

**Clark Fork Watershed Education Program**  
**Milltown Dam Curriculum**  
**Lesson #4: Tying It All Together**

<p>Class size: 25 students  Time: 55 Minutes  Grade: 5-8</p> <p><b>Teacher Lesson Plan Outline:</b>  Page 2: Key Vocabulary  Page 3: Lesson Procedure  Page 5: Standards Alignment</p> <p>Appendix I: Milltown Jeopardy*  <i>*This is an optional follow-up activity</i></p>	<p><b>Objective:</b> Students will understand and be able to:</p> <ul style="list-style-type: none"> <li>• Review the reasons for the Milltown Dam removal</li> <li>• Analyze the decision to deposit Milltown wastes at the BP-ARCO repository at Opportunity</li> <li>• Discuss the impacts to the Clark Fork Watershed from historic mining practices</li> <li>• Discuss the importance of scientific literacy and stewardship of restoration</li> </ul>
<p><b>Materials:</b></p> <ul style="list-style-type: none"> <li>• PowerPoint: “Milltown Dam –Tying It All Together”</li> <li>• Computer, Projector</li> <li>• Handouts: “Milltown Dam—Tying It All Together”</li> <li>• Post Survey</li> </ul>	<p><b>Correlations to Montana Curriculum Standards</b>  <i>(Benchmarks noted are for grade 8)</i></p> <p><b>Science:</b>  <b>Standard 1:</b> <i>Benchmarks 3, 5</i>  <b>Standard 3:</b> <i>Benchmark 4</i>  <b>Standard 5:</b> <i>Benchmarks 1, 2,3</i>  <b>Standard 6:</b> <i>Benchmark 3</i></p> <p><b>Mathematics:</b>  <b>Standard 1:</b> <i>Benchmark 1</i>  <b>Standard 2:</b> <i>Benchmark 3</i>  <b>Standard 5:</b> <i>Benchmarks 1,2</i>  <b>Standard 6:</b> <i>Benchmarks 2, 5</i>  <b>Standard 7:</b> <i>Benchmarks 2, 3</i></p>

**Vocabulary:**

Please refer to lessons 1-3 for vocabulary related to this unit.

# CFWEP Milltown Dam Curriculum

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### Lesson Procedure

#### **1. Engage:**

- **Describe some of the observations you made on the field trip.**
- **List a few of the things you have learned throughout this unit.**
- **Who is responsible for making sure that the restored reaches of Silver Bow Creek and the Clark Fork River remain clean and healthy?**
- **What are possible environmental impacts from the removal of the dam?**
- **How do Bull Trout fit into the picture at Milltown?**
- **What evidence of environmental damage did we gather?**

#### **2. Explore and Explain:**

Students review data sheets and begin to explore their findings. Allow time for students to discuss results and possible hypothesis within their work groups before beginning slide presentation.

Present the interactive PowerPoint presentation, “Milltown Dam –Tying It All Together” to the class. The *notes view* of this presentation outlines teacher input and student activities on a slide-by-slide basis.

#### **3. Elaborate:**

Possible extension lesson and activities that are available in the Clark Fork Education Program Virtual Trunks are:

- *World Water Monitoring Day—This unit is typically completed in October during the World Water Monitoring Day Organization’s month of water monitoring activities. Students collect water quality data and report to the WWMD site. Students can compare watershed data across the world.*
- **How Much is a Million? – Students discover how a “part per million” is measured and the significance of concentration in water quality measurement.**

#### **4. Evaluate:**

Students complete the post survey for the unit, which does include dispositions about science and dispositions about caring for the environment.

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### Montana Content Standards Alignment:

#### Science

**Standard 1:** Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate and communicate the results and form reasonable conclusions of scientific investigations.

- Benchmarks:**
- 3.** Review, communicate and defend results of investigations, including considering alternative explanations.
  - 5.** Identify strengths and weaknesses in an investigation design.

