

"La Sangre de La Tierra" River Science

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We are life that wants to live in the midst of other life that wants to live.
- Albert Einstein.

The main purpose of this unit is to demonstrate the importance of water in our community. Water is one of the most important renewable resources we have on earth, yet we contaminate and misuse it. The earth is 70 percent water, but only three percent of the earth's water is a usable source for life. Much of this is frozen. This unit will be a thematic unit on the Rio Grande River integrating math, science and Spanish language arts. The unit will be part of the 6th grade dual language program with all subject areas and themes taught in Spanish. This unit will explain how water is in nature and what happens when humans intervene.

Students will be introduced to life science concepts in the classroom through their science textbooks. They will then apply this knowledge to the Rio Grande region. Students will study various aspects of the Rio Grande. They will focus on the Rio Grande as a biome. A biome is an area of land based on its climate, plants, animals and other characteristics. They will study historical changes made to the Rio Grande by human influences and natural occurrences. They will study the geography of the area. The necessity and demand of the water will be an issue analyzed. Students will be expected to consider and produce efficient ways to use the river's water in our ever growing community. The culture of the people along the Rio Grande will also be studied.

Through hands on experiences with the Rio Grande students will learn the importance of water in nature to plants and animals. They will learn where water is in New Mexico and how it got there, and they will learn the effects of water in society and culture. At minimum, I expect students to gain an awareness and appreciation for the Rio Grande and the bosque.

Academic Setting:

This unit was developed for a dual language 6th grade classroom at Washington Middle School. Students who participate in the dual language program have been in a dual language program throughout their elementary career. Science, math, and Spanish language arts will be taught in Spanish. Students will receive language arts, literature and social studies classes in English by another teacher. Some students will participate in the dual language program as recent arrivals from Mexico or other countries whose primary language is Spanish. Other students will be students who have participated in the dual language program as learners of English as a second language or as learners of Spanish as a second language. The overall goal of my classes taught in Spanish is to provide content in Spanish and enriched Spanish literacy.

Context and Background Information:

Water: Quantity, Quality, Uses

Water is made of molecules like all substances. A drop of water contains trillions of water molecules. Drops of water maintain their sphere shape and elasticity because of a force called surface tension. This property can be demonstrated on the Rio Grande when animals travel on the surface of the water.

Water from the Rio Grande river is what brought many cultures to settle here. But, this water is getting more precious daily. Some years the amount of water used is greater than the availability. Farms in Texas, southern New Mexico and Mexico use water released from the Elephant Butte and Caballo dams near Truth or Consequences. They use approximately 790,000 acre feet of water. Mexican farmers in Juarez are only permitted 60,000 acre feet of water.

Irrigation is the greatest use of Rio Grande water. Eighty percent of the water used from the river is used by irrigation for agricultural purposes in the US and Mexico. The San Luis Valley in Colorado, the Rincon and Mesilla Valleys in southern New Mexico, the El Paso and Juarez Valleys, and the Rio Grande Valley below Amistad Dam are the areas which use irrigation for agricultural purposes.

But, there is a growing municipal demand for water as cities like Albuquerque and El Paso/ Ciudad Juarez exhaust their groundwater supply. In the next three years, Albuquerque will begin to use river water for residents. El Paso is already receiving 43 % of its water source from the river. Las Cruces will begin to use the river in the next ten years. By the year 2025, the aquifer which supplies Juarez and El Paso, El Hueco Bolson, will be empty.

Water is also used for the following: municipal and industry, fish production, flood control, pollution removal (residential, industrial, mining, and agricultural sectors use the Rio Grande for the disposal of waste), hydropower, grazing and logging in the upland areas, development, recreation, and Native American uses - spiritual, cultural, fishing.

As these cities grow, no new source of water is available for consumption. All water in the Rio Grande is claimed by someone. This means the Rio Grande is considered "fully appropriated." For the river to survive, we must use the water effectively or other sources must be found.

Geography

The Rio Grande is the 24th longest river in the world. It is one of the longest in the United States. It is approximately 1,960 miles. It starts in the San Juan Mountains of southern Colorado and empties in the Gulf of Mexico near Brownsville, Texas. The Rio Grande forms a border between Mexico and the United States south of New Mexico and in Texas. The middle Rio Grande Valley runs from the Cochiti Dam to San Marcial, New Mexico and is 160 river miles. The Rio Grande river basin is 7,700 square miles. Its major reservoirs are the Rio Grande Reservoir, La Jara Reservoir, Platoro Reservoir, Continental Reservoir, and San Luis Lake.

