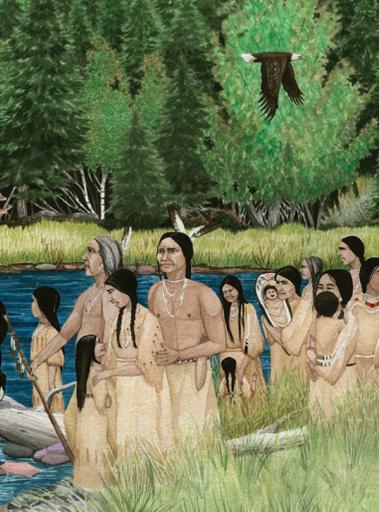
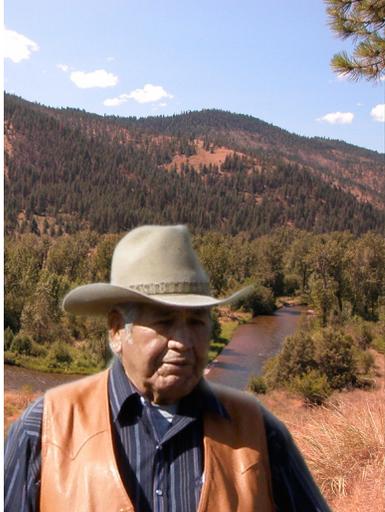




BULL TROUT, TRIBAL PEOPLE AND THE JOCKO RIVER

CSKT Explore
the River
Project



EXPLORE THE RIVER

*An Integrated Multimedia Curriculum Framed by the Cultural Values
of the Salish and Pend d'Oreille People*



CONFEDERATED SALISH AND
KOOTENAI TRIBES

Please Note: This curriculum was developed for the Flash-based interactive DVD, and so many of the lessons refer to the DVD as opposed to the website. So if you are using this curriculum with the web version of Explore the River, you can simply ignore the references to the DVD. Because all of the content on the DVD is on the Explore the River website and because the menus are basically the same, so you will can still use this curriculum, you just need to navigate to the web page you need.

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CREDITS

Project Director: Germaine White

Curriculum Developer/Writer: Tammy Elser

Reviewers: Germaine White, David Rockwell

Layout and Design: Tammy Elser and David Rockwell

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Printed in the United States of America



Confederated Salish and Kootenai Tribes
Natural Resource Department
P.O. Box 278
Pablo, MT 59831
(406) 883-2888 ext. 7299
www.cskt.org

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Welcome from the Project Director

In the beginning, when I saw the land, it was beautiful. This land was good...All our waters, our creeks were flowing along good...It is there in the water—that is where there were many animals—fish and other things. And by that, we are wealthy from the water...

—Mitch Smallsalmon, Pend d’Oreille elder,
Confederated Salish and Kootenai Tribes, 1977

Mitch Smallsalmon often spoke about the intimate relationship our ancestors and our Salish and Pend d’Oreille elders have had with the natural world and how valuable that world is to our wellbeing. Mitch’s words also foreshadowed the profound changes our streams and rivers would undergo and the consequences of those changes for plant and animal communities and humans. For some animals, like the bull trout of the Jocko River, the changes have been hugely consequential—the bull trout’s environment has been altered to the point that the species is now listed as threatened.

A number of our elders have lived long enough to know what our streams and rivers were like nearly a century ago. They also know the value of being connected to the natural environment, of spending time fishing or simply sitting on the bank of a river listening to the water and the songs of the birds. That is how they spent much of their time growing up, and they are saddened to see that today many young people have lost that connection. Indeed, students are now busier than ever, have more responsibilities, are involved in more activities, and experience more intrusions from the electronic world and dozens of different kinds of media than ever before.

One of the primary purposes of this Bull Trout Education Project is to reconnect our students with the natural world, especially with our rivers and streams. It integrates tribal and scientific knowledge about water, fish and wildlife, and the relationship that people have had with the Jocko River and other streams, both past and present. Students learn from scientists about the importance of riparian areas to bull trout, for example. They listen to elders talk about their memories of rivers—of the great spawning runs of bull trout; of camping in pristine riparian areas rich with deer, elk, moose, and bear; of drinking clean cold water straight from the stream. They learn about warblers and stoneflies and sculpins. About fish traps and fish spears and traditional ways of caring for our waterways. Most important, they learn about what we can gain through restoration, how we can restore some of what we have lost by giving back to our rivers.

Reciprocity is a core cultural value of the Salish and Pend d’Oreille, and it is the theme of this project: when we take something from our environment, we are obliged to give something in return. In this way, we do our best to meet the spiritual, cultural, and material responsibilities handed down to us from our elders and ancestors—and which we must pass on to future generations.

Other cultural values of the Salish and Pend d'Oreille are also woven throughout this curriculum. Inseparable from the way we interact with and perceive the land and other people, these values include: respect, honesty, humility, generosity, courage, kindness and compassion, patience, humor, good cheer, warmth, endurance, strength, fortitude, cooperation and helpfulness, selflessness, quiet and calm, thoughtfulness, level-headedness, self restraint, self discipline, responsibility, self respect, observation, listening, and relatedness.

The values make up a unified whole, at the center of which is a deeply held spiritual attitude of respect toward the land, water, plants, and animals and a way of living closely and in community with one another. The Tribes' use of water and our attitude toward water grew out of these cultural values and this belief system. So we begin each lesson by listing and defining the values relevant to the lesson's content. We believe that if each lesson is to be effective in teaching about water and its value to both humans and natural systems, it must be placed within this larger context, the Salish and Pend d'Oreille worldview.

In this tribal view, the natural and spiritual worlds are valued equally. Animals and plants are respected because they were here before us and have nurtured us from the beginning of time. We honor them by never taking more than we need, never failing to leave something for others, and never wasting. In short, we care for them, and they take care of us. Similarly, we value, honor, and respect our elders and ancestors, and we love our children. For them we want to ensure the continuation of our languages and cultures, of which water (water that is cold, clean, complex, and connected) is a central part. We can leave no greater gift to future generations.

So welcome, and thank you for using this integrated, multimedia curriculum. We welcome your comments and suggestions, which you can send to:

Germaine White
Information and Education Specialist
NRD, Confederated Salish and Kootenai Tribes
Box 278
Pablo, MT 59855
(406) 883-2888 ext. 7299
germainew@cskt.org

A Message from the Curriculum Developer

Dear Fellow Educator,

For many years, during my tenure with the Arlee Public Schools, I would walk the Jocko River—a stretch adjacent to a fish hatchery that was not far from the school. This reach of the river was modified long ago, with levees and a holding pond and ditches that diverted water to the hatchery. The river was straight, less shaded by riparian vegetation, and disconnected from its floodplain. Spotted knapweed and other invasive plants and non-native fish had become more common than the native species the Tribes had traditionally depended on. The river bore little resemblance to the free-flowing reaches upstream on the South Fork.

The Confederated Salish and Kootenai Tribes, true to their motto, are a people of vision. Their mission statement states in part, “...we will provide sound environmental stewardship to preserve, perpetuate, protect, and enhance natural resources and ecosystems.” Indeed, as the new century was getting under way, the Tribes undertook what can only be described as a visionary restoration project on the Jocko River, the aim of which was to restore bull trout habitat and the health of the river. Soon after, dramatic changes started to appear in the part of the stream I had come to know.

This curriculum is uniquely place-based, focused on the Jocko River and the Tribes’ restoration efforts, but the concepts and principles it teaches apply to all rivers. The curriculum is also values-based in that it is built upon the rich cultural values and history of the Salish and Pend d’Oreille people. Through it, students will gain an understanding of what makes a healthy river and how healthy rivers support an abundance of native fish and other animals, plants, and insects. Students will develop and practice critical skills sets, including literacy, applied math, research, listening, speaking, and the application of technology. Indeed, this curriculum is deeply integrated, connecting many content areas, skill sets, and conceptual understandings.

Schools continue to separate domains of knowledge and skills from each other in ways that can actually make learning harder for children. History (or story) is separated from scientific investigation; cultural understanding is removed from the development of essential skills like listening or literacy. Days are divided into small, distinct bursts of activity built around tiny pieces of content or isolated skills. We continue to do this (driven in part by textbooks, policy, and traditional ideas about how “school” works) in spite of our awareness that the kind of study and inquiry that draws upon many different content areas and skill sets can lead to improved outcomes for children. Indeed, a deeply integrated curriculum—one that connects many content areas and skill sets—demands critical thinking and creativity and promotes curiosity, collaboration, and communication, all of which are essential if we are to prepare students for the 21st century.

This curriculum, in keeping with the traditional ways of teaching and learning among the Salish and Pend d’Oreille, blurs the artificial lines drawn between content areas. While some lessons are ideal for a science

course, others lend themselves to being taught in language arts, and still other elements or lessons provide significant content in areas of history, culture, art, math, library media, and technology.

In non-departmentalized, intermediate-grade settings, teachers are sometimes charged with teaching all these content areas, and so could teach the *Explore the River* curriculum throughout the day, confident they will be addressing essential skills in literacy, math, listening, speaking, technology, and more, along the way. In other settings common to middle schools and high schools, teachers address their assigned content in relative isolation. In those settings this curriculum can be divided up, carefully timed and taught by a collaborative team across the content areas. We have included a [collaboration chart](#) for this purpose. It shows how seven, separate content-area specialists might address this material, working as a team.

When preparing to teach this curriculum, here are a few things to keep in mind:

First, the curriculum is broken into 14 lessons. Some take a single class period, others unfold over as many as 6 to 10. The actual amount of time a lesson takes will depend on the students' ages and background knowledge and the teacher's choice of strategies or extensions. You may also choose, based on your students' needs, to omit or delay teaching certain units in the curriculum cycle.

Second, in place of traditional objectives, this curriculum employs learning targets. Learning targets are stated as "I statements" and worded in language intended to be shared up front with your students. Post these as they are addressed, and refer to them often to support your students' meta-cognition or thinking about their thinking. The learning targets are linked back to state and national content standards in a wide variety of content areas.

Third, you will notice text boxes sprinkled throughout the document. These are teacher tips or notes regarding pedagogy that we have included to help you as a teacher more deeply and consciously understand some of the instructional practices that are employed. Two instructional strategies to note are the use of interactive lecture and authentic literacy. More on these age-old structures (including straight-forward examples in four core content areas) can be found in Mike Schmoker's book, *Focus: Elevating the Essentials to Radically Improve Student Learning* (Association for Supervision & Curriculum Development, 2011).

Fourth, this curriculum provides a variety of video supports, including elder's interviews, video overviews of content, and videos of Tim Ryan developing traditional technologies. To keep students active during longer periods of viewing, we encourage you to apply an interactive lecture format, where you (1) establish a clear purpose, (2) pose questions, and (3) segment or intermittently interrupt passive viewing with opportunities for students to discuss and write about what they have seen and what they understand while you pose questions to check for understanding and elaborate or clarify content that may not be clear. This format is designed to be used as an instructional loop that can be repeated as often as necessary to keep students engaged and focused.

Fifth, in addition to videos, the DVD includes three books:

- *Bull Trout's Gift* – a picture book that includes both a traditional story and an informative text

- *How a Healthy Stream Works: Eight Attributes of Healthy Alluvial Stream* – a scientific informative text with interactive illustrations that focuses on the qualities of healthy streams
- *Aay u sqélix^w: A History of Bull Trout and the Salish and Pend d’Oreille People* – a six chapter historical narrative

These three books are ideal for teaching reading comprehension strategies in the content areas, exploring genres, and providing extensive, supported, reading practice. To address them, we use an authentic literacy approach whereby teachers build background, establish purpose by posing a question, model and demonstrate using think-aloud strategies, allow for guided practice with active processing in pairs or groups (talking and writing alternately), transition as students show mastery to independent practice, and finally, have students synthesize the material in some written form. The goal is a gradual release of responsibility to the student. This method is repeated with variations throughout the curriculum.

Sixth, you will notice the procedures section is broken down by day. Instructionally, these are actually class periods and may be separated by days. If you are integrating this curriculum as intended into more than one content area, several class periods may actually occur on the same day.

Finally, again, as you look at the procedures, you will notice they are highly explicit. They were developed this way to support teachers with differing levels of experience or who want to expand their personal instructional repertoire to include new interactive strategies. Take them in whole or in part, as you wish. Adapt them as needed to suit your students, but also, consider trying out new strategies, even ones you believe might be “too hard” for your children. They will rise to your expectations, so be sure those expectations honor the unlimited potential of each child.

The intent of the elders and the Confederated Salish and Kootenai Tribes was to develop a curriculum for K-12 schools framed by cultural values and history, while teaching the essentials of hydrology, aquatic and riparian habitat, and fish—especially the bull trout and its relationship to the Salish and Pend d’Oreille. I have learned much designing curriculum to teach this amazing content and tell this important story. I wish to express my gratitude to the Confederated Salish and Kootenai Tribes, who are indeed a people of vision.

Sincerely,

Tammy Elser

| Period or Day | Science | Math | Social Studies | Language Arts | Library / Media | Technology | Visual Arts |
|---------------|---|---|---|---|---|---|--|
| 1 | Bull Trout's Gift ~4 C's ~What makes a healthy river? | | Bull Trout's Gift ~What is the role of stories and the oral tradition? ~Relationship and reciprocity | Bull Trout's Gift ~What are genres? ~What is the theme, value imparted? | | | Bull Trout's Gift ~Illustration/Illustrator Profile |
| 2 | Make a River ~Define hydrology ~Parts of a steam ~Stream table experiments | | More Than Water ~Elder's stories ~Summarization | Listen Up! ~Elder's stories ~Descriptive writing. | Make a River ~Define hydrology ~Greek and Latin roots, prefixes and suffixes | | |
| 3 | Make a River ~Stream table experiments ~Hypothesis test, data collection ~4 C's | | More Than Water ~Elder's stories | River Song ~The natural world ~Onomatopoeia ~Descriptive writing, summary | More Than Water ~Launch personal project | More Than Water ~Launch personal project | |
| 4 | Make a River ~Stream table experiments ~Hypothesis test, data collection ~4 C's | More Than Water ~Launch personal project ~Mentor role | More Than Water ~Launch personal project ~Mentor role | River Song ~Joe Eneas interview listening ~Retail summarization ~Compare/contrast | More Than Water ~Launch personal project ~Mentor role | More Than Water ~Launch personal project ~Lead and mentor role | More Than Water ~Launch personal project ~Mentor role |
| 5 | Role in the Community ~Species research project | Water Watch ~Jocko watershed tour ~Hydrograph study | History of Bull Trout and Salish and Pend d'Oreille ~C.1 The Tribal World | More Than Water ~Launch personal project | Role in the Community ~Species research project ~Research and inquiry methods | More Than Water ~Launch personal project | |
| 6 | Role in the Community ~Species research project | Water Watch ~Hydrograph study ~Stream gauge study ~USGS data ~Statistics | History of Bull Trout and Salish and Pend d'Oreille ~C.1 The Tribal World p.6-12 | Role in the Community ~Species research project ~Paraphrasing | Role in the Community ~Species research project ~Research and inquiry methods | More Than Water ~Launch personal project | |
| 7 | Who's Who? ~Fish ID pretest ~Matching game | Water Watch (5 min.) ~ Problem writing/solving ~Daily teaser with river data | History of Bull Trout and Salish and Pend d'Oreille ~C.2 Fishing and Life Ways p.13-26 | Role in the Community ~Species research project ~Report writing | Role in the Community ~Species research project ~Source citation | More Than Water ~Continue personal project | |
| 8 | Who's Who? ~Species study ~Fish ID ~Matching game | Water Watch (5 min.) ~ Problem writing/solving ~Daily teaser with river data | History of Bull Trout and Salish and Pend d'Oreille ~C.2 Fishing and Life Ways p.26-35 | Role in the Community ~Species research project ~Report writing | Role in the Community ~Species research project ~Source citation, plagiarism, fair use | To Catch a Fish ~What is technology? | |
| 9 | Who's Who? ~Fish ID post test ~Species oral reports | Water Watch (5 min.) ~ Problem writing/solving ~Daily teaser with river data | History of Bull Trout and Salish and Pend d'Oreille ~C.3 Confidence p.36-46 | Elders, Water and Fishing ~Listening ~Similarities and differences ~Cultural uses | Role in the Community ~Species research project ~Report writing | To Catch a Fish ~Invent / Design a trap | Who's Who? ~Salmonid anatomy ~Anatomy art ~Scale, proportion, detail |

Overview of the Curriculum and How to Use the Electronic Version

Overview of the Lessons



Tab 1: Bull Trout's Gift

Bull Trout's Gift is a picture book that contains a story within a story. The first is the true story of a class of 5th-grade students learning about the ecology of the Jocko River by going on a field trip led by fisheries biologist Craig Barfoot and tribal elder Johnny Arlee. Embedded in this informative story is a traditional story told by Johnny Arlee. This second story demonstrates the values of respect and reciprocity and the cultural significance of the bull trout to the Salish and Pend d'Oreille people. In telling the story, Johnny recounts the banishing of Aay (Bull Trout) and how the people suffered as a result and then were able to make amends. The book ends with the 5th graders reflecting on the value of reciprocity and learning how today the Tribes are practicing reciprocity by working to restore the river and reestablish their traditional relationship with bull trout.

Cultural Values:

Reciprocity, Observation, Listening, Respect, Quiet, Calm

Steps:

1. Introduce *Bull Trout's Gift*
2. Oral tradition, genres, theme of relationship and value of reciprocity
3. Reading comprehension strategies
4. Read *Bull Trout's Gift*
5. Discuss relationship and reciprocity in Johnny Arlee's Story
6. Introduce the Four C's
7. Compare / contrast genre of traditional story to informational text
8. Map the story within a story
9. Introduce restoration of habitat as an invitation for Bull Trout to return
10. Exit ticket - What makes a healthy river?



Tab 2: Listen Up!

Listening attentively and deeply understanding the spoken words of another are essential skills and were the principal means of transmitting knowledge in the past. Today, listening skills have changed as many messages are transmitted in 30-second bites. Attention spans and the ability to retain information and make connections among different speakers, personal experiences, and background knowledge have diminished. As Salish and Pend d'Oreille people, we continue to practice our oral traditions and value listening skills as essential to our way of life. This lesson is designed to help students develop and practice attentive, respectful listening.

Cultural Values:

Listening, Cooperation, Respect

Steps:

1. Circle phone game
2. Difference between gist and literal detail
3. Listening skills practice
4. Pair-share activity
5. Louise McDonald interview
6. Summarization
7. What is it like to pay full attention?



Tab 3: River Song

Contemporary life is noisy. Objects beep, tweet, ring, and buzz in nearly all aspects of our lives, but this was not so in times past. As our elders recount, long ago you could hear the song of a river, recognize birds by their calls, and predict changes in the environment related to weather and animals just by listening. Listening skills are essential to our way of life and enhance our understanding of the world we live in. This lesson is designed to help students develop and practice listening as a form of observation of the natural world. In this way, we can more deeply understand a place.

Cultural Values:

Listening, Observation, Cooperation, Respect

Steps:

1. Mystery piece - inferring from sounds in nature
2. Onomatopoeia mini lesson
3. Descriptive paragraphs
4. Sounds in nature field experience
5. Field journal descriptions
6. Joe Eneas interview listening practice
7. Retell - Summarization
8. Compare / contrast comprehension skills used; nature's sounds to elder's story



Tab 4: Make A River

From time immemorial our people observed changes in the landscape—some were slow, occurring over geologic timeframes, and some were rapid, seemingly happening in the blink of an eye. Water and fire are two powerful forces that have brought about change, both fast and slow. Together, they have helped shape the ecosystems in which we now live. Today, we can listen to the stories of our elders to understand their relationship to the river and the fish that helped them thrive. We can see stretches of the Jocko River that flow freely, much as they did from time immemorial, and other stretches that have changed dramatically, often as a result of

human activity. This lesson helps us understand how the force of water creates rivers that are naturally complex and connected and how things we do can disrupt this natural process.

Cultural Values:

Relatedness, Cooperation, Observation, Respect

Steps:

1. Admit ticket, define hydrology (check for background knowledge)
2. Hydrology overview parts 1-3 and interactive lecture using DVD
3. Parts of a stream
4. Stream table experiments
5. Variables and hypothesis
6. Data collection
7. Habitat overview part 1 on 4 C's
8. Analyze experiment outcomes based on bull trout habitat needs



Tab 5: More Than Water

The Jocko River is many things. The elders tell us of camping, fishing and living along its banks. They also talk about the critical role of the river and water overall in healing, prayer, and the spiritual practices of our people. Water is not only a source of life, but also a unique part of the lives of all of us. As the story Bull Trout's Gift reminds us, without water we are a poor and desperate people. In this unit we will learn more from the elders about water, bull trout, and the river, and then we will apply elements of what we have learned to honor the river through our individual efforts.

Cultural Values:

Respect, Listening, Cooperation, Relatedness, Reciprocity

Steps:

1. Reflective writing – What is water to you?
2. Elder's perspective (Pat Pierre)
3. Summarization
4. Partner process and group report out
5. Independent project plan (talent, time and resource management)
6. Your river project
7. Personal project presentations – Honoring the River



Tab 6: Water Watch

As tribal people, we understood the patterns of streamflow because we observed them directly and on a daily basis as we hunted, fished, harvested foods and medicines, and practiced our religion along the banks of streams throughout our aboriginal territory. Today, there are many factors other than weather that change the flow of rivers, including the Jocko. Irrigation, dams, and other uses of water have dramatically changed the natural flow of the streams. We watch now with a system of stream gauges and monitor using hydrographs to understand these impacts. In this lesson, students will practice essential math skills while learning how hydrographs and stream gauges help tell the story of the Jocko River and how it has changed.

Cultural Values:

Helpfulness, Cooperation, Generosity, Endurance, Strength, Gratitude

1. Tour of Jocko watershed
2. Hydrograph study, stream gauge data analysis, and graph interpretation
3. Employ USGS data sets from South Fork of Jocko
4. Graphing high, average and low stream flow years on the South Fork of the Jocko
5. Statistics study
6. Daily practice in contextualized math, story problem writing
7. Write, share and solve story problems as warm-up activity with land, stream and weather data sets



Tab 7: Role in the Community

Elders know that all plants and animals live in a community with each other and that each has a special role they play in maintaining that community. Biologists use different words to talk about the roles that each creature or plant plays in the ecosystem in which they live. Both elders and scientists are aware of how fragile communities can be. For example, how easily the niche occupied by bull trout can be altered by invasive species. In this lesson, students explore the life ways and needs of a plant or animal native to the Jocko River—and the role that plant or animal plays in the larger community.

Cultural Values:

Relatedness, Observation, Balance, Respect

Steps:

1. Species research project
2. Research or inquiry methods
3. Knowledge flood strategy
4. Source citation, plagiarism, paraphrasing and fair use
5. Reports (paper, Powerpoint, video, web-page, blogs, wikis, moodles or poster sessions)
6. Independent research, note taking, writing, publishing and sharing with class



Tab 8: Who's Who?

Living sustainably with a river and the community of life it supports is possible as the Salish and Pend d'Oreille people have shown, but it requires being respectful and conscientious in our actions and giving back as much as we take. It also requires a detailed knowledge of all the plants and animals. With the changes over the past hundred years, some of this knowledge has diminished as close observation over time in the natural world is less frequently practiced. This lesson helps students look closely at the similarities and differences between many species of fish and learn to identify them at different stages in their lives.

Cultural Values:

Observation, Relatedness, Responsibility, Self-Restraint, Fortitude, Skill,

Steps:

1. Quick-write reflection – What do you know about fish?
2. Pre-testing, online tutorial on bull trout identification (MT Fish Wild Life and Parks Training Program)
3. Sorting and matching game
4. Species review direct instruction using Explore the River DVD
5. Group species assignment and oral reports
6. Post test
7. Anatomy DVD tutorial
8. Anatomy – shape and place art project (field journal)



Tab 9: Elders, Water and Fishing

Our elders provide important information on the traditional relationship with water which helps us understand the role of water in traditional life and the impact of water quality on the bull trout and other native fish. The elders' stories inform our collective histories, and are central to our contemporary understanding of how to care for the rivers. To learn from the experience of the elders and the generations that have gone before them, careful listening is required.

Cultural Values:

Respect, Listening, Cooperation, Relatedness

Steps:

1. Listening practice
2. Focusing on similarities and differences
3. Experiences
4. Observations
5. Traditional relationship with bull trout, fish and water
6. Cultural uses for water and fish
7. Summarization and paraphrasing
8. Cooperative work



Tab 10: Bull Trout's Life

All living things go through a unique cycle of life. With each stage come changing needs for food, habitat, and natural predators. Having lived for thousands of years within our aboriginal territory, our Salish and Pend d'Oreille ancestors understood the life cycles of all the plants and animals upon which they depended for their existence and that we still depend on today for the perpetuation of our culture. This body of knowledge was passed down through the oral tradition from generation to generation. Today, these life cycles are studied by biologists trying to prevent the extinction of a species—in this case the threatened bull trout. Learning the life cycle of the bull trout can help us understand how to protect and enhance its habitats so the species will be around for future generations.

Cultural Values:

Relatedness, Balance, Observation, Cooperation, Respect

Steps:

1. Quick-write - What do you know about life cycle of bull trout?
2. Overview video Fish part 2, life cycle of bull trout
3. Group research and chart
4. Personification, perspective and point of view; student delivered mini lessons
5. Autobiography project
6. Knowledge check on Fish
7. Publish and share



Tab 11: To Catch A Fish

The tools our ancestors developed enabled them not only to survive but to thrive throughout our aboriginal territory. Those tools are technologies, uniquely adapted to the environment and created with materials from the land. This investigation will explore the technologies associated with fishing and with the sharing of knowledge about the use of those technologies.

Cultural Values:

Relatedness, Skill, Observation, Listening, Gratitude, Level-Headedness

Steps:

1. Quick-write 1 – What is technology?
2. Identify technologies
3. Mystery piece (twine), debate
4. Explore creation of cordage,
5. Quick-write 2 – What is the “value” of various technologies?
6. Design a trap, cordage and willow team project (paper drawing or prototype)
7. Teams share fish trap designs, critique and discuss
8. Explore traditional technologies
9. Cordage, spears and hooks
10. Traps video
11. Trap simulation



Tab 12: History of Bull Trout and the Salish and Pend d’Oreille People

For thousands of years, our ancestors hunted, fished, and harvested plant foods across a vast territory that encompassed most of what is now western and central Montana, northern Idaho, and eastern Washington, centering around the drainage systems of the Flathead, Clark Fork, and Pend Oreille Rivers, and extending east of the divide to the upper Missouri system and the Musselshell. Across this immense area, the Tribes fostered a relationship of respect and reciprocity with the plants and animals. Our ancestors sustained themselves well and took good care of their homeland. Over the past 200 years, many changes have occurred that have transformed our lives and our important relationships to the plants and animals. As a result of these changes, our relationship to bull trout is now threatened. In this investigation, students will learn the history of the Salish and Pend d’Oreille people’s relationship to bull trout, while practicing close reading and using authentic literacy to support the development of robust comprehension skills.

Cultural Values:

Respect, Observation, Listening

Steps:

1. Elders interview video segment, daily opening
2. Daily authentic literacy lesson, chapter per day
3. Text annotation strategy to deepen comprehension
4. Reading comprehension strategies for historical narratives
5. Chapter 1: The Tribal World
6. Chapter 2: Fishing and Lifeways
7. Chapter 3: Confidence
8. Chapter 4: Narrowing World
9. Chapter 5: Decimation
10. Chapter 6: Resistance and Renewal
11. Culture and History video overview – summary and inspiration piece (show only after fish trap design project in To Catch a Fish investigation)
12. Essay assignment, final assessment
13. Knowledge check on Culture and History



Tab 13: Healthy Rivers

People have learned about the qualities or attributes of a healthy stream by studying the negative impacts of our activities on rivers like the Jocko. The reaches of the river that remain as our elders remember—untouched and free—have very different qualities than the stretches of the river where human activities have played a significant role. Close observation of these differences helps hydrologists and biologists restore functions to critical aquatic and riparian habitats. In this lesson, students learn the attributes of a healthy stream, the negative changes that have damaged the river, and passive and active tools being used to restore the stream—and welcome back the bull trout.

Cultural Values:

Reciprocity, Relatedness, Cooperation, Observation

Steps:

1. Three cycles of close reading and annotation of text with discussion, extension using the DVD
2. Cycle 1: Expert pairs on Eight Attributes of a Healthy Stream (Hydrology)
3. Knowledge check on Hydrology
4. Cycle 2: Four expert teams on changes (A Century of Change)
5. Knowledge check on Century of Change
6. Cycle 3: Five expert teams on passive tools (Restoration)
7. Team Reports
8. View overview video on Restoration and conduct interactive lecture on active tools
9. Jocko restoration
10. Simulation
11. Knowledge check on Restoration

**Tab 14: A Place for Everyone**

Elders teach us to avoid wasting and misusing water and to treat plants and animals respectfully. They teach us to take only what we need and when we do take, to give something of equal or greater value in return. They teach us that all aspects of aquatic and riparian habitats are interrelated, that every plant and animal has a role to play and each affects how the river functions. This lesson is a scenario game that allows students to practice what they have learned about habitats, fish, human impacts, and restoration by taking on the role of an animal or plant and responding to changes that affect that organism's habitat.

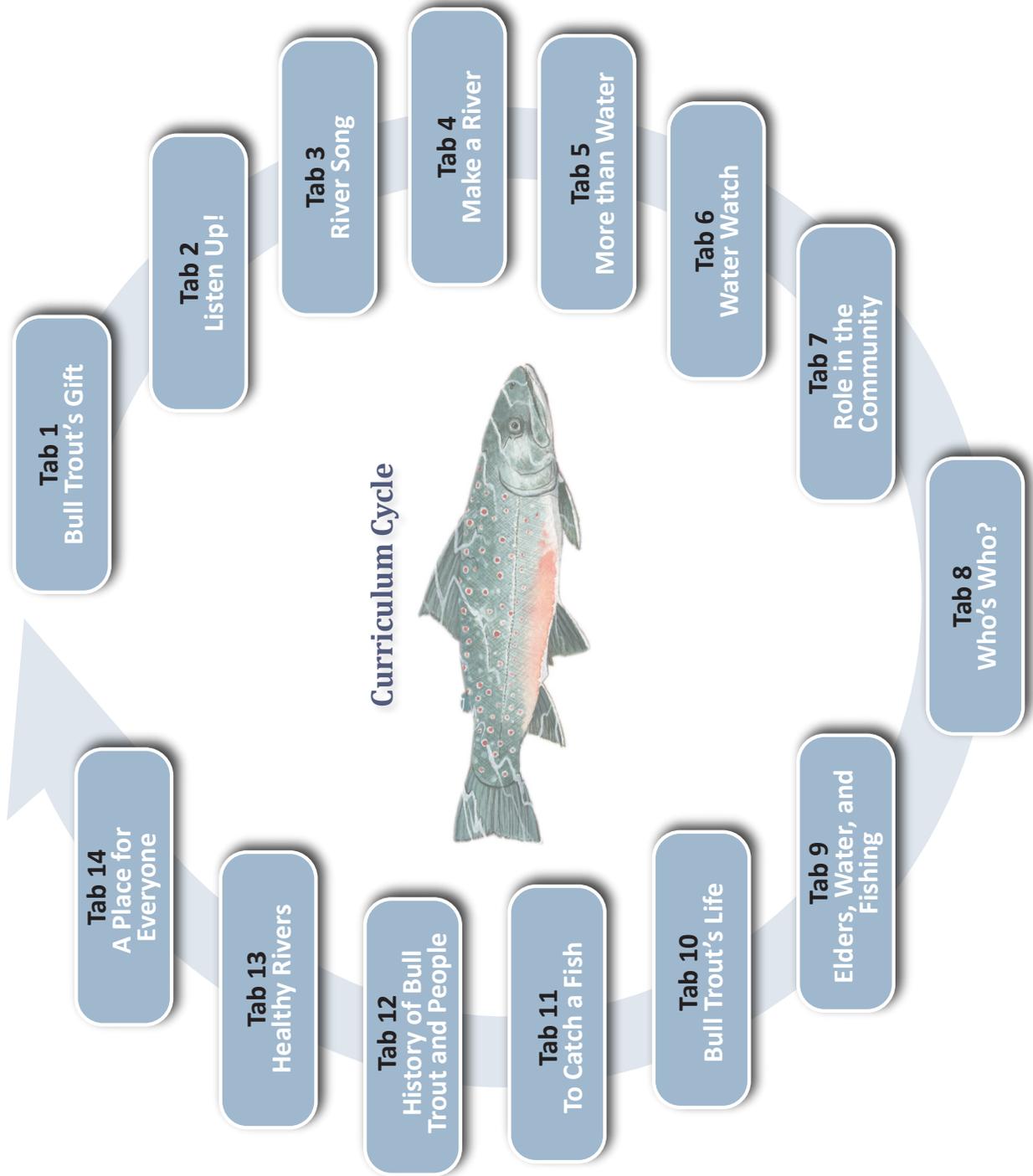
Cultural Values:

Relatedness, Observation, Cooperation, Respect

Steps:

1. Reflective writing - What's your place?
2. Role play and role research
3. Habitat review, matching game with definitions and labels of complex stream parts
4. Scenario game / simulation (scenarios are changes or passive tools, both positive and negative)
5. Write an obituary or autobiography for role based on one scenario
6. Knowledge check on Habitat





Information Contained in Each Lesson

Cultural Values

The cultural values of the Salish and Pend d’Oreille are inseparable from the way we, as Tribes, interact with and perceive the land and other people. They make up a unified whole, at the center of which is a deeply held spiritual attitude of respect toward the land, water, plants, and animals and a way of living closely and in community with one another. We believe that if each lesson is to be effective in teaching about water and fish and their value, they must be placed within this larger context.

Multimedia Content

The “pointing-finger” icon  appearing throughout the lessons is a signal there is some interactive or multimedia content such as a rollover button, a video, or Flash content. For example, you can rollover the Cultural Values listed at the start of each lesson to see definitions of those values. When you see the icon, use your mouse to rollover or click on whatever the finger is pointing at to interact with the material.

Rationale

The purpose of the lesson and the topics explored.

Learning Targets

“I statements” that state what the student will be able to do upon successful completion of the lesson. These are intended to be shared with your students when you begin the lesson and are linked back to state and national content standards in a wide variety of content areas.

Resources

The materials that you will need to implement the lesson.

Instructional Techniques

These are techniques and specific skills that you will use or that will be practiced or reinforced in the lesson.

Time Frame

The suggested amount of time needed to complete the lesson and a suggested way to break the lesson down by class period. If you are integrating this curriculum as it is intended—into more than one content area—several class periods may occur on the same day.

Suggested Grade Levels

The grade levels that the lesson targets and other grades that it will work with if adapted.

Procedures

Highly explicit, step-by-step teacher instructions to implement the lesson. They were developed to support teachers with differing levels of experience or who want to expand their personal instructional repertoire to include new interactive strategies. They can be followed in whole or in part and adapted as needed to suit the students.

Extensions

Ways to expand or extend the lesson by incorporate additional or alternative procedures.

Assessment

Ways to assess the skills and knowledge that students learn from the lesson.

Adaptations

How the lesson might be adapted for a grade level other than the targeted grade level. They can be followed in whole or in part and adapted as needed to suit the students.

References

The reference material cited or referred to in the lesson.

What is the Difference Between the two Explore the River DVDs?

The lessons in this curriculum are based on the Interactive DVD entitled *Explore the River*. In addition to the curriculum itself, which is a pdf file, the Curriculum DVD includes the contents of the Interactive DVD. Both disks are intended to be used on a computer (as opposed to a television).



The Curriculum DVD contains an electronic version of the curriculum as a pdf file as well as all of the contents of the *Explore the River Interactive DVD*.



The Interactive DVD is Flash based. The user interacts with the content. **The contents of the Interactive DVD are also included on the Curriculum DVD.**

Connecting to the Interactive DVD from the Curriculum PDF

As we mentioned, the Curriculum DVD contains the curriculum (which is a pdf file) as well as the full contents of the interactive *Explore the River* DVD. The latter is a Flash file which includes rollovers that provide key definitions, video clips, supplemental interactive Flash content, and important web links. To play any of the Flash or other multimedia material, **you need both the latest Flash® player from Adobe as well as Adobe Reader® 9 or later installed on your computer.** Earlier versions will not work. Most computers already have these two players installed. But if they are not on your computer or if you do not have the latest versions, you can download them for free from the Adobe website. It should only take a few minutes. To download them, click on the buttons below and follow the instructions:



GET THE LATEST FLASH
PLAYER



GET THE LATEST ADOBE
READER

Even if you have these players installed, links to Interactive DVD within the curriculum pdf may not work on some computers, especially those running Windows. This is most likely due to the settings of the antivirus software on those machines or the autoplay settings of the operating system. If you experience this problem, your school's IT specialist may be able to correct it. If not, see the [Read Me First](#) file on this DVD for a work around.

You can dramatically improve the performance of the *Explore the River* DVD by copying its contents to a folder on your hard drive (copy the appropriate "ExploreTheRiver" file (Mac or Windows) as well as the assets folder). The files will occupy approximately 3.54 Gigabytes of space. If you do this, be sure to place *all* the files from the DVD into the *same* folder on your hard drive, otherwise the program will not work. Your school's IT specialist can help you do this.

One last suggestion. Many teachers find it helpful to print a hardcopy of the curriculum from the PDF file. While the electronic version is useful because it is easy to search and because it has interactive content, a hardcopy version has advantages too, especially for a busy teacher in a classroom full of students. Most teachers find that having both available is the best option.





All along the way the rivers and streams rushed clear and full. Birds sang and bathed in the water. The people saw elk and deer and moose and bear. The plants grew strong. All was well. All was good.

BULL TROUT'S GIFT

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Bull Trout's Gift

 *Cultural Values: Reciprocity, Listening, Respect, Quiet, Calm*

Rationale

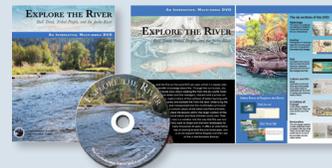
Bull Trout's Gift is a picture book that contains a story within a story. The first is the true story of a class of 5th-grade students learning about the ecology of the Jocko River by going on a field trip led by fisheries biologist Craig Barfoot and tribal elder Johnny Arlee. Embedded in this informative story is a traditional story told by Johnny Arlee. This second story demonstrates the values of respect and reciprocity and the cultural significance of the bull trout to the Salish and Pend d'Oreille people. In telling the story, Johnny recounts the banishing of Aay (Bull Trout) and how the people suffered as a result and then were able to make amends. The book ends with the 5th graders reflecting on the value of reciprocity and learning how today the Tribes are practicing reciprocity by working to restore the river and reestablish their traditional relationship with bull trout.

Learning Targets

- I listen attentively.
- I picture what is happening in the story in my head.
- I recognize the story within a story.
- I know the difference between the genre of a traditional story and an informative text.
- I retell each story with accuracy.
- I recognize the structures for each story and how they share similar themes in different ways.
- I understand the meaning of reciprocity in relation to each story.
- I storyboard scenes from each story in sequence.
- I identify parts of each story, including beginning, middle, and end.
- I know how each of the four "C's" contribute to maintaining a healthy river.
- I know how traditional stories help to teach about the natural world.

Resources

- The book, *Bull Trout's Gift*
- Explore the River DVD* (note that *Bull Trout's Gift* is on both the *Explore the River DVD* and this Curriculum DVD and may be projected from either disk)
- Field Journal for *Explore the River* Project (or blank book, composition book and/or small sketch pad), 1 per student
- Computer with DVD player



View the interactive book version of the story on the Explore the River DVD (go to Culture & History > Bull Trout's Gift).



Read the story in pdf form.



Read a pdf of the essay on the story's relevance.

- PC projector
- Chart paper and markers for creating storyboards or maps
- Three-level recording form on reciprocity ([attached](#))
- Exit tickets, one per student ([attached](#))

Instructional Techniques

Prediction; activation of prior knowledge; whole class read-aloud; attentive and active listening; individual, partner, or small-group re-reading of selected parts; storyboard key events; summary and paraphrasing; large-group discussion

Time Frame

Two 50-minute class periods; may vary based on age, grade level, and the teacher's choices to support literacy goals.

1st period for "reciprocity hunch" writing activity, [book walk](#), predictions, listening/viewing the telling of the story *Bull Trout's Gift*, confirm or reject predictions, begin story maps.

2nd period possible re-read (either the teacher or the *Explore the River* DVD) of *Bull Trout's Gift*, students refine and extend their storyboard, post and share out in groups, exit tickets.

Suggested Grade Levels

Grades 2 - 12

The procedures listed below target students in grades 4 through 8. However, with suggested [adaptations](#), these may be useful for grades from 2 through 12.

Procedures

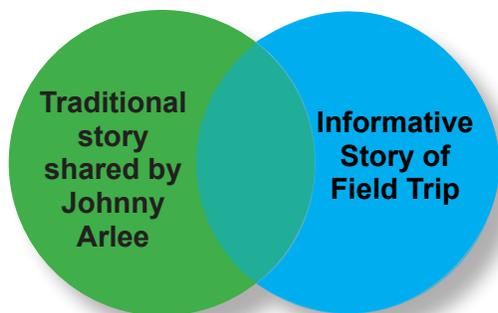
Day One

1. Introduce students to their Field Journals (these could be the journals developed for this curriculum, or spiral notebooks or composition books reserved for this purpose.)
2. Tell them during the coming weeks they will be participating in an adventure that will help them more deeply appreciate the role of the river (water and aquatic ecosystems) in their lives. They will come to understand the river from many perspectives; flora, fauna, scientists, poets, and human beings.
3. To introduce the book *Bull Trout's Gift*, invite students to use their Field Journal or notebook, or use the three part reflection sheet attached at the end of this lesson if you prefer.
4. First have students write "reciprocity" on the top of a blank page (unless using the reflection sheet attached), and then write their best prediction or hunch regarding the meaning of that word.
5. Have students draw a line under this hunch to separate it from the next part of the reflection if using a notebook or Field Journal.
6. Set aside when done writing hunch definition.
7. Conduct a book-walk to build background knowledge, activate prior knowledge and engage students.
8. Introduce the book *Bull Trout's Gift*; the storyteller, Johnny Arlee; and the illustrator, Sashay Camel.

MAKE IT THEIR OWN

Consider having students employ the Field Journal to start by writing a short autobiographical piece in the journal, or an "I am" poem. Once you do this, and their stories are connected to the pages, these notebooks will be maintained with respect.

