

Spirit of the Rio Grande: Protecting Our River

Marlene Wensits Brown

Academic Setting

West Mesa High School serves more than 2300 regular and special education students from the ninth through twelfth grades. The diverse student body population is made up of several ethnic groups from a variety of lower socio-economic neighborhoods. Seventy-five percent of the students are Hispanic, 20% Anglo, 5% Indian, 4% Black and 1% Other. WMHS graduates an average of 390 seniors each year. A 1999 follow-up study showed that about one-half of the graduates went on to post-secondary education. This would indicate that the other half of graduates enter the work force. This unit is designed for 11th and 12th grade students in an English class in the work-study program. The students receive special education services due to mild / moderate learning disabilities. Verbally, the students appear quite average, written language is the primary disability. Vocabulary is generally poor and below grade level. Most students will enter the work force after graduation, a few will go on to TVI in a trades-related field.

Goals and Objectives

The goal of the unit is for students to become familiar with the history, issues and concerns of every day water usage of the Rio Grande River. They will learn how cultures from the past revered and preserved the river, and how industrialized minds ("progress") changed the course of the river forever. Students will learn that the Rio Grande and all fresh water can no longer be taken for granted; these formerly abundant natural resources are now scarce or threatened. It is critical that we conserve, protect and replenish our water supply for future generations. Students will be challenged to take a pro-active and informed stand concerning environmental issues that we all face today. Problem solving activities are geared for students to take control and make decisions concerning water usage and how it will affect their lives and the future. Another major aspect of this unit is for students to become more informed about careers in the environmental arena. There are many opportunities for employment in this area, and the more people who are involved can and do make a difference. Service learning opportunities can also be explored for interested students in this unique school-to-careers program.

Context and Background

The Rio Grande, heart of the Southwest desert, is a river of rugged beauty cascading from the Rocky Mountains of southern Colorado through New Mexico, Texas, Mexico, and finally reaching the Gulf of Mexico. In the high mountain peaks the river runs wild; it is clear and icy flowing over speckled brown, red, and golden stones. The river narrows and widens through deep, volcanic canyons and narrow gorges with massive red rock cliffs, pastoral plains, lush green valleys, and harsh, dry desert land. Fish and wildlife thrive along one of nature's wonders. It is home for bald eagles, red-tailed hawks, turkey vultures, and other intriguing birds of prey. This rich riparian habitat supports dozens of bird and animal species. The upper Rio Grande in the high mountain peaks provides water, timber, pasture, and medicinal plants for humans as well as wildlife. The middle Rio Grande is one of the major providers of water to all of New Mexico, for urban as well as agricultural usage. The lower Rio Grande provides water to both Texas and parts of northern Mexico.

We who live along this river comprise an "oasis civilization." That is, we live in a semi-desert, yet we have swimming pools, lush golf courses, grass and vibrant flower gardens, all of which require fresh water. We depend on the Rio Grande a large percent of the time for these uses, yet this river occupies less than one percent of the land of the Southwest. How in the world would we survive without this extraordinary river?

Yet the Rio Grande, a live, magnificent river, is in danger of becoming a dead ditch! Civilizations throughout history have lived in harmony and flourished next to this great river. The ancient Pueblo Indians, the Spanish and Mexicans, and eventually Anglo-Americans have thrived along the Rio Grande in their own distinctive cultural environment. Each of these cultures has their own unique beliefs, as well as good, weak and blind qualities. Each of these cultures has depended on the river for drinking water and food, as have plants and animals of the bosque. It is also used for recreational purposes, as well as waste disposal and industry.

The Rio Grande has drastically changed and been altered by man since the late 1800's. The underground aquifer where Albuquerque gets clean, potable water is rapidly disappearing. New data tells us that the river does not have enough water to replace what is being used from this aquifer. Eventually, it could even suffer irreversible damage if we continue to pump water the way we have been. Buildings could become affected if we continue to suck water from underground.

The bosque all along the river is going up in flames because of drought conditions and accumulation of too much dead underbrush. Our Rio Grande bosque is one of the few great cottonwood forests in the world. It is now vanishing because these splendid, native trees are not being allowed to reproduce. They are also being overtaken by non-native species of trees, which drink a lot more water. The river water is so diverted and polluted that several native species of fish are now extinct. Right now the silvery minnow is on the endangered species list because its habitat on the Rio Grande is drying up. This small fish is indicative of the shape the river is in, and is here to remind us that we must clean up and protect the river now. Our neighboring desert state, Arizona, did not have the foresight to protect their rivers from overuse. The Salt River through Phoenix and the Santa Cruz through Tucson are now dead, *concrete* ditches rather than rivers meandering over the land. We must all become involved with conserving and protecting our precious water supply. It is not too late. The San Pedro River east of Tucson was once endangered, it is now partially recovered due to efforts of people who care. This paper will tell how historically the Rio Grande River was used and valued, and how man-made plumbing of the river: (dams, drains, and diversion channels) has altered the flow of the river. These practices must now be rethought and revised. We do not want our river to become a concrete ditch just because humans want all the water for themselves and their uses. The river must be allowed to be a river, flowing naturally and providing nourishment and life for plants and animals that also live alongside it.