One of the main geological features of the river is that it was formed by a rift in the earth. This occurred over 15 to 30 million years ago when volcanic eruptions caused the crust to drop forming the rift which is a trough that is five miles deep in some areas. The rift is 500 miles long and extends from central Colorado through New Mexico. Basins in the rift eventually filled with runoff waters. This water eroded the canyons between the basins. After approximately a half million years, these basins were connected slowly forming the Rio Grande River and emptying in the Gulf of Mexico. The river consists of a series of connected basins. At one time, each of these basins had its own short-lived lake. The river has flowed in the valley in its present form for over one million years. This process has also formed the fertile valleys along the river through overflowing and flooding.

The Rio Grande has three major confluences. They are the Conchos, the Pecos, and the

Chama rivers. Part of the Rio Grande basin is in the Chihuahuan Desert. The Conchos flows for approximately 250 miles to the Rio Grande. Lesser tributaries to the upper Rio Grande are the Conejos and Alamosa rivers.

The Rio Grande region has been arid to semi-arid for the past 5,000 years. Some years have been drought years and others have been wet years. Precipitation to the river falls at either end, in the form of snow at its headwaters and in the form of rain at its mouth. Due to the arid climate, the river shrinks in size as it flows downstream. Water is lost due to evaporation, transpiration by plants, and seepage into the ground. The amount lost is greater than the amount replaced by tributaries, rain, runoff from snow and other sources.

At one time, the Rio Grande was a free flowing river changing direction and moving within the flood plain. The river moved by forming meanders which are loop like bends. When currents erode the outside banks of the meander and sediment builds on the inner side of the meander, the direction of the river changes. An oxbow is formed when a loop is cut off from the new direction of the river. This creates a mini habitat that eventually dries out. The river also braided creating sandbars and interconnected channels. Now, however, with human intervention, the river is much more restricted to a *constricted* channel.

Habitat/Biome/ Ecology

The Rio Grande natural zone is a riparian zone. Riparian pertains to living or nonliving entities located on the bank of a natural fresh watercourse such as a river or lake. This zone is bordered in the Rio Grande Valley by cottonwood forest known as the bosque. These zones are threatened by continued urban development in the area. The Rio Grande river is in danger of collapse due to over irrigation and damming. Over irrigation and water use, 95% of the rivers flow, has contributed to the salinity of waters downstream. This has major effects on this aquatic biome. Both organisms and vegetation have been impacted. There is an active effort to restore the bosque and conserve Rio Grande waters.

Originally, natural flooding of the Rio Grande renewed the water and surrounding habitat. Floods knocked down old cottonwoods providing space for new trees to grow. Floods produced wetlands including wet meadows, marshes, sloughs, ponds and small lakes. Each of these were nutrient rich biomes.

Animals

Arthropods

Evidence of insects, spiders and other arthropods is of course abundant in the Río Grande bosque. This area provides an excellent opportunity for students to collect, observe, classify and study arthropods. The arthropods in the Rio Grande are both natural and exotic. Each one has its story to tell, a story about how it got there or what it does to help the environment. One example of an exotic arthropod is the crustacean isopods (pill bugs and wood lice). They are non - native invertebrates which now have the greatest population of invertebrates in the Rio Grande Valley. These animals are exotic to the Rio Grande area. Exotic means that they are not indigenous to the area. They arrived with humans in the soil carried on their boats from Europe.

Amphibians/Reptiles

The riparian habitat along the Rio Grande is ideal for amphibians which require water habitats for at least part of their life cycle. There are at least nine native species in the

Rio Grande bosque. It also supports at least three turtle species, 17 lizard species, and 18 snake species according to the *Bosque Educational Guide*.

Leopard frogs and chorus frogs which are native to the Rio Grande, are decreasing in numbers as the wetlands decrease. The non-native bullfrog population, however, is growing in the Rio Grande area. These bullfrogs compete with native amphibians.

Fish

Because of changes to the river, 11 of 27 species of fish found in New Mexico have become extinct due to human changes to the river. Damming and irrigation have affected fish population and reproduction. For humans, this means the fishing industry has suffered resulting, in loss of jobs.

