

*Chapter 1*

**Introduction**

Introduction to the Bosque Education Guide ..... 17

Words from Teachers ..... 24



# Introduction to the Bosque Education Guide

17



Introduction



You hold in your hands not just a book, but a program. This guide does more than offer guidance; we hope it also offers knowledge, ideas, and passion about a special ecosystem found along the rivers of New Mexico. Our focus in particular is an approximately 200-mile stretch of forests and woodlands growing directly adjacent to the Rio Grande in central New Mexico. We call this forest the Middle Rio Grande bosque. We call this book the *Bosque Education Guide*.

This guide does not stand alone. Workshops, kits, web pages, handouts on access and organizational contacts, and newsletters are some of the additional tools designed to help New Mexico educators teach about the bosque. We expect this guide will be used in as many different ways as there are teachers who pick it up. However, we provide a recommended approach for using this guide, as well as ideas for inquiry-based learning.

We also hope this chapter answers the question of why you may want to use this guide or, more accurately, why you might want to use the bosque as a focal point in your teaching. We have taken two approaches to addressing this question. First, we have provided some history on this guide and some background on how and why it was developed. In addition we have appealed to several teachers who regularly use the bosque as an outdoor learning environment to share their thoughts about teaching in the bosque. In the next section of this chapter, you will find their essays, presented as inspiration for your own teaching and writing.

Whether you have been teaching about the bosque for years, or this is the first time you have heard of this ecosystem, we hope you will find this guide a worthwhile companion in your efforts to connect more students to the natural world around them.

## *About This Guide*

The first edition of the Bosque Education Guide was published in 1995. The guide takes an interdisciplinary approach and includes activities that are both field based and classroom based. In the first seven years over 600 educators attended workshops on how to use this guide and received the first edition of the guide and kit.

This second edition of the guide represents major revisions. The guide—originally targeted for students in third to fifth grade—has been expanded to include activities for students from kindergarten through high school. Actually, we find that some activities in the guide have been applied in college classrooms and adult programs as well.



*The Rio Grande Nature Center's Discovery Pond is a popular destination for field trips. Photo by Will Dumas*



The guide has been broadened. New activities have been added that teach about geology, agriculture, culture, and plants. We have expanded and updated the background information, offered adaptations for bosque ecosystems outside of the Middle Rio Grande Valley, and referenced the activities in this guide to relevant New Mexico Department of Education standards (K–12, all disciplines).

The major change offered by this second edition is the addition of ecosystem restoration in our understanding of the river system. In the first edition, we presented the river as two different ecosystems. The old river (we called Rio Grande Viejo) represented how the river functioned before major human-influenced changes (dams, diversions, water-flow management, exotic species introductions, etc.). The new river (we called Rio Grande Nuevo) represented how the river was altered by human activities. In this guide, we model three river systems: the wild river, or Rio Bravo (akin to the old river in the old guide); the tame river, or Rio Manso (akin to the new river in the old guide); and the new river, or Rio Nuevo, which represents what the river ecosystems can be like when people care and act for the river.

### *How This Guide is Organized*

This new guide is organized into six chapters and a substantial set of appendices. Throughout the guide, we have provided icons in the outside margin to help identify the material. Each chapter can be recognized quickly by its own icon, as can:



the appendices;



the index;



pages that should be copied for students' use; and



background reading for teachers.



**Chapter 1: Introduction** presents the concept of using the bosque as a focus for instruction.



**Chapter 2: Bosque Background** includes background information on both the bosque and on many ecological concepts that are important to understanding the bosque. This is intended as reading for the teacher, to prepare her or him for presenting the activities in this book. This chapter may also be good background reading for high school and college students.



**Chapter 3: Going Out—Field Activities** compiles an assortment of field activities to support multiple visits to the bosque. These include activities that support observation skills for a class's first introductory field trip, as well as activities to develop students' critical-thinking skills in follow-up field trips.



**Chapter 4: River of Change** is devoted to creating a cloth and paper model of the river valley that can be used for many lessons. The basic activity, "Changing River," provides a setting for the subsequent activities that explore the roles of animals, plants, cottonwood trees, agriculture, and change in the river of the past,



the present, and the future. The River of Change model, which is designed for use in the classroom, is unique to this program and provides a hands-on approach to understanding river ecology.



**Chapter 5: Meandering Channels** compiles classroom and schoolyard-based activities that do not utilize the river model. These activities are grouped under the following topical subheadings: natural history, geology, water, and human influence. Within these activities several essays provide additional in-depth background information on specific topics.



**Chapter 7: Living Like We Love It—Service Learning and Outreach** explores the potential of making the bosque a focal point for service-learning opportunities. This chapter is intended to guide teachers toward helping their students participate in improving the bosque ecosystem. Research shows that when environmental education involves students in action efforts the students develop increased knowledge. Your students will also be empowered by the opportunity to help the bosque. This chapter is divided into two sections; the first provides information on traditional service-learning projects that include taking action in the woods, and the second section suggests ways students can share their knowledge of the bosque with other people.



**Appendix A: Glossary** defines many of the terms throughout this book. The next two appendices share information on additional references. **Appendix B: Annotated References** includes some of resources that influenced activities in this guide as well as some favorite books and videos submitted by the contributors to this guide. **Appendix C: Supplemental Activities** describes environmental education activities found in other activity guides that can be included in a unit on the bosque. **Appendix D: Human Chronology** offers a time line of human activity in the Middle Rio Grande Valley.

