SALISH AND KOOTENAI TRIBES'

LEARNING ABOUT THE RIVER

Dear Educator,

These instructional materials support the *Interactive Map of the Lower Flathead River DVD*, produced by the Confederated Salish and Kootenai Tribes. They are intended to be used after your students attend the Tribes' annual River Honoring and after the students have explored the interactive map. We also recommend one or more field trips to the river using the plant and animal guide while visiting some of the sites discussed in the interactive map. The river is a wonderful educational resource that we are lucky to have available to us for learning about our local environment and history, so we encourage you to make full use of it.

Lesson 1. You Decide: An Exploration of Real-world Management Dilemmas

Essential question: If you were a land manager working on the river, how would you manage the river corridor for hydropower, grazing, off-road vehicles, and recreational use?

It is the desire of the Tribes that the natural and cultural values of the Lower Flathead River Corridor be preserved for present and future generations of the Tribes; that management shall give priority to enhancing resource values associated with traditional cultural uses of the corridor such as hunting, fishing, plant harvesting, and other cultural activities; that resource uses are managed to be compatible with the restoration and maintenance of the river's outstanding natural and aesthetic qualities; and that management shall be consistent with the needs and desires of the Tribes.

Directions:

1. Introduce the concept of "land management" and how it often involves making hard choices. Ask students to define the term (making decisions about how an area of land will be used and cared for) and ask them what kind of college degree a person would need to be a land manager (forestry, wildlife or fisheries biology, natural resource conservation, range management, wilderness management, land management). Explain that most of what a land manager does is manage the use of the land and water, deciding for example, where and when should cattle be grazed? How many recreationists are too many, and what types of recreational uses are appropriate? How should a dam be managed to ensure that river flows meet the land management goals for the area? Tell your students that in the case of the lower Flathead River, the Confederated Salish and Kootenai Tribes own 82% of the land within the river corridor (the river corridor is defined as an area that includes one-half mile on either side of the river from just

below the tailrace of Kerr Dam to the Reservation Boundary) and as such, they have the primary responsibility of managing the river corridor. They have established several goals for its management, and the land manager must try to meet these goals. They include:

- *Develop management strategies that will ensure the restoration and protection of the scenic and environmental integrity of the corridor and that will minimize permanent human influences within the rural areas of the corridor.*
- *Promote uses that are consistent with the restoration and long-term preservation of the river's natural and scenic values.*
- *Give priority to appropriate tribal uses of the corridor.*
- *Emphasize education and visitor contact over regulation.*

Write these goals on the board. Tell your students to imagine that they are the land manager in charge of the river corridor and that their job involves making hard choices because they might affect long-standing uses of the land, the income of individuals or the Tribes, or the welfare of fish and wildlife populations.

2. Divide your class into groups. Assign each group one of the issues below and distribute the appropriate student handout (Student Handout 1a or 1b) to each group:

- *Grazing: Decide how cattle grazing should be managed within the river corridor. This group will write a brief grazing management plan, specifying the grazing management tools they would use to meet the goals that Tribes have set for the river corridor, explaining why they have chosen the tools they have.*
- *Recreation: Decide how much and what kinds of recreational uses will be allowed on the river and how those uses will be managed and how enforcement will be conducted. This group will write a brief recreation management plan, specifying the management tools they would use to meet the goals that Tribes have set for the river corridor, explaining why they have made the decisions they have, and why they have chosen the tools they have.*

SALISH AND KOOTENAI TRIBES'

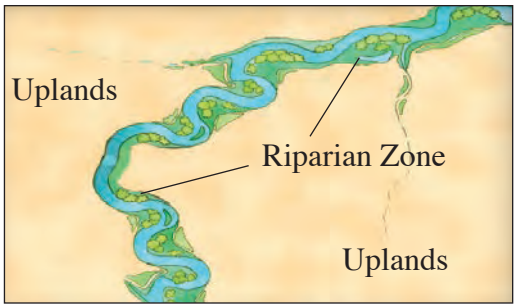
LEARNING ABOUT THE RIVER

Student Handout #1a: Grazing Management

Name: Date:

Directions: Study the information below and do your own research on the web to help you make land management decisions about how cattle grazing should be managed within the river corridor.

Within the river corridor, there are upland and riparian areas. Riparian areas are found along the banks of the river. Riparian habitat can be thought of as the green ribbon of trees and shrubs and grasses and forbs that follow the stream course. It is ecologically diverse and home to a wide range of plants, insects, amphibians, reptiles, and many, many different species of birds and mammals. Most of western Montana's mammal and bird species depend on or utilize riparian habitat. Upland areas are the drier grassland areas that border riparian areas. Uplands turn brown in mid summer, while the riparian stays green. Land managers typically manage these two types of areas differently.



We know what high quality riparian habitat looks like. It is diverse. It includes an overstory of large mature trees, a diverse shrub understory, and meadows of forbs, sedges, and grasses. It is expansive, occurring on undeveloped floodplains connected to the river. The shrub understory often forms dense thickets. And the plants are native. These characteristics mean the riparian zone will provide shade, food, and water; escape, hiding, and resting cover; breeding and rearing habitat; and travel routes for literally hundreds of wildlife species.

We also know what healthy uplands look like. They have lots of native grasses and flowering plants and few weeds. They are productive and resilient, and their soils are relatively stable and can resist erosion from wind and rain.

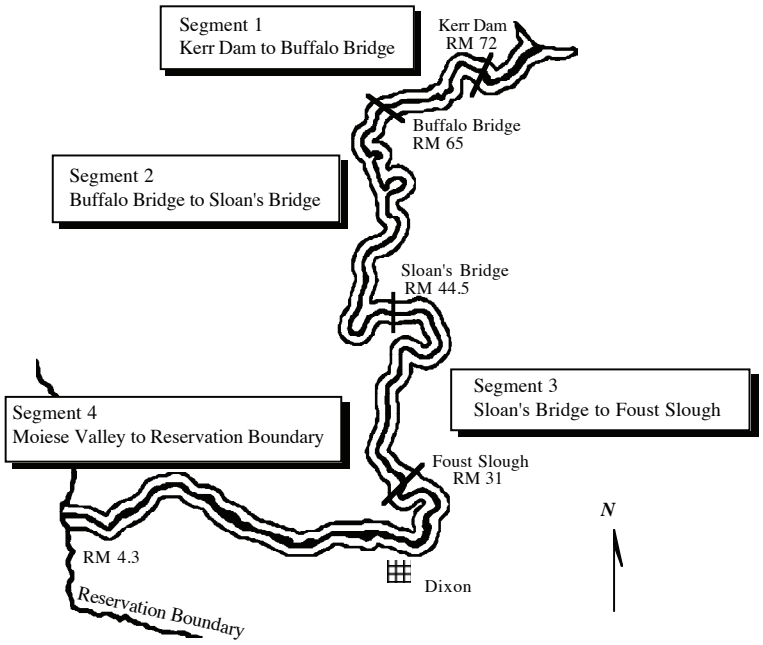
Decades of research by range managers, biologists, and hydrologists has shown the value of riparian areas to fish and wildlife and human communities. And we now know the range management techniques and tools that can promote healthy riparian areas.

Well-managed riparian areas. Healthy riparian areas have these multiple layers of vegetation—grasses, forbs, shrubs, and trees—of all ages. Stream channels are narrow and deep. Trout and other aquatic organisms thrive because healthy riparian areas create complex aquatic habitats. Wildlife also does well because of the diversity of habitats. Healthy riparian areas are vital because roughly 80% of wildlife use riparian areas for part of their lifecycle requirements.

Poorly Managed Riparian Areas. Overuse of riparian areas by livestock greatly simplifies or eliminates riparian vegetation. Multiple layers become a single layer of shallow-rooted grasses and weeds. Channels become shallower, the water warmer, and trout disappear. When the remaining mature trees die, few younger ones replace them. The site becomes drier and looks more like an upland area. Wildlife have fewer places to live, and forage for livestock declines. Passive restoration would manage livestock to minimize or eliminate these impacts.

Grazing in the river corridor.
Overview: There are twelve tribal range units that are intersected by the river corridor. Several other privately owned lands within the corridor are used for range or pasture. Tribal range units are permitted primarily for cow/calf operations and are used for either spring and summer or fall grazing. Grazing seasons run 3 to 5 months in duration.

Most of the cattle grazing within the corridor occurs in segments two and three. The west side of segment two of the river is part of a single range unit that is used as summer and fall pasture (May to October). Portions of the east side of segment two are broken into individual leases that the lease holder has the option of using as summer, fall, or winter pasture. The west side of river segment three is part of a single range unit used summer and fall. Rangelands on the east side of segment three are used principally in the fall.



Cattle do not distribute themselves evenly over the range. Riparian areas and uplands close to water receive concentrated use. Many of these areas have been heavily impacted by livestock over the years. The levels of use have often exceeded the capacity of native bunchgrasses to survive and reproduce. Riparian areas that were once dominated by shrubs have been converted to herbaceous communities, infestations of noxious weeds and undesirable species have increased dramatically in recent years, streambank vegetation has been reduced or eliminated, and bank erosion has accelerated. Cattle readily graze young cottonwoods, and this has contributed to the significant general decline in cottonwood regeneration throughout the corridor. In recent years, leafy spurge has become established on the banks of some islands of segments three and four. Leafy spurge is extremely difficult to control and is rapidly spreading throughout the lower riparian areas. Other noxious weeds within the riparian areas include spotted knapweed, sulfur cinquefoil, and thistles. The timing of use is also a problem; in some areas cattle are turned out on the range too early in the spring. While there is a need for an up-to-date assessment of range conditions, indications are that the current conditions of riparian areas and uplands located near the river are at best fair to poor and deteriorating.

The following tools are used by ranchers and land managers to produce healthy riparian and upland areas:

- **Timing:** Time grazing so cattle are not in sensitive areas when they are vulnerable, such as in spring when stream banks are saturated with moisture and susceptible to trampling or when seedlings or shrubs or sensitive forbs might be damaged. The proper timing of grazing can also give sensitive plants time to produce seed before they are eaten, ensuring the plants successfully reproduce.

- **Fencing:** Fencing of riparian, wetland, and sensitive habitats can protect areas from overuse by livestock or other human activities.

- **Access to Water in Combination with Fencing:** Providing ease of access to water through limited graveled or hardened access points that livestock will prefer to use can protect stream banks and riparian vegetation. It can also prevent cattle from going through fences.

- **Herding:** Depending on topography and vegetation, herding cattle to keep them out of riparian and other sensitive areas can be one of the most effective means of protecting streams.

- **Off-site Water Developments:** Stock water developments like these tanks placed at springs can attract cows away from riparian areas and eliminate the need for cattle to visit a stream.

- **Mineral Blocks and other Attractants:** Mineral blocks, salt blocks, oilers, or rubbing posts will draw animals away from riparian areas.

- **Deferred Rotational Grazing:** Rotational grazing requires subdividing the range into smaller units and rotating the cattle through them. Deferred rotation involves changing the sequence of rotation from year to year. A given field is never grazed at the same time two years in a row. This provides rest for pastures, avoids season-long grazing, enables ranchers to control the season of use, and generally yields higher production.