The silvery minnow is the only survivor of five similar fish that once inhabited the Rio Grande from as far up as Espanola and the Rio Chama. In 1994, it became a threatened species. This fish is about three to five inches in length with a white belly and plain fins. In the past, the silvery minnow was found in great quantities from Espanola, New Mexico to the Gulf of Mexico. It was found in the Pecos river from Santa Rosa, New Mexico to its confluence in South Texas. Now, it can only be found in about 5% of its original habitat, (275 km). It cannot be found at all in the Pecos.

The decrease in silvery minnows in the Rio Grande is attributed to the construction of Elephant Butte Dam. With its construction came the production of non-native fish. These non-native fish often replace native fish species completely. The following native fish species are now extinct: shovelnose sturgeon, Colorado River cutthroat trout, bonytail chub, Rio Grande bluntnose shiner, phantom shiner, American eel, beautiful shiner, Palomas pupfish, freshwater drum. Thirty non-native species of fish have been introduced to the Rio Grande.

Mammals

Mostly rodents, there are over 60 species of mammals in the Rio Grande Valley. Loss of habitat has threatened the meadow jumping mouse and tawny-bellied cotton rat. Beaver were once heavily trapped along the Rio Grande Valley. They became in endangered. But, through efforts to reintroduce them, their populations are growing. There are 11 species of bats. Occasionally, the jaguar, gray wolf and grizzly have visited the Rio Grande Valley. However, today, they have disappeared from the valley.

Mammals introduced to the valley have had a negative effect on the native mammal population. These include cattle, sheep, goats, horses, donkeys, mules, feral cats and feral dogs.

Birds

Over 270 species of birds are present in the Rio Grande bosque. Native species of birds are threatened by loss of habitat and non-native species of birds. The southwest willow flycatcher struggles to find breeding places. Warblers and vireos are overtaken by cowbirds. Non - native European starlings and house sparrows use up nesting cavities leaving none available for native birds. Hunting once threatened the Rio Grande turkey and whooping crane. Efforts to protect these birds have been somewhat successful.

Plants

Native plants to the Rio Grande Valley include Godding and peachleaf willow, New Mexico olive, coyote willow, false indigo, Anderson wolfberry, and seepwillow. As with animals, the plant life along the Rio Grande is either natural or exotic. Some

examples of exotic plant life include tamarisk (salt cedar), Russian olive, Russian Thistle and Mulberry. These non-native plants are more aggressive and dominate over native plants. Many rare plant species are threatened with loss of habitat.

Trees

Cottonwoods can be up to three meters in diameter and grow up to 30 meters tall. They grow in areas where water is plenty. Their leaves are smooth, triangles with flattened leaf stalks, and have serrated edges. The fruit of the cottonwood produces hundreds of seeds with cottony plumes which are dispersed by the wind. The seeds travel long distances across the flood plains. The trees themselves do not grow in elevations over 2000 meters. Cottonwoods grow quickly.

Because of the reduction of wetlands in the flood plains of the bosque cottonwood forest are fading. Cottonwoods grow well only when their roots can reach ground water. Only in areas where there is a permanent water supply can the seeds germinate. Cottonwood forests grow along the Rio Grande, Pecos, San Juan and Gila rivers. They grow in New Mexico, Texas, Chihuahua, Sonora, Arizona, Utah and Colorado. Farming and river irrigation projects have cleared away much of the cottonwood forest. Large cottonwood forests remain only along the Rio Grande in central New Mexico. Exotic species of plants and trees caused the elimination of all saltgrass meadow and nearly half of the cottonwoods in the middle Rio Grande during the years 1918 and 1980s. The riparian cottonwood bosque will experience more changes under current human interventions with the river.

The river is no longer free flowing. This has affected the growth of cottonwoods. Cottonwoods germinate on sandbars newly formed by the river. The seeds need a bare, moist, sunny area. When the river flowed freely it produced ideal locations for new cottonwoods to grow. Now, however the population is stunted as seeds can only find shaded areas beneath older trees.

Pinon trees provided an important food source for prehistoric Indians. The nut from this tree is still popular today. It is a coniferous tree with a rough dark bark. Each cone produces about 20 nuts. The cones can also be used for kindling.

The ponderosa pine is a big tree that often grows to over 125 feet. It can live to be 300 years old. The leaves on the tree do not start until half way up the tree. This tree has a vanilla smell in its black, rough bark.