The next four appendices offer specific information about natural history topics in the bosque. Checklists of some of the species found in the bosque are included in **Appendix E: Arthropods**, **Appendix F: Vertebrates** and **Appendix G: Plants**. **Appendix H: Dichotomous Plant Key** is a simple key to some of the common bosque shrubs. It is a nice tool for introducing the concept of dichotomous keys.

The final three appendices help educators select appropriate activities for their classes. They include **Appendix I: Activities by Grade**, **Appendix J: Activities by Topic**, and **Appendix K: Standards Correlation**.

A note about New Mexico Content Standards and Benchmarks: Activities in Chapters 3, 4 and 5 are numbered, and the numbers are used in the Standards appendix. Activity numbers appear in a cottonwood leaf:



The **Index** follows the appendices. The final page of the book is an **Alphabetical Listing of Activities** that includes page numbers and standards references.



## *A Recommended Approach For Using the Guide*

### *Step 1*

#### **Teacher**

prepares for the unit by reading the background information about the program, the bosque and the first field trip.

#### **Recommended Readings:**

Chapter 1: all  
Chapter 2: all  
Chapter 3: Planning a Bosque Field Trip

### *Step 2*

The first **class field trip** to the bosque focuses on exploration, observation and “bonding” with the bosque.

#### **Possible BEG Activities:** (all in Chapter 3)

Bosque Bingo  
Bosque Discovery Booklet  
Naturalist Notebooks  
Scavenger Hunt

#### **Activities From Other Programs:**

(see Appendix C)  
Thicket Game (Project WILD)  
Water Plant Art (Aquatic PWILD)  
River of Words (DAW: RG/RB)

### *Step 3*

Back in the **classroom and schoolyard**, the class undertakes a study of the river, the bosque and ecosystems. Each teacher tailors the program for grade, time, standards to be met and interest in issues.

**River of Change (Chapter 4)** is a collection of activities that utilize the river model focusing on seeing the river three ways (Rio Bravo, Rio Manso and Rio Nuevo).

**Meandering Channels (Chapter 5)** is a collection of activities separate from the model done in either the classroom or the schoolyard. They are organized thematically (natural history, geology, water and human influence).

**Appendix C** also recommends many other activities from other programs that can be a part of this unit.

**Step 4**

The second **class field trip** to the bosque gives students a chance to utilize and expand their knowledge about the bosque. There are opportunities for inquiry learning and exploration.

**Suggested BEG Activities:**

Activities in **Chapter 3** not utilized during the first field trip

Activities from other programs:

**See Appendix C** listings under “Field Trips.”

**Step 5**

**Service-learning Project: Planning Stage.** Engage students in planning how they can take action to help the bosque. See **Chapter 7** for more details.

**Step 6**

**Service-learning Project: Action and Reflection.** Have students participate in a service-learning project that includes a reflection component. See **Chapter 7** for more details.

**Step 7**

**Bosque Celebration.** Celebration is the final step for the service-learning project, but it can be combined with a celebration of the entire bosque study. Develop ways to share information the students learned with family, school and community. See **Chapter 7** for more details.



### *Inquiry-based Learning*

As expressed in the National Research Council's National Science Education Standards (1996), inquiry is an important facet of science teaching and learning. Inquiry is more than science as process skills, in which students learn such skills as observing, inferring, and experimenting. This is how the national standards describe inquiry:

When engaging in inquiry, students describe objects and events, ask questions, construct explanations, test those explanations against current scientific knowledge, and communicate their ideas to others. They identify their assumptions, use critical and logical thinking, and consider alternative explanations. In this way, students actively develop their understanding of science by combining scientific knowledge with reasoning and thinking skills.

While providing students with hands-on experiences is essential, it is not enough. Students must have "minds-on" experiences as well. Through inquiry, students will discover that science is something they *do*; it is not something that is done to them.

Many of the activities in this guide provide excellent launching pads for inquiry-based units. For example, after learning how to construct and use kick-nets or do pitfall trapping, students are well equipped to begin an investigation of their own design. Learning the procedures should not be the only outcome for the student; instead, it should be a tool for learning more about the ecology of the bosque.

At this point, the role of the teacher is to encourage and sharpen questions for further investigation, provide guidance on procedure and safety, and help students find resources, be they experts in the field, web sites, or written material. Additional resources for inquiry-based learning are listed in Appendix B: Annotated References.





### *Who Developed the Guide*

This guide represents the efforts of nearly 100 individuals. This project has always been a grass-roots effort, with educators and natural resource managers coming together with a common interest of using the bosque to teach students about our earth. The guide was inspired in 1993 by the publication of the *Middle Rio Grande Bosque: Biological Management Plan*, and the first edition was produced in 1995. Work on this edition was initiated in 2000 and this version was first available in the spring of 2003. For names of individuals and their contributions, please examine the Acknowledgments pages.

The concept of using the bosque as an outdoor classroom continues to gain support and expand. We are excited to have you join this experience.

*Students from Hubert  
H. Humphrey  
Elementary check a  
pitfall trap  
(see Chapter 3) at the  
Nature Center. Photo  
by Mary Stuever*



# Words from Teachers



## *Why Do I Use the Bosque With My Second-grade Students?*

*By Molly Madden*

*Rio Grande Elementary School, Belen, NM*

I did not have a specific goal when I first started taking my classes to the local bosque in Belen 15 years ago. In fact, for years, I took my students in October for a walk in the woods to gather fall leaves for a variety of projects to complete back in class. Although these trips served many purposes, I did not realize then the potential for using the bosque in my classroom. Then, in mid to late '90s, two things happened that made me look differently at our bosque trips.

