

## Riparian Corridor and Stream Banks Module

The riparian corridor is the land immediately adjacent to the stream. A forested riparian corridor will strengthen stream banks and reduce erosion benefiting the water quality in a watershed. In addition, a forested riparian corridor provides habitat for wildlife, filters runoff pollutants, and provides various economic and recreational opportunities for landowners.



## Introduction

The strip of land bordering a stream channel is called a stream or riparian corridor. This is actually a part of the flood plain, but because it is so important to the stream system it deserves special consideration. A well functioning corridor is at least 100 feet wide and forested. The riparian corridor is technically defined as the area of the flood plain that experiences regular flooding.

The vegetation growing in this corridor provides many benefits and is necessary for creating a healthy stream. For instance, riparian trees shade the water and protect it from the scorching sun. Their leaves provide raw organic material for food chains. They also hold stream banks together with deep, dense root systems. During floods, they slow the flow of water and protect adjacent fields from flood plain scouring. When these trees eventually fall in the water, they provide valuable fish cover and habitat. All streams are dependent on well-managed riparian corridors. Re-establishing adequate riparian corridors is a key step in restoring degraded streams.

Healthy, well-managed riparian areas have a variety of tree species and understory vegetation growing at least 100 feet from each bank. They also have a layer of dead leaves, which contribute to a thick humus layer in the soil. This wooded border benefits the stream and neighboring landowners by controlling erosion and sediment in several ways. During a flood the streamside trees and brushy vegetation slow the water before it passes over the flood plain. This reduces erosion on bottom land fields.

Because the water is slowed within the wooded corridor, it drops much of the sediment, gravel, and sand within the stream corridor rather than on bottom land fields or in backwater areas downstream. This corridor of trees also traps woody debris that would otherwise end up in fields. The tree canopy and underlying leaf layer of healthy stream corridors protect the soil from the direct force of falling rain and the forest floor acts as a sponge to slow runoff and reduce erosion.

Well-managed riparian corridors are accompanied by a general lack of erosion. The root systems of trees growing near the water's edge are vital to controlling stream bank erosion. A wide corridor of trees will ensure that banks are protected even when unusual flooding removes some streamside trees.

A riparian corridor that is managed poorly may be less than 25 feet wide. Trees may be sparse or lacking. Grazed woodlands and pastures or fields plowed to the edge of the stream are examples of rural riparian corridors that have been poorly managed. Urban areas are no different. Trees are frequently replaced by parking lots and other hard surfaces.

The function of stream banks to contain flowing water is obvious, but stable banks offer additional benefits to the watershed. The trees present on stable banks shade the stream to moderate water temperatures. The leaf litter produced is a vital source of soil nutrients and a food supply for many aquatic insects. Streamside vegetation also attracts terrestrial insects which fall to the water and provide food for fish. The submerged root systems of these trees also act as excellent habitat for fish, frogs, beaver, muskrat, otter, and a variety of other animals. Fish and wildlife habitats are

improved by forested stream corridors. These corridors provide many species with food, protection, travel lands, and nesting cover. Every part of the tree is important when it is living and even after it has died.

Some animal species use riparian woodlands through all stages of their lives. Most animal species use the riparian corridor for part of their habitat needs. The diversity of plant species, along with a source of water, make riparian woodlands attractive to wildlife. Nuts, fruits, roots, and grasses are among the beneficial products available to wildlife in the riparian woodlands. Trees, grasses, and other plants provide shelter and cover for various species of wildlife. Various sizes of trees serve as specific habitats. After trees have died, their decaying logs provide shelter for snakes, rodents, and other ground-dwelling species. Trees provide shade over streams which affect the amount of dissolved oxygen the water can hold. Shaded stream areas may be as much as 10 degrees cooler than areas exposed to direct sunlight.

Stable banks are well vegetated with a variety of tree species and exhibit a minimal amount of soil erosion. The root system of the trees and other plants hold the soil and provide stability under normal conditions. Stability also depends on the material composition of the banks. For example, a bank comprised of compacted clay and tree roots will be much more stable than one comprised of sand and silt.