There are three types of juniper trees, one-seed juniper, Rocky Mountain juniper, and alligator juniper. This tree can be a shrub or small tree. It has small blue berries. Many one-seed juniper can be found with piñon trees in the lower reaches of the middle Rio Grande watershed. Juniper berries are used by Pueblo people for many purposes. The berries were used for food. Teas were made from the berries for colds, stomachaches, and rheumatism. The wood from the juniper had many purposes including building. The bark was used for matting and even a makeshift baby diaper.

Coyote willow found along the Rio Grande are used for basket weaving. The branches are also used by Pueblo people for prayer sticks. The bark from the willow tree is brewed by Navajos to form a tea that helps sore throats or other pains. The same substance found in the bark is found in aspirin.

Human Life along the Rio Grande

The Rio Grande has many different names and is home to many different cultures. It is called the Rio Bravo del Norte or el Rio del Norte in Mexico. It has been called Rio de

las Palmas. Native Americans call it Po'soge.

In 1975, the Cochiti Dam was completed. This project changed the river dramatically. The dam made the water colder and clear. Once muddy and warm, the change in the river has had a negative affect on many species in the water including the silvery minnow.

Bad management of the Rio Grande has granted industry use of the water in unsustainable and wasteful ways. Many of the water laws are combined with old water laws and use first rights as a grant to use water. This means people who have been using the water have rights for continued use. However, pueblos have struggled to enforce their rights as the first people to use the water.

New Mexico does not qualify the protection of stream water as a necessity. Colorado does. It preserves some of the water to be saved for the river. However, this is miniscule compared to other water uses that are considered to be beneficial uses. Beneficial uses are domestic, agricultural, industrial, commercial, or any other purpose defined by the state engineer.

Implementation

This unit will begin by focusing on water and its properties, and rivers. Learning about rivers in general, students will make the connection between the Rio Grande and the people of Albuquerque. Emphasis will be placed on the science of water and rivers and their importance to life. But, throughout the unit, attention will be given to the Rio Grande for its aesthetic and cultural value as well.

This unit will begin with an initial field trip to the Rio Grande. Students will be invited to familiarize themselves with the river and discover the rivers many attributes. Following this field trip, an area around the river will be adopted to focus their studies. This will be a place to gather information.

The *Bosque Education Guide* provides many activities to help students understand the nature of the Rio Grande and how human intervention has affected the Rio Grande. Instructions are given in this guide to make a model of the river which students can manipulate to show changes in the river. This will be integrated throughout the unit.

As a read aloud title, students will hear *The Mother Ditch* by Oliver La Farge. This will help students understand the importance of the river to Albuquerque communities and culture throughout history. The book gives an explanations of acequias and their management. Speakers from acequia societies will be invited to present to the class.

Students will have an opportunity to see an acequia and meet people from acequia communities on a field trip. Additional field trips will include a field trip to the public works department, so students can see how water is treated and distributed to residential communities.

Lesson - River Journal

Objective: Students will keep a record of their experiences, thoughts, learnings, and feelings about the Rio Grande and water.

Materials: One notebook provided by students. River Journal Rubric. Writing utensils.

Activity: 1. Read selected passages from *The Heroic Triad*, *Mayordomo*, *The Mother Ditch*, or other books related to the Rio Grande.
2. Explain to students that they will use this notebooks to record their thoughts about

the Rio Grande and the experiences they have had with the river.

3. Allow students to work in groups to brainstorm a list of types of writings they might include in the notebook. These should include, but are not limited to, observations, personal experiences, lists, notes on experiments, feelings, etc.

4. Have groups share their brainstorming with the whole class. As they are sharing, record their ideas on chart paper with the title "River Journals." Post the chart where all students can see.

5. Allow students to quick write for five to 15 minutes depending on the atmosphere of the group. During the quick write, they may write about an experience they've already had on the water or record the brainstorm list as a reference.

6. Have students share their initial entries if they want.

7. Share with students how their journal will be evaluated. Explain to students that they will evaluate their own entries. A peer will evaluate an entry and the teacher will evaluate an entry. Pass out journal evaluation rubrics for students to staple in the front cover of their journal to use as a guide. Explain each category of the journal evaluations. If possible provide examples of entries that meet the criteria or fail the criteria.