First in 1995, I participated in the training program at the Rio Grande Nature Center for the Bosque Education Guide. Here I received the first edition of this guide, and received materials and ideas for teaching about the bosque both in the field and in the classroom. Second in 1998, I volunteered my class to work with the Bosque Ecosystem Monitoring Program (BEMP), which required us to gather data in the bosque on a monthly basis. Early on in our involvement with BEMP, we paired my second graders with fifth-grade partners. Over the past few years, several other teachers and their classes have joined my class in the monthly trips. Researchers from UNM consistently tell us that the data collected by this combination of fifth- and second-grade students is as good or better than data turned in by middle and high school students in the program. Since the opportunity to collect data is really limited to a



*Molly Madden and students  
at Rio Grande Elementary  
in Belen visit the bosque at  
Willie Chavez Park.*



smaller group of students, and not the 90 students we take to the field each month, we have had to plan carefully how to make the most of these opportunities. We set up a rotation so each student collects BEMP data once or twice during the school year. This gives us an opportunity to do many other activities with students in the bosque, and here the Bosque Education Guide has served as an excellent resource for ideas and activities.

We have found it very important to have a specific focus for each trip to the bosque. We always use the “Bosque Bingo” for our first trip in September, because it provides a focus but also allows for discovery and exploration. Starting with this first trip we try to ensure that students have some quiet, non-directed time for reflection in the bosque. On subsequent trips we may use a page or two from the “Bosque Discovery Booklet” or “Field Explorations Booklet” as a focus. Each student keeps a bosque journal for the entire school year and records in words and pictures his/her discoveries as well as weather data on each trip.

The monthly trips are critical to the students’ developing a meaningful relationship with the bosque. This relationship includes a growing love for the bosque, a sense of belonging in the bosque, and a responsibility for its healthy maintenance. When children spend a lot of time in one place, their natural curiosity and awareness combine to build personal connections that are so powerful they will last forever and will affect who they are as adult citizens as they make informed decisions about the future of the natural world. Our bosque program encourages children to develop a sense of place. When their parents and grandparents share their stories and memories of the bosque, this sense of place and community is enriched even further.

Once the children have explored the bosque and made personal discoveries, we follow up in class with some of the more structured lessons in the *Bosque Education Guide*, like “Changing River” (the river model) and “Bosque Leaf Hunt Relay.” At the end of the year we build models of what the bosque might look like in 25 years as a way to assess what the children have learned since September.

I have slowly realized the value of visiting the bosque on a regular basis. As the children become familiar with the bosque, they find special spots they want to visit each time. One day, after our data collection was completed, a student asked me if we could go to that *special dream place*. I was confused by her request, but after she eagerly led me to the spot, I understood what she meant. It *was* dreamlike in the quiet, still shade of the Russian olive and cottonwood trees. But the special feature was the soft, downy layer on the ground created by the fluffy, white seeds of the cottonwood trees. As we sat and listened, I realized she had reminded me of something we tend to forget about: the importance of quiet time in a special place with no purpose other than to *be*. She loves her place and will protect it with passion and knowledge in the future.



## The Changing River Model

By Jacqueline Beckham-Dale

Fourth-grade Teacher, Ernest Stapleton Elementary School, Rio Rancho, NM

I explained working with the *Bosque Education Guide* to my students and they were very excited because they know how much the Rio Grande and its bosque mean to me-and now to them. They are a wonderful group of kids. Two classes were both doing the land and water science kit so we joined forces. The *Bosque Education Guide* fit quite nicely with the kit. The science kit was a study of land and water in general and this project made the study of land and water very personal and meaningful, as it is *our* bosque.

Our first experience with the guide was the “River of Change” model activity. I rearranged the desks in the room to be an open rectangle, in case we had to leave the model up for more than one day. This gave everyone in the class a good view of each stage of the Rio Grande and started many discussions and writing projects. When the other class joined us, they sat in front of the desks, facing the model, so everyone was able to see and participate.

Several days before we began, all of the students were given vocabulary words that would help them understand what they saw. We also used overheads to give them a visual idea of what we were talking about. I have one Special Education student who does much better with visual learning, and it doesn’t hurt the rest of the class, either. Then, the fun really began.

	<b>Rio Bravo</b>
	The Rio Bravo is the Rio Grande of the past. It had
<input type="radio"/>	more meanderings than it does now. It had more plants
	like cattails and cottonwoods.
	There are more braids,
<input type="radio"/>	oxbows, and sand bars than there is now. That is a little
	bit of what the Rio Bravo is.
<input type="radio"/>	

After an explanation of the Middle Rio Grande region, where it was, what types of plants live there and why, the kinds of birds and animals that live there and why, and the part humans play in all of this, we began building the Rio Bravo. Most students were anxious to take their shoes off and build mountains with them. I divided the classes into groups to match the number of cards I had. In this way, everyone could participate, either reading their respective card or following the directions on the card. Each group was anxious to take their turn, but they all paid attention because they knew a writing assignment would follow. Being familiar with the vocabulary words really helped. We moved at a fairly rapid pace. I’ve found that it keeps the group involved and on their toes.



Following the directions on the cards was an interesting experience. Everyone had an idea about how things should be placed. We discussed it and used a general consensus when there were too many objections—or directions. When it was completed, the classes were proud of the Rio Bravo they had created. We reviewed what we had learned and began a story web on the board. Each student finished his or her own web, and then wrote a paper about what had been observed and learned.