9. As a group, make predictions about the book based on the title and the front and back cover art.
 - What do you think this book will be about?
 - Why?
10. Write these predictions on the board or chart paper where students can see them.
11. Older students should write their own predictions first, and then share with the class, creating a collective list of predictions that can be debriefed on later. Their personal list is then used for reflection. These predictions can be stored in their Field Journal for this project or in a notebook used daily for exploratory writing. If using the Field Journal for this purpose, be sure to leave space (2 pages) after the “hunch” activity above, before they jot their predictions. They will come back to this later.
12. To support comprehension, tell students that the format of the book is that of a story within a story.
13. Establish purposes for their listening.
 - Ask students to listen for the transition between parts of the book as the story within the story is revealed.
 - Ask them to think about what type or types of stories these two are. Are they fiction or non-fiction?
 - What genre's or genre are the two distinct parts of *Bull Trout's Gift*?
14. Share the book as a read aloud (see the [Extension](#) section for ideas related to developmental needs of your students.) If you have access, project the book so the beautiful illustrations can be seen easily by all.
15. Ask students to identify the story within the story.
16. What is the purpose of each story? Record responses on the board. It will look something like this:
 - The class field trip shares information about the Jocko River Restoration Project and what makes a healthy river.
 - The story told by Johnny Arlee shares the cultural significance of the Bull Trout to the Salish and Pend d'Oreille within their cultural context and teaches about respect and reciprocity—two critically important cultural values.
17. Draw a [Venn diagram](#) on the board.



AVOID INTERRUPTING THE STORY

Read the entire story without excessive “teacher talk.” It has become common for teachers to over-teach texts, often breaking them up with many side-bar literacy lessons. The most important lesson is that the story itself has value. Try to always share stories with few or no interruptions the first time through. This will increase attention spans and listening over time, and also enhance comprehension and intrinsic motivation.

18. Invite discussion of each story noting details for each in one part of the diagram. The area of overlap is not literal detail, but rather conceptual—focused on equal exchange and the cultural value of reciprocity.
19. After discussion, invite students to return to their Field Journals below the hunch they made regarding the meaning of reciprocity. This could also be done on another page or the [response form](#) attached to this lesson, preserving the Field Journal for field notes.

20. Instruct students: "Now that we have read *Bull Trout's Gift*, how do you think the value of reciprocity is demonstrated in each part of the book?" and have students write their response. You may invite them, using the DVD or a hard copy of the book, to go back and confirm their thinking, making reference to the text.
21. Finally, have the students go to the dictionary and look up the meaning of reciprocity. Now they must determine the definition that most closely matches the behaviors of reciprocity in the book, and then write it in their Field Journal or on the [form](#) provided in the third space.
22. Have them self-check or reflect. How closely did their hunch regarding the meaning of the word match what the word actually means?
23. Discuss with the whole group how they now understand the cultural value of reciprocity from the two examples provided in the stories of *Bull Trout's Gift*.
24. Close by having students, working in teams, begin the storyboards or maps on chart paper showing the different parts of each story in a visual or graphic way. Be sure they capture or layer details that help them understand the nature of a healthy stream, the role of humans in helping to restore the balance and correct their relationships to the Bull Trout by caring for the river. The more detail they layer on the better. Encourage the use of colored markers or colored pencils to add visual interest to the charts and possibly separate visually the two or three major parts of the book.

Day Two

1. Allow time to complete the charts.
2. Have each group share out, discussing their thinking and describing the details captured on their charts, summarizing the teachings of *Bull Trout's Gift*.
3. Promote discussion, filling in details as needed.
4. Close the class by requiring a quick-write exit ticket to determine the level of understanding after the story, but at the beginning of the unit of study. This will be compared to a similar exit ticket at the conclusion of the entire unit to determine growth in understanding.
5. Pass out the [exit ticket form](#) attached to this lesson.
6. Have them write a short paragraph answering the following question:
 - What makes a healthy river?
7. Set a writing timer for 5-10 minutes. Use protocol for quick-writes.
 - Write quickly and do not stop.
 - Don't worry about spelling or grammar as you get your ideas down.
 - This is what you think now. There are no "wrong" answers.
 - Go! Create urgency. Allow 5 to 10 minutes for the quick-write.
8. If you choose, allow an additional 4 to 5 minutes after the quick write to check for the following and revise:
 - short paragraph
 - at least 3 ideas
 - complete sentences
9. Once the quick writing is completed, students' pair-share, each taking one minute to share what they think. This should not take more than 5 minutes, including the pairing, sharing, and return to seats.
10. Have them turn in the exit tickets before the end of class.
11. Close by sharing the 2:35 minute introductory video from *Explore the River*. Go to Main > Play the Overview.



While in the Explore the River DVD, click this window in the center of the opening page of the DVD to view the Main Overview

Extension

Depending on your community, you could select to do a walk to a location near a river or stream for the reading of *Bull Trout's Gift*. This could be a regular occurrence and would allow for quick, quiet observations to be written at different times in students Field Journals. Any and all opportunities to take this unit of study outdoors should be used.

Assessment

- Direct observation of listening behavior
- Reciprocity prediction, contextual description from two parts of the story, dictionary definition and self-assessment (in Field Journal or on response-form provided)
- Venn diagram details
- Storyboards or maps made by student groups showing structure of the stories and key details
- Accurate retell of the story with or without the drawings
- Student quick-writes, "What makes a healthy river?"
- Evidence of student awareness resulting from in-class discussion of how traditional stories helped to teach about the natural world
- Observation of group participation and partner collaboration

Adaptations

The following adaptations are designed to support your efforts to meet the needs of every learner. Grade levels here are only a suggestion and would not preclude use of a great 3rd-grade strategy with a 9th grader or vice versa.

Grades K-3 (or students at any level who need more support)

The critical task of primary students is the development of independent literacy—both reading and writing. To achieve this, they will require modeling, demonstration, and temporary supports. The following procedural options could help you more closely meet these needs.

1. For beginning readers, write the book title on the board and say it slowly, providing one-to-one matching support. This is a good opportunity to pre-teach a few sight words from the book.
2. Vocalize words as you write predictions, or capture any other part of the class discussion, on the board. Students learn phonics in context from writing and watching you write and talk about your thinking as you write and re-read what you have written. This is important modeling and language experience.
3. You could use the language-experience approach (group dictation with modeling of writing by the teacher) and a [KWL](#) chart for emergent readers at the Kindergarten or early 1st grade levels (filling in only the K and W sections of a KWL chart with whole class participation) in place of the individual exit ticket. Keep posted as they learn more resulting from selected lessons in the unit and fill in the L section at the close of your investigation.

Grades 4-6 (or students at any level who require greater challenge)

This age group needs reading practice and will continue to benefit from stories read aloud or told. In addition, when a story has a written form, they should always be required to do some of the reading independently or

WRITE EVERY DAY

Be careful to maintain expectations for writing at all grade levels from the first day of kindergarten. While you may not be able to read this "writing," your students will tell you their intended message and over several months of daily writing, kindergartners will emerge as writers and learn the fundamentals of the alphabetic principle along the way. Many kindergartners don't write because we don't allow them risk-free opportunities to do so, resulting from our beliefs about their abilities.

with guidance. They benefit from developing an understanding of genres and story structures, as well as rich exposure to the cultural context for the use of a story. The following options could help you extend their learning during the *Bull Trout's Gift* lesson.

1. Take advantage of the opportunity to examine genre and genre labels associated with traditional literature. Clarify that animals talking is not a feature of fantasy if a text or story otherwise meets the criteria of traditional literature.
2. This age group would benefit from reading the story independently.
3. After their independent reading, have them write a summary paragraph capturing all the action of the story within a story in correct sequence.
4. Place limits on their summary paragraphs—for example, limit them to 7 to 10 sentences in order to force them to be clear and concise.

Grades 7-12 (or students at any level who require greater challenge)

Older or more advanced students should be given more responsibility and should be required to read the entire story independently in addition to any whole-class reading. You may call for a volunteer or team of volunteers to rehearse and then read aloud the story to the class using the projected DVD version as “staging” or a back drop, however do not force round-robin reading. Students benefit from opportunities to analyze, compare, and contrast stories, as well as develop understanding of how to determine the authenticity of a traditional story. Their task, beyond enjoying and comprehending the story, is critical literacy.

1. Older students need to read the story independently before or after a class presentation of the story (read aloud or performance).
2. After their independent reading, have them write two (or three) summary paragraphs capturing all the action of critical parts of each story in correct sequence.
3. Place limits on their summary paragraphs—for example 7-to-10 sentences in order to force them to be clear and concise.
4. You may choose to provide an investigation revealing the Eurocentric genre labels that often misrepresent the religious and historic importance of traditional stories in American Indian cultures.
5. High school students might like to conduct a study comparing authentic stories coming from an oral tradition and authored by the tribe of origin, to contemporary “fakelore”. If interested in this investigation, check out the article “Fakelore, Multiculturalism, and the Ethics of Children’s Literature” by Eliot Singer which can be downloaded from the following web site: <https://www.msu.edu/user/singere/fakelore.html>. It provides a powerful comparative discussion of the difference between authentic traditional stories coming from the oral traditions of different tribes and those created by non-Indian authors for commercial purposes.
6. For a different take, or an additional support document for high school students related to the above investigation, check out the Debbie Reese’s blog <http://americanindiansinchildrensliterature.blogspot.com/> which includes discussion and reviews of recently released children’s literature featuring American Indian themes.
7. Located on the above blog, you will find a humorous article designed to get this point across: “How to Turn a Traditional Indian Story into a Children’s Book (for fun and profit)” by Beverly Slapin. It can be downloaded from <http://americanindiansinchildrensliterature.blogspot.com/2007/07/beverly-slapins-how-to-turn-traditional.html>. This article is a bruising tongue-in-cheek parody of a “How to...” guide that gets the point of ownership and authenticity associated with literature coming from the oral traditions of any tribe across to students and teachers alike. It is an opportunity to teach about parody, satire, and irony.
8. Conduct an in class discussion of the “living” nature of the oral tradition. Johnny Arlee’s story is a classic example of the power and importance of the oral tradition in capturing and imparting essential cultural knowledge and values for future generations.

References

Confederated Salish and Kootenai Tribes. (2011). *Bull Trout's Gift* Lincoln, NE: University of Nebraska Press.

Confederated Salish & Kootenai Tribes. (2011). *Explore the River: Bull Trout, Tribal People, and the Jocko River*. (An Interactive Educational DVD) Pablo, MT: Confederated Salish and Kootenai Tribes.

Confederated Salish and Kootenai Tribes. (2011). *Sngqeymintn/Field Journal*. Lincoln, NE: University of Nebraska Press.

Reciprocity Reflection: Three Steps to Discovery

Name: _____ Date: _____

Pre-Reading: Write in the space below your best guess of the meaning of the word reciprocal or reciprocity? What does it mean to reciprocate?

After Reading: Now that we have read *Bull Trout's Gift*, how do you think the value of reciprocity is demonstrated in each part of the book?

Mrs. Howlett's Class Field Trip Story?

Johnny Arlee's Story of *Bull Trout's Gift*?

Now, what is the dictionary definition of the word reciprocate or reciprocal or reciprocity that most closely matches the actions in each story

On a scale of 1 to 5 with 1 being "Not at all!" and 5 being "Perfect match!" How did your definition or hunch above match the definition you found below? Mark your thought with an X on the diagram below.



EXIT TICKET

Name: _____ Date: _____

What makes a healthy river? You have 5-10 minutes to write as much as you know right now. Go!

EXIT TICKET

Name: _____ Date: _____

What makes a healthy river? You have 5-10 minutes to write as much as you know right now. Go!

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LISTEN UP!



“They put too many, too many different kinds of fish in the creeks and rivers...nowadays, they put fish here and there. Now our old fish [are] gone.”

— Louise McDonald

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Listen Up!

Cultural Values: Observation, Listening, Respect

Rationale

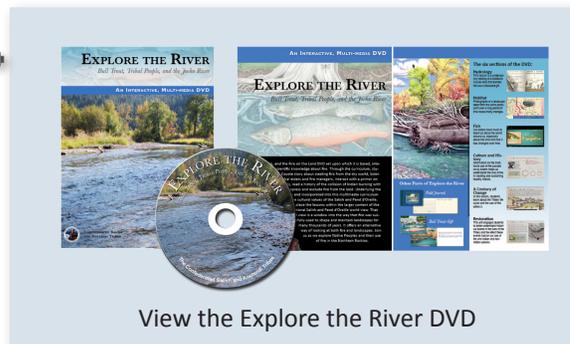
Listening attentively and deeply understanding the spoken words of another are essential skills and were the principal means of transmitting knowledge in the past. Today, listening skills have changed as many messages are transmitted in 30-second bites. Attention spans and the ability to retain information and make connections among different speakers, personal experiences, and background knowledge have diminished. As Salish and Pend d'Oreille people, we continue to practice our oral traditions and value listening skills as essential to our way of life. This lesson is designed to help students develop and practice attentive, respectful listening.

Learning Targets

- I “turn my ear” toward the person who is talking, and/or look at him or her.
- I listen and don’t interrupt.
- I think about what the person is saying.
- I picture what the person is saying.
- I ask questions to find out more or to understand better.
- I nod, smile or say something to show that I understand.
- I repeat what I heard in my own words.
- I retell in my own words a personal story shared by a classmate with details in sequence.
- I state new ideas or understandings resulting from a story shared by a classmate.
- I retell in my own words a personal story shared by an elder with details in sequence.
- I summarize, using my listening skills, the consequences of fish stocking from this single, personal example.
- I reflect on my own listening skills in order to improve.

Resources

- Explore the River DVD
- PC or Mac with DVD player, with speakers
- PC projector
- Listening skills rubric ([attached](#))
- Listening feedback cards ([attached](#))
- Chart paper and three colored markers (blue, red and black) for each group of four in the classroom.



- Listening skills quick reference cards ([attached](#), optional)

Instructional Techniques

Whole class demonstration and practice, individual active listening to a short segment of an elder interview (once for dictation, then for gist), pair-share, whole-class debrief.

Time Frame

One, 50-minute class period. The amount of time required may vary based on age and grade level.

Suggested Grade Levels

Grades K-12

Procedures below are developed for students in grades 1 through 8. However, with suggested [adaptations](#) following the procedures section, these may be useful from grades K through 12.

Procedures

1. Clear an area in the classroom.
2. Seat yourself and students in a circle on the floor.
3. Play the “telephone” game. Teacher and students whisper a statement from person to person moving around the circle. Instructions go like this:
 - “Next, we are going to do an activity called the Telephone Game. Some of you may have heard about or played this game before.”
 - “I have a statement that I am going to whisper into (name of first person)’s ear. S/he is going to whisper the statement into (name of second person)’s ear... We will pass the message around the circle clockwise.”
 - “The rules are that you must whisper and that you can only say the statement once; no repeating is allowed! Whatever you hear, pass along the statement as best you can to the next person.”
 - “The last person will be (name of last person). When the statement comes around to that person, s/he will say aloud what s/he heard.”
 - “Is everyone ready? I’ll start...”
4. At the end, compare the original message to the message stated by the last student in the circle. Discuss:
 - What happened?
 - How is it that (last person) heard “...” when the original statement was “...”?
 - How often do we hear something very different than the message being shared by a speaker?
 - What rules of the game were responsible for the changes in the message or statement? (Possible answers: whispering, no repeating)
 - When people are really listening to you, how do you know? What are some ways they sit? What are some ways they talk? What are some ways they look at you? What does it feel like?
 - Do you think we can improve our listening and pass on the actual message being sent with practice?
 - What might we do differently?

INCREASE THE BENEFIT

Increase the benefit to students by carefully selecting the statements you use for the telephone game. Think of statements that reinforce a big idea or key fact central to the content of the lesson, remind students of a key behavior you hope they will practice, or make an announcement related to upcoming class activities.

5. Write students' ideas to improve communication and listening on a piece of chart paper or board.
6. If time allows, play the game again, but this time have the students receiving the new message attempt to listen and pass on the message word for word. (Teach students the terms "literal" and "verbatim" here.)
7. Any differences? Discuss what you noticed.
8. If time allows, play the game a third time, but this time have the students receiving the new message attempt to paraphrase the message in their own words.... retaining the original meaning but making the message their own.
9. Any differences? Discuss what you noticed.
10. Share with students the learning targets for this lesson. At this time, you may want to hand out the [self-assessment rubric](#) (one per student) with the listening skills listed.
11. Review skills on the [checklist of good listening skills](#) and compare to the students' ideas to improve communication from the telephone-game activity.
12. While they are still in the circle, tell students you will be requiring them to practice their listening skills by retaining a set of directions for the next activity. They will need to "Listen Up!" You may project instructions but do not allow students to "shout out" requests for clarification.
13. Here are the instructions:
 - Sit with a partner. (Teachers will want to make the pairs assigning role "A" OR "B" until students are practiced at this.)
 - Take a few minutes to think of a story... something you did or that happened to you. Your story can be funny or share an interesting experience you or a family member had, anything you would like to share. Your story needs to have at least 3 parts or significant details. Jot these on a piece of paper to help you remember.
 - Allow about 3 minutes to think of and record a story for sharing.
 - Partner A will be the storyteller; Partner B will be the listener.
 - Partner A tells the story to Partner B. (Allow just 1 minute or so.)
 - Partner B uses the following script to retell the story told by Partner A (post on board).
 - "What I heard was...(repeat in your own words what you heard)"
 - "I am now aware that....(a new awareness resulting from what you heard)"
 - "Now I understand that...(a new understanding resulting from what you heard)"
 - Using the Listening Feedback Cards provided to each pair ([attached](#)) Partner A provides feedback to Partner B on the accuracy of his or her retell. (That's it!, Not Quite, or Nope. Try Again.)
 - If "Not Quite, or Try Again," Partner A repeats all or part of the story to clarify, and Partner B attempts a repeat.
 - Repeat the entire process, shifting roles.
14. After both partners have a turn as teller and listener, have them complete the self-assessment checklist you provided ([attached](#)).
15. Debrief with the entire class.
 - What was it like to be the story teller?
 - How did you know your partner was paying attention to the story?
 - What was it like to be the listener?
 - Did you practice the skills we discussed in class?
16. Now test their skills.

THE BENEFIT OF TALKING

Talking supports both comprehension and writing. Get students to share the message in their own words in order to more deeply understand the message (listening comprehension) and be able to share that message with others, either verbally or in writing. Whatever they can say in their own words, they can write!

17. Using the Explore the River DVD, locate and load the Elders Interviews>interview of Louise McDonald.



18. Play Louise's entire interview (about 3 minutes), audio only (this is a three-part clip from a longer interview). Each section is important and separated by a pause. For the first two passes through, use the audio only, then allow students to see the clip with subtitles and self check the accuracy of their listening. Students should listen with great attention. The three section titles summarize the essence of each statement or story:

- "He caught a wide, really big Bull Trout"
- "You want to go fishing everyday, go ahead"
- "They put too many different kinds of fish in the creek"

19. Have them listen, desks clear (no note-taking), to Louise's entire clip.

20. Now, using the skills they have developed during this lesson, have students individually write a short written retelling of Louise's interview, using the prompts employed for the above partner activity.

- "What I heard Louise say was (repeat in your own words what you heard)"
- "I am now aware that (a new awareness resulting from what you heard)"
- "Now I understand that (a new understanding resulting from what you heard)"

21. Reseat students in groups of three or four.

22. Have them compare their notes on the three parts of Louise's interview, and then using chart paper, capture what they heard collectively. (This is a case of two or more heads being better than one.) Record using a blue marker.

23. Now have students listen again to the interview as a group—once again without talking or taking notes.

24. When the interview is completed, allow the groups 5 minutes to talk through what they heard, and then another 3 to 5 minutes to record what they heard, but this time layer it over the blue marker notes using a red marker.

25. Finally, show the entire interview audio and video, so students can see the subtitles.

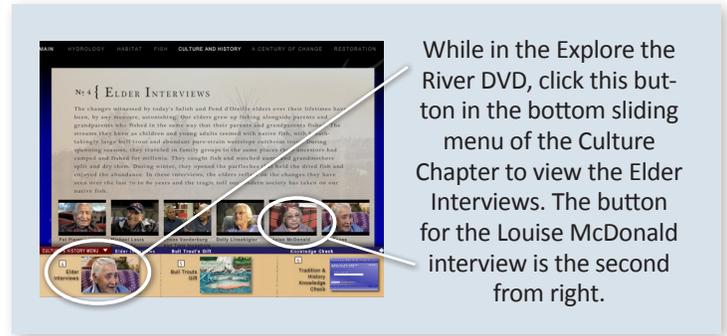
26. Allow the group to talk after viewing for a few minutes, and then have them use a black marker to add clarifying notes over the blue and red, showing the progression of their understanding as a group.

27. Gather their self-assessment checklists and their individual written retell from Louise's interview clip to determine the level of student skill and the success of the lesson.

- Examine the self-assessment rubrics for patterns of strength and weakness for the class and individual students.
 - Are there any patterns present?
 - Do you think they overestimate or underestimate their listening skills as a group? As individuals?
- Look for any discrepancy between what students perceived about their own skill on the checklist and what they demonstrated in their written retelling of Louise's interview.
- In addition, look for their awareness of the feelings or emotions experienced by Louise in the sharing of her experiences. Picking up on the emotions felt by others while listening is an indication of deep understanding and empathy.

28. These observations on your part will help you support their learning throughout the Explore the River Unit.

29. Post their group layer charts for all to see and debrief on them as time allows on a subsequent day. This will build background knowledge and reactivate schema as they work in other parts of the unit with an emphasis on the memories and awareness of the elders.



While in the Explore the River DVD, click this button in the bottom sliding menu of the Culture Chapter to view the Elder Interviews. The button for the Louise McDonald interview is the second from right.

Extension

Once you have taught this lesson, spontaneously play the telephone game connected to big ideas and key content – or as a class surprise, periodically. Ask students to assess their own their own listening behavior after a guest speaker, assembly, or peer presentation using the attached rubric. Reuse the listening feedback cards and the pair-share activity anytime you want to support students in processing information presented in class, even following a traditional lecture or teacher-directed presentation of important new ideas or content. What a student speaks or writes will more likely be retained and used.

Assessment

- Direct observation of listening behavior
- Chart of communication strategies
- Direct observation of students accurately following instructions for partner activity
- Peer feedback: That’s it! — Not Quite.... — Try Again
- Self-assessment checklist: What do good listeners do?
- Written individual retell of Lousie McDonald’s interview after one audio listening
- Group three-layer chart paper summarizing Louise’s interview

Adaptations

The following adaptations are designed to support your efforts to meet the needs of every learner. Grade levels here are only a suggestion and would not preclude use of a great 3rd-grade strategy with a 9th grader or vice versa.

Grades K-3 (or students at any level who need more support)

Strong listening skills will support learners at all grade levels. Sometimes passive viewing and “screen time” diminish students’ awareness of the experience of a speaker or performer. As a teacher, have you ever seen students behave with a classroom guest as if that person were a media presentation, rather than live? Respectful behavior as a member of an audience toward a storyteller, speaker, or performer is a skill that must be taught. Following are some ideas to support younger students learning to develop strong listening skills.

1. Invite guests to speak in your classroom, or read to your students regularly.
2. Remind students of appropriate listening behaviors in advance of a guest speaker or performer coming to your classroom or school. Take time frequently to pre-teach and re-teach the listening skills found on the rubric.
3. Use the rubric provided here one time each week over the course of a year to have students reflect on their own skills and growth as good listeners.
4. Use pair-share strategies like the one articulated in this lesson frequently so children have opportunities to be both speakers and listeners and opportunities to paraphrase or summarize information presented in class. Make this part of your classroom procedures to support deeper understanding of the content of a lesson while also building these skills.
5. Traditional approaches, like “show and tell” and “author’s chair” are good opportunities to enhance student listening skills. Make students aware (meta-cognitively) of the skills involved and reflective of their application of those skills by using the rubric periodically. Ask students listening to summarize in their own words (either spoken or written) often.

Grades 4-6 (or students at any level who require greater challenge)

1. Require students to periodically (once a week or more) write a quick summary of a lesson, activity, or lecture they experienced in class. You can tell them in advance, or increase the challenge by spontaneously requiring this “quick-write summary” for any content you want students to master and use. Like exit and admit tickets, these quick-writes

allow you as a teacher to know what the students are taking away and also help the students develop awareness of their own learning. Students develop the habit of active listening when they know they will be held accountable for retelling, understanding, and applying the knowledge, skills, or abilities later. Use a timer for the quick-writes. A standard procedure goes like this:

- Write quickly and do not stop.
 - Go! Create urgency. Allow just 5 minutes for the quick-write summarizing what was heard.
2. Sometimes students are hard pressed to summarize the spoken word of another, and they rarely know the difference between a verbatim retelling (literally word for word) and retaining the essence or gist of a spoken message. Provide a mini-lesson on the difference between these two approaches using the telephone game demonstration provided as options in the lesson above. Two things to note: (1) It is hard to retain a word-for-word retelling in short-term memory long enough to be successful and (2) It is much easier to retain the gist of a story or material presented in the form of a story. Have students discuss and explore why this is so.
 3. Provide older students with the [good listening skills quick reference cards](#) in advance of a guest speaker or performer. Have them practice these skills.

Grades 7-12 (or students at any level who require greater challenge)

1. To adapt for older students, use the quick-write strategy above, but increase the complexity of the content heard. In addition, try this strategy with different types of audio input, perhaps including podcasts, music, etc.
2. Demand more structure for the retellings, including holding students accountable for technical writing skills, observation/listening notes, field notes, etc.
3. Don't forget the key elements connected to the retell and work with older students to internalize so answering these questions becomes automatic:
 - What did he or she say? **Retell**
 - What does it mean? **Broad interpretation**
 - What does it mean to me? **Personal interpretation**
 - Why should I care? or Why is that important? So what? **Value and Action**
4. Provide older students with the [good listening skills quick reference cards](#) in advance of a guest speaker or performer. Have them practice these skills.

References

Confederated Salish and Kootenai Tribes. (2011). *Bull Trout's Gift*. Lincoln, NE: University of Nebraska Press.

Confederated Salish & Kootenai Tribes. (2011). *Explore the River: Bull Trout, Tribal People, and the Jocko River*. (An Interactive Educational DVD). Pablo, MT: Confederated Salish and Kootenai Tribes.

Confederated Salish and Kootenai Tribes. (2011). *Snoqeymintn/Field Journal*. Lincoln, NE: University of Nebraska Press.

Listening Rubric—Student Checklists (Cut Apart)

Name _____ Date _____

| What do good listeners do? |  |  |  |
|--|---|---|---|
| Look at the person who is talking, or turn your ear toward him/her. | | | |
| Listen and don't interrupt. | | | |
| Think about what the person is saying. | | | |
| Picture what the person is saying. | | | |
| Ask questions, if appropriate, to find out more or understand. | | | |
| Nod , smile or say something to show you understand. | | | |
| Repeat what you heard in your own words. | | | |

Name _____ Date _____

| What do good listeners do? |  |  |  |
|--|---|---|---|
| Look at the person who is talking, or turn your ear toward him/her. | | | |
| Listen and don't interrupt. | | | |
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| Nod , smile or say something to show you understand. | | | |
| Repeat what you heard in your own words. | | | |

Name _____ Date _____

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|--|---|---|---|
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| Listen and don't interrupt. | | | |
| Think about what the person is saying. | | | |
| Picture what the person is saying. | | | |
| Ask questions, if appropriate, to find out more or understand. | | | |
| Nod , smile or say something to show you understand. | | | |
| Repeat what you heard in your own words. | | | |

Print 1 set for every pair of students and cut out.



Good Listening Skills Quick Reference

- Show concern about what the speaker has to say.
- Give the speaker your full attention.
- Make eye contact if you feel comfortable with it.
- Lean forward toward the speaker.
- Do not interrupt, judge, or criticize the speaker.
- Use nonverbal skills: Nod or shake your head, change your facial expression as appropriate. For example: show concern or excitement.
- Use brief verbal responses that show you are listening such as “yes,” “I see,” “go on,” etc.
- Ask questions to clarify what the person is saying and to encourage the person to say more. For example: “So, what happened next?” “How did you feel?” or “What did you think about that?”
- Try to figure out the feelings reflected by the speaker’s words. Ask a question to determine whether you are correct about how the speaker is feeling.
- Get feedback. Test how well you understand the speaker by sharing with the speaker what you think is being said.

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- Get feedback. Test how well you understand the speaker by sharing with the speaker what you think is being said.

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RIVER SONG



Once in a while, I go to the river, and I sit on the shore. I listen to the water. Later, I hear a song. Once in a while, I hear a beautiful song.

— Pat Pierre

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River Song

 *Cultural Values: Listening, Observation, Calm, Quiet, Cooperation, Respect*

Rationale

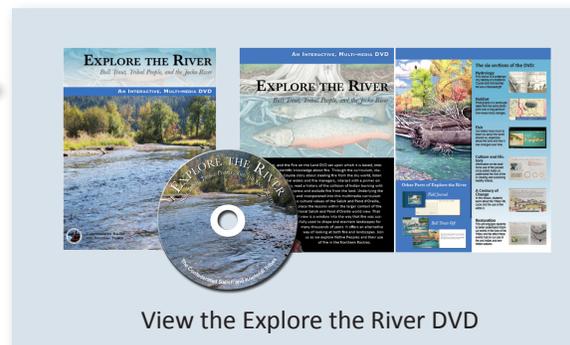
Contemporary life is noisy. Objects beep, tweet, ring, and buzz in nearly all aspects of our lives, but this was not so in times past. As our elders recount, long ago you could hear the song of a river, recognize birds by their calls, and predict changes in the environment related to weather and animals just by listening. Listening skills are essential to our way of life and enhance our understanding of the world we live in. This lesson is designed to help students develop and practice listening as a form of observation of the natural world. In this way, we can more deeply understand a place.

Learning Targets

- I listen thoughtfully to sounds in my environment to better understand a place.
- I respect the needs of my classmates and teacher for quiet and calm, and retain the class norm for silence during listening activities.
- I picture what I hear in my mind, either in the environment or from a person speaking.
- I write to describe what I hear.
- I compare/contrast listening to sounds in nature to listening to a story, noting similarities and differences.
- I use comprehension strategies including prediction, inference, background knowledge, questioning, and summarization to more deeply understand what I hear.
- I am aware that different comprehension strategies are emphasized, depending on what I am listening to.
- I retell in my own words a personal story shared by an elder with details in sequence.
- I reflect on my own listening skills in order to improve.
- I define and use onomatopoeia in my own descriptive writing.

Resources

- Explore the River DVD
- Field Journal for Explore the River Project (or blank book, composition book and/or small sketch pad), 1 per student
- Computer with DVD player and speakers
- mp3 files for a variety of sounds in nature downloaded in advance from [YouTube](#) (used for mystery piece and in the event a field experience is not possible, as alternate source)
- PC projector



- Four-part observation form ([attached](#))
- Exit ticket ([attached](#))

Instructional Techniques

Direct instruction (onomatopoeia and listening mini-lessons), outdoor field experience (or simulated indoors if necessary), individual listening, descriptive writing, group or partner sharing, viewing elder's video, summarization paragraphs from elder's story, compare and contrast.

Time Frame

Two 50-minute class periods; time required may vary based on age, grade level and the teacher's choices to support cross-curricular goals.

1st period: mystery piece audio, story listening to elder, four-part repeated observation, summary, compare-and-contrast-nature-to-human story, prep for field experience

2nd period: onomatopoeia mini-lesson, field observations, synthesis exit ticket

Suggested Grade Levels

Grades K-12

Procedures below target students in grades 4 through 8. However, with suggested [adaptations](#) following the procedures section, these may be useful from grades K through 12.

Procedures

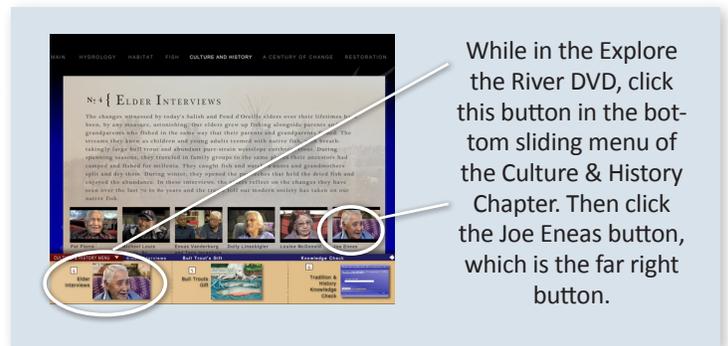
Day One

1. Prepare by downloading in advance nature sounds (see [YouTube](#) for a vast selection of nature sounds including sounds of rainforest, rain, thunderstorms, bird songs, waves, streams, and waterfalls).
2. Assure that each student has access to a Field Journal in some form.
3. For this activity you need your PC and speakers only; do not project the video.
4. Instruct students to clear their desks.
5. Tell students that for the next 3 to 5 minutes, they will be listening carefully to sounds from the natural world.
6. It may help to lower lights or diminish other visual stimuli. Have students close their eyes while listening.
7. Establish the norm for absolute silence during listening activities. Note that the most common offender is usually the teacher. If you adhere to the norms, so will your students. Eliminate "teacher talk" during the times when listening, reading, or writing are occurring. If one person is talking, no one is reading, writing, or listening to anything other than that conversation.
8. Play a nature-sound clip, audio only, as a mystery piece. It may be helpful to use a sound clip that is less familiar, such as the rainforest, but you may also select weather or ecosystems related to other areas of study to connect the dots between content previously taught and this lesson.

MODEL CLASSROOM NORMS

Whatever you want your students to do, be sure to do it yourself along with them. In this case, have your own field journal, conduct observations and participate in each activity just as you expect students to. Model writing and norms of group behavior (including silent times) yourself, exactly as you expect your students to behave. If you have students attempting to draw you out of silence using attention gaining behaviors, ignore their requests and non-verbally redirect them to the task, again by modeling.

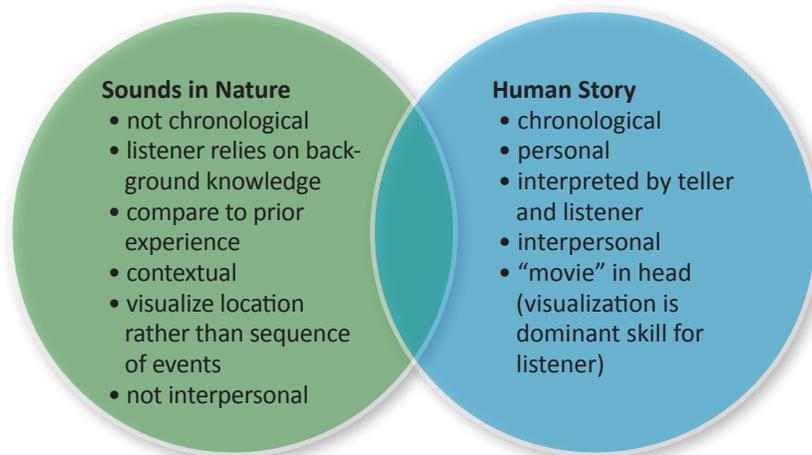
9. After the 3 to 5 minutes are up, have students conduct a five-minute “quick write” describing what they heard, using their field journals.
10. Ask students to visualize what they heard.
 - What environment did the sounds originate from?
 - How can you tell?
 - What made the sounds?
 - What did you picture in your mind?
 - Could you draw it?
11. Now describe it in writing.
12. Follow this protocol for the “quick write” in the Field Journal.
 - Set writing timer for 5 to 10 minutes.
 - Write quickly and do not stop.
 - Don’t worry about spelling or grammar as you get your ideas down.
 - This is what you observed/heard. There are no “wrong” answers.
 - Go! Create urgency. Allow 5 to 10 minutes for the quick-write.
13. When the timer goes off, have students pair/share with a partner, each reading to the other what they observed.
14. Whole group, ask the students if their descriptions were the same or different from each other.
15. Invite (but don’t require) several students to share what they wrote.
16. Conduct a class discussion about different interpretations of the sound clip and its possible origin.
17. Now have students apply their listening skills to a different subject.
18. Using the Explore the River DVD, locate and load the Elders Interviews — interview of Joe Eneas (Culture and History > Elders’ Interviews > Joe Eneas.)
19. Prepare students by telling them that Joe will recount some of his experiences and knowledge of Bull Trout. They will have to listen with intense attention.
20. Ask them to record what they hear, playing the audio without the video projecting so they are forced to use only their ears and not their eyes.
21. Have students make their notes on a [four-part recording form](#) found attached to this lesson rather than in their field journals. They can record what they learn later in the field journals after repeated listening and final viewing with sub-titles and video support.
22. Play the entire interview (2 minutes, 9 seconds) of Mr. Eneas.
23. Allow several minutes for students to respond under Listening Observation 1.
24. Repeat the procedure listening and responding under Listening Observation 2 and 3.
25. Finally, show the entire video with subtitles asking students and having students self assess whether they “got the gist” of Joe’s short interview clip.
26. Have them write their final summary under Listening Observation 4 and copy to their Field Journals if they choose. The four parts allow you to see the progression of their listening over the lesson.
27. What did they notice?
28. What are the similarities or differences between listening to sounds in nature and listening to a story shared by a person?



While in the Explore the River DVD, click this button in the bottom sliding menu of the Culture & History Chapter. Then click the Joe Eneas button, which is the far right button.

29. Draw a Venn diagram on the board and record students' responses.

30. The following may be some of the responses.



31. Note to teachers: if students are stumped, use these bullets to pose questions, thereby jump starting the discussion. For example, you might ask, “Are the sounds in nature chronological, or a sequence of events where one follows the other in time? Or do they occur randomly and concurrently (at the same time and overlapping)?”

32. Facilitate class discussion examining differences in listening behavior based on the type of material being heard.

33. Prepare the class for a field experience on the following day (coats, walking shoes, lunches, whatever they might need in order to go to your selected locations). Inform them that they will listen to environmental sounds in various locations—ideally one that includes a lot of nature sounds, and another setting that includes sounds of human activity.

Day Two

1. Open class period by sharing this quote (project or write on board) from Salish Elder, Pat Pierre, and invite students to write a response to it in their Field Journal. (The quote is found in the Field Journal on page 73 and in the Elder Interview of Pat Pierre, where it is in Salish, on the DVD under Culture and History > Elder Interviews.)

“Once in a while I go to the river. I sit on the shore; I listen to the water. Later I hear a song, once in a while a beautiful song. It passes by. I think I want to remember that song [but] I forget it; it passes by. That is the water. It passes by. It never stops.”

— Pat Pierre, 2006

2. Once warm-up writing in response to the quote is completed, provide a five-minute mini-lesson on onomatopoeia, the use of words (for example: hiss, murmur, zip, cluck, pop) that imitate the sounds associated with the objects or actions they refer to. Inform students that they will likely find themselves using onomatopoetic words as they attempt to capture sounds in the environment.

3. Remind students of class rules for field experience:

- Follow all instructions from teacher (or chaperoning adult) immediately.
- Do not to leave the group.
- Employ the buddy system, monitoring the whereabouts of a partner.
- Follow all instructions for safety related to “watch-out situations” (traffic, water, or other hazards.)

4. Tell students they will be engaged in a variety of activities during class to help them sharpen their listening skills. To be effective, everyone will have to cooperate in creating silence so elements of the natural world can be heard. A whistle or alarm will be used to signal the start and stop of silent observation sessions.

5. Gather coats or other necessary equipment, Field Journals, and pens or pencils and proceed to a selected location for Observation 1. As the teacher, you will also need a whistle and a stop watch.
6. Possible locations may include: a riverside, a quiet park, a forest, a parking lot, the school lunch room, an open field, a sport stadium, etc...
7. At each location, have students write in their journal a 2-or-3-sentence description of where they are, then listen intently for up to 5 minutes, followed by a description of what they hear.
8. Stretch them to provide as much detail as they can. If for example they all hear birds, ask them in follow up if any know what kind of birds? Can they replicate in writing the sound made by the birds? Can they imitate the sound of the birds they hear? It is the details they capture that allow the places to tell stories of their own, by linking sounds in nature to context.
9. Return to the classroom.
10. Ask final reflection question: “What can you tell about a location by sound alone?” Invite students to respond in their Field Journals or on an [exit ticket](#) you provide for that purpose.
11. Collect exit tickets (if used) to assess the outcomes of this lesson.

Extension

The natural extension to this lesson is to have students listen to the song shared by Johnny Arlee.



Assessment

- Direct observation of listening behaviors, cooperative support for listening of others
- Mystery piece listening observation, descriptive writing
- Story listening observations: Joe Eneas, note taking, story summary
- Venn diagram compare and contrast nature versus story
- Outdoor listening observations, details, onomatopoeia, descriptive writing
- Exit tickets - Synthesis

Adaptations

The following adaptations are designed to support your efforts to meet the needs of every learner. Grade levels here are only a suggestion and would not preclude use of a great 3rd-grade strategy with a 9th grader or vice versa.

Grades 4-6 (or students at any level who need more support)

The critical task of intermediate students is the development of strong comprehension skills, whether listening or reading along with and continued development of critical literacy. To achieve this with complex content, many students will require modeling, demonstration, and temporary supports. The following procedural options could help you more closely meet the needs of younger students.

1. Conduct regular lessons in listening. A second listening lesson is presented for use as an extension and was adapted to the content of Explore the River, originally developed for curriculum for Fire on the Land: An Integrated Multimedia Curriculum Framed by the Cultural Values of the Salish and Pend d’Oreille People. [Lesson 2, Listen Up!](#) presents additional strategies for practicing listening including the “phone game” and a partner listening activity. These are ideal for younger students and can be adapted for grades K through 6, with modifications.
2. Hold students accountable for listening. Conduct listening focus days, where you commit to provide clear and explicit directions and abstain from repetition. Many teachers repeat instructions extensively, essentially teaching students to ignore the first set of directions. If you try this activity, announce it in advance. Provide some skeletal visual supports for multi-part directions (a page number on the board, etc.) Do not make the activity punitive, as it is not

intended to be a “gotcha” situation, but rather an activity to try to sharpen students’ listening skills and your skills of direction. Take a few minutes at the end of the day to debrief with students. What did they notice? Was the classroom quieter? Were students able to follow? Were people on task? Did they like less repetition? Be sure to provide appropriate support for any students who are hearing impaired.

Grades 9-12 (or students at any level who require greater challenge)

Older or more advanced students should be given more responsibility and should be expected to listen and summarize more complex material from auditory sources.