**Standard 3:** Students, through the inquiry process, demonstrate knowledge of characteristics, structures and function of living things, the process and the diversity of life, and how living organisms interact with each other and their environment.

- Benchmark:**
- 4.** Investigate and explain the interdependent nature of populations and communities in the environment and describe how species in these populations adapt by evolving.

**Standard 5:** Students, through the inquiry process, understand how scientific knowledge and technological developments impact communities, cultures and societies.

- Benchmarks:**
- 1.** Describe the specific fields of science and technology as they relate to occupations within those fields
  - 2.** Apply scientific knowledge and process skills to understand issues and everyday events.
  - 3.** Use scientific knowledge to investigate problems and their proposed solutions and evaluate those solutions while considering environmental impacts.

**Standard 6:** Students understand historical developments in science and technology.

- Benchmark:**
- 3.** Describe and explain science as a human endeavor and an ongoing process.

#### Mathematics

**Standard 1:** Students engage in the mathematical processes of problem solving and reasoning, estimation, communication, connections and applications, and using appropriate technology.

- Benchmarks:**
- 1.** Formulate and solve multi-step and nonroutine problems using a variety of strategies. Generalize methods to new problem situations.

**Standard 2:** Students demonstrate understanding of and an ability to use numbers and operations.

- Benchmarks:**
- 3.** Use the relationships and applications of ratio, proportion, percent, and scientific notation.

**Standard 5:** Students demonstrate understanding of measurable attributes and an ability to use measurement processes.

- Benchmarks:**
- 1.** Estimate, make and use measurements to describe, compare, and/or contrast objects in real-world situation.

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2. Select and use appropriate units and tools to measure to a level of accuracy required in a particular setting.

**Standard 6:** The students demonstrate understanding of an ability to use data analysis, probability, and statistics.

- Benchmarks:**
2. Construct, read, and interpret tables, charts, and graphs.
  5. Make predictions based on experimental results or probabilities.

**Standard 7:** Students demonstrate understanding of and an ability to use patterns, relations and functions.

- Benchmarks:**
2. Describe and represent relationships with tables, graphs, and rules.
  3. Analyze functional relationships to explain how a change in one quantity results in a change in another.

**Appendix I: Lesson #3**  
**Milltown Jeopardy**

## ***CFWEP—Milltown Dam Curriculum***

### ***Lesson #2: Student Worksheet***

#### **Not in My Backyard!**

*Where or where should the Milltown wastes go?*

#### **Introduction:**

Wastes from Silver Bow Creek, the Clark Fork River and Milltown Dam are consolidated and managed at the Opportunity Ponds or BP-ARCO repository near Anaconda. There are millions of tons and cubic yards of wastes at the site. Are all wastes at the site considered equally toxic? Should we continue to add wastes to this site or should we find another solution?

#### **Explore:**

1. With your group, count the number of beads of each color in the jar provided.
2. What is the total number of beads you have?
3. How many green beads do you have?
4. How many clear beads do you have?
5. Write a ratio to express the number of green beads to the total number of beads.
6. What is the percent (%) of green beads in your jar?  
(Hint: Imagine you had one green bead in a jar with 99 clear beads. What is your percentage?)
7. Thinking in terms of the BP-ARCO repository and the Milltown sediments, what do you think the green beads represent? How about the clear beads?

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Lesson #2: Student Worksheet***

**Elaborate:**

1. Based on what we've learned in the lecture, what are some of the differences between the Milltown wastes and the wastes already located at the ponds?
2. Write down your observations about the two samples. What do you notice? Which sample looks "more toxic"? Why?
3. How can you "test" that there are differences between the Milltown wastes and the Opportunity wastes?
4. Why do you think that the Milltown wastes look more like "dirt" rather than like tailings?
5. What makes Milltown wastes toxic?
6. What does location of waste have to do with relative toxicity?
7. List a few concerns people in the town of Opportunity may have about Milltown wastes being deposited near their town.