Pueblo Beliefs

Evidence exists that Pueblo people have lived along the river in cliff dwellings or pueblos since at least the thirteenth century. The ancient people of the Rio Grande were intimately connected with their spirituality. They believed that all life came from the underworld, and so it returned there at death. To come in life and go in death, people and animals had to pass through a lake and then climb up a great fir tree to enter this world. This was called "emergence" and was a very sacred act. With them came spirit, which could dwell in anything on earth. Some spirits were good, some bad. The Pueblo Indians believed that everything in the world was part of the same living force, that Earth was the center and Earth's navel was in the very center of each group of people. They believed all things existing on Earth were there to help people live. All things in nature were worshiped – sun, moon, stars, clouds, lightning, thunder, wind, rainbows. They believed a person must be in harmony with life in all things, and that the way to find harmony was through religion. So prayer and observances were

part of all daily life.

The pueblo itself was typically built near or above a river. The river was a power and part of the day's prayer. The river dictated farming methods. It let water be taken from well-laid canals and ditches to fields below the town to grow crops. The people used the river and it sustained them. They grew corn, beans, pumpkins, gourds and cotton through irrigation and use of controlled floodwater. Old and young trees, willow and cottonwood grew along its banks, as well as grasses and little meadows. The cottonwood was the most useful tree in Pueblo country. It supplied material for many objects, the leaves were beautiful and provided shade, and the wood burned hot and fast leaving rich ash for many uses. Everything in the landscape was sacred. At twilight the men would put on ceremonial dress and go to the river. They would bathe, thank and bless it.

Pueblo life was organized and based on a communal value system with ruling ideas of order, moderation, and unanimity. The people agreed without exception in their worship, work, ways of making things, property ownership, education of children, healing of the sick, and death. It was a satisfactory plan of living in harmony with nature that sustained them for close to a thousand years.

Hispanic Beliefs

Spain was a country wherein men believed in their own inherent greatness and risked their lives to conquer the "infidel" wherever they could find him. They wanted to spread their faith across the world, this was just as important to them as conquering new lands and pursuing great fortunes. All Spaniards, from the monarch to the beggar, believed in God and all aspects of the Holy Catholic Church. They were zealous in their beliefs; faith was a condition of their very being. Spaniards believed that the king was given his authority from God, so they would do whatever the king commanded. They also believed everyone was equal before the law.

The king of Spain lived and followed these beliefs, and he also required justice and equality for the Indians in the New World. It was his uppermost desire that their souls be saved through Christianity. He strongly supported priests and missionaries in the New World, who worked ceaselessly to convert the Indians. The military, landowners, and civil officials believed that conversion was a proper thing, but that once done, the natives should be used for labor and arms. Some of these men believed that Indians were sub-humans who could never understand Christianity. The missionaries convinced the Crown that they could be productive and worthy subjects, and eventually the king made laws to protect the Indians in the New World.

Spaniards settling in northern New Mexico wanted to colonize the area. The friars continued their work, and eventually Indians began to blend Christianity with their own religious beliefs. Many missions were built and Indians learned how to use new tools and build adobe bricks. Friars introduced new vegetables and fruits to the river country and taught the Indians how to herd and breed sheep, cows, and horses. Men who wanted to settle stayed, but treasure hunters who didn't want to work for what they wanted left. In 1680 the Indians did revolt and destroyed much of the colony in order to hold on to their lands. But they were now divided, Many kept their ancestral ways, but many also believed in the Spanish teachings.

Spanish towns were rebuilt. But the Spanish Crown was no longer interested in the river country, it lacked gold and Indians were difficult to unite. Land grants were given to settlers and riverside villages began to flourish. The Pueblo people and Spaniards were co-existing peacefully and sharing the river. The river belonged to the community.

Spaniards, Chicanos, Indians in the upper Rio Grande watershed continued farming using the traditional acequia method of irrigation. They developed and expanded their agroecology system by utilizing local indigenous knowledge. Over the years, they have successfully farmed and preserved the rich riparian habitat of the river area. Some of the methods they used were dividing the land into long lots rather than squares. This is much more compatible to a high-altitude, arid environment. This way, every family had access to pinon-juniper woodlands on mesa tops and foothills, which provided wood for fuel and construction. They had dry grassland prairies for pasture, riverbanks for access to water, fish and wetlands, as well as irrigated meadows for planting and growing crops. During dry periods, controlled flooding would water the fields and preserve the bosque. Native crops were planted rather than hybrids. Native crops adapt to local climate and reduce the need for fertilizers and pesticides. Farming and ranching were integrated which supplied organic fertilizer, natural weed control (sheep and goats), and crops for human use and farm animals were both grown by the farmers. Traditionally, man and animal power, rather than machinery, had been used for plowing, planting, cultivating, and harvesting. Also, since the river belonged to the community, there were shared common lands for grazing, fuelwood gathering, hunting, and fishing. During hard times, sharing whatever natural resources were available was part of tradition. All of these factors have contributed to the care and protection of the environment, and have helped preserve biodiversity of the land.