- **Intensity of Grazing:** By controlling the intensity of grazing, ranchers can substantially lessen the impacts on riparian areas. Intensity is a function of animal numbers times the duration of the grazing.

- **Rest:** Resting rangeland can enhance plant vigor and improve the stream condition. It allows for bank building and enables tree seedlings to grow and reach a more grazing-resistant stage.

Review the Tribes goals for the river corridor and use the information above and any other information you can glean from the Internet to develop a brief grazing management plan for the river corridor. You have a budget of $20,000 a year. Use the tools you feel are appropriate and well suited for the river corridor. Give reasons for your decisions.

SALISH AND KOOTENAI TRIBES'

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Student Handout #1b: Recreation Management

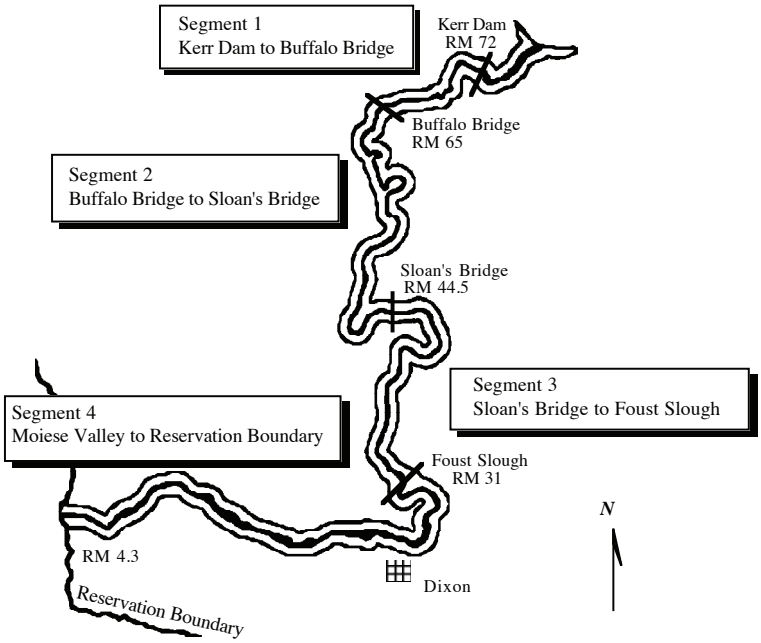
Name: Date:

Directions: Study the information below and do your own research on the web to help you make land management decisions about how recreational use should be managed within the river corridor.

The most recent data estimates non-commercial or public use of the river is approximately 14,193 visitor days for the thirteen-week period running from the first week in July to the second week in October. Winter use is estimated to be only about three to five percent of that occurring in summer. There is a significant amount of non-floating visitor use that occurs just below Kerr Dam (associated with the Kerr Overlook and the river shore immediately below the dam) which has not been documented. Hence, total commercial and non-commercial use is estimated to be between nineteen and twenty thousand visitors days per year.

According to visitor registration data, segment one, which received about half of the total use, is the most popular stretch of river among recreationists. It is followed by segments two (27%) and four (19.4%).

The river corridor is traversed by many roads and is accessible at dozens of points; for example, segments one and two alone contain over sixty roads that provide access to the river. The access point receiving the most use is Buffalo Bridge. This is because boaters using both segments one and two use the site to either take-out or put-in. According to visitor registration data the second most popular access point is the old Dixon Bridge site, then Kerr Dam, and then Sloan Bridge. However, informal observations suggest that registration compliance may have been low at the Kerr and Sloan sites (Kerr Dam for example, probably receives more use than the old Dixon Bridge site).



There are dozens of impromptu campsites (campsites created by visitors, not managers) scattered throughout the corridor. The largest of these are at Goose Bend (river mile 62) and the Moiese/Foust Slough area (river mile 30). Three official campsites or picnic areas have been modestly developed with tables, outhouses, or both. These are located at Buffalo Bridge, Sloan Bridge, and the old Dixon Bridge site. The most popular campsites on the river are at the Buffalo Bridge, Moiese/Foust Slough and Goose Bend areas. There are four frequently visited cultural or historical sites.

There are approximately seven easily accessible boat ramps within the corridor. These are located in the vicinity of Kerr Dam, Buffalo Bridge, Sloan Bridge, Dixon, and the Perma Bridge. They are used by canoeists, rafters and motorboaters. During the peak floating times, lines often form at the Kerr Dam and Buffalo Bridge launch sites.

The visitor survey of river users found that canoes and rafts make up 70% of the boats on the river, while motorboats account for about 11%. The majority of persons using motorboats are anglers. Tribal regulations restrict motorboat use to fifteen horsepower or under and the river is closed to all motorboat use from March 1 to June 30.

The survey also found that the most popular activities of recreationists are floating, photography and nature study, swimming, fishing, picnicking, and camping, in that order. The average size of a group is between 4.6 and 5.4 persons. The most common group size is two. However, over 14% of the use is from groups of eleven people or larger, and groups as large as seventy have been reported. The average length of stay is 1.35 days. Virtually no groups stay longer than four days. Most visit the river during evenings, especially on weekends.

When people visiting the riverwere asked to rank uses that they perceive as conflicting or potentially conflicting with their enjoyment of the river, the use of motorboats was ranked the highest. Off-road vehicle use, changing water flows, and logging, also ranked high.

Off-road motorcycle use and other forms of off-road-vehicle travel have created numerous impromptu roads and trails, often on steep grades. Most of this use occurs on the east bank of segments two and three, in the vicinity of Buffalo and Sloan bridges. It has resulted in a serious degradation of the aesthetic quality of the river corridor and has created chronic erosion problems.

Due to the remote nature of much of the river corridor enforcement of tribal recreation regulations is difficult. Indications are that a number of problems related to law enforcement exist. The most significant of these are low permit compliance and indiscriminate off-road vehicle use. A part-time river ranger could help to alleviate many of these problems.

Visitor use surveys suggest strongly that recreationists are attracted to the river because of its remote, undeveloped, natural character, and they feel strongly that off-road vehicle use destroys this quality of the river.

The culture committees have stated that current levels of recreational use conflict at times with traditional tribal member uses of the river. In addition, vandalism of at least one important cultural site located near a popular recreation area has occurred. Traditional Indian uses, which include hunting, fishing, food and medicinal plant harvesting, and spiritual uses require a high degree of privacy and a pristine natural environment. The Salish/ Pend d'Oreille Culture Committee believes that increases in recreational use that are uncontrolled may one day destroy the values that make the river a vital cultural area.

The following **tools** are used by land managers to manage recreational use on rivers:

- **Education:** An important and powerful tool for many managers is to step up education efforts to inform the public about recreation etiquette on the river (for example, educating people about the damage done by indiscriminate off-road vehicle use so that people believe it is no longer "cool" or acceptable to drive off of designated roads).

- **River Rangers:** Some river managers hire river rangers. They patrol the river by boat and by road to ensure that visitors are following regulations and that they are not driving their vehicles off of designated roads.

- **Increased Law Enforcement:** If budgets do not allow for dedicated river rangers, managers can step up patrols of existing game wardens who can patrol many areas of the river corridor by vehicle.

- **Increased Fines for Violations:** In addition to education and increasing patrols by game wardens, managers can work with the Tribal Council to implement stiffer penalties for people who violate regulations (for example, for people who drive their vehicles off of designated roads and cause erosion problems).

- **Fencing and Barriers:** Another option is for managers to build fences and create barriers that block visitors from using their vehicle off designated roads. This can be effective in some areas. In other areas where the terrain allows, people can simply drive around the barrier or cut a fence.

- **Permit Systems:** To provide a quality experience and to protect fragile river resources, managers have designed and implemented permit systems on some rivers that limit the total number of boaters through a permit system. While this means that you may not get on the river as often, when you do, it may be a better experience: conditions will not be as crowded, you will have no trouble finding a place to camp, and camp areas will be in good condition. Users must apply for a permit in advance and depending on demand may or may not receive one.

- **Packing Out Requirements:** Some rivers have human waste pack-out requirements. Visit this site: http://www.river-management.org/better-boater-bathrooms to learn about “Better Boater Bathrooms” for details and a list of human waste pack out systems and products.

Review the Tribes goals for the river corridor and use the information above and any other information you can glean from the internet to develop a brief recreation plan for the river corridor. Use the tools you feel are appropriate and well suited for the river corridor. You have a budget of $20,000 a year. Give reasons for your decisions.

Lesson 2. What did you catch? Learning to identify fish.

Essential question: A habitat is an area that offers feeding, roosting, breeding, nesting, or refuge areas for a fish, reptile, amphibian, bird, or mammal species native to Montana. Montana's fish and wildlife is one of its most precious resources. Surveys consistently show that residents value fish and wildlife as part of their quality of life. In addition, fish and wildlife are valued throughout Montana for the contribution they make to tourism, recreation, hunting, and fishing. As a result, there is an increasing appreciation of the role that fish and wildlife contribute to quality of life. What do you think are some of the most important things managers can do to ensure people take care of Montana's native fish species?

Biologists have long recognized the importance of public education in the restoration of imperiled resident fish, and specifically bull trout. For example, the Montana Bull Trout Restoration Team recommended an increased level of education and information as an essential part of bull trout recovery. They advised implementing a broad-based education effort to reduce the mistaken identification of native species, decrease the introduction of non-native species, minimize illegal harvest, reduce habitat degradation, and generate strong support for restoration and protection activities. To protect imperiled resident fish, managers need to enhance public education and awareness of management efforts through activities like fair displays, school programs, media contacts, angler education classes, etc.

Directions:

1. Lead a discussion about why it is important for anglers to know the fish they catch (see sidebar for some reasons that biologists cite and tools they think should be used).

2. Challenge students: "How well do you think you know the fish, particularly the trout, found in western Montana streams like the lower Flathead River? What is your background related to fishing?" Have the students write a paragraph about their experience(s) with fishing, who taught them how to fish, and how well they think they know the fish found in the river. If a student has not fished before, tell them it is still important to know our fish because everyone should know about the environment around them so they can help managers make informed decisions.

3. Prepare the "fish image cards" in advance by printing a set for each class group on card stock, then cutting them apart on the dotted lines, making sure that the species name is not on any of the pieces. Shuffle each set. Write the following fish names on the board: Bull Trout, Westslope Cutthroat Trout, Slimy Sculpin, Mountain Whitefish, Brown Trout, and Longnose Dace.

4. Divide students into small groups (3-4 students per group) and hand out one set of fish image cards per group along with two different colored pens. Tell them that six species (the six you have written on the board) are represented and that there are six image cards for each species. Ask each group to identify the species in each image by writing the name of the fish on the back of the image card using one of the colored pens. This should be done based only on the student's current knowledge (without using any other references).

As the students are doing this, remind them that many fish look different based on their life stage, with juveniles and spawning adults having variations (sometimes dramatic) in appearance and coloration.