Next, I passed out the cards for the Rio Manso. This was a real eye-opener for the students. The changes we made were drastic in some areas and the students protested loudly. They began to question water use. They also noticed the cottonwoods

were disappearing and exotic plants were taking their place. There were fewer seedlings, which led to fewer teenage trees and, in turn, led to fewer mature trees. As the old cottonwoods died out, there weren't as many new trees to replace them. As more plants disappeared, animals did, too. That was a great topic for discussion.

People became more dominant in the area around the river and a prime user of water and other resources. This information really opened the students' eyes. After we had followed all of the directions, we used a Venn Diagram to compare and contrast the Rio Bravo and the Rio Manso. Students wrote from the Venn Diagram.

As we began changing the river to the Rio Nuevo, I explained to the students that this was only a glimpse of what the future river might

look like. I explained it is their responsibility to protect the Rio Nuevo, as they will be in charge in the future. This is where I introduced the activity "Bosque Chaos." In nature's hands, as in the roll of the dice, some of the changes are positive and some of the changes are negative. Students jeered and booed when the changes seemed negative and cheered when they perceived the changes as positive. It was amazing how quickly they "owned" the river.

<b>Rio Manso</b>	
	The Rio Manso is the Rio Grande of today. In the Rio
<input type="radio"/>	Manso, there are many changes from the Rio Bravo. It is a lot straighter than the Rio Bravo. There is less marsh because there is less water.
<input type="radio"/>	The Rio Manso looks a lot different from the Rio Bravo. It has jetty jacks. They are pieces of steel that help stabilize the river. There are a lot of ditches and a lot of homes on the river.
<input type="radio"/>	I learned that Rio Manso is an important thing.



I reinforced that reliance on nature is not enough to save the Rio Nuevo. The voters of the future must take responsibility for the river's health and vitality. They can do this by appropriating money when necessary, by volunteering for committees that are in charge of maintaining and improving the Rio Grande and its bosque, by using water and other resources wisely, and by teaching their children the importance of taking care of the Rio Grande and its surroundings.

I teach at a preschool in the summer and this would be a great program to use as early as kindergarten. The sooner young students learn about the Rio Grande and how to take care of it, the sooner those students will begin practicing what they have learned. No matter what our theme is, I always teach the importance of using water and other resources wisely. I teach the little ones how to wash their hands without wasting water. I try to instill pride in ownership, so we pick up litter regularly. Although they are young, I hear from parents that they have been taught to wash their hands correctly by their preschoolers, and their family often goes on "litter walks" together.

	<b>Rio Nuevo</b>
	The Rio Nuevo is the Rio Grande
<input type="radio"/>	of the future. In the Rio Grande of the future, we are planning to make the Rio Grande meandering and make it so it has more plants and animals.
<input type="radio"/>	In Rio Nuevo we plan to get rid of many of the jetty jacks. We also plan to get most of the nature back and get rid of the bugs* and trash. I learned that I am responsible for the Rio Grande of the future and it is my job to keep the bosque clean.

\*Editor's note: It is certainly not the role of this guide to encourage getting rid of the "bugs"; they are a part of nature, but we appreciate the writer's overall concern for the ecosystem.

The *Bosque Education Guide* covers many of the standards and benchmarks for New Mexico in science, math, social studies, and language arts. I could teach from this book all day long!

We plan to take a field trip to the Nature Center in the spring. We will utilize additional activities then and I am certain it will be a very meaningful field trip and will reinforce everything we are learning in the classroom.



*The river model as laid out by fourth-graders at Rio Rancho's Stapleton Elementary.  
Photo by Jacqueline Beckham-Dale*



## *Using the Science of the Community to Partner in Learning and Teaching*

*By Dolores Varela-Phillips*

*Educational Consultant and Curriculum Writer, Bosque, NM*

“Gee! I can’t believe we’re going on a field trip right at our own school!” The excitement radiated through the air as the kids gathered in assigned teams, double-checked their equipment and materials and got ready to embark on their water quality investigations. One team was going off to the local irrigation ditch that ran parallel to Los Padillas Elementary School and the other team was heading toward the pond located in the Los Padillas Wildlife Sanctuary, a five-acre on-site outdoor learning laboratory. Accompanied by well-prepared parents and their teacher, these third-graders (also well prepared) were going to use simple tools to collect water samples and data at each site. This investigation was an important one. It had great meaning to all involved. The South Valley of Albuquerque, where the Los Padillas students, parents and some teachers live, has been plagued by polluted ground water for a while now. So, the teams were going to find out, by collecting, sorting and rating aquatic arthropods for pollution tolerance, just how healthy these two bodies of water were. They would then compare data, draw conclusions and present their findings.

Since the mid-1980s teams of Los Padillas teachers, realizing the incredible learning/teaching opportunity the environment and culture of this rural part of the South Valley presented, worked to develop a meaningful thematic curriculum around it. In addition, this same vision enabled the realization of the Los Padillas Wildlife Sanctuary. The inspiration came from the knowledge the kids brought to school supported by the rich cultural aspects the parents and grandparents were willing to share. The kids knew the habits of insects, birds and tumbleweeds; they knew when to plant

and irrigate; they knew how to “read” their farm animals and care for them. The parents and grandparents knew how it used to be: the old ways of farming, healing and living and the cultural values inherent in the way of life of *mas antes*. All generations also knew that changes were occurring and some of these changes were beginning to cause



*Outdoor classroom (above) and wetland plants (next page) at Los Padilla Wildlife Sanctuary. Photos by Mary Stuever*





problems to the quality of life they were used to. Encroaching urbanization was taking a toll on quality water supplies, open space and clean air. The hope, then, of this integrated thematic curriculum was that the Los Padillas students would have the tools to become informed, responsible activists who would work to ensure a sustainable, healthy and culturally relevant community.