8. Provide time at least 3 times a week for students to reflect and write in their journal.

Evaluations: The journal is an ongoing work that should be evaluated more than once to allow students to improve. When it is time for evaluation, students will choose their best entry for evaluation. Alternating times, journal entries will be self- evaluated, peer evaluated, and teacher evaluated. The journals will be evaluated on the following criteria:

Heading - Date, Type of Entry	0 - 10 points
Creativity and Ideas	0 - 20 points
Originality and Voice	0 - 10 points
Increased Evidence of Knowledge	0 - 10 points
Expression of Attitudes	0 - 10 points
Completeness	0 - 10 points
Handwriting	0 - 10 points
Vocabulary Usage	0 - 10 points
Spelling and Grammar	0 - 10 points

Lesson: Palabras del Agua

Objective: The purpose of this activity is to help students develop vocabulary to use in their river journals. This activity is adapted from *Aquatic Project Wild*.

Materials: river journals, writing materials, butcher paper or chalkboard, extra water photos, glue, scissors.

Activity:1. Students bring in photos of water from magazines, or personal photos that they can cut and paste.

2. Have students make a water collage on the cover of their river journals using photos they brought in to class.

3. Begin a web on the butcher paper or chalkboard. Start the web with the word water. Have students give other words that are related to water. As you call on students, tell them to explain their connection.

4. Start another web with the words Rio Grande in the center. Have students brainstorm again, explaining how they are connecting the words.

5. Using the webs students created together, have students write a paragraph in their river journals. They can make paragraphs or poems by describing the connections the

words make.

Evaluation: Use the river journal evaluation rubric.

Webquest are designed to provide inquiry projects for students. Students are presented with a research task in which most of their information is found on the Web. I have included two webquests as part of this unit. For more information on webquest, a good web site to look at is Bernie Dodge's Webquest Page:

<http://edweb.sdsu.edu/people/bdodge/Professional.html>.

Lesson - Webquest: Agua, Agua
Objective: The purpose of the webquest is to give students experience using the Internet to gather information. This webquest is designed to present students with information on water, the water cycle, water contamination and water conservation.

Materials: Computer with Internet access. Construction paper for posters, drawing papers and markers.

Activity: This activity is presented on the web in the form of a webquest page. Students are instructed to access the page from their classroom folder. The webquest is reviewed by the whole class. Then, students are given three to four computer periods to complete the task.

Agua, Agua

¿Sabes que hay diferentes tipos de agua? Puedes encontrar el agua en diferentes estados (formas)? Usando el sitio de red - ¿No es divertido aprender del agua?, vamos a ver que viejo es el agua.

INTRODUCCION: La Tierra esta cubierto por 70% de agua por los mares y océanos. Pero, solo 3% del agua que existente no es salada. La mayor parte de esta agua es en la forma de hielo. Parte de agua está contaminado. Por eso, tenemos que aprender del agua, sus características, y como ahorrar el agua.

TAREA: Van aprender del agua y preparar una carta para enseñar a la clase. Trabajando en grupos de tres o cinco, escojen un tópico de abajo. Usando el sitio del red ¿No es divertido aprender del agua?, agarra información de su tópico. Usa una carta para preparar información de su tópico. En su carta, incluye tres datos y tres dibujos por lo menos. Practica con sus compañeros la presentación de su información. Cada persona tiene que hablar sobre el tópico:

Tópicos
Información del Agua
El Ciclo del Agua
Estados del Agua
Tipos del Agua
Contaminación del Agua
Ahorro del Agua

EL PROCESO:

#Escoje su grupo. En su grupo necesitarán niños y niñas.

#Con los miembros de tu grupo, escojen un tópico. Antes de empezar, da a la maestra los nombres de tu grupo y tu tópico.

#Marcan el sitio del red - ¿No es divertido aprender del agua? Buscan la información que necesitarán para su presentación.

#Leen la página del red.

- #Decidan que información es más importante para su presentación.
- #Agarran su carta y un lápiz.
- #Escriben los tres datos en la carta. Recuerden, como siempre, que tienen que escribir la información en sus propias palabras.
- #Decidan que dibujos van a usar en su carta. Escojen quien va dibujar los dibujos.
- #Agarran papel para dibujar. Hagan los dibujos. Tienen que incluir color y los encabezamientos en sus dibujos.
- #Pegan sus dibujos en la carta.
- #Leen su carta con su grupo. ¿Tiene sentido? ¿Hay palabras que puedes usar para mejorar la información? ¿Las palabras están bien escritos?
- #Corrijan su escritura. Rastreen sobre sus palabras con marcadores.
- #Practiquen su presentación.

