 1983. Fishes of Wisconsin. University of Wisconsin Press, Madison, Wisconsin. 1052 pp.

Family	Common Name	Common Adult Length (inches)	General Feeding Guild	Specific Food	General Habitat	Spawning Temperature (°F)	Spawning Habitat	Spawning Substrate	Comments
Percichthyidae	 White Bass	8-10	Omnivore			54-79			Spawn along backwater or lake shore
Escocidae	 Northern Pike	20-36	Piscivore			34-40			Large numbers congregate in shallows
Amiidae	 Bowfin	20-32	Piscivore			61 -66			Male builds nest by clearing away weeds
Acipenseridae	 Sturgeon	25-60	Omnivore			67-70			Migrate upstream for spawning. Sometimes into tributary streams

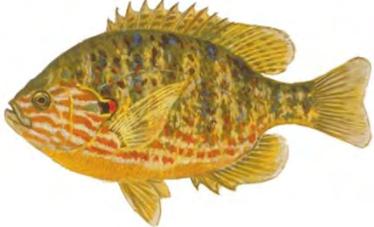
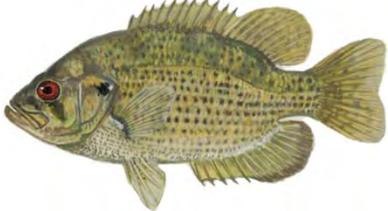
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Family	Common Name	Common Adult Length (inches)	General Feeding Guild	Specific Food	General Habitat	Spawning Temperature (°F)	Spawning Habitat	Spawning Substrate	Comments
Hiodontidae									
	Mooneye	8-12	Omnivore			55-59			Move upstream in large numbers
Sciaenidae									
	Freshwater Drum	10-14	Omnivore			66-72			Males produce drumming sounds preceding spawning
Atherinidae									
	Brook Silverside	2-3	Omnivore			68-75			Pairs spawn at surface of water
Lepisosteidae									
	Longnose Gar	18-24	Piscivore			66-72			Migrate upstream into tributaries for spawning
	Shortnose Gar ²	18-24	Piscivore			66-74			Prefer shallow water, eggs scattered over vegetation

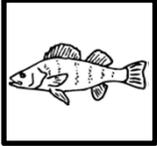
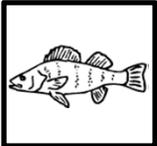
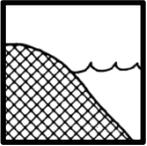
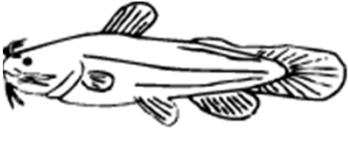
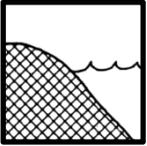
Habits and Habitats of Fishes in the Upper Mississippi River

Family	Common Name	Common Adult Length (inches)	General Feeding Guild	Specific Food	General Habitat	Spawning Temperature (°F)	Spawning Habitat	Spawning Substrate	Comments
Centrarchidae									
	Black Crappie	7-10	Omnivore			58-68			Male clears and defends nest, male guards young
	White Crappie	6-9	Omnivore			57-73			Male selects spawning area, male guards young
	Green Sunfish	4-5	Omnivore			59-83			Male clears and defends nest, male guards young
	Warmouth	3-5	Omnivore			68-72			Male clears and defends nest, male guards young

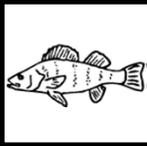
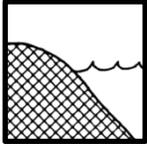
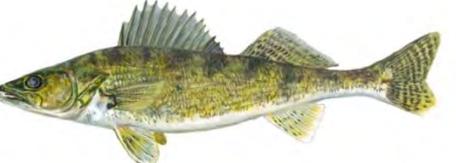
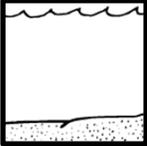
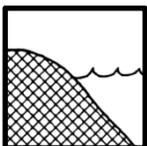
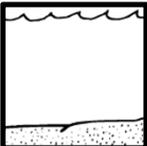
Habits and Habitats of Fishes in the Upper Mississippi River

