

Lesson 1

The Bull Trout and Its Role as an Indicator of Watershed Health

Time Needed: A one hour session

GOAL To understand the important role Bull Trout serves as an indicator of water quality.

OBJECTIVES Students will:

- Learn how to identify Bull Trout
- Learn the key characteristics of healthy Bull Trout habitat
- Learn about the role of Bull Trout as an indicator species

MATERIALS

- Powerpoint Program, Part I
- Fish ID Game Materials
- Handout materials (Fish ID booklets & placemats)

VOCABULARY adfluvial, anadromous, biodiversity, Bull Trout, char, comprehensive, connectivity, distribution area, dorsal fin, ecosystem, embryo, fine sediment, Five Cs, FMO habitat, fluvial, fry, historically occupied habitat, indicator species, identification, large woody debris, life cycle, life history, migration, natal stream, pool habitat, range, rearing, redd, resident, riffles, riparian area, salmonid, spawning, SR habitat, umbrella species, watershed

TEACHER INPUT

[key words are typed in bold, questions for the students to answer are underlined, and *actions* to take are typed in italics]

Begin Part I of the powerpoint program.

Our subject is the Upper Clark Fork River Basin — home, where you live. The central feature is the Upper Clark Fork River **Watershed**. A watershed is an area of land from which rainfall (and/or snow melt) drains into a stream or other water body. Watersheds are also referred to as drainage basins or drainage areas. Ridges of higher ground generally form the boundaries between watersheds.

Why is water important to us?

What types of activities do you think depend upon water?

The Bull Trout (*Salvelinus confluentus*) is the largest **native salmonid** in Montana. They are known for their large size (the Montana record is nearly 30 pounds) and their lengthy spawning migrations have been documented up to 90 miles in Montana. The Bull Trout is actually a member of the **Char** family of fishes native to Alaska and the far north. They were once abundant in virtually every stream and river in Montana west of the Continental Divide, including the Clark Fork Watershed. Due to the fact that an adult Bull Trout feeds mostly on other fish, in the past Bull Trout were not considered a valuable species and there were liberal catch limits.

Today, Bull Trout numbers are a fraction of what they were and they are now legally classified under the federal Endangered Species Act as a "Threatened Species" in the Clark Fork River Basin and elsewhere within its **range**, or **distribution area** in the states of Montana, Idaho, Oregon, Washington and Nevada. Their numbers are particularly low in the Upper Clark Fork Watershed, but they are an essential part of the region's native **biodiversity**.

Biodiversity is a term that people hear more and more frequently these days. What is it? Breaking the word down into its simplest terms, biodiversity means the variety of living things, such as plants, animals, and insects, present in a particular area, whether that area is as small as one individual valley or an entire planet ("bio" meaning life and "diversity" meaning variety). These areas, regardless of size, can also be classified as an **ecosystem**, defined most simply as a community of plants and animals and the environment in which they live.

Since the Bull Trout are a threatened species, it is very important to know how to identify one. The most reliable and distinguishing characteristic is the lack of black spots or markings on the **dorsal fin** (top fin). The Montana Department of Fish, Wildlife & Parks has sponsored the "No Black, Put it Back!" campaign for public education. Juvenile Bull Trout are often mistaken for Brook Trout. But even at a young age Bull Trout have no black on the dorsal fin.

Bull Trout in the lower 48 states have four **life history** forms. These are **fluvial**, where the Bull Trout grow large in a river and return to a small mountain stream to **spawn**. The **adfluvial**, where the Bull Trout grow large in a lake or reservoir and return to a small mountain stream to spawn. The **resident**, where the Bull Trout spend their entire life in one stream, and the **anadromous**, found only in the Puget Sound area of Washington, where the Bull Trout grow large in the saltwater of Puget Sound and return to small freshwater mountain stream to spawn.

The fluvial and resident forms are found in the Upper Clark Fork Watershed.

Bull Trout have a lengthy **life cycle**. Adult Bull Trout begin their migration journey in mid-summer, arriving at spawning grounds from mid-August through late September. Spawning streams are typically small mountain streams with low gradient. These streams are often associated with groundwater upwelling.

The female Bull Trout uses her tail to excavate stream bottom gravels, digging what is known as a **Redd**, or spawning nest where the eggs are laid. The adult males fertilize the eggs, which the female then covers with fine gravels.

The Bull Trout **embryos** remain in the gravel for 5-7 months, emerging as **fry** that **rear** in the tributary stream for 2 years before migrating downstream to larger waters. Once in larger water, they grow large for another 2-4 years before completing the cycle by migrating back to the **natal stream** to spawn. Unlike salmon, Bull Trout may spawn several times in their life span.

How do you think Bull Trout find their natal stream after all those years?

