Home Sweet Home

OBJECTIVES: Students will be able to:

- describe at least three different aquatic habitat types (lake, wetland, river) found in Wisconsin and four different habitat zones in a lake (littoral, limnetic, benthic, wetland)
- detail the different phases in a fish's life cycle
- explain one species' spawning habitat in detail
- present their independent research

METHOD: Students will create a "travel brochure" for a particular species' spawning habitat. The travel brochure will include a detailed description of the environment, a description of the amenities that the fish species requires for spawning, and graphics from the internet or another source. The students will present their brochures to the class.

MATERIALS:

1) A variety of travel brochures

2) Research materials (books and/or internet access)

3) Computers

SETTING: Indoors

DURATION: Three to four 45-minute periods

VOCABULARY: Spawn, littoral, limnetic, benthic, terrestrial, tributary, dynamic, headwaters, mouth, wetlands, marsh, substrate, redd, fry, fingerling, profundal

STANDARDS:
Science: F 8.7, 8.8, 12.7, 12.11.
Environmental Education: B 8.6, 8.8, 12.2, 12.4.

BACKGROUND: Each species of fish is adapted to the environment in which it lives. As a result, fish life cycles and habitat requirements are highly variable between species. However, most fish progress through the following generalized life cycle: egg, sac fry (larval fish), fry, fingerling (juvenile), adult, and spawning.

Fish eggs are easily destroyed by sedimentation or flooding, predators, or changes in water temperature or dissolved oxygen content. Spawning fish have developed a variety of strategies to protect their eggs from the most predictable harm: predators. To fool predators, fish may disguise eggs as substrate or attach them under the leaves of submerged plants. Some fish, like male largemouth bass, actively guard eggs.

Once they hatch, sac fry live off of their yolk sacs for the first stage of their lives. These yolk sacs are eventually absorbed by the fish, at which point the fish become fry. Fry develop through several more stages over the first few months of their lives. During the fry stages, young fish are tempting food items for many adult fish. Some adult fish, like the male small-mouth bass, remain near larval fish to protect them from hungry predators. Young fish use vegetation, submerged structures, and undercut banks as protection from underwater and surface predators. As fish mature into fingerlings (juvenile stage), they are still challenged by predators, but also face competition for habitat. Shelter is critically important to fish at this stage in their lives. Most fish do not survive their youth.

Fish are considered adults once they are able to reproduce. In some species, this happens within a year (goby); for others it can take decades (lake sturgeon). Fish often select different habitats in their adulthood than they had as youth. As adults, fish are less susceptible to predators and can move more freely through various habitats. They are still, however, constrained by food, temperature, shelter, and dissolved oxygen parameters.

When it is time for fish to spawn, they often relocate to the appropriate spawning environment. Some fish spawn every year, others every few years, and still others only once in a lifetime. To spawn, females release their eggs into the water and males release milt (sperm). After spawning, some fish, like salmon, die. Others return to their adult habitats, or stay near the eggs to protect them from predators.

OPENING: Have students read **Home Sweet Home**. When they are finished, open a discussion about the life cycle of a fish. Have students make some predictions: Where are fish likely to lay their eggs? What challenges might a young fish face? How might the fish overcome those challenges? What sort of differences might exist between a young fish's habitat and an adult fish of that same species?

Tell students that the rest of the activity will be focused on only one habitat selection for fish: the spawning habitat.

MAIN ACTIVITY: Have students look over the travel brochures and make points about how the brochure is organized. What sorts of information are on a brochure? How does the company or location market itself? Have the students notice features of the brochure that are appealing to them or parts that do not make them want to travel to the advertised destination. Tell students that they will be making travel brochures to entice the species of fish they are profiling to a Spa(wning) Resort. The travel brochure will have all the components that fish need for spawning, presented in an attractive manner.

Students will conduct research on their species' needs using books, the internet, fish *Wildcards*, or other sources, and then will create the brochures on computers using graphics or drawing their own by hand. Allow at least one full class period for creating the travel brochures.

CLOSING: Once students have completed their brochures, have them take turns presenting their Spa(wning) Resort to the rest of the class. Encourage students to ask each other questions. When all students have presented, discuss similarities and differences in habitat choices between species. Encourage students to think about how adaptation and natural selection have figured into spawning habitat choices.

ASSESSMENT QUESTION: Name the five zones of a lake, one characteristic of each, and a species of fish that resides in each.

ANSWERS:
Littoral: shallow, warmer, spawning area, light; northern pike, young fish, sunfish

Limnetic: darker, colder, deeper; coldwater fish (salmon, trout, whitefish)

Profundal: deep, dark lake zone below the limnetic zone

Benthic: low oxygen, murky; scavengers (catfish, bullhead)

Wetland: dynamic, shallow, fertile, spawning area, weedy protection, acts as a filter and a sponge; northern pike, young fish

EXTENSIONS:

Art: Have students work in groups to construct a spawning habitat for a species of fish using natural materials collected near the classroom.

Field: Investigate a local waterbody for spawning habitat. Record the substrate, types of vegetation, and water temperature. What species could spawn in this waterbody? **See Appendix F** for the Field Trip Record Sheet options.