As students negotiate with each other regarding their best guesses of species, rove the room listening. In the event that a group struggles, pose questions, but don't give answers. Examples might include:

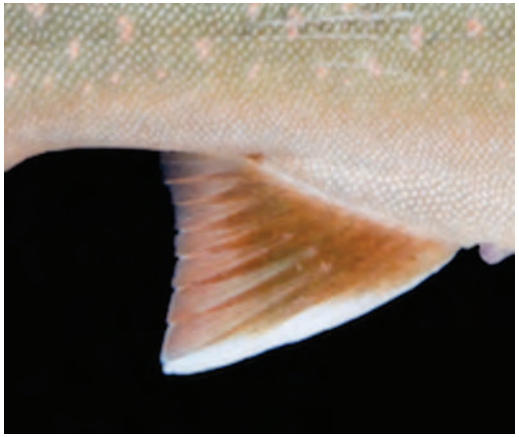
"What do you notice?"
"Is there a difference between, this and this?" (referring to two images)
"What is the difference between these two?"
"What life stage do you think that one might be in?"
"Why do you think this one goes with these?"
"What is the same (or different) about these?"

When students have grouped all the cards, inform them that they will be required to confirm their ID's by conducting further research in the section on Fish>Species Profiles found on the Explore the River DVD. If you don't have a copy of the DVD, you can request one from Germaine White in the Tribes' Natural Resource Department or have your students look up the fish on the internet. Have

them write the results of this research on the back of the card in the second color. How many did they get right? At the end of the lesson, you can hand out the Fish Guide, "Common Fish of the Lower Flathead River," to the students so they can take it with them next time they go fishing. The guide can be found at the end of this lesson.

Bull Trout Image Set

Cut on dotted lines.



Westslope Cutthroat Image Set

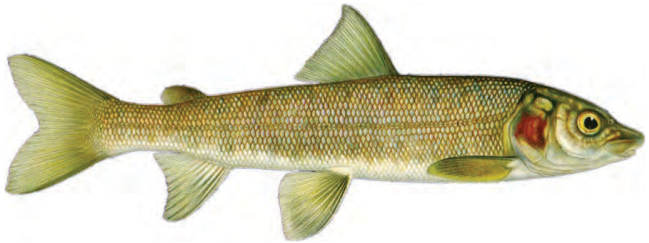
Cut on dotted line.

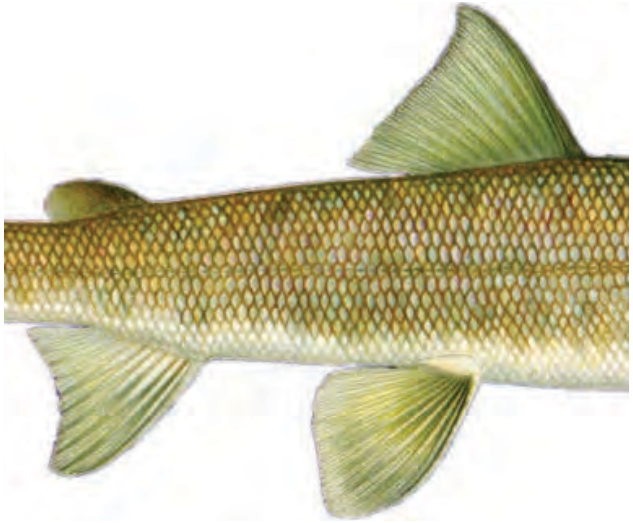
Slimy Sculpin Image Set

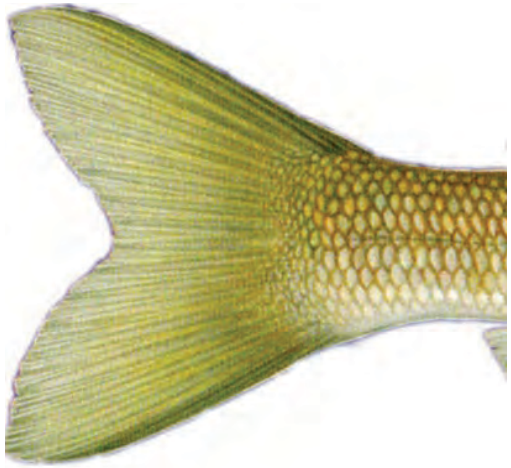
Cut on dotted lines to create fish image cards.

Mountain Whitefish Image Set

Cut on dotted lines to create fish image cards.

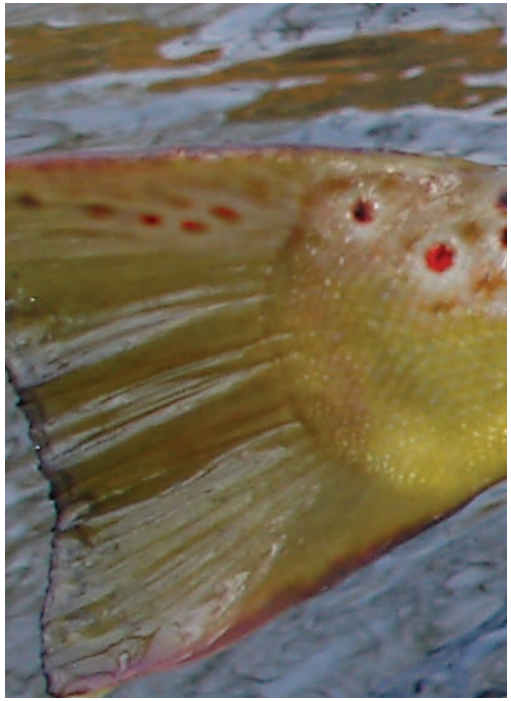






Brown Trout Image Set

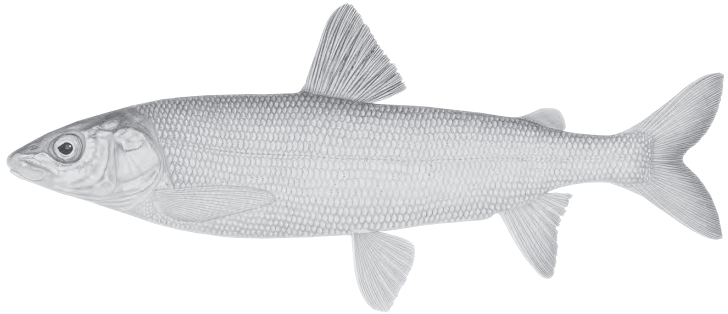
Cut on dotted lines to create fish image cards.



Longnose Dace (from the Minnow Family) Image Set

Cut on dotted lines to create fish image cards.

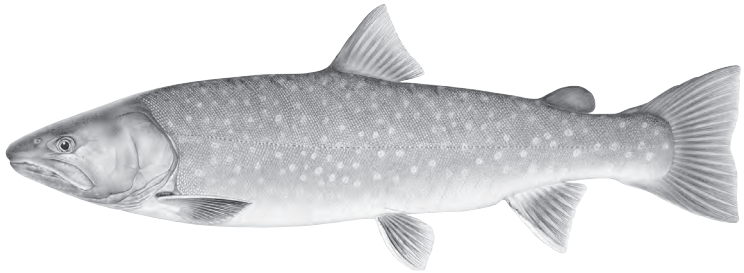
Common Fish of the Lower Flathead River†



Mountain Whitefish
Prosopium williamsoni
The mountain whitefish is a native species and an active feeder that eats mostly aquatic insects, but also takes terrestrial insects that fall into the water. It feeds in riffles throughout the winter. Age and length statistics are as follows: 1st year – 4 inches; 2nd year – 8 inches; 3rd year – 11 inches; 4th year – 13 inches; 5th year – 14 inches; 6th year – 16 inches.

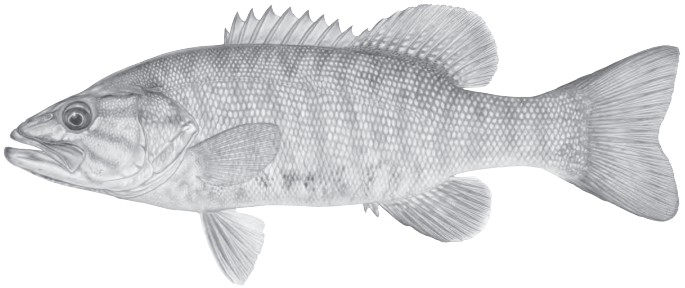
Westslope Cutthroat Trout
Oncorhynchus clarki
Westslope cutthroat trout is one of several subspecies of cutthroat trout native to the Rocky Mountain region. It often exhibits bright yellow, orange, and red colors and is generally distinguishable from other inland subspecies of cutthroat trout by the particular pattern of black spots that appear on the body.

The species feeds primarily on immature and mature forms of aquatic insects, and terrestrial insects. It rarely feeds on other fishes. Average age and length statistics are as follows: 1st year – 3 inches; 2nd year – 6 inches; 3rd year – 8 inches; 4th year – 10 inches; 5th year – 12 inches. The species is declining throughout much of its range.

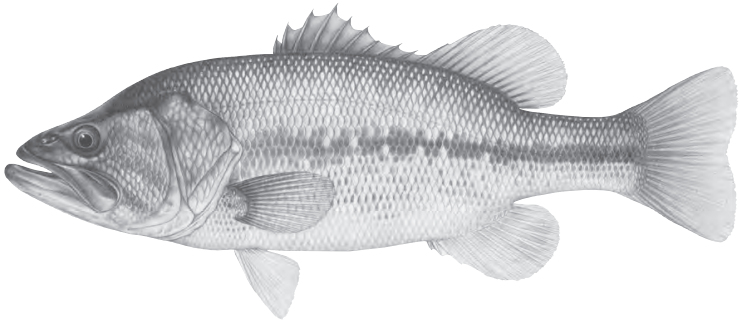


Bull Trout
Salvelinus confluentus
The bull trout received its name from its large head and mouth. It is also distinguished by its predatory nature, and its diet as an adult consists largely of other fish. But when given an opportunity it has also been known to eat frogs, snakes, mice, and ducklings. Bull trout can live up to ten years and are sexually mature after four. Average age and length statistics are as follows: 1st year – 3 inches; 2nd year – 5.5 inches; 3rd year – 8 inches; 4th year – 11 inches; 5th year – 14 inches; 8th year – 20 inches. Can reach over 35 inches. The species is declining throughout much of its range.

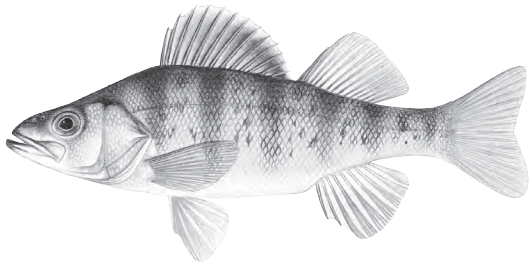
Brown Trout
Salmo trutta
Introduced from Europe in 1883, the brown trout is now widely established in western United States. It is more difficult to catch than rainbow trout and cutthroat trout and has a reputation for being able to resist environmental changes. The coloration is normally yellowish-olive dorsally, with black and occasional orange-red, blue-bordered round spots on the sides. Food is primarily insects, other invertebrates, and smaller fishes.



Smallmouth Bass
Micropterus dolomieui
This nonnative is distinguished by its bronze back, red eyes, defined dark bars that radiate out from the eye area, and tiny flecks of gold on some scales. It is a cool water species that prefers streams with gradients sufficient to produce riffle areas and clean bottoms. In the Lower Flathead River it is found in the reach below Dixon. Smallmouth take about 4 years to become sexually mature. The average weight is from 1 to 3 lbs.