The partners—teachers, students, educational assistants, parents, administrators and other staff folks—all shared in and contributed to units such as medicinal plants, water ecology, native plant gardening, native plant identification and herbariums, birds and bird migration, soil ecology and arthropods. Students then learned how to sample flora, fauna and abiotic factors along a transect line in order to understand the components of an ecosystem. The unit possibilities were endless.

The enthusiasm for these meaningful hands-on outdoor ecology units was infectious. The kids would beg to go to the Wildlife Sanctuary! Parent support and involvement was at an all-time high. Teachers were as excited as the kids and felt renewed energy. Science test scores rose far beyond any other content area scores (go figure—the science part was a lot of reading!)

The Los Padillas Wildlife Sanctuary ecology education program stands the test of time. It has been going on, formally, since the facility was completed in 1993 (and, actually, way before then when it was in its experimental stage). It survived changes in administrators, teachers and student population. One reason for this is because a professional development model designed around the program was implemented in the late 1990s. Fifteen interested teachers wrote the grant to fund the model, designed it and hired experts as their mentors/trainers. Some of these teachers are still on board and are mentoring new teachers in the program. In addition, UNM College of Education's Science and Math Academy has produced a cadre of teachers some of whom migrate to Los Padillas because of its ecology program and outdoor learning laboratory.

The program has truly taken on a life of its own! It appears as if it is here to stay. The partners will continue to share in teaching and learning with the science of their community as their theme.





## *Flying Doughnuts and Hoped-for Eagles*

*By Daniel Shaw*

*Middle School Science Teacher, Bosque School, Albuquerque, NM*

Somewhere, in my desire to have my students look up, I offered a dozen doughnuts to any one of them if they pointed out autumn's first bald eagle. We are urban dwellers who live in a desert. We also live along the continent's second longest river, the Rio Grande. And within this desert, along this river, and in the heart of Albuquerque, every winter we share our riverside forest with a few dozen bald eagles.

On our way to our monitoring site we traipse through the forest, that we know by its local Spanish name, "*bosque*." We are part of a network of students who keep track of the environmental conditions of this forest through our participation in the Bosque Ecosystem Monitoring Program. Armed with probes to measure groundwater depths, paper lunch sacks to gather a month's worth of fallen plant material that has dropped into oversized dog bowls, and three-part forms to record all of this and more, we are on a scientific mission. In the afternoon I will send the work of my sixth graders to the University of New Mexico's Biology Department. There it will be incorporated into a larger study of this forest's conditions and trends. Later, in an annual report, the results will be studied and acted upon by area natural resource professionals. All of that sounds important, but in this moment, we are just some folks out walking in the woods.

That my students are doing science that matters far beyond their own little classroom is just my cover story. My real goal is to put them afield in their home watershed. I want to provide an opportunity for them to discover a magic of place. I want them to build visceral connections with this place that sustains them. How this landscape nurtures them is probably something that they can hardly articulate, and may not even know. But in time, I hope that they will at least feel it.

So as our winding path moves in and out of dense cottonwood canopy cover, I encourage them to look about. But I am realistic. These are sixth graders after all. Their attention is not constantly drawn to the natural world. I listen to their conversations. I capture bits of sentences. I hear enough to know that one group of boys is deeply engaged in a discussion about an online computer game. Some girls are chatting about shopping this past weekend at the mall. Another group of students is enthralled with the intrigue of a certain boy and a particular girl liking each other. Someone wants to know if the two are "going out." I wonder too. After teaching middle school for a decade, sixth grade romance still intrigues and perplexes me. Of course I am also intrigued and perplexed by adult romance. My mind wanders just as easily as that of a sixth grader. And my sixth graders' minds do roam.

Computers, the mall, and adolescent love is what captures my students' attention. They are who they are. The world their thoughts travel in seems far removed from



the sandy, alluvial path their feet trod along. I notice a red-shafted flicker move through a thicket of New Mexico olive. Its flight of flap-flap-glide, flap-flap-glide creates a pattern of gentle roller coaster ups and downs. Its bright orange sides permit me to see brilliant flashes of color as its wings beat. How many notice it? I doubt very many. Perhaps one or two, or maybe none. At such moments our worlds seem so far apart.

Our worlds, however, are not apart. These students and their concerns are linked and part of the whole. The mall is less than a half-mile away. Sounds from its traffic cross the river and penetrate this urban forest. The boy and girl who, as it happens to be, are “going out” are right here in this forest. No less so than the flicker.

I cannot force them to watch the sky. In fact, I do not want to force them to encounter this place. Forced learning is no education at all. I merely want to create the opportunity for my students to choose to connect with their backyard forest and the river that permits it to be. I cannot find meaning for them. I cannot make them care for this place. That is something this place and my students will have to work out on their own terms.

But I’m not above making introductions. I’m even willing to resort to low level bribes. So I make my offer. “See a bald eagle and point it out to me before I point it out to you, then I give you a free dozen doughnuts.”

One girl says, “But I don’t like doughnuts.”

“Do you like bagels?” I ask. She nods her head yes. I revise my offer. I announce, “A dozen bagels or a dozen doughnuts to the first bald eagle spotter.” Eyes wander. Someone points out a crow. It gives us a chance to talk about the size of an eagle compared to a crow and what distinguishes one from the other. A flight of wood ducks bursts by quickly followed by the squeaky wings of mallards. This time I am sure that flying birds are noticed by most all. The chatter that once was all about computers, malls, and sixth grade romance now includes observations about wild animals. I don’t ask my students to surrender their world; I merely want them to expand it.

