Our Mississippi

Educational Activities

about the Upper Mississippi River

Grades 5–6

www.OurMississippi.org

St. Paul District
Rock Island District
St. Louis District

US Army Corps of Engineers ®

National Great Rivers Museum
P.O. Box 337
Alton, Illinois 62002

Background Information

In September 2004, the U.S. Army Corps of Engineers (Corps) distributed the Final Integrated Feasibility Report and Programmatic Environmental Impact Statement for the Upper Mississippi River-Illinois Waterway System Navigation Feasibility Study.

The report described an integrated plan for modifications and operations changes to the Upper Mississippi River and the Illinois Waterway for navigation efficiency and ecosystem restoration. It also discussed the programmatic actions and the associated beneficial and adverse effects regarding navigation efficiency and ecosystem restoration needs.

To protect the known and unknown significant historic properties affected by the implementation of the navigation improvements, several government agencies signed a Programmatic Memorandum of Agreement. The signers included the Corps; U.S. Fish and Wildlife Service; Illinois, Iowa, Minnesota, Missouri, and Wisconsin Historic Preservation Officers; and the Advisory Council on Historic Preservation. It was decided that documenting the history and significance of the Upper Mississippi River and the Illinois Waterway would address some of these possible effects.

As part of that effort, the Corps held the first meeting of the Navigation and Ecosystem Sustainability Program (NESP) Cultural Resources and Stewardship Mitigation Team in La Crosse, Wisconsin, in June 2006. A second meeting was held in Alton, Illinois, in April 2008. In August 2009, the Corps contracted Formations of Portland, Oregon, to produce "Our Mississippi: Educational Activities about the Upper Mississippi River."

The production of the various drafts of the Teacher's Activity Guide was coordinated with the NESP Cultural Resources and Stewardship Mitigation Team through three workshops held between December 14-18, 2009 at Alton, Illinois; Pleasant Valley, Iowa; and St. Paul, Minnesota. All comments and responses were considered in various draft reviews.

Special Thanks to...

This Teacher's Activity Guide would not have been possible without the assistance and cooperation of many people. We would like to extend an earnest thank you to everyone who helped to develop this book, especially the workshop participants, draft reviewers, and content providers.

We would like to personally thank the following individuals for their extensive support and invaluable contributions: Brad Walker, The Izaak Walton League of America; Jeff Janvrin, Wisconsin Department of Natural Resources; and Paul Rohde, Waterways Council Incorporated.

Development Team

Thank you to the talented group of people with the U.S. Army Corps of Engineers for their assistance: Kimberly Rea, Mindy Cory, Erin Hilligoss-Volkmann, Angie Smith, Ron Deiss, Mark Cornish, and Ken Barr. Also, thank you to the capable and clever design team led by Formations: Corrie Greening, Marie Naughton, and Karen Adams.

Table of Contents

Welcome to Our Mississippi

Educational Activities about the Upper Mississippi River

Introduction

The U.S. Army Corps of Engineers is pleased to present this balanced, comprehensive guidebook to help teachers inform future decision-makers about this important natural resource.

Our Mississippi has been years in the making. In 1986, Congress designated the Upper Mississippi River System as both a nationally significant ecosystem and a nationally significant navigation system. Since then, the Corps has worked with multiple groups and agencies to improve the economic and environmental sustainability of the river.

This guidebook is a result of several different programs and partnerships that included other federal agencies, five states, and a wide variety of environmental, conservation, navigation, and industry groups to strike that ever-crucial balance of human and wildlife interests.

We embrace the Mississippi for different reasons and from different perspectives. It is a national resource shared for different purposes. The river is important to communities and individuals. We may have individual perspectives on the river, but successful management requires an integrated and collective effort.

Educational Approach

The main goal of Our Mississippi is to provide teachers with a mix of classroom, self-directed, and collaborative lessons and activities about the Upper Mississippi River that meet a wide range of national learning standards. They follow a multidisciplinary approach, weaving science, technology, and math with social science, language, and arts collaboratively to address complex, real-life resource management issues and multiple uses of the river.