Unstable banks are characterized by a lack of woody vegetation and severe **erosion**. A common cause of unstable banks is the clearing of trees in the riparian corridor. Other causes are overgrazing, gravel removal that increase erosive forest, and changes in the watershed that increase the speed and volume of runoff waters. Unstable banks lose valuable soil to erosion. These eroded soils smother aquatic habitats downstream. In addition, unstable, eroded banks lose their aesthetic appeal and cloud the water. The clouded water in turn increases the absorption of sunlight which raises the water temperature and thus decreases the dissolved oxygen content which is essential for aquatic life.

What can be done to establish and protect riparian corridors? On nonforested stream sides, trees should be planted on at least a 100-foot wide strip on each side of the stream. This can be done by planting seedlings, cuttings, or seed, or by allowing natural reforestation to take place. Plant species that are adaptable to local conditions should be used. On forested stream sides, at least a 100-foot wide strip should be protected on each side of the stream. Fences can be constructed to exclude livestock from the stream side except for controlled accesses for watering and crossing. Allowing livestock to graze along stream banks is damaging to riparian woodlands. Vegetation is destroyed and stream bank erosion increases. Fallen trees should be left in the stream. Heavy equipment such as tractors, log skidders, or bulldozers that could remove ground cover should not be used near a stream bank. It is also important to consult a local forester before cutting trees along a stream. He or she can advise how to harvest trees without damaging the stream bank and riparian corridor.

## Riparian Corridor – What Is It?

### Lesson Abstract

<b>Summary:</b>	Students discover characteristics of flora and fauna in the context of the physiographic regions of Missouri. The importance of these organisms to flood control, erosion prevention, and biodiversity is stressed.
<b>MO GLE:</b>	SC4.1.B.6; 4.1.D.6; 5.3.A.6, 5.1.A.6
<b>Subject Areas:</b>	Science, Communication Arts
<b>Show-Me Standards:</b>	Goals – 1.1, 1.6 Strands – SC 3, 4, 5; CA 6
<b>Skills:</b>	Writing, hypothesizing, questioning
<b>Duration:</b>	2 class periods (50 minutes)
<b>Setting:</b>	Classroom
<b>Key Vocabulary:</b>	Riparian corridor, buffer zone, stream bank, slumping, humus

### Rationale:

- The riparian corridor is essential for the health of the stream.
- The health of the riparian corridor will affect recreation, agricultural practices, wildlife habitat, aesthetics, and flood management.
- Healthy stream banks are essential for a healthy stream.
- Healthy stream banks help prevent erosion and damage from floods.
- Students will observe firsthand the characteristics and attributes of a given riparian corridor in their local area (watershed).

### Student relevance:

- The diversity of plants and animals in an area determine the biological health of that area.

### Learning Objectives:

Upon completion, students will be able to . . .

- Identify their physiographic region of the state.
- Determine plants and animals in their biographical region through questioning.

## Students Need to Know:

- Common plants and animals in their area.

## Teachers Need to Know:

- The concept of erosion.
- The hydrologic cycle.
- The different types of soils (humus, sand, clay).
- Physiographic regions of Missouri.
- Differences of riparian corridors across the state of Missouri.
- Human influences of riparian corridors and stream banks.
- The differences between sand, gravel, and rock formations.
- Typical fauna and flora of riparian corridors.

## Resources:

The following materials are available at no charge from the Missouri Department of Conservation, P.O. Box 180, Jefferson City, MO 65102-0180, (573)751-4115.

*Understanding Streams* (brochure)

*Animal Cards/Habitat Cards* (poster with 24 species)

### Conservation Education Series for Junior and Senior High

*Aquatic Field and Classroom Activities*

*Missouri's Rare and Endangered Species*

*Wildlife Management in Missouri*

*Biogeography of Missouri*

*Relief Map of Missouri*

Available from the Missouri Department of Natural Resources, Division of Geology and Land Survey, P.O. Box 250, Rolla, MO 65402, (573)368-2125.

website for DNR publications:

<http://www.dnr.mo.gov/geology/adm/publications/pubscatalog.pdf>

## Materials Needed for Lesson:

*Biogeography of Missouri* -Available free from MDC order on line at:

<http://www.mdc.mo.gov/documents/teacher/materials/request.pdf>

*Relief Map of Missouri*

Index cards

Writing paper

## Procedure:

- Review the terminology for riparian corridors and stream banks with students.
- Introduce physiographic regions of Missouri (pages 1-11 in *Biogeography of Missouri*: <http://www.mdc.mo.gov/teacher/materials/>).
- Have students identify the physiographic region they live in using the *Relief Map*.
- Review the flora and fauna common to the physiographic region they live in.
- Use Appendix 6 in *Biogeography of Missouri* and put names of common flora and fauna on the cards, then distribute the cards face-down to students so they can't read them (have these prepared in advance).
- Each student in turn will take their card (without looking at it) to a designated student, and go to the front of the class. The designated student will let the rest of the class see the card but not the student who originally had it.
- The object is for the student at the front of the class to try and guess what the animal or plant is by asking questions. The guessing student has a limit of 10 questions.
- When the student has correctly guessed the plant or animal, he or she can describe the contribution of this organism to flood control, erosion control, and/or biodiversity. Then the student can go to the map and place the card in the appropriate physiographic region (more than one region could be correct).
- If the student cannot identify the plant or animal, the class will name it. Then the student can place the card in the appropriate region on the map and describe this organism's contributions as described above.

## Evaluation Strategies:

- Have students select their favorite riparian corridor native plant or animal, draw a picture of it, and write a short poem about it (place in a poster format).

## Extension Activities:

- Create a bulletin board or wall mural using large art paper to create the plants and animals that would be found in a typical Missouri riparian corridor.
- Visit streams in different physiographic regions of Missouri. For example, a group of students from the Ozarks could travel to streams in northern Missouri or the big river region of the Missouri or Mississippi rivers. This would enable the students to become acquainted with the differences. Have students write stories for the local or school newspaper about their experiences and findings.
- Adopt a stream or Department of Conservation Access through the STREAM TEAM Program. (See Resource References in back for more information.) <http://www.mostreamteam.org/>

## Suggested Scoring Guide:

### Riparian Corridor - What is it?

Teacher Name: \_\_\_\_\_

Student Name: \_\_\_\_\_

CATEGORY	3	2	1	0
<b>Contributions</b>	Routinely provides useful ideas when participating in the group and in classroom discussion. A definite leader who contributes a lot of effort.	Usually provides useful ideas when participating in the group and in classroom discussion. A strong group member who tries hard!	Sometimes provides useful ideas when participating in the group and in classroom discussion. A satisfactory group member who does what is required.	Rarely provides useful ideas when participating in the group and in classroom discussion. May refuse to participate.
<b>Quality of Work</b>	Provides work of the highest quality.	Provides high quality work.	Provides work that occasionally needs to be checked/redone by other group members to ensure quality.	Provides work that usually needs to be checked/redone by others to ensure quality.
<b>Focus on the task</b>	Consistently stays focused on the task and what needs to be done. Very self-directed.	Focuses on the task and what needs to be done most of the time. Other group members can count on this person.	Focuses on the task and what needs to be done some of the time. Other group members must sometimes nag, prod, and remind to keep this person on-task.	Rarely focuses on the task and what needs to be done. Lets others do the work.
<b>Problem-solving</b>	Actively looks for and suggests solutions to problems.	Refines solutions suggested by others.	Does not suggest or refine solutions, but is willing to try out solutions suggested by others.	Does not try to solve problems or help others solve problems. Lets others do the work.
<b>Working with Others</b>	Almost always listens to, shares with, and supports the efforts of others. Tries to keep people working well together.	Usually listens to, shares with, and supports the efforts of others. Does not cause "waves" in the group.	Often listens to, shares with, and supports the efforts of others, but sometimes is not a good team member.	Rarely listens to, shares with, and supports the efforts of others. Often is not a good team player.
<b>Grasps the Concept of Biogeography</b>	Student has a complete understanding of the concept of biogeography and relates the flora and fauna relationship with the diverse Biogeography of Missouri.	Student has a reasonable understanding of the concept of Biogeography and relates the flora and fauna relationship with the diverse Biogeography of Missouri.	Student understands that different areas in Missouri have different types of land forms, plants, and animals	Student does not choose to participate in the activity

Rubric Made Using: **RubiStar** (<http://rubistar.4teachers.org>)