We pass a willow grove with signs of recent beaver activity. Someone asks, “If we see a beaver what do we get?” I realize that I have opened up B.F. Skinner’s version of Pandora’s box. My first inclination is to say, “You get nothing.” Instead I say, “You get the joy of knowing you share this place with wild creatures.” But I realize that it is presumptuous of me to dictate what brings them joy. So I try to be a little more humble. I amend my response and I ask them, “I don’t know, what do you get?”



Some still caught up in the punishment of rewards remain locked on the thought of me giving them something. “We get TWO dozen doughnuts!” shouts one hungry boy. “No. We get ice cream!” offers another. I can only laugh as I point out in the mud where the beaver has slid in and out of the water. If we see a beaver, or for that matter an eagle, we will just have to wait and see then what gifts are ours.

As we go about our business, the gifts abound. An orange and black feather, perhaps from the same flicker I saw earlier, is picked up and admired by one student. A great blue heron stalks the shadows across the river and we stop to watch it for a few moments. Then we move on to gather this month’s fallen vegetation samples. More crows pass overhead, and though they know the difference, some students try to pass them off as doughnut bearing eagles.

This riverside forest is hardly more than a hundred yards wide, yet the kids find plenty of room to explore and romp as they move through it. I break the class into smaller teams and send each group off to gather bits of data and various biological samples. In the thick vegetation, groups fall out of sight within a few dozen yards. I can hear them all, but often cannot see them. I move back and forth between the teams as I check on both them and their work.

Each team has its own small group, student leader. The leaders divvy up their small group’s work. One member of each group is also given the task of quality control. It is up to that person to make sure everything is collected according to protocol and all observations are properly recorded. As I do my rounds, I check in with each team leader about the group dynamics, distribution of labor, and the like. With the quality control person I ask about their confidence in their group’s accuracy and completeness. I rapidly get caught up in moving between groups, checking on their work and monitoring how the team members are getting along. I watch one group and try to listen for the other three or four.

In the middle of working with one team, I hear but cannot see the one that starts shouting, “Bald eagle! Bald eagle!” I look up and through the thick canopy. I don’t even see a crow. I holler back some skeptical comment. “No, we aren’t kidding,” they tell me in reply. I scan the gaps of blue that are visible through the clumps of autumn foliage. The students continue to shout, “It’s circling. It’s so cool. It really is a bald eagle. Do you see it?” The voices from another group join the first, “We see it too! It is circling!” More scattered shouts let me know that each group sees it as the eagle circles. And then, I too see it. And in that moment, it is for sure that my students and I share the same world of abundant gifts.

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# Nature and Nurture

## The Case for Real Environmental Education

By Roger Reese

Albuquerque School on Wheels, Westgate Community Center

35



Introduction



The first time I took my students into the bosque in Los Lunas we saw a bald eagle. It dropped out of a cottonwood snag on the far side of the Rio Grande and flapped away, low over the muddy water, leaving behind 20 awe-struck alternative high schoolers.

Not even a half-mile from our cars and already we'd struck gold. "Too cool" they said. Most had never seen an eagle before, though most had lived in the valley all of their 16-plus years. Some time in middle school—amid the tug of gangs and drugs, cars and trouble—too many had lost touch with the bosque. Saw it only as a place to party. An irreverent *Blair Witch* view of the woods.

We hiked over three miles that morning. Overcast, cold, mid-January, our faces red. We made notes, talked about what we'd seen, took pictures: piles of trash, broken glass, trees tagged with red and blue graffiti. A loose affiliation of sandhill cranes sonorously trumpeting overhead. The students kept thanking me for bringing them out. Kept telling me how cool it was.

The next day in class we started asking questions: What had been? What could be? What could we do? What should we do?

We were searching for a community project, something we could sink our teeth into while earning all the credits needed to graduate. We were all tired of being stuck in the classroom, working in isolation, doing trivial, rote tasks to prove our intellectual vigor. We wanted to do something different. Something real, like saving the bosque and watching eagles fly.

Over the course of the next 18 weeks we saw the bosque turn green, made it to the river once a week and began learning its history, its laws, its science, its art, its economics, its stories. We worked with groups like Tierra Bonita and the Middle Rio Grande Conservancy District to develop trails and haul out trash. We took over the management of the University of New Mexico BEMP site in Los Lunas. We drove wells, learned the names of trees, their roles in the bosque, the stories of simple little creatures like the roly poly (how it came from Europe in the soil weighing down wooden vessels that came for our forests), about the snow geese (how our management policies have led to a population explosion and devastation of their Arctic habitat), and the struggle of eagles to survive (DDT made our farms more productive, but at a cost . . .).

Expert help was everywhere: UNM, NMSU, the USDA, Hawks Aloft, the BLM, Los Lunas Parks and Recreation, local horticulturalists and history buffs. Always we asked: What's happened here? What can we do? What should we do?



We made lists. The students made calls, scheduled the trips and the guest speakers for their communications credits, wrote the thank-you notes and press releases. Made a video. Wrote articles for a newsletter. Created Power Point presentations and a plant guide. Worked as a team.

We visited the BioPark, a sewer treatment plant, the mountains, the AG Science Center, UNM-VC, the Nature Center. There was never a moment when there was not something important to learn, something relevant to do.

We developed real skills that semester and graduated eight seniors with plans to pursue either college or vo-tech training. Five went straight to work *and* school, four were parents.