Service Learning: Team up with a local fishing or conservation club to help with spawning habitat restoration projects.

If you have downloaded this booklet, please see the appendix that follows for additional materials.

Home Sweet Home

Why do certain fish live deep in lakes, while others can be found in shallow streams, and still others dart in and out of a reedy marsh? Think back to the past two lessons in this section. Fish need to live in waterbodies that can supply enough energy (a small pond cannot support 10-pound walleye) and that will meet their temperature and dissolved oxygen requirements. But fish have more needs than just food and water; they also need places to hide—either to surprise prey or take cover from predators—and places to **spawn** (lay their eggs). A great diversity of aquatic habitats makes for a great diversity of fish species. Woody cover (like fallen logs), aquatic vegetation, rock piles, and overhanging riverbanks are all components of different ideal fish habitats.

Spawn
Lay eggs

Go with the Flow: Rivers and Streams

Rivers and streams provide fish with **dynamic** habitat. Streams dramatically change in depth and flow with the weather, the seasons, and the climate. A flood, for example, can quickly destroy spawning habitat by washing out bottom material. Floods can also make new spawning habitat instantly by felling a log, creating a shady deep pool. Streams are also different from one section to the next—the temperature and current that you find at the **headwaters** of a stream will be different from the temperature and current at the **mouth** of that same stream, and will vary considerably along the stream's entire length from rapids to riffles to pools. Fish travel into, out of, and within stream systems to find the conditions perfect for their food, protection, or spawning needs. As with other habitat types, rivers and streams will warm as our climate changes, which may make them uninhabitable to temperature-sensitive species like trout.

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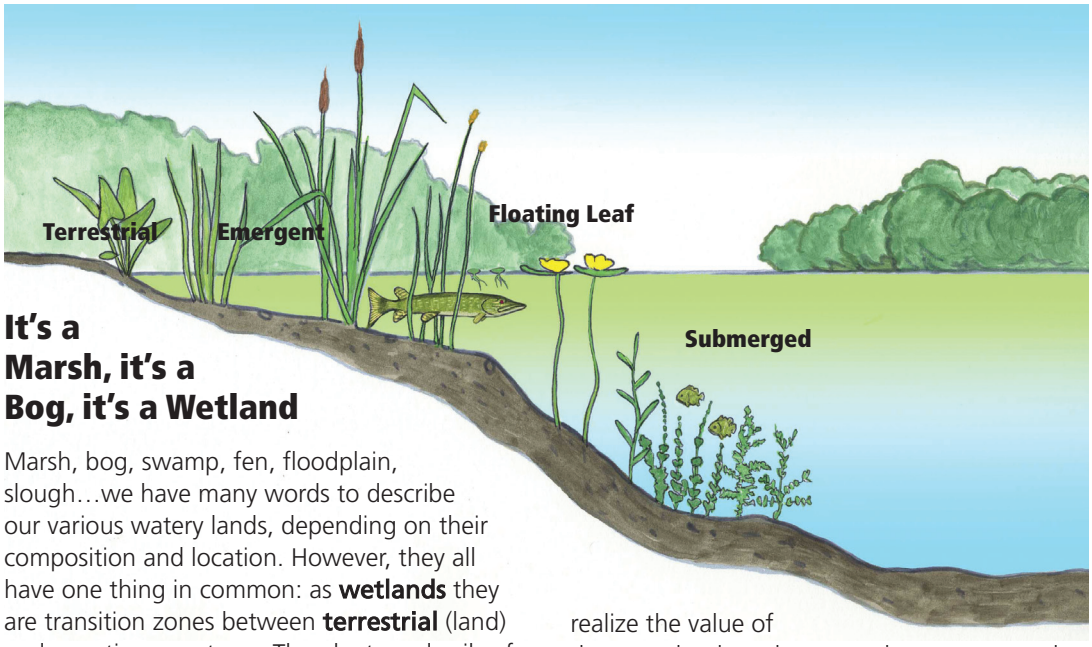
Wanted

> Large, oligotrophic lake with plenty of minnows and other small fish. Cold depths required. Silty bottom preferred. Access to littoral zone a must. Call or email. - A. Sauger

Math Quiz

Wisconsin once had 10 million acres of wetlands and now has only 5.3 million acres. What percent of Wisconsin's wetlands have been lost? Wisconsin was once 28% wetland. What is it today?



A diversity of native aquatic plants are vital to fish habitat and are rooted in the littoral zone of a lake.

It's a Marsh, it's a Bog, it's a Wetland

Marsh, bog, swamp, fen, floodplain, slough…we have many words to describe our various watery lands, depending on their composition and location. However, they all have one thing in common: as **wetlands** they are transition zones between **terrestrial** (land) and aquatic ecosystems. The plants and soils of a wetland are generally saturated with water for at least one season during the year. Like streams, wetlands are very dynamic and change with the weather. During dry spells water might not even soak a wetland's soil. However, during rainy periods wetlands are quick to fill and the water may be over your head. Some fish spend their entire lives in wetlands, while others come only to feed or spawn. Marshes, which are usually wet year-round and filled with shelter-providing grasses, tend to be the most hospitable wetlands for fish. Bogs are typically too acidic for fish.