The acequia method of irrigation is also a cultural tradition in northern New Mexico. Communities were built near the rivers, and land grants were issued to petitioners from the republic of Mexico in the mid 1800's. The acequia communities were the only form of local government at the subcounty level, thus they performed political and social functions as well as irrigation. Acequias have served as political subdivisions since at least 1851, and often hold the oldest water rights in most streams and rivers other than federal reserved rights for Indian reservations. Acequia associations have been responsible for the upkeep of canals and ditches, and traditional agricultural practices have continued by each passing generation of users in the same local manner to date.

This "old mentality" of farming and irrigation has gone on for hundreds of years and is now at stake. A "new mentality" of farming methods, and an increase in land and water-rights values, has contributed to the demise of our precious, natural environment. Biodiversity and cultural diversity are both being threatened in the upper Rio Grande watershed.

The Anglo-American

Men from frontier settlements eventually heard of a critter living on the Rio Grande they believed could make them rich - the beaver. At that time, beaver fur was in great demand in Europe and the East Coast for the making of men's hats. Adventurous trappers came to New Mexico and fought against many hazards such as hostile Indians, hunger and thirst, grizzly bears and rattlesnakes in order to make their fortune. This went on for over three decades. Trade with Mexico flourished, and by the early 1800's the first wagon trains began using the trails previously used only by horsemen. These wagon trains carried merchandise from the Mississippi Valley all the way to Santa Fe. This was the beginning of accessible roads, and what became an Anglo-American invasion. The Mexicans and Spaniards were shocked to see so many wagon caravans, and the flood only increased. The Spaniards feared that this much business with the new culture would somehow give these visitors power over their ways; little did they know they were so right! These people who migrated to the New World had a purpose... and that purpose was freedom and self-government. They migrated to the New World for freedom, and then to the American West for fortune. The frontier men and women were a courageous, adventuresome new group of people on a constant search for a better, easier way of life. They faced danger and the unknown, and consequently developed new ways of thinking.

Unfortunately for the Indian and Spaniard, the new culture wanted

freedom, not only for independence, but freedom to dominate their new, material environment. This mentality was new to the established cultures because in accordance with their beliefs, the environment, nature, dominated them. If the new settlers wanted a new road, they would clear out any trees in the way; if they were hunting a raccoon that went up a tree, they would chop down the tree. They were wasteful in their hunting practices, they would hunt for the skin of an animal alone, rather than hunting for subsistence. These attitudes and beliefs differed greatly from those of the Indian and Spaniard, who had been living in harmony with nature in the Rio Grande valley over hundreds of years.

Eventually, houses were built and life of a family would begin. Neighborhoods took form, and finally religion re-entered the people's lives, for they could now get together and worship on the Sabbath. These beginning ventures into religion in the New World were very emotional, and there was much screaming and crying and testimonials given to the Lord. Their hardships, suffering, and sin could be purged by spectacular emotional expressions done in the name of the Lord and against Satan.

Politics became the supreme topic for conversation. Every American became an expert on politics, for in this new world he *was* the government. They believed all citizens had the right to be heard, and began making laws in accordance with the will of the majority. But they did reserve the right to break these laws if they conflicted with the rights of an individual. If the Anglo did not like a law, he felt free to enlist others with him to change that law and resist central authority. He would remake a law over and over again to the likeness of his view of life in the new world, for it was not in his "nature" to be denied.

The settlers were civilized people moving to and taking new land, and they formed new social ideas. At this same time, a world revolution in technology was beginning. Soon the settlers discovered new technological methods, which made individual life much easier. The American tinker soon became a maker of machines that would do work. The Anglo's genius for practical inventions became a national characteristic that would soon lead to a new standard of material life that the world had never before experienced.

North America appeared to have endless depths of forest; consequently wood was the most common American building material. The frontier craftsman made houses, furniture, and many other objects out of wood. For tasks too great for a single family, the settlers would gather together to help each other. They'd make

entertainment out of their work and share ideas about how to make it easier.

Technology now brought about the steamboat, electric telegraph, printing press, and the steam locomotive. Barbed wire enabled cowboys to fence pastures and enclose land. The beef and cattle industry grew rapidly, as they could be shipped by rail all over the country. Westward settlement became even easier. These Anglo-Americans penetrated and finally "owned" the continental United States. They wanted a better life today, and believed that every citizen, in his / her own way, could have a still better life tomorrow.

It took only a few generations for man's new resources of power and technology to reach all across the Southwest and bring to it the material lifestyle common to the nation as a whole. In New Mexico, the three cultures learned to survive together, but ultimately began the demise of a traditional, long standing way of life by the indigenous peoples.