Family	Common Name	Common Adult Length (inches)	General Feeding Guild	Specific Food	General Habitat	Spawning Temperature (°F)	Spawning Habitat	Spawning Substrate	Comments
Centrarchidae									
	Orangespotted Sunfish	2-3	Omnivore			65-89			Male clears and defends nest, male guards young
	Pumpkinseed	5-7	Omnivore			65-69			Male clears and defends nest, male guards young
	Rock Bass	6-8	Omnivore			69-79			Male clears and defends nest, male guards young
	Bluegill	5-7	Omnivore			67-80			Male clears and defends nest, male guards young

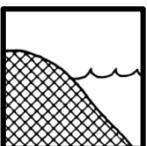
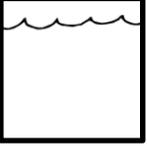
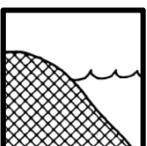
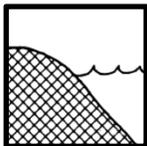
Habits and Habitats of Fishes in the Upper Mississippi River

Family	Common Name	Common Adult Length (inches)	General Feeding Guild	Specific Food	General Habitat	Spawning Temperature (°F)	Spawning Habitat	Spawning Substrate	Comments
Centrarchidae									
	Largemouth Bass	9-12	Piscivore			62-65			Male clears and defends nest, male guards young
	Smallmouth Bass	9-14	Piscivore			55-75			Male clears and defends nest, male guards young
Ictaluridae									
	Channel Catfish	12-20	Omnivore			75-80			Male clears nest under ledge or undercut bank, male guards young
	Flathead Catfish	20-30	Piscivore			72-75			Male and female prepare nest beneath undercut bank male guards young
	Tadpole Madtom	2.5-3.5	Omnivore			--			Spawn under objects or in cavities in river bank

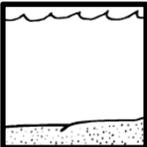
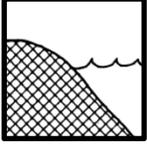
Habits and Habitats of Fishes in the Upper Mississippi River

Family	Common Name	Common Adult Length (inches)	General Feeding Guild	Specific Food	General Habitat	Spawning Temperature (°F)	Spawning Habitat	Spawning Substrate	Comments
Percidae									
	Yellow Perch	5-9	Piscivore			42-66			Eggs deposited in gelatinous strand in sheltered areas
	Sauger	12-13	Piscivore			43-53			Migrate into tributary streams or rip-rap areas of dam tailwaters
	Walleye	14-17	Piscivore			40-60			Migrate into tributary streams or rip-rap areas of dam tailwaters
	Logperch	3-4	Omnivore			50			Male follows female and defends a moving territory surrounding her
	Western Sand Darter	2-3	Omnivore			--			Little known about spawning behavior

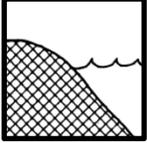
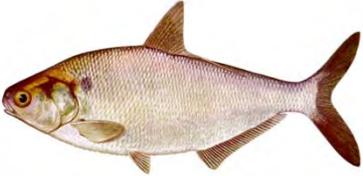
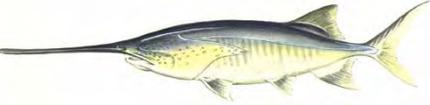
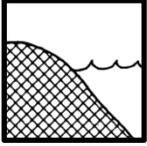
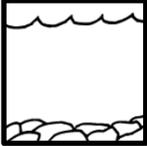
Habits and Habitats of Fishes in the Upper Mississippi River

Family	Common Name	Common Adult Length (inches)	General Feeding Guild	Specific Food	General Habitat	Spawning Temperature (°F)	Spawning Habitat	Spawning Substrate	Comments
Percidae	 Johnny Darter	2	Omnivore			63-70			Eggs deposited on underside of rocks, logs, or other objects
	 River Darter	2-3	Omnivore			52			Little known about spawning behavior
Cyprinidae	 Common Carp	16-18	Omnivore			65-75			Form small groups in shallows for spawning
	 Emerald Shiner	2-3	Omnivore			70-75			Spawn just below surface in deep water
	 Spotfin Shiner	2-3	Omnivore			70-75			Male selects and defends spawning site
	 Spottail Shiner	2-3	Omnivore			60-70			Migrate into tributaries to spawn