1. Teach students that what they hear is determined, at least to a degree, by the purpose they set for listening, in the same way that what they recall from reading is impacted by the purpose they set for the reading. Practice this with this exercise.
 - Select a piece of music with powerful lyrics as well as rhythm.
 - Ask students to listen to the piece of music and then to tell a partner what the song is about. Allow 5 minutes to listen, then 1 minute each to pair/share regarding the meaning of the song.
 - When they are done, ask them if they think they listened to the piece carefully. (They will likely say yes.)
 - Now, without replaying the piece, ask them to replicate the rhythm by clapping. Can they?
 - Many won’t be able to.
 - Next, ask them if they can “sing” the melody without words? (la, la, la) Can they?
 - Listen to a totally new piece of music, but this time, tell them you want them to be able to replicate the rhythm.
 - After they have done so, ask them if they can remember what the song is about?
2. Hold students at all grade levels accountable to the highest standards of audience participation, either when inviting a guest speaker into the classroom, during a formal performance, or in daily classroom settings when peers and their teacher are speaking.
3. In class discussions or small-group and partner work, have students repeat the stance or statement made by another—before stating their own opinion. In this way, you teach students to short circuit the human tendency to formulate a response in their own minds while another is actually sharing his or her own stance. The goal is attentive listening, with verification or confirmation by the listener of what was said, before they begin formulating and sharing their idea. This is a critical life skill.

References

Confederated Salish and Kootenai Tribes. (2011). *Bull Trout’s Gift*. Lincoln, NE: University of Nebraska Press.

Confederated Salish & Kootenai Tribes. (2011). *Explore the River: Bull Trout, Tribal People, and the Jocko River*. (An Interactive Educational DVD). Pablo, MT: Confederated Salish and Kootenai Tribes.

Confederated Salish and Kootenai Tribes. (2011). *Snoqeymintn/Field Journal*. Lincoln, NE: University of Nebraska Press.

Four Listening Observations: Joe Eneas Interview

Listening Observation 1

Listening Observation 2

Listening Observation 3

Final Observation with Video Support

EXIT TICKET

Name: _____ **Date:** _____

What can you tell about a location by the sounds you hear alone? You have 5-10 minutes to write as much as you know right now. Go!

EXIT TICKET

Name: _____ **Date:** _____

What can you tell about a location by the sounds you hear alone? You have 5-10 minutes to write as much as you know right now. Go!

MAKE A RIVER



Rivers that are connected to their floodplain are free to migrate across the floodplain by eroding and depositing sediments. Meanders grow and move. Floodplains, islands, and side channels form and reform. As a consequence, a river is continually changing its position and shape. In a sense, rivers make themselves through this process.

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Make A River



Cultural Values: Balance, Relatedness, Reciprocity, Cooperation, Observation

Rationale

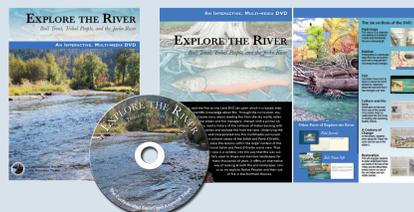
From time immemorial our people observed changes in the landscape—some were slow, occurring over geologic time-frames, and some were rapid, seemingly happening in the blink of an eye. Water and fire are two powerful forces that have brought about change, both fast and slow. Together, they have helped shape the ecosystems in which we now live. Today, we can listen to the stories of our elders to understand their relationship to the river and the fish that helped them thrive. We can see stretches of the Jocko River that flow freely, much as they did from time immemorial, and other stretches that have changed dramatically, often as a result of human activity. This lesson helps us understand how the force of water creates rivers that are naturally complex and connected and how things we do can disrupt this natural process.

Learning Targets

- I follow directions with care, listening attentively.
- I can write a hypothesis or prediction.
- I can set up an experiment to test my hypothesis or prediction.
- I watch closely, collecting accurate data.
- I work cooperatively as a member of a group.
- I observe how changes to any of the variables alters the formation of the model river.
- I can label the parts of a healthy stream.
- I observe differences in complexity and connectedness based on manipulation of variables.
- I write my observations with accuracy.
- I can apply what I know about geomorphology and conditions of the river to analyze bull trout habitat based on the four C's.
- I reflect in my field journal on implications of what I have observed.
- I am familiar with numerous Greek and Latin roots, prefixes and suffixes related to scientific terms giving me access to thousands of terms commonly used in scientific study.

Resources

- Explore the River DVD
- Field Journal for Explore the River Project (or blank book, composition book and/or small sketch pad), 1 per student



View the Explore the River DVD

- Computer with DVD player and Internet Connection
- PC projector
- Stream table (some have pumps and hoses for cycling water through the table, the Internet has construction plans for easy and inexpensive stream tables)
- Waste water bucket
- Fine sand
- Watering can or spouted bucket for pouring water
- Water
- Wood blocks (etc.) for elevating the table if necessary
- Protractor (for measuring slope)
- Sketch paper and drawing materials
- Toothpick flags with stream-part labels (make from toothpicks and address labels)
- Tiles, PVC pipe sections, etc. (for creating man made obstructions)
- Plant materials from outside gathered by students (to simulate riparian vegetation and root systems)
- Cup of fine gravel and some stones (simulating bedrock and boulders in upper canyon)
- Flour, food coloring (four colors), potting soil (to simulate agricultural or industrial contaminants or siltation sources, use in the final wild-card scenario)
- Ruler
- Pipette or eyedropper (to deposit food-coloring contaminants at 1-to-2 inch intervals adjacent to stream flow, allows for surface application and simulated groundwater contamination)
- Data-capture form ([attached](#))
- Hypothesis-finding form ([attached](#))
- Four C's reflection form ([attached](#))
- Greek/Latin root sheet for mini lesson on terms (extension activity) ([attached](#))

Instructional Techniques

Inquiry and scientific experimentation, observation, whole-group demonstrations, small group discussions, debrief, data access, display and interpretation, vocabulary building

Time Frame

Three, 50-minute class periods; the time required may vary based on stream table availability. Lab blocks are ideal for conducting the experiment and making observations.

1st period: Introduction to hydrology, view hydrology overview, direct instruction from DVD, parts of stream, whole class experiment, demonstration, observation and development of stream table scenarios, group discussion and individual recording of findings

2nd and 3rd period: Continue stream-table scenarios, recording of findings as needed. Show Habitat Overview Part 1 (4 C's.) Establish criteria for analysis of findings from the perspective of native trout, based on the four "C's".

Suggested Grade Levels

Grades 3-12

Procedures below target students in grades 5 through 9. However, with suggested [adaptations](#) following the procedures section, these may be useful for grades from 3 to 12.

Procedures

1st period (or about 90 minutes as a lab)

1. Admit ticket: As students enter the classroom, pass out note cards or small (4th of a sheet) scratch paper.
2. Write admit ticket instructions on the board as follows:
 - Come up with your own definition, based on what you know today, for the word "hydrology".
 - What does this word mean?
 - Write your best educated guess.
 - Share why you think this, or on what body of evidence you are making this guess.
 - Sign your name to the admit ticket.
 - Drop in a basket or container available for this purpose upon completion.
3. Use these admit tickets later to assess prior exposure to the term and concept, Greek and Latin roots or previous study of water.
4. Using Field Journals or notebooks, have students conduct a quick writing activity, answering this question: Where does the water in a watershed, in this case the Jocko watershed, come from?
5. Allow about two minutes for students to write descriptively based on their current knowledge.
6. Have students share their responses with a partner.
7. Pose the question back to the class. What do they think? Where does the water come from?
8. If varied responses exist, list on the board.
9. View the entire overview video from Explore the River found under Hydrology> Play Overview, (Parts 1-3) to build back ground knowledge. 
10. Using DVD, provide brief direct instruction on the parts of a stream, found under the hydrology section. Do this as a 5-minute mini-lesson. 
11. Conduct the following experiment with the whole class. (Note if you have more than 1 stream table available, you may select to group the students, but have all the students observe all experimental scenarios.)
12. Introduce the stream table experiments. Inform students there will be four scenarios, and they will be testing the impact of different conditions or variables in each. All scenarios can be found in the Jocko River watershed or in a watershed near you.



While in the Explore the River DVD, click this button in the center of the opening page of the Hydrology Chapter to view the Hydrology Overview.

While in the Explore the River DVD, click this button in the bottom sliding menu of the Hydrology Chapter to view the Parts of a Stream.

13. The scenarios include:
- An unchanged segment of river that flows without impediment on to the valley floor (like the South Fork of the Jocko). In this scenario there is no vegetation.
 - An unchanged segment that includes significant native vegetation along the stream banks.
 - A segment of the river that has been channelized or restrained by human activity for significant stretches.
 - Wild card – a river modified by multiple forms of human activity on a river segment designed and simulated by the students (be creative here).
14. Variables that you will be manipulating in each of these scenarios include:
- Slope (elevating the end of the stream table by degrees)
 - Flow (flood, normal, or low flow conditions simulated by controlling the release of water and quantity of water on the stream table)
 - Obstructions (fixed features in the land that impact complexity and connection to the floodplain, simulated channelization, roads, railroads, irrigation canals, etc. These can be simulated by small connected tiles, short lengths of PVC pipe, etc.)
 - Vegetation (presence, absence, and relative density of native vegetation along the riparian corridor simulated by tiny fir twigs and other natural plant materials along the stream bed)
15. If you have only 1 stream table available, start by setting up Scenario A, allowing students to see how the stream, without vegetation in the riparian zone, is created through natural processes of erosion. If you have more than 1 stream table, reserve the first one for Scenario A followed by Scenario B (adding the variable of vegetation) and the 2nd one for Scenarios C and D. Have two groups work at the same time to set up their scenarios in preparation for testing their hypotheses.
16. Note that all students are required to make hypotheses and observe outcomes from each of the four scenarios, whether or not that scenario was constructed by their group.
17. Have students set up the stream table(s) by filling the upper end (to be raised) of the stream table with fine sand. They may pick up the raised end and shake the stream table gently until the sand covers about the top two-thirds, deeper and thus steeper at the top, and gradually shallower in the middle third of the table. The sand should be smooth with no vegetation or obstructions for the first observation of Scenario A.
18. Set the slope by elevating the upper end of the stream table moderately, approximately 5 to 10 degrees (or 3 to 5 cm) as measured by a protractor.
19. Provide a mini-lesson defining (or reviewing) the term hypothesis.
- A hypothesis can be tested by designing an experiment. To do this, there need to be measures or observations of what you do (treatment or independent variable – “givens”) and what happens or appears to happen as a result (dependent variable).
 - A hypothesis is a prediction based on a hunch or educated guess about how things work.
 - A hypothesis can be written like this: “If _____ [I do this] _____, then ___[this]___ will happen.” For example: “If moderately flowing water passes over the sand unobstructed, given ___ slope and _____ _vegetation, then _____ will occur, gradually developing into _____.”
 - Provide support from your adopted science curriculum on scientific method.

HYPOTHESIS DEFINED

A tentative assumption made in order to draw out and test its logical or empirical consequences (Webster’s); or a proposition, or set of propositions, set forth as an explanation for the occurrence of some specified group of phenomena, either asserted merely as a provisional conjecture to guide investigation (working hypothesis); or accepted as highly probable in the light of established facts (Dictionary.com).

20. Require students to write their “predictions” in the form of a formal hypothesis using the [Hypothesis-finding form](#) found at the end of this lesson. Given the scenario, what do they think will happen?
21. Now, on their [Data-capture form](#) (also attached), have students describe the conditions for Scenario A in detail, including the “givens” or independent variables of slope, flow, vegetation, and obstruction. This is done “a priori” before the experiment is conducted.
22. Have students prepare for the observation (pencils, notebooks, sketch pads, cameras) and document or record all the steps of the experimental process used to test the hypothesis.
23. Begin pouring water, slowly and steadily, from a watering can that is held slightly above the high end of the stream table. Have students observe the small stream that is forming in the sand. Questions for reflection include:
 - What happened to some of the sand as the water flowed over it?
 - Where did the sand go?
 - Where is erosion occurring?
 - Where is deposition occurring?
 - What do they notice?
 - Would they describe what they see as meandering (as seen in the lower Jocko) or braiding?
24. Make a sketch capturing what has developed after 5 to 10 minutes. Label this Scenario A.
25. Can you identify meanders? Are any point bars and pools forming?
26. If so, label with toothpick flags any identifiable parts of a stream. Take a picture. (You may keep the Stream Parts section of the DVD up, projected from the DVD to support their labeling. This is not a test of short-term memory, so use the DVD as a learning tool, helping them make more specific descriptions and observations using consistent language.)
27. Now, modify conditions to more closely mimic the Jocko by adding gravels at the top end to simulate steeper sloped canyon and bed rock and boulders along with extensive vegetation.
28. Repeat the entire process, describing Scenario B, making a hypothesis, describing what happens, recording, sketching, labeling parts, and photographing. Note that viewing Hydrology > Overview Part 3 may help build the scenario consistent with the Jocko, and may be worth the 3 minutes it takes to view again.
29. Repeat for scenario C above. Consider playing A Century of Change > Overview, **Part 1 only**, to help students design the human altered river elements with the Jocko in mind. Note: **Do not play** Part 2, as impacts or effects of those changes to the geomorphology of the river are discussed. You do not want to bias or circumvent student observations by telling, rather, let them discover.
30. When these observations are done, invite students to develop a wild card that includes toxins, silt, and other stressors. As the sand will be quite wet at this time, the entire stream table comes to represent both the water table or groundwater and the stream.
 - What would happen if food coloring (simulated toxin) were to be inserted in the aquifer 1 inch, 2 inches, 3 inches from the stream bed in the mid to upper middle reach of the system?
 - How might a flood impact the channel? (High-flow scenario, from more than one source)
 - What if the slope was steeper?



While in the Explore the River DVD, click this button in the center of the opening page of the Hydrology Chapter to view the Hydrology Overview.

While in the Explore the River DVD, click this button in the center of the opening page of the Century of Change Chapter to view the Century of Change Overview.

31. Allow some time to explore and “play” with different variables, examining changes in the streams that are developed.

2nd period

1. Have students assemble their notes, sketches, and drop all photos into a quick photo album in PowerPoint to review with class.
2. Place students in small groups, with their assembled resources.
3. Pose the question: What did we learn about the formation of streams under different conditions?
4. Have groups discuss each of the scenarios, referencing their notes, sketches, and photos, then write a summary or finding statement adjacent to each hypothesis on the [Data-capture form \(pg 2\)](#).
5. Now shift perspective.
6. Show the Explore the River DVD, play Habitat > Overview Part 1 and 2. This will take 7:20 minutes.
7. Let's take the perspective of the bull trout based on what they need in terms of habitat and re-examine our findings for the four scenarios in the stream-table experiments.
8. Have students develop a simple scale to help them think about each of the 4 C's in relation to each scenario. An [example](#), or form that you can use is found at the end of this lesson, however, having the students create their own is a great learning opportunity.
9. Have groups discuss each scenario determining if the C's are present and positive, diminished, or absent as a result of the geomorphology or conditions created in each scenario.
10. Using notebooks or Field Journals, have students write in response to this question: “Which scenario supports healthy habitat for bull trout? How and why?”

POWER OF EXPLORATION, OBSERVATION, AND PLAY

At the end of this more formal stream-table experiment, time is allowed for students to create their own scenarios. This play may not result in empirical observations following western conceptualizations of science, but is critically important for students to gain an intuitive understanding of alluvial river systems. This experience allows them to create better hypotheses in the future, but also informs one aspect of their relationship to the river—much like the multi-generational observations shared in the stories of the elders.



While in the Explore the River DVD, click this button in the center of the opening page of the Habitat Chapter to view the Habitat Overview.

Extension

1. Consider a study of [Greek and Latin roots](#), prefixes and suffixes. This builds essential cognitive academic language and is far superior to rote memorization of vocabulary words. The entire Explore the River investigation is a strong, contextualized study in terms that use these basic building blocks.
2. Take students to rivers, streams and creeks near you to examine geomorphology in action. Have them use their Field Journals to capture observations.

Assessment

- Hydrology admit ticket
- Where does the water come from quick write
- Direct observation of group participation and interaction
- [Hypothesis-finding form](#)
- [Data-capture form](#)

- [Four C's Reflection form](#)
- Final written reflection on bull trout habitat

Adaptations

The following adaptations are designed to support your efforts to meet the needs of every learner. Grade levels here are only a suggestion and would not preclude use of a great 3rd-grade strategy with a 9th grader or vice versa.

Grades 3-4 (or students at any level who need more support)

The critical task of intermediate students is the development of strong content area reading skills and continued development of critical literacy. To achieve this with complex content, many students will require modeling, demonstration, and temporary supports. The following procedural options could help you more closely meet the needs of younger students.

1. You may select to use the simpler form “I predict that ...” for developing a hypothesis found at the end of this lesson. If you do, be sure to introduce the term hypothesis and inform them that what they are writing as a prediction can be considered a simplified hypothesis. They need exposure to academic terms early and often.
2. Consider allowing students to work in groups developing descriptions, rather than having each student describe and note each scenario with relative independence.
3. Model on Scenario A, whole group, so they know how to pose a hypothesis, gather and record observation data, sketch what they see, and determine a finding. Support them doing this with more independence on Scenario B. Expect them to do it, but be open for questions with Scenario C, practicing gradual release of responsibility.
4. Directly teach Greek and Latin roots, prefixes, and suffixes used in this study including geo, hydro, morph, graph, logy, hypo, and thesis. Instead of knowing only four words (hydrology, geomorphology, hydrograph and hypothesis) students with knowledge of only these roots, prefixes, and suffixes will get a running start on thousands more terms used in academic language.

Grades 9-12 (or students at any level who require greater challenge)

Older or more advanced students should be given more responsibility and should be required to:

1. High school students benefit dramatically from study of Greek and Latin roots, prefixes, and suffixes as they need to be able to determine or make a strong guess as to the meaning of an unfamiliar word “on the fly” in ever more complex texts. Study these in context as they occur and also provide the supportive list compiled by Jessica Deforest and reprinted here with her permission. Again, teaching these is like giving students “keys to the kingdom” when it comes to background knowledge and comprehension. It is a far more supportive strategy to help them master academic language than the attempted (and nearly always failing) strategy of rote memorization of isolated and unrelated words.
2. This unit is a logical and uniquely integrated one for use in 9th-grade earth-science classes. With few adaptations, the Explore the River investigation could meet or exceed many of the common core standards in a variety of content areas including science, social studies, and communication arts.

References

Confederated Salish and Kootenai Tribes. (2011). *Bull Trout's Gift*. Lincoln, NE: University of Nebraska Press.

Confederated Salish & Kootenai Tribes. (2011). *Explore the River: Bull Trout, Tribal People, and the Jocko River*. (An Interactive Educational DVD). Pablo, MT: Confederated Salish and Kootenai Tribes.

Confederated Salish and Kootenai Tribes. (2011). *Snoqeymintn/Field Journal*. Lincoln, NE: University of Nebraska Press.

Data-capture Form (page 1 of 2)

Team Members: _____

Date of Inquiry: _____

| Observation | Characteristics | Slope | Flow Intensity | Free or Obstructed | Vegetated or Barren |
|-------------|-----------------|-------|----------------|--------------------|---------------------|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |

Data-capture Form (page 2 of 2)

| | I predict that... | I observe that... |
|---|-------------------|-------------------|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |

Hypothesis-finding Form

| | Hypothesis | Finding |
|---|--|---|
| 1 | "if ____ [I do this] ____, then ____ [this] ____ will happen." | "When ____ [I did this] ____, then ____ [this] ____ actually happened, ____ {Proving..... or disproving} ____ my hypothesis." Why do you believe that happened? If you have a new hunch, or hypothesis, how can you prove or disprove it? |
| 2 | | |
| 3 | | |
| 4 | | |

Four C's Reflection Form (page 1 of 2)

Scenario A:

| Habitat Indicator | Rating (5 = Good, 1 = Bad) | | | | | Why? Detail why this scenario might result in good or bad habitat for bull trout and other native species. |
|-------------------|----------------------------|---|---|---|---|--|
| | 5 | 4 | 3 | 2 | 1 | |
| Clean | | | | | 1 | Dirty |
| Cold | | | | | 1 | Warm |
| Complex | | | | | 1 | Simple |
| Connected | | | | | 1 | Disconnected |

Scenario B:

| Habitat Indicator | Rating (5 = Good, 1 = Bad) | | | | | Why? Detail why this scenario might result in good or bad habitat for bull trout and other native species. |
|-------------------|----------------------------|---|---|---|---|--|
| | 5 | 4 | 3 | 2 | 1 | |
| Clean | | | | | 1 | Dirty |
| Cold | | | | | 1 | Warm |
| Complex | | | | | 1 | Simple |
| Connected | | | | | 1 | Disconnected |

Four C's Reflection Form (page 2 of 2)

Scenario C:

| Habitat Indicator | Rating (5 = Good, 1 = Bad) | | | | | Why? Detail why this scenario might result in good or bad habitat for bull trout and other native species. |
|-------------------|----------------------------|---|---|---|---|--|
| | 5 | 4 | 3 | 2 | 1 | |
| Clean | | | | | 1 | Dirty |
| Cold | 5 | 4 | 3 | 2 | 1 | Warm |
| Complex | 5 | 4 | 3 | 2 | 1 | Simple |
| Connected | 5 | 4 | 3 | 2 | 1 | Disconnected |

Scenario D:

| Habitat Indicator | Rating (5 = Good, 1 = Bad) | | | | | Why? Detail why this scenario might result in good or bad habitat for bull trout and other native species. |
|-------------------|----------------------------|---|---|---|---|--|
| | 5 | 4 | 3 | 2 | 1 | |
| Clean | | | | | 1 | Dirty |
| Cold | 5 | 4 | 3 | 2 | 1 | Warm |
| Complex | 5 | 4 | 3 | 2 | 1 | Simple |
| Connected | 5 | 4 | 3 | 2 | 1 | Disconnected |

Greek and Latin Roots, Prefixes and Suffixes

A Supportive Quick Reference for Students

| | Root | Meaning | Examples |
|----|-----------------------|----------------------------|---|
| 1 | acer, acid, acri | bitter, sour, sharp | acerbic, acidity, acrid, acrimony |
| 2 | acu | sharp | acute, acupuncture, accurate |
| 3 | ag, agi, ig, act | do, move, go | agent, agenda, agitate, navigate, ambiguous, action |
| 4 | ali, allo, alter | other | alias, alibi, alien, alloy, alter, alter ego, altruism |
| 5 | alt(us) | high, deep | altimeter, altitude |
| 6 | am, amor | love, liking | amiable, amorous, enamoured |
| 7 | anni, annu, enni | year | anniversary, annually, centennial |
| 8 | anthrop | man | anthropology, misanthrope, philanthropy |
| 9 | anti(co) | old | antique, antiquated, antiquity |
| 10 | arch | chief, first, rule | archangel, architect, archaic, monarchy, matriarchy, patriarchy |
| 11 | aster, astr | star | aster, asterisk, asteroid, astronomy, astronaut |
| 12 | aud, aus | hear, listen | audiology, auditorium, audio, audition, auscultate |
| 13 | aug, auc | increase | augur, augment, auction |
| 14 | auto, aut | self | autobiography, automobile, autograph, automatic |
| 15 | belli | war | rebellion, belligerent, casus belli, bellicose |
| 16 | bibl | book | Bible, bibliography, bibliomania |
| 17 | bio | life | biology, biometrics, biome, biosphere |
| 18 | brev | short | abbreviate, brief |
| 19 | cad, cas | to fall | cadaver, cadence, cascade |
| 20 | calor | heat | calorie, caloric, calorimeter |
| 21 | cap, cip, cept | take | capable, intercept, forceps, capture, except, reciprocate |
| 22 | capit, capt | head | decapitate, capital, captain, caption |
| 23 | carn | flesh | carnivorous, incarnate, reincarnation, carnal |
| 24 | caus, caut | burn, heat | caustic, cauldron, cauterize |
| 25 | cause, cuse, cus | cause, motive | because, excuse, accusation |
| 26 | ced, ceed, cede, cess | move, yield, go, surrender | procedure, proceed, cede, concede, recede, precede, accede, success |
| 27 | cenetri | center | concentric, centrifugal, centripetal, eccentric |
| 28 | chrom | color | chrome, chromosome, polychrome, chromatic |
| 29 | chron | time | chronology, chronometer, synchronize |
| 30 | cide, cise | cut down, kill | homicide, exorcise, germicide, incision, scissors |
| 31 | cit | call, start | incite, citation, cite |
| 32 | civ | citizen | civic, civil, civilian, civilization |
| 33 | clam, claim | cry out | exclamation, clamor, proclamation, reclamation, acclaim |
| 34 | clud, clus, claus | shut | include, conclude, recluse, claustrophobia, occlusion, occult |
| 35 | cognoac, gnosi | know | recognize, prognosis, cognoscenti, incognito, agnostic |

| | | | |
|----|-----------------------------|----------------------|--|
| 36 | cord, cor, cardi | heart | cordial, concord, discord, courage, encourage |
| 37 | corp | body | corporation, corporal punishment, corpse, corpulent, corpus luteum |
| 38 | cosm | universe, world | cosmos, microcosm, cosmopolitan, cosmonaut |
| 39 | crat, cracy | rule | autocrat, aristocrat, theocracy, technocracy |
| 40 | crea | create | creature, recreation, creation |
| 41 | cred | believe | creed, credo, credence, credit, credulous, incredulous, incredible |
| 42 | cresc, cret, crease, cru | rise, grow | crescendo, concrete, increase, decrease, accrue |
| 43 | crit | separate, choose | critical, criterion, hypocrite |
| 44 | cur, curs | run | current, concurrent, concur, incur, recur, occur, courier, precursor, cursive |
| 45 | cura | care | curator, curative, manicure |
| 46 | cycl, cyclo | wheel, circular | Cyclops, unicycle, bicycle, cyclone, cyclic |
| 47 | deca | ten | decade, decalogue, decathlon, decahedron |
| 48 | dem | people | democracy, demography, epidemic |
| 49 | dent, dont | tooth | dental, denture, orthodontist, periodontal |
| 50 | derm | skin | hypodermic, dermatology, epidermis, taxidermy |
| 51 | dict | say, speak | dictation, dictionary, dictate, dictator, edict, predict, verdict, contradict, benediction |
| 52 | doc, dokein | teach | doctrine, indoctrinate, document, dogma, dogmatic |
| 53 | domin | master | dominate, dominion, predominant, domain |
| 54 | don | give | donate, condone |
| 55 | dorm | sleep | dormant, dormitory |
| 56 | dox | opinion, praise | orthodox, heterodox, paradox, doxology |
| 57 | drome | run, step | syndrome (run together), hippodrome (place where horses run) |
| 58 | duc, duct | lead | induce, seduce (lead aside), produce, reduce |
| 59 | dura | hard, lasting | durable, duration, endure |
| 60 | dynam | power | dynamo, dynamic, dynamite, hydrodynamics |
| 61 | endo | within | endorse, endocardial, endoskeletal, endoskeleton, endosperm |
| 62 | equi | equal | equinox, equilibrium, equipoise |
| 63 | erg | work | energy, erg, allergy, ergometer, ergograph, ergophobia |
| 64 | fac, fact, fic, fect | do, make | factory, fact, manufacture, amplification, confection |
| 65 | fall, fals | deceive | fallacy, falsify, fallacious |
| 66 | fer | bear, carry | ferry, coniferous, fertile, defer, infer, refer, transfer |
| 67 | fid, fide, feder(is) | faith, trust | confidante, fidelity, confident, infidelity, infidel, federal, confederacy, semper fi |
| 68 | fila, fili | thread | filigree, filament, filter, filet, filibuster |
| 69 | fin | end, ended, finished | final, finite, finish, confine, fine, refine, define, finale |
| 70 | fix | fix | fix, fixation, fixture, affix, prefix, suffix |
| 71 | flex, flect | bend | flex, reflex, flexible, flexor, inflexibility, reflect, deflect |
| 72 | flu, fluc, fluv | flowing | influence, fluid, flue, flush, fluently, fluctuate |
| 73 | form | form, shape | form, uniform, conform, formulary, perform, formal, formula |

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|-----|--------------------|----------------------|--|
| 74 | fort, forc | strong | fort, fortress, fortify, forte, fortitude |
| 75 | fract, frag | break | fracture, infraction, fragile, fraction, refract |
| 76 | gam | marriage | bigamy, monogamy, polygamy |
| 77 | gastr (o) | stomach | gastric, gastronomic, gastritis, gastropod |
| 78 | gen | birth, race, produce | genesis, genetics, eugenics, genealogy, generate, genetic, antigen, pathogen |
| 79 | geo | earth | geometry, geography, geocentric, geology, geomorphology |
| 80 | germ | vital part | germination, germ, germane |
| 81 | gest | carry, bear | congest, gestation |
| 82 | gloss, glot | tongue | glossary, polyglot, epiglottis |
| 83 | glu, glo | lump, bond, glue | glue, agglutinate, conglomerate |
| 84 | grad, gress | step, go | grade, gradual, graduate, progress, graduated, egress |
| 85 | graph, gram | write, written | graph, graphic, autograph, photography, graphite, telegram |
| 86 | grat | pleasing | congratulate, gratuity, grateful, ingrate |
| 87 | grav | heavy, weighty | grave, gravity, aggravate, gravitate |
| 88 | greg | herd | gregarious, congregation, segregate, gregarian |
| 89 | hypn | sleep | hypnosis, hypnotherapy |
| 90 | helio | sun | heliograph, heliotrope, heliocentric |
| 91 | hema, hemo | blood | hemorrhage, hemoglobin, hemophilia, hemostat |
| 92 | here, hes | stick | adhere, cohere, cohesion, inherent, hereditary |
| 93 | hetero | different | heterogeneous, heterosexual, heterodox |
| 94 | homo | same | homogeneous, homonym, homogenize |
| 95 | hum, human | earth, ground, man | humus, exhume, humane |
| 96 | hydr, hydra, hydro | water | hydrology, dehydrate, hydrant, hydraulic, hydrograph, hydrophobia |
| 97 | hyp, hypo | under | hypoglycemia, hypothermia, hypothesis |
| 98 | ignis | fire | ignite, igneous, ignition |
| 99 | ject | throw | deject, inject, project, eject, interject |
| 100 | join, junct | join | adjoining, enjoin, juncture, conjunction, injunction, conjunction |
| 101 | juven | young | juvenile, rejuvenate |
| 102 | lau, lav, lot, lut | wash | launder, lavatory, lotion, ablution, dilute |
| 103 | leg | law | legal, legislate, legislature, legitimize |
| 104 | levi | light | alleviate, levitate, levity |
| 105 | liber, liver | free | liberty, liberal, liberalize, deliverance |
| 106 | liter | letters | literary, literature, literal, alliteration, obliterate |
| 107 | loc, loco | place | locality, allocate, locomotion |
| 108 | log, logo, ology | word, study, speech | catalog, prologue, dialogue, zoology, biology, hydrology, geomorphology |
| 109 | loqu, locut | talk, speak | eloquent, loquacious, colloquial, circumlocution |
| 110 | luc, lum, lus, lun | light | translucent, luminary, luster, luna (moon goddess) |
| 110 | macr-, macer | lean | emaciated, meager |

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|-----|----------------|--------------------------------|--|
| 111 | magn | great | magnify, magnificent, magnanimous, magnate, magnitude, magnum |
| 112 | man | hand | manual, manage, manufacture, manacle, manicure, manifest, maneuver, emancipate |
| 113 | mand | command | mandatory, remand, mandate |
| 114 | mania | madness | mania, maniac, kleptomania, pyromania |
| 115 | mar, mari, mer | sea, pool | marine, marsh, maritime, mermaid |
| 116 | matri | mother | matrimony, maternal, matriarchate, matron |
| 117 | medi | half, middle, between, halfway | mediate, medieval, Mediterranean, mediocre, medium |
| 118 | mega | great | megaphone, megalopolis, megacycle (a million cycles), megaton |
| 119 | mem | remember | memo, commemoration, memento, memoir, memorable |
| 120 | meter | measure | meter, voltammeter, barometer, thermometer |
| 121 | micro | small | microscope, microfilm, microcard, microwave, micrometer |
| 122 | migra | wander | migrate, emigrant, immigrate |
| 123 | mit, miss | send | emit, remit, submit, admit, commit, permit, transmit, omit, intermittent, mission, missile |
| 124 | mob, mot, mov | move | mobile, motionless, motor |
| 125 | mon | warn, remind | monument, admonition, monitor, premonition |
| 126 | mor, mort | mortal, death | mortal, immortal, mortality, mortician, mortuary |
| 127 | morph | form | amorphous, dimorphic, metamorphosis, morphology, geomorphology |
| 128 | multi | many, much | multifold, multilingual, multiped, multiply |
| 129 | nat, nasc | to be from, to spring forth | innate, natal, native, renaissance |
| 130 | neo | new | Neolithic, nouveau riche, neologism, neophyte, neonate |
| 131 | neur | nerve | neuritis, neuropathic, neurologist, neural, neurotic |
| 132 | nom | law, order | autonomy, astronomy, gastronomy, economy |
| 133 | nomen, nomin | name | nomenclature, nominate, ignominious |
| 134 | nov | new | novel, renovate, novice, nova, innovate |
| 135 | nox, noc | night | nocturnal, equinox, noctilucet |
| 136 | numer | number | numeral, numeration, enumerate, innumerable |
| 137 | numisma | coin | numismatics |
| 138 | oligo | few, little | Oligocene, oligosaccharide, oligotrophic, oligarchy |
| 139 | omni | all, every | omnipotent, omniscient, omnipresent, omnivorous |
| 140 | onym | name | anonymous, pseudonym, antonym, synonym |
| 141 | oper | work | operate, cooperate, opus |
| 142 | ortho | straight, correct | orthodox, orthodontist, orthopedic, unorthodox |
| 143 | pac | peace | pacifist, pacify, pacific ocean |
| 144 | paleo | old | Paleozoic, Paleolithic, paleomagnetism, paleopsychology |
| 145 | pan | all | Pan-American, pan-African, panacea, pandemonium (place of all demons), |
| 146 | pater, patr | father | paternity, patriarch, patriot, patron, patronize |
| 147 | path, pathy | feeling, suffering | pathos, sympathy, antipathy, apathy, telepathy |

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|-----|------------------|---------------|--|
| 148 | ped, pod | foot | pedal, impede (get feet in a trap), pedestrian, centipede, tripod, podiatry, |
| 149 | pedo | child | orthopedic, pedagogue, pediatrician |
| 150 | pel, puls | drive, urge | compel, dispel, expel, repel, propel, pulse, impulse, pulsate, compulsory, expulsion, repulsive |
| 151 | pend, pens, pond | hang, weigh | pendant, pendulum, suspend, appendage, pensive |
| 152 | phage | eat | macrophage, bacteriophage |
| 153 | phil | love | philosophy, philanthropy, philharmonic, bibliophile |
| 154 | phlegma | inflammation | phlegm, phlegmatic |
| 155 | phobia, phobos | fear | phobia, claustrophobia, acrophobia, aquaphobia, ergophobia, homophobia |
| 156 | phon | sound | phonograph, phonetic, symphony, homophone, euphonious |
| 157 | photo | light | photograph, photoelectric, photogenic, photosynthesis |
| 158 | plac, plais | please | placid, placebo, placate, complacent |
| 159 | plu, plur, plus | more | plural, pluralist, plus |
| 160 | pneuma, pneumon | breath | pneumatic, pneumonia, |
| 161 | pod (see ped) | | |
| 162 | poli | city | metropolis, police, politics, Indianapolis, megalopolis, acropolis |
| 163 | poly | many | polysaccharide, polyandrous, polytheistic |
| 164 | pon, pos, pound | place, put | postpone, component, opponent, proponent, expose, impose, deposit, posture, position, expound, impound |
| 165 | pop | people | population, populous, popular |
| 166 | port | carry | porter, portable, transport, report, export, import, support, transportation |
| 167 | portion | part, share | portion, proportion |
| 168 | pot | power | potential, potentate, impotent |
| 169 | prehendere | seize, grasp | apprehend, comprehend, comprehensive, prehensile |
| 170 | prim, prime | first | primacy, prima donna, primitive, primary, primal, primeval |
| 171 | proto | first | prototype, protocol, protagonist, protozoan, Proterozoic, protoindustrial |
| 172 | psych | mind, soul | psyche, psychiatry, psychology, psychosis |
| 173 | punct | point, dot | punctual, punctuation, puncture, acupuncture, punctuation |
| 174 | reg, recti | straighten | regiment, regular, rectify, correct, direct, rectangle |
| 175 | ri, ridi, risi | laughter | deride, ridicule, ridiculous, derision, risible |
| 176 | rog, roga | ask | prerogative, interrogation, derogatory |
| 177 | rupt | break | rupture, interrupt, abrupt, disrupt, ruptible |
| 178 | sacr, sanc, secr | sacred | sacred, sacrosanct, sanction, consecrate, desecrate |
| 179 | salv, salu | safe, healthy | salvation, salvage, salutation |
| 180 | sat, satis | enough | satient (giving pleasure, satisfying), saturate, satisfy |
| 181 | sci, scientia | know | science, conscious, omniscient, cognocienti |
| 182 | scope | see, watch | telescope, microscope, kaleidoscope, periscope, stethoscope |
| 183 | scrib, script | write | scribe, scribble, inscribe, describe, subscribe, prescribe, manuscript |

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|-----|----------------------------|------------------|--|
| 184 | sed, sess, sid | sit | sediment, session, obsession, possess, preside, president, reside, subside |
| 185 | sen | old | senior, senator, senile |
| 186 | senescere | to grow old | senescence, evanescent |
| 187 | sent, sens | feel | sentiment, consent, resent, dissent, sentimental, sense, sensation, sensitive, sensory, dissension |
| 188 | sequ, secu, sue | follow | sequence, consequence, sequel, subsequent, prosecute, consecutive, second, ensue, pursue |
| 189 | serv | save, serve | servant, service, subservient, servitude, preserve, conserve, reservation, deserve, conservation, observe |
| 190 | sign, signi | sign, mark, seal | signal, signature, design, insignia, significant |
| 191 | simil, simul | like, resembling | similar, assimilate, simulate, simulacrum, simultaneous |
| 192 | sist, sta, stit | stand | assist, persist, circumstance, stamina, status, state, static, stable, stationary, substitute |
| 193 | solus | alone | solo, soliloquy, solitaire, solitude |
| 194 | solv, solu | loosen | solvent, solve, absolve, resolve, soluble, solution, resolution, resolute, dissolute |
| 195 | somnus | sleep | insomnia, somnambulist |
| 196 | soph | wise | sophomore (wise fool), philosophy, sophisticated |
| 197 | spec, spect, spic | look | specimen, specific, spectator, spectacle, aspect, speculate, inspect, respect, prospect, retrospective, introspective, expect, conspicuous |
| 198 | sphere | ball, sphere | sphere, stratosphere, hemisphere, spheroid |
| 199 | spir | breath | spirit, conspire, inspire, aspire, expire, perspire, respiration |
| 200 | string, strict | draw tight | stringent, strict, restrict, constrict, boa constrictor |
| 201 | stru, struct | build | construe (build in the mind, interpret), structure, construct, instruct, obstruct, destruction, destroy |
| 202 | sume, sump | take, use, waste | consume, assume (to take, to use), sump pump presumption (to take or use before knowing all the facts) |
| 203 | tact, tang, tag, tig, ting | touch | tactile, contact, intact, intangible, tangible, contagious, contiguous |
| 204 | tele | far | telephone, telegraph, telegram, telescope, television, telephoto, telecast, telepathy |
| 205 | tempo | time | tempo, temporary, extemporaneously, contemporary, pro tem, temporal |
| 206 | ten, tin, tain | hold | tenacious, tenant, tenure, untenable, detention, retentive, content, pertinent, continent, obstinate, contain, abstain, pertain, detain |
| 207 | tend, tent, tens | stretch, strain | tendency, extend, intend, contend, pretend, tender, extent, tension, pretense |
| 208 | terra | earth | terrain, terrarium, territory, terrestrial |
| 209 | test | to bear witness | testament, detest, testimony, attest |
| 210 | the, theo | God, a god | monotheism, polytheism, atheism, theology |
| 211 | therm | heat | thermometer, theorem, thermal, thermos bottle, thermostat, hypothermia |
| 212 | thesis, thet | place, put | antithesis, hypothesis, synthesis, epithet |

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|-----|-------------------|--------------------|--|
| 213 | tom | cut | atom (not cuttable), appendectomy, tonsillectomy, dichotomy, anatomy |
| 214 | tort, tors | twist | torture (twisting to inflict pain) retort, extort, distort, contort, torsion, tortuous, torturous |
| 215 | tox | poison | toxic, intoxicate, antitoxin |
| 216 | tract, tra | draw, pull | tractor, attract, subtract, tractable, abstract, subtrahend |
| 217 | tom | cut | atom (not cuttable, smallest particle of matter), appendectomy, tonsillectomy, dichotomy, anatomy |
| 218 | tort, tors | twist | torture (twisting to inflict pain), retort, extort (twist out), distort, contort, torsion |
| 219 | tox | poison | toxic, intoxicate, antitoxin |
| 220 | tract, tra | draw, pull | tractor, attract, traction, subtract, tractable, abstract (to draw away), subtrahend (the number to be drawn away from another). |
| 221 | trib | pay, bestow | tribute, contribute, attribute, retribution, tributary |
| 222 | turbo | disturb | turbulent, disturb, turbid, turmoil |
| 223 | typ | print | type, prototype, typical, typography, typewriter, typology, typify |
| 224 | ultima | last | ultimate, ultimatum |
| 225 | umber, umbraticum | shadow | umbra, penumbra, (take) umbrage, adumbrate |
| 226 | uni | one | unicorn, unify, university, unanimous, universal |
| 227 | vac | empty | vacate, vacuum, evacuate, vacation, vacant, vacuous |
| 228 | vale, vali, valu | strength, worth | equivalent, valiant, validity, evaluate, value, valor |
| 229 | ven, vent | come | convene, intervene, venue, convenient, avenue, circumvent, invent, convent, venture, event, advent, prevent |
| 230 | ver, veri | true | very, aver, verdict, verity, verify, verisimilitude |
| 231 | vert, vers | turn | avert, divert, invert, introvert, convertible, reverse, controversy, versatile |
| 232 | vic, vicis | change, substitute | vicarious, vicar, vicissitude |
| 233 | vict, vinc | conquer | victor, evict, convict, convince, invincible |
| 234 | vid, vis | see | video, evident, provide, providence, visible, revise, supervise, vista, visit, vision |
| 235 | viv, vita, vivi | alive, life | revive, survive, vivid, vivacious, vitality, vivisection |
| 236 | voc | call | vocation, avocation, convocation, invocation, evoke, provoke, revoke, advocate, provocative, vocal |
| 237 | vol | will | malevolent, benevolent, volunteer, volition |
| 238 | volcan | fire | volcano, vulcanize, Vulcan |
| 239 | volvo | turn about, roll | revolve, voluble (easily turned about or around or talkative), voluminous, convolution |
| 240 | vor | eat greedily | voracious, carnivorous, herbivorous, omnivorous, devour |
| 241 | zo | animal | zoo (short for zoological garden), zoology, zoomorphism (attributing animal form to god), zodiac, protozoan |

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MORE THAN WATER



When you go to the shore and sit, later you feel goodness. Again, water is medicine. Strong medicine, for everything...Not only [for] us, for the animals that walk on the earth, that fly, that swim, that crawl. Everything uses the water.