A River Tamed

Approximately one hundred years later, by the early 1900's, the Rio Grande was seriously feeling the effects of overuse of its limited water supply. Erosion problems were aggravated because of over grazing, logging, building of roads and trails, fires, and irrigation. All this greatly increased the river's sediment load. Also, Mormon settlers in southern Colorado were creating more diversion channels for large areas of farming. By diverting river water for more acequias up north, cities and farming areas in the lower Rio Grande watershed began getting less and less water. Additionally, there was less water to carry out sediment created by upstream developments. Many families from Mexico and Texas were forced to abandon the area altogether. Agriculture in the middle Rio Grande area also declined because of rapid aggradation of the river channel.

The problems of the Rio Grande were also occurring in other rivers in the West. Society and its governmental institutions responded by creating new institutions to manage key lands and waters. The idea was to protect our natural resources from hasty and wasteful exploitation, and from uncoordinated development. Conservationists wanted to control our natural resources to meet future, long-term demands of a growing population and an increasingly industrial society. Unfortunately, these government institutions went overboard, and tried to improve upon nature. For example, they wanted to give the increasing urban population, agriculture, and industry all the water they wanted, and they believed that river flooding was wasteful as well as fresh water running to the sea. So they resolved to stop floods,

and to put the river water fully to use. The mistake that was made was not allocating any water for the Rio Grande to be itself - a river. A river needs to flow somewhat naturally to maintain a healthy, riparian habitat and clean out the bosque of dry, dead wood and debris. Numerous plant and animal species had survived in the Rio Grande area for hundreds of years and flourished. Natural fires and floods cleared out the bosque of quick-to-burn underbrush and of sediments, and allowed the mighty cottonwood forest to survive and thrive. This was no longer the case.

The Bureau of Reclamation and the Forest Service were created in the early 1900's. Construction of Elephant Butte Dam also began at this time under private sponsorship, but was suspended because of protests from Mexico. The Bureau of Reclamation later completed it. In 1925 another institution was created in central New Mexico, the Middle Rio Grande Conservancy District (MRGCD). Its goal was to achieve higher efficiency of water usage. More dams were built including El Vado and Caballo Dams. The river's last great flood occurred in 1941, and inundated towns along the river including Espanola and downtown Albuquerque. Property damage was terrible. As soon as World War II ended, the Bureau of Reclamation along with the Army Corps of Engineers went into a dam building frenzy. They built the Platoro, Jemez Canyon, Abiquiu, Galisteo, and Cochiti dams within the next twenty-five years. And all of these dams were on just one river, the Rio Grande. The river was dredged and channeled, levees were rebuilt and jetty jacks erected to confine the river. Cement irrigation ditches were constructed, which was a big mistake. River water leaks out of natural irrigation ditches and waters trees and plants necessary for wildlife and the bosque habitat. But these agencies didn't want one drop of water "wasted." Additionally, New Mexico, along with several other states, signed the Colorado River Compact, which allows NM to get more water from the San Juan-Chama project. This project is a tunnel going through the continental divide, which diverts water from the Navajo River into the Rio Grande. This project required its own dam and reservoir, and so Heron Lake and dam came into being. Now, due to all this expensive new "plumbing", every drop of river water is managed by a human agency rather than by nature.

Historically, the Rio Grande has been the "river of life" for fish and wildlife, the bosque and cottonwood forests, and several different cultures. Acequia communities along the river have shared responsibility for the care, maintenance, and use of the ditch networks for traditional agricultural uses. This community system of valuing water has been successful for the farmers along the Rio Grande for

centuries. Now, with the growing population in New Mexico, there has been a growing demand for water, especially since the river can be engineered to deliver water to any requesting party. Traditional farming communities all along the Rio Grande still need water for irrigation. There are also large agricultural industries in central NM, such as the chile farms, that need water. Since the late 1960's, land and water-rights values have increased in parts of the Rio Grande region and have been posing a threat to the acequia culture.

Albuquerque and Santa Fe are prime examples. Albuquerque has been expanding and sprawling, and more water is needed for urban development, drinking, and sewage treatment. High-tech corporations are moving into NM's major cities, and are requesting water-rights. Golf courses are being built all along the river valley, and keeping all that grass green requires large amounts of watering. Recreational facilities such as Taos Ski Valley also use a lot of our precious water. As you can see, there is a huge, growing demand for water in our semi-desert state, which depends on the Rio Grande River and the underground aquifer for clean drinking water for all of its inhabitants. Today, our traditional bosque and other formerly abundant things can no longer be taken for granted. Open space, the woods, access to the river's edge, opportunities for recreation, contact with nature and solitude, and many living traditions are now scarce or are being threatened with extinction.