Bull Trout have very specific habitat requirements which make the Bull Trout an **indicator species** for watershed health and water quality. Biologists have dubbed these habitat requirements the **Five Cs**, representing **Cold, Clean, Complex, Connected** and **Comprehensive**.

Cold- Bull Trout came from the North with the advance of the glaciers during the Ice Ages. As a member of the Char family, Bull Trout have evolved with very cold water conditions. In fact, their requirements for cold water are greater than for other salmonids. Average summer stream temperatures should ideally be less than 58° F. while spawning and rearing habitats should be 48° F. or less. Biologists report that ideal temperatures for incubation range from 36° F. to 39° F. In the Upper Clark Fork Watershed, Bull Trout habitat starts high in the Pintlar and Flint Creek Mountain Ranges.

Clean- Bull Trout are particularly sensitive to changes in water quality and have a low tolerance for **fine sediment** in the streambeds. Fine sediments fill in the spaces between stream bottom rocks and gravel, smothering Bull Trout embryos and also reduce aquatic insect life. When these fine sediments less than 6.3mm comprise greater than 20% of the streambed material, Bull Trout embryo survival and fry emergence decline, reducing reproductive success. Bull Trout are also sensitive to other pollutants, including heavy metals and phosphates. In the Upper Clark Fork Watershed, the healthiest populations of Bull Trout are found in the cleanest waters, including Rock Creek.

Complex- Bull Trout habitat isn't just a geographic place, it is also a set of physical and environmental conditions. Complex stream habitat includes deep **pools**, **riffles**, undercut banks, overhanging vegetation and **large woody debris** and rocks in the stream. The large woody debris

and rocks create pools that contain deeper, cooler water that provides resting and feeding areas for Bull Trout. Undercut banks and overhanging vegetation provide cooling shade and hiding cover from predators. Broad riparian areas 150 feet wide or up to twice the average tree height is also ideal.

Connected- Bull Trout evolved as a **migratory** species which was a large, interconnected population throughout its historic range. Their habitat must remain free from blockages to seasonal migrations for spawning and feeding. Some problem areas that must be addressed include dams, water diversions, thermal barriers, and inadequately designed road culverts.

Comprehensive- In order to recover Bull Trout, a comprehensive, rangewide approach is needed. To re-connect and restore some populations, some amount of currently unoccupied habitat must become reoccupied by Bull Trout. This is important because if Bull Trout can re-occupy historic habitat, it means that water quality has been improved and/or restored in that area.

Why would it be important to restore Bull Trout to areas they once lived?

Due to its wide range and stringent habitat requirements, biologists have identified Bull Trout as an **indicator species** for water quality and watershed ecosystem health. Bull Trout are being monitored to track the health of watersheds and water quality. Species like Bull Trout, which have a wide range and special habitat needs are also called **umbrella species**. By protecting and restoring them, hundreds of other species with lesser needs can also be protected under the habitat "umbrella."

END OF PART I OF POWERPOINT PROGRAM.

Ask some Qs of the students.

What is the single most reliable identifying marking on a Bull Trout?

Bull Trout are a member of which family of fishes?

Can you name at least three of the Five Cs?

Why did some people think Bull Trout were an undesirable species in the past?

Handout fish ID cards and handout materials. Discuss.

Play the fishing game for fish ID.

GLOSSARY

Adfluvial refers to a **life history form** of fish that grow large in a lake or reservoir and migrates to a small stream to **spawn**.

Anadromous refers to a **life history form** of fish that grow large in saltwater and migrates to a small stream to **spawn**.

Biodiversity means the variety of living things, such as plants, animals, and insects, present in a particular area, whether that area is as small as one individual valley or an entire planet ("bio" meaning life and "diversity" meaning variety. These areas, regardless of size, can also be classified as an **ecosystem**, defined most simply as a community of plants and animals and the environment in which they live.

Bull Trout are a large migratory fish native to the Northern Rockies and Pacific Northwest. They are actually a member of the **Char** family of fishes, related to the Arctic Char.

Char are members of the Salmonid group of fishes and distinguished from other salmonids such as trout and salmon by the absence of teeth in the roof of the mouth, no black spots on the dorsal fin, light-colored spots on a dark background, smaller scales, and differences in skeletal structure. Their range extends farther north than any other freshwater species except Alaskan blackfish.

A **Comprehensive** approach to species recovery means considering the entire range of the species including some historically occupied habitat which are suitable for reintroduction.

Connectivity refers to habitat that is linked together whereby Bull Trout have free access of movement from one area to another.

Dorsal fin is the top fin on salmonids. On Bull Trout, there are no black spots or markings on the dorsal fin.

An **ecosystem** is a defined area and consists of all the living plants, animals, fish and the environment in which they live.