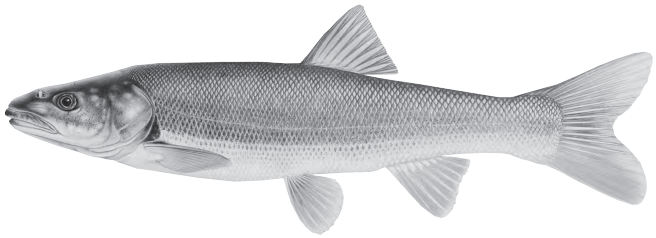


Largemouth Bass
Micropterus salmoides
The largemouth is found in every state, but the species originally ranged from the Great Lakes region to the Rio Grande and eastward to Florida. It is not native to western Montana. It prefers somewhat turbid, weedy, quiet waters. It may be distinguished from the closely related smallmouth by its larger size, the dark lateral stripe, and the fact that the posterior end of the upper jaw extends to beyond the eye in adults. Largemouth reach up to 22 pounds and feed mainly on other fishes.



Yellow Perch
Perca flavescens
Yellow perch have an almost circumpolar distribution in the fresh waters of the northern hemisphere. They are generally 4-10 inches long. Coloring varies with size and habitat but usually the back and head are a bright green to olive or golden brown; sides are a yellow- green to yellow with the color of the back extending down in tapering bars. Spawning occurs in the spring in the shallows of lakes and tributary rivers.

Northern Pike
Esox lucius
The basic coloring of this fish is light spots on a darker backing, the back being a brilliant green through olive-green to almost brown. The eyes are a brilliant yellow. The northern pike is a spring spawner who scatters its eggs at random throughout the heavily vegetated floodplains of rivers, marshes and lakes. The eggs hatch 12-14 days later. Life expectancy ranges from 10-26 years according to the area. Adults feed largely on other fish as well as frogs, crayfish, mice, muskrats and ducklings.



Northern Pikeminnow
Ptychocheilus oregonensis
The northern pikeminnow, a native of the Columbia River system, is a large member of the minnow family. It has a long snout and large mouth and is similar in shape to the walleye. It eats other fish and invertebrates. There is concern elsewhere in the Columbia Basin that northern pikeminnow are hurting salmon recovery.

Lesson 3. Who Belongs Where? An Exploration of Aquatic, Riparian and Upland Habitats and the Animals that Use Them.

There are several, related meanings of the word habitat. Here we talk about broad categories of habitat that are not species specific. For example, in the context of this lesson, the term aquatic habitat refers to the underwater area of the river. The term habitat can also be used to refer to the place where a specific population of a given species lives. The habitat must supply at least some of the needs of that organism, such as food, water, temperature, oxygen, or minerals. If the population's needs at that point in its lifecycle are not met, it will move to a better habitat.

Essential questions: Why is it important to have a diversity of habitats? Why is having connections between these habitats important? What would happen if one kind of habitat became severely degraded?

Habitats are the places where plants and animals live. For bull trout it's cold, clean water. For caddisflies and ouzels it's the water in the river, the air above it, and the plants on its banks. While there are many kinds of wildlife habitats, this lesson will only look at the major types—aquatic, riparian, and upland—and some of the species associated with each. Most animals use more than one type of habitat because they have specific requirements for feeding, roosting, breeding, nesting, and refuge areas that cannot always be found in a single habitat. One of the most important points about habitats that is constantly reiterated by Tribal elders is that aquatic and riparian and upland habitats are interrelated and should be treated as such.

Directions:

1. Ask students to take 5-10 minutes and write a brief definition of each of the following types of habitats (formal definitions are given in parentheses). The definitions should be short—one to three sentences at most.

> *Aquatic: (Aquatic habitat in a river like the lower Flathead is the area contained within the river's channel with water. The water may move permanently or intermittently or be still, as in a riverside pond.)*
>
> *Riparian: (Riparian habitat is found along the banks of the river where the water table is relatively high. It can be thought of as the green ribbon of trees and shrubs and forbs that follow the stream course.)*
>
> *Upland: (Upland habitat is the drier grassland areas that borders riparian habitat and is higher in elevation so is father from the water table. Uplands turn brown in mid summer, while the riparian stays green.)*

2. Distribute the two-page "Lesson Three Student Handout" to each of the students. Ask the students to work in pairs and use the information presented in the handout and the internet (if needed) to complete the handout.

3. When the students are done, lead a classroom discussion about the importance of connected habitats using the information below to lead the discussion:

> *In connected riparian areas, animals can move easily between different habitats. In fragmented riparian areas, many animals are prevented from moving between different habitats, some of which may be essential for the species' survival.*
>
> *When a riparian area becomes fragmented, it can prevent some wildlife species from finding other members of their kind. As their habitats become smaller because of development or land clearing, the distance between members of a species increases. The developed areas can become barriers if species are unwilling to cross them or if they are killed when they try to cross.*
>
> *Population effects of isolation will occasionally lead wildlife populations living in small patches to die off in that immediate area. Causes include the inability to access required habitats, disease, disturbance, increase in predators or competitors, and fluctuations in birth and death rates.*

By creating small and isolated patches of natural space, fragmentation can divide a once large wildlife population into smaller, more vulnerable populations. Small wildlife populations are more likely to succumb to random events that can harm them than large populations. If a population of salamanders, for example, dies off in a small riparian patch because of a fire or disease outbreak and there is not another population in a nearby patch, the species cannot re-establish a new population.

Wildlife populations can be susceptible to a number of genetic effects from isolation as well. Close relatives are more likely to mate as populations become isolated. Common results of breeding between relatives are increased juvenile mortality, decreased fertility, and reduced overall ability of a species to survive.

Small populations are likely to become more genetically similar — the potential for change and adaptation is lost. A species may lose a rare genetic trait that could help it survive under different circumstances.

In most species, some individuals will disperse away from their natal population to ensure genetic diversity. In fragmented landscapes, dispersal is not possible, and so there is no opportunity for outside individuals to bring new genes to a population with declining genetic diversity.

Encourage your students to do research on the fragmentation of habitats and its impacts on song bird habitat. You might ask them to write a short paper on the subject.

SALISH AND KOOTENAI TRIBES'

LEARNING ABOUT THE RIVER

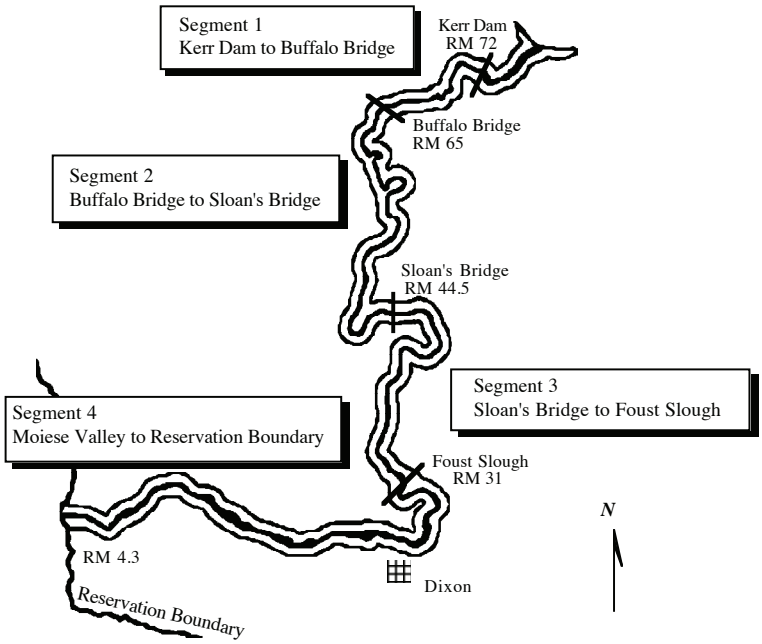
Student Handout #3: Who Belongs Where?

Name: Date:

Directions: Read the information below and then complete the activity that follows.

Big game species found within the corridor include white-tailed deer, mule deer, bighorn sheep, pronghorn antelope (on the Bison Range), elk, moose, and black bear. Of these seven species, deer are the most plentiful. In the upper half of the river (segments one, two and three) small herds of white-tailed deer and to a lesser extent mule deer move between the upland shrub and herbaceous communities and the narrow riparian habitats of the river bottom. The brushy draws that are common in this stretch of river are used extensively by deer as travel corridors and for resting and hiding cover.

The riparian zone of the lower half of the river (segment four) supports small, year-round resident herds of white-tailed deer, while both white-tailed and mule deer use the uplands. The south-facing slopes on the north side of the river provide winter range for mule deer herds and small groups of white-tailed deer from the Ferry Basin area.



Bighorn sheep were transplanted near Perma in 1979 and are now well established. The herd disperses over a large area during lambing, but winters on the south-facing slopes on the north side of the river from just below Perma to beyond the Reservation boundary.

Elk visit the corridor occasionally, moving into segments three and four from Ferry Basin to the north and the Magpie-Seepay area to the south. Most of their use is restricted to the upland zone where they feed on bitterbrush and native grasses.

Moose from the Revais, Magpie and Seepay drainages occasionally travel into riparian areas along this same stretch of river. It is believed that this was the traditional winter range for these populations. However, moose sightings are now rare, probably due to hunting pressure and limited moose numbers.

Black bears occur throughout the corridor. Their densities are highest in the wetter and brushier riparian areas of segment four where favored foods are abundant and there is adequate cover. Many of the larger ponderosa pine trees have claw marks on their trunks from black bears.

Coyotes, red foxes, bobcats, mountain lions, striped skunks, badgers, and long-tailed weasels are considered more or less common animals in the corridor. Each of these carnivores occupy specific upland niches, although all, with perhaps the exception of badger, frequent the riparian zone.

Semi-aquatic furbearers within the corridor include beavers, raccoons, muskrats, mink, and river otters. The most recent sign surveys, which were carried out from 1985 to 1988, indicate that, in general, furbearer density is low on the upper half of the river (segments one, two and three). Beavers are the most abundant furbearer on these upper segments, although their populations are limited by a lack of suitable habitat. Raccoons are common on the upper river, while surveys have found very little mink and no muskrat sign there.

Several species of reptiles and amphibians use the riparian and aquatic habitats as well. Painted turtles inhabit backwater and slough areas and several species of snakes—including bull snakes, common and western garter snakes, rubber boas, and prairie rattlesnakes—use riparian and adjacent upland areas. Spotted frogs and Pacific chorus frogs inhabit backwater and slough areas, and bullfrogs, an introduced species, can be found in potholes along the river near Perma.

Peregrine falcons (*Falco pereginus*) were undoubtedly once more common but habitat destruction and the widespread use of DDT and other pesticides dramatically reduced the numbers. Since DDT has been banned in the U.S. and a captive breeding program started, peregrine falcons have increased steadily in many parts of their former range. On the Flathead Indian Reservation, the species probably inhabited portions of the Mission Mountains and lower Flathead River. Prior to the early 1990s, peregrines were observed as occasional migrants during fall and spring, and were seen during the summer as recently as 1990. In the early 1990s two reintroduction sites were established on the Reservation. Reintroduction has been successful at both of these sites, and additional nesting territories have been established.