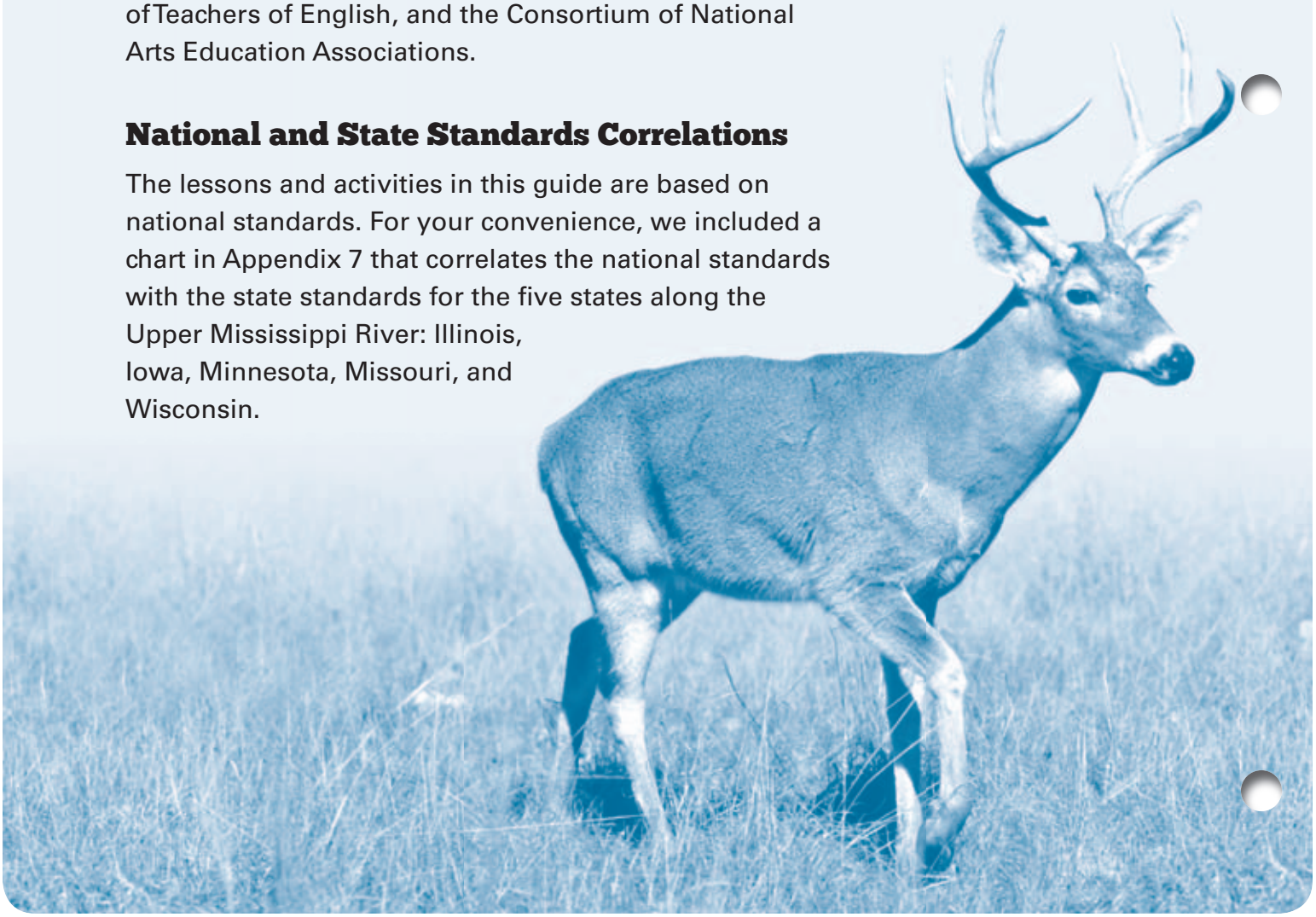
The lessons and activities chosen for the guidebook focus on concepts that can be investigated or demonstrated. Designed for grades 5 and 6, each unit includes activities or extension ideas for upper and lower grades as well.

National Standards

The lessons and activities in Our Mississippi were developed based on the national educational standards recommended by the National Research Council (for science standards), International Society for Technology in Education, National Council of Teachers of Mathematics, National Council for the Social Studies, National Council of Teachers of English, and the Consortium of National Arts Education Associations.

National and State Standards Correlations

The lessons and activities in this guide are based on national standards. For your convenience, we included a chart in Appendix 7 that correlates the national standards with the state standards for the five states along the Upper Mississippi River: Illinois, Iowa, Minnesota, Missouri, and Wisconsin.



How to Use this Guide

This guidebook was designed to provide teachers with a complete, cross-curricular approach to a wide range of subjects relating to the Upper Mississippi River, including earth science, physical science, social science, language arts, fine arts, and math in five interrelated units organized by subject area. Although each lesson can be used by itself as a stand-alone piece, the strength of this guidebook lies in the sequential manner in which the lessons and activities build on and complement one another.