Embryo is a developing stage of multicellular organisms. Bull Trout embryos have an exceptionally long development period, remaining in the stream bed gravels for 5-6 months before emerging as fry.

Extirpation is the elimination of a species from a particular local area. This is different from extinction, in which the entire species is eliminated permanently.

Fine Sediment is the portion of the streambed material that is comprised of sediments less than 6.35mm in diameter.

The **Five Cs** represent the habitat requirements of Bull Trout. They are Cold, Clean, Complex, Connected and Comprehensive.

Fluvial refers to a **life history form** of fish that grow large in a river and migrates to a small stream to spawn.

Foraging, Migrating, Overwintering (FMO) Habitat is typically downstream from spawning and rearing habitat and contains all the physical elements to meet critical overwintering, spawning migration, and subadult and adult rearing needs.

Fry is the youngest stage of Bull Trout following emergence from the embryonic sac.

Historically occupied habitat refers to areas where Bull Trout were once present, but have been extirpated from that portion of their range.

Identification is the process of correctly identifying a fish using key markings and physical characteristics.

An **Indicator Species** is a species used as a gauge for the conditions of a particular habitat, community, or ecosystem. For example, due to their stringent habitat needs, Bull Trout are an indicator of water quality and watershed health.

Large Woody Debris (LWD) refers to large pieces of wood within the stream, usually logs or root wads. These create deep pools.

Life Cycle is the entire sequence of stages in the life of an organisms, from the adults of one generation to the adults of the next.

Life History is the group of traits, such as size and number of offspring, length of maturation, age at first reproduction, and the number of times reproduction occurs, that affect reproduction, survival, and the rate of population growth.

Migration is a life history strategy whereby fluvial, adfluvial and anadromous Bull Trout move back and forth from feeding, migrating and overwintering habitats to spawning and rearing habitats.

Natal stream is the stream in which a Bull Trout is born and also where it completes its life cycle by returning to spawn as an adult.

Native refers to species which are endemic to the region in which they are located. They have naturally evolved with conditions in that area. A non-native species is one from a different ecosystem and is most often introduced by humans, both intentionally and unintentionally.

Pool habitat refers to deep pools within a stream. These pools contain colder water and provide resting and hiding habitat for native salmonids. Pool habitat is often associated with large woody debris and large rocks or boulders in the stream.

Range refers to the geographic area occupied by an entire species. It also known as a **distribution area**.

Rearing is the stage in the Bull Trout life cycle where they live in their natal stream for up to 2 years.

Redd is a nest constructed by female fish of salmonid species in streambed gravels where eggs are deposited and fertilization occurs.

Resident refers to a **life history form** of fish that spends its entire life in one stream.

Riffles are the fast-moving, shallower parts of streams between deeper, slower moving sections.

A **Riparian Area** is defined as the area adjacent to or beside a river, stream or lake. Riparian areas also include a variety of different types. Willows, alder, sedges and rushes are typically found within a riparian area but seldom found in upland areas.

Salmonids are from the Salmonidae branch of fishes that include the various trout species, salmon and char.

Spawning is the part of the reproductive process where the male and female Bull Trout return to their natal streams to mate. The female digs a redd in the stream bed into which she deposits the eggs.

Spawning & Rearing (SR) Habitat is typically headwaters streams where spawning and rearing of migratory or resident fish occurs. These areas contain the physical elements for Bull Trout (cold, clean, complex habitat) necessary to meet critical egg incubation and juvenile rearing needs.

An **Umbrella Species** is typically a wide-ranging species with stringent habitat needs. By meeting the needs of an umbrella species, many other species with smaller ranges and less stringent habitat needs can also be protected under the “umbrella.”

Watershed is an area of land from which rainfall (and/or snow melt) drains into a stream or other water body. Watersheds are also referred to as drainage basins or drainage areas. Ridges of higher ground generally form the boundaries between watersheds.

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Pratt, K. L. 1992. A review of bull trout life history. In: Howell, P.J.; Buchanan, D.V., eds. Proceedings of the Gearhart Mountain bull trout workshop; 1992 August; Gearhart Mountain, OR. Corvallis, OR: Oregon Chapter of the American Fisheries Society: 5-9.

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Weaver, T. and J.J. Fraley. 1991. Fisheries habitat and fish populations. Pages 53-68 in: Flathead Basin Cooperative Program Final Report. Flathead Basin Commission. Kalispell, MT.

Links to Bull Trout & Watershed Education Sites

<http://www.cfwep.org/>

<http://www.fws.gov/pacific/bulltrout/>

<http://fwp.mt.gov/education/fishingeducation/default.html>

<http://www.streamnet.org/>

http://www.phschool.com/science/biology_place/glossary/index.html

<http://www.swrcb.ca.gov/waterwords.html>