

## DAY TEN

### **OVERVIEW OR SUMMARY OF LESSON**

Day Ten continues the study of the Middle Rio Grande Valley using a game called Ecosystem On A Wall. After drawing a 10'-12' river with a riparian area, each class member receives a card with the name of an organism on one side and a description of its place in the ecosystem on the other. After making a journal entry about the plant or animal and drawing a picture of it on their card, the students, one at a time, place their cards on the river drawing in such a way that the interrelationship of organisms makes sense. The game teaches students about some components of the ecosystem found along the Rio Grande in central New Mexico, and gives them a sense of the web of interdependency.



### **PROCEDURES**

1. Give each student a printed card (if you want, have them draw a picture of the organism(s) on the back), and have them read the information on their card to themselves. Field individual questions about vocabulary and the meaning of the card descriptions. When possible, have other students answer these questions.
2. Discuss the importance of habitats and how various plants and animals have very specific needs for space, light, water, and food.
3. Instruct students to make a journal entry describing the organism that has been assigned to them. Ask them to identify the organism as a producer or consumer, an herbivore or a carnivore. Have them speculate about their plant or animal habitat, and what it might look like.
4. Begin the game, Ecosystem On A Wall. There are a number of ways you could use the cards, depending upon the abilities of your students. Below are two versions:
  - A. Have some students draw (on butcher paper, 10-12 feet of posterboard taped together, or on the blackboard) a drawing of the river and riparian area, showing river, trees and brush. Referring to the Teacher's Card Content Summary, begin with the simplest organism ("bacteria, fungi and soil invertebrates"). When you call out the name of the organism, the student identifies his/her card, tells the rest of the class about the information on the back of the card, and tapes the card in an appropriate location along the river. As you proceed on to more complex organisms, you can interject additional background information on organisms and habitats.
  - B. Make the river drawing. Beginning with Card #1 ("Starting with the smallest organism in the Rio Grande..."), the class listens to the student with Card #1 read or describe bacteria, fungi and soil invertebrates. Then the student asks the question which follows the written information on the card. ("Why are small

invertebrates important to the ecosystem? What are some of their names?") As student #1 tapes the card in an appropriate location in or near the river, whoever thinks s/he has an answer to the question introduces the next plant or animal. The game proceeds through all the cards, the described organisms becoming increasingly more complex.



### **ALTERNATIVE OR SUPPLEMENTAL ACTIVITIES**

Students might further research the organisms on their cards. The New Mexico Department of Game and Fish has a data bank for many N.M. plants and animals. Students could share their research with the class, make a more detailed journal entry, or make a drawing or model of the organism in the context of its habitat.

### **CONTENT DISCUSSION FOR DAYS TEN & ELEVEN**

In 1992, the Rio Grande Bosque Conservation Committee (a citizen's committee formed by Senator Pete Domenici) asked an interagency team of biologists to develop a biological management plan for the Middle Rio Grande Bosque. They were to study the bosque's problems and to recommend changes in the way biological resources are managed in the Middle Rio Grande ecosystem. Biologists surmise that if changes in management are not implemented, the cottonwoods and much of the bosque as we know it could disappear within 40 years: This means that in YOUR lifetime much of the bosque would disappear.

THE MIDDLE RIO GRANDE ECOSYSTEM: BOSQUE BIOLOGICAL MANAGEMENT PLAN describes the bosque ecosystem both as it used to be and in its present altered state. It also offers futuristic scenarios and makes recommendations for managing a healthy riparian ecosystem.

The Bosque Biological Management Plan presents a wealth of information about one of New Mexico's most important resources. The activities on Days Ten and Eleven of the River Science Curriculum are based on this research. They offer students an opportunity to begin to explore the complexities of an ecosystem in this region.

It is important for students to understand that the Middle Rio Grande ecosystem includes a diversity of habitats. There are 11 types of habitats for fish alone! The number and variety of aquatic and terrestrial habitats illustrates the complexity of the Middle Rio Grande ecosystem. The interrelatedness of all the living organisms and the importance of protecting their habitats becomes apparent.

The Bosque Biological Management Plan also includes 21 recommendations for insuring that the biological quality, referring to the diversity and abundance of species, especially native species, can be sustained in the future. A look at these offers students a thoughtful and authentic example of problem-solving to create a future healthy environment for many living species.

We hope the activities on Days Ten and Eleven provide a way for students to enjoy learning about their environment. Those schools located outside the Middle Rio Grande ecosystem might explore their own unique riparian ecosystem by using this research and comparing it to their own.