Unit 1: Upper Mississippi River Watershed

The first unit presents a broad overview of the vast drainage basin of the Mississippi River, preparing students for an in-depth examination of the Upper Mississippi River by first placing it in the spatial context of its entire watershed. It introduces students to the river's geography, earth science, and physical science using a large wall map of the entire watershed that will serve as the conceptual thread that runs through all the units.

Unit 2: Upper Mississippi River Ecosystems

The second unit builds on the broad overview of the entire watershed to focus on the Upper Mississippi River itself. This unit explores the river's ecosystems and the life that depends on it through life science. Students investigate what a healthy river system is, how the river's health is measured and monitored, and what happens to the river—as well as people, plants, and animals—if the river is not healthy.

Unit 3: Upper Mississippi River History and Culture

The skills and knowledge learned in the first two units serve as the background information needed to examine human history, migration, and settlement through social science, language arts, and fine arts. The human history of the Upper Mississippi River is explored from the context of family or community traditions.

Unit 4: The Mississippi River at Work

This unit focuses on the river as a vital lifeline for human commerce. It uses the knowledge and skills presented in previous units to explore how humans rely on the river. Having learned how people used the river for transportation and trade in the past, students compare and contrast those uses with how people use the river today, including recreation and tourism.

Unit 5: A Shared Resource – Our Mississippi River

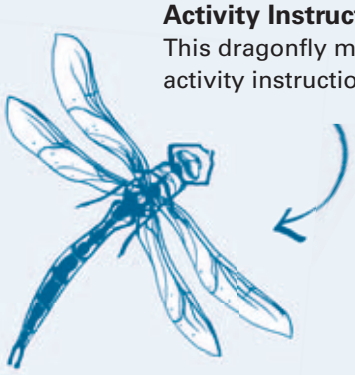
The knowledge and skills learned in the previous four units are applied in the final unit using higher-level skills, including communication, problem solving, and compromise. In this unit, students synthesize the earth science, physical science, and social science information to debate and problem-solve a variety of solutions for managing and conserving the Upper Mississippi River.

All pages in this guide are perforated and three-hole punched for your convenience. Copies of all lessons and activities can be found on the accompanying CD-ROM and companion website at www.OurMississippi.org. The website also includes additional information, activities, and up-to-date links for computer-based activities and extensions.

Primary Icons

Summary Sidebar
A river otter sits atop the summary sidebar that begins each lesson introduction and lesson to provide you with a quick overview of its purpose and focus.

Activity Instructions
This dragonfly marks all activity instructions.



Standards Correlation
The ruler provides you with a quick summary of the national and state standards addressed in a unit introduction or lesson.

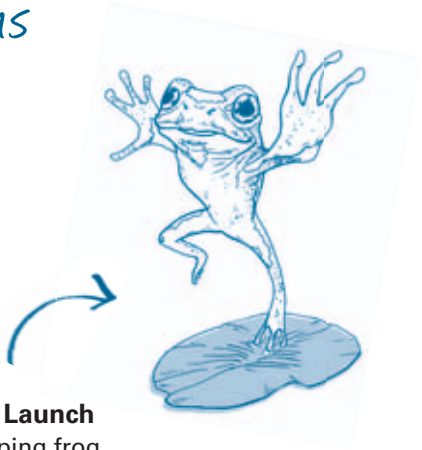
Copy Me
This Viceroy butterfly identifies pages that can be reproduced on a copier.

Use of Icons

This guidebook includes icons to help you find what you need at a glance among the wealth of information, activities, and extension ideas. They serve as quick reference points for different types of information.

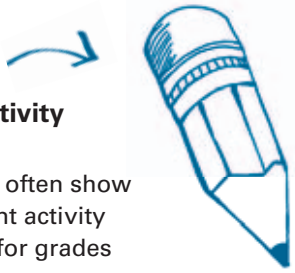
Secondary Icons

Helpful Hints
Post-It notes provide suggestions and tips.

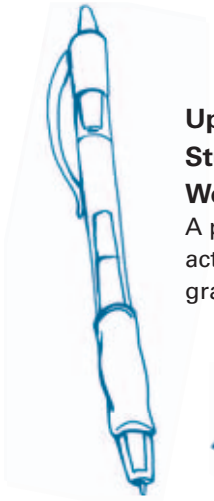


Career Launch
The leaping frog identifies career ideas to share with students.

Answer Keys
A set of keys identifies the answers to pre- and post-assessments and activities.



Student Activity Worksheet
A pencil will often show up on student activity worksheets for grades 5–6 students.



Upper Grade Level Student Activity Worksheet
A pen marks student activity worksheets for grades 7–12 students.