Wetlands provide important functions available nowhere else on earth. Beyond providing habitat for fish, they are also wildlife nurseries for birds, amphibians, reptiles, and insects. Wetlands also act as great sponges, sopping up floodwaters and filtering out contaminants before they reach groundwater and surface waters. Wetlands keep the effects of erosion in check by holding back silt and preventing it from clogging spawning beds in rivers and streams. Wetlands used to cover 10 million acres or 28% of Wisconsin. Today roughly 5.3 million acres remain. Long after the damage was done, many people came to realize the value of these wetlands and now work to protect and restore them.

In the Zone: Inland Lakes

Lakes have distinct habitat zones that vary in nutrients, oxygen content, temperature and cover. Fish inhabit lake zones when and where the conditions match their needs. The most commonly recognized habitat zones in a lake are the **littoral** (shallow), **limnetic** (open water), **profundal** (deep water), **benthic** (bottom), and **wetland**. The littoral zone extends from the shoreline out as far as emergent, floating, and submerged rooted plants can grow, which is generally about 15 feet, depending on water clarity and lake depth. It is an important zone for females to spawn and for young fish to hide because of the protection underwater plants and fallen trees offer. The limnetic zone (sometimes called the pelagic zone, particularly in ocean environments) begins where water is too deep for rooted plants to get established, but an abundance of sunshine photosynthesizes phytoplankton (microscopic floating plants).

Large, cold-loving fish can be found in the limnetic zone, feeding on free-swimming

Littoral
shallow

Limnetic
open water

Profundal
deep water

Benthic
bottom

Wetland
land-water transition area

Watery Wisconsin

Trace the history of our abundant aquatic resources and you'll be led back about 15,000 years to the ice age. Mountains of glacial ice channeled out many of Wisconsin's 44,000 miles of rivers and streams. Footprints of the glaciers became the Great Lakes as well as most of the 15,081 inland lakes that are splashed across the state.

Many of Wisconsin's wetlands were created where chunks of ice left depressions. The southwest part of Wisconsin, known as the "driftless area," was not glaciated during the last glacial period. Streams in this region have been at work for thousands of years, cutting deep valleys into the soft layers of limestone and sandstone deposited by ancient inland seas. There are few natural lakes and wetlands in this area.

zooplankton like crustaceans and rotifers. The deep, dark profundal zone lies below the limnetic zone and oxygen levels start to drop. The benthic zone is a very low-oxygen environment where decomposers and scavengers roam.

Wetland habitats associated with lakes are marshy transition areas from the water to upland areas. It is common for the littoral zone to also be called a "wetland" in lakes.

Fingerlings
Young fish

Substrate
Bottom material

Superior Habitat: Great Lakes

Wisconsin's eastern and northern borders are nestled against two of the largest freshwater lakes in the world, Lake Michigan and Lake Superior. The extreme depths and cold temperatures of the Great Lakes provide habitat for many of Wisconsin's big game fish. Near-shore rocky reefs attract chinook salmon, coho salmon, and brown trout, while rainbow trout (or "steelhead") live near the surface in open water, often many miles from shore. Lake trout require the coldest waters and generally live in 50 to 200 feet of water, depending on the season. Extensive wetlands and **tributaries** along Lake Superior provide spawning habitat for brown trout, steelhead, chinook and coho, while northern pike head to Chequamegon Bay at spawning time.

Nursery Needs

Wetlands and littoral zones are host to many aquatic plants that serve as protection for fish eggs, **fry** (newly hatched fish), and **fingerlings** (young fish). This makes them a popular site for spawning—but plenty of fish go elsewhere to raise their young. Protection is one consideration for parent fish, but **substrate** (bottom material) is another. Many fish create **redds** (nests) out of a certain bottom material. If that material is not available, the fish will go elsewhere. Other fish deposit their eggs directly on the bottom of a lake or river, while still other fish have eggs that float or that attach to vegetation. Some fish, like salmon, return to the site where they were spawned when it is time to lay their own eggs. Temperature, dissolved oxygen, and food availability are also important indicators of where a fish will spawn.

Follow Your Nose

When salmon are very young, they "imprint" on the stream in which they are stocked or hatched. In spring, the young salmon migrate to the Great Lakes. At spawning time, the salmon are drawn by their strong sense of smell back to their "home" stream.

Spa(wning) Resort

Research the spawning habitat requirements for a fish in order to determine the ideal habitat for the fish's needs. Then design a travel brochure using images and text to lure the fish to your Spa (wning) Resort. As you develop your travel brochure, keep the following questions in mind:

1) What temperature and dissolved oxygen content do the eggs and fingerlings of the species require?

2) What types of protection do the eggs need? Do they need to be camouflaged or placed under a structure? Do the parent fish create a redd?

3) Who will prey on the eggs or fry? What can the fish parent do to prevent this? What other threats might the eggs and fry encounter?

4) What will the fingerlings eat when they hatch? Is it available nearby?

5) How far will the fingerlings have to travel to reach the area where they live in maturity?