Consequences of Over Use

The Rio Grande has been stretched to its limits and now we must face the consequences. If you ever visit El Paso / Juarez, and you look at the river on both sides of the border, you will be shocked and wonder, "What in the world is going on here?" Suffice it to say that Mexico is not getting nearly the amount of water it needs for quality usage and survival. In the state of New Mexico, USA, biodiversity and cultural diversity are both threatened.

Since the Rio Grande has not been allotted any water to just be a river, we are losing one of the last, great, cottonwood forests in the Southwest. The cottonwood is an icon of the West, its arching canopy offers shelter and shade and it signals water amidst dryness. The cottonwood requires flooding to reproduce, and since there has been no flooding it is being overtaken by non-native species of trees such as the Russian olive and the tamarisk, or salt cedar. These non-native trees suck up almost twice as much water as the natives.

Since the river has not flooded meaningfully in decades, in most areas of the bosque there are unnaturally heavy accumulations of dead wood. There hasn't been a current to carry it off, or standing water to

saturate it or speed up decomposition. The first dropped cigarette from a careless person or a lightning strike can doom the bosque to another catastrophic fire.

The diversion of river water has made the mighty Rio Grande look more like a giant mud puddle in some areas. In San Acacia and some places in Albuquerque, you can actually walk across this great river in ankle deep water, with some areas being completely dry. This loss of water and consequent loss of habitat accounts for the endangerment and extinction of several species of fish. The following great creatures are no longer with us in the Rio Grande: the shovelnose sturgeon, the grey redhorse, the freshwater drum, and the American eel. Imagine what those fish looked like! Imagine the American eel; it used to migrate from the Caribbean all the way up the Rio Grande to the Espanola area! Eels could no longer make this trip after dams went into place. Right now, the silvery minnow is getting a lot of publicity. It used to be abundant from northern NM to the Gulf of Mexico, but it has now been added to the endangered species list. Its habitat is drying up. Other fish and birds will soon join the silvery minnow on the endangered list, signaling the unhealthy, declining state of our river. This loss of habitat is a grave situation. If we continue to lose our rich, riparian habitat, where will wildlife live and get their drinking water? The river must be allowed to be a river, to flow naturally and provide sustenance to plants, fish, birds, wildlife, and humans, too. Ecologically, the native ecosystem of the Middle Rio Grande may be on its last legs, but it's not gone yet. There is still time for us to prevent it from turning into a dead, concrete ditch if we become involved now.

The transfer of water rights is a serious issue threatening cultural diversity in the upper Rio Grande valley. The Taos area, with some of New Mexico's most traditional Pueblo and Hispanic irrigation communities, has been most hard hit by development and the population explosion. In the late sixties, land and water-rights values began to increase at an alarming rate due to tourism and recreation, city growth and expanding industry, and mining and logging. All of these new subdivisions and developments require water, water which was previously used for agriculture by the indigenous community. Government agencies began to prioritize water usage as high value or low value, with low value classification going to acequia users. Who's making these new water laws? Certainly not the traditional users of the irrigation systems who have kept the land and bosque intact for the past several hundred years. By making water a commodity that could be bought and sold to the highest bidder, local water-rights and tradition are both being threatened. Acequia associations were formed

to rally against proposed developments and laws, which would allow water-rights to be transferred for other uses outside the community. This has been and continues to be an uphill battle for the acequia community.

A prime example of tragic loss to a community is the "Condo War" in Taos County by the residents of Valdez in the 1980's. A developer proposed to buy and transfer water from a parcel of farmland to a planned condominium project for the Taos Ski Valley, which was nine miles upstream. There was a notice in the legal section of the newspaper, which went undetected by the residents of Valdez. By January 1982, the State Engineer, without the knowledge of the village, had already approved the water transfer. The reason this hurts the acequia community is because each time a parcel of farmland loses its water rights, a proportional amount of labor and ditch fees are also lost to the system as a whole. This increases the burden of maintenance for the remaining ditch users, and it weakens control of the community water system. The residents of Valdez and others who were opposed to this development of luxury condos marched, protested, and picketed the developer, who eventually quit the project because of the barrage of negative publicity in 1982. Unfortunately, tensions in the Taos Valley did not end with the conclusion of the "Condo War." Development in other areas of the Taos Ski Valley continued causing land values in the Valdez area to skyrocket. This development also started causing environmental damage to the acequia infrastructure and contamination to the irrigation waters. Heavy trucks hauling cement, adobes, and other construction materials to subdivision sites were crossing over roads and ditch culverts that were not designed to support them. Sometimes they actually crushed the culverts. Sedimentation on the ditches increased which would run off into the irrigation water. This would then divert downstream into the fields and gardens at Valdez and contaminate them.

There is a clash of cultures going on in this area between newcomers and developers vs. natives, and unfortunately neighbors against neighbors who would sell. More importantly, locals have begun to unite, as unity is necessary to defeat the developers and government agencies that are approving these playgrounds and second homes for the rich.