— Pat Pierre

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More Than Water



Cultural Values: Respect, Listening, Reciprocity, Cooperation, Relatedness

Rationale

The Jocko River is many things. The elders tell us of camping, fishing and living along its banks. They also talk about the critical role of the river and water overall in healing, prayer, and the spiritual practices of our people. Water is not only a source of life, but also a unique part of the lives of all of us. As the story Bull Trout's Gift reminds us, without water we are a poor and desperate people. In this unit we will learn more from the elders about water, bull trout, and the river, and then we will apply elements of what we have learned to honor the river through our individual efforts.

Learning Targets

- I organize my resources and my time to plan and complete a project.
- I apply what I have learned about the Jocko River to develop a project that celebrates some aspect of the river or a river near me.
- I apply my unique talent to the task.
- I work with independence.
- I present or share the product of my work with others.
- I celebrate and honor the river.

Resources

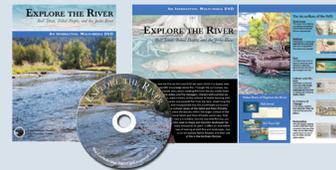
- Explore the River DVD
- Book Bull Trout's Gift
- Field Journal for Explore the River Project (or blank book, composition book and/or small sketch pad), 1 per student
- Computer with DVD player
- PC projector
- Computer lab or 2-to-1-student-to-computer ratio for partner project with DVD
- Pat Pierre's Interview Sections (cut apart and drop pairs into a hat or container to create student pairs) ([attached](#))
- Summary of Pat Pierre's Interview Sections (print 1 per student) ([attached](#))



Read the story in pdf form.



Read a pdf of the essay on the story's relevance.



View the Explore the River DVD

- Project Planning Form (print 1 per student) ([attached](#))
- Each student will have his or her own list of unique materials required to complete their project

Instructional Techniques

Setting the stage examining elders' perspectives on the river and bull trout, divergent process, student independent planning and execution of projects, public display or performance and/or online sharing and collaboration, celebration

Time Frame

Two, 50-minute class periods for kick off; and time set aside to support independent projects throughout the unit. If following the collaborative plan, time may be provided across multiple content areas or classes. Time required will vary based on individual projects, age, grade level, and the teacher's choices to support cross-curricular goals. Several periods at the close of the unit to showcase students projects.

1st period: Elders' perspectives and ways to honor or give back to the river (Johnny Arlee's song, Pat Pierre interview)

2nd period: Kick off, begin planning

Ongoing: Daily work toward completion of the project. Students follow individual plans.

Suggested Grade Levels

Grades K-12

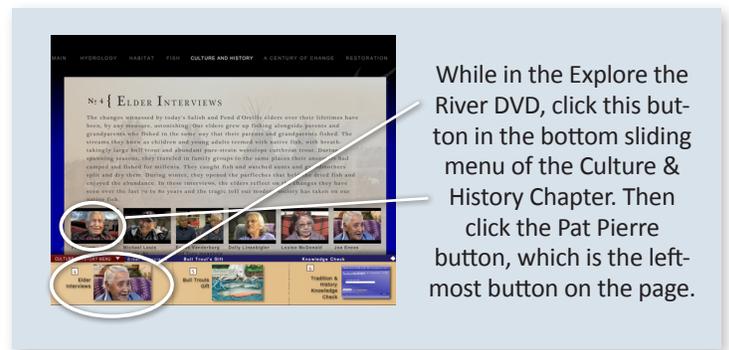
Procedures below target students in grades 4 through 8. However, with suggested [adaptations](#) these may be useful for grades K through 12.

Procedures

Day One

1. Prepare topic slips from Pat Pierre's interview (cut apart, fold, and drop into container to draw.) To do even pairs, you would need a large class group (28), so adjust by cutting two topics together instead of one to adjust for your class size. These video segments are not long, however the entire interview is in Salish with subtitles, so a divide and conquer strategy is employed to assure all aspects of Mr. Pierre's interview are thoughtfully addressed.
2. Open the class period by asking students to clear their desks, excluding their Field Journals and listen attentively.
3. Prepare students by sharing that people have many ways in which they celebrate and give back—or express reciprocity and appreciation for the river, and together we will listen to a song presented as a gift in honor of the river.
4. Play this audio file of Johnny Arlee singing his song for the river.  
5. After listening, have students conduct a quick write in their Field Journals, reflecting on the song as a gift to the river, a form of reciprocity.
6. When writing is done, conduct a brief discussion about other ways people experience the river and how they might give back to the river.
7. Now have students draw topic slips from a hat or container.
8. Once they have their topic(s), they need to circulate through the room to locate their partner or partners.
9. Pairs will then progress to a computer lab or stations in the classroom to review the section(s) of Pat's interview assigned to them.

10. To navigate to this section of the DVD, go to Culture and History > Elder's Interviews > Pat Pierre.
11. To get to their segment(s) they simply use the forward double-arrow key to move forward until they get to the assigned topic(s).
12. Instruct pairs to conduct at least two "passes" through the segments of the interview assigned.
13. During the first pass, listen, watch and read subtitles with care, do not take notes, but listen for the "gist" of Pat's story.
14. After the first pass, pause to restate to each other what the essence of Pat's statement or story was.
15. Record this quickly on a piece of chart paper in any form you please (web, list, drawing, etc.)
16. Next, listen a second time, but this time, focus on details.
17. Together add details to your chart paper.
18. Pass out [Pat Pierre Interview Summary Sheets](#) (1 per student, attached at end of lesson)
19. With your partner, write a summary on the summary form for your assigned sections. These could be two or three sentences in length and need sufficient detail to tell the story or impart the essence of Mr. Pierre's experience.
20. Finally, share out segments in the order that they occur on the video. As each pair shares their chart and summary statements, the class records the findings in the proper section of their own summary form.
21. When done, discuss the many ways the river, water, and fish were experienced by Mr. Pierre, and the ways in which he shared how people took care of and respected the river.
22. Foreshadow the assignment by posing the question: "How might you give back (or express reciprocity) to the river?" "How might you honor and respect the river?"
23. Invite students to reflect on this briefly in their Field Journals, and to think about it over night. Tomorrow, they will begin to develop a personal project and plan to give back.



Day Two

1. Introduce students to the assignment.
2. First, allow 5 minutes and have students brainstorm responses to the following questions projected on the board. Note that they may want to use a notebook or even their Field Journal for this reflection.
 - What are some things you enjoy or do well, or some things you have always wanted to learn to do, but haven't had a chance?
 - If you could "give back" to the river, or express gratitude for water, how would you choose to do so?
 - Are there unique ways you can use one of your existing talents or develop a new talent that you could employ to honor, celebrate, teach about, or help restore the river or our relationship to water?
3. When they are done with this initial thinking, share with them this list of examples.
 - Terry wants to support healthy rivers by assisting with planting of native plants along stream sides where those plants have been lost due to human activity and grazing. She contacts a local conservation group to see if they have ideas and quickly is connected to the coordinator of a community planting day along the river corridor. She participates and also documents all aspects of the process, creating a video to assist with the promotion of the next community planting day. Her video is posted on her class web site and the site of the conservation group she volunteered with.

PROMOTE CHOICE

Students rarely have legitimate choices in activities or assignments, and often are not afforded the opportunity to experience the intrinsic motivation that occurs when developing a project of their choosing. Here is an opportunity for students to individually express gratitude and caring for water.

- Jessie is a talented writer and has selected to craft five narrative poems, one for each major part of a stream (pools, riffles, point bars, floodplains, and uplands). His finished works will be printed and framed for display and also submitted to a magazine for potential publication.
 - Crystal has studied ballet for several years, she decides to choreograph a dance that captures attributes of a healthy stream. She intends to teach the dance to three friends and together perform the piece in an upcoming concert.
 - Jordan checks out a digital camera from his school library and begins developing a photo essay of threats to the river found in his own neighborhood. He captures images of neighbors fertilizing their lawns near a ditch that flows freely into the river; oil leaking from the engine of an older model truck; an irrigation head-gate that pulls water from the river, lowering stream flow; a dam made by kids to create a swimming hole that hinders or blocks fish passage; an area where careless dog walkers have left dog waste near the water; a shallow stretch of the river where someone thoughtlessly drove into the stream bed gravels where native fry and juvenile trout live; open storm drains near gas pumps; etc. He will present his photo essay as framed images and also as an iMovie that can be uploaded to the classroom web site.
 - Samantha has been fishing with her father and grandfather her entire life. She decides to study aquatic insects at different life stages and then asks her grandfather to teach her how to tie flies replicating the favorites of trout. She displays what she creates along with the steps in the process at the classroom showcase.
 - Joe organizes a community clean up day at a heavily used public access point along the river. He documents the day of service with a video flip camera and records the number of trash bags filled, creating a multimedia presentation for the class showcase.
 - Connie decides to focus on respecting water by developing a water-conservation project in homes. She begins collecting 1 liter soda bottles and locates a source that will allow her access to sand. Then she takes the materials to a 2nd-grade classroom in her school where the teacher has allowed her to teach the students how they can conserve many gallons of water per day by placing a sand filled 1 liter pop bottle in the tank of each toilet. To drive the message home, she helps the students write a “message” that will be tucked into each bottle as they are filled with sand, sharing how much water is saved with each “flush.” She documents her project with a combination of video clips and still shots to be edited into an instructional video for others.
 - David is an artist. He decides to create a series of original watercolors capturing the river in each of the four seasons. With other advanced art students, they create a themed art exhibit around aquatic and riparian habitats and the animals and plants that live there. They end up with 32 original works that can be displayed together, each illuminating some aspect of the river.
4. As a homework assignment, have each student reflect on what he or she would like to pursue individually as a project over the coming weeks. Remind them that the criteria for these personal projects are open and each student will determine what they want to create or do, and how they intend to do it. The most important thing is to pick a project they are passionate about pursuing, that allows them to develop or use a special talent to honor the river or show respect for water.

DIVERGENT VS. CONVERGENT PROCESS

As a teacher, success in this unit will be determined by the uniqueness of the student’s projects and how different they are from each other and how they reflect each student’s talents, passions and interests. The most challenging aspect of this project for the teacher is to stay “out of the way” and trust students to arrive at a product that uniquely expresses their respect and awareness of the importance of the river or some aspect to the aquatic or riparian ecosystems.

Day Three and ongoing

1. Use the [personal project planning form](#) attached to this lesson, copy in advance and hand out 1 per student.
2. Open class by asking students to write in the planning form, as detailed a description as they can of the project they would like to conduct over the coming two weeks.

3. With this ideal description in hand, now have them go back and make a running list of challenges they may face.
4. Examining their individual challenge list, now ask students how they might narrow or limit their project to assure they can complete it in the time provided. Have them write this.
5. What supports will they need to overcome the challenges? List them.
6. Using your Internet connection, PC and projector, engage the entire class in a discussion of backwards planning.
7. With the class, discuss the things you hope to do and cover in the coming weeks connected to the Explore the River investigation.
8. Tell them the last day will be a celebration or honoring when they will share the outcomes of their projects.
9. Invite them to plan with you what day that will be. Use a [Google Calendar](#) (or other) for this purpose and show them how you create an event and fill in details. (Note, to use this free online tool, you and your students will need g-mail accounts. Many schools are moving to Google Docs and other freeware tools. If yours is not among them, you can find other calendar building tools, but students will not be able to share theirs with you via the Internet. Instead, they will have to use a hard-copy form and print and turn into you after their “backwards” plan is roughed in. With the online version, as things change, they can be quickly updated and all who are invited to share the document or calendar can see it real time.)
10. The celebration date is your absolute deadline. Now set intermediate deadlines including a dry-run or dress-rehearsal date.
11. At this point, with the absolute deadline and the dry-run or rehearsal deadline in place, cut students free to list the steps necessary to conduct their project, assign each step (in chronological order) to a daily task list with a date for its completion, and note this on their calendar. The more detail built into the plan, the better. Remind them that they need all tasks completed before the dry-run or dress-rehearsal date.
12. Allow the remainder of the class period, and a block of time each day to address their projects. Collaborate with other teachers to support students, allowing time and access to those with special content-area expertise.

Last Day of Explore the River Study

1. Honor the river. Set the last day of the Explore the River investigation for students to share their projects with each other and possibly the community. Frame this as a celebration. See the extensions following for ideas.

Extension

1. Consider presenting the completed projects to the community in the form of a showcase or open house where students at stations show what they did and how it celebrates the river or teaches about the river or supports water quality, etc. This type of showcase generates support and awareness of adults in the community for both the topic and the students whose work created these projects.
2. The Confederated Salish and Kootenai Tribes host a [River Honoring](#) each spring. Consider coordinating a field trip if your school is on or near the Flathead Reservation to this extraordinary event.

Assessment

- Plans developed individually and shared as they evolve
- Backwards planning calendar (each student)
- Resources needed list (each student)
- Steps in the process list (each student)
- Daily tasks lists (each student)
- Final product performance assessment (rubrics or feedback forms will vary)

Adaptations

The following adaptations are designed to support your efforts to meet the needs of every learner. Grade levels here are only a suggestion and would not preclude use of a great 3rd-grade strategy with a 9th grader or vice versa.

Grades 4-6 (or students at any level who need more support)

1. The younger the student the more support they may need to stay organized and on task in an open-ended project like this one. Conduct frequent progress monitoring and coaching sessions to support younger students.
2. Consider using a format similar to a revision or editing conference—where the teacher and an individual student can meet briefly to discuss the work and progress and provide valuable feedback and direction as needed. This will be time well spent.

Grades 9-12 (or students at any level who require greater challenge)

Older or more advanced students should be given more responsibility and should be required to work with greater levels of autonomy.

1. Students at these grade levels can and should be expected to do amazing things. For this particular project they will be seriously limited by the constraints of time. Consider spreading the course of study out, to allow additional time to bring these projects to conclusion.
2. Require students to develop their own rubrics with which to evaluate and reflect on their performance. Templates can be adapted for use from <http://rubistar.4teachers.org/>. Take time to assure that students think deeply about which qualities they will base their evaluation on and what constitutes “excellence” in each quality.

References

Confederated Salish and Kootenai Tribes. (2011). *Bull Trout's Gift*. Lincoln, NE: University of Nebraska Press.

Confederated Salish & Kootenai Tribes. (2011). *Explore the River: Bull Trout, Tribal People, and the Jocko River*. (An Interactive Educational DVD). Pablo, MT: Confederated Salish and Kootenai Tribes.

Confederated Salish and Kootenai Tribes. (2011). *Snoqeymintrn/Field Journal*. Lincoln, NE: University of Nebraska Press.

Pat Pierre's Video Interview Sections

Cut on dotted line, fold, allow students to draw from hat or container to create pairs.

| | |
|---|---|
| 1. Introduction - (Including written bio) | 1. Introduction - (Including written bio) |
| 2. Blessing the Streams | 2. Blessing the Streams |
| 3. Water is Medicine | 3. Water is Medicine |
| 4. Carrying Water | 4. Carrying Water |
| 5. A Story About Healing Power of Water | 5. A Story About Healing Power of Water |
| 6. Fishing with Poles | 6. Fishing with Poles |
| 7. Respect the Water | 7. Respect the Water |
| 8. Beavers | 8. Beavers |
| 9. Defending and Protecting Our Water | 9. Defending and Protecting Our Water |
| 10. Impact of Cows | 10. Impact of Cows |
| 11. There Used to Be Plenty of Bull Trout | 11. There Used to Be Plenty of Bull Trout |
| 12. Drying Fish | 12. Drying Fish |
| 13. Trapping Fish | 13. Trapping Fish |
| 14. The Waters Getting Too Warm | 14. The Waters Getting Too Warm |

Summary of Pat Pierre's Video Interview Sections

Name: _____ Date: _____

| Interview Section | Summary Notes |
|---|---------------|
| 1. Introduction - (Including written bio) | |
| 2. Blessing the Streams | |
| 3. Water is Medicine | |
| 4. Carrying Water | |
| 5. A Story About Healing Power of Water | |
| 6. Fishing with Poles | |
| 7. Respect the Water | |
| 8. Beavers | |
| 9. Defending and Protecting Our Water | |
| 10. Impact of Cows | |
| 11. There Used to Be Plenty of Bull Trout | |
| 12. Drying Fish | |
| 13. Trapping Fish | |
| 14. The Waters Getting Too Warm | |

Project Planning Form

Name: _____ Project Title: _____ Date: _____

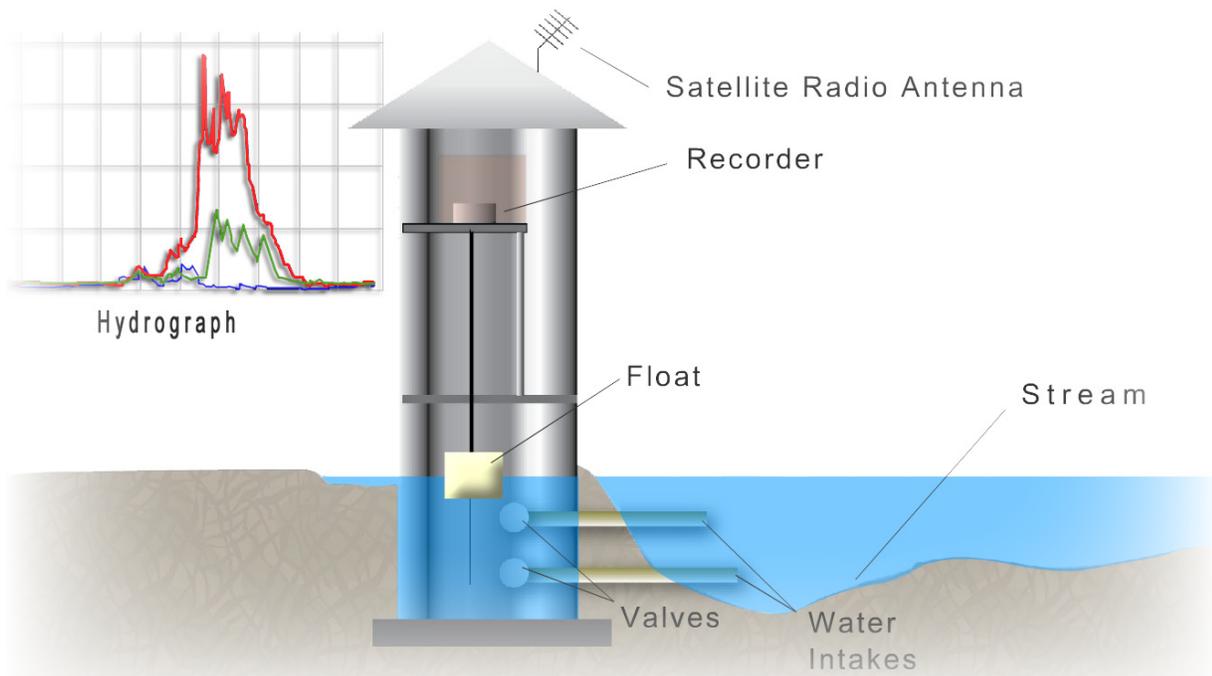
Describe what you want to do as your personal project?

List challenges you may face:

Narrow your project to avoid or help overcome challenges – revise description here:

What do you need in terms of expert help, resources, materials and time to conduct your project?

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Hydrographs are one of the primary tools used by hydrologists. Hydrographs show the change in streamflow over time, so they reveal a lot about how a stream functions and the effects of human developments like irrigation. A hydrograph displays the data that is generated by a stream gauge. As the flow in the stream increases, the float in a stream gauge rises, and the gauge records that rise. Similarly, when the stream drops, the float falls, and the recorder documents that change. The results are recorded on a hydrograph, and that data can be used for all kinds of mathematical explorations.

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- Graph paper
- Rulers
- Real-time stream gauge data, South Fork of the Jocko <http://waterdata.usgs.gov/nwis/uv?12381400>
- Print out of the time series: monthly statistics cut into horizontal strips so that each individual student can receive and examine one year's data.
- Print out of the time series: monthly statistics cut into vertical strips so that pairs of students can receive and examine one month's data (a single column) for all the years data have been collected. (Cut-off the means computed at the bottom of the table.)

Instructional Techniques

Whole group direct instruction, pair-share, small group data analysis, graphing practice, interpretation

Time Frame

Two, 50-minute class periods with follow-up time for development of stream-gauge and hydrograph story problems and math extensions; time required may vary based on age, grade level, and the teacher's choices to support cross-curricular goals.

1st period: Tour of Jocko Watershed, hydrograph study, stream gauge data analysis, and graph interpretation

2nd period: USGS data sets from the South Fork of Jocko, students create hydrographs, run basic statistics, interpret, share and look for patterns between graphs, examine longitudinal data, refocus on questions, wild card analysis, and quick write

Additional time: Story-problem writing, problem solving, statistics, and data interpretation

Suggested Grade Levels

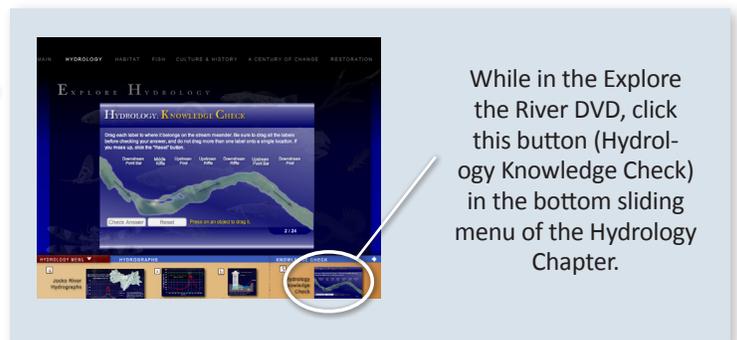
Grades 3-12

Procedures below target students in grades from 5 to 8. However, with suggested [adaptations](#), these may be useful for grades from 3 to 12.

Procedures

Day One

1. You may choose to take the Knowledge Check for the Hydrology unit now as part of the anticipatory set for this unit. This supports students' sense of purpose and focus throughout this and the [Make a River](#) lesson—both developed to teach hydrology geomorphology in the context of the Jocko River.
2. Establish purpose for the next segment of instruction by posting the following questions on the board:
 - What is a hydrograph? (a tool used by hydrologists to measure a rivers flow or discharge over time)



While in the Explore the River DVD, click this button (Hydrology Knowledge Check) in the bottom sliding menu of the Hydrology Chapter.

- What is represented on the X and Y axis of a hydrograph? (the x-axis is the horizontal plane and represents time measured in months, while the y-axis is the vertical plane representing water or flow as measured by cubic feet per second or cfs—a unit used to measure water flow. One cubic foot per second is equal to 449 gallons per minute.)
- Using Explore the River DVD, PC, and projector, view Hydrology > Overview > Part 2 (3 minutes)
 - Pause and have students share what they now understand about hydrographs with a partner.
 - After a minute or two of discussion, randomly call on pairs to report out in order to check for understanding.
 - Next, using the DVD, go to Hydrology > Explore the Jocko Watershed (Watershed Maps) and conduct a virtual tour of the watershed. These layered maps build context for the study to follow.
 - Establish purpose for the tour, asking students to pay attention to the different ways in which land and water are being used. Ask “What does each map tell us about land and water use in the Jocko watershed?”
 - Pass out the Jocko Watershed Map Analysis Form ([attached](#)), and have them take notes as you work through the maps.
 - Scroll through each of the seven maps showing different aspects of the watershed.
 - Pause on each map allowing time to read the narrative with students, and ask: “What units of measurement and types of mathematical calculations are being used to present data that is included in the map and narrative descriptions?” Ask students to respond to a partner and then randomly call on pairs to share their understanding. Clarify as you progress through the maps.
 - These units of measurement and data sources may be used by students later to develop place-based story problems, using the Jocko watershed to provide context.
 - Map by map, have students write what they think on the [Data Capture Form](#). “Based on what you know now, what implications does the variable being represented on each map layer have for streamflow? Stream health?”
 - Rove the room as they do this, checking for understanding and calling on students randomly to share what they think.
 - Next, draw students attention to the nature of the information provided. Where does it come from? How is it derived? What kinds of measurements and observations are necessary to have developed the maps? What mathematical procedures are being used?
 - Scroll back looking for evidence.
 - Introduce data collection, instrumentation, and representation of data for analysis (math and concept terms to frame understanding of hydrographs).



While in the opening page of the Hydrology Chapter of the Explore the River DVD, click this window in the center of the page to view the Hydrology Overview.



While in the Explore the River DVD, click this button (Explore the Jocko Watershed) in the bottom sliding menu of the Hydrology Chapter to view the watershed maps.

POWER OF CONTEXT

Students benefit enormously from taking math skills—which are usually used in the abstract—and applying them to the natural world (working as scientists) or the social world (thinking like economists, psychologists, social scientists or even teachers). Math in context is accessible to more students because they can bring their knowledge from other areas of study to support their mathematical thinking. Explore the river provides unique opportunities to connect math to science, social studies, and Salish and Pend d'Oreille culture through the investigation of a contemporary tribal response to an actual problem.

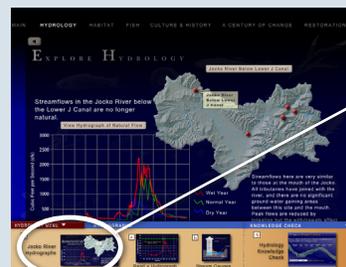
17. Go to the “Read a hydrograph” section in the Hydrology chapter to directly teach students how to read hydrographs.
18. Review the function and parts of a stream gauge found in the “Stream Gauges” section in the Hydrology chapter to learn about this instrument which collects and records data.
19. Discuss cubic feet per second (cfs) as the unit of measurement used by stream gauges and represented over time in the form of a hydrograph.



While in the Explore the River DVD, click these buttons (Read a Hydrograph and Stream Gauges) in the bottom sliding menu of the Hydrology Chapter.

20. Ask students what they can tell from a single hydrograph representing one year’s stream flow through a single stream gauge? Project the single year’s hydrograph found in “What’s a hydrograph?”
21. Have students discuss this in small groups or pairs. What does a single hydrograph tell us?
22. Have groups report out their findings and note on the board.

23. Break students into five groups.
24. Assign each group one stream gauge station on the DVD from the Jocko watershed.



While in the Explore the River DVD, click these buttons (Jocko River Hydrographs) in the bottom sliding menu of the Hydrology Chapter.

25. Provide each group a PC and have them thoroughly review the data presented for their assigned stream gauge. Let them know that they will be reporting their findings and projecting from the DVD to teach the rest of the class about that particular part of the watershed. They may choose to go back to the maps while in their groups to gain more information. Allow 10 minutes to study and discuss.
26. Have each group take the class on a three-minute tour, this time focused on the streamflows (dry, wet, normal) and the comparing to the natural flows pre-irrigation in the Jocko (the existing streamflows in the South Fork remain relatively natural so students will not be able to compare natural vs unnatural for this tributary).

27. Questions for discussion might include:

- How do hydrologists know it is a “wet” year?
- How do hydrologists know it is a “dry” year?
- How do hydrologists define a “normal” year?

28. After all have reported out, go back to the question, “What does a single hydrograph tell us?” Look again at the list on the board. Now frame the question in reverse, and conduct a short whole class discussion. “What don’t we know, or can’t we tell from a single annual hydrograph?”

29. Close class period requiring students to individually conduct a quick write exit ticket on the following questions:

- What does a single hydrograph for a single year tell us?
- What can’t we tell from a single year’s hydrograph? or,
- What is the difference between one observation and many observations over long periods of time?

30. Use [exit tickets](#) to check for student understanding in preparation for day two.

WRITING IN MATH

The power of writing in math is well documented. All students benefit from interpreting, analyzing, and arguing competing interpretations of data employing math skills and linguistic skills together. According to acclaimed math educator Lynn Steen, all math has two fundamental aspects: calculation and interpretation (Steen 2007). Writing is a critical tool for expressing interpretations of mathematical findings.

Day Two

1. Introduce the concept of longitudinal data or data collected from multiple observations over time.
2. Now pose these three questions to the class again, posting on the board:
 - How do hydrologists know it is a “wet” year?
 - How do hydrologists know it is a “dry” year?
 - How do hydrologists define a “normal” year? or,
 - What are scientists doing with this longitudinal data to determine “wet, dry, and normal?”
3. With students seated in pairs or small groups, pass out graph paper, one sheet per student, ruler, and a single year (row or strip) from the monthly time series statistics from the [USGS web site](#) for the South Fork of the Jocko stream gauge data. Provide one year per student.
4. Note: Excel spreadsheets or graphing calculators may also be used to conduct this segment of the lesson based on teacher preference.
5. Each student is assigned a year (complete year data only) from 1983 to 2010.
6. Have each student create their own hydrograph for their assigned year.
7. Return to the Explore the River DVD to support students creating the hydrograph with proper Y and X axis, clear labels, and appropriate scale (increments of measurement in months and cfs)
8. Show them how there will be 12 data points on their simple graph (one per month) and that they must make the scale of the vertical (y-axis) appropriate to the flow data—from 0 to 500 in appropriate increments to their graph paper.
9. As students create their graphs, monitor by roving to check for understanding.
10. Once they are done, have them write up a one-paragraph interpretation of the graph, noting differences in average cfs based on month.
11. Now, have them share and discuss their graph and interpretation with others in their group and possibly mingle in the class to see as many others as possible.
12. Now what do they see?
13. Ask students to compute, for their assigned year, a calculation of total discharge as measured in cfs. (They will simply add the 12 monthly means for their assigned year.)
14. Now pair students up and provide each pair with a month with all collected data from 1983 to 2010. (Each pair has a column from the monthly USGS data.) Be sure to exclude the monthly means at the bottom of the table.
15. Ask students how an average or mean is calculated.
16. What do they know?
17. Provide direct instruction in the calculation of the mean for each month. (Adding the total cfs for all available observations and then divide by the number of observations.) You may select to take a month and model this directly.
18. In pairs, have them calculate the average or mean for their assigned month.
19. Whole class, have pairs report out their means for their assigned month and put together a hydrograph with the class that shows the average monthly discharge in cfs from 1982 to 2010.
20. Now, have students individually compare their hydrograph for their assigned year, to the average over all 28 years during which data has been collected.
21. Have students conduct a quick write exit ticket arguing for whether their assigned year is a dry year, wet year, or normal year on the South Fork of the Jocko. Require them to support their claim with statistical evidence.

22. If the lesson titled [Make a River](#) has been completed, now is the time to conduct the Knowledge Check for the Hydrology section of the Explore the River DVD. Whole class, small group or individually—check for content knowledge.



While in the Explore the River DVD, click this button (Hydrology Knowledge Check) in the bottom sliding menu of the Hydrology Chapter.

Additional time (daily content related story problems)

1. Allow students to develop story problems using actual stream gauge data sets, national weather service data sets, and data embedded in the Jocko Watershed maps and other areas of inquiry to support teaching problem solving, applied statistics, and translation from story problem to number sentence and vice versa. Have students take five minutes per day to write and share brain-teaser problems with each other from this data over the remaining days of the Explore the River study.

Extensions

1. Provide direct instruction on other measures of central tendency (i.e. median and mode). Have students run these statistics for their assigned months and years.
2. Have students create scatter plots of the USGS data looking for trend lines and outliers. If an outlier is identified (extreme high or low flow) re-run the measures of central tendency (means) without the outlier. What are the differences? Which statistic do students think might be more reliable?
3. Ask, if we had 500 or 1,000 years of data, how do you think our observations would differ? What might we be able to understand with many more years of observation?
4. Have students write their own argument related to this prompt. “The oral traditions of the Salish and Pend d’Oreille contain “data” collected from time immemorial. In what ways can this rich information be considered multi-generational longitudinal data? What might be the limits for use of data and information coming from the oral tradition? What types of insight does this type of longitudinal information support?”

Assessment

- Direct observation of group reports
- Random pairs checking for understanding
- Quick writes
- Individual hydrographs
- Accuracy of annual total discharge data per year
- Pair calculations of monthly means
- Exit tickets
- Story problems written
- Story problems solved

Adaptations

The following adaptations are designed to support your efforts to meet the needs of every learner. Grade levels here are only a suggestion and would not preclude use of a great 3rd-grade strategy with a 9th grader or vice versa.

Grades 4-6 (or students at any level who need more support)

Intermediate students are continually developing critical thinking and problem solving skills. To achieve this with complex content, many students will require modeling, demonstration and temporary supports. The following suggestions may help you more closely meet the needs of younger students.

1. Pose the question, “Can we compare streamflow observations from one river to another river or in different parts of the country? What variables might make this data useful or less than useful? Would ‘normal’ on one river be the same as ‘normal’ on another? Why or why not?”
2. Provide a whole group Google Earth and Google Map demonstration touring the Jocko watershed, and looking up Google map directions from your town, to Arlee. Show students the driving instructions, and then click to reveal the walking directions. This gives them a frame of reference for the location.
3. For younger students, work from the concrete to the abstract. Find your location on a globe, then a map, and then find the location of the Jocko. Reference both the globe and the map before going to the Google Map. They need the idea of a “box, within a box, within a box” re, “my house is in my neighborhood, is in my town, is in my county, is in my state.” This conceptual awareness is critical before you begin zooming on a cyber-map.
4. Don’t dumb down academic language. When dealing with graphs, talk about vertical and horizontal lines, X and Y axis, longitude and latitude, portrait, and landscape page displays, etc. These terms are conceptually the same and need to be taught, the dots connected, as you introduce the graphs. Failure to do so is a lost instructional opportunity that diminishes cognitive academic language skills.
5. All students can and should work with real data sets to develop context driven story problems and solve them as a form of daily practice. Writing the problems teaches the strategies for problem solving at a far higher level than just solving unrelated problems from a text.

Grades 9-12 (or students at any level who require greater challenge)

Older or more advanced students should be given more responsibility and should be required to employ higher-order thinking skills with independence.

1. Have students analyze their reading (from literature to informational texts) for quantitative information embedded in the text. Have them regularly analyze the everyday math found in the texts of other content area material and generate and solve problems from the context of these disciplines.
2. Have students (individually or in pairs) conduct a Google Earth tour of the Jocko watershed. They can even develop a virtual tour and save as a KMZ or KML files to share or upload to your classroom web site. Layers of information can be added including still images along with captions about locations, historical and cultural sites, flora and fauna. This could be a project a student might consider for the [More Than Water](#) lesson in this curriculum.
3. All students can and should work with real data sets to develop context driven story problems and solve them as a form of daily practice. Transfer this skill to other contexts, for example game or sports statistics, and other units of study.
4. Create a daily habit of problem writing in context to support content-area learning, develop highly specific and clear writing skills, and develop problem-defining and problem-solving skills. Problem defining or posing the right questions is an even more sophisticated skill than problem solving and will have significant benefits to students.

References

- Confederated Salish and Kootenai Tribes. (2011). *Bull Trout’s Gift*. Lincoln, NE: University of Nebraska Press.
- Confederated Salish & Kootenai Tribes. (2011). *Explore the River: Bull Trout, Tribal People, and the Jocko River*. (An Interactive Educational DVD). Pablo, MT: Confederated Salish and Kootenai Tribes.
- Confederated Salish and Kootenai Tribes. (2011). *Snoqeymintn/Field Journal*. Lincoln, NE: University of Nebraska Press.
- Steen, L. A. (2007, November). How mathematics counts. *Educational Leadership*, 65(3), 8-15

Jocko Watershed Map Analysis – What do you think?

| Map Layer | Implications for stream flow? | Implications for stream health? |
|-----------------|-------------------------------|---------------------------------|
| Streams | | |
| Canals | | |
| Vegetation | | |
| Precipitation | | |
| Roads | | |
| Land Status | | |
| Protected Lands | | |

EXIT TICKET—DAY ONE

Name: _____ Date: _____

What does a single hydrograph tell us? What can't we tell from a single hydrograph? or,
What is the difference between a single observation and many observations over time?

EXIT TICKET—DAY ONE

Name: _____ Date: _____

What does a single hydrograph tell us? What can't we tell from a single hydrograph? or,
What is the difference between a single observation and many observations over time?

QUICK WRITE—DAY TWO

Paragraph Analysis Of Hydrograph For Assigned Year

Analysis of Hydrograph for _____ (year). Recorded by _____

QUICK WRITE - DAY TWO

Comparative Analysis

Analysis of Hydrograph for _____ (year) compared to hydrograph created from 28-year means.

Recorded by _____

EXIT TICKET—DAY TWO

Name: _____ Date: _____

Argue whether your assigned year is a dry year, wet year, or normal year on the South Fork of the Jocko. Support your claim with statistical evidence.

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In general, organisms in the ecosystem are adapted to and often dependent on, each other. For example, a westslope cutthroat trout depends on mayflies, stoneflies, and caddisflies for food. The oxygen needed by those insects (and all animals, for that matter) is produced by plants while the waste product of animal respiration—carbon dioxide—is used by plants. The nitrogen cycle, the water cycle, and the control of prey populations by natural predators are other examples. Animals and plants should always be thought of as members of a complex and deeply inter-connected community of life. And it should always be remembered that each species has a vital role to play within that community.

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Role in the Community



Cultural Values: Relatedness, Observation, Balance, Cooperation

Rationale

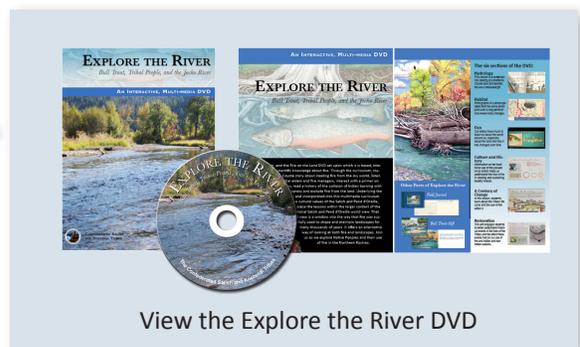
Elders know that all plants and animals live in a community with each other and that each has a special role they play in maintaining that community. Biologists use different words to talk about the roles that each creature or plant plays in the ecosystem in which they live. Both elders and scientists are aware of how fragile communities can be. For example, how easily the niche occupied by bull trout can be altered by invasive species. In this lesson, students explore the life ways and needs of a plant or animal native to the Jocko River—and the role that plant or animal plays in the larger community.

Learning Targets

- I work independently.
- I know how to use the library and internet sources to research a topic.
- I develop a report, PowerPoint, or other product to teach others.
- I use technology as a tool for both research and sharing the findings of my research.
- I research one plant, animal, or insect; its habitat and the role that it plays in maintaining a healthy river ecosystem.
- I locate sources, determine credibility of sources, read sources, take notes from sources, and credit sources.
- I understand the role of a healthy river in the maintenance of an ecosystem that supports diverse plants and animals.
- I write a descriptive paragraph from a photo.
- I use notes from various sources to answer questions about a plant or animal.
- I organize my report using a question-and-answer format and a logical sequence.
- I cite sources and create a Works Cited or References page.
- I apply research strategies.
- I use the writing process to share my results.

Resources

- Explore the River DVD
- Computer with DVD player for whole-group presentation and possible use of library or lab setting to allow individual word processing or development of PowerPoint or other presentation form
- PC Projector
- Library access
- Access to the Internet for advanced research



View the Explore the River DVD

- Blogs, Wiki's, or classroom [Moodles](#) to publish and share reports (optional)
- Student Assignment Sheet ([attached](#))

Instructional Techniques

Independent research, note taking, writing, publishing, and sharing with class

Time Frame

1st period: Introduce the project, teach research skills, and launch independent work, plus intermittent independent work time over the next week or two to allow for project development

2nd period: Direct instruction or practice (mini-lessons) on topics like paraphrasing, citing sources, creating a reference or works cited list, plagiarism and fair use (science, communication arts, and library/media time all work well)

3rd period: About 5-to-10 days after the introduction, to present findings to class, publish or post

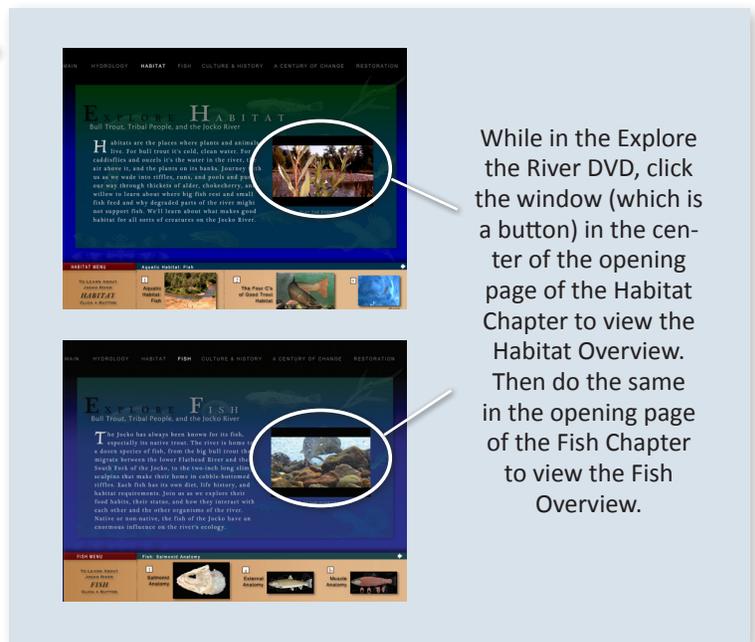
Suggested Grade Levels

Grades 4-9

Procedures below target students in grades 5 through 8 or students of any age who struggle with writing or have limited practice writing and researching topics. However, with suggested [adaptations](#) following the procedures section, these may be useful from grades 4 through 12.

Procedures

1. Begin project by viewing entire overview video on habitat, followed by the overview part 1 on fish.
2. Go to Habitat, from the opening window, play Overview Parts 1 and 2, then navigate to Fish, and from the opening window view only Part 1 of the Fish Overview.
3. Discuss how different plants and animals require unique qualities in either the riparian or aquatic habitats in order to thrive. In addition, each either contributes to (or sometimes detracts from) these beneficial qualities for other creatures. All play some role in sustaining or degrading the community.
4. Inform students that they will each be creating a report on a plant or animal that includes a special focus on its habitat, what makes that habitat ideal and how the presence of this plant or animal contributes to or detracts from the needs of other animals or plants.
5. Distribute [student assignment sheet](#) provided.