Project Crossroads acknowledges and thanks the Middle Rio Grande Interagency Team for allowing us to use their Bosque Biological Management Plan.

Note: Loss of habitat along the Middle Rio Grande is an on-going problem. Pages 275-279 of the Management Plan provides information on the habitat for federally designated threatened and endangered species. Some of the recommendations relate to reestablishing habitats for native species.



A river, almost by definition, is a body of water large enough to occupy one's mind.

## NARRATIVE FOR “ECOSYSTEM ON A WALL” GAME

To be accompanied with 10' x 12' drawing of the river and handout cards with the following text on back (not the questions in *italics*) and the underlined name and possible drawing on the front.



*STARTING with the smallest organisms in the Middle Rio Grande ecosystem:*

1) Bacteria, fungi, and soil invertebrates (like earthworms) break up surface litter in the Rio Grande bosque. Leaf litter and fallen wood, when decomposed, add needed nutrients to the bosque floor. They contribute to the supply of soil nutrients taken up by the roots of trees and other plants.

*Small invertebrates are important to the ecosystem. What are some of their names?*

2) Small invertebrates are important in aquatic ecosystems because they eat plants and also serve as food for higher level organisms. These small invertebrates live in many habitats along the river, including the river bottom and the riparian habitats along the shore. Flies, dragonflies, and beetles are invertebrates that live in and along the river.

*What are some of the aquatic plants in the Rio Grande that provide food and cover for invertebrates?*

3) Algae, floating plants (such as duckweed) and pond-weed, all of which are rooted to the river bottom, provide food and cover for invertebrates. The small invertebrate life provides food for fish and birds. When ducks, marsh birds, and shorebirds scoop up and eat these plants they are also eating invertebrates living among them.

*What plant, named after a bird predator, provides habitat for birds?*

4) Cattails are extremely important in providing habitat for waterfowl, marsh birds, and shorebirds during nesting and migration. Besides providing needed cover, cattails and their seeds are eaten by geese and other waterfowl.

*Wetlands provide important habitats for fish, too. What native fish live in the Rio Grande?*

5) The Rio Grande supports lots of kinds of native fish. Fish habitats range from deep mainstream flows to isolated pools and shoreline that can provide necessary food and cover. However, studies show a steady decline in both the variety and number of native fish. Some, like the Rio Grande shiner and speckled chub, are more-or-less extinct. The red shiner is the most abundant native fish today.

*What affects the habitat of native fish?*

6) How much water there is, and how often it flows, affects native fish habitats. High river flows trigger spawning for some fish like the Rio Grande silvery minnow, but they also drift downstream during part of their development. In 1984 the silvery minnow was one of the most abundant fish in the Middle Rio Grande, but now they occupy only 5% of their original habitat and are on the state endangered species list. Poor water quality around Albuquerque plus the introduction of non-native fish may have influenced their decline.

*How might the introduction of a non-native fish affect native fish such as the silvery minnow?*

7) Non-native fish have been introduced into the Rio Grande through accidental releases and to encourage sportfishing. Non-native fish compete with native fish for the same resources. Introduced fish are often found in the habitats preferred by native species and sometimes squeeze them out. Studies show that non-native fish may increase the diversity of fish species, but they also reduce the number of native fish.

*Other animals in the riparian ecosystem are declining in number. What amphibian was once common along the river?*

8) Amphibians, such as chorus frogs, bullfrogs, and northern leopard frogs live in the wet meadows and marshes of the bosque. Northern leopard frogs were once very common along the Rio Grande. They forage in wet meadows and breed in quiet, shallow waters where aquatic plants thrive. Today their population has declined -- perhaps due to the introduction of bullfrogs and the destruction of their habitats.



*What animal shares a similar habitat with northern leopard frogs?*

9) Painted turtles were once common in the Rio Grande Valley. They share a similar habitat with the northern leopard frog, because both like quiet water with abundant aquatic plants. If the northern leopard frog's habitat could be restored and protected, painted turtles would also be better off.

*What other animals benefit from standing marshes and wetlands habitat?*

10) Standing and slow-moving marsh and wetlands habitat provides an abundance of insects for many bird species. Black-chinned hummingbirds, barn swallows, flycatchers, and numerous other insect-eating birds forage at aquatic and wetland sites along the Rio Grande during migration and breeding.

*Many birds live among the cottonwoods. Where do the cottonwoods live?*

11) Cottonwood trees dominate much of the riparian zone along the Rio Grande. They form a canopy (cover) along the river. Cottonwoods, along with lower-growing trees, provide an ideal habitat for many species of animals, including a great variety of birds. How much and how often water flows in the river determines how cottonwoods germinate and grow. Without special attention and management, some bio-logists have warned that, in the future, there could be far fewer stands of cottonwoods along the river.