Los Recursos

¿No es divertido aprender del agua?

Agua

El Ciclo Del Agua

Rúbrica de Evaluación	
Criterios	Las Puntas Posibles
Cooperación	10
Presentación	10
Organización	10
Tres datos	30
Tres dibujos	30

Lesson: The River and the Water Cycle, adapted from the book *Rivers* by Haslam.

Objective: The learner will demonstrate the water cycle and the importance of the river to the water cycle.

Introduction: After completing the webquest, Agua, Agua, students will know the vocabulary and steps to the water cycle. This activity is to demonstrate the importance of the river to this cycle. Even though rivers are only 1% of the fresh water on earth, they are important to the process of water renewal.

Materials:

1 sheet of glass (the size of a small pane), 12 bricks, a piece of board or cardboard, a plastic tub, boiling water, river journals

Vocabulary: Evaporación, Evapotranspiración, Condensación, Transpiración, Afluencia, Vapor de Agua, Filtración, Precipitación

Activity:

1. Review the water cycle and vocabulary with students. Ask students what role the river plays in this cycle.
2. Stack 2 rows of 10 bricks to represent mountains. Place the remaining 2 bricks to support the glass between the 10 bricks at a slope. The glass will be slanted at an angle. The glass represents the earth's atmosphere.
3. Place the plastic tub next to the two bricks. The plastic tub represent the sea.
4. Balance the board on the 12 bricks, the mountain, and the plastic tub, the sea.
5. Pour boiling water in the plastic tub. It is easier to see with food coloring in the

water.

6. Steam will rise from the plastic tub and condense on the glass. It will fall along the board and run down to the plastic tub, as rivers run to the sea.

Evaluation: Repeat this demonstration more than once for students. Call on students to explain the process as you do the demonstration. In their explanations, students should use the vocabulary for the water cycle. In their river journals, have students draw the demonstration and explain it. Again, ask students about the role of the river to the water cycle.

Extension: The Rio Grande Bosque Water Cycle from the Bosque Education Guide, pages 85 to 97, shows how the water cycle runs in nature and how it is affected by agriculture, industry and residential communities.

Lesson: Meanders and Oxbows, parts of this lesson have been adapted from the book *Rivers* by Haslam.

Objective: To help students understand how rivers change course and form oxbows.

Introduction: Without human manipulations, rivers naturally change courses. Loops formed by the changing course of a river are called meanders. Oxbows form when the river cuts off a meander from its original path.

Materials: cardboard boxes - several per groups of students, blue ribbon for rivers, yard material for banks and land along river, pictures of meanders and oxbows.

Activity 1:

1. Show students pictures of a river meander and oxbows. It would be ideal to take students to the Rio Grande and point out oxbows and meanders.
2. Explain meanders and oxbows.
3. Divide students into groups. Each groups should use materials to make a model of an oxbow or meander or both.
4. Have students show their models and call on other students to tell if the model is of a river meander or oxbow. Display models.

Materials: bricks, flower bed box or other plastic box to collect water, board, clay, plastic cup, water and pouring container.

Activity 2:

1. Place board between bricks and flower bed to make a gradient.
2. Have a student pour water down the board. The will see that the water flows almost directly into the flower bed box.
3. Remove a few bricks to reduce the gradient of the board.
4. Make a hole in the bottom of the plastic cup. Place it on the bricks with the hole facing the board.
5. Use the clay to secure the cup and make a channel from the hole onto the board.
6. Call on one student to pour water into the cup. The water will meander and travel more slowly.

Evaluation: Ask student to describe the experiment in their river journal. As part of their explanation they should explain meanders and oxbows.

Lesson: Acuíferos Webquest

Objective: The purpose of this lesson is to have students use the Internet to get a better understanding of our aquifer and the relationship between groundwater and surface water.

Materials. Acuífero Webquest, Computers with Internet access, River Journals, Maps of New Mexico for drawing on, one per student, construction paper.