At least twenty bald eagle breeding territories occur within the Flathead Indian Reservation. Most of these are along the Lower Flathead River, on islands or the shoreline of Flathead Lake, or along tributaries and near irrigation reservoirs. Migrant and overwintering bald eagles may number as high as 70 birds during peak periods.

Species considered sensitive within the corridor include ospreys, prairie falcons, golden eagles, and other raptors. One survey found 8 prairie falcon nests over the 72 mile stretch of river, which is not considered a particularly high density. The nests were distributed throughout the corridor and were generally found on cliffs located near upland grasslands. These birds are specific in their nest site requirements and are quite sensitive to disturbances such as roads, buildings and other structures.

Other raptors known or suspected to nest within the corridor include: golden eagles, marsh hawks, red-tailed hawks, American kestrels, sharp-shinned hawks, Swainson's hawks, great horned owls, short-eared owls, long-eared owls, and screech owls. Of these, all but the Swainson's hawk use the river as a wintering area. Merlins may nest within the corridor, and Cooper's hawks and goshawks migrate through the area and may nest there.

Several waterfowl species nest in the corridor. The most common of these are mallards, common mergansers and Canada geese. Most waterfowl use occurs in the winter, however, and species common during these months include mallard, common merganser, Canada goose, eared grebe, common goldeneye, and red-breasted merganser. Canvasbacks, ruddy ducks and pintails have been observed on the river but are uncommon. Tundra swans, and occasionally trumpeter swans, can be seen during spring and fall migrations.

A number of other populations of birds depend directly on the river. Among these are great blue herons, double-crested cormorants, cliff swallows and belted kingfishers. There are three active great blue heron nest concentrations on the river. These are relatively small and most occur in river segment four. Double-crested cormorants do not nest on the river. However, populations nesting at Ninepipe and Pablo Reservoirs depend heavily on the river as a fishery. Concentrations of cliff swallows are abundant anywhere clay or rock cliffs border the river, and belted kingfishers are common throughout the corridor. Ring-necked pheasants are the most common upland game bird in the corridor. On the upper half of the river they occupy principally agricultural lands and adjoining grasslands. On the lower half they use agricultural lands, brushy riparian areas, wetlands, and more densely vegetated islands. Ruffed grouse occur in segment four wherever mixed deciduous-coniferous forests with dense undergrowth are found. Hungarian partridges are common in upland areas. Wild turkeys and chukars are uncommon.

Activity

Work in pairs and use the information presented in the preceding paragraphs and on the interactive map to list 10 species that use each type of habitat. For each species, describe the type of use (for example: feeding; roosting; breeding; nesting; thermal protection (shade); water; hiding and resting cover; rearing habitat; and travel corridor). A species may use more than one kind of habitat or may use a single habitat in several ways.

Aquatic Habitat

Species	Habitat Use
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

Riparian Habitat

Species	Habitat Use
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

Upland Habitat

Species	Habitat Use
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

Lesson 4. Healthy Land and Water: Living in Harmony with the River

Essential questions: Why does one river support an abundance of healthy native fish while another has few fish and even fewer native fish species? Why are some river corridors full of wildlife, while others have little or no wild species living on their banks? In other words, what makes a healthy river? In this lesson, students will explore some of the factors that make for a healthy river.

Directions:

1. Lead a discussion with your students about why we need healthy rivers using the following information[1] as a discussion guide (you might also use the information in the sidebar to explore with the students how they would define a healthy river):

Why We Need Healthy Rivers

Clean, healthy rivers are the lifeblood of our communities and are vital to our health, safety, and quality of life. Most Americans live within a mile of a river or stream, and all of our drinking water comes directly or indirectly from rivers and streams. By protecting and restoring rivers, we are protecting clean drinking water, creating jobs and recreation opportunities that benefit our economy, and revitalizing our natural heritage for future generations.

Healthy Rivers Give Us Clean Drinking Water

More than 60 percent of Americans' drinking water comes from rivers and streams. A healthy river and surrounding forests can act as a natural water filter, reducing the need to treat the water with chemicals or expensive filtration systems.

Healthy Rivers are Home to Fish and Wildlife

America's rivers support a wide variety of wildlife and fish, and are especially important during times of breeding and migration. In dry areas, particularly in the western U.S., rivers and streams are crucial to the well-being of wildlife. From kingfishers to crawdads, otters to black bears, eagles to trout, whatever creature you're looking for, chances are you'll find it along the river.

Healthy Rivers are Good for the Economy

Going fishing may feel like taking the day off, but its overall economic impact in the U.S. is estimated at $116 billion. And consider the fact that more people fish in the United States than go to Disneyworld. When Americans participate in outdoor activities, they aren't just having fun and staying fit, they're also pumping billions of dollars into the economy—in industries including manufacturing, leisure and hospitality, transportation, and wholesale and retail trade.

What is a healthy river? It is one which has flow regimes, water quality and channel characteristics such that:

- in the river and along its banks, the majority of plant and animal species are native, and the presence of exotic species is not a significant threat
- natural ecosystem processes are maintained
- major natural habitat features are represented and are maintained over time
- native river bank vegetation is sustainable along the majority of the river's length
- native fish and other animals can move and migrate up and down the river
- linkages between river and floodplain and associated wetlands maintain ecological processes
- natural linkages to lakes are maintained
- associated lake systems are productive ecosystems.

An ecologically healthy river could be one where some aspects of river condition may have been traded off to provide for human uses. It might be a river where a balance may have been struck between human use and the ecology of the river – a balance where the integrity of the system is still preserved, a reasonable level of human needs can be met, and where both can be sustained into the future.

While parts of the lower Flathead River ecosystem are not as healthy as they could be, the river is a good example of one where human uses are or can be compatible with a healthy river. The river generates power, uplands and riparian areas within the corridor provide grazing habitat for cattle, and it is well used by recreationists.

Perhaps most important, the river remains important as a cultural and historical resource for the Confederated Salish and Kootenai Tribes. Upper Pend d'Oreille, Salish and Kootenai families and individuals continue to camp, hunt, fish and harvest foods and medicinal plants along its banks, as their ancestors did, and places that have been used for hundreds, if not thousands of years, are still visited by tribal members.

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1 *Adapted from American Rivers: http://www.americanrivers.org/about-rivers/why-we-need-healthy-rivers.html*

Healthy Rivers are Fun!

Beyond all the other services and benefits healthy rivers can provide, they are just plain fun. Rivers and streams offer endless recreation opportunities, including swimming, fishing, boating, hiking, and wildlife-watching. Whether you need exhilaration, solitude, a much-needed break from the daily grind, or just a pleasant place for a family float or picnic, there's a river out there, beckoning you to come out and play.

Healthy Rivers are a Key Link our Heritage

To get an idea of just how important rivers are to our heritage, listen to the Welcome messages by Tony Incashola and Vernon Finley on the DVD.

2. Explain to the students that they will learn about two factors that can damage the health of a river. Ask your students to read the Lesson Four Student Handout and then, using what they have learned and the internet, write a three-page paper on one of the following two topics:

A. It is important to have healthy rivers because…

B. If I were the land manager in charge of managing uses along the lower Flathead River, I would manage for a more healthy river by…

Student Handout #4: What Damages a River?

Name: Date:

What Damages a River? Loss of Riparian Cover

Riparian areas and wetlands occupy less than 4% of Montana's land area, yet they are used by more than 80% of the bird species found in Montana and 75% of all vertebrates. Cottonwood riparian forests are especially important: no other habitat supports a higher diversity of breeding birds, and many species that breed in other habitats forage in cottonwoods during migration. So what happens when riparian habitats are converted to cropland or degraded by heavy grazing or logging or weeds?

Riparian Cover: Productivity

With Riparian Cover

During autumn, leaves drop into the stream. As they decompose, they are fed upon by aquatic insects. They, in turn, are the most important food source for fish and riparian birds. So a healthy riparian zone adds immensely to the productivity of the stream. Leaves also fertilize the floodplain. As they fall and decompose, they release carbon, nitrogen, and other chemicals that nourish the soil and that tree roots can assimilate the following season.

Without Riparian Cover

Riparian vegetation supplies energy in the form of leaf litter and other organic debris, which is at the foundation of the aquatic food web. When a riparian forest is converted to agricultural cropland or removed for other reasons, there is no autumn leaf drop, and that means a lot less food for aquatic insects and ultimately for fish and birds.

Riparian Cover: Channel Stability

With Riparian Cover

Riparian vegetation is the most critical component of channel stability. The combined root masses of riparian trees, shrubs, forbs, and grasses are exceptionally strong and dense. Think of them as "riparian rebar". They work together to form a tight mesh that reinforces and holds stream banks. Roots also increase the roughness of the channel, helping to dissipate the energy of floodwaters and catching and trapping sediment so it does not fill downstream pools.

Without Riparian Cover

The loss of riparian forest cover means there are no roots to stabilize the stream bank, and that can result in erosion or downcutting—the stream cutting its way deeper into the bed and releasing sediment into the stream. The channel becomes less stable, and the increased fine sediment levels in the stream hurt trout spawning habitats by clogging streambed gravels. The sediment also fills in pools and lowers aquatic insect production.

Riparian Cover: Water Temperature

With Riparian Cover

The shade provided by riparian trees moderates local air and water temperatures and significantly reduces peak summer temperatures within the stream. Bull trout require cold water; they cannot tolerate maximum summertime water temperatures above 15° C (59° F). Riparian forests will have an increasingly important role to play in limiting the effects of global warming on fish.

Without Riparian Cover

Increases in direct solar radiation caused by the reduction or loss of riparian vegetation is the single factor most responsible for high stream temperatures. Fish biologists think the Jocko River is probably 5 to 10° F warmer today than it was in the late 1800s. Much of that increase is due to the loss of substantial areas of streamside riparian vegetation, trees and shrubs that once shaded the river.

Riparian Cover: Habitat

With Riparian Cover

Riparian areas enhance a variety of important habitats for trout. Perhaps most important, they contribute large woody debris (logs) to the stream, which provides resting, hiding, and feeding areas for native fish. Tree roots of both standing and downed trees also provide important cover for juvenile trout. In addition, riparian areas provide important habitat for birds and mammals. Three quarters of species in Montana use riparian habitats.

Without Riparian Cover

The removal of trees from riparian areas eliminates the source of large woody debris, which is essential to maintaining habitat complexity and productivity. Grazing and trampling of vegetation by livestock can also damage habitats for fish and wildlife. The result is often wide, open channels with lower, warmer, and more turbid flows in summer; damaging ice conditions in winter; and *flashier*, more turbid flows during high-water periods in spring (flashy means the stream is susceptible to very rapid changes in water level following heavy rains or during spring runoff).

Riparian Cover: Water Quality

With Riparian Cover

Riparian areas protect water quality by capturing, storing, and treating water through their soils before it gets to the stream. Healthy growing plants take up nutrients transported into the riparian areas, and organic matter that drops from the riparian canopy onto the floodplain helps to capture contaminants and facilitate their breakdown.