Habits and Habitats of Fishes in the Upper Mississippi River

Family	Common Name	Common Adult Length (inches)	General Feeding Guild	Specific Food	General Habitat	Spawning Temperature (°F)	Spawning Habitat	Spawning Substrate	Comments
Catostomidae									
	Bigmouth Buffalo	14-18	Omnivore			54-77			Many males crowd around one female in flooded areas or marshes
	Smallmouth Buffalo	12-16	Omnivore			60-65			Prefer marshes or flooded meadows
	Quillback	12-16	Omnivore			66-83			Migrate into tributary streams to spawn
	Shorthead Redhorse	10-12	Omnivore			47-61			Migrate to riffle areas, male defends spawning site

Habits and Habitats of Fishes in the Upper Mississippi River

Family	Common Name	Common Adult Length (inches)	General Feeding Guild	Specific Food	General Habitat	Spawning Temperature (°F)	Spawning Habitat	Spawning Substrate	Comments
Catostomidae									
	Spotted Sucker	10-12	Omnivore			54-70			Migrate to riffle areas, male defends spawning site
Clupeidae									
	Gizzard Shad	10-14	Planktivore			50-70			Spawn in schools along water's surface
Polyodontidae									
	Paddlefish	35-45	Planktivore			50-65			Spawn in large schools near water's surface

Suggested Reading

The following books were used in the preparation of this guide and are recommended for more extensive information on these and other fishes.

- Becker, G. C. 1983. Fishes of Wisconsin. University of Wisconsin Press, Madison, Wisconsin. 1052 pp.
- Eddy, S., and J. C. Underhill. 1974. Northern fishes. University of Minnesota Press, Minnesota. 414 pp.
- Harlan, J. R., and E. B. Speaker. 1956. Iowa fish and fishing. Iowa State Conservation Committee. 338 pp.
- Pflieger, W. L. 1975. The fishes of Missouri. Missouri Department of Conservation. 343 pp.
- Scott, W. B. , and E. J. Crossman. 1973. Freshwater Fishes of Canada. Fishery Research Board of Canada, Bulletin 184. 966 pp.
- Smith, P. W. 1979. Fishes of Illinois. University of Illinois Press. 314 pp.

Links

The following links were used in the preparation of this guide are recommended for more extensive information on fish and fishing regulations in the Upper Mississippi River area.

Fishes of Wisconsin - <http://www.seagrant.wisc.edu/greatlakesfish/becker.html>

State Fishing Regulations

Minnesota - <http://www.dnr.state.mn.us/regulations/fishing/index.html>

Wisconsin - <http://dnr.wi.gov/fish/regulations/>

Illinois - <http://dnr.state.il.us/fish/digest/>

Iowa - <http://www.iowadnr.gov/fish/regulations/iafshregs.html>

Missouri - <http://mdc.mo.gov/regs/>

Acknowledgments

This project was originally supported and completed by the National Fishery Research Laboratory, La Crosse, Wisconsin, U.S. Fish and Wildlife Service, in coordination with the Upper Mississippi River Conservation Committee. This revised version was supported by the Upper Mississippi River Conservation Committee and the Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin in coordination with the Upper Mississippi Wildlife and Fish Refuge and the U.S. Fish and Wildlife Service. Special thanks goes out to the original authors, artists, and contributors. Images were provided by the Wisconsin Department of Natural Resources, Iowa Department of Natural Resources, Fish and Wildlife Service, and Duane Raver. Funds for this publication were provided by the U.S. Department of the Interior, Fish and Wildlife Service, the Upper Mississippi River Conservation Committee, Rock Island, Illinois, and in kind donations by the Upper Midwest Environmental Sciences Center and the University of Wisconsin – La Crosse River Studies Center.

Habits and Habitats of Fishes in the Upper Mississippi River: an Update¹



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Steven Zigler, U.S. Geological Survey
Robert Kratt, U.S. Geological Survey**

¹ **Based on the original booklet: Littlejohn, S., L. Holland, R. Jacobson, M. Huston, and T. Hornung. (1985) Habits and Habitats of Fishes in the Upper Mississippi River. U.S. Fish and Wildlife Service, La Crosse, Wisconsin.**