Lower Grade Level Extensions
This duckling identifies extension ideas for grades K–4 students.

Unit Overview

Each unit is designed to give you everything you need to explore a given subject area in depth, including activities and extension ideas.

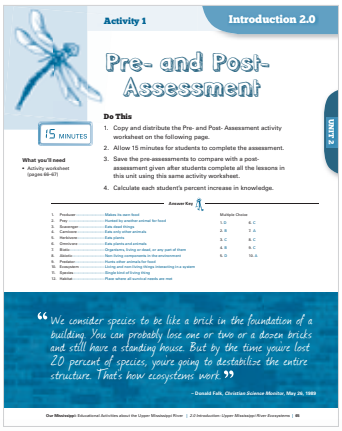
All units begin with a two-page overview that provides a brief summary of the unit and its lessons and activities.

Units contain:

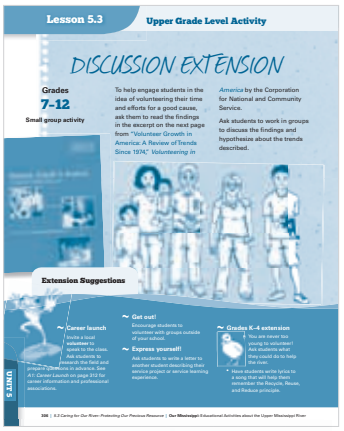
- Unit Goal
- Pre- and Post-Assessment
- Introduction
- Lessons
- Activities
- Extensions

Every unit contains four or five lessons that include one or two activities each.

Each unit includes a pre- and post-assessment designed to evaluate student knowledge before and after each unit. Answer key is included.



All units contain at least one upper and lower grade level extension activity.



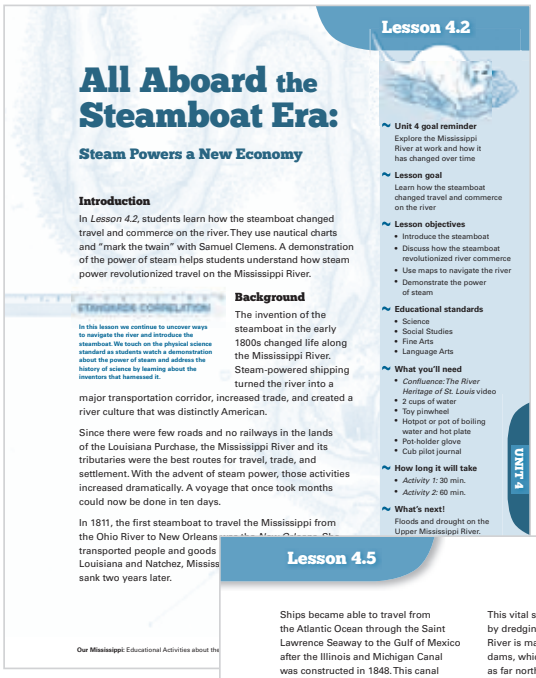
To help you choose and plan lessons and activities, we included a chart that provides all the pertinent information you need at a glance. It lists the goals, objectives, page numbers, standards, and activities for all the lessons in this guide in one place. This is located in the appendix section of the guide.

Lesson Overview

Each lesson provides all the information you need to explore a particular subject. Student activities are experiential hands-on activities or experiences. Highly adaptable, most can be used as either individual or small group activities or as classroom demonstrations, depending on the teacher's goals and resources.

Each lesson contains:

- Background information, key concepts, vocabulary, and/or interesting facts
- Discussion ideas and lesson instructions
- Student activity worksheets
- Related careers and quotes
- Extension ideas


Lesson 4.2

All Aboard the Steamboat Era:

Steam Powers a New Economy

Introduction

In *Lesson 4.2*, students learn how the steamboat changed travel and commerce on the river. They use nautical charts and "mark the twain" with Samuel Clemens. A demonstration of the power of steam helps students understand how steam power revolutionized travel on the Mississippi River.

STANDARDS CORRELATION

In this lesson we continue to uncover ways to navigate the river and introduce the steamboat. We touch on the physical science standard as students watch a demonstration about the power of steam and address the history of science by learning about the inventors that hamessed it.

Background

The invention of the steamboat in the early 1800s changed life along the Mississippi River. Steam-powered shipping turned the river into a major transportation corridor, increased trade, and created a river culture that was distinctly American.

Since there were few roads and no railways in the lands of the Louisiana Purchase, the Mississippi River and its tributaries were the best routes for travel, trade, and settlement. With the advent of steam power, those activities increased dramatically. A voyage that once took months could now be done in ten days.