## Inventory/Field Study

### Lesson Abstract

<b>Summary:</b>	This is a hands-on investigation of the characteristics and attributes of a riparian corridor and stream bank.
<b>Grade Level:</b>	6-8
<b>MO GLE:</b>	SC5.3.A.6; 4.1.D.6
<b>Subject Areas:</b>	Science
<b>Show-Me Standards:</b>	Goals – 1.3, 1.6 Strands – SC 3,4,5,7,8
<b>Skills:</b>	Observing, recording, measuring, classifying
<b>Duration:</b>	2 to 3 hours
<b>Setting:</b>	Outdoor, with classroom preparations and follow-up
<b>Key Vocabulary:</b>	Riparian corridor, stream bank, biodiversity, erosion

### Rationale:

- The riparian corridor is essential for the health of a stream.
- The health of the riparian corridor will affect recreation, agricultural practices, wildlife habitat, aesthetics, and flood management.
- Healthy stream banks are essential for a healthy stream.
- Healthy stream banks help prevent erosion and damage from floods.
- Students will probably become landowners someday and make land use decisions that can affect water quality and biodiversity in their watershed.

### Student relevance:

- Maintenance of a healthy riparian corridor is essential to a healthy watershed.
- Human activities and attitudes influence the health of stream banks and riparian corridors.
- Healthy riparian corridors are important for recreational and other uses.
- The study of riparian corridors offers students life-relevant learning situations.

### Learning Objectives:

Upon completion, students will be able to . . .

- Identify typical components of healthy and unhealthy riparian corridors (see riparian corridor introduction).
- Identify characteristics of healthy and unhealthy stream banks (see riparian corridor introduction).
- Describe the importance of healthy stream banks and riparian corridors for flood control, erosion prevention, and biodiversity.
- Describe beneficial and destructive human impact upon riparian corridors and stream banks.
- Describe the role of riparian corridors in providing wildlife habitat.
- Identify positive and negative uses of riparian corridors and stream banks.

### **Students Need to Know:**

- Recreational uses of streams
- Their own experiences with streams and rivers and how they use and enjoy the outdoors.
- The functions of the water cycle.
- Typical plants and animals of local riparian corridors (*Biogeography of Missouri*).
- The concept of erosion.
- The conditions of healthy and poor riparian corridors.
- The land use practices which enhance the development of healthy and poor riparian corridors.

### **Teachers Need to Know:**

- Riparian corridor plant and animal life.
- How to identify erosion.
- How to use tree and animal tracks identification handbooks.
- How to read a topographic map (optional).

### **Resources:**

The following materials are available at no charge from the Missouri Department of Conservation, P.O. Box 180, Jefferson City, MO 65102-0180, (573)751-4115.

*Understanding Streams* (brochure)

*Managing the Stream Side Forest*

*Restoring Stream Banks with Willows*, 1991

*Trees Along Streams*, 1994

*Tree Revetments for Stream Bank Stabilization*

*How to Build a Stream Revetment* (video for free loan from MDC Media Library)

Conservation Education Series for Junior and Senior High Order on line at:

<http://www.mdc.mo.gov/teacher/materials/>

*Aquatic Field and Classroom Activities*

*Missouri's Rare and Endangered Species*

*Wildlife Management in Missouri*

*Biogeography of Missouri*

### *Topographic Maps*

Available from the Missouri Department of Natural Resources, Division of Geology and Land Survey, P.O. Box 250, Rolla, MO 65402, (573)368-2125

Website for DNR publications:

<http://www.dnr.mo.gov/geology/adm/publications/pubscatalog.pdf>

### **Materials Needed for Lesson:**

*Riparian Corridor Inventory Checklist* (provided with lesson)  
Nature guides, tree and animal tracks identification handbooks  
Topographic maps (optional)  
Notebooks  
Plastic shopping bags