6. Allow time to find plants or animals for study on the Explore the River DVD under Habitat > Aquatic Insects or under Fish > Species Profiles. There is also a substantial list of plants and animals native to the Jocko watershed found in the forward material in the Field Journal.
7. Allow students to choose a plant or animal. Note that both native and invasive species are worthy of study as the reports generated will expose how they contribute or detract from the community—some potentially threatening the biodiversity of the watershed.
8. Have students brainstorm what they need to know about their plants or animals. They can do this individually, in pairs or small groups.
9. Have students convert their brainstorm list into five to seven guiding questions. For example:
 - What does _____ look like?
 - Where does _____ live?
 - How does _____ behave? (animal), or
 - How is _____ used? By what or whom? (plant or animal)
 - What does _____ eat or require?
 - What interactions does _____ have with other plants and animals in the community?
 - What is the role of _____ in helping to maintain an intact ecosystem?
10. Each question will become a paragraph of this simple report.
11. Ask students where they would go to find this information. Use the Explore the River DVD as an example of a source that they will all have on their list of sources and future Works Cited list.
12. Draw students' attention to the resources section on the DVD as well as the sections on Habitat, Fish, and Century of Change (for invasive species impacts). All are good starting points for study.
13. The [Montana Fish, Wildlife & Parks](#) and the [Montana Field Guide](#) web sites also have information and links that could be supportive related to native and invasive species. Another good site is the [Bull Trout ID Quiz](#). Begin to collect a list of reliable sites.
14. Write their ideas on information sources on the board.
15. Next, teach students how to take notes related to each guiding question. They can use note cards, a section in their field notebook or use the [PowerPoint note-taking strategy](#) found at the end of this lesson.
16. Remind students that they are to paraphrase information from sources and must always note the source (author, title, year published, publisher and the page number) where they found an answer to one of their questions. These



While in the Explore the River DVD, have students click these buttons on the bottom sliding menu of the Habitat and Fish chapters.

STRUCTURE SUPPORTS YOUNG WRITERS

Some students struggle to organize their ideas when writing. To help, you can invite students to use PowerPoint as a tool for organizing a report. The structure will support and prompt them, sentence by sentence, through the writing process. Keep in mind they can use the paragraph-per-slide model suggested here, or they can make each slide a full section of a longer report, with the title box the heading and each major bullet the topic sentence of a distinct paragraph. Technical reports, like science fair projects, lend themselves wonderfully to use of PowerPoint as a scaffold. Instructions are found in a [handout](#) at the end of this lesson.



While in the Main (opening page) of the Explore the River DVD, click this button at the bottom of the page to view the Resources page, which includes many links.

will be noted as “Works Cited” at the end of their paper and will be cited within the text of their report. This is a critical habit that must be reinforced as Internet plagiarism becomes an ever-increasing problem.

17. Provide a mini-lesson on paraphrasing:
 - Define paraphrasing.
 - Handout the [Attributes of a Healthy Stream paraphrasing form](#) found at the end of this lesson.
 - Provide a whole-class demonstration on the board, taking one key attribute as stated in the scientific paper and “unpack it,” showing how you could rewrite in your own words (examples are provided in a “teacher” form at the end of the lesson.)
 - Have students, in pairs, come up with paraphrased versions of the remaining attributes. Note that these are already stated two ways by the articles authors—so you are seeing an example of paraphrasing already employed.
 - Have each pair partner with another pair and compare statements.
 - Ask them:
 - Do the statements you wrote mean the same thing as the original statement?
 - Which is easier to understand? Your version or the original? Why?
 - Which paraphrased statement held the meaning, but changed the words the most?
 - Show some of the best student examples, where meaning was retained but the words differed dramatically, on the board.
 - Discuss students’ ideas about why some of their paraphrased statements are easier to understand than the original. Why might that be? What does that tell us about reading difficult or technical material?
18. Allow time throughout the week in class or the library to conduct research.
19. Shake it up and break it up! Students find reports and larger writing tasks to be daunting. Teach them strategies to divide and conquer the task. Try this “Flash Flood!” strategy:
 - Over the 5 to 10 school days after the assignment has been given, set a classroom alarm clock (your computer will work for this) for a random time each day. Be mindful of the times so you don’t interrupt a key point in your teaching!
 - Keep the times a secret as the element of surprise makes this strategy effective.
 - Teach students in advance the following protocol for the “Flash Flood!” strategy.
 - When the alarm goes off, tell students to Drop Everything! Roll into Research Mode!
 - You must work silently!
 - You have 5 minutes, with only the resources available in class, to find one key fact about your selected plant or animal.
 - Once you find a fact, determine which of your guiding questions that fact answers.
 - Paraphrase or quote the fact in your notes associated with that part of your report.
 - Note the source of this fact in your works cited list (author, source title, source type, copyright date, page #, etc.)

TEACH STUDENTS PARAPHRASING

Paraphrasing is rewriting ideas from a source in your own words, while retaining the original meaning. It is often done to clarify meaning for the reader and supports the writer in understanding content as well. It is required, along with citation of sources, to avoid plagiarism. Paraphrasing is a skill that requires much practice and direct instruction. Whenever you assign a report, provide a mini-lesson or demonstration on paraphrasing using a related example text.

GATHER RESOURCES IN ADVANCE

Prepare your classroom by having resources handy from your classroom library or resources pulled temporarily into the classroom, checked out by students, and/or the internet.

- Return to your seat before the timer goes off!
20. Post these rules for the “Flash Flood!” strategy in your classroom for future reference.
 21. Try to do this at random times daily for about 5 days. If you notice students are all on task and on a roll with their reports, find ways to extend or stretch the time at least until they finish the task at hand.
 22. Adjust the timer to accommodate your students. Your goal is excitement and purposeful urgency, not panic or chaos.
 23. Once they have conducted enough research to finish their reports, provide a mini-lesson with the Student Assignment Sheet and the Rubric so students know exactly what their finished report should look like.
 24. If some of your students tried the PowerPoint report writing strategy attached, this is the point where they edit the PowerPoint in outline view and then copy and paste into Word, following the procedures provided.
 25. If students have been working from note cards or paper/pencil, this is the point where they organize these notes and begin writing (by hand or using word processor) the information into a 7 or 8 paragraph report.
 26. Have them draft until all parts of the report are written in 1st draft form.
 27. Have students find a partner and each take turns sharing and commenting on each other’s 1st draft report.
 28. Coach students to use questions to help each other make the reports more complete and more easily understood.
 29. Using the peer feedback, have students revise their reports – adding details, rearranging the order of parts, clarifying points and developing stronger paragraphs that stay logically on topic answering the guiding question.
 30. Once revisions are done, have student spell check and carefully proofread.
 31. Have them save and then print a proofread draft.
 32. Exchange drafts with partner.
 33. Each partner reads and comments on the report in the role of editor, looking for grammar and spelling errors, as well as clarity of thought and completeness.
 34. Return to author for final proofing, minor revision and formatting.
 35. Self-assess and reflect using rubric provided, and make any additional changes warranted.
 36. Save.
 37. Print final drafts.
 38. Post or publish final drafts (can use bulletin boards, author’s chair, classroom websites, blogs, wiki’s moodles, etc.)
 39. Submit to teacher for feedback.

Assessment

- Direct observation of independent work (time on task, problem solving)
- Three sources from a variety of media found on students’ “Works Cited” list
- Notes in field notebook, note cards or PP draft
- Final Report – Self and Teacher Assessment Rubric
- Publication of report (share with class via author’s chair, bulletin board, websites, blogs, wiki’s, moodles or PP)

Extensions

As suggested throughout the lesson, this standard report can be enhanced and shared with peers using technology. Support students in posting their report and possible PP presentation to a classroom website, blog, wiki or moodle. Once posted, have each student write two questions that can be answered if you read their report. Have them all share these questions (Google Forms is an option) with each other and create a web quest type of treasure hunt for the class. Invite students to access and read each others’ reports in order to answer the questions. In this way, they benefit from publishing their work for a real audience and the class learns about all the plants and animals assigned and their unique role in the community.

Adaptations

The following adaptations are designed to support your efforts to meet the needs of every learner. Grade levels here are only a suggestion and would not preclude use of a great 3rd grade strategy with a 9th grader or vice versa.

Grades 2-3 (or students at any level who need more support)

1. Write a simple report following this lesson on an animal native to the Jocko watershed, but do so as a group, teaching mini-lessons on paraphrasing (with simpler text examples), on note-taking, citations, and report structure.
2. Use the PowerPoint strategy for your whole-group report demonstration, and fill slide by slide with students conducting the research and adding facts and details as they find them. This format makes it easy for students to see and follow your demonstration if projected using an electronic white board or other projection device.
3. If demonstrating using the PowerPoint strategy, create a mini lesson on organization by setting up the slides as a template (8 or 9) and then in slide sorter view, drag them into a scrambled order. Have students put them into logical order that follows report form and flows logically based on the topic. They will like dropping and dragging the slides into sequence and learn a lot about organization at the same time.
4. Each time a student (pair of students or group of students) locates a new fact, go through the entire process of noting the fact, and also noting the source both with the fact and on the "Works Cited" page. Teach them where to locate the information.
5. Provide lessons early and often about plagiarism and how to avoid it by properly crediting sources.
6. Repeat different elements of note-taking and report development with students often.
7. Have students write in relation to content area study daily using a variety of short summary, clarification or reflection strategies (admit and exit tickets for example.)
8. Reports can be presented to others as PowerPoints, poster sessions, hosted or guided gallery walks, etc. Allow students to share their findings in a variety of ways based on interest and ability.

Grades 9-12 (or students at any level who require greater challenge)

1. There is great diversity in any high school class. As a result, some students will need extensive guidance and support that gradually diminishes over time. Others will need much more freedom and require a more open-ended process. Accommodate all by providing differing levels of support based on students' needs.
2. High school students will like posting their reports to classroom blogs, websites, wiki's or moodles. If they do so, require Internet-based discussion of student work using discussion boards or synchronous chat tools.
3. A common reason students' leave college without a degree is weak writing skills. Students must write daily in a variety of modes with high expectations and equally high scaffolds or supports. The guidance provided in this lesson supporting use of PowerPoint, the Student Assignment Sheet and the Assessment Rubric are designed to clarify this assignment with students at any grade level who may have had limited writing experience.

References

Confederated Salish and Kootenai Tribes. (2011). *Bull Trout's Gift*. Lincoln, NE: University of Nebraska Press.

Confederated Salish & Kootenai Tribes. (2011). *Explore the River: Bull Trout, Tribal People, and the Jocko River*. (An Interactive Educational DVD). Pablo, MT: Confederated Salish and Kootenai Tribes.

Confederated Salish and Kootenai Tribes. (2011). *Snoqeymintn/Field Journal*. Lincoln, NE: University of Nebraska Press.

Student Assignment Sheet

You are assigned to independently write a report on a plant or animal that lives in the Jocko River or riparian area. Find your plant or animal on the Explore the River DVD under Habitat > Aquatic Insects or under Fish > Species Profiles. There is also a substantial list of plants and animals native to the Jocko watershed found in the forward material in the Field Journal.

Your report will have the following parts:

1. Title
2. Introduction
 - a. What plant or animal are you reporting on?
 - b. Why did you select it?
 - c. Why is it important?
3. Guiding Question #1
 - a. Fact or detail
 - i. Source
 - b. Fact or detail
 - i. Source
 - c. Fact or detail
 - i. Source
4. Guiding Question #2
 - a. Fact or detail
 - i. Source
 - b. Fact or detail
 - i. Source
 - c. Fact or detail
 - i. Source
5. Guiding Question #3
 - a. Fact or detail
 - i. Source
 - b. Fact or detail
 - i. Source
 - c. Fact or detail
 - i. Source
6. Guiding Question #4
 - a. Fact or detail
 - i. Source
 - b. Fact or detail
 - i. Source
 - c. Fact or detail
 - i. Source

7. Conclusion

- a. In summary, what have you learned about _____?
- b. What does it mean?
- c. Why is it important?

8. Works Cited

- a. Author, copyright date, title, source, where published, publisher
- b. Author, copyright date, title, source, where published, publisher
- c. Author, copyright date, title, source, where published, publisher
- d. Author, copyright date, title, source, where published, publisher

You will be evaluated on the completeness of your report (each section above is included), the quality of the information you uncovered, as well as how you presented this information and credited your sources. See the rubric below for guidance.

| CATEGORY | 4 | 3 | 2 | 1 |
|---------------------|---|--|---|--|
| Organization | Information is very organized with well-constructed paragraphs and subheadings. | Information is organized with well-constructed paragraphs. | Information is organized, but paragraphs are not well-constructed. | The information appears to be disorganized. |
| Information | All guiding questions answered with at least 2 sentences about each. | Most questions answered with at least 2 sentences about each. | Most questions answered with 1 sentence about each. | One or more questions were not addressed. |
| Sources | All sources (information and graphics) are accurately documented in the desired format. | All sources (information and graphics) are accurately documented, but a few are not in the desired format. | All sources (information and graphics) are accurately documented, but many are not in the desired format. | Some sources are not accurately documented. |
| Paragraphs | All paragraphs include introductory sentence, explanations or details, and concluding sentence. | Most paragraphs include introductory sentence, explanations or details, and concluding sentence. | Paragraphs included related information but were typically not constructed well. | Paragraphing structure was not clear and sentences were not typically related within the paragraphs. |
| Mechanics | No grammatical, spelling or punctuation errors. | Almost no grammatical, spelling or punctuation errors. | A few grammatical, spelling or punctuation errors. | Many grammatical, spelling or punctuation errors. |

Scaffold for Note-Taking Using PowerPoint

Student Directions - Check as you go!

- Open a blank PowerPoint presentation file.
- Insert 6 or 7 slides, or one for each of the Five W's that you will be researching related to the historical event: Who, What, When, Where, and Why plus a How slide for impacts and a References or Sources slide. Make sure each inserted slide uses the bulleted-list format.
- On each slide, write the question word along with the context. For example: What happened? Why did it happen? Who was involved? Where did it happen?
- Now, as you research your topic, take notes in this PowerPoint presentation, writing a phrase or sentence on the appropriate slide for each detail or fact you find. Each note will be a bullet on the list.
- Note the author's last name, if known, or title of the text or website (if author not known) next to each detail you add to any slide in the body of your report. This will make it easy to cite your sources later.
- Keep a list of the different sources you use; on a references or works-cited slide, write the author, title, magazine, website, etc. and page number, publisher and copyright year.
- When you are done with your research and have collected notes on each slide that answer each guiding question, revise your notes to be complete sentences. Each sentence will be a bullet on the list.
- Run the presentation to check for organization.
- Reorder your slides using slide sorter, or your bullets (select, drop and drag) within any slide to follow a logical pattern. This is the revision step in the writing process.
- Next, from "normal view" which allows you to see the slide in the editor, as well as the 6 slides you have created along with left side of the screen, convert from showing the slides to the "outline" view on the left side.
- While in "outline" view, you can correct spelling in the presentation using spell checker.
- Re-read the text for strong and specific word choice.
- Re-read the text to be sure sentences are complete (no fragments, no run-ons.)
- If you have a personal editing list or have a standard editing checklist, use it to be sure you have applied what you know about the rules of grammar and spelling.
- Save your PowerPoint.
- Print your presentation as a 6-slide-per-page, black-and-white handout for reference.
- With the information you have collected on the PowerPoint slides, you can now begin designing your poster to present the story of the event to your class.

Student Paraphrase Form for Attribute of a Healthy River

| Attributes of a Healthy River – (Trush, McBain and Leopold, 2000) | In my own words...paraphrase. |
|--|-------------------------------|
| <p>“The primary geomorphic and ecological unit of an alluvial river is the alternate bar sequence.”</p> <p>Or</p> <p>“Dynamic alternating bar sequences are the basic structural underpinnings for aquatic and riparian communities in healthy alluvial river ecosystems.”</p> | |
| <p>“Each annual hydrograph component accomplishes specific geomorphic and ecological functions.”</p> <p>or</p> <p>“Annual hydrograph components (including winter storm events, baseflows, snowmelt peaks, and snowmelt recession limbs) collectively provide the impetus for processes that shape and sustain alluvial river ecosystems. These components are uniquely characterized by year-to-year variation in flow magnitude, duration, frequency, and timing.”</p> | |
| <p>“The channelbed surface is frequently mobilized.”</p> <p>or</p> <p>“Coarse alluvial channelbed surfaces are significantly mobilized by bankfull or greater floods that generally occur every 1–2 years.”</p> | |
| <p>“Fine and coarse sediment budgets are balanced.”</p> <p>or</p> <p>“River reaches export fine and coarse sediment at rates approximately equal to sediment input rates.”</p> | |

Teacher Example with Sample Paraphrases

| Attributes of a Healthy River – (Trush, McBain and Leopold, 2000) | In my own words...paraphrase. |
|--|--|
| <p>“The primary geomorphic and ecological unit of an alluvial river is the alternate bar sequence.”</p> <p>or</p> <p>“Dynamic alternating bar sequences are the basic structural underpinnings for aquatic and riparian communities in healthy alluvial river ecosystems.”</p> | <p>Periodic rearranging of point bars is critical to a healthy stream. (Trush, McBain and Leopold, 2000)</p> |
| <p>“Each annual hydrograph component accomplishes specific geomorphic and ecological functions.”</p> <p>or</p> <p>“Annual hydrograph components (including winter storm events, baseflows, snowmelt peaks, and snowmelt recession limbs) collectively provide the impetus for processes that shape and sustain alluvial river ecosystems. These components are uniquely characterized by year-to-year variation in flow magnitude, duration, frequency, and timing.”</p> | <p>Each type of flow has an important function in maintaining a healthy river. (Trush, McBain and Leopold, 2000)</p> |
| <p>“The channelbed surface is frequently mobilized.”</p> <p>or</p> <p>“Coarse alluvial channelbed surfaces are significantly mobilized by bankfull or greater floods that generally occur every 1–2 years.”</p> | <p>Materials on the streambed move around periodically. (Trush, McBain and Leopold, 2000)</p> |
| <p>“Fine and coarse sediment budgets are balanced.”</p> <p>or</p> <p>“River reaches export fine and coarse sediment at rates approximately equal to sediment input rates.”</p> | <p>The sediment entering equals the sediment leaving. (Trush, McBain and Leopold, 2000)</p> |

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WHO'S WHO?



One hundred and fifty years ago, just three members of the trout family lived in the Jocko River—bull trout, westslope cutthroat trout, and mountain whitefish. Other fish native to the Jocko River include three minnows, two suckers, and one sculpin.

When non-Indian settlers arrived, they introduced three more trout species—brown, rainbow, and brook. So now the Jocko has twelve species of fish.

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Who's Who?

 *Cultural Values: Observation, Relatedness, Balance, Respect, Cooperation*

Rationale

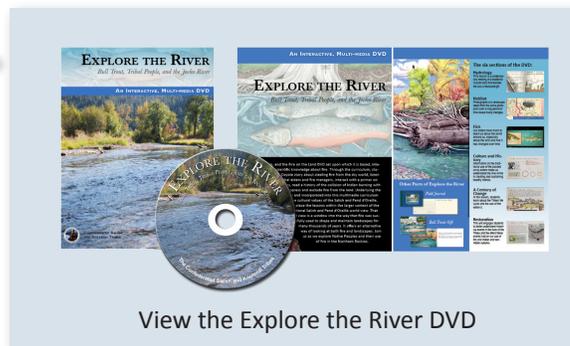
Living sustainably with a river and the community of life it supports is possible as the Salish and Pend d'Oreille people have shown, but it requires being respectful and conscientious in our actions and giving back as much as we take. It also requires a detailed knowledge of all the plants and animals. With the changes over the past hundred years, some of this knowledge has diminished as close observation over time in the natural world is less frequently practiced. This lesson helps students look closely at the similarities and differences between many species of fish and learn to identify them at different stages in their lives.

Learning Targets

- I look closely at something, noting fine details.
- I know similarities and differences in details from visual observation of more than one species of fish.
- I apply the skills of observation and description to other situations.
- I distinguish between various species of trout—both native and non-native.
- I know that at different stages in their life, fish can look different.
- I work cooperatively within a group.
- I draw and/or write to describe something I have observed.

Resources

- Explore the River* DVDs
- Field Journal for *Explore the River* Project (or blank book, composition book and/or small sketch pad), 1 per student
- Computer with DVD player
- PC projector
- Internet connection
- Access to a computer lab, or bank of multiple computers with Internet connection (desirable)
- Game pieces printed on card or cover stock and cut apart on dotted lines, mixed up, found at end of this lesson ([attached](#))



- For teacher, print [game piece key](#) (6 pages) for your own reference – not to share with students until later
- Drawing materials including paper, colored pencils or markers
- Chart paper and markers for making predictions, etc.
- Admit/Exit Tickets, one per student

Instructional Techniques

Pre-testing, online tutorial, whole group, small group, or individual direct instruction from the Explore the River DVD, sorting or matching game in small groups, and post testing

Time Frame

Three 50-minute class periods; the actual time required will vary based on age, grade level and the teacher's choices to support cross-curricular goals.

1st period: Reflection, entrance test, take the online Identification tutorial from the Montana Fish, Wildlife & Parks site individually, take the exit test, record and reflect, discuss challenge in groups or whole class

2nd period: Conduct whole-group species direct instruction from Explore the River DVD as quick review, play sorting/matching game in small groups, have groups use Explore the River DVD in teams to determine the species of their fish after sorting and learn about the fish lifeways

3rd period: Prep oral reports using DVD, take final Exit Exam on bull trout ID from Montana Fish, Wildlife & Parks site, print certificates for all students after the Exit Exam

Suggested Grade Levels

Grades K-12

Procedures below target students in grades from 4 through 8. However, with suggested [adaptations](#), these may be useful for grades from K through 12.

Procedures

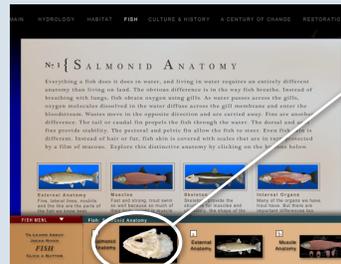
Day One

1. Ideally, convene class in a computer lab setting or library that allows a one-to-one-student-to-PC ratio.
2. Require students to bring their Field Journals and a pen or pencil.
3. Challenge students: "How well do you think you know the fish, particularly the trout, found in western Montana streams like the Jocko? Why? What is your background related to fishing?"
4. Have them write their responses to this question in their Field Journals using the quick-write protocol.
5. Set writing timer for 5 minutes.
 - Write quickly and do not stop.
 - Don't worry about spelling or grammar as you get your ideas down.
 - This is what you think now. There are no "wrong" answers.
 - Go! Create urgency. Allow 5 minutes for the quick-write.
6. Have students draw a line under this thinking to separate it from the next related entry.
7. Ask students go to <http://fwpiis.mt.gov/bulltroutid>, this is the site of the Montana Fish, Wildlife & Parks Bull Trout Education Program.

8. From this site, have each student take the Entrance Exam on Bull Trout ID.
9. Once complete, require each student to post an entry in his/her Field Journal indicating the date of the Entrance Exam, his/her score, and then a short reflection on what this challenge was like.
 - What made it easy or hard for you?
 - What do you think of your Entrance Exam score?
 - Are you a reliable identifier of trout species?
10. After the reflection is complete (again, perhaps 5 minutes in quick-write protocol format), have students individually work through the online tutorial from Montana Fish, Wildlife & Parks located at the same [web site](#). Allow 30 minutes or so to do this.
11. Allow students to self-pace.
12. As they finish, require them to take the Exit Exam. Any who take the Exit Exam and pass with the required 80% should print a certificate of completion. Those who don't pass with 80% will have another chance on Day Two.
13. Have each student record their score (passing or not) on the second try in their Field Journal, again with a note on what made this easy or hard and what they did or think they may have to do to score 80% or higher on the Exit Exam.
14. Direct students who finish early to the Explore the River DVD, under the Fish tab, and have them begin study of Salmonid Anatomy found under the Fish menu, Section 1. 
15. Take note of who passes with 80% and who does not for reference during tomorrow's work.

PROMOTE THINKING ABOUT THINKING

A powerful life skill promoted by the use of the field journal here is self-reflection on, and self-awareness of, thinking and how we each learn as individuals. This is called meta-cognition. It is an invaluable tool to teach students to promote greater levels of independence in their work. As students become more aware of strategies that give them greater success in learning, they can begin to tailor how they address learning challenges to their individual needs.



While in the Explore the River DVD, click this button (Salmonid Anatomy) in the bottom sliding menu of the Fish Chapter.

Day Two

1. The opening activity can be done in the classroom, but the last half of the class is better conducted with a one-to-one-student-to-computer ratio (lab, library or model lab).
2. Prepare game pieces in advance by printing a set for each class group on card stock, then cutting them apart on the dotted lines.
3. For each group, place a mark or single colored dot on the back side of a different species (so one group will have a mark on bull trout, the next on westslope cutthroat trout, etc...) randomly assigning so there is a marked card on a different species for each sub group. These will later become assignments for the group reporting out using the Explore the River DVD species profiles under the Fish tab.
4. Mix each set thoroughly.
5. Place a set of game cards on tables (or desks pulled together) where groups will be working.
6. Break class into 6 groups with 3 to 4 students each.
7. Over the next 10 to 20 minutes, have groups examine the images closely and sort them into clusters based on their best guess as to which are the same species.
8. 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.

9. 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?"

10. When students have grouped all the cards, inform them that they will be required to confirm their grouping by conducting further research in the section on Fish found on the Explore the River DVD.

11. Note that this is the ideal time to employ laptop computers if you have them available (each group could use one with the DVD installed), and then work as a team through the Species Profile section examining different species profiles in the four major family groups in order to learn about each and also confirm their placement of the cards in groups. Doing this without having to move the card to a lab setting saves time and limits disruption.



While in the Explore the River DVD, click this button (Species Profiles) in the bottom sliding menu of the Fish Chapter to go to the Species Profiles section.

12. Allow students at least 20 to 30 minutes to confirm their placement and then write a label with the proper name of the species for each of the 6 card groups.
13. Rove the room to confirm that they have correctly identified each species. Note this for assessment purposes.
14. Correct any errors as you go, again by questioning. "What other group could that belong to based on its markings?" "How do you know?" "That's right!"
15. Now have groups locate the marked card.
16. Inform them that this is their group report assignment and that tomorrow they will be delivering an oral report in which they will teach the rest of the class about this species using the DVD as a visual aide and support.
17. Allow the remainder of the period for the group to focus in on the details on their assigned species using the DVD as their primary resource.

Day Three

1. Provide time for groups to continue working on their oral presentation (approximately 20 minutes).
2. Encourage groups to share roles, and allow each student to present a section related to the species they are assigned.
3. Allow approximately 5 minutes for each group presentation, projecting from and using information on the DVD.
4. Leave about 10 minutes for the class to take the Exit Exam and to print their certificates.
5. Have your students reflect on what they have learned in their Field Journals. Do they now feel confident that they can identify bull trout?

QUESTION MORE THAN ANSWER

An important strategy employed by teachers conducting guided inquiry is that of questioning. Asking the open-ended question that moves a learner to deeper thinking and nudges them in the direction of more thoughtful inquiry is an art that needs to be practiced. As you reflect on your own practice as a teacher, examine the ratio of open-ended questions that guide student thinking to statements of fact in lecture format. The more questions, the more the students are doing the important "heavy lifting" of learning. Their effort creates their ability.

Extension

1. This is the ideal time to review or introduce students to taxonomic classification specific to the various species of fish being examined in the study of bull trout and the Explore the River DVD. Under the Fish tab, the species profiles are organized by family. These families include all the species of fish found in the Jocko. They will be well served to understand taxonomy and classification systems as tools for future study. The diagram at right shows the taxonomic classification for bull trout, *Salvelinus confluentus*. Looking up any species in Wikipedia reveals ([on the right-hand margin of the page](#)) the taxonomic classification with links that lead deeper. In this way students can explore the taxonomy of any of the native fish species in the Jocko or any other river and compare and contrast the classification with that of other species to look at relationships.
2. Conduct an Anatomy Art Lesson
 - Go to Fish > Fish: Salmonid Anatomy.
 - Review the details using DVD.
 - Next look at Fish > Fish: Species Profiles.
 - This time, pay special attention to the quality of the drawings. Many students will have thought they were looking at photo images.
 - Move through the profiles, looking at the images.
 - Have students adopt a species to draw.
 - Using grid paper, conduct lesson on scale and proportion.
 - Have them start by drawing their fish in profile, outline only on the grid.
 - Next, have them share their outline. Ask students to note any clues in the drawing that indicate what type of forager they are.
 - Are they predators? Bottom feeders? How can you tell?
 - Cross check each profile to be sure the mouth and fin patterns show what type of feeder the fish is.
 - Continue by filling in critical details in the medium of student choice that will help in the identification of their selected fish species.
 - Post on the wall when done, hosting a gallery walk.
 - Have students move through and see if they can label each image by species based on the details provided by the artist.



Taxonomic classification for bull trout, *Salvelinus confluentus*

Assessment

- Pre-study reflection (how did they think they would do and why)
- Entrance Exam scores from the Montana Fish, Wildlife & Parks site
- Reflections on the difficulty of the task
- Midway Exit Exam scores from the Montana Fish, Wildlife & Parks site
- Reflections on success, failure, and learning strategies
- Sorting game outcome (take a photo with your phone of each table as you rove).
- Group reports using the DVD
- Exit Exam scores from the Montana Fish, Wildlife & Parks site

Adaptations

The following adaptations are designed to support your efforts to meet the needs of every learner. Grade levels here are only a suggestion and would not preclude use of a great 3rd-grade strategy with a 9th grader or vice versa.

Grades 3-6 (or students at any level who need more support)

Intermediate students may require more demonstration to experience success on the ID exams.

1. After having a go, consider working through the tutorial from Montana Fish, Wildlife & Parks with the whole class, projecting and discussing information as you go.
2. If you conduct whole-class direct instruction, avoid round-robin reading. Instead, ask for volunteers to take on a page or section, then give them a block of time to pre-read, practice, and address words they fear they may mispronounce. You could also promote some elements of choral reading with selections such as “No Black, Put it Back!”

Grades 9-12 (or students at any level who require greater challenge)

Older or more advanced students should be given more responsibility and should be required to conduct independent research.

1. Encourage students to go deeper in their study of the species, and specifically bull trout, by researching and reading additional papers on the topic. One good sample paper on the topic of bull trout lifeways and differences between bull trout and Dolly Varden, etc. can be found at http://watershed.ucdavis.edu/skeena_river/documents/initial_reports/MAFish.pdf
2. Conduct a taxonomy study as suggested in the extension.
3. Consider taking on another species to see if you can locate parallels to the plight of bull trout. Salmon in the Pacific Northwest are experiencing serious threats as well. Encourage advanced students to look for parallels to compare and contrast to the bull trout. Do similarities in lifeways account for the threatened or endangered status of these species? An interesting and authoritative article on the topic salmon biodiversity can be found at <http://www.americanscientist.org/issues/feature/2001/3/preserving-salmon-biodiversity/1>.

References

Confederated Salish & Kootenai Tribes. (2011). *Explore the River: Bull Trout, Tribal People, and the Jocko River*. (An Interactive Educational DVD). Pablo, MT: Confederated Salish and Kootenai Tribes.

Confederated Salish and Kootenai Tribes. (2011). *Snyeymintn/Field Journal*. Lincoln, NE: University of Nebraska Press.

Bull Trout Image Set

Cut on dotted lines.



Westslope Cutthroat Image Set

Cut on dotted line.



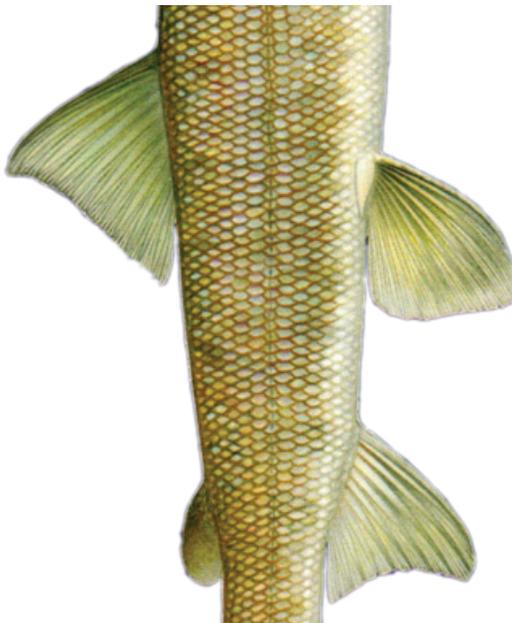
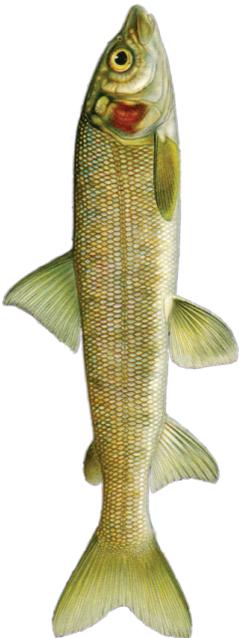
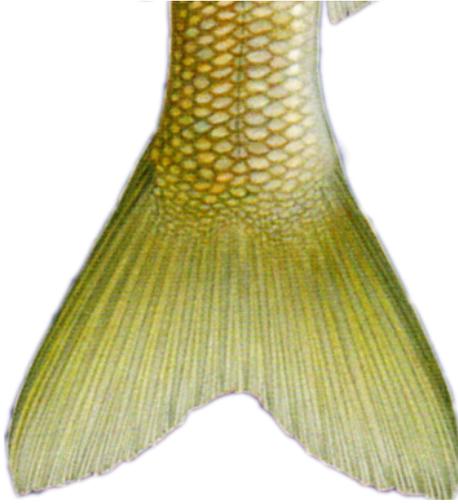
Slimy Sculpin Image Set

Cut on dotted lines to create game cards.



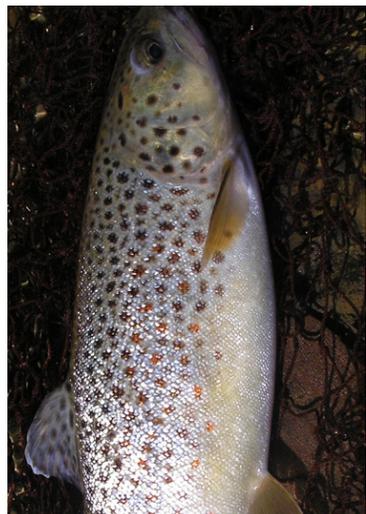
Mountain Whitefish Image Set

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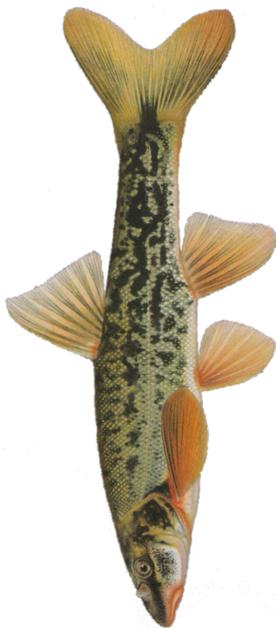
Brown Trout Image Set

Cut on dotted lines to create game pieces.



Longnose Dace (from the Minnow Family) Image Set

Cut on dotted lines to create game pieces.



THE ELDERS, WATER, AND...



The changes witnessed by today's Salish and Pend d'Oreille elders over their lifetimes have been, by any measure, astonishing. Our elders grew up fishing alongside parents and grandparents who fished in the same way their parents and grandparents fished. The streams they knew as children and young adults teemed with native fish, with breathtakingly large bull trout and abundant pure-strain westslope cutthroat trout. They caught fish and watched aunts and grandmothers split and dried them. Later, they opened the parfleches that held the dried fish and enjoyed the abundance.

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The Elders, Water, and Fishing

 *Cultural Values: Respect, Listening, Cooperation, Relatedness*

Rationale

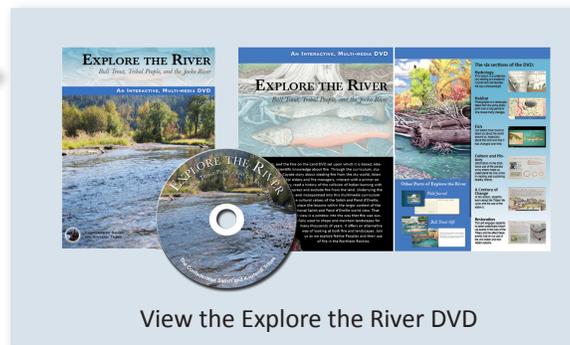
Our elders provide important information on the traditional relationship with water which helps us understand the role of water in traditional life and the impact of water quality on the bull trout and other native fish. The elders' stories inform our collective histories, and are central to our contemporary understanding of how to care for the rivers. To learn from the experience of the elders and the generations that have gone before them, careful listening is required.

Learning Targets

- I am aware of life experiences that inform the relationship of elders to water and fish.
- I recognize that today, we take water and its availability to us for granted.
- I know at least five ways in which water was cared for by the Salish and Pend d'Oreille in times past.
- I understand the importance of water and fish to Salish and Pend d'Oreille people.
- I understand these interviews are a part of a living oral tradition that informs history and science in the contemporary life of Salish and Pend d'Oreille people.
- I listen attentively.
- I summarize or paraphrase key ideas and information from an oral interview.
- I record information to remember and share with others.
- I work effectively and respectfully with a partner.
- I teach others what I have learned.

Resources

- Explore the River DVD
- Computer with DVD player for each student group (possible use of library or lab setting to facilitate five groups, or rotate groups through a single computer station over time)
- Large piece of chart paper for each group
- Markers for each group
- [Questions handouts](#) (optional)



Instructional Techniques

Interpreting elder interviews from DVD, attentive and active listening, small-group process, summary and paraphrasing, comparing and contrasting information, small-group presentation, large-group discussion

Time Frame

Two, 50-minute class periods, depending on the nature of the student-led presentations and the grade level of the students.

1st period: for initial research, first listening, small group discussion and second listening with chart development (layer 1 and part of layer 2, or procedure steps 1 to 9)

2nd period: devoted to completing chart, developing oral presentation and delivery of presentation to class; if presentations are more formal or elaborate (Power Point, etc.) then the lesson will extend to a 3rd period (procedure steps 8 to 10, or, 8 to 14).

3rd period: for small group presentations, whole-class discussion and debrief (procedure steps 10 to 14, as time allows).

Suggested Grade Levels

Grades 3-12

Procedures articulated below are targeted at the students in grades from 5 to 8. However, with suggested [adaptations](#) following the procedures section, these may be useful for grades from 3 to 12.

Procedures

- Place students into four groups of three to five. (Note: you may also place students in pairs or trios and break each elder interview into segments ranging from 7 to 11 minutes, this will allow for greater depth with less material, and may make is possible with informal presentations to do this lesson in a single class period.)
- Assign each group to one of the elder interviews.
 - Michael Louis Durglo, Sr. (14 minutes, in Salish with sub-titles)
 - Dolly Linsebigler (23 minutes, in Salish with sub-titles)
 - Eneas Vanderburg and Tony Incashola (First half, 22 minutes, in English)
 - Eneas Vanderburg and Tony Incashola (Second half, 22 minutes, in English)
- Each group will review the assigned interview on the Explore the River DVD at a computer station in the classroom, lab or library. Have them go to Culture and History > Elders' Interviews.
- Groups should begin by taking a few minutes to read the biography of the elder that they have been assigned, at the intro to each elder's interview.
- Instruct the groups to listen to the entire interview with care all the way through before they begin discussing, summarizing and charting the elders' responses. Require them to do this with their ears only, no note-taking and no conversation.
- After the first listening to the elder, ask the students to engage in a discussion. [Questions for consideration](#) (included in the handouts with this unit) might include:
 - How did _____ learn about traditional uses of water and fishing practices by the Salish or Pend d'Oreille people?



While in the Explore the River DVD, click this button (Elders' Interviews) in the bottom sliding menu of the Culture and History Chapter

- Based on the interview, what was the relationship of the people to water?
 - Based on the interview, how were fish caught and used?
 - What first-hand experiences were shared by the elder whose interview you watched?
 - What did you learn about the life and the culture of the elder?
7. Allow time for discussion (about 10 minutes); then have them begin recording in **blue** their first impressions on the chart paper provided. Their selected format could be a list, a web, a mind map or story board or any format of their choice. Invite them to provide as much detail as they remember, all with the **blue** marker, but remind them that they will be adding another layer of information or detail over the top of their blue notes.
 8. Next, have students go back to the interview and this time, listen to the interview section by section.
 9. For each section, they will pause to add detail to their chart, this time, in **red** marker. Should they find that they have misunderstood or misrepresented aspects of the elder's interview, they are free to place an "X" over the misquote. Ask them to leave the text under the "X" visible, rather than scribble it out. This is a form of checking for understanding and allows you to track the evolution of their thinking and attention to detail and may support teaching points during the lesson connected to their listening.
 10. When they are done with the second review of the interview, provide 10 minutes to prepare a three-to-five minute presentation to the rest of the class on their findings. You may choose to have groups take an additional class period (or use time associated with computer instruction) to put together a 5 to 10 slide PowerPoint presentation.
 11. Each group presents their findings to the rest of the class. You may prime the class to listen to their peers' presentations looking for similarities and differences among the elders' interviews.
 12. As they present, post their charts. These may remain and be referred to throughout the remainder of your *Explore the River* investigation as a reminder of the elders' testimony and the oral histories that inform part of our current understanding about water, fish, and fishing.
 13. Follow up with a whole-class discussion of any details noted as differences (if any). Pay close attention to the consistent similarities between each elder's understanding of the roles of water and fish, his or her personal experience with water and fishing, and the oral histories passed to them regarding traditional life pre-dating the arrival of European-Americans in the aboriginal territory of the Salish and Pend d'Oreille.

Extensions

1. The lesson can be extended throughout the unit by inviting students to watch and listen to the interviews of elders that were assigned to other groups during free time, down time, or when finished with other work. They can be invited to make comments on missing or supporting details they hear by making a note on a "post-it" and adding their comment or addition to the poster associated with that elder's interview. In this way, they continue to interact with the ideas put forward by the elders as they are increasingly exposed to the study of hydrology, aquatic and riparian habitats, and fish.

Assessment

- Anchor charts show knowledge of use of water, care for water and importance of fishing.
- Anchor charts show significant detail, and differences in depth are evident from 1st listening to 2nd listening.
- Anchor charts indicate one or more ways tribes' cared for the water, protecting its quality in the past.
- Direct observation of listening behavior.
- Direct observation of effectiveness working as a member of a small group, including equity of contributions.
- Clarity and detail demonstrated in presentation to class.
- Observation of respectful behavior to members of each group as they present to whole class.

Adaptations

The following adaptations are designed to support your efforts to meet the needs of every learner. Grade levels here are only a suggestion and would not preclude use of a great 3rd-grade strategy with a 9th grader or vice versa.

Grades K-3 (or students at any level who need more support)

For younger students you may need to provide different supports and model the process. The following procedural options could be a place to start.