River Recoveries

The Rio Grande is in bad condition, and sad to say, other rivers in the Southwest are in worse condition. We can still save our river and bosque from becoming a dead, concrete ditch, but we must act now

and become a part of the solution instead of part of the problem. We have just taken the first step, and that is to become informed of the gravity of the situation. Remember, knowledge is power. We know what is happening, so we can begin to do something about it rather than just sit back. Government agencies must make some of the changes, but who is behind them, pushing them? Yes, we, the people, the voters tell them what to do. And, there are many things that we, as individuals, can do now to conserve our precious water supply. We are each an important player in the chain of people that makes things happen.

We must accept that we can't get the old river or bosque back as it was before all the man-made plumbing and heavy human usage. The bosque will always include exotic species of trees such as the Russian olive, tamarisk, and Siberian elm, which are already established. There will continue to be exotic fish that have found new homes in the river. What we can do is to make sure that native trees, the cottonwood and willow, can reproduce and flourish. And we can make sure that the silvery minnow is allowed to survive. This tiny fish simply needs the river to be a river, to have flowing water so it can breed and swim where it needs to go. No more creatures must be allowed to become endangered or extinct simply because humans want nature's homes for human uses.

The bosque and the Rio Grande can be revitalized if we start managing the plumbing of the river to mimic its natural flow as closely as possible. There needs to be water rights for the river...just to be a river and flow, and have ponds and lagoons and wet meadows and sandbars for fish, wildlife, and trees. It's not natural for a river to flow in a straight line and not have a rich, riparian environment along its shores. People, also, need to be able to enjoy the beauty and solitude of the rivers' edge just for relaxation. All of the political entities controlling the flow of the water need to start working together for one common purpose: protecting our live river. This will not be easy, but it is critical. In order to maintain our bosque we need flooding of the riverbanks, and "prescribed floods", just like "prescribed fires" for our forests, will work just fine. Flooding will serve two important purposes: it will allow the cottonwood to reproduce (and may thin out some non-native plants), and it will help saturate the forest floor and wash away some dead, dried wood. This is critical in preventing catastrophic fires that get out of control as quickly as they begin.

Agricultural users of acequia systems should also think of ways in which they could be conserving water. Drip irrigation systems may be more cost effective than flooding for some farmers. Experimenting

with this prospect is certainly in order.

There are many ways we can conserve water in our own homes, both indoors and outside. In the house, we can reduce water usage simply by not letting tap water run unnecessarily while doing dishes or taking a shower. Many stores and companies offer rebates to customers who buy low-flow showerheads or toilets. There are even washing machines that are made to be more water efficient. Outdoors there are numerous opportunities to conserve water, especially for landscaping purposes. There is a \$500 rebate offered on the water bill for customers who convert medium or high water-use yards to low water-use landscapes. Xeriscaping, or draught-tolerant landscapes are the only way to go here in the desert.

It is time for state policymakers to seriously evaluate and amend water-laws to protect both the river and cultural traditions of people who have lived by and cared for it for hundreds of years. The acequia culture must be recognized as a state historic treasure; it has been an endemic, self-reliant, grassroots institution in NM and has proven itself over time. Acequia communities need to be allowed to retain ownership of their ancestral water rights. Development may need to be curtailed. The rights of long-time year-round residents must be protected from part-time recreational visitors. Long-term studies and plans need to be made concerning the future of the river's rights and needs, and how much water people can actually use while preserving the Rio Grande for future generations. People love "The Land of Enchantment" for it's magnificent sunsets, the beauty of the mountains and desert terrain, rural landscapes and, New Mexican arts and crafts, it's rich cultural history, and recreational opportunities along the Rio Grande. It is time now for everyone to be socially responsible concerning the future of all of our states' precious cultural and natural resources. The challenge is now, to keep the river and bosque alive.

Implementation

This unit will take approximately nine weeks, or one grading period. Students will read orally and discuss the text, *Spirit of the Rio Grande*. To insure comprehension, there will be vocabulary exercises and essay questions, as well as oral discussion. Students will write an essay comparing different cultural beliefs, and an essay on water as a finite resource. They will do a hands-on project that shows how each individual can conserve water. They will research different environmental careers and write a research paper on a career of their choice. Students will also work together and do a group problem-solving activity. Field trips will also be incorporated into this

unit.

Weeks 1 and 2.

Objective: Read the text to learn what is happening to the Rio Grande River, improve reading comprehension and writing skills.

Lesson: Students will read the text orally and discuss it. Vocabulary words will be put on the board and defined as a group. Students will copy words and definitions and write their own sentence using the vocabulary word. Teacher should assign some of the words to be located in the text, with students copying those sentences correctly with 100% accuracy.

Suggested vocabulary list: harmony, flourish, bosque, thrive, aquifer, potable, draught, endangered, diversion channel, nourishment, sustain, irrigate, communal, irrigation, moderation, acequia, indigenous, riparian habitat, arid, natural resource, biodiversity, demise, cultural diversity, migrate, dominate, subsistence, technology, erosion, sediment, over graze, aggradation, dredge, levee, jetty jack, reservoir, water-rights, abundant, extinct, accumulate, saturate, decompose, diversion, commodity, prioritize, culvert, efficient, xeriscape, revitalize.