### **Procedure:**

- Use topographic maps (optional) to identify an appropriate area for a field trip.
- Divide students into groups of 5 or 6 for the field trip.
- Pass out copies of *Riparian Corridor Inventory Checklist* and instruct students to be observant and complete the handout based on their observations.
- Ask students to identify trees and other significant vegetation within a reasonable area (approximately 10' x 10'). Use identification handbooks and prior knowledge.
- Have students collect leaf samples from trees for pressing and mounting.
- Have students record all signs of animal life (tracks, droppings, rubbing).
- Have students observe and record any evidence of human activity.
- Have students observe and record signs of flooding and the effects of the riparian corridor on the flood waters.
- Have students make judgments as to the aesthetic qualities of their area.
- Have students observe the litter and soil, and take samples if appropriate. (Soil and litter should reflect the sediment trapping properties and flood control abilities.)
- Have students observe how the riparian corridor trees affect the stream itself. (Shade from these trees helps cool the water, thus increasing the water's ability to hold oxygen.)
- From their classroom activities and field experiences, ask students to draw conclusions about the characteristics of a healthy riparian corridor and stream bank.
- Ask students to make recommendations for planning and maintaining such healthy riparian corridors for their stream.

### **Evaluation Strategies:**

- The riparian corridor inventory can be a performance assessment.

- Students can summarize their learning in a story, poem, concept map or crossword puzzle that they create.

### **Extension Activities:**

- Create a bulletin board or wall mural using large art paper to create the plants and animals that would be found in a typical Missouri riparian corridor.
- Have students write stories for the local newspaper about their experiences and findings.
- Involve the local radio or television station in coverage of activities.
- Visit other streams in different physiographic regions of Missouri.
- Adopt a stream through the Missouri STREAM TEAM Program.
- Conduct litter pick-ups in a riparian corridor.
- Talk with local, state, and federal leaders about riparian corridors and stream banks.
- Simulate healthy and unhealthy stream banks using a stream table or the River Cutters Program.
- Plant trees in riparian corridors.
- Plant willow stakes on bare stream banks.
- Examine the different strata in soil profile trenches along the stream.
- Build a stream table. (Contact the Missouri Department of Conservation for the booklet *How to Build a Stream Table*.)

## Suggested Scoring Guide:

### Inventory/Field Study

Teacher Name: \_\_\_\_\_

Student Name: \_\_\_\_\_

CATEGORY	4	3	2	1
<b>Contributions</b>	Routinely provides useful ideas when participating in the group discussion. A definite leader who contributes a lot of effort.	Usually provides useful ideas when participating in the group discussion. A strong group member who tries hard!	Sometimes provides useful ideas when participating in the group discussion. A satisfactory group member who does what is required.	Rarely provides useful ideas when participating in the group discussion. May refuse to participate.
<b>Focus on the task</b>	Consistently stays focused on the task and what needs to be done. Very self-directed.	Focuses on the task and what needs to be done most of the time. Other group members can count on this person.	Focuses on the task and what needs to be done some of the time. Other group members must sometimes nag, prod, and remind to keep this person on-task.	Rarely focuses on the task and what needs to be done. Lets others do the work.
<b>Monitors Group Effectiveness</b>	Routinely monitors the effectiveness of the group, and makes suggestions to make it more effective.	Routinely monitors the effectiveness of the group and works to make the group more effective.	Occasionally monitors the effectiveness of the group and works to make the group more effective.	Rarely monitors the effectiveness of the group and does not work to make it more effective.
<b>Working with Others</b>	Almost always listens to, shares with, and supports the efforts of others. Tries to keep people working well together.	Usually listens to, shares with, and supports the efforts of others. Does not cause "waves" in the group.	Often listens to, shares with, and supports the efforts of others, but sometimes is not a good team member.	Rarely listens to, shares with, and supports the efforts of others. Often is not a good team player.

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# Riparian Corridor Inventory Checklist

Directions: Observe your designated area carefully and describe what you see directly and indirectly for each item listed below. Be as specific as possible.

Large trees

Erosion

Root wads

Exposed roots

Overhanging trees

Humus

Understory vegetation

Wildflowers

Insect signs

Bird signs

Snakes

Beaver

Flooding Signs

Debris in trees

Water marks on trees

Sand deposits

Gravel or sand bars

Human impact (roads, fences, picnic tables, trash, logging, gravel or sand mining, buildings, livestock overuse, farming up to the stream bank)

Evidence of animal habitat in and around the riparian corridor and stream bank (look for tracks, droppings, rubbing, vegetation consumption, etc.)