In 1811, the first steamboat to travel the Mississippi from the Ohio River to New Orleans [illegible] transported people and goods [illegible] Louisiana and Natchez, Mississ[illegible] sank two years later.

Our Mississippi: Educational Activities about the

Unit 4 goal reminder
Explore the Mississippi River at work and how it has changed over time

Lesson goal
Learn how the steamboat changed travel and commerce on the river

Lesson objectives
- Introduce the steamboat
- Discuss how the steamboat revolutionized river commerce
- Use maps to navigate the river
- Demonstrate the power of steam

Educational standards
- Science
- Social Studies
- Fine Arts
- Language Arts

What you'll need
- *Confluence: The River Heritage of St. Louis* video
- 2 cups of water
- Toy pinwheel
- Hotpot or pot of boiling water and hot plate
- Pot-holder glove
- Cub pilot journal

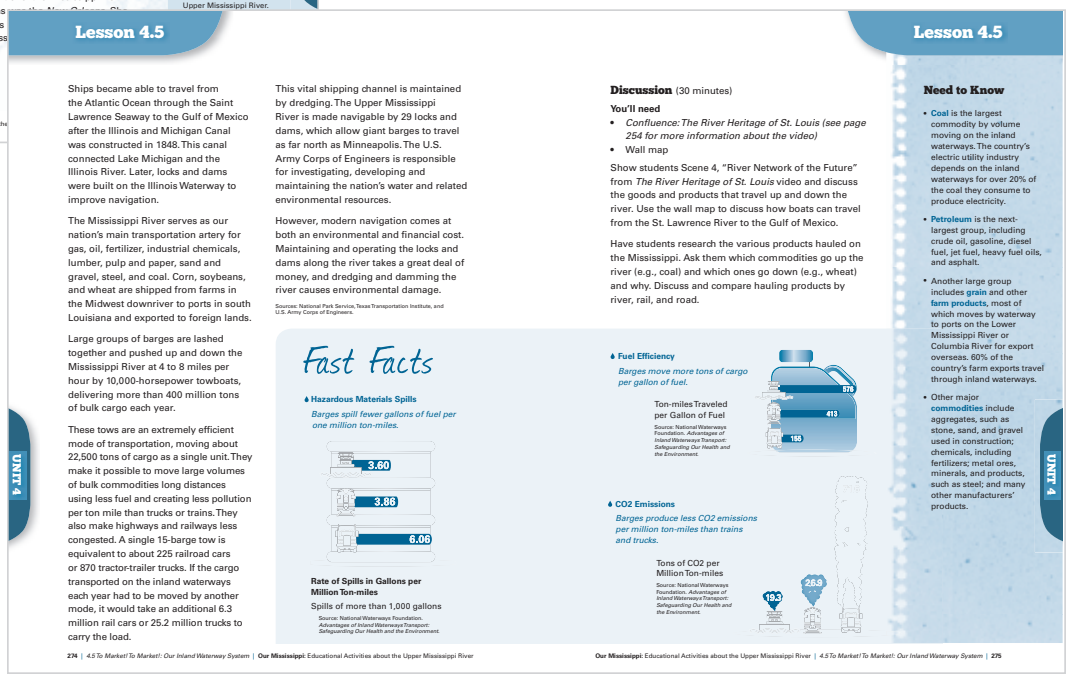
How long it will take
- *Activity 1:* 30 min.
- *Activity 2:* 60 min.

What's next!
Floods and drought on the Upper Mississippi River.

UNIT 4

Each lesson includes a summary sidebar listing the unit goal, lesson goal, learning objectives, education standards, materials needed, time, and a preview of the next lesson.

To save teachers time and effort, we have provided background information to help teachers get up to speed on a topic, as well as engaging fast facts and ideas for leading structured discussions that will help prepare students for the activities and extensions.


Lesson 4.5

Ships became able to travel from the Atlantic Ocean through the Saint Lawrence Seaway to the Gulf of Mexico after the Illinois and Michigan Canal was constructed in 1848. This canal connected Lake Michigan and the Illinois River. Later, locks and dams were built on the Illinois Waterway to improve navigation.

The Mississippi River serves as our nation's main transportation artery for gas, oil, fertilizer, industrial chemicals, lumber, pulp and paper, sand and gravel, steel, and coal. Corn, soybeans, and wheat are shipped from farms in the Midwest downriver to ports in south Louisiana and exported to foreign lands.