By summer, we had a mile and a half of new trail north of Main Street in Los Lunas ready for the public, though the threat of fire made us postpone the trail opening until fall. By then a new group of students had taken over the project—along with a half dozen from the previous year—and they acted as guides for a pack of fifth graders on a scavenger hunt, helping them find tent worms and cottonwood leaves skeletonized by wood lice.

And then the class was canceled. We still had plans to make interpretive signs, pursue grants, continue to develop trails and get involved in the reduction of non-native species and excess fuel loads and help begin the restoration of the bosque in Los Lunas. But what we were doing was too radically different. Administrators didn't want to spend time leafing through students' portfolios and logs to see the value of their time in class; they wanted grades in the book corresponding to more normal tasks, like tests and worksheets. Two grades a week.

I was left to teach English. A little Ecology. Sometimes Communications. The school invested money in a set of boxed curriculums from Texas, articulated with the New Mexico Benchmarks and Standards. My new principal told me I didn't have to worry about a thing anymore. The boxes would take care of everything.

But they couldn't put the river in the box, couldn't help me explain to the students why everything had changed. Why we couldn't walk and talk anymore, why I couldn't get to know them or counsel them about problems with drugs, alcohol, love, parents, babies, the future . . . give them the nurturing they needed amid the healing power of nature.

To my sorrow—for I love my students and I loved working in the community in which I live and am raising my own children—I resigned. I couldn't go back to teaching in pieces once I'd seen the eagle fly and heard my students lose their usual apathy. Too cool they'd said. Too cool.

## *A Winter Day at Santa Ana*

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37



Introduction

**W**e are going out to the bosque again. It feels right. This is day two of our winter break “Bosque Education Program” at the Pueblo of Santa Ana. We plan to follow the format of the *Bosque Education Guide*. Yesterday we took our discovery field trip. The plans for today are to stay at the Santa Ana Pueblo library and start the classroom portion of the project. Plans belong on paper, however, and paper sometimes deserves to be ignored. Our only repeat customer from yesterday’s field trip is Desirae, and the sixth-grader has brought her nephew A.J., a bright kindergartner who is expecting to go to the woods. It is going to take word-of-mouth success to build a clientele for this optional program. My colleague Laura and I convince another teacher, Elaina, to join us. The five of us walk toward the river.

We cross the bridge that spans the drain, stopping to admire the refuse left by dining birds. Crayfish claws. Freshwater mussel shells. All treasures to be taped to the covers of our study guides.

As we crest over the levee and drop into the bosque, the memories flood over our small group. Elaina remembers when her grandfather brought her to the river to bathe when she was five months pregnant. “A shower just doesn’t cool you down when you are pregnant,” she recalls. “Your body has so much heat. A bath in the river is what you need.” A.J. and Desirae recall a fishing trip with A.J.’s father. “Remember, A.J.,” Desirae emphatically urges, “you were sitting right there.” She points to a spot on the bank of the river. “Yeah,” A.J. recalls beaming proudly, “and my dad carried me across the river.”

We spend time exploring the bosque, looking for animal tracks, interesting leaves, pretending we are trees. Always we are confronted by the trash we find. A couch here. A chair there. Boxes of cardboard holding who knows what. A pile of cow bones. Some magazines. “Look up there at the tire.” I gaze up and, hanging about 20 feet in the air, suspended from the cottonwood branches, is a bicycle tire.

“How do you think it got there?” I ask, secretly wishing the answer had something to do with a grand flood, the kind of annual cleansing event under which this ecosystem evolved. I know with our systems of reservoirs and water management that this kind of event is not possible now, but I enjoy the thought for the moment.

“Oh,” Desirae explained, “someone just threw it up there.”

The evidence is all around us. This is a bosque that has been used. The land is littered with shotgun shells, bones and carcasses, and trash of all kinds. But there is hope for a more reverent approach to these woods, as I watch A.J. notice and retrieve the granola bar wrapper that falls out of his pocket.



As we leave the bosque, A.J. spots a huge bird and declares it is a bald eagle. We gaze at the bird he is pointing to, wondering from its dark silhouette if it is just another crow. It turns into the sunlight and its white head and tail signal back to us. The six-year-old boy knows his birds. Goose bumps slide down my back as we watch the eagle float back to the river.

*Postscript: This essay was written in December 1998. Since then several community clean-up events have been held in this bosque, and much of the debris noted here has been removed. The Pueblo of Santa Ana has also done extensive restoration in the bosque, removing exotic species, restoring hydrological functioning by lowering banks, and establishing an outdoor classroom. There is an excellent outreach program to inform tribal members on environmental issues, including bosque management.*



# *The Spirit of the Rio Grande/Rio Bravo*

## *Land, Water and Cultural Identity*

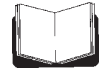
*By Enrique R. Lamadrid*

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39



Introduction



In an arid land, home is always by the water. In Colorado, New Mexico, southern Texas, and the northern fringe of the Mexican border states of Chihuahua, Coahuila, Nuevo León, and Tamaulipas, in the most primordial sense, home is the valley of a bounteous river that cuts a 1800-mile course through the largest desert in North America. A dozen cultures and a dozen languages have named it over the centuries: the “big river”—Po’soge; the “great river”—Rio Grande; the “wild and brave river”—Rio Bravo. To the most ancient inhabitants of the watershed, the river was a living being, a life-giving serpent, sometimes quick and transparent, sometimes lethargic and the color of clay.