Without Riparian Cover

Removing or reducing riparian cover by grazing, logging, or conversion to agricultural land will often lower the water quality of a stream. The effects of grazing can include trampling and sloughing of streambanks, loss of over-hanging banks, accelerated bank erosion, compaction of soils, increased sediment input, and the introduction of disease-causing organisms (livestock manure in streams is an important human-health concern—bacteria, protozoa, viruses, and helminthes (worms) from cattle-introduced fecal matter can cause serious human illness). Farming can increase erosion and sedimentation processes many fold over natural rates. Logging can cause rapid changes in flow, increase peak flows, and increase sediment load (because the channel is less stable and eroding).

What Damages a River? Non-Native Species

Non-native species are plants and animals that are not native to our area. Some, like brook trout, come from east of the Continental Divide. Others, like spotted knapweed or whirling disease, come from as far away as Europe or Asia. Non-natives often have advantages over native species because insects, diseases, and animals that would normally control them are absent. And many non-natives, whether they are fish or plants, thrive in areas that have been degraded or disturbed by human activities; all the more reason to take care of streams and riparian areas.

Brook Trout

Brook Trout: Hybridization

One of the major threats brook trout pose is that they can hybridize with bull trout. Most but not all bull trout-brook trout hybrids are sterile. Hybridization threatens bull trout in several ways:

1. There is a wasted reproductive effort on the part of already-threatened bull trout populations;
2. There is a mixing of genetic material between the two species, resulting in a loss of bull trout genes; and
3. There is the potential introduction of a highly competitive hybrid population.

Brook Trout: Competition

Brook trout compete with native trout for food, space, and other resources. Brook trout have a reproductive advantage over bull trout. They reproduce at a younger age and at a higher rate and so can supplant them. The two species compete for food, and brook trout appear to be more aggressive. Young brook trout also have significantly higher growth rates than young bull trout. Brook trout have an especially strong advantage over bull trout at warmer water temperatures. Global warming and the loss of riparian habitat will help non-native brook trout at the expense of native bull trout. Brook trout also out-compete juvenile westslope cutthroat trout for food. Experience shows that once brook trout dominate a stream, cutthroat trout never regain it.

Rainbow Trout

Rainbow Trout: Hybridization

Rainbow trout pose one of the greatest threats to native westslope cutthroat trout because both spawn in the spring and can interbreed or hybridize. Hybrid trout may be perfectly good fish for angling, but because they carry non-native trout genes, they are a threat to the genetically pure native westslopes. If the problem is not corrected, rainbows and cutthroat-rainbow hybrids will continue mixing with the native westslopes, and the westslope cutthroat trout population will eventually be lost. Hybrid characteristics include slashes and rose-colored ventral region (cutthroat traits) and profuse spotting and a hint of a red mid-lateral band (rainbow traits).

Rainbow Trout: Competition

Rainbow trout and brook trout are considered the most significant competitors with native westslope cutthroat trout (and native bull trout), even to the extent of wiping out westslope cutthroat trout populations in some areas. Rainbows compete for food and habitat with both bulls and cutthroats and, when it comes to westslope cutthroat trout, they also compete for mates. Water temperature plays a central role in how much competition there is between bull trout and rainbow trout. Higher water temperatures may not completely exclude bull trout, but they may well shift the competitive advantage toward rainbow and brook trout.

Brown Trout

Brown Trout: Competition and Predation

Brown trout impact both bull trout and westslope cutthroat trout. In some Rocky Mountain streams, brown trout have caused bull trout populations to decline. Elsewhere, they have even contributed to their extirpation (local extinction).

That's because brown trout occupy the same niche as bull trout and achieve a similar size. Both eat fish, so they compete for food. They also compete for space and spawning habitats. Brown trout can prey on young bull trout. Brown trout prey on westslope cutthroat trout too, and competition between the two is believed to have caused the displacement of some westslope cutthroat trout populations. This has most often occurred in conjunction with habitat degradation, which has made waters more suitable for introduced fish like brown trout. Higher water temperatures, especially, shift the competitive advantage towards brown trout.

Whirling Disease

Whirling Disease: A Non-native Killer

Whirling disease is a parasitic infection caused by a non-native, microscopic organism called *Myxobolus cerebralis*. *Myxobolus cerebralis* (abbreviated hereafter as Mc) infiltrates the head and spinal cartilage of fingerling trout like westslope cutthroat trout, rainbow trout, and brown trout, causing spinal deformities and interfering with the ability of the fish to feed. Once in the fish, it multiplies rapidly, and because it affects the fingerling's organ of equilibrium, it often causes it to swim erratically and in a whirling pattern.

In severe cases, the fish dies, and when an infected fish dies, millions of tiny, nearly indestructible Mc spores (each about the size of a red blood cell) are released into the water where they can survive in this "dormant" form for 20 to 30 years. They fall on to the bottom of the stream and are covered by sediments.

Eventually, many of the spores are ingested by Tubifex worms that live in the sediments (tubifex worms are sometimes called sludge worms). Inside the worm, the spore changes and is then released in a highly infective form, called the Triactinomyxon (TAM). TAMs are free-floating in the water until they infect trout, beginning the cycle over again. Rainbow and cutthroat trout are the most vulnerable to whirling disease, but it can infect all salmonid species.

What does an infected fish look like? Typical signs of whirling disease include a darkened tail, twisted spine, and deformed head (shortened, twisted jaw). Young fish may also swim erratically (whirl). However, other diseases and even genetic conditions can cause these signs as well. If you see fish with these signs in an area where whirling disease has not been reported, you should contact the Tribes' Fisheries Program or if you are off the Reservation, the state fisheries agency—in Montana, Montana Fish, Wildlife & Parks.

The paragraphs that follow provide brief descriptions of each stage of the organism:

The TAMS
This is the TAM stage of *Myxobolus cerebralis*. TAMs are a free-floating form of the parasite released by the tubifex worms. They float in the water until they infect trout fry.

The Spores (called Myxospores)
Myxobolus cerebralis spores enter stream sediments when infected trout die and decay. Each fish can release many thousands to millions of the parasite spores into the water. Each spore is virtually indestructible -- it can live in a stream (or former stream) for 20 to 30 years, surviving freezing temperatures and drought.

Infected Trout Fry or Fingerlings
The parasite penetrates the head and spinal cartilage of fingerling trout. There, it multiplies rapidly, deforms the body, and affects the organ of equilibrium, which causes the fish to swim erratically in a whirling pattern. Feeding and avoiding predators becomes difficult. In severe infections, the disease causes high rates of mortality in young fish. Those that do survive until their cartilage hardens to bone can live a normal life span, but they are marred by skeletal deformities and that reduces their ability to reproduce, although fish can reproduce without passing on the parasite to their offspring.

Tubifex Worms
Eventually a spore will be ingested by its alternate host, a tiny, common aquatic worm known as *Tubifex tubifex* or sludge worm. In the worm, the spores change into the highly infectious stage of *Myxobolus cerebralis*, the TAM stage that infects trout fry.

What Can We Do To Prevent the Spread of Whirling Disease?

Stocking or natural movement of live, infected fish is the primary route by which whirling disease is spread. However, there are other ways that the parasite can be spread, including by birds and humans—particularly boaters and anglers.

But is there anything anglers and boaters can do to help prevent further spread? Absolutely! Anglers, boaters, and others can make a difference. Distribution of the parasite is expanding rapidly in some areas, so you should assume its presence if you don't know otherwise. Recommended precautions that will help prevent not only the spread of whirling disease, but also other disease-causing organisms and aquatic pests include:

1. Never transport live fish from one water body to another. (**This is illegal under Tribal and state regulations!**)
2. Do not use trout, whitefish, or salmon parts as cut bait.
3. Dispose of fish entrails and skeletal parts properly. Never discard fish parts in or near streams or rivers. Because an infected fish may harbor tens of thousands of myxospores, simply disposing of infected fish parts in a clean drainage could provide enough spores to start an infection. Do not discard fish parts in a kitchen disposal. Whirling disease myxospores can survive most wastewater treatment systems. Instead, discard in dry waste that would go to a landfill.
4. Rinse all mud and debris from equipment and wading gear, and drain water from boats before leaving an infected drainage. This is good practice for preventing transfer of other aquatic hitchhikers as well.

Non-Native Plants

Depending on the plant and/or its location, infestations of noxious and non-native weed species (hereafter referred to as weed species) have many ecological consequences, including altering hydrologic cycles, increasing erosion, displacing desirable native vegetation, and reducing forage and cover for wildlife. In particular, weeds are highly competitive with native plant species for resources like water, nutrients, and light, and their presence can hinder or prevent the restoration of native plant communities.

Reed canarygrass, introduced as early as the 1880s, has probably had a greater effect on native plants than any other weed. It was typically seeded on wet pastures to improve hay and forage yields. But it's aggressive and spreads prolifically, and it can rapidly colonize a range of moisture conditions, forming large monocultures and almost totally precluding the establishment of woody vegetation.

Other weeds of concern in riparian areas include two tree species: golden willow and Russian olive. Both were planted on the floodplain, and both have invaded in limited areas.

Weed species distribution on the floodplain tends to follow hydrologic gradients, and drier sites tend to have infestations of spotted knapweed, sulfur cinquefoil, Saint John's wort, and Dalmatian toadflax. These species are also common on recent gravel bars in parts of the river heavily impacted by irrigation withdrawals and in areas where channel incisement has occurred and the substrate is well drained.

Herbaceous weeds in mesic (moderately moist) and wetter sites on the floodplain include houndstongue, burdock, oxeye daisy, teasel, black henbane, woolly mullein, and Canada thistle. Riparian areas that have had their woody overstory removed are particularly susceptible to weed encroachment.

Lesson 5. Keeping a River Journal

Note to Teachers: A great time to do this lesson is in association with the annual river honoring. Doing this will require doing steps 1-3 before the River Honoring and step 4 during a visit to the river or even during the river honoring in a special time set aside for journaling. Step 5 can be done in the classroom when you return.

Essential questions: If you could record something about the river in writing what would it be? Would it be a description of something you see—a stand of river cottonwoods at sunrise on an autumn day? Would it be something you hear—the call of a hundred Canada geese as they fly over town on their way to the river? Would it be a science observation—the kinds of flowers you see or the type of tracks you see in the river mud. Or would it be something you feel in your heart—the way you might feel, for example, on a summer evening sitting around a campfire with your friends and family on the bank of the river?

One thing is clear, a river is a great place to find inspiration, and one way to capture that inspiration is to begin with a journal: a hand-written recording of what you see and hear and feel when you visit the river. These basic observations, once written down, can become treasures that you can read for years to come and that you can share with your family and friends. The nature journals of some writers have even been published and are considered great works of literature.

Journals kept by William Duncan Strong (top) and William Healey Dall (bottom)

In this lesson, your students will explore a spot on the river and write their observations in a journal. A copy of John Wesely Powell's, Exploration of the Colorado River of the West and Its Tributaries (1869) is helpful for this lesson, although not necessary. You will want to look at the Smithsonian Institution's Introduction to the Nature Journal, *which can be found on the DVD. Then, visit the river and have your students write observations in their journals. They can also illustrate their writing (so you may choose to bring some tins of watercolors along). They should also include a hand-drawn map of the specific location they visit where they make their observations.*

As part of the science extension activities, students can be provided with ecological terms and definitions to further describe their experience outdoors. The plant and animal field guides and interactive map can assist them in identifying what they see.