Large groups of barges are lashed together and pushed up and down the Mississippi River at 4 to 8 miles per hour by 10,000-horsepower towboats, delivering more than 400 million tons of bulk cargo each year.

These tows are an extremely efficient mode of transportation, moving about 22,500 tons of cargo as a single unit. They make it possible to move large volumes of bulk commodities long distances using less fuel and creating less pollution per ton mile than trucks or trains. They also make highways and railways less congested. A single 15-barge tow is equivalent to about 225 railroad cars or 870 tractor-trailer trucks. If the cargo transported on the inland waterways each year had to be moved by another mode, it would take an additional 6.3 million rail cars or 25.2 million trucks to carry the load.

This vital shipping channel is maintained by dredging. The Upper Mississippi River is made navigable by 29 locks and dams, which allow giant barges to travel as far north as Minneapolis. The U.S. Army Corps of Engineers is responsible for investigating, developing and maintaining the nation's water and related environmental resources.

However, modern navigation comes at both an environmental and financial cost. Maintaining and operating the locks and dams along the river takes a great deal of money, and dredging and damming the river causes environmental damage.

Sources: National Park Service, Texas Transportation Institute, and U.S. Army Corps of Engineers.

Fast Facts

Hazardous Materials Spills
Barges spill fewer gallons of fuel per one million ton-miles.

Rate of Spills in Gallons per Million Ton-miles
Spills of more than 1,000 gallons

Source: National Waterways Foundation. *Advantages of Inland Waterways Transport: Safeguarding Our Health and the Environment.*

Fuel Efficiency
Barges move more tons of cargo per gallon of fuel.

Ton-miles Traveled per Gallon of Fuel

Source: National Waterways Foundation. *Advantages of Inland Waterways Transport: Safeguarding Our Health and the Environment.*

CO2 Emissions
Barges produce less CO2 emissions per million ton-miles than trains and trucks.

Tons of CO2 per Million Ton-miles

Source: National Waterways Foundation. *Advantages of Inland Waterways Transport: Safeguarding Our Health and the Environment.*

Discussion (30 minutes)

You'll need
- *Confluence: The River Heritage of St. Louis (see page 254 for more information about the video)*
- Wall map

Show students Scene 4, "River Network of the Future" from *The River Heritage of St. Louis* video and discuss the goods and products that travel up and down the river. Use the wall map to discuss how boats can travel from the St. Lawrence River to the Gulf of Mexico.

Have students research the various products hauled on the Mississippi. Ask them which commodities go up the river (e.g., coal) and which ones go down (e.g., wheat) and why. Discuss and compare hauling products by river, rail, and road.

Need to Know

- Coal is the largest commodity by volume moving on the inland waterways. The country's electric utility industry depends on the inland waterways for over 20% of the coal they consume to produce electricity.
- Petroleum is the next-largest group, including crude oil, gasoline, diesel fuel, jet fuel, heavy fuel oils, and asphalt.
- Another large group includes grain and other farm products, most of which moves by waterway to ports on the Lower Mississippi River or Columbia River for export overseas. 60% of the country's farm exports travel through inland waterways.
- Other major commodities include aggregates, such as stone, sand, and gravel used in construction; chemicals, including fertilizers; metal ores, minerals, and products, such as steel; and many other manufacturers' products.

UNIT 4

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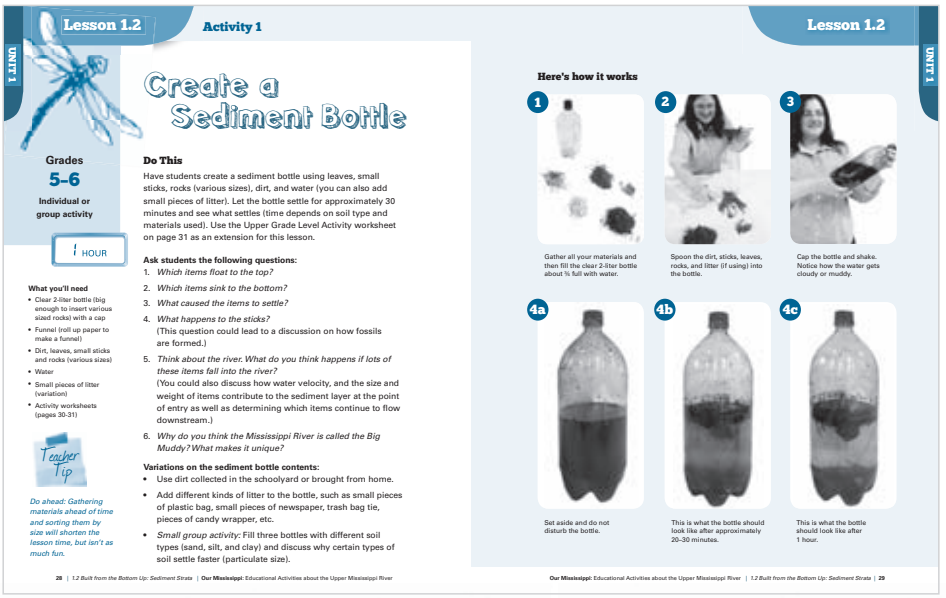
Our Mississippi: Educational Activities about the Upper Mississippi River | 4.5 To Market! To Market!: Our Inland Waterway System | 275