1. Instead of starting with the small-group process outlined above, you may select to conduct a whole-class demonstration using one or more of the interviews. If you are working with younger students, say 1st or 2nd grade, you may go section by section having them listen with care, then discuss as a class or in pairs or groups, then summarize with them on the board, modeling literacy processes.
2. After you conduct a demonstration with one of the interviews in class, set them up in groups and have them follow the process outlined (2nd graders in particular) adjusting as required for differences in ability.
3. This same process could be conducted with whole-class participation, but using the much shorter segments in English (Eneas Vanderburg and Tony Incashola) as the model, and then it may work even with Kindergartners.
4. Always reinforce the very important value of attentive listening to the stories of the elders. Ask students to put away projects and objects and clear their desks so they can just listen to the first review of any of the interviews.

Grades 9-12 (or students at any level who require greater challenge)

Older or more advanced students should be given more responsibility and can conduct research via the web links and the bibliography and resource section of the *Explore the River* DVD; they should be encouraged to develop personally or locally relevant projects coinciding with their study of *Explore the River*, including possibly vocational or service-related projects. The [More Than Water](#) investigation in the *Explore the River* curriculum is a good opportunity for a service learning project.

1. Require advanced reading. A good place to have students look is in the resources section of the DVD. Related to the *Explore the River* investigation, you will find numerous articles and primary source documents of interest including the Jocko Restoration plan and the ARCO settlement. Unique to the Salish and Pend d'Oreille, these plans take into careful account the testimony of the elders.
2. Here is a depth of study challenge: *The Explore the River* investigation can be used as a local investigation bringing meaning and increased relevance to the essential questions, "Can human beings right wrongs, or correct past degradation of rivers and streams?" The Jocko restoration project was based on the idea of "build it, they will come" meaning that if the environment and habitat are ideal to support migrating bull trout, they will return to the stream. So the question looms "If we restore the habitat, will they return?" "At what point is the opportunity lost?"
3. A logical parallel can be found in the removal of the Milltown Dam near Missoula. The Jocko restoration project in many ways foreshadowed and informed these more recent efforts. As both projects continue, what are the rewards or benefits in relation to the greater ecosystem in Western Montana?

References

Confederated Salish and Kootenai Tribes. (2011). *Bull Trout's Gift*. Lincoln, NE: University of Nebraska Press.

Confederated Salish & Kootenai Tribes. (2011). *Explore the River: Bull Trout, Tribal People, and the Jocko River*. (An Interactive Educational DVD). Pablo, MT: Confederated Salish and Kootenai Tribes.

Confederated Salish and Kootenai Tribes. (2011). *Snoqeymintn/Field Journal*. Lincoln, NE: University of Nebraska Press.

THE FOLLOWING QUESTION SETS ARE INTENDED TO BE CUT APART AND PROVIDED TO GROUPS FOR DISCUSSION IN STEP 4 OF THE PROCEDURES.

- How did **Mike Durglo** learn about traditional uses of water and fishing practices by the Salish or Pend d'Oreille people?
 - Based on the interview, what was the relationship of the people to water?
 - Based on the interview, how were fish caught and used?
 - What first-hand experiences were shared by the elder whose interview you watched?
 - What did you learn about the life and the culture of the elder?
-

- How did **Dolly Linsebigler** learn about traditional uses of water and fishing practices by the Salish or Pend d'Oreille people?
 - Based on the interview, what was the relationship of the people to water?
 - Based on the interview, how were fish caught and used?
 - What first-hand experiences were shared by the elder whose interview you watched?
 - What did you learn about the life and the culture of the elder?
-

- How did **Eneas Vanderburg** and **Tony Incashola** learn about traditional uses of water and fishing practices by the Salish or Pend d'Oreille people?
 - Based on the interview, what was the relationship of the people to water?
 - Based on the interview, how were fish caught and used?
 - What first-hand experiences were shared by the elder whose interview you watched?
 - What did you learn about the life and the culture of the elder?
-

- How did **Eneas Vanderburg** and **Tony Incashola** learn about traditional uses of water and fishing practices by the Salish or Pend d'Oreille people?
 - Based on the interview, what was the relationship of the people to water?
 - Based on the interview, how were fish caught and used?
 - What first-hand experiences were shared by the elder whose interview you watched?
 - What did you learn about the life and the culture of the elder?
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Like many salmonids, bull trout shift their diet as they grow. Most small bull trout feed on aquatic insects. But adult migratory bull trout are piscivores, which means they eat fish. They are able to grow large because they eat fish, both native and introduced species.

BULL TROUT'S LIFE

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Bull Trout's Life

 *Cultural Values: Observation, Listening, Respect, Relatedness, Cooperation, Humor*

Rationale

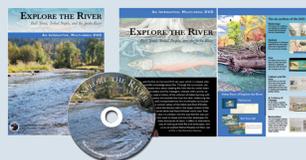
All living things go through a unique cycle of life. With each stage come changing needs for food, habitat, and natural predators. Having lived for thousands of years within our aboriginal territory, our Salish and Pend d'Oreille ancestors understood the life cycles of all the plants and animals upon which they depended for their existence and that we still depend on today for the perpetuation of our culture. This body of knowledge was passed down through the oral tradition from generation to generation. Today, these life cycles are studied by biologists trying to prevent the extinction of a species—in this case the threatened bull trout. Learning the life cycle of the bull trout can help us understand how to protect and enhance its habitats so the species will be around for future generations.

Learning Targets

- I work cooperatively in a group.
- I work independently.
- I listen attentively.
- I create a drawing or graphic organizer to help remember the stages and details within each stage of bull trout's life.
- I understand the meaning of the terms: personification, perspective, point of view, and anthropomorphize.
- I write a narrative in 1st person, as if I were a bull trout.
- I understand the difference between an autobiography or memoir, and a biography.
- I write an expository or informational text in the style of a memoir or autobiography.
- I know all the stages of bull trout's life and represent these stages in my writing from my imagined perspective of bull trout.
- I understand different vulnerabilities experienced by bull trout in each life stage and the environmental factors or changes in the river that contribute to that vulnerability.
- I reflect on human life cycles in the context of bull trout's story.

Resources

- The book, *Bull Trout's Gift*
- Explore the River DVD
- Field Journal for Explore the River Project (or blank book, composition book and/or small sketch pad), 1 per student
- Computer with DVD player



View the interactive book version of the story on the Explore the River DVD (go to Culture & History > *Bull Trout's Gift*).



Read the story in pdf form.

- PC projector
- Drawing materials, colored pencils, markers, etc.
- Chart paper and markers for group data capture
- Writing materials (could include computers, notebooks, paper, and pencils)
- Assignment sheet ([attached](#))
- Genre chart ([attached, optional](#))

Instructional Techniques

Whole group instruction, small group discussion and recording, representation of stages of bull trout's life cycle in the form of graphic organizer or drawing, research with DVD, independent writing, publication (sharing or posting)

Time Frame

Two, 50-minute class periods plus additional time for writing; the time required may vary based on age, grade level and the teacher's choices to support cross-curricular goals.

1st period to explore the known, overview video Fish Part 2, discussion, charting, layering information from Fish > Bull Trout Life History

2nd period to review content, finish charting, report out, student-delivered mini lessons on terms, explore genre, assign paper/project

3rd period or beyond to allow time over a week or more to write, allow opportunity to publish and share

Suggested Grade Levels

Grades K-12

Procedures below target students in grades 4 through 8. However, with suggested [adaptations](#), these may be useful from grades from K through 12.

Procedures

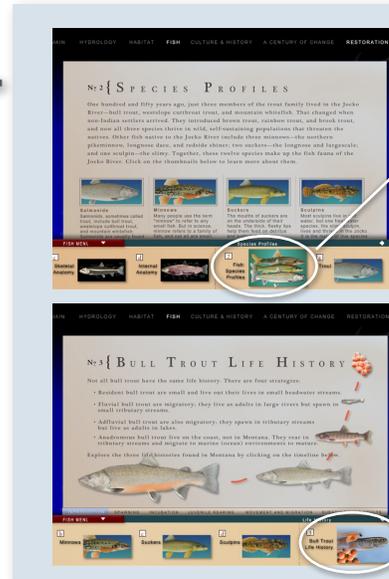
Day One

1. Seat students in small groups and provide chart paper and markers.
2. Have students open with a 5-minute reflective writing in their Field Journals or on admit tickets answering the question: "What is the life cycle of the bull trout?" Use this writing to access their level of prior knowledge.
3. Using PC projector, show students the Overview, Part 2 under Fish from the Explore the River DVD (Once the Overview opens, Parts 1 & 2 are accessed in the top left corner of the window). During this viewing ask them to watch and listen closely, but not to write. Have students focus their full attention on remarkable video, images, and narrative of bull trout's life cycle.
4. When the video is finished (4.5 minutes), have each student group discuss (within their group) what they noticed.



While in the Explore the River DVD, click this window in the center of the opening page of the Fish Chapter to view the Fish Overview.

- What stages did they see?
 - What did the bull trout look like in each stage?
 - Where did bull trout live in different stages?
 - Are there different types of bull trout?
 - Did their food sources change with different stages?
 - How do residential, fluvial, and adfluvial bull trout differ in their life cycles, and how are they the same?
5. Allow time for discussion, and invite groups to begin a draft [anchor chart](#) to capture their thinking.
 6. Run the video again. After reviewing, instruct groups to add additional detail missed on the first pass.
 7. Providing a PC for each group, have them go to the Explore the River DVD and examine bull trout's profile under Fish > Species Profiles, and then also under Fish > Bull Trout Life History
 8. Have groups spend the remainder of the hour exploring and reading about the life history and profiles of bull trout, adding detail to their group anchor charts.



While in the Explore the River DVD, click this button on the bottom sliding menu of the Fish chapter to open the Species Profile section

Click this button on the bottom sliding menu of the Fish chapter to open the Bull Trout Life History section

Day Two

1. Allow groups a few minutes with the DVD and their anchor charts to add details.
2. Have groups report out, noting differences or additional details from each other that they may have missed.
3. Post their charts for reference.
4. Introduce Bull Trout's "autobiography" project.
5. Hand out student [assignment sheet](#) and quickly review.
6. Assign each group one of the following terms (definitions here from Webster's Dictionary are provided for the teachers benefit), but do not give them the definition.
 - **Personification:** "a figure of speech in which a thing, quality, or idea is represented as a person"
 - **Perspective:** "a specific point of view in understanding or judging things or events, especially one that shows them in their true relations to one another"
 - **Point of view:** "the viewpoint from which a story is narrated"
 - **Anthropomorphize:** "to attribute human shape or characteristics to a non-human entity (a god, animal, etc.)"
7. Set timer for 3 minutes (or less!) and have students conduct a quick search for definitions of the term.
8. Allow 1 minute for each group to report out.
9. Now, with the whole class, discuss what these terms have in common.
10. Pass out student assignment sheet.
11. Provide a mini-lesson on genre, including informational text, autobiography, biography, and memoir.

RELEASE RESPONSIBILITY

Effort creates ability. Everyday, teachers create mini lessons to teach students directly, in short bursts, about specific terms, background information, or skills. In this unit there are several areas where direct, explicit instruction is warranted. When you can, develop structures that turn over the mini-lesson teaching task to students. Teach them how to research and then teach what they learned. They will have more control of the content, be more likely to remember it, and apply it later. The goal is to design instruction so that the students are doing more and the teacher is managing and supporting their active learning, rather than doing the heavy lifting for them.

12. This is a good time to reference the [genre chart](#) attached, reminding students of the two genre found in the picture book *Bull Trout's Gift* (traditional story and informational text) as well as the historical narrative "A History of the Bull Trout and the Salish and Pend d'Oreille People" (informational text) and "Attributes of a Healthy Stream" (informational text).
13. Discuss the difference between form and genre as you are addressing types of texts. It is possible to write a work of historical fiction in the form of a novel and at the same time write this in verse more common to poetry; or to write autobiography in the form of a journal.
14. Today students will write an informative text sharing factual information about bull trout, but do it as if they were developing an autobiography of the bull trout from the trout's perspective. So the genre is an informational text but the form is like a memoir or autobiography.
15. Discuss difference between 1st, 2nd, and 3rd person, reminding students that they will be using 1st person, "I" as they write personifying bull trout.
16. Allow time for students to write intermittently over the next week, and provide access to resources on the Explore the River DVD.
17. Consider posting to a classroom web site, blog, or wiki as a form of publication when complete.
18. These stories, because they are focused on voice yet present factual information, are often funny. Enjoy the humor as students creatively share what they learned. Some may even select to "perform" their work for the class!

ENCOURAGE HUMOR!

These stories blend imagination along with information. The result is the content is mixed in a way that can lead to some humorous personifications of bull trout. These will be memorable—locking the information into students' long term memories as a result of the fun, emotions and social opportunity connected to the task. Enjoy this with your students!

Extension

The perspective "I" and distinction between 1st, 2nd, and 3rd person can be a difficult concept to master, and many adults slip in their writing between 1st and 3rd person. It is a common error. Begin drawing students' attention to it right from the start by asking questions like "Who is telling the story?" Then, talk specifically about "I" and "me" being first person, "you" being second person, and "he" or "she", being third person. Build cognitive academic language by linking accurate terms to your developmentally appropriate or simplified explanation.

Assessment

- Direct observation of group cooperative work
- Direct observation of listening/viewing
- Anchor charts developed by groups with life stages and details of bull trout's life cycle
- Bull trout's autobiographies
- Assessment rubric for bull trout's autobiography project ([attached](#))

Adaptations

The following adaptations are designed to support your efforts to meet the needs of every learner. Grade levels here are only a suggestion and would not preclude use of a great 3rd grade strategy with a 9th grader or vice versa.

Grades K-3 (or students at any level who need more support)

The single most important factor in student success on a writing project is their knowledge of the topic they are attempting to write about. This lesson has been designed to assure that all students have sufficient information and good details as well as solid "pictures" in their minds' eyes to support writing with authority.

1. Keep anchor charts and possible personal graphic organizers visible to support organization and clarity in their narratives.

2. For very young students (K-2) consider modeling by writing a detailed bull trout memoir with your students telling the story of all the different stages in the life of bull trout from the trout's perspective.
3. Use "divide and conquer" presented in the "Role In The Balance" lesson, suggesting to students they might use presentations software as a scaffold to help with structure. For this assignment, each life stage will be a single slide.

Grades 9-12 (or students at any level who require greater challenge)

Older or more advanced students should be given more responsibility and should be required to:

1. Examine this lesson for all the mini-lessons and direct instruction opportunities, and turn the teaching of each segment over to groups of students. Four possibilities come to mind:
 - Mini-lesson on four terms - perspective, point of view, personification, and anthropomorphizing
 - Mini-lesson on 1st versus 3rd-person narratives
 - Mini-lesson on genres
 - Mini-lesson describing the actual assignment (use assignment sheet and rubric, but have students do the overview)
 - Mini-lesson sharing strategies for publication, posting and sharing (they will have many more ideas as digital natives)
2. Encourage students to go deeper in their study of the bull trout's life by researching and reading additional papers on the topic. The resources section of the Explore the River DVD has much to offer for extended study. Another good sample paper on the topic, looking at bull trout life ways, differences between bull trout and Dolly Varden etc. can be found at http://watershed.ucdavis.edu/skeena_river/documents/initial_reports/MAFish.pdf

References

Confederated Salish and Kootenai Tribes. (2011). *Bull Trout's Gift*. Lincoln, NE: University of Nebraska Press.

Confederated Salish & Kootenai Tribes. (2011). *Explore the River: Bull Trout, Tribal People, and the Jocko River*. (An Interactive Educational DVD). Pablo, MT: Confederated Salish and Kootenai Tribes.

Confederated Salish and Kootenai Tribes. (2011). *Snoqeymintn/Field Journal*. Lincoln, NE: University of Nebraska Press.

Student Assignment Sheet – Bull Trout's “Autobiography”

You are assigned to write an imaginary autobiography in first person “I” written from the imagined perspective of a bull trout. The purpose of your autobiographical story is to share, as if you were a bull trout, all the stages of life and major life events that the bull trout experiences. So, if a bull trout could talk, what would it say? What would it see? Where would it be hanging out and living at different stages? What would it be eating? What would it be afraid of or threatened by? Present bull trout's story as if you were the trout, and be sure to capture or expose all stages of the bull trout's life. Present the stages for the adfluvial variety to add adventure to your story. This might allow you to encounter or compare your life history to the resident or fluvial bull trout - your close cousins. Be creative with voice, but also stay true to the scientific facts.

Your bull trout “autobiography” will be evaluated on accuracy (addressing all life stages with significant details), creativity and voice (creating a memorable 1st person narrative as if you were bull trout and developing a compelling bull trout persona) and finally mechanics (staying in 1st person and maintaining high standards for grammar, spelling and punctuation in your finished product.) See the rubric below for guidance.

| CATEGORY | 4 | 3 | 2 | 1 |
|---|---|---|---|---|
| Bull Trout's Life Stages Accurately Described | All stages of bull trout's life cycle are accurately shared with significant detail. | Stages of bull trout's life cycle are accurately shared but lacking significant details. | Most stages of bull trout's life cycle are shared but accuracy and details lacking. | Few or no stages of bull trout's life cycle are shared with accuracy or details. |
| Told from Bull Trout's Perspective or Point of View | Stays in 1st person throughout. Develops the character of bull trout as a device for teaching about the life cycle. Entertaining and fun to read. | Drifts from 1st person occasionally, but generally fun and shares life stages from bull trout's point of view. Less development of character of bull trout while teaching about the life cycle. | Drifts often from 1st person. Low development of character of bull trout while teaching about the life cycle. | Not written in 1st person. A 3rd person report sharing details about bull trout's life cycle. |
| Mechanics | Writer makes no errors in grammar or spelling that distract the reader from the content. | Writer makes 1-2 errors in grammar or spelling that distract the reader from the content. | Writer makes 3-4 errors in grammar or spelling that distract the reader from the content. | Writer makes more than 4 errors in grammar or spelling that distract the reader from the content. |

Assessment Rubric – Bull Trout's Life

Name _____ Date _____

| CATEGORY | 4 | 3 | 2 | 1 |
|---|---|---|---|---|
| Bull Trout's Life Stages Accurately Described | All stages of bull trout's life cycle are accurately shared with significant detail. | Stages of bull trout's life cycle are accurately shared but lacking significant details. | Most stages of bull trout's life cycle are shared but accuracy and details lacking. | Few or no stages of bull trout's life cycle are shared with accuracy or details. |
| Told from Bull Trout's Perspective or Point of View | Stays in 1st person throughout. Develops the character of bull trout as a device for teaching about the life cycle. Entertaining and fun to read. | Drifts from 1st person occasionally, but generally fun and shares life stages from bull trout's point of view. Less development of character of bull trout while teaching about the life cycle. | Drifts often from 1st person. Low development of character of bull trout while teaching about the life cycle. | Not written in 1st person. A 3rd person report sharing details about bull trout's life cycle. |
| Mechanics | Writer makes no errors in grammar or spelling that distract the reader from the content. | Writer makes 1-2 errors in grammar or spelling that distract the reader from the content. | Writer makes 3-4 errors in grammar or spelling that distract the reader from the content. | Writer makes more than 4 errors in grammar or spelling that distract the reader from the content. |

Notes to student:

| Literary Genres | | |
|------------------------|-------------------------------|---|
| Fiction | Fantasy | A story that is not considered traditional literature, which includes elements that are considered impossible such as magical creatures or super powers. Imagination and make-believe are what this genre is all about. |
| | Science Fiction | A type of fantasy usually set in the future, often including science and technology themes (robots, time machines, etc.) |
| | Poetry | Poetry is verse written to create a response of thought and feeling from the reader. It often uses rhythm and rhyme to help convey its meaning. |
| | Mystery | A suspenseful story about a puzzling event that is not solved until the end of the story. |
| | Realistic Fiction | A story using made-up characters that could happen in real life. |
| Non Fiction | Traditional Literature | Stories passed down over many generations. These could include oral traditions, parables, folktales, legends, fables, fairy tales, tall tales, and myths. Many stories in this genre have historical significance and all have cultural significance to the group who own them. Depending on the beliefs of the group that continues to tell and use these stories, they are not always presented as fiction. |
| | Historical Fiction | A fictional story that takes place in a particular time period in the past. Often the setting is real, but some characters and details are made up in the author's imagination. |
| | Biography | The story of a real person's life written by another person. |
| | Autobiography | The story of a real person's life that is written by that person. |
| | Informational Text | Texts that provide facts about a variety of topics (sports, animals, science, history, careers, travel, geography, space, weather, etc.) |

(Chart originally published in *Language Arts Units for Indian Education for All*, Montana Office of Public Instruction; Elser, 2009, used with permission.)

TO CATCH A FISH



The Salish and Pend d'Oreille not only had an extensive knowledge of plants and animals, they possessed sophisticated and effective technologies to harvest them. Acquiring wild foods in a dependable and efficient way is not easy. It requires knowledge of the organism, of course, but also the tried and true tools and techniques. The Tribes' fishing technologies represented the culmination of thousands of years of development. They helped to ensure that the Tribes always had available high quality foods rich in protein.

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To Catch a Fish

 *Cultural Values: Respect, Relatedness, Reciprocity, Cooperation, Level-Headedness, Observation*

Rationale

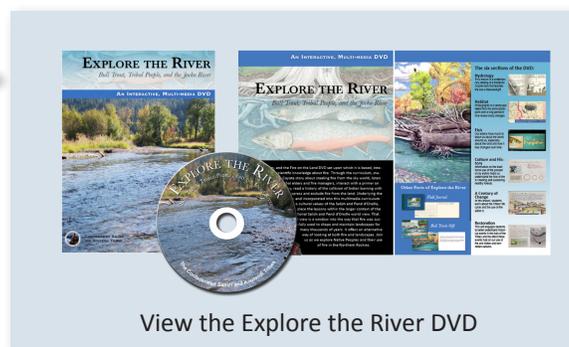
The tools our ancestors developed enabled them not only to survive but to thrive throughout our aboriginal territory. Those tools are technologies, uniquely adapted to the environment and created with materials from the land. This investigation will explore the technologies associated with fishing and with the sharing of knowledge about the use of those technologies.

Learning Targets

- I know that technology is a “body of knowledge available to a society that is of use in fashioning implements, practicing manual arts and skills, and extracting or collecting materials.”
- I understand that application of technology is adapted to contexts and available resources—what appears advanced under one condition is potentially useless in another.
- I explore technology within the traditional culture of the Salish and Pend d’Oreille people.
- I design a trap capable of catching fish in a stream.
- I critique my trap design for potential effectiveness.
- I know how four tools, critical to the survival of the Salish and Pend d’Oreille, were constructed.
- I understand the traditional ways in which resources were collected and the values of respect and reciprocity.
- I discuss and explore ideas with a partner or group to deepen my understanding of content.
- I work cooperatively with others to create a product.

Resources

- Explore the River DVD
- Field Journal for Explore the River Project (or blank book, composition book and/or small sketch pad), 1 per student
- Computer with DVD player and internet connection
- PC projector
- Chart paper and markers for each group
- Thin, two-ply, twine (a foot or two for each student)



- Sandbar or other willow (only enough for each group to have a few shoots)
- Small collection of tech toys for each group (props for intro; note that most students will have enough in their pockets and backpacks alone, aka cell phones, MP3 players, iPods etc.)

Instructional Techniques

Individual reflection, quick write, group project, debrief, interactive lecture applied to video, debate

Time Frame

Four, 50-minute class periods; time required may vary based on age, grade level and the teacher's choices to support cross-curricular goals.

1st period: Quick write, define technology, identify technology, add a mystery piece (twine), debate, explore creation of cordage, write about the "value" of various technologies

2nd period: Brainstorm how to catch a fish, in small groups, design a fish trap, prepare a presentation

3rd period: Present and critique on traps, self-assess, view Gallery of Tools from the DVD, watch the video on fish hook development

4th period: View Making a Fish Trap video using interactive lecture structure, take the knowledge check quiz for culture and history if history is done, final written reflection

Suggested Grade Levels

Grades 3-12

Procedures below target students in grades from 4 to 8. However, with suggested [adaptations](#) following the procedures section, these may be useful for grades from 3 to 12.

Procedures

Day One

1. Using Field Journals or notebooks, pose the question, "What is technology?" Allow students three to five minutes using the quick-write protocol to explore their personal definition or idea of what constitutes technology.
 - Set writing timer for three to five minutes.
 - Write quickly and do not stop.
 - Don't worry about spelling or grammar as you get your ideas down.
 - This is what you think now. There are no "wrong" answers.
 - Go! Create urgency. Allow about three to five minutes for the quick write.
 - Have students draw a line under this first quick write, separating from the next idea.
2. Have student's pair-share, discussing what they think.
3. Call on random pairs to report out, starting a whole class discussion.
4. Pull pairs together creating groups of four or so.
5. Ask students to peruse the classroom for only 60 seconds, each gathering a different example of a "technologies" and bringing it (as they can) back to their group table.
6. Have each student report to their group in 30 seconds or less why the object they brought back is an example of technology.

7. Debrief whole class posing questions like the following:
 - What do you see?
 - What makes the objects in front of you examples of technology?
 - Does any group have an object that changes your definitions of technology?
 - What are they?
 - Why were these items selected?
8. Listen carefully as students justify the inclusion of an item under the umbrella of the definition of “technology”.
9. Ask the class, “How does the dictionary define ‘technology’?”
10. Use your classroom computer, internet access and projector to locate and project multiple definitions of technology.
11. Draw students attention to the following definition from the *The American Heritage® Dictionary of the English Language, 4th edition*:

tech·nol·o·gy (tĕk-nŏl'ə-jĕ)

Definition # 3 - Informed by field of anthropology

The body of knowledge available to a society that is of use in fashioning implements, practicing manual arts and skills, and extracting or collecting materials.əə

Origin: Greek tekhnologiā, systematic treatment of an art or craft : tekhnē, skill; see teks- in Indo-European roots + -logiā, -logy.

12. As well as these from *Webster's New World College Dictionary* Copyright © 2010

tech·nol·ogy (tek nāl'ə jĕ)

1. The science or study of the practical or industrial arts, applied sciences, etc.
2. The terms used in a science, etc.; technical terminology
3. Applied science
4. A method, process, etc. for handling a specific technical problem
5. The system by which a society provides its members with those things needed or desired

Origin: Gr technologia, systematic treatment: see technic & -logy

13. As you go through definitions, ask students to reflect on the objects they selected, and mentally note if the object is consistent with one or more definitions of the term “technology” and if so, how?
14. Now pass each student a small (about 12 inches) piece of two-ply twine.
15. Using their field journals, and with the definitions still posted, ask them to quick write again answering this question: Is this a “technology?” If so, how?
 - Set writing timer for three minutes.

- Write quickly and do not stop.
- Don't worry about spelling or grammar as you get your ideas down.
- This is what you think now. There are no "wrong" answers.
- Go! Create urgency. Allow about three minutes for the quick write.

16. Again, pair-share for a minute, debriefing on their writing.

17. Whole class, using the Explore the River DVD, go to Culture and History > Making Traditional Fishing Tools > Making Cordage.

18. The entire class will view this first video, with a pause to process cultural protocols after the first section which answers the question: "How did you prepare yourself for today?"

19. View first 1:40 seconds, then pause.

20. Ask students:

- How are the cultural values of respect and reciprocity being addressed by Tim Ryan in the video?

21. Allow groups a few minutes to discuss.

22. Continue video playing for next 11 minutes to the end.

23. After viewing ask:

- Does cordage fit with your personal definition of technology?
- Which dictionary definition might a human made tool like cordage fall under?
- Which has more "value?" An iPod or cell phone? Or a tool, like cordage?
- Which one would you rather have, and why?

24. Allow groups about five minutes to discuss, argue or debate.

25. Now, provide the students with the following scenario:

- "It is 1680. You and your family live in the area that will one day be called Western Montana. You have been provided with these two objects (iPod and cordage) Which one do you want, and why? How might you use them?"

26. Students may discuss in groups and/or write their own response to the above scenario. Allow discussion for the remainder of the class period, either whole class or small group.

27. Assign writing (possibly a three-paragraph essay) as homework responding personally to the scenario. Ask students to state their position and work to be clear, logical and persuasive.



While in the Explore the River DVD, click this button (Making Cordage) in the bottom sliding menu of the Culture and History Chapter

Day Two

1. Seat students in small groups.
2. Collect essays from previous day. Use these to determine understanding.
3. Open class, warming up with the following question, requiring students to quick write, brainstorming in their field journals.
 - How many different ways can you think of to catch a fish?
 - Set writing timer for three to five minutes.
 - Write quickly and do not stop.
 - Don't worry about spelling or grammar as you get your ideas down.

- This is what you think now. There are no “wrong” answers.
 - Go! Create urgency. Allow three to five minutes for the quick write.
4. Conduct a quick debrief, as students share, generate a list on the board.
 5. Tell students that one way the Salish and Pend d’Oreille caught fish, including bull trout, was through the use of traps.
 6. Today, in your groups you are going to create a paper/pencil design for a trap, using similar materials to those used by the Salish and Pend d’Oreille.
 7. Provide each group with chart paper, markers, a few branches of willow and the sample pieces of cordage from the day before.
 8. Inform them that this will be a “design” for a functional trap, but they will not get to actually build one today. As a group, their trap must be able to be created using only the following:
 - a sharp stone tool with a serrated edge for cutting,
 - cordage that you have made yourself from dogbane following the previous day’s video demonstration,
 - sandbar willow, and
 - dogwood.
 9. In their imaginary world, their access to these resources is only limited by the time they need to gather and create or refine them.
 10. Groups may want to draft ideas on scratch paper before transferring them to the large chart paper provided.
 11. Groups must be ready to share their trap design on the following day, presenting it to the rest of the class and highlighting its function as a technology created to support the people by providing fish as a food source.
 12. Provide groups with the rubric [attached](#) to help keep them on task.
 13. Allow the remainder of the class period (40 minutes or more) for students to work in their small groups creating a paper-and-pencil design for a functional trap.

Day Three

1. Groups take turns presenting their trap designs, highlighting its function as a technology created to support the people by providing fish as a food source. (Maximum of three to five minutes per group.)
2. Allow a few minutes (two or three) after each presentation for the class to pose questions or make comments about design merits.
3. Have all groups post their designs.
4. Have students as a group self-rate their design using the rubric provided.
5. After group presentations conclude, use the Explore the River DVD. Go to Culture and History Fishing: Gallery of Traditional Tools and show images of each tool in the gallery, conducting a whole class discussion of the tools as examples of technology developed for a specific purpose, place, and time.
6. End the class by showing the video on making fish hooks (16 minutes). On the Explore the River DVD, go to Culture and History > Making Traditional Fishing Tools > Making a Fish Hook.

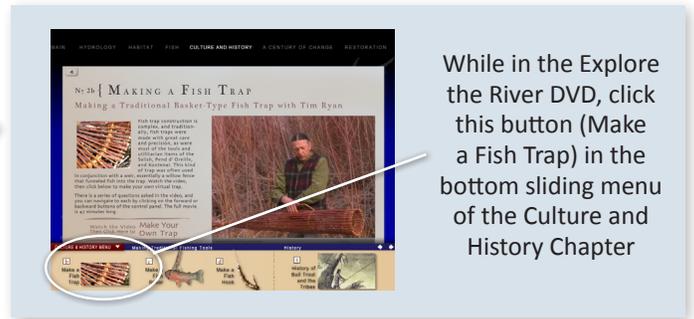


While in the Explore the River DVD, click this button (Gallery of Traditional Tools) in the bottom sliding menu of the Culture and History Chapter

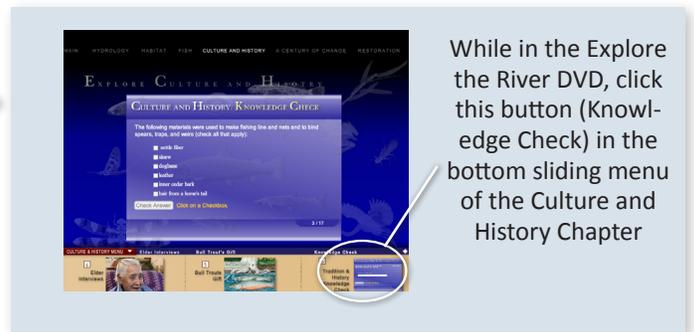
While in the Explore the River DVD, click this button (Make a Fish Hook) in the bottom sliding menu of the Culture and History Chapter

Day Four

1. Show the trap video on the Explore the River DVD, go to Culture and History > 2) Making Traditional Fishing Tools > b) Making a Fish Trap.
2. Present the first instructional segment, stopping at a natural break or chapter break in the video after 10 to 12 minutes.
3. When done (about 12 minutes) have students in pairs or small groups, conduct a thinking review - drawing conclusions, making inferences, posing more questions.
4. Rove, listen, observe and read over shoulders, checking for understanding of topic and purpose.
5. Repeat steps 2 – 4, four times until done, occasionally randomly calling on pairs during step 3, or going back to repeat or extend the lecture (in this case Tim’s lecture and demonstration presented on the video) as needed.
6. Take final knowledge check quiz on culture and history if history unit is complete.
7. At the end of this inquiry, ask students again, “What is technology?” Have them write their response and compare to their first quick-write.
8. Ask:
 - How have your ideas about technology changed?
 - Would the gadgets we call “technology” today be tools supporting survival and quality of life in the past?



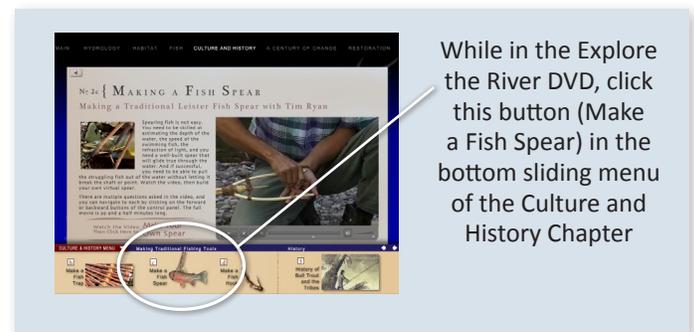
While in the Explore the River DVD, click this button (Make a Fish Trap) in the bottom sliding menu of the Culture and History Chapter



While in the Explore the River DVD, click this button (Knowledge Check) in the bottom sliding menu of the Culture and History Chapter

Extension

1. Have students write and share fishing stories. If they have never been fishing, they can create their own fishing tall tale.
2. Allow time for some students to explore more of Tim Ryan’s videos, looking at how to make a fish spear. Many will be fascinated by the activities.
3. As a project under the investigation titled [More Than Water](#), a student might want to try his or her hand at making a fishing tool or cordage following Tim’s instructions. Remind them of the cultural protocol for the use of the materials (gather and take in a respectful way, never waste, always make sure some remain for others and future use, find ways to give back, and give thanks).
4. Invite Tim Ryan of [AST Northwest](#) to speak at your school. His workshops are engaging, fun, and highly educational.



While in the Explore the River DVD, click this button (Make a Fish Spear) in the bottom sliding menu of the Culture and History Chapter

Assessment

- Three-layered quick writes on technology
- Trap group design
- Class and group discussions
- Identification of technology in class (observation, what they pick shows what they understand)

- Rubric for trap design, filled out by groups
- Final writing on nature of technology (now what do you know?)

Adaptations

The following adaptations are designed to support your efforts to meet the needs of every learner. Grade levels here are only a suggestion and would not preclude use of a great 3rd-grade strategy with a 9th grader or vice versa.

Grades 4-6 (or students at any level who need more support)

The following procedural options could help you more closely meet the needs of younger students.

1. Younger students can learn how cordage was made and would welcome hands-on opportunities to learn skills associated with tool creation.
2. Be selective using videos because they are often too passive to put important content in long-term memory unless you break them up a bit and provide student's opportunities to interact, discuss, and argue ideas presented or practice skills. Those on this DVD are broken into chapters with title pages to support pausing so students can process material occasionally.
3. Take students on a field trip to sites where resources might be gathered. Can they identify sandbar willow, dogwood, or dogbane? On location, teach them respect for the native plants and animals and how to show respect by never abusing this resource.

Grades 9-12 (or students at any level who require greater challenge)

Older or more advanced students need to be encouraged to explore big ideas in greater depth and to juxtapose seemingly unrelated concepts.

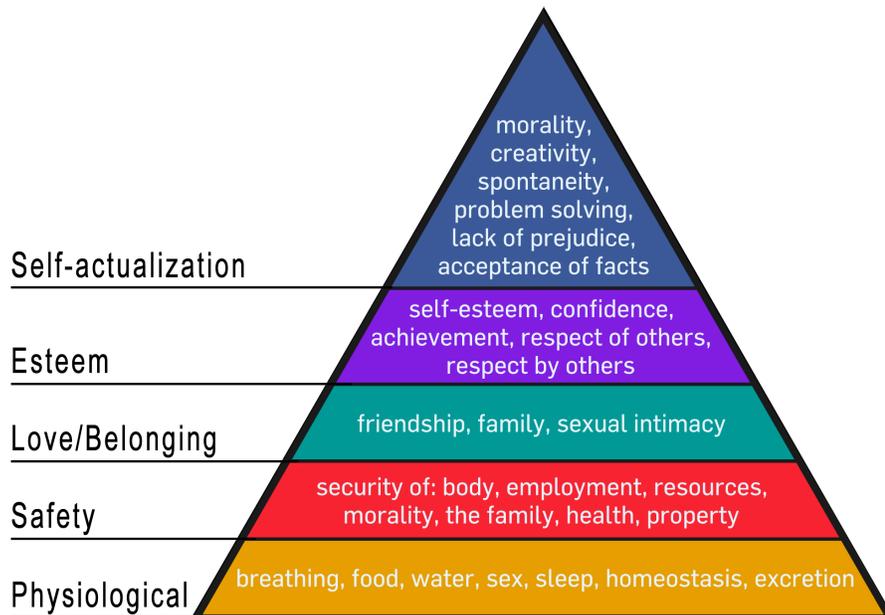
1. Just like younger students, students of any age benefit from opportunities to go into the field. Older students should be involved in planning field experiences—everything from arranging guest speakers, determining itineraries, planning travel routes, even learning targets. Practice gradually releasing responsibility at all levels.
2. Tribal technologies are often stereotyped pejoratively in literature and media as being “primitive”. Conduct a discussion/debate around this common misconception and the use of the word primitive. Technologies are adaptations to land, resources, and skill within unique cultural and environmental contexts. Gadgets developed for an electronic and electrified world can be uniquely maladaptive when faced with power outages or the actual conditions found in wilderness. Frame a debate to challenge the idea that new is more advanced and more sophisticated.

As students are developing a definition of technology that moves beyond contemporary electronic gadgets, have them reflect on the role of technology in meeting needs associated with the construct articulated by Maslow, known commonly as the hierarchy of needs.

USING INTERACTIVE LECTURE FOR VIDEOS

Watching a video from a hard copy or internet source can be a great opportunity to experience a virtual field trip or it can be a great waste of time. What the teacher does in preparation and how the teacher supports reflection, inference, discussion, and questioning will determine whether it is a great learning experience or a pleasant “low demand” activity that fills or steals time. Break video viewing up, using an interactive lecture structure and treating the video as if it were a lecture. Allow active processing, discussion, questioning, and checking for understanding to occur about every 7 to 12 minutes for a documentary or informational video. Steps 2 through 5 (Day Four) provide part of a strong interactive lecture structure. For more information, see the recent book, *Focus: Elevating Essentials to Radically Improve Student Learning*, pages 67 – 73, by Mike Schmoker (2011).

Of the technologies they identify and discuss on Day One of this study, which ones would they associate with physiology, safety, belonging, esteem, or self-actualization. Why? Have them discuss, arguing to justify their stance. Of the traditional tools associated with fishing in the cultural and environmental world of the Salish and Pend d'Oreille, where do they fall on this hierarchical scheme?



From Wikipedia article on Maslow's Hierarchy of Needs

http://en.wikipedia.org/wiki/Talk:Maslow%27s_hierarchy_of_needs

<http://www.teacherstoolbox.co.uk/maslow.html>

3. Have students research the origins of the hierarchy of needs. Where did it come from and what experiences and teachings influenced Maslow?

References

- Confederated Salish and Kootenai Tribes. (2011). *Bull Trout's Gift*. Lincoln, NE: University of Nebraska Press.
- Confederated Salish & Kootenai Tribes. (2011). *Explore the River: Bull Trout, Tribal People, and the Jocko River*. (An Interactive Educational DVD). Pablo, MT: Confederated Salish and Kootenai Tribes.
- Confederated Salish and Kootenai Tribes. (2011). *Snoqeymintn/Field Journal*. Lincoln, NE: University of Nebraska Press.
- Schmoker, M. (2011). *Focus: Elevating the Essentials to Radically Improve Student Learning*. Alexandria, VA: ASCD.

Rubric for Group Fish Trap Designs

Group Members: _____

Date: _____

Directions

Today, in your groups you are going to create a paper-and-pencil design for a trap, using similar materials to those used by the Salish and Pend d'Oreille.

As a group, your trap must be able to be created using only the following:

- a sharp stone tool with a serrated edge for cutting,
- cordage that you have made yourself from dogbane following the previous day's video demonstration,
- sandbar willow, and
- dogwood.

In your imaginary world, your access to these resources is only limited by the time you need to gather, create or refine them. You may want to draft ideas on scratch paper before transferring them to the large piece of chart paper provided. Be ready to share your trap design tomorrow, presenting it to the rest of the class and highlighting its function as a technology created to support the people by providing fish as a food source.

| CATEGORY | 4 | 3 | 2 | 1 |
|-------------------------------|--|---|--|--|
| Design | This design would catch fish in large quantities and could be used over and over, saving time and labor. | This design would catch fish, but once used, would not likely be able to be used again. | Not sure how many fish this might catch. | Where are the fish? Unlikely to have success trapping fish with this trap. |
| Durability | Structure would function extraordinarily well, holding up under atypical stresses. | Structure would function well, holding up under typical stresses. | Structure would function pretty well, but deteriorates under typical stresses. | Fatal flaws are likely in function with complete failure under typical stresses. |
| Plan | Plan is neat with clear measurements and labeling for all components. | Plan is neat with clear measurements and labeling for most components. | Plan provides clear measurements and labeling for most components. | Plan does not show measurements clearly or is otherwise inadequately labeled. |
| Presentation | All group members participated in presentation of the design. Presentation "sold" the trap, even if design features were weak. | Several group members participated in presentation of the design. Presentation was pretty good. | Two group members participated in presentation of the design. Presentation was ok. | Only one group member talked during presentation. |
| Construction Materials | Only materials allowed, including cordage from the dogbane plant, sandbar willow, and sharp stone cutting tools were used in the design. | | | The group failed to stick to the approved materials list. |

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HISTORY OF BULL TROUT...