Directions:

1. Introduce the idea of keeping a journal. See the background section of the Smithsonian's Introduction to the Nature Journal.

There are many famous journals in our country's history, but certainly John Wesley Powell's journals, published as Exploration of the Colorado River of the West and Its Tributaries (1869) and written during his journey down the Grand Canyon, made quite a stir. Powell's journal is striking for its keen-eyed detail as he recreates what he sees, hears, and feels in specific, concrete language, bringing the world of the canyon to life upon the page.

2. Tell your students that their journal will be a two-part exercise: (1) the creation of a map and (2) the recording of what they find in the area around them. To begin the journal exercise, you can introduce John Wesley Powell, present his journal entries from his book, Exploration of the Colorado River of the West and Its Tributaries *(use excerpts from Chapter 3 Swallow Canyon, day 3 and 4), and discuss with your students why an explorer might keep a journal during his or her trip to a river and what he or she might record in that journal.*

3. First ask your students to list the kinds of things written about in the Powell journal sample, such as animal life, plant life, and the geography of the place. Help them to identify what stands out about the writing (details, specific concrete language and images, the names of things). Create a word bank from the Powell journal entries. Brainstorm with your class on what types of things that they will most likely observe in their own experience by the river, such as kingfisher, deer, waterfowl, cottonwoods, etc., and write those words on the board.

Have your students Google the term "nature journal" and click on "Images" to see many beautiful examples of nature journals that other people have done (see the image at right). This will give them some inspiration.

4. Now visit the river (the River Honoring site, Buffalo Bridge and surroundings, Sloan Bridge and surroundings, Hoskin's Landing at Dixon, or the Perma Bridge and surroundings are all good, accessible places) and give your students their journal assignment. ***Caution them about river safety. Make sure they are where you can see them and that they stay out of the water and away from any unsafe banks where they might fall in.***

If you can't take a field trip to the river, give them the journal assignment over a weekend and have them go to any natural spot or favorite place with a parent or other adult.

Students can record not only what they see, hear, smell, and touch during their exploration, but their feelings and thoughts about the place. Suggest to your students that they draw a map of their area or sketch it out. Encourage them to use the plant and track field guides to help them learn the names of things. Suggest they photograph or sketch pictures of the plants and birds they see to include within their journals (to complement, not substitute for their writing).

Journal Observation Suggestions for Students

- *Describe what you see, smell, touch, and hear in this place*
- *Describe physical characteristics of the area: water, rock outcroppings, tracks in the mud, trees and shrubs, etc.*
- *Describe weather characteristics: clear, rainy, snow, or drought?*
- *Describe flower and plant communities: what flowering plants inhabit the area? What trees? What do they look like? Smell like? Feel like? What are their names?*
- *Describe birds they see. What do they look like? What are their names? What behaviors did you observe? What birds are known to inhabit the area?*
- *Describe how what you see and hear makes you feel inside and what you think about when you let your mind wander as you sit by the river.*

5. Share their entries:
When they return to class, the students can read their journal entries aloud or you can post them around the room.

Lesson 6. Bison and the River: An Important Chapter in the History of Bison

Essential questions: What role did the Pend d'Oreille play in saving the bison from extinction? What role did the lower Flathead River play in the story of the nation's last wild, free-roaming bison?

The relationship with the buffalo is vitally important to members of the Confederated Salish and Kootenai Tribes. The elders tell of the respect for the buffalo, and of how much the people relied upon them, both spiritually and materially. They tell how the buffalo was their most important source of meat, fat, marrow, clothing, tools, materials, and shelter; of how great a gift the Creator gave the people in providing the buffalo.

In this lesson, students will learn about the Tribal relationship with bison, the role the Pend d'Oreille played in saving the bison from near extinction, and the history of the bison on the Reservation, both before and after the establishment of the National Bison Range. They will learn how Tribal members Michel Pablo and Charles Allard once ranged buffalo in the grasslands along the Flathead River, a herd of hundreds of animals and what happened to those bison and why.

Directions:

1. Introduce your students to the topic by giving them a brief overview of the special relationship the Confederated Salish and Kootenai Tribes have always had with bison and the very special role the Tribes played in saving the bison from extinction.

2. Ask your students to read Student Handout Six, which includes a brief article titled, "Buffalo and the Salish & Pend d'Oreille People" by the Salish-Pend d'Oreille Culture Committee.

3. Show your students the historic photos on the interactive map DVD (see the images below to know how to navigate to the right place) and discuss the photos with them. Then watch and discuss the Charlie McDonald video where he talks about the last bison round up.

1. Start by clicking on this spot on the locator map

2. Then click on this button

3. Watch and discuss the slideshow

4. Watch and discuss the Video of Charlie McDonald

4. If possible, take a field trip to the National Bison Range. Drive the short loop to look at live bison and visit the Visitor's Center, allowing your students to explore all the exhibits there.

5. Ask your students to complete and turn in the handout.

Student Handout #6: Bison and the River
Name: Date:

1. Read this short article by the Salish-Pend d'Oreille Culture Committee:

Buffalo and the Salish & Pend d'Oreille People

By the Salish–Pend d'Oreille Culture Committee

The relationship with the buffalo lay at the heart of the traditional way of life of the Salish and Pend d'Oreille people. The elders tell of the respect for the buffalo, and of how much the people relied upon them, both spiritually and materially. They tell how the buffalo was their most important source of meat, of how great a gift the Creator gave the people in providing the buffalo. There are many stories of how the people risked their lives every year in going to buffalo, where there was the danger of battle with enemy tribes—a hazard which increased greatly in the nineteenth century, first with the introduction of firearms, then with reduction of the bison herds. For countless thousands of years before that time, the Salish and Pend d'Oreille people had lived in a sustainable relationship with the buffalo. When the first non-Indians arrived, they found the land covered with millions of bison—so many that they had difficulty believing that native people had lived here for so long.

"Going to buffalo" was part of the traditional cycle of life. The elders tell that when the wild roses bloomed in late spring or early summer, they knew it was time to move east to hunt buffalo. The people would begin the journey as soon as they had dug their supply of camas.

After tribes throughout the region acquired the horse, the Salish and Pend d'Oreille would often be joined on their hunts by Spokanes and other tribes from the west. Before the horse, a number of Salish bands were based at places east of the mountains, such as Three Forks. Some Salish- speaking peoples closely allied with the Pend d'Oreille also lived east of the mountains, such as the now-vanished Tunaxn of the Sun River area. The Salish and Pend d'Oreille developed a wide-ranging, complex trail system throughout their vast territories, and several routes connected the lands west of the mountains with the buffalo grounds to the east. Most often the people travelled up the Clark's Fork and Little Blackfoot rivers to *Čłmlšé* (the Helena area), and from there continued east to the Yellowstone and Musselshell country. Sometimes the Salish traveled east from the Hamilton area over the more rugged Skalkaho Pass. At other times, they went over through the Big Hole Valley. The Pend d'Oreille would usually travel by more northerly routes -- via the passes at the head of the Blackfoot River, Badger Pass, or Marias Pass -- moving to the clear plains near Great Falls and Shelby. At the Judith River treaty in October 1855, the Pend d'Oreille insisted on, and won, affirmation by the Piegans and others that they had always held aboriginal rights to hunt in the Sweetgrass Hills.

Until buffalo became scarcer, the people usually returned home during summer or early fall. In later times, some parties would stay through the winter on the plains. They relied on medicine men to help the people locate the increasingly scarce buffalo, and at times to break the bitter cold of plains winters when the very survival of the camp was threatened.

Elders have told in detail of the many ways bison were hunted. In the time before horses, the people utilized their intimate knowledge of the buffalo and the land itself to herd them over cliffs, the “buffalo jumps” such as those near Bozeman and Great Falls. In later times, buffalo were hunted from horseback using highly efficient and effective weapons, including lances, bows and arrows, and then guns.

Uses of the Buffalo

The respect held for the buffalo was reflected in the way the people used all parts of the animal and wasted nothing. This was central to the sustainability of the relationship between the people and the buffalo. It is difficult to find an account of buffalo hunting and the use of the buffalo by the elders where the lack of waste is not discussed. There are names in the Salish language for all of the cuts of meat and for all the inside parts. When the hunters went out, they would be followed by the best skinners in the tribe, and when the meat would be brought back to camp, the women would have the dry meat racks ready. They would work day and night for several days until all of the buffalo were taken care of. The meat would be dried, pounded, and then packed into parfleches, often mixed with mint leaves to deter bug infestations. Even the hooves were boiled for food. The people knew certain ways to prepare and bake the intestines and the organs. The brains would be prepared and stored, and could keep for as long as five years. The neck hide of the bulls would be formed over stumps and then used for buckets, or sometimes it would be made into strong ropes by cutting it into long strips and then pounding it with stone hammers. The hair of the bulls would be braided for horse halters or bridles. The bones would be chopped and pounded, and bone marrow would be extracted and stored in hollowed out elderberry branches, and later used for lubricating oil. The horns would be used for drinking cups or, in later times, for storage of gun powder. The robes were always taken care of and were highly prized for clothing and bedding. The scraped hides, after expert tanning, would be sewn together with great skill by the women to make lodges or tipis, which were known for their ability to keep cool in summer and retain warmth in winter. The ribs of the buffalo made excellent hide scrapers, and the sinew was valued for its strength as thread. Of course, the dried buffalo chips -- those over two years old -- would be gathered by the children and used for making fire in the camps on the treeless prairies.

When the parfleches were full, the women would inform the chiefs that they should stop hunting to avoid wasting anything, and the chiefs would then announce that they would be moving back to the west the next day.

The Pend d’Oreille Save the Buffalo from Extinction

The elders say that in the second to last year of the traditional Pend d’Oreille buffalo hunts, the hunters were able to kill only 27 buffalo. The following year, they killed only seven. The buffalo that had once blanketed the plains, and fed and clothed the people for thousands of years, were gone by the early 1880s.

Fortunately, however, the Pend d’Oreille had already saved the buffalo from total extinction. The elders have told how some years earlier, a man named Atatice? (Peregrine Falcon Robe) , had proposed to the chiefs that the people herd some of the orphaned calves back west of the mountains to begin a herd on the Flathead Reservation. The people could see that the numbers of the buffalo were already declining, and inter-tribal

conflicts over the dwindling resource were intensifying. But Atatice? was suggesting a fundamental change in the traditional way of life. After three days in council, the leaders remained divided, so Atatice? withdrew his proposal. In the late 1870s, however, the chiefs, seeing that the non-Indian slaughter of the buffalo would not stop, allowed Atatice?'s son, Łatatí (Little Peregrine Falcon Robe), to carry out the idea. About six calves survived the journey west. Some years later, Łatatí's stepfather, Samwell, sold the herd to Michel Pablo and Charles Allard. Pablo and Allard ranged the buffalo in the grasslands along the Flathead River, where the herd quickly grew to hundreds of animals.

In 1896, Allard died, and in 1901 some of his portion of the herd was sold to the Conrad family of Kalispell. Other portions of the Allard herd were sold to Howard Eaton, a friend of Charles Russell. Eaton later sold his animals to Yellowstone Park. Thus the origin of the Yellowstone Park herd were in part the buffalo originally saved by Łatatí.