Each activity marked with a dragonfly lists information on grade level, time required, and materials. Some activities include photos of step-by-step instructions.



Lesson 1.2 Activity 1

UNIT 1

Create a Sediment Bottle

Grades 5–6

Individual or group activity

1 HOUR

What you'll need

- Clear 2-liter bottle (big enough to insert various sized rocks) with a cap
- Funnel (roll up paper to make a funnel)
- Dirt, leaves, small sticks and rocks (various sizes)
- Water
- Small pieces of litter (variation)
- Activity worksheets (pages 30-31)

Teacher Tip

Do ahead: Gathering materials ahead of time and sorting them by size will shorten the lesson time, but isn't as much fun.

Do This

Have students create a sediment bottle using leaves, small sticks, rocks (various sizes), dirt, and water (you can also add small pieces of litter). Let the bottle settle for approximately 30 minutes and see what settles (time depends on soil type and materials used). Use the Upper Grade Level Activity worksheet on page 31 as an extension for this lesson.

Ask students the following questions:

1. *Which items float to the top?*
2. *Which items sink to the bottom?*
3. *What caused the items to settle?*
4. *What happens to the sticks?* (This question could lead to a discussion on how fossils are formed.)
5. *Think about the river. What do you think happens if lots of these items fall into the river?* (You could also discuss how water velocity, and the size and weight of items contribute to the sediment layer at the point of entry as well as determining which items continue to flow downstream.)
6. *Why do you think the Mississippi River is called the Big Muddy? What makes it unique?*

Variations on the sediment bottle contents:

- Use dirt collected in the schoolyard or brought from home.
- Add different kinds of litter to the bottle, such as small pieces of plastic bag, small pieces of newspaper, trash bag tie, pieces of candy wrapper, etc.
- *Small group activity:* Fill three bottles with different soil types (sand, silt, and clay) and discuss why certain types of soil settle faster (particulate size).

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Lesson 1.2

UNIT 1

Here's how it works

1. Gather all your materials and then fill the clear 2-liter bottle about ¾ full with water.
2. Spoon the dirt, sticks, leaves, rocks, and litter (if using) into the bottle.
3. Cap the bottle and shake. Notice how the water gets cloudy or muddy.

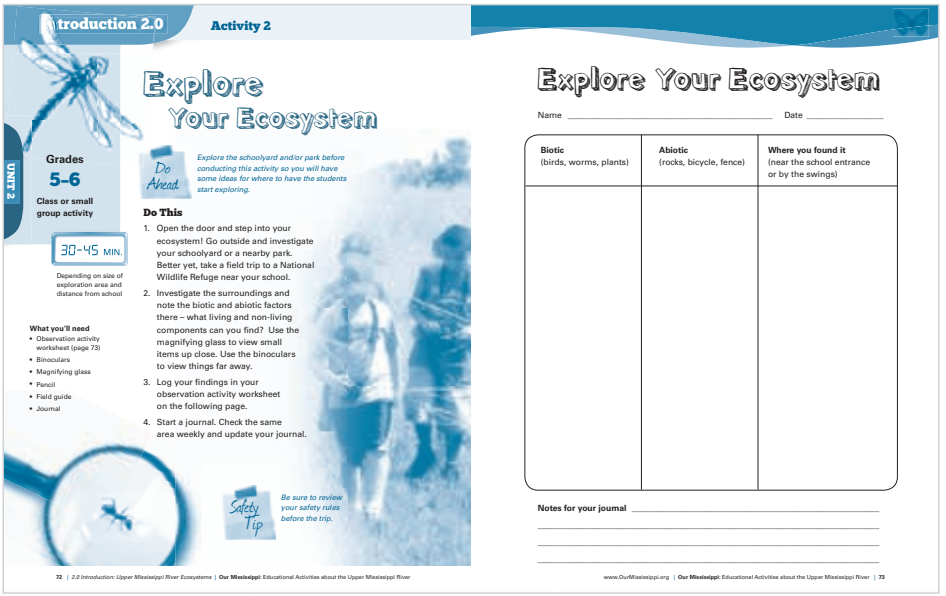
4a. Set aside and do not disturb the bottle.