Suggested discussion questions (oral or written):

Introduction:

Describe uses of the Rio Grande.

How is the river changing today?

Identify some things happening to the bosque.

Part 1.

Describe religious beliefs of the Pueblo people.

How did the Pueblo people use the river?

What was pueblo life based on? What does that mean to you?

Part 2.

What were the Spaniard's goals for the New World?

What are some things the Indians learned from Spaniards?

How did the Indians and Spaniards get along after the revolt in 1680?

Describe some Chicano methods of farming.

Why is the acequia culture an important tradition in northern NM?

Part 3.

What was the Anglo who moved to the New World searching for?

Compare the new Anglo cultures' views on nature with the Indians' beliefs.

How did technology change the West?

Part 4.

Describe some problems happening with the Rio Grande in the early 1900's.

What were the goals of newly created government institutions concerning the protection of our natural resources?

What were some mistaken beliefs of these same institutions?

What did the Army Corps of Engineers do to prevent the Rio Grande from flooding?

Describe all the current demands for water in our state.

Part 5.

What is happening to the cottonwood forest along the bosque?

Describe problems happening along the river due to loss of habitat.

Why doesn't the river have enough water to prevent these problems?

What is causing water rights problems in northern NM?

How are acequia communities hurt when a parcel of farmland loses its water rights?

Part 6.

Why are water rights for the river so important?

What is the importance of "prescribed floods"?

How can we conserve water in our own homes?

What are some ways you can become involved and persuade state policymakers to

protect the river and cultural traditions in our state?

Assessment: Teacher made vocabulary, essay question test

State standards met: Language Arts – Reading Analysis, Literary Analysis 3

Language Arts – Expressive Language: Writing, Writing Strategies 3

Week 3.

Objective: Improve writing skills by writing a paragraph on "Water, a Finite Resource."

Lesson: Students will write a seven-sentence paragraph about water. They will write a rough draft, edit it with a partner, then rewrite their final copy. This will be proofread by the teacher, then the final copy will be done on the computer.

Assessment: Paper will be graded and checked for correct spelling, sentence structure, capitalization and punctuation, logical presentation of information.

State standards met: Language Arts – Expressive Language: Writing, Writing Strategies 3 and 4

Week 4.

Objective: Students will do a hands-on activity on water conservation.

Lesson: Students will design a poster or pop-up about one way an individual could conserve water.

Assessment: Teacher observation of effort put into project, quality

State standards met: Career Readiness, Standard 2

Week 5.

Objective: Improve writing skills by writing a multi-paragraph essay comparing different cultural values and beliefs about nature and the environment.

Lesson: Students will brainstorm and create a web on differing beliefs and values concerning the environment. They will write a rough draft, edit it with a partner, then rewrite their final copy. This will be proofread by the teacher, then the final copy will be done on computer.

Assessment: Papers will be graded and checked for correct spelling, sentence structure, capitalization and punctuation, logical presentation of information.

State standards met: Language Arts – Expressive Language: Writing, Writing Strategies 3 and 4

Week 6.

Objective: Given a problematic situation, students will identify the main concern and brainstorm all possible solutions, deciding upon the best outcome (group activity). They will learn how to debate through discussion and compromise.

Lesson: Reread the "Condo War" scenario in Part 5. Divide class into two groups: the developers and the indigenous population. It is important for students to know that there are pros and cons to any issue, and each sides' objectives must be identified. Brainstorming all angles, both desires and concerns, will be put on the board. Developers should then list their problems, "locals" list theirs. Each side will prioritize their concerns by rank ordering the top five problems of greatest interest. At this point, each side will then brainstorm all possible solutions to each problem on the board, and discuss as a group. Each group shall decide collectively the best solution for their objective and present it in detail to the class. The following areas need to be addressed: The problem is..... The solution would be to.....Who will do what, where, when, and how? The best solution should be written in paragraph form. This is to be a group activity, with students deciding who will write, what should be written, and who will present to the class. This activity will show that there are many different avenues that can be taken to solve a problem. It is important to understand that when debating an issue, all people have different concerns and objectives. All sides are valid and to be discussed. Students will learn how to disagree, but yet

commit to the groups' ultimate outcome.

Assessment: Acceptance of the right to individual opinions and the right to change one's mind; work co-operatively in a group activity and accept the groups' ultimate decision

State standards met: Career Readiness, Standards 4 and 5

Weeks 7 and 8.

Objective: Identify at least ten environmental health and safety related careers. Research one specific career and write a paper about it.