For hundreds of generations, the Salish and Pend d’Oreille people inhabited a vast territory that included the area now encompassed by western Montana. And for almost all of that immense span of time, our ancestors lived entirely as hunters, gatherers, and anglers. One of the keys to the long-term success of the Salish and Pend d’Oreille way of life, as Pend d’Oreille elder Mitch Smallsalmon said, was the water—the clear, cold waters of the Tribes’ territories and the abundant fish and wildlife they supported. He said, “By that, we were wealthy from the water.”

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History of Bull Trout and the People



Cultural Values: Reciprocity, Listening, Respect, Quiet, Calm

Rationale

For thousands of years, our ancestors hunted, fished, and harvested plant foods across a vast territory that encompassed most of what is now western and central Montana, northern Idaho, and eastern Washington, centering around the drainage systems of the Flathead, Clark Fork, and Pend Oreille Rivers, and extending east of the divide to the upper Missouri system and the Musselshell. Across this immense area, the Tribes fostered a relationship of respect and reciprocity with the plants and animals. Our ancestors sustained themselves well and took good care of their homeland. Over the past 200 years, many changes have occurred that have transformed our lives and our important relationships to the plants and animals. As a result of these changes, our relationship to bull trout is now threatened. In this investigation, students will learn the history of the Salish and Pend d'Oreille people's relationship to bull trout, while practicing close reading and using authentic literacy to support the development of robust comprehension skills.

Learning Targets

- I understand elements of the tribal world of the Salish and Pend d'Oreille prior to the arrival of Europeans. (Chapter 1)
- I know the importance of bull trout and fishing in the tribal way of life. (Chapter 2) I am aware of how fishing, and bull trout especially, created a reserve of readily available food, assuring the survival of tribal people during hard times. (Chapter 3)
- I understand how changes in the life ways of the Salish and Pend d'Oreille influenced fishing and bull trout. (Chapter 4)
- I know how changes to the rivers, changes in land use and other negative impacts of people have decimated bull trout—threatening the species with extinction. (Chapter 5)
- I understand how Salish and Pend d'Oreille people have worked and fought to restore habitat and protect bull trout and other natives in an effort to restore the Jocko River ecosystem. (Chapter 6)
- I annotate text to more deeply comprehend.
- I use prior knowledge and/or personal experiences that connect to the text to increase my understanding of the topic. (Schema)
- I combine background knowledge with information from the text to go beyond what is written in order to gain meaning. (Inference)
- I ask questions using the five W's and the H before, during, and after I read in order to clarify meaning and deepen my understanding. (Questioning)
- I use the five senses to create a movie of what I am reading in my head. (Visualizing)
- I adapt/revise the images I make as I read to deepen my understanding. (Visualizing)
- I decide on and explain the most important and useful pieces of information in a text, depending on my purpose for reading. (Determining Importance)

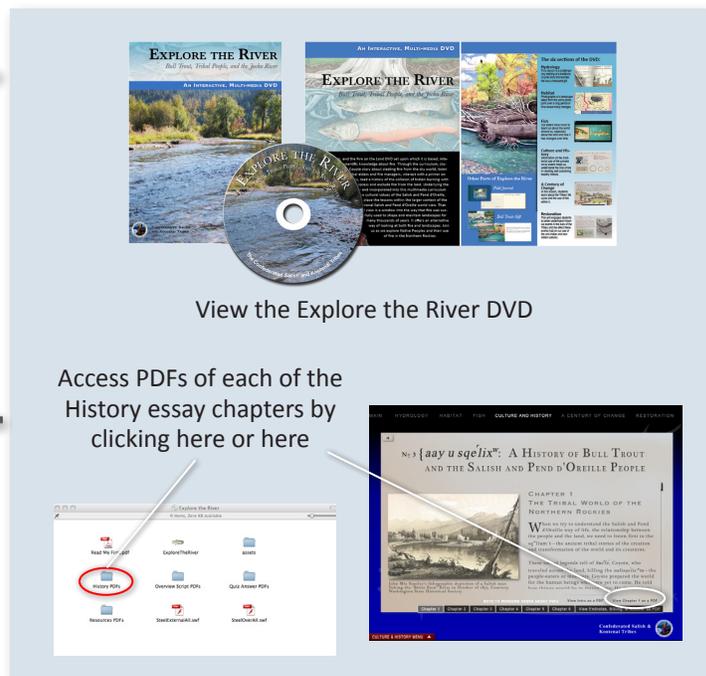
SEVEN COMPREHENSION STRATEGIES

1. Schema
2. Making Inferences
3. Asking Questions
4. Visualizing
5. Determining Importance
6. Synthesizing
7. Monitoring/Fix-Ups

- I integrate information from multiple sources to create a new, overall understanding of the text. (Synthesizing)

Resources

- Explore the River* DVD
- Field Journal for *Explore the River* Project (or blank book, composition book and/or small sketch pad), 1 per student
- Computer with DVD player
- PC projector
- The essay: *A History of Bull Trout and the Salish and Pend d'Oreille People* (PDF files can be accessed at the bottom of the page in each of the essay chapters in Culture and History > History of Bull Trout, and they can be found in a folder titled “Resources” on *Explore the River* DVD (not in the *Explore the River* program itself, but on the disk). If no electronic platform is available, then you will want to print a copy of chapters 1 through 6 for each student. Even with computer, tablet, or e-reader access, selected passages should be made available as hard copies so you can see student annotations, thus checking for understanding.



View the *Explore the River* DVD

Access PDFs of each of the History essay chapters by clicking here or here

- Highlighters, post its and other annotation tools (one highlighter per student)
- Computers, tablets, or e-readers (optional)
- Any of the processing [support forms or structures](#) attached (used for quick-writing and student processing activities) as desired

Instructional Techniques

Techniques employed can be summarized as read, talk, and write. Each day students read, talk, and write about one chapter in *A History of Bull Trout and the Salish and Pend d'Oreille People*. At the same time, they will practice close reading using annotation techniques applied to history and develop one or more reading comprehension strategies. Each day will use the same basic authentic literacy structure. The basic structure includes the following steps: build background, establish purpose by posing question, model, and demonstrate close reading for that purpose, allow for guided practice while you check for understanding, gradually release responsibility allowing for independent practice, talk and write about the reading. For more detail on the authentic literacy including a template and strategies for reading in social studies and science, go to Schmoker (2011) *Focus: Elevating the Essentials to Radically Improve Student Learning*, ASCD publication. Other useful resources can be found in the [References](#), including Robb (2006), Fisher and Frey (2007), Harvey and Goudvis (2007), and Wineberg (2001).

Time Frame

Six to eight, 50-minute class periods; time required may vary based on age, grade level and the teacher's choices to support cross-curricular goals.

1st period: [The Tribal World of the Northern Rockies](#), Chapter 1, employing authentic literacy strategies

2nd period: [“An Abundance of These Most Excellent Fish”: the Importance of Bull Trout and Fishing in the Tribal Way of Life](#), Chapter 2, employing authentic literacy strategies

3rd period: [Fishing, Bull Trout, and the Confidence of Tribal People](#), Chapter 3, employing authentic literacy strategies

4th period: [Bull Trout and Fishing in a Narrowing World](#), Chapter 4, employing authentic literacy strategies

5th period: [The Decimation of Bull Trout](#), Chapter 5, employing authentic literacy strategies

6th period: [Resistance and Renewal](#), Chapter 6, employing authentic literacy strategies

Suggested Grade Levels

Grades 4-12

Procedures below target students in grades from 5 to 10. However, with suggested [adaptations](#), these may be useful for grades from 4 to 12.

Procedures

Day One through Day Six, repeat each day

Structure of an Authentic Literacy Lesson

1. In advance of the class, post learning targets for that day so students know where they are headed.
2. Build background and pre-teach essential vocabulary. (This can be an elaborate multi-text building background knowledge workshop, or a five-minute mini-lesson providing orientation, and selecting two to four key terms likely to trip students up as they read.)
3. Establish purpose for reading; pose a guiding question.
4. Model higher-order reading with a selected passage, conducting annotation and “think-aloud” protocol related to the question.
5. Make the passage you select to model central to your presentation, with some critical content. This supports content-area learning and gets them engaged in the complexity of the material while they still have your support.
6. Again, think five-minute mini-lesson here where you get them started by modeling on the opening page or paragraph of the reading. To do so, project the section assigned for that day from your classroom computer.
7. If you do this in PDF in current Adobe Acrobat, you will have access to annotation tools like **electronic highlighters** and post-its.
8. In addition, you can also electronically share periodically so students reading on computers or e-readers can annotate and layer their annotations in small groups or whole class. Check out these cool features allowing e-sharing of thoughtful annotation. (Adobe, Google Docs, Diigo, and others allow this.)
9. Whether working electronically or from printed text, allow for guided practice, having students read the next sections, coding and annotating.
10. Rove and monitor students as they practice, checking to assure understanding. Re-teach if there is evidence student understanding is at a low level.

MODEL THE ANNOTATION OF TEXT

Adult learners annotate any text they are studying in order to increase their comprehension and retention of complex material. Students rarely have the opportunity to do what adult learners do routinely. This is largely a consequence of the fact that students use expensive textbooks that must last through multiple years. Selected informational text needs to be made available to students regularly in a form that they can use to highlight, underline, and write in the margins. In addition, teachers need to model using a “think-aloud” approach—how they select key words and phrases of importance that will help them later to remember and deepen their understanding of the content.

11. Every few minutes, pause the action and have students pair-up and summarize what they read, share what they think at this point in their reading, and make predictions about what they think will come next.
12. Call on random pairs to report out to class to check for comprehension.
13. Occasionally, have students quick-write before or after they pair-share, to deepen their thinking.
14. Continue through the text repeating steps 9 through 13, extending more time as you become assured that they are mastering the text.
15. After all students are capable and engaged, allow them to continue on their own, practicing independently.
16. After reading is complete, open for whole class discussion or debate focused on the question and purpose for the reading.
17. Close each day by requiring students to write in reference to the text, telling what they learned, arguing a point or perspective, or reflecting on implications. Vary these writings from informal exit tickets to more structured and formal essays and occasionally a fully developed research paper. (For an example of the summative essay, see the [Closing](#) for this lesson.)

A Typical Daily Structure of Authentic Literacy Lesson with Examples

| Minutes | Instructional Segment Following Authentic Literacy Lesson Template |
|---------|---|
| 1 | <p>Post or project learning targets in the classroom - Post three learning targets: one for the chapter, one for annotation and close reading of text, and at least one for the comprehension skill you wish to highlight in your demonstration. These should be on the board as students enter the classroom and should be referenced throughout the lesson when appropriate.</p> <p>If addressing Chapter 4 for example, targets could include:</p> <ul style="list-style-type: none"> • I understand how changes in the lifeways of the Salish and Pend d'Oreille influenced fishing and bull trout. (Chapter 4) • I annotate text to more deeply comprehend. • I ask questions using the 5 W's and the H before, during, and after I read in order to clarify meaning and deepen my understanding. (Questioning) <p><i>Note: If projecting, use a split screen feature. You want students to see these and be reminded of them continually.</i></p> |
| 5 | <p>Build interest and curiosity - Connect this written historical narrative to one of its essential sources, the oral tradition and the stories of the elders. Using the Elders Interview for Eneas Vanderburg and Tony Incashola, quiet the class and establish a context and personal connections to the content by watching about five minutes of the interview each day. The interview is broken into 24 sections, and each stands alone and takes just a minute or two. Plan to view two to four per day as a content and context rich warm-up.</p> <div style="display: flex; align-items: center; justify-content: center;">   <div style="margin-left: 20px;"> <p>While in the Explore the River DVD, click this button on the Elder Interviews page of the Culture and History Chapter</p> </div> </div> |

| | |
|--------|---|
| 5 | <p>Activate prior knowledge - On day one, this will be a five-minute mini-lesson on the Salish and Pend d'Oreille. Simple things like who are the Salish and Pend d'Oreille? What is their native language? Where do they live today? Where did they live long ago? It is important not to assume that students have this very basic cultural context. If it is day two to six of the unit, this can be as simple as having a two-minute quick-write admit ticket assignment on the board, "What did we learn yesterday from our assigned Chapter?" Follow with quick discussion. "Let's summarize together what we now know." Then randomly call on students to answer the following questions: "What did we learn yesterday? Can you add to that? Do you have any other thoughts?" Proceed until students have reconstructed the previous days reading orally. Then, select a few high-importance vocabulary words or concepts to define specific to the chapter.</p> |
| 1 | <p>Set purpose, pose question - For example: "Today we are going to read the 1st half of Chapter 4 to determine what factors or changes were "narrowing the world" of the Salish and Pend d'Oreille people and how those changes impacted bull trout and fishing." So, focus you annotations today on identification of changes. Write on the board: "What factors or changes were 'narrowing the world' of the Salish and Pend d'Oreille people and how did those changes impact bull trout and fishing?" Remind students of the Chapter 4 learning target and how that is parallel to the question, establishing the purpose for the reading.</p> |
| 5 | <p>Model, demonstrate close reading and comprehension strategy - Project the 1st page of the days in-class reading. Highlighting and adding comments as you go, read a passage aloud, pausing periodically to conduct a "think aloud" protocol, sharing with students what you are thinking. So, for the opening of Chapter 4, it might go like this:</p> <ul style="list-style-type: none"> • Read aloud, "before the arrival of non-Indians in western Montana - before the transformation of the tribal world here—bull trout, and fishing in general did not provide the majority of the caloric intake of the Salish and Pend d'Oreille people ..." • Pause and think aloud, "Umm, now when was that? I remember that there were trappers in this area before Lewis and Clark so I bet I am safe to say that "first arrival" is in the 1780's or 1790's. But at that time, it is hard to say what impact those few people had on Salish and Pend d'Oreille life. Um... I wonder if they brought diseases with them, like smallpox? That would have had a horrible impact. Lewis and Clark came through in 1804-1806. Some think that marked the 'beginning of the end,' so maybe after them? Or maybe during the boom of fur trading in the 1830's? Let's see which hunch is right." (This example is one of inference, questioning and predicting in which the teacher is using prior knowledge of history to attempt to comprehend the chronological sequence of events and determine when things occurred.) Explicitly connect to the learning target for annotation (used every day) and an example of determining importance, and also a selected learning target for a comprehension strategy that you are demonstrating—in this case, questioning and inference. |
| 5 – 10 | <p>Guided practice Session 1 – Now, following your model, students will read silently while annotating the text. Have them read up to a specific and logical text break (about five minutes) then pause the class for a debrief and processing session. Project a reading timer set for five to ten minutes for each segment of guided practice. This is a classroom-management tool that reminds both students and the teacher to enforce absolute silence during these short segments of reading time. If anyone is talking, no one is reading. If students need your attention, have them write a note to you and raise their hand. Never vary this protocol or violate it and the class will always respect and appreciate this quiet, focused time.</p> |
| 5 | <p>Students active processing - Process by having students quick-write then pair-share (or pair-share then quick-write). During this time, the teacher is roving and listening in to check for understanding, correct misconceptions, and occasionally pose an open-ended question or guiding question to support the pairs as they process content. Your goal here is lots of purposeful talk! You may select to set a "talk" timer to limit the time and keep them focused. I often do a minute per student – to assure each student talks, then one more minute for both to discuss.</p> |

| | |
|---------|---|
| 5 – 10 | Guided practice Session 2 – Repeat from Session 1 above. If you feel confident, resulting from your observation of their highlighting and annotation as well as the previous pair-share and/or quick-write processing, that they are comprehending the material, then stretch the time to eight to ten minutes. If not confident, leave it at five minutes and then check in and process after that. |
| 5 | Students active processing – Repeat from above. Remember, look for evidence of understanding. You may also ask to see some of their quick-writes if you are having them do them. These will provide further evidence of understanding. If comprehension begins to break down, go back and model and demonstrate with another passage, or provide more background. |
| 5 – 10 | Guided practice Session 3 – Repeat only as needed and time allows. |
| 5 | Students active processing – Repeat from above. |
| 10 - 15 | Independent practice – Students continue annotating and reading until done with the days assigned passage. For jackrabbits (those who read quickly and finish early) have task cards ready. These can include things like “Go get a drink of water.” “Read or review this passage for me (extended reading of related material.)” “Go to the classroom computer and locate and copy to a slide the definitions of these five words from tomorrow’s chapter.”, etc. These instructions are printed on note cards, detailed enough to follow without conversation, and related to the reading or the next class activity or content. They are designed as meaningful learning opportunities to support gifted kids or fast readers. Again, you want to support the silence in the classroom to sustain attention on the reading. |
| 5 | Whole class debrief – As guided practice sessions are diminished, increase the opportunity to debate and discuss great ideas presented in the text. The more time students talk and discuss, the deeper their understanding of the text. They also find debate and discussion opportunities to be personally engaging and rewarding. This is fun! |
| 5 | Write about what you learned – You may select to use a simple exit ticket asking “Now what do you know?” or a 3-2-1 format as a form of quick-written summary. These need to be collected so you can plan the next day, determining whether you can reduce the number and length of guided practice sessions or whether you need to go back over elements of text where students appear to be confused. |

Closing

1. Conduct the Knowledge Check for the Culture and History chapter found at the end of that menu.
2. By way of review and for inspiration prior to final essay, have students watch the video overview for the Culture and History chapter.
3. Once you have cycled through all the chapters in the essay, set aside an hour and have students write a formal essay of their own. Ask them, by way of a prompt, to write about the following, arguing their point of view.
 - “Are the history of the Salish and Pend d’Oreille people and the plight of the bull trout linked? If so, how? Justify your response by referencing the history. You may use the document itself, elders interviews and quotes, the *Explore the River* DVD and of course your notes or annotations on the history. Be sure to refer to the text at least three times directly. Cite your sources. Go!”



While in the Explore the River DVD, click this button (Knowledge Check) at the end of the bottom sliding menu of the Culture and History chapter



While in the Explore the River DVD, click this button (Play the Overview) in the center of the opening page of the Culture and History chapter

Extension

1. In 2010, the Montana Office of Public Instruction published a guidance document for schools to support implementation of Indian Education for All. Titled *The Framework: A Practical Guide for Montana Teachers and Administrators Implementing Indian Education for All*, it provides explicit recommendations. One recommendation is to place the tribal content first, and then juxtapose to other historical narratives, so students can gain awareness of the different perspectives. This historical narrative offers the perfect opportunity to do just that. It could be read in tandem with, or in advance of, a study of Montana history using a text like [Montana: Stories from the Land](#) available online as PDF's from the Montana Historical Society. This curriculum focused on 7th or 8th grade, the grade levels at which most Montana students take Montana history.
2. Consider conducting a book study for teachers across all content areas, while working with students on the investigations in the *Explore the River* curriculum. This history and the application of the authentic literacy and interactive lecture templates used explicitly and implicitly throughout the curriculum create extraordinary opportunities for teacher professional development. In 2011, Mike Schmoker came out with his second book published by ASCD titled, *Focus: Elevating the Essentials to Radically Improve Student Learning*. His text provides outstanding examples and a crystal clear and simple description of active pedagogy and best practice with an emphasis on literacy. While teachers are engaged in teaching *Explore the River*, there is a wonderful opportunity to develop a Professional Learning Community to more deeply understand and consciously employ the instructional strategies found throughout this curriculum. It would be a rare opportunity to “talk the talk, and walk the walk.”

Assessment

- Daily writings in the form of informal quick-writes, admit and exit tickets, or [pre/post reflection form](#), 4-square, double entry journal or other structures (see a few examples provided at the close of this lesson)
- Direct observation of students in pair-sharing discussions, whole class debriefs and random call checking for understanding
- Observation of and hard evidence of annotation of selected text (paper with highlighting and other text coding) showing a pattern of understanding
- Formal writing (see [Closing](#) essay prompt) or reporting on content learned through the readings

Adaptations

The following adaptations are designed to support your efforts to meet the needs of every learner. Grade levels here are only a suggestion and would not preclude use of a great 3rd-grade strategy with a 9th grader or vice versa.

Grades 4-6 (or students at any level who need more support)

The critical task of intermediate students is the development of strong content-area reading skills and continued development of critical literacy. To achieve this with complex content, many students will require modeling, demonstration, and temporary supports. The following procedural options could help you more closely meet the needs of younger students.

1. The younger your students, the more support you want to provide by stretching your instructional segment of modeling and demonstration, covering a few more paragraphs or even pages and extending guided practice for additional segments based on your monitoring of their comprehension. Think of the supported reading as being about 60 to 70% based on the ability of the readers and the complexity of the text. Never remove the responsibility of actually having to read from the students. We are doing far too much reading aloud and far too little direct teaching of reading while students actually practice reading important and complex texts.

| Model and Demonstrate (Read To or Read With) | Guided Practice (Read By, Monitor Comprehension & Check for Understanding) | Independent Practice (Read By) |
|--|---|--|
| 20 - 30% | 40% | 30% |

Grades 9-12 (or students at any level who require greater challenge)

Older or more advanced students should be given more responsibility and should be required to read with greater independence and also address increasingly complex texts.

- Older students still require modeling, demonstration, and guided practice, but these should be diminished over time, again resulting from the watchful eye of the teacher who is continually checking for understanding and monitoring student comprehension. As a general rule (which is designed to be broken): if you have a 10-page chapter or segment of text, model with 10% or one page, conduct one or two guided-practice sessions 10% each session, then cut them loose if their comprehension is strong, for the remaining 70%. So roughly, one page out of ten is modeling and demonstration, two pages out of ten are guided practice, and seven out of ten are independent practice. In place of “pages” make the sections logical segments based on the text (could be three-quarters of a page or one-and-a-half pages—wherever the logical break occurs.) The harder the text, the greater the support.

| Model and Demonstrate | Guided Practice | Independent Practice |
|------------------------------|------------------------|-----------------------------|
| 10 - 15% | 20 - 30% | 60 - 70% |

References

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Pre / Post Reading Reflection Form (print 6 for each student, 1 per chapter)

Name: _____ Chapter: _____ Date: _____

| Before Reading – Predict and Preview | After Reading – Reflect and Analyze |
|--|---|
| <p>Based on the title, what do you think this is about?</p> | <p>What was it about?</p> |
| <p>What do you know, or think you know, about that?</p> | <p>Was what you knew or thought you knew accurate? Or, have you changed your thinking? Explain.</p> |
| <p>What questions do you have?</p> <p>1.</p> <p>2.</p> <p>3.</p> | <p>Were your questions answered? How? If not, what new questions do you have resulting from your reading?</p> <p>1.</p> <p>2.</p> <p>3.</p> |

Guided practice session 1 Quick-write:
I think...

Guided practice session 2 Quick-write:
Now I understand that...

Guided practice session 3 Quick-write:
Now I understand that...

Guided practice session 2 Quick-write:
So, this chapter was about...

Questions?

Answers

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A healthy river is what we all want, but how do we get that? Probably the simplest way is to stop doing the things that harm the river and let the river heal itself, which it will do over time. It is a process we can speed up somewhat by paying attention to four words, and they all start with a “C”. Cold, Clean, Complex, and Connected. Streams that are healthy for native fish and wildlife are cold, clean, complex and connected.

HEALTHY RIVERS

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Healthy Rivers

 *Cultural Values: Observation, Relatedness, Cooperation, Reciprocity*

Rationale

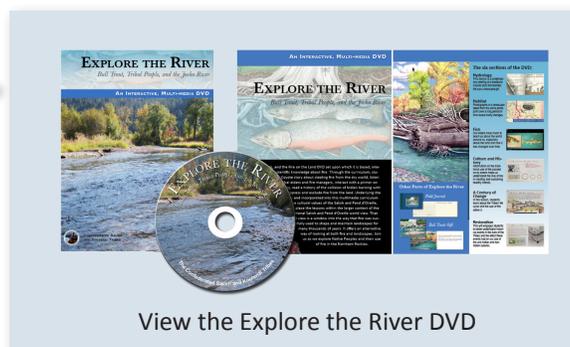
People have learned about the qualities or attributes of a healthy stream by studying the negative impacts of our activities on rivers like the Jocko. The reaches of the river that remain as our elders remember—untouched and free—have very different qualities than the stretches of the river where human activities have played a significant role. Close observation of these differences helps hydrologists and biologists restore functions to critical aquatic and riparian habitats. In this lesson, students learn the attributes of a healthy stream, the negative changes that have damaged the river, and passive and active tools being used to restore the stream—and welcome back the bull trout.

Learning Targets

- I know the attributes of a healthy stream.
- I understand the cause/effect relationship of changes made to the stream and the deterioration of aquatic and riparian habitats.
- I can list at least five changes and the impact of those changes on the Jocko River.
- I can list at least five passive strategies to prevent deterioration of stream health and allow the system to right itself over time.
- I am aware of active strategies employed to restore the Jocko.
- I read to determine importance.
- I annotate text to more deeply understand and later recall significant ideas.
- I picture conditions in my mind described in text.
- I can recognize how texts are organized—for example, straight-forward information, question and answer, chronological, and problem/solution structures.
- I read scientific text closely, to deeply understand the concepts described in the text.
- I work cooperatively with partners and groups.
- I work independently.

Resources

- Explore the River DVD
- Field Journal for Explore the River Project (or blank book, composition book and/or small sketch pad), 1 per student
- Computer with DVD player



- PC projector
- Access to computers or lab with DVD installed on each system (2 to 1 for the first activity, then a system for each group—five required for last segment of this investigation)
- Attributes of a Healthy Stream articles [attached](#) (11 segments, print 2 or 3 sets, each set on a different color of paper, enough to provide one segment for reading and study to each student and create pairs with a few groups of three)
- Four Changes articles, provide a copy for each member of a group
- Highlighters for annotation, determining importance (allowing teacher to check for understanding at a glance)
1 per student
- Chart paper (five sheets for five summary groups)
- Blue, red, and green marker set for each group to create layered anchor charts

Instructional Techniques

Three cycles of close reading and text coding, discussion, extension using the DVD, and reporting out with DVD support. Cycle 1 = expert pairs (attributes), Cycle 2 = Four expert teams (changes), Cycle 3 = Five expert teams (passive tools). Anchor chart groups will be teams from Cycle 3. After each reporting segment, the groups will create layered-anchor charts. Close with whole group interactive lecture on active tools.

Time Frame

Three or four 50-minute class periods; time required may vary based on age, grade level, and the teacher's choices to support cross-curricular goals.

1st period: Anticipatory set, demonstration of determining importance and annotation, individual reading, Cycle 1 expert pairs on attributes of a healthy stream. Assign 5 groups to create chart layer 1 (**blue marker**) on healthy attributes.

2nd period: Cycle two, four expert teams, each assigned a change topic. (Break up one group from previous day for the reading section only, they will come back together for the processing (charting) and the final reading assignment.) Individual reading, annotation, small group discussion, extension with DVD, report out using DVD support. Reassemble into five groups to chart layer two, hurtful changes (**red marker**).

3rd period: Start Cycle 3 (DVD only) on passive tools. Allow time for teams to study their assigned tool and then report out. Add layer 3 to anchor chart (**green marker**) on passive tools. Close with whole group interactive lecture on active tools.

4th period: Watch overview for Restoration section. Using DVD provide whole group interactive lecture on active tools, follow-up with simulation (individually) on river restoration, knowledge check.

Suggested Grade Levels

Grades 3 - 12

Procedures below target students in grades from 5 to 8. However, with suggested [adaptations](#), these may be useful for grades from 3 to 12.

Procedures

Day One

Teacher and Classroom Preparation

1. Prepare your room by creating group seating for 5 separate groups, providing chart paper and 3-color-marker set for each group (blue, red and green).
2. Print 2 (if you have 22 students or less) or 3 (if over 22 students) copies of the [Attributes of a Healthy Stream passages attached](#). Each set should be on a different color of paper.
3. Cut passages apart on dotted lines, creating 11 little passages for each printed set.
4. Print and cut apart [Attributes Summary Statements attached](#) (these are titles in the DVD book, *Attributes of a Healthy Stream*).
5. Post these 11 summaries on your classroom walls separated by as much space as possible.
6. Print [Changes articles](#) attached for four groups, one copy for each member of the assigned expert team.
7. Arrange for computer access (11 systems) if you don't have access in your classroom. Be sure the DVD has been installed on the hard drive of each, and check in advance to assure it is working properly.
8. Strategically determine partners and five-group membership. (The teams of four will be developed, breaking one group and assigning each member to one other team—giving the group a resident expert later.)

Class Activities

9. Provide each student with a blank square of scratch paper. This will serve as an admit ticket.
10. On the board pose this question: “What are the 4 C’s?”
11. Have students write their response on the admit ticket, sign their name, and drop in a collection basket or box.
12. Check these later to see if they are retaining key content.
13. When students are done, open for discussion by randomly calling on a student, asking him or her to tell the rest of the class about one of the 4 C’s.
14. Repeat, moving randomly from student to student until they have articulated all 4 C’s (Clean, Cold, Connected, and Complex).
15. Have the entire class hold up four fingers. Have them repeat with you wiggling one of their four fingers for each of the 4 C’s. This recitation supports getting the terms in long-term memory.
16. Inform the class that over the next few days they will learn:
 - What qualities or attributes of a stream allow it to retain these four qualities: cold, clean, connected, and complex?
 - What changes negatively impact the stream, diminishing these four qualities?
 - What strategies can we use to prevent deterioration of aquatic and riparian habitats?
 - How can we restore aquatic and riparian habitats?
17. Write this guiding question on the board establishing a purpose for the reading to follow.
 - What attributes of a stream allow it to stay cold, clean, connected, and complex?

WHY RANDOM?

The age-old practice of having students “volunteer” by raising their hands during interactive lectures provides the teacher with very distorted knowledge of what the entire class understands. In place of this strategy, which rewards the same students over and over while allowing others to sleep through class, great teachers get students accustomed to being called on at any time, while always making it clear that this is not a test. There is no shame in not knowing. What the teacher is seeking is knowledge of what the students really know, to determine when he or she needs to go back and re-teach a key concept or review material. This strategy is a probe to determine the effectiveness of teaching, never the success or failure of the individual student.

18. Using field journals or notebooks, ask students to write in quick-write format what they think right now in response to that question.
 - Set writing timer for five minutes.
 - Write quickly and do not stop.
 - Don't worry about spelling or grammar as you get your ideas down.
 - This is what you think now. There are no "wrong" answers.
 - Go! Create urgency. Allow about five minutes for the quick write.
19. When done, have them simply share with a seating partner what they think now. Allow just a minute or two for this pair-share.
20. While they share, you listen and rove (checking for understanding); passing out passages, 1 per student.
21. There are 11 passages per set so a class of 22 will have two students assigned to each passage.
22. If you have more students, some will work as a trio later. If you have fewer, you may have several students working independently. Be strategic in this selection, assuring that students who benefit from more social interaction have maximum opportunity to work with supportive others.
23. If your class is small, reserve one passage for you to use to model annotation and conduct a "think aloud"—directly demonstrating for students how to read science content and annotate the text. If the class is larger, then select the longest passage and work your way through just the first paragraph, reading in front of them (a document camera and PC projector are great tools here, otherwise, make an old-fashioned overhead transparency of the passage you wish to demonstrate with), highlighting important concepts or ideas, circling unknown words, and underlining less familiar words that you think you understand in context.
24. Talk aloud about your thinking as you demonstrate.
25. When you are done, students are to do the same thing with their passages, reading silently, and annotating as they progress through the passage. Post or project these instructions on the board.
 - Highlight important concepts or ideas
 - Circle unknown words
 - Underline less familiar words that you think you understand in context
26. Allow five minutes or so, roving and monitoring to see if they have the idea of how to annotate the text. Again, you are checking here for understanding.
27. When they are done, ask them to write a quick summary. What was that about? Could they picture it? Did they get it?
28. Ask students to take their passage, summary, and pen and stand and rove the room reading each of the 12 Attributes summaries posted on the walls, comparing them to their passage (and their summary).
29. After reading each one, have them return to stand in front of the one they think summarizes the passage they have read. There will be two or three students in front of each summary statement.
30. At this point, you are checking to see if the students are right. Could they find the summary that aligns with their passage? If so, this is a good indicator of comprehension.
31. Have the students in front of each compare. If they are right, they will have the exact same passage. If not, ask them to help each other until they all are in front of the correct summary.
32. Now, have them individually check what they wrote. Does their summary roughly match the one where they are standing? Does their partner's match theirs, and the one posted to the wall? If not, allow a minute for quick revision.
33. Have the students in pairs take their passages and their summaries to an assigned computer with the DVD installed and the Explore the River program up on the monitor.

34. Have them go to Hydrology > Attributes of a Healthy Stream and review the book, locating their section by matching the summary statement to the title.



35. Now, with their partner, have them review the material for their section, including the interactive graphics that support understanding of the attribute.

36. Ask students:

- Was this how you imagined it?
- Now do you understand the attribute more clearly?
- How does the image and graphic representation support your reading and understanding of the hydrological process?

37. Discuss whole group briefly.

38. Allow about five minutes for the partners to prepare a two-minute informal presentation on the attribute using the DVD for visual support. They should have a bulleted list (scratch paper) of the three key ideas they want the class to understand about their attribute and its contribution to maintaining clean, cold, connected, and complex rivers.

39. Have partners share, following the sequence of the DVD book.

40. Each pair stands and presents. Encourage them to use the DVD for visual support, but not to read the text aloud to their classmates (BORING!).

41. When all 11 pairs have reported, place students in five groups, each at a table with chart paper, markers, and ideally a PC which will allow them to go back to the text. Remind them that summary statements are still posted around the room and available for their use in addition to the DVD book.

42. Using the [blue marker](#), have the groups chart or summarize the eight attributes. You might remind them that this includes three impacts of flooding and two impacts of freedom (stream channel and migration). They can capture this any way they wish. Drawings, keywords or phrases, in a web, etc. It is their choice as a group. The more detail they include, the better. Allow the remainder of the period for this processing and additional time later if possible. (10 to 20 minutes)

Day Two

1. Place copies of each groups assigned passage (enough for all member of the group) at each of four tables where they will be working.

2. Seat students in four groups by simply breaking one group up temporarily, assigning each member to a different group. Leave the 5th table ready as they will later go back to their processing group.

3. Whole class, conduct the final Knowledge Check for the Hydrology Chapter. This re-engages students with the content linked to healthy stream attributes from the previous day.

4. Remind them of our guiding questions (posted or projected).

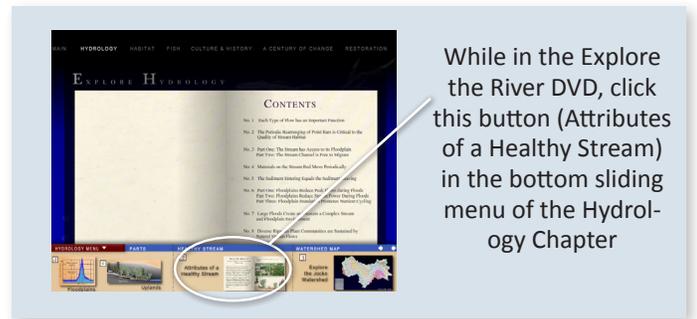
- What qualities or attributes of a stream allow it to retain these four qualities: cold, clean, connected, and complex?
- What changes negatively impact the stream, diminishing these four qualities?
- What strategies can we use to prevent deterioration of aquatic and riparian habitats?
- How can we restore aquatic and riparian habitats?

5. Tell them the next reading will help them answer the question:

- What changes negatively impact the stream and its aquatic and riparian habitat?

6. Remind them of the process you demonstrated for annotation on the previous day.

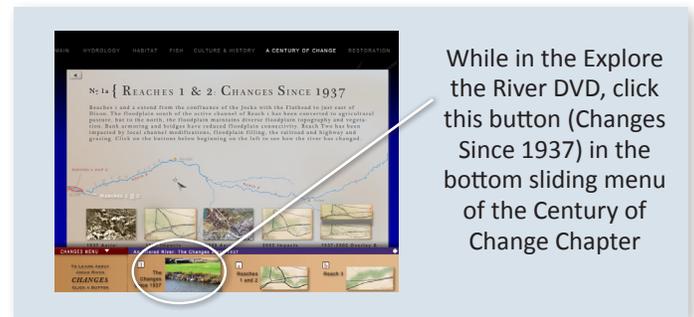
7. Take a longer or more complex passage (the section from Group 2 on whirling disease for example) and use it to model annotation and conduct a “think aloud” —directly demonstrating for students how to read science content and annotate the text.



While in the Explore the River DVD, click this button (Attributes of a Healthy Stream) in the bottom sliding menu of the Hydrology Chapter

8. Use a document camera and PC projector, or make an old-fashioned overhead transparency of the passage you wish to demonstrate with.
9. Work your way through a short section of the passage, reading in front of them highlighting important concepts or ideas, circling unknown words and underlining less familiar words that you think you understand in context.
10. Talk aloud about your thinking as you demonstrate.
11. When you are done, students are to do the same thing with their passages, reading silently and annotating as they progress through the passage.
12. Post or project these instructions on the board.
 - Highlight important concepts or ideas
 - Circle unknown words
 - Underline less familiar words that you think you understand in context
13. Group 4 has a mix of reading and interactive work on the DVD (a secondary source), situate them outside the classroom (a library or computer-lab setting) to avoid distraction. Their instructions, after reading and annotating the two short paragraphs assigned to them, are:

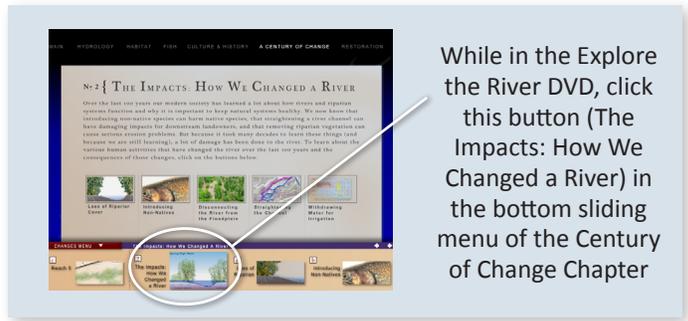
- Continue to study using DVD.
- Go to: A Century of Change > Changes Since 1937.
- As a group, examine the photos and overlays and read the descriptive pop ups connected to the features that you see.
- Look for evidence of channel straightening and irrigation impacts.
- Be prepared to share this section with the class as an expert team.



While in the Explore the River DVD, click this button (Changes Since 1937) in the bottom sliding menu of the Century of Change Chapter

14. Use a timer tool (you can download one from <http://www.online-stopwatch.com/>) and project to support students. Allow 10 to 15 minutes for this longer reading and annotation or study. Set for 10 and extend as necessary. Follow these rules for use of the timer.
 - Have one timer for talk (bomb-with-fuse graphic), and another for silent reading and writing (egg-timer graphic).
 - Teach students that when a specific timer is on the board, that is the only activity allowed in the room until after the timer goes off.
 - Never break your own rule!
 - If a student needs to leave the room, or pose a question during a silent-timer time, they need to write you a note.
 - If a group has a mix of reading and interactive discussion required by their assignment, locate them outside the classroom to avoid distraction.
 - If one person (teacher, aide, principal, or parent) is talking during the short reading/writing interval, then no one is actually reading. All are distracted and listening to talk.
 - Use timers to create urgency and intense short-term focus. You want them to have enough time (not a race) but barely enough.
15. Monitor your class, roving as they read, to assure they understand the annotation process.
16. Look for elements or strategies you see individuals employ that you might directly teach about later. For example, do any students write in the margins? If so, what are they saying? Are they arguing with the author or connecting a dot to something else? If you see a new strategy emerge, later teach it!
17. When they are done, have them discuss in their groups what they read.
18. Remind them to go back to the question and then back to the text to answer the question.
 - What changes negatively impact the stream and its aquatic and riparian habitat?

19. After about five minutes, tell the groups of go to a PC and explore the section assigned to them under A Century of Change > The Impacts, and select theirs from the bottom menu.
20. Now have groups review the material for their section, including the interactive graphics that support understanding of the change assigned to their group.
21. Ask students:
 - Was this how you imagined it?
 - Now do you understand the change and its impact on the river more clearly?
 - How does the image and graphic representation support your reading and understanding of the hydrological process?
22. Discuss whole group briefly to help them think about their thinking and reaction to the visual support. (Meta-cognition)
23. Allow about five to ten minutes for the groups to prepare a five minute informal presentation on the changes assigned to them using the DVD for visual support. They should have a bulleted list (scratch paper) of the key ideas they want the class to understand about their assigned change and its impact on the river.
24. Have groups present, following the order on the bottom menu under A Century of Change.
25. Have groups use the DVD for visual support, but avoid reading the text verbatim to their classmates (BORING!).
26. When all four groups have reported, place students back in their five processing groups, each at a table with chart paper, markers, and ideally a PC that will allow them to go back to the text.
27. This time, using the **red marker**, have the groups chart or summarize the changes negatively impacting the river. Layer this over the top of the **blue** attributes. They can capture this any way they wish. Drawings, keywords or phrases, in a web, etc. It is their choice as a group. The more detail they include, the better. Allow the remainder of the period for this processing - and additional time later if possible. (10 to 20 minutes)



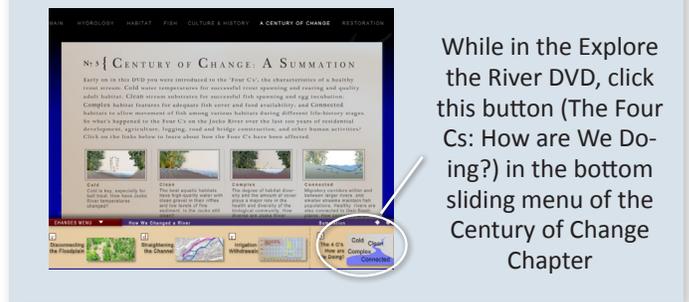
While in the Explore the River DVD, click this button (The Impacts: How We Changed a River) in the bottom sliding menu of the Century of Change Chapter

Day Three

1. Have students seated in their five processing groups with a computer, their processing or anchor chart, and three colored markers ready.
2. Play overview video both Part 1 and 2 to A Century of Change to re-engage students with the content.
3. After playing the 4 minute video, pass out [Reflection Form](#) (attached at the end of this unit) and allow students a few minutes to rate how they think the Jocko River habitat may have been impacted by the changes we studied so far.
4. Have them quickly share reflections at their tables.
5. Whole class, provide a five minute interactive lecture on the last segment Summation reviewing the current status of Cold, Clean, Connected and Complex for the Jocko River resulting from a century of change.