*There are other trees in the bosque that provide ideal habitats for a great variety of birds. What non-native fruit-bearing tree does this?*

12) The Russian olive tree is the major non-native species found throughout the northern part of the Middle Rio Grande. Cottonwoods and Russian olive trees in a marsh habitat attract the highest density of birds year-round. Russian olive trees provide cover and food for many animals. Russian olive trees have adapted easily to the Middle Rio Grande ecosystem because they can germinate and grow in shady areas. Their roots provide a process that contributes important nutrients to the bosque floor.



*What other non-native tree is flourishing along the Rio Grande?*

13) Salt cedar is not native to New Mexico, but it is spreading rapidly in riparian habitats. It was first introduced in Albuquerque in 1908. Originally an ornamental and shelterbelt plant from the eastern Mediterranean, it can flower and produce seeds throughout the growing season. Salt cedar provides a habitat for many species of birds, but because it is pushing native plants out, attempts are being made to eradicate it from the wetland areas.

*What animal likes to live in salt cedar?*

14) Lizards prefer habitats with low shrubby salt cedar. Along the river, the highest number of lizard species are found in open areas such as sand bars and levee banks.

*Many small rodents live in the bosque. Please describe some of them.*

15) Three of the most common rodents in the bosque are the white-footed mouse, western harvest mouse, and the house mouse. They account for 92% of captured small mammals in cottonwood/shrub habitats.

*What animal in the Rio Grande ecosystem lives underground and likes to tunnel?*

16) Botta pocket gophers are widespread throughout the riparian zone in areas of deep, sandy soil where trees are not too dense. They are especially common near coyote willows. The tunneling of pocket gophers mixes large quantities of soil and provides habitat for many invertebrates.

*What mammal in the Rio Grande Valley flies?*

17) Eleven species of bats have been identified in the Rio Grande Valley. Two -- Yuma myotis and little brown myotis, live only in open water, drains, ponds, and the river.

*Besides the construction of dams by the Army Corps of Engineers, what other mammal builds dams along the Rio Grande?*

18) Beavers were once very common along the river, living in scattered areas of cottonwood/willows, marshes and permanent water. After extensive trapping, their population decreased until they were restocked in 1947 and 1948. Today they dig dens along the riverbanks. Their presence is controversial: although beaver dams can help create wetlands, they can also damage irrigation ditches and drains.

*What animal likes Russian olive fruit?*



19) Raccoons are abundant omnivores in Rio Grande riparian habitats. They live at the water's edge, using snags and fallen logs for shelter. Russian olive fruit appears to be one of their favorite foods.

*What other mammal likes quiet backwaters and lives throughout the Middle Rio Grande?*

20) Muskrats live wherever permanent water is found in the Middle Rio Grande. They are most common along ditches and quiet backwaters.

*Can you name some carnivores who inhabit the ecosystem?*

21) Several species of carnivores are found in the bosque, including coyotes, grey fox, bobcat, striped skunk, and long-tailed weasel. They prefer riparian areas because of the abundant prey to be found there.

*What other wildlife lives in this riparian habitat?*

22) Resident mule deer are found along riparian corridors next to desert or grasslands habitats. Their numbers have declined due to human settlements. The areas in which they live are restricted; they often live near protected wildlife areas.

*There are many introduced animal species that live in the Rio Grande Valley. Describe them, please!*

23) Livestock -- including cattle, goats, horses, donkeys and mules --forage on trees and grasses in the Middle Rio Grande floodplain. This area includes native riparian habitats, pastures, and croplands. These creatures are used for work, pleasure, food, by-products (such as leather) and for commercial sale. Livestock can either be helpful or harmful to plants, soil, water, and wildlife in the bosque -- depending on how the area is managed.

*What other inhabitants of the Middle Rio Grande Valley have a great impact on the ecosystem?*

24) About 578,000 people -- or 38% of New Mexico's population -- live in the Middle Rio Grande Valley. Along the river, a series of reservoirs, dams, drainage ditches, levees, and acequias (irrigation ditches) have been built to divert water for agricultural and urban uses. Land has also been set aside and protected for its riparian habitats and recreational purposes. Because of growing population and increased demands for clean water, our impact on the Middle Rio Grande is significant!

*Although this is the end of the game, we've only mentioned a few of the plant and animal species who inhabit the Middle Rio Grande ecosystem!*