4b. This is what the bottle should look like after approximately 20–30 minutes.

4c. This is what the bottle should look like after 1 hour.

Our Mississippi: Educational Activities about the Upper Mississippi River | *1.2 Built from the Bottom Up: Sediment Strata* | 29

Some activities include worksheets that can be copied and given to students to complete.



troduction 2.0 Activity 2

UNIT 2

Explore Your Ecosystem

Grades 5–6

Class or small group activity

30–45 MIN.

Depending on size of exploration area and distance from school

What you'll need

- Observation activity worksheet (page 73)
- Binoculars
- Magnifying glass
- Pencil
- Field guide
- Journal

Do Ahead

Explore the schoolyard and/or park before conducting this activity so you will have some ideas for where to have the students start exploring.

Do This

1. Open the door and step into your ecosystem! Go outside and investigate your schoolyard or a nearby park. Better yet, take a field trip to a National Wildlife Refuge near your school.
2. Investigate the surroundings and note the biotic and abiotic factors there – what living and non-living components can you find? Use the magnifying glass to view small items up close. Use the binoculars to view things far away.
3. Log your findings in your observation activity worksheet on the following page.
4. Start a journal. Check the same area weekly and update your journal.

Safety Tip

Be sure to review your safety rules before the trip.

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Explore Your Ecosystem

Name _____ Date _____

Biotic (birds, worms, plants)	Abiotic (rocks, bicycle, fence)	Where you found it (near the school entrance or by the swings)

Notes for your journal _____

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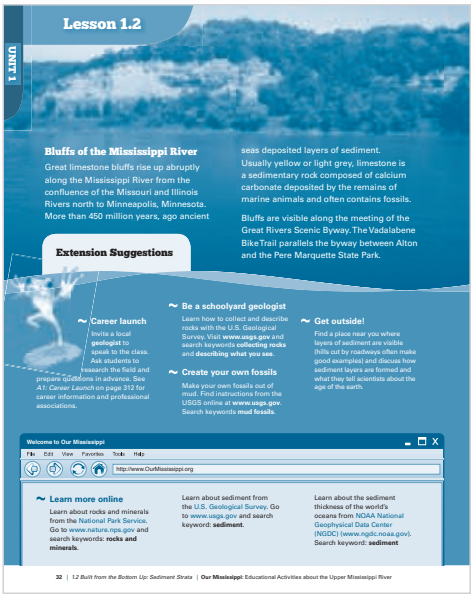
At the end of each lesson you will find ideas on how to extend the lesson. These provide additional depth to each lesson and include suggestions for outdoor and online activities for a variety of grade levels.



Lesson 1.2

UNIT 1

Bluffs of the Mississippi River

Great limestone bluffs rise up abruptly along the Mississippi River from the confluence of the Missouri and Illinois Rivers north to Minneapolis, Minnesota. More than 450 million years, ago ancient seas deposited layers of sediment. Usually yellow or light grey, limestone is a sedimentary rock composed of calcium carbonate deposited by the remains of marine animals and often contains fossils.

Bluffs are visible along the meeting of the Great Rivers Scenic Byway. The Vadalabene Bike Trail parallels the byway between Alton and the Pere Marquette State Park.

Extension Suggestions

Career launch

Invite a local **geologist** to speak to the class. Ask students to research the field and prepare questions in advance. See *A1: Career Launch* on page 312 for career information and professional associations.

Be a schoolyard geologist

Learn how to collect and describe rocks with the U.S. Geological Survey. Visit **www.usgs.gov** and search keywords **collecting rocks** and **describing what you see**.

Create your own fossils

Make your own fossils out of mud. Find instructions from the USGS online at **www.usgs.gov**. Search keywords **mud fossils**.

Get outside!

Find a place near you where layers of sediment are visible (hills cut by roadways often make good examples) and discuss how sediment layers are formed and what they tell scientists about the age of the earth.

Learn more online

Learn about rocks and minerals from the National Park Service. Go to www.nature.nps.gov and search keywords: **rocks and minerals**.

Learn about sediment from the U.S. Geological Survey. Go to www.usgs.gov and search keyword: **sediment**.

Learn about the sediment thickness of the world's oceans from NOAA National Geophysical Data Center (NGDC) (www.ngdc.noaa.gov). Search keyword: **sediment**

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