After 1896, most of the herd continued to roam on the collective tribal lands along the Flathead River. But then, in 1904, Congress passed the Flathead Allotment Act, which would cut up the land into smaller parcels, and eventually throw open the reservation to non-Indian homesteaders. Though bitterly opposed by tribal people, the act forced Michel Pablo to round up and sell his herd. Unable to find an American buyer, he sold the herd to the Canadian government, and by 1908 some 695 buffalo had been rounded up and shipped by special train cars to Alberta. Some were too wild for the cowboys to catch, and when white poachers began to shoot them, Pablo told tribal members to hunt them for food.

In 1905, some wealthy non-Indians formed the American Bison Society in New York. In 1909, they convinced Congress in effect to seize over 16,000 acres of the Flathead Reservation in order to form a National Bison Range. A price for the land was dictated to the Tribes, who were given no power over the matter. Pend d'Oreille oral historian Blind Mose Chouteh told of the meeting that was held in St. Ignatius, where tribal leaders told the U.S. Indian Agent they did not want to give up that land, because it was some of their good hunting grounds. But the Agent told them they had no choice in the matter.

Big Medicine

In May 1933, a buffalo cow at the Bison Range — in all likelihood a descendant of the buffaloes that Łatati had rescued some sixty years before — gave birth to a white buffalo calf. The calf was named "Big Medicine" in recognition of his sacred significance. He died in 1959.

Student Handout #6: Bison and the River
Name: Date:

2. Answer the following questions, and when you are finished, turn in your paper.

A. What does the word extinction mean?

B. Re-read the following paragraph:

> *Fortunately, however, the Pend d'Oreille had already saved the buffalo from total extinction. The elders have told how some years earlier, a man named Atatice? (Peregrine Falcon Robe) , had proposed to the chiefs that the people herd some of the orphaned calves back west of the mountains to begin a herd on the Flathead Reservation. The people could see that the numbers of the buffalo were already declining, and inter-tribal conflicts over the dwindling resource were intensifying. But Atatice? was suggesting a fundamental change in the traditional way of life. After three days in council, the leaders remained divided, so Atatice? withdrew his proposal. In the late 1870s, however, the chiefs, seeing that the non-Indian slaughter of the buffalo would not stop, allowed Atatice?'s son, Łatatí (Little Peregrine Falcon Robe), to carry out the idea. About six calves survived the journey west. Some years later, Łatatí's stepfather, Samwell, sold the herd to Michel Pablo and Charles Allard. Pablo and Allard ranged the buffalo in the grasslands along the Flathead River, where the herd quickly grew to hundreds of animals.*

C. What was it about *Atatice?'s* proposal that was "a fundamental change in the Salish-Pend d'Oreille traditional way of life?" Why did it take the chiefs so long to decide if they wanted to bring bison west of the divide?

D. Look closely at the interactive map of the lower Flathead River on the DVD and, with the help of your teacher, find the place where the last bison round up took place (the round up Charlie McDonald describes in the video). Notice the terrain, especially on the south and west banks of the river. Why do you think this place was chosen for the round up?

E. Do you think you could find any evidence today that the round-up took place there?

F. Write a paragraph stating in your own words how the world would be different today if bison had been hunted into extinction in the 1800s.

Lesson 7. What Does The River Mean To You?

Tony Incashola Vernon Finley

Tony Incashola's and Vernon Finley's welcome videos do much more than simply welcome students to the DVD. They are beautiful, heartfelt essays about the river and its place in their and our lives. Because they are thoughtful and thought-provoking, they will add a great deal of depth to your students' appreciation of the river and the natural history information contained on the DVD. We highly encourage you to take the time to watch and discuss them with your class.

Essential question: In the two videos, Tony Incashola and Vernon Finley discuss what the river means to them and to their tribes. Their eloquent statements are a testament to the river's power. What does the river mean to you? What role does it play in your life? If another river has played a more important part in your life, answer these questions thinking about that river.

Directions:

1. Watch the Tony Incashola Welcome video and when it is finished, lead a short discussion about what the river means to the Salish and Pend d'Oreille people and what it means to Mr. Incashola. Why is it important to him to protect the river? What does he recommend to students at the end of the video?

Now watch the Vernon Finley Welcome video and when it is finished, lead the same kind of discussion. What does the river mean to the Kootenai people? What does he mean when he talks about the river as a "Pathway" or "Road"? What does the river and the dam represent to Dr. Finley? What does he recommend to students at the end of the video?

2. Challenge students: Ask your students to think for a while about what Mr. Incashola and Dr. Finley had to say, and ask them to write a one-page essay about what the river means to them (if they are more familiar with another river, they can write about that). Is it a place to boat and have fun (for example, white-water rafting); a place to go with family and friends for camping and picnicking; a place where you can be close to nature; a place to fish; a quiet place to think about important things; a place to take pictures or watch wildlife; a place that, even though they may not visit very often, is important because it offers habitat to trout and swans and deer, elk, and bear….?

3. Set up a video camera and have each student read their paper to the camera or simply talk about the importance of the river to them much like Mr. Incashola and Dr. Finley do in their video. (If you don't have the time or resources to produce a video, simply have each of your students read his or her paper to the rest of the class.) Then as a class project, produce a video about what the river means to your students. If you have a large class, you can divide your class into groups of 4 or 5 and have each group create a video. If you are able, take a trip to the river to capture both still images and video of the river itself, its wildlife, its plants—whatever else they think will make their video more interesting and compelling. If they have a grandparent or uncle or aunt they want to interview, that could be included as well. They can also add music and natural sounds (like the sound of moving water or bird songs) that they record as part of the project.

4. Have your students upload their video(s) to Youtube. Following the straightforward instructions on this link:

http://www.youtube.com/watch?v=5WRaXrNdYiI

The channel will be especially helpful if they create more than one video (i.e. if you have divided the class into groups); the channel can easily hold all of their videos in one place. The students can then add additional videos on the river or on other subjects as the year progresses.

SALISH AND KOOTENAI TRIBES'

LEARNING ABOUT RIVERS

WATER & RIVER EDUCATION RESOURCES

The following websites are designed primarily for teachers who want to teach about water and the organisms that live in it. Many include high-quality curricula. They are not presented in any particular order, so we encourage you to explore all the links. Following the list of websites is a series of PDFs focused primarily on stream restoration.

Global Rivers Environmental Education Network

Global Rivers Environmental Education Network (GREEN) seeks to engage young people as active citizens who improve conditions in their watersheds now and in the future. They have an award-winning curriculum available at: http://www.earthforce.org

Children's Discovery Museum

That 4th and 5th grade students could engage in authentic scientific research was a revolutionary idea in 1993, but Children's Discovery Museum of San Jose garnered the support of the Howard Hughes Medical Institute and matching funds from Cisco Systems, Inc. to create BioSITE (Students Investigating Their Environment). Their curricula can be downloaded here:
http://www.cdm.org/biosite/forum/index.asp?sub=show&action=posts&fid=15&tid=33

Kids in the Creek

The objective of the Kids in the Creek program is to show kids how streams and watersheds work. Students walk away with an understanding of how their actions can effect stream health, in both negative and positive ways.
http://www.cascadiacd.org/index.php?page_id=229

Water Action Volunteer Monitoring

This site includes keys to insects and pond life as well as a publication titled: Wonderful Wacky Water Crit-

ters, which is a detailed, illustrated guide to critters commonly found in Wisconsin's waterways. It is written for young readers and describes insects included in the pond and river keys: http://watermonitoring.uwex.edu/wav/pubs.html

Canada Department of Fisheries and Oceans

For more than 25 years, Fisheries and Oceans has supported Educators in British Columbia and the Yukon who teach their students to understand, respect and protect freshwater, estuarine and marine ecosystems, and to recognize how all humans are linked to these complex environments. This site includes lots of great resources that are just as relevant in the states. Go to: http://www-heb.pac.dfo-mpo.gc.ca/community/education/eduintro_e.htm

Project WET

Since 1984, Project WET, an award-winning organization, has dedicated itself to the mission of reaching children, parents, teachers and community members of the world with water education. http://projectwet.org/water-education-project-wet/water-education-project-wet/

U.S. Geological Survey's Water Science for Schools

The U.S. Geological Survey's (USGS) Water Science for Schools website offers information on many aspects of water, along with pictures, data, maps, and an interactive center where you can give opinions and test your water knowledge. Go to: http://ga.water.usgs.gov/edu/

U.S. Geological Survey's Science in Your Watershed

The U.S. Geological Survey's "Science in Your Watershed" website is designed to help you find scientific information organized on a watershed basis. This information, coupled with observations and measurements made by the watershed groups, provides a powerful foundation for characterizing, assessing, analyzing, and maintaining the status and health of a watershed. Go to: http://water.usgs.gov/wsc/

Watershed Education Network

WEN is a non-profit organization dedicated to fostering knowledge, appreciation, and awareness of watershed health through science and outreach. Located in Missoula, their website is available at: http://www.montanawatershed.org/index.html

Salmon and Trout Education Program

This program was developed in the late 1980s as an effort to educate young students to the importance of healthy watersheds, rivers, streams and ultimately the planet. Their site can be viewed here: http://www.salmontrouteducationprogram.com/

Missouri Stream Team

Though this curriculum is from Missouri, it includes a variety of lessons that are relevant to other states. The goal is to provide middle school educators with a framework for a watershed-based study guide that ties together the relationships between watersheds and their geology, floodplains, wetlands, riparian corridors, streambanks, stream channels, aquatic habitat, water quality, aesthetics, and streams and society. http://www.mostreamteam.org/activity_guide/contents.htm

Montana Fish, Wildlife & Parks Adopt a Fish Program

Montana's Adopt-A-Fish Program integrates research projects in western, central and eastern Montana with educational programs that promote native and sport fish conservation. By tracking fish implanted with radio transmitters on this website, students learn about ecology, the perils facing native and wild fish, as well as the wonders of Montana's natural resources: http://fwp.mt.gov/education/angler/adoptAFish/

Seed Water Project

This is an international site on the environment, and the link below is to the water page. It is predicted that water will be the biggest issue we will face in this century. What can an individual student or class do? Follow the projects of people around the world as they examine their local water quality, sources and cultures. Go to: http://www.seed.slb.com/waterproject_landing.aspx

Watershed Education Links

These links, compiled for the Saint Joe Watershed Project, include a number of watershed education resources. http://www.stjoeriver.net/wmp/edulinks.htm

The Kootenai and the Kokanee

This fun site is a collaborative project by Grade 4 & 5 students. Go to: http://erickson.uniserve.com/kok_Kutenai.htm

Massachusetts Riverways Program Fact Sheets

This site's fact sheets are a great resource but are not appropriate for younger students. They are appropriate for high school students and teachers. Go to: http://www.mass.gov/dfwele/der/riverways/programs/technical/index.htm

Michigan Environmental Education Curriculum

This site includes some very basic (not fancy) water education modules and animations that might prove useful. http://techalive.mtu.edu/meec_demoindex.htm

River of Words

River of Words is a California-based organization that has been conducting training workshops for teachers, park naturalists, grassroots groups, state resource agencies, librarians and others since 1995, helping them to incorporate observation-based nature exploration and the arts into their work with young people. Their website includes resources for teachers.
http://www.riverofwords.org/about/index.html