Lesson: On the board, teacher will brainstorm with the class and list as many environmentally related careers as possible, using the resource books listed under student bibliography, and the "Choices" program. Teacher will write a brief description of each career, and students will copy this into their notebooks. Students will then select, research, and write a one to two page paper about one specific career and present it to the class. The information should include the following: aptitudes needed, training, job description and working conditions, salary, helpful information about getting the job. The final copy should be done on the computer and include a picture (hand drawn or cut out).

Assessment: Papers will be graded on information requirements, correct spelling and grammar, neatness.

State standards met: Career Readiness, Standards 1,3

Language Arts - Expressive Language: Writing, Writing Strategies 3 and 4

Week 9.

Objective: Design a cartoon or poster using an endangered fish (individual or small group).

Lesson: Students should reread Part 5 and choose an extinct fish for their project. Design a cartoon or poster showing what happens when there is loss of habitat for a certain species of fish.

Assessment: Teacher observation of effort put into project, quality

State standards met: Language Arts ; Reading Analysis, Literary Analysis 3 and 4 Literary Applications 4

APS Content Standards and NM State Standards

Language Arts Content Standard - Reading Analysis: The student responds to, examines, and critiques historically and culturally significant issues and events portrayed in literature that both illustrate and affect people, society, and individuals.

Gr. 3, Literary Analysis: Interacts with text before, during, and after reading

Gr. 4, Literary Analysis: Makes inferences, draws conclusions, and forms opinions about the events, characters, and setting based on supporting evidence from the text

Gr. 4, Literary Applications: Visualizes and recalls story details, including characterization and sequence

Language Arts Content Standard – Expressive Language: Writing – The student writes effectively for different audiences and purposes (e.g., to describe, narrate, express, explain, persuade, and analyze) using appropriate writing strategies and conventions. Gr. 3-4, Writing Strategies: Uses the writing process to create a final product; uses technology to present information

Career Readiness:

Standard 1 – Students will identify career interests and aptitudes to develop an educational plan which supports personal career goals.

Standard 2 – Students will utilize and manage resources effectively to produce quality services and products.

Standard 3 – Students will demonstrate the technological knowledge and skills required for future careers.

Standard 4 – Students will develop and demonstrate responsible and ethical workplace behaviors.

Standard 5 – Students will develop effective leadership, interpersonal, and team skills.

For more detailed information on standards and benchmarks, see (<http://sde.state.nm.us>) or

(<http://www.aps.edu/aps/standards/index.html>).

Bibliography

City of Albuquerque. Public Works Department. *Our water. Our future*. City of Albuquerque: Water Resources Division, 2000.

Paid advertisement stating policies the City of Albuquerque has adopted to conserve our drinking water supply.

De Buys, William. "One Hundred Years of Change in the Bosque of the Middle Rio Grande." *A Presentation to the Middle Rio Grande Bosque Consortium's Fall Conference*, 5 Nov. 1999.

Excellent article discussing ramifications to the Rio Grande due to excessive dams and overuse: unhealthy bosque and now-extinct native fish. Suggestions are given on what needs to be done.

Horgan, Paul. *The Heroic Triad*. Albuquerque, NM: University of New Mexico Press, 1994.

Three dominant cultures that have inhabited the Rio Grande River Valley through history are discussed in detail.

Pena, Devon G. "Cultural Landscapes and Biodiversity: The Ethnoecology of an Upper Rio Grande Watershed Commons." *Ethnoecology: Situated Knowledge, Located Lives*. University of Arizona Press, 1999.

Traditional farming methods used in the San Luis Valley are discussed in detail, excellent for use in an arid, high-altitude environments.

Rivera, Jose A. *Acequia Culture*. Albuquerque, NM: University of New Mexico Press, 1998.

Scenarios from traditional, acequia communities and how these communal institutions are a grassroots foundation in New Mexico.

Soussan, Tania. "Running Low." *Albuquerque Journal*. 16-20 July 2000, five-part series.

Newspaper articles discussing the Rio Grande and the growing demand for its water usage.

Student:

"Choices." *Careerware*. Canada: Peterson's Publishing, 2000
Bridges.com Co.

Software program designed for students, includes introduction to a career path in high school relevant to their interests, aptitude test and specific career information.

JIST, The Job Search People. *Exploring Careers*. Indianapolis, Indiana: JIST Works, Inc., 1990.

Detailed guide and descriptions of over 300 different jobs.

---. *Occupational Outlook Handbook*. Indianapolis: JIST Works, Inc., 1996-97.

Career information on nearly 250
occupations, developed by the U.S.
Department of Labor.

Quintana, Debra. *100 Jobs in the Environment*. New York, NY:
Macmillan, 1996.

A very informative book detailing 100 jobs
environmentally related; student friendly.

Wisconsin Career Information System. *Occupations Digest*. Madison,
Wisconsin: University of Wisconsin System Board of Regents,
1995.

A student friendly book detailing
occupations and where to write to get more
information.

Supplemental Materials

"Future Problem Solving Program."
Laurinburg, NC: Future Problem Solving
Program, 1988.