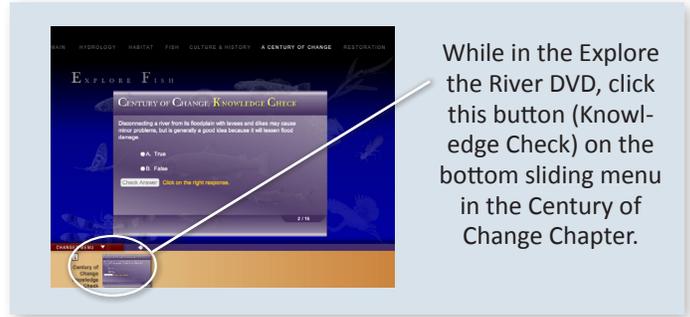


While in the Explore the River DVD, click this button on the opening page of the Century of Change Chapter



While in the Explore the River DVD, click this button (The Four Cs: How are We Doing?) in the bottom sliding menu of the Century of Change Chapter

6. Conduct Knowledge Check (whole group, individually or small group) on A Century of Change.
7. Remind students of our guiding questions (posted or projected).
 - What qualities or attributes of a stream allow it to retain these four qualities: cold, clean, connected, and complex?
 - What changes negatively impact the stream, diminishing these four qualities?
 - What strategies can we use to prevent deterioration of aquatic and riparian habitats?
 - How can we restore aquatic and riparian habitats?
8. Our next focus is:
 - What strategies can we use to prevent deterioration of aquatic and riparian habitats?



While in the Explore the River DVD, click this button (Knowledge Check) on the bottom sliding menu in the Century of Change Chapter.

9. Today we will use the Problem/Solution structure on the DVD to look specifically at passive tools that can help us improve aquatic and riparian habitat or prevent further damage.
10. Have one student per group act as “driver” and manage navigation on the DVD on the computer provided.

11. Go to Restoration > Passive Tool Box, and assign each of the groups to one of the following topics:



- Livestock
- Transportation
- Vegetation
- Water
- Other Uses

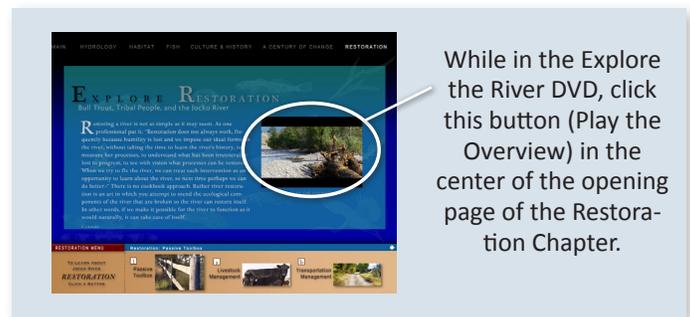


While in the Explore the River DVD, click this button (Passive Toolbox) on the bottom sliding menu in the Restoration Chapter.

12. Allow 15 minutes for the groups to study their assigned topic and organize a way to present on that topic to the rest of the class.
13. Place a talking timer on the board, and set for 15 minutes. Encourage lively discussion of what they find as they move through the tool box feature focusing on problems, solutions, and benefits.
14. At seven minutes (or less), remind them that they will be teaching this material in a presentation to the rest of the class. Be sure that all students have a role or a part in presenting the information.
15. Have groups present following the order on the bottom menu under Restoration.
16. Have groups use the DVD for visual support, but avoid reading the text verbatim to their classmates (BORING!).
17. Can they come up with any dramatic ways to get the information across to their classmates? Encourage divergent ideas and processes here.
18. When all five groups have reported, have them add their third layer to the processing charts.
19. This time, using the **green marker**, have the groups chart or summarize the passive tools to support a healthy river. Layer this over the top of the **blue attributes** and **red changes**. Again, they can capture this any way they wish. Drawings, keywords or phrases, in a web, etc. It is their choice as a group. The more detail they include, the better. Allow the remainder of the period for this processing—and additional time later if possible.

Day Four

1. View overview of Restoration section from DVD (about five minutes).



While in the Explore the River DVD, click this button (Play the Overview) in the center of the opening page of the Restoration Chapter.

- Conduct interactive lecture on the active tools whole group, using the DVD.
- Move through each of the four Active Tools using the DVD to support instruction.
 - Channel Realignment and Shaping
 - Bank-Stabilization Structures
 - Grade-Control Structures
 - Floodplain/Riparian Restoration Techniques
- Pause briefly after the introduction of the problem section on each tool and ask students in their groups to process or hypothesize possible solutions and potential benefits. Allow about four minutes for students to discuss before moving on to the solution and then benefit for the use of the tool.
- Once done, allow students to rotate through computers (or use a lab setting) in order to explore the sections on the Restoration Team and also experience the Restore a Stream simulation.
- Once all students have had a chance to explore, conduct the Knowledge Check on Restoration section in their small groups, allowing discussion and the use of their processing charts.



While in the Explore the River DVD, click this button (Restore a River) on the bottom sliding menu in the Restoration Chapter.

While in the Explore the River DVD, click this button (Knowledge Check) on the bottom sliding menu in the Restoration Chapter.

Extension

- Visit a restoration site if there is one near your school.
- Throughout this study and then beyond, as you encounter images of fish, require students to look closely and identify the species. This type of close identification is important and under-taught, leaving large numbers of students without the skills to properly tell a lake trout from a bull trout, or worse, a sucker from a salmonid!
- The narratives used on the DVD and provided here as PDF files and in the resources section of the DVD are ideal models of various text structures. Text structures, and student awareness of them, are key to deeper comprehension. Identification of text structures is a skill represented many times on the Montana Criterion Referenced Test. Consider identifying ideal content rich passages from these materials that represent the following structures, and directly teaching the structures in the context of this content. In this way, you are able to “kill two birds, with one stone” adding instructional benefit and saving time.
 - Compare/Contrast,
 - Cause/Effect,
 - Problem/Solution (and benefit),
 - Question/Answer, and
 - Chronological (from the historical narratives)

CAREERS IN HYDROLOGY, BIOLOGY AND NATURAL RESOURCE CONSERVATION

The section on the restoration team has special importance informing and motivating students to consider careers in these fields. This is an area where you may encourage students to review each team member audio on the DVD, check out college and career awareness websites looking at the educational requirements for these careers, and even visiting with individuals in careers in this field

Assessment

- 4 C's Quick Write

- Short written summary of passage
- Student match of passage to posted summary
- Reflection form on How are we doing?
- Anchor or processing chart created by group
- Pair-share discussions
- Direct observation of group discussions
- Annotations (highlighter, circle, and underlining) on reading passages
- Three different partner and small-group reports
- Knowledge Checks for Hydrology, A Century of Change, and Restoration Sections of DVD

Adaptations

The following adaptations are designed to support your efforts to meet the needs of every learner. Grade levels here are only a suggestion and would not preclude use of a great 3rd-grade strategy with a 9th grader or vice versa.

Grades 4-6 (or students at any level who need more support)

The critical task of intermediate students is the development of strong content area reading skills and continued development of critical literacy. To achieve this with complex content, many students will require modeling, demonstration, and temporary supports. The following procedural options could help you more closely meet the needs of younger students.

1. Model and conduct think-aloud protocols, sharing with students how you process information in complex texts.
2. For younger students, locate materials at lower reading levels and resources like *Bull Trout's Gift*, which blend informative text with an accessible story line and strong visual supports. These help students comprehend.
3. Limit some more complex or technical texts, for example, you may decide to hold back the article on whirling disease to address whole class.

Grades 9-12 (or students at any level who require greater challenge)

Older or more advanced students should be given more responsibility and should be required to read material from the field, much like the professionals who work within that field.

1. Add more complex text to the readings by having students address the articles, technical reports, and presentations from the resources section of the DVD. A challenging one for advanced readers is the article by Trush, McBain, and Leopold on *Attributes of an Alluvial River and Their Relation to Water Policy and Management*. (There is a link to this paper in the Resources section of the DVD (see the bottom menu of the opening page). The article is the last on the list of the Resources.) This is the type of reading students need to do more often to be highly prepared for college level study.
2. Have older students write a research or position paper on restoration efforts in their area. In a position paper they must argue authoritatively for or against such action, citing quality sources. In a research paper, they report the facts, again, citing appropriate sources. Any time writing is required, higher-order thinking skills are employed. Students should write every day from Kindergarten through 12th grade in a variety of contexts. It is the essential skill linked to college retention and success.

References

Confederated Salish and Kootenai Tribes. (2011). *Bull Trout's Gift*. Lincoln, NE: University of Nebraska Press.

Confederated Salish & Kootenai Tribes. (2011). *Explore the River: Bull Trout, Tribal People, and the Jocko River*. (An Interactive Educational DVD). Pablo, MT: Confederated Salish and Kootenai Tribes.

Confederated Salish and Kootenai Tribes. (2011). *Snoqeymintn/Field Journal*. Lincoln, NE: University of Nebraska Press.

Attributes of a Healthy Stream

Make two to three copies of the following 11 passages (depending on class size). Students will each have one and will have a partner with the same for processing. Print each set on different color paper and cut apart on lines.

At least four types of flows are necessary to support the proper functioning of a stream system: baseflow, bankfull, riparian flow, and floodplain flow. These flows affect conditions in the channel, the channel's shape, streambank vegetation, and the character of the floodplain, respectively. All four also affect fish habitat in important ways. Bottom line: all four flows are absolutely key to sustaining a healthy stream.

- Baseflow is generally the lowest flow and usually occurs during the summer months. It maintains some water in critical habitat units, keeping riffles wet and pools inundated.
- The bankfull flow is the maximum flow within a channel before water spills on to the floodplain. It provides the stream power to transport sediment and maintain high-quality spawning gravels.
- Riparian flow refers to high flows that access parts of the active floodplain every few years. Riparian flow affects overhanging bank cover and the availability of large wood in the stream, which makes for complex, quality habitat.
- Floodplain flows are major flooding events that occur every 25 to 100 years. Although infrequent, they determine the architecture of the floodplain and the connection between the floodplain and active channel.

Point bars are sand and gravel deposits that form at the inside of a bend or meander in a stream, opposite a pool. The combination of point bar and pool repeats itself many times on a stream in one meander after another. Because of that, point bar and pool are said to form the fundamental building blocks of a healthy stream.

The development and rearrangement of point bars is important to the revitalization of riparian plant communities. Major floods are responsible for rearranging point bars, and when they do, they not only create diverse, high-quality riparian habitats, they also improve aquatic habitats for fish and aquatic insects. Periodic flood disturbances are essential to a properly functioning stream.

Access to the floodplain means a stream is connected to its floodplain. This is one of the most important requirements for a healthy stream. In situations where this connection has been lost, the stream channel becomes *incised* (deepens to a level well below the level of the floodplain).

When floods are no longer able to expand onto the floodplain, streams focus their power and erosive energy on bank margins, disrupting the balance between water yield and sediment load that characterizes a stable stream.

Streams are affected by the loss of connection because pools fill in, banks become unstable, and the stream begins an alternating pattern of incision (downcutting) and channel braiding.

Floodplains are affected because they dry out and are no longer scoured by periodic floods. One of the Tribes' key restoration strategies on the Jocko River is to raise the river by adding fill or moving the channel to pre-disturbance locations, where it can access its floodplain.

- In a stable, healthy channel that is connected to the floodplain, floods have access to the floodplain and the channel is free to migrate.
- In an incised channel (one that has deepened below the level of the floodplain), floods cannot expand onto the floodplain.

As streams migrate, the channel erodes older floodplain deposits on the outside bend and deposits sediments on the bar on the inside bend.

Channel migration is one of the most important processes creating habitats for plants and animals, including fish and aquatic insects. That the stream has occupied numerous locations in its valley is evidenced by direct observations of its movement over time and by looking at aerial photos where old meanders are often clearly evident.

Typically, channels do not migrate during periods of low flow. Rather they move across the floodplain when flows approach and exceed bankfull discharge.

As streamflows rise in the spring during peak snowmelt, often the flows move sand, gravel, cobbles and even larger rocks on the streambed. Sands move at lower flows than gravels, and gravels at lower flows than cobbles, and so on. Also, materials in some parts of the stream move before similar-sized materials in other parts of the stream. Gravels in pool tails, for example, move at lower flows than gravels in riffles.

In general streambed materials move many times a year, but in some years they may not move at all. On average, the streambed is mobilized about once a year.

The periodic mobilization of the streambed is vital to the proper functioning of a stream.

- At base flow there is little or no movement of streambed materials.
 - At 30 to 40 percent of bankfull flow, the sand stored in pools begins to move downstream.
 - At 75 to 85 percent of bankfull flow, the gravels in pool tails begin to move downstream.
 - At bankfull flows, the gravels in riffles begin to move downstream. At higher flows, still larger materials move.
-

Over many years, the amount and size of sediment moving into a stream equals the amount and size of sediment moving out. Periodic flood flows are critical to maintaining this balance.

When the balance is upset, the stream either erodes or begins filling in, depending on which way the scales are tipped.

Chronic channel erosion (or degradation) indicates either that (1) less sediment is coming in than is leaving or (2) the sediment size has decreased.

Chronic stream filling (a process called aggradation) indicates either that (1) more sediment is coming in than is leaving or (2) the sediment size has increased.

- When more sediment enters a stream than is leaving it, the stream responds by filling in.
 - When less sediment enters, the stream erodes.
 - When sediment size increases, the stream responds by filling in.
 - When sediment size decreases, the stream erodes.
-

Naturally vegetated riparian areas serve a number of beneficial functions for flood control. An undeveloped, vegetated floodplain reduces the force, height, and volume of floodwaters by allowing them to spread out horizontally and relatively harmlessly across the floodplain. Water that floods into vegetated floodplains reenters the main channel slowly, enabling it to be soaked up by the “sponge” of the floodplain.

Riparian vegetation also intercepts and holds runoff from adjacent upland areas that would otherwise flow directly into rivers and exacerbate flooding conditions downstream. The root systems of streamside forest and emergent aquatic vegetation keep pores of the soil open so that two to three times more water can infiltrate the soil compared to lands used for cultivation or grazing.

In addition, trees, shrubs and herbaceous plants in riparian areas use large amounts of water in transpiration, which, in effect, transfers floodwaters to the atmosphere. Several thousand gallons per acre of water are used by plants each day, thereby drying the soil and making more room in the “soil sponge” for floodwater.

The combined effect of all of these functions is a significant reduction in peak flows and flooding downstream. Naturally vegetated riparian forests thus help prevent thousands of dollars in property damage and obviate the need for human-made flood control measures and structures.

Maintaining or reestablishing vegetation in riparian areas increases the water-holding capacity of soil, which helps to recharge groundwater supplies. The slowing and dispersal of runoff and floodwater by floodplain vegetation allows additional time for this water to infiltrate and recharge groundwater aquifers.

Floodplain soils and vegetation can also help to purify the water as it filters down to the aquifer. Once there, the clean groundwater can reemerge and seep back into surface water during the drier months and help reduce the frequency and duration of low streamflows and higher water temperatures.

The floodplain soaks up floodwater like a sponge. Later in the year when flows in the stream channel are low, that stored water slowly flows into the channel, providing cold, clear water when it is most needed by people, fish, and other organisms.

Undeveloped, vegetated floodplains reduce the force of floodwaters by allowing them to spread out horizontally and relatively harmlessly across a relatively rough floodplain surface. Some of that roughness comes from living, decaying, and dead vegetation that provides numerous barriers against moving water. Adding to the roughness is floodplain topography, which includes lots of rises and depressions that also slow the flow of water so it is not delivered downstream as quickly or with as much force.

The conversion of streamside forests to agricultural land for grazing or crop production harms the floodplain’s ability to reduce the force of floodwaters. Removing streamside forests also results in an increase in soil compaction and a reduction in soil porosity. All these impacts combine to cause a significant decrease in infiltration and a corresponding increase in the speed and amount of flood runoff, which means an increase in flooding and storm damage downstream and greater risk of serious damage to the stream itself as well as lives and property.

Rivers play a major role in shaping the landscape and creating habitat for flora and fauna. Habitat along rivers and streams is as rich and diverse as anywhere. Much of that richness is from the sediment deposited by floodwaters as they spread across the floodplain.

As water covers the floodplain, flow velocity decreases, and sediment begins to settle out. After the flood, a fresh accumulation of fine sands and silts are left behind on the floodplain. These deposits are nutrient rich and promote the regeneration and growth of riparian vegetation.

All the various flows—base, bankfull, riparian, and floodplain flows—are necessary to create and maintain diverse riparian plant communities.

Riparian plant communities along the Jocko River are adapted to constantly changing flows. They develop over time as a direct result of flooding disturbances and are closely linked to and dependent on river channel processes.

Floods, for example, scour point bars, cause the channel to migrate, and inundate and scour the floodplain, all of which create the conditions necessary for an array of different plant communities.

Complex in terms of physical structure and plant-species richness, forested riparian areas provide shade, contribute large wood to the stream channel, and provide habitat for mammals, birds, amphibians, and fish (up to 75% of Montana's vertebrate species depend on or utilize riparian areas).

Natural stream flows, including baseflows, bankfull, riparian, and floodplain flows, create and sustain diverse riparian plant communities.

Large floods—those that occur at intervals of greater than 10 or 20 years—reshape and/or redirect meanders, move the main-stem channel, rejuvenate riparian stands, form and maintain side channels, scour floodplains, and maintain off-channel wetlands.

Floodplains are wetted almost every spring, but once every 10 to 20 years or so on average, flows are great enough to scour the floodplain. These infrequent large floods are critical for sustaining the complexity of the channel because they change the location and shape of the river on a large scale.

Cut statements apart and post on walls around your classroom.

Each type of flow has an important function.

The periodic rearranging of point bars is critical to the quality of stream habitat.

The stream has access to its floodplain.

The stream channel is free to migrate.

Materials on the stream bed move periodically.

Sediment entering equals sediment leaving.

Floodplains reduce peak flows during floods.

Floodplains reduce stream power during floods.

Floodplain inundation promotes nutrient cycling.

Large floods create and sustain a complex stream and floodplain environment.

Diverse riparian plant communities are sustained by natural stream flows.

How We Changed a River: [Group 1] 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).

How We Changed a River: [Group 2] 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.

How We Changed a River: Disconnecting the River and the Floodplain

[Group 3]

Lower and Warmer Summer Flows

Connected to the Floodplain

More Stable and Cooler Flows

Each spring, snows melt and stream flows rise. Often that water flows onto the floodplain where much of it is soaked up like a sponge.

Later in the year, in summer and fall when flows in the stream channel are low and warmer, that stored water slowly flows back into the channel, providing clean, cold water when it is most needed by people, fish, and other organisms.

Returning groundwater can moderate stream temperatures enough to make the stream habitable for many cold-water species.

Not Connected to the Floodplain

Warmer, Lower, Less Stable Flows

In a stream confined by dikes and levies or otherwise channelized, the high flows in the spring don't reach the floodplain. As a consequence, the floodplain does not get recharged with water. Then later in the summer, the floodplain has nothing to return to the river. The consequences are serious:

- Lower stream flows in the summer and fall, a critical time for fish and aquatic insects.
- Warmer water temperatures because the floodplain is not returning cool groundwater to the stream. Bull trout and other aquatic species need cold water.

Less Stable, Less Complex Stream

Connected to the Floodplain

More Stable Channel, More Complex Stream

When a river is connected to its floodplain, high flows in the spring spread out over the floodplain and the water slows. Consequently, there is less channel erosion than if the stream is confined and focuses all of its power and erosive energy on bank margins.

Rivers that are connected to the floodplain are also more complex, which is better for fish and wildlife. That's because as a river overflows its banks and expands onto the floodplain, it rejuvenates riparian stands, forms and maintains side channels, scours floodplains, develops and rearranges point bars, and maintains off-channel wetlands.

Not Connected to the Floodplain

Less Stable Channel, Less Complex Stream

A section of the Jocko River has been channelized and forced against the hillslopes along the National Bison Range. Here, the river no longer has access to its floodplain and has formed a very simplified channel.

A common result of diking, levees, and channelization is a reduction in the stream channel's length and a corresponding increase in the steepness or gradient of the channel. This focuses the stream's energy and causes it to downcut, which leads to channel incision (the process by which a stream erodes its bed downward below the surrounding ground), which causes further isolation from the floodplain.

Less Nutrient Cycling

Connected to the Floodplain

More Nutrient Cycling, More Productive Floodplains

Floodplain flows are a natural phenomenon that cycles water, nutrients, and sediment through river systems. They scour away organic materials that accumulate on river bottoms and deposit sediment onto streambanks, encouraging growth of riparian vegetation.

Wetting of floodplain soil releases an immediate flush of nutrients: those left over from the last flood, and those that result from the rapid decomposition of organic matter that has accumulated since then. Microscopic organisms thrive and larger species like insects enter a rapid breeding cycle. Opportunistic feeders like birds move in to take advantage. The surge of new growth endures for some time, which makes floodplains particularly valuable for fish and wildlife.

Not Connected to the Floodplain

Less Nutrient Cycling, Less Productive Floodplain

Floodplain habitats provide some of the most important wildlife habitat in the Northern Rockies. For example, they support the highest diversity of breeding birds of any habitats in the western US. But when a floodplain is disconnected from its river, high spring flows are no longer able to spread across it, depositing a layer of nutrient-rich sediments. The floodplain becomes much less productive, which means it is much less valuable to wildlife. Bottom line: disconnecting a river from its floodplain degrades the most important wildlife habitats we have. Protect riparian habitats and you protect fish and wildlife.

Greater Flood Damage

Without a Connection to the Floodplain there is Often Greater Flood Damage

When flood water is able to access the floodplain, it affects the velocity, depth, and slope of the flood flow. Trees, shrubs, and grasses dramatically slow the water and reduce its power. Loss of floodplain access and function can lead to greater stream power and erosion during floods, which usually results in more damage.

Because of human-caused changes on the Jocko River, even moderate to mild floods, like the one in 1997, have led to significant bank erosion, channel incision, and continued stream-channel instability.

How We Changed a River: Straightening the Channel and Irrigation

[Group 4]

Channel Straightening Damage

Channel straightening replaces a winding stream with a shorter, straighter stream. The new channel has a steeper slope because water makes the same elevation drop over a shorter distance. After straightening, the stream adjusts. Water begins to flow faster, causing increased scour of the streambed and increased bank erosion. As erosion continues, increasing amounts of soil are deposited downstream, and streamside landowners are faced with more problems.

Channel straightening is also costly. Besides the immediate environmental damage due to the loss of fish and wildlife habitat, there are long-term adverse impacts such as damage to the downstream channel, increased water temperature from loss of shading, increased turbidity, increased erosion, and more difficult fish migration due to increased water speeds.

Irrigation Withdrawals

The amount of water flowing in a stream and the timing of flows are key factors that define the character of floodplain riparian areas and the stream channel. In the lower Jocko, irrigation diversions have reduced channel-maintenance flows (flows that maintain the channel) by as much as 50 percent from what they were historically. The reduction is higher in dry years and lower during wet years due to demands for irrigation water.

The river has responded to this overall reduction in peak flows by decreasing the amount of water the channel can convey and the amount of sediment the river can transport. This, coupled with artificial straightening and bank hardening, has increased stream energy in some reaches of the river, which has resulted in accelerated bank erosion, localized sediment deposition, and the formation of braided channels. Other impacts of reduced flows are warmer water and less hospitable habitats for fish.

Group Four continues study using DVD. Go to: A Century of Change > An Altered River: Changes Since 1937. As a group, examine the photos and overlays and read the descriptive pop ups connected to the features that you see. Look for evidence of channel straightening and irrigation impacts. Be prepared to share this section with the class as an expert team.



While in the Explore the River DVD, click this button (Changes Since 1937) in the bottom sliding menu of the A Century of Change chapter.

Reflection Form for Day Three (Print, cut apart, provide one for each student.)

Name: _____

| Habitat Indicator | Rating (5 = Good, 1 = Bad) | | | | | | Why? What do you think has changed resulting in good or bad habitat for bull trout and other native species in the Jocko? |
|-------------------|-------------------------------|----------|----------|----------|----------|---------------------|---|
| Clean | 5 | 4 | 3 | 2 | 1 | Dirty | |
| Cold | 5 | 4 | 3 | 2 | 1 | Warm | |
| Complex | 5 | 4 | 3 | 2 | 1 | Simple | |
| Connected | 5 | 4 | 3 | 2 | 1 | Disconnected | |

Name: _____

| Habitat Indicator | Rating (5 = Good, 1 = Bad) | | | | | | Why? What do you think has changed resulting in good or bad habitat for bull trout and other native species in the Jocko? |
|-------------------|-------------------------------|----------|----------|----------|----------|---------------------|---|
| Clean | 5 | 4 | 3 | 2 | 1 | Dirty | |
| Cold | 5 | 4 | 3 | 2 | 1 | Warm | |
| Complex | 5 | 4 | 3 | 2 | 1 | Simple | |
| Connected | 5 | 4 | 3 | 2 | 1 | Disconnected | |



A stream with complex habitat has pools, riffles, runs, glides; lots of shade and undercut banks; lots of woody debris; groundwater upwellings; and quiet water.

Each stream organism, in turn, has its own set of preferences for those habitats—select any habitat in a stream, and there will be a distinct group of insects and fish adapted to it, all interacting with each other in complex and fascinating ways. The combination of high-quality, complex stream habitats and intact biological communities is what we call a healthy stream.

A PLACE FOR EVERYONE

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A Place for Everyone



Cultural Values: Observation, Relatedness, Cooperation, Reciprocity, Humor, Good Cheer, Responsibility

Rationale

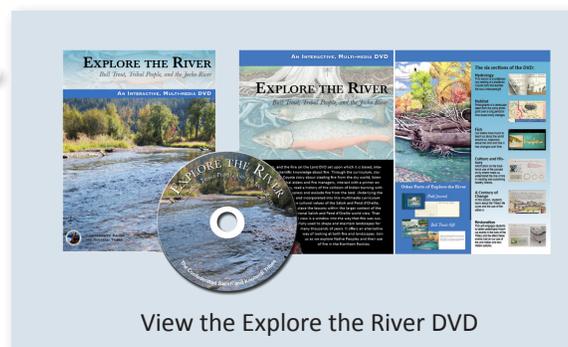
Elders teach us to avoid wasting and misusing water and to treat plants and animals respectfully. They teach us to take only what we need and when we do take, to give something of equal or greater value in return. They teach us that all aspects of aquatic and riparian habitats are interrelated, that every plant and animal has a role to play and each affects how the river functions. This lesson is a scenario game that allows students to practice what they have learned about habitats, fish, human impacts, and restoration by taking on the role of an animal or plant and responding to changes that affect that organism's habitat.

Learning Targets

- I think critically.
- I work cooperatively as part of my class.
- I know five habitats that contribute to stream complexity.
- I place river habitats in the order in which they occur most often.
- I know different plants and animals use different habitats, and that the habitats they use change as they move through their different life stages.
- I predict the impacts of certain events on the quality of river habitats.
- I determine positive and negative consequences of various events.
- I understand and respond in my plant or animal role, as part of a chain reaction resulting from a change.
- I apply my knowledge of hydrology, habitats, impacts and passive and active restoration efforts.

Resources

- Explore the River DVD
- Field Journal for Explore the River Project (or blank book, composition book and/or small sketch pad), 1 per student
- Computer with DVD player
- PC projector
- Computer lab setting for student research on roles
- Set of [Identity Game Cards](#), printed on card stock and cut apart



- Set of [Scenario Game Cards](#), printed on card stock and cut apart
- [Aquatic Habitat Signs](#) (pool, glide, riffle, run and quiet water)
- [Aquatic Habitat Description Signs](#) (pool, glide, riffle, run and quiet water)
- [Aquatic Habitat Label and Description Cards](#) (print 5 sets on card stock, cut to create cards)
- Tape

Instructional Techniques

Independent research, group matching and sorting activity, scenario game

Time Frame

One to two 50-minute class periods; time required may vary based on age, grade level, and the teacher's choices to support cross-curricular goals.

1st period: Assign identity roles, conduct research using DVD in computer lab setting, play matching/sorting game in small groups, review aquatic habitat, post signs creating five of the complex stream habitats, students go to zone or habitat area based on identity role, draw scenarios, debrief (respond to) scenario (each based on role), repeat asking guiding questions to support critical thinking and correct misconceptions throughout

2nd period: Start or continue scenario game, at close select one scenario for student quick write—an obituary or autobiography of what happened to their identity role resulting from the change

Suggested Grade Levels

Grades 3-12

The procedures below target students in grades 4 through 8. However, with suggested [adaptations](#), these may be useful for grades from 3 to 12.

Procedures

Day One

1. Pass out [Identity Cards](#) (one per student).
2. Using a computer lab setting or library, conduct research using the Explore the River DVD.
3. Students need to know the following:
 - In what habitat area does their assigned identity live?
 - Does it relocate to other areas at different life stages?
 - What does it eat?
 - What eats it?
 - What is it sensitive too, for example: pollution, silt, temperature changes, turbulent waters, oxygen levels, streamflow conditions?
4. Allow students approximately 30 minutes to research their identity, take detailed notes regarding the above, and briefly review the 4 C's under Habitat and also under A Century of Change.



While in the Explore the River DVD, click this button (The 4 Cs of Good Trout Habitat) in the bottom sliding menu of the Habitat Chapter

While in the Explore the River DVD, click this button (The 4 Cs: How are We Doing?) in the bottom sliding menu of the Century of Change Chapter

5. Tell them the more wisely they use their time reviewing material on the DVD, the better they will do in the scenario game.
6. Use a timer tool to keep them focused and gathering or reviewing information as quickly as possible.
7. Return to classroom (if lab is separate.)
8. Have students leave their notebooks open for your review on their desks as you rove the room. You are looking for the above key questions and details, at a glance, the more ink on the page, the better.
9. As you rove, also check for understanding by calling randomly on a few students to report what they learned about their assumed identity.
10. Have students sit in five groups.
11. Pass out [small habitat labels](#) and [definitions cards](#), one set per group. Be sure these are mixed up prior to passing them out.
12. Have groups lay the cards out on the table, matching the label to its definition.
13. Rove among groups, listening as they deliberate and looking to assure the matches are correct.
14. Once they all have the matches correct, have each group place these in the order in which they would find these elements in the stream, beginning randomly with “pools.”
15. Again, rove among groups, checking for understanding and looking at their ordering.
16. Students will quickly discover that “Quiet Waters” fail to actually fit the pattern, as they can occur in various parts of the stream.
17. Have them place the “Quiet Waters” cards above glides, riffles or runs.
18. It should look something like this:

Quiet Waters

Pool > Glide > Riffle > Run

19. Have students hold up four fingers, wiggling each as the class repeats this pattern:

Pool > Glide > Riffle > Run > Pool > Glide > Riffle > Run > Pool > Glide > Riffle > Run

20. Pass out a label sign to each group.
21. Have the group move to a table where you have located the sign definitions.
22. Have them match their sign label to its definition and with the others groups, reconstruct the **Pool > Glide > Riffle > Run** plus **Quiet Waters** pattern in a large circle using all four classroom walls.
23. If you have a quiet hall where the game won't disturb other classes, you can use it and the linear space for this purpose as it helps to visualize the river as a line and not a circle.
24. The posted signs represent five elements or zones of complex stream habitats.
25. Now, have students pin their identities on the front of their shirts so others know who they are.
26. Tell students now to mingle for a minute to figure out who wants to eat them, and who or what they want to eat. (The adult trout are now thinking the juveniles look delicious, and the juveniles are eyeing fly nymphs and larvae, etc.)

USING GAMES FOR LEARNING

The scenario and matching or concentration games used here are easy to create to reinforce content knowledge or practice critical thinking skills around any important topic. The key is you need to move beyond simple definition matching and rote learning. Create scenarios with complex information, and then use questioning strategies as the facilitator. If you employ this technique often, you can eventually have students write the scenarios for each other—getting even more instructional benefit. Note that all students answer or respond to all scenarios all the time. No one should be “waiting” for their turn. Students will love the social aspects of these activities and learning then becomes painless!

27. Create a common signal for silence. Tell them failure to follow the signal will result in suspending the simulation or game.
28. Give students the following directions:
 - In a minute, you will go to your preferred habitat.
 - If your preferred habitat is occupied by one that would like to eat you, you may have to “swim” on the margins of that habitat, or move to your second favorite.
 - One of us will draw a scenario card, read it aloud, then for the next 60 seconds we will each think about the impact of that scenario on our identity or role. After that, we will report out.
29. Model the debriefing as you draw different scenarios, asking students guiding questions to support their thinking. For example:
 - “Now, what happens?”
 - “What would _____ (the stream bank, water clarity, gravelly bottom, etc.) look like?”
 - “Would that be good _____ (pasture, riparian cover, etc.)?”
 - “Is the stream more or less cold, clean, complex, or connected?”
 - “How does that impact you?”
30. Model on several scenarios, debriefing (responding to) each scenario (each student based on his or her role), asking guiding questions to support critical thinking and correct misconceptions throughout.
31. After they all have the idea, try the following variations.
32. Shake it up, allowing different ways for the students to show what they know, for example:
 - Charades or Silent Movie
 - Super Quick Writes (use clipboards and scratch paper for them to jot the story of what happened as a result of the scenario)
 - Stand-and-deliver reporting out (can be combined with quick writes above, write 1st, talk 2nd)
 - Acting out (can you picture the bull trout eating the young rainbow here?)
 - Drawing (if white boards are near this is easy)
 - Single-word or phrase response on small portable white boards

CLASSROOM MANAGEMENT AND SILENCE

Raising your hand and requiring each student as they see it to stop talking and raise their hands tends to work well without using noise or a vocal command. Noises and vocal commands tend to escalate the noise level, particularly as they get excited. Establish that this is an absolute requirement. Failure of students to cooperate respectfully must end the game. Maintain this expectation consistently and reward their fantastic responsive behavior with deeply intrinsically motivating and social learning activities. Tolerate the sounds of excited learning.

Day Two

1. Start or continue the scenario game following all the instructions above.
2. If you had enough time the previous day to work through four or five scenarios, now is a good time to have them shift roles.
3. To accomplish this, have them take their notes from their research on their role or identity, wrinkle into a loose ball and toss to the center of the room.
4. Have each student pick up a piece of paper randomly tossed by another.
5. Now, have them review the notes made by their classmate about their identity.
6. Have them seek each other out, getting identity cards, pinning on their shirts, and then asking questions that they may have about that creature or seeking points of clarification from the original owner of that identity.
7. Start the scenario game again, once again trying different variations for students to show what they think would occur as a result. Some are dramatic, others not at all.
8. If students have new identities, allow the previous owner to help out in the first scenarios.
9. Finally, allow the final 15 minutes of class time for the students to write.

10. Select a dynamic scenario for student quick write.
11. Have students write an obituary or autobiography, telling what happened to their identity role resulting from the change.
12. Use the protocol for quick writes:
 - Set writing timer for 10 to 15 minutes.
 - Write quickly and do not stop.
 - Don't worry about spelling or grammar as you get your ideas down.
 - Tell the story as you think it will unfold, based on what you know now about your identity.
 - Go! Create urgency.
 - Pair share or have random students or volunteers report out when done.
13. Collect writing to examine in a final check for understanding.

Extension

1. Use the game pieces to create an old fashioned game of concentration.
 - Print the habitat labels and definitions in smaller format on card stock.
 - Place upside down in a grid pattern on the playing surface.
 - Place identity cards (you could exclude non-natives) face up on a nearby table or surface.
 - Students take turns turning two cards at a time, trying to match the label to its definition.
 - Once they have a match, they must go to the area with the identity cards and determine at least two animals (vertebrates), insects, or plants that frequent that part of the stream.
 - When they have done this successfully, they win the pair and can go on for another turn.
2. Conduct a simple sorting activity with the scenario cards. Have students sort based on good or bad consequences for the river.

Assessment

- Matching aquatic habitat to its definition.
- Correct sequence of habitats (excluding quiet waters) based on where they occur related to each other (pool, glide, riffle, run, pool, glide riffle, run)
- Placement of identity in the correct or preferred habitat
- Response to scenarios (dies, thrives, eats, spawns) (could include quick writes!)
- Direct observation of discussion and deliberation

Adaptations

The following adaptations are designed to support your efforts to meet the needs of every learner. Grade levels here are only a suggestion and would not preclude use of a great 3rd-grade strategy with a 9th grader or vice versa.

Grades 4-6 (or students at any level who need more support)

The critical task of intermediate students is the development of strong content area reading skills and continued development of critical literacy. To achieve this with complex content, many students will require modeling, demonstration and temporary supports. The following procedural options could help you more closely meet the needs of younger students.

1. Create two of each identity card and have students work together in pairs.
2. Play the game first having students take on the identity of the plant, animal, or insect they studied and reported on in the [Role in the Community](#) lesson.
3. Narrow the number of identities.

Grades 9-12 (or students at any level who require greater challenge)

Older or more advanced students should be given more responsibility and should be required to:

1. Have older students develop their own scenarios.
2. Older students should nearly always be engaged in a “quick write” (1 minute reply) for each scenario card drawn, answering the question, “What would happen to (identity), if (scenario)? And why?”
3. Have students learn to debrief each scenario and quickly “stand and deliver” reporting on status orally after the conditions of the scenario are understood.
4. Always increase individual responsibility (gradual release of responsibility.)

References

Confederated Salish and Kootenai Tribes. (2011). *Bull Trout's Gift*. Lincoln, NE: University of Nebraska Press.

Confederated Salish & Kootenai Tribes. (2011). *Explore the River: Bull Trout, Tribal People, and the Jocko River*. (An Interactive Educational DVD). Pablo, MT: Confederated Salish and Kootenai Tribes.

Confederated Salish and Kootenai Tribes. (2011). *Snoqeymintn/Field Journal*. Lincoln, NE: University of Nebraska Press.

Cut on dotted lines creating game cards.**Scenarios****Page 1 of 2**

Jennifer catches seven trout. She releases 3 cutthroat and 1 bull trout. She keeps, cleans and cooks the 2 rainbows and 1 brook trout.

A heavy mining operation starts in the uplands.

New roads are constructed along the stream channel.

A fifty-year flood transforms the stream channel.

Bob and Sam construct a dam, making a swimming hole in the center of the sunniest part of the stream.

Several older cottonwoods fall across the stream during a spring flood.

Mr. Jones has a herd of 171 cows that get their water from the banks of the Jocko River without fencing or alternative sources.

The local dump hosts “hazardous waste days” collecting more than a thousand gallons of paints, solvents, lawn chemicals, and pesticides that will now be properly disposed of.

Bobby loves riding his ATV. On hot summer days he frequents the river bottom and often crosses the stream during low-flow in a stretch of open riffle.

Barbra’s view of the mountains is obstructed by tall black cottonwoods, ponderosa pine trees and other riparian vegetation. She decides to have them taken down to improve the view.

Chris loves to fish. He regularly goes to a variety of “blue ribbon” trout streams, and fishes for hours in his waders, working his fly rod. His wet gear just stays in his truck, so anytime he sees a nice spot, he can stop and fish.

Tracy cleans his fish in the field, dropping the entrails back in the stream.

Cut on dotted lines creating game cards.

Scenarios

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Jim is building a new house along the river. Worried about infrequent high water, he builds a levee just upstream and adjacent to his new house, barn, and outbuildings.

The water temperatures regularly exceed 58° Fahrenheit and for prolonged periods are in the low 60s during the month of July.

Two additional miles of concrete irrigation channel are being constructed to serve a cluster of smaller homesteads.

The Smith family has been in the cattle business for generations. They maintain salt and rubbing posts far from the stream that crosses their land and have installed fencing and, in some places, watering tanks to accommodate their herd.

A new dam is under construction as a solution to irrigation and power needs for a growing population on the valley bottom.

A private land owner with more than 1,000 acres is making a significant effort to remove small dams and levees on her property.

A development of new homesites will add 20 family homes to the valley. Two bridges, culverts and various access roads are being carefully planned.

Glen wants to put a new barn on the lower 40 acres of his small ranch. He will need a road to access it. He has his own backhoe and a small Bobcat, so he just follows the existing trail along the stream—widening it a bit for his truck.

New timber harvesting practices, which include logging in certain areas only during winter months, have diminished some disruption to the native ground cover and erosion from skidding operations.

Miles of new logging roads have been punched into the forested uplands above the Jocko River. Clearcut operations are ongoing.

Jay catches a bunch of nice rainbows and brooks in the Blackfoot. Rather than kill and clean them in the field, he puts them live in his cooler. If he runs out of time, he can then just release them in the stream near his home.

Decades ago, a landowner built a system of levees and dikes to stop flooding.

Cut on dotted lines creating game cards.

Identity

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Adult Bull Trout

Juvenile Bull Trout

**Adult
Westslope Cutthroat
Trout**

**Fry
Westslope Cutthroat
Trout**

**Mayfly Nymph
(burrower)**

Whitefish

Northern Pikeminnow

Bull Trout Eggs

Longnose Sucker

Spawning Bull Trout

Slimy Sculpin

Adult Stonefly

Cut on dotted lines creating game cards.

Identity

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**Dogbane,
Common Yarrow,
Field Mint**

Blackfly Larvae

**Black Cottonwood,
Quaking Aspen**

Stonefly Larvae

**Sandbar Willow,
Serviceberry,
Red-osier Dogwood**

Mayfly Nymph (clinging)

**Sedges, Rushes,
Wheatgrass**

Adult Caddisfly

Adult Rainbow Trout

Adult Brook Trout

Adult Brown Trout

Spotted Knapweed

Pool

Glide

Riffle

Run

Quiet Water

Often located on the outside of a meander, these deep, slower waters provide holding, resting, and feeding habitat for adult trout. Some aquatic insects, including dragonfly and damselfly larvae, also rely on this habitat.

Smooth surfaces and slower-moving water characterize this transition downstream from a pool and upstream of a riffle. Trout often hold and feed in this transition zone.

This straight stretch between meanders has shallow turbulent water bubbling rapidly over cobble and clean gravel. The fastest moving part of the river, it is also the most oxygen and insect-rich stretch.

Upstream of pools, but after the fastest moving straight stretch, the river gets a bit deeper, resulting in an unbroken water surface with less turbulence. Insects + deeper water = trout feeding and holding area.

Out of mainstream flows and turbulence, these waters are the river's nursery. Backwaters, spring-fed channels, sloughs, and alcove pools shelter young fish and provide food particles and shade far from predators.

Pool

Often located on the outside of a meander, these deep, slower waters provide holding, resting and feeding habitat for adult trout. Some aquatic insects, including dragonfly and damselfly larvae, also rely on this habitat.

Glide

Smooth surfaces and slower moving water characterize this transition downstream from a pool and upstream of a riffle. Trout often hold and feed in this transition zone.

Riffle

This straight stretch between meanders has shallow turbulent water bubbling rapidly over cobble and clean gravel. The fastest moving part of the river, it is also the most oxygen and insect-rich stretch.

Run

Upstream of pools, but after the fastest moving straight stretch, the river gets a bit deeper, resulting in an unbroken water surface with less turbulence. Insects + deeper water = trout feeding and holding area.

Quiet Water

Out of mainstream flows and turbulence, these waters are the river's nursery. Backwaters, spring-fed channels, sloughs, and alcove pools shelter young fish and provide food particles and shade far from predators.