Since all human beings need to be by the water, the banks of this river are by definition a contested space. The Españoles Mexicanos or Spanish Mexicans, as they called themselves, arrived in the 16th century with all the fury and repressed desire of the Spanish peasant to possess the land. The price of arrogance was paid in blood in 1680 when the Rio Grande Pueblo Indians arose and reclaimed their spiritual heritage. Afterwards, in the space of a few generations, the newcomers who sought title to the land were instead possessed by the land. As they mixed culture and blood with the Natives, they too became indigenous to this place. The boundaries of the Campo Santo, their Sacred Ground, spread past the narrow churchyard and the bones of the dead towards valleys, plains, and mountains beyond. The greatest Native contribution to Mestizo or mixed culture belief systems is their expansive sense of sacred space, that the Earth itself is holy.

In the center of this sacred landscape are the Native and Mestizo peoples who have survived the rigors of the northern desert and the cost of each other’s desire. They are dancing. The Matachines dance drama portrays the cultural and spiritual struggle of Spanish and Native cultures and is the prime example of Indo-Hispanic cultural synthesis in the entire region. The ritual dance drama is staged on key feast days in all seasons. It is often performed along the river itself and the banks of the acequias or irrigation canals which carry its life-giving water. In all probability the dance was brought to the northern borderlands by Tlaxcalan Indians who accompanied the Spanish Mexican colonists on their trip north. It is performed throughout the region today.

From Taos to El Paso, from the mountains of Chihuahua to the plains of Laredo, the Matachines step in unison to the insistent but gentle music of drums and rattles, guitars and violins. The fluttering ribbons that hang from their crowns and shoulders are the colors of the rainbow. In proud formation they do battle against chaos, and



reenact the terms of their own capitulation. The *toro*, a small boy dressed as a bull, runs wild through their lines. With three-pronged lightning swords they carve the wind in symmetrical arabesques.

Christian souls or Aztec spirits, they dance in graceful reconciliation, now in crosses, now in lines. In their midst a great king receives the counsel of a little girl. She is Malinche. In the south her name is synonymous with betrayal, but she is no traitor here. At the edges of the fray the *abuelos* or grotesque grandfathers guard the dancers, make fun of the people, and ridicule the new order. These old men of the mountains taunt and overpower the *toro*. They kill and castrate the *toro*. They cast its seed to the joyful crowd. Have they vanquished evil as the people say or has the savage bull of European empire met its consummation? *Gracias a Dios*, thank God it is a mystery, we all agree. Legend says that long ago Moctezuma himself flew north in the form of a bird with bad news and good advice. He warned that bearded foreigners were on their way north, but if the people mastered this dance, the strangers would learn to respect them, would join the dance and come to be just like them.

A hard-won cultural tolerance and understanding are the greatest blessings of the people of the Rio Grande/Rio Bravo. The greatest blessing of the land itself is rain and water. The desert environment shapes the faith of its inhabitants. In the Pueblo world, clouds are the *kachina* spirits of ancestors returning, and are always welcome since they bring rain and snow. Petitions for rain were prayed and sung to Christian saints like San Isidro (Saint Isidore the Husbandman), San Juan Bautista (Saint John the Baptist), and the Holy Child. Like the makers of *kachina* images, the *santeros* or saint makers to this day carve their holy images from the root of the cottonwood, a holy tree revered for its association with water.

When the water blessed the fields, another cultural synthesis took place in the valleys. Native American corn, beans, and squash held their ground beside the wheat, legumes, and fruit trees introduced by the Europeans. The chiles and tomatoes of central Mexico found their way north as well to add their piquant flavors to the local diet. The most famous staple of the northlands is as hybrid as its peoples: the fluffy wheat tortilla gives a New World shape and texture to an Old World grain. Of all the elements of human culture, food is the first to be shared and to cross cultural and ethnic boundaries.

By far the greatest changes on the land were wrought by the domestic animals that came north with the colonists. Horses, cows, pigs, goats, and sheep quickly became emblems of European culture, and missionaries used them to upset the power of native hunting societies and their priests. Besides mobility and meat, other animal products like wool and weaving technology brought revolutionary change to native life styles.

The horse which made exploration and trade possible also upset the political balance of the northlands. When nomadic native tribes such as Apaches and Comanches acquired horses, their pedestrian hunting and gathering ways changed forever.



With horses they mobilized, refined the arts of equestrian warfare, and became a force to be reckoned with.

The lush mesquite forests of the lower Rio Grande/Rio Bravo were the perfect environment to support large numbers of wild cattle. The first phase of development of the ranching was cattle hunting. Whenever meat was needed, hunters sallied out on horseback with reatas or lariats and media lunas or pole-mounted hocking blades to immobilize and slaughter their prey. Only when the population grew did the concept of cattle ownership develop, along with the culture of the vaquero or Mexican cowboy, fully equipped with the knowledge and technology of large-scale stock management. The ecosystems of the upper Rio Grande/Rio Bravo were more fragile, and four centuries of grazing animals resulted in desertification, degradation of grasslands, and the loss of several feet of topsoil. Fortunately, the introduction of alfalfa helped offset this damage and fertilized the irrigated fields.

There is, in the valleys of the Rio Grande/Rio Bravo, a highly developed sense of place and cultural identity the people themselves define as *querencia*, a folk term from the Spanish verb *querer*, to want or desire. *Querencia* is a deep, personal, even spiritual attachment to place which collectively defines a homeland. Although in 1848 a national border was imposed along the lower Río Grande/Río Bravo, the sense of *querencia* is intact. Far from the centers of national power, this bioregion developed its own unique culture. As the pressures of urbanization and international commerce strain the ecological resources of the valley, some important lessons may be learned from the Native and Mestizo communities who have learned to survive in the desert. Their cultural and environmental knowledge can be applied to the challenges of the future.