Activity: This activity is presented on the web in the form of a webquest page. Students are instructed to access the page from their classroom folder. The webquest is reviewed by the whole class. Then, students are given 3 to 4 computer periods to complete the task.

Acuífero

Lectura Antes de empezar el webquest, lee con un compañero el artículo "Agua de la Superficie y del Subsuelo," paginas cuatro y cinco del libro *Tierras Aridas, Aguas Sagradas Selección de Actividades para Estudiantes.*

Tarea

Usando los sitios del red y su artículo, contesta los siguientes preguntas en tu diario del río. Usa un mapa de Nuevo México para dibujar el acuífero que usamos aquí. Usa papel de construcción para hacer tu presentación de tu tópico

1. Escriban una definición de un acuífero.
2. Nombran los tipos de acuíferos por su tipo de piedra.
3. Escojen un tipo de acuífero y identifiquen donde están en Los Estados Unidos.
4. Cómo se llama el acuífero que usamos aqui en Nuevo Mexico?
5. ¿Qué tipo de acu'fero es?
6. Usen un mapa de Nuevo México. Dibujen nuestro acu'fero en el mapa.
7. ¿Qué es el tamaño del nuestro acu'fero?
8. ¿Qué cantidad del aqua está sacado de este acuífero?
9. Escojen uno de los siguientes tópicos y haz una carta que explica el tópico.

¿Cómo el agua de la superficie y del subsuelo tienen conexiones?

Amenazas para el agua subterránea

Las piedras que tienen agua.

Zona Saturada y Zona no Saturada

Información de Agua Subterránea

¿Qué es un divisoria de las aguas, "watershed"?

Vocabulario del Agua (dies palabras)

10. En su carta, incluyen un explanation de su tópico y sus dibujos.

Los Recursos:

Acuífero <http://sr6capp.er.usgs.gov/aquiferBasics/index.html>

Ground Water and Surface Water

<http://www.ctic.purdue.edu/KYW/Brochures/GroundSurface.html>

Ground Water Monitoring In Albuquerque

http://nm.water.usgs.gov/alb_wl_pumpage_mon.html

Evaluación

Preguntas 1 a 5 vale por 7 puntas cada respuesta.

Pregunta 6, su mapa del acu'fero, vale por 16 puntas.

Preguntas 7 y 8, valen por 7 puntas cada respuesta.

Su presentación del t'opico vale por 25 puntas.

Lesson: Rio Grande Habitat and other Biomes Lectura: Explorar los biomas terrestres p. 69 - 92, del libro Ecología: Recursos vivos de la tierra.

Objetivo: Los estudiantes van a aprender de los diferentes biomas del mundo y sus características. Con información de los biomas, los estudiantes van a describir el bosque del Rio Grande. Sus descripciones tienen que ser desarrollado en palabras escritas y en voz alta.

Actividad: Después de leyendo del biomas y el viaje inicial al bosque, los estudiantes van a trabajar en grupos de cuatro o cinco para hacer un mural de bosque. Usando diferentes materiales, los estudiantes tienen que incluir características que identifian el bosque del Rio Grande y describir que tipo de bioma es. Los estudiantes van a escribir un párrafo que describe el Rio Grande. Vamos a colgar los murales y los párrafos juntos.

Actividad: Trabajando en grupos, los estudiantes van a estudiar las caracter'sticas de un bioma, (tundra, selva, pradera, desierto, agua). En un lado de su papel, cada grupo, van a hacer una lista de las características, tipos de animales, tipos de plantas, y el clima del bioma. En el otro lado del papel, van a rotular el Rio Grande. Los estudiantes marcaran con un equis si el bosque del Rio Grande tiene las mismas caracter'sticas que su bioma.

Evaluación: Los estudiantes demuestren y comparen las características de biomas.

Lesson: Palabras del Rio

Objective: To have students demonstrate vocabulary learned in the river unit.

Materials: Writing tools, River Journals

Vocabulary: acu'fero, afluencia, aguas dulces, aguas negras, aguas subterráneas, areas ribereñas, condensación, evaporación, evapotranspiración, vapor de agua, presa, lago en forma de herradura (oxbow), cabecera de un río, afluente (tributario), serpenteo (meander)

1. Have students brainstorm a list of words associated with rivers. Make sure to add words from the vocabulary list.
2. Tell students to select a word from the list and think as if they were the word.
3. Explain to students that they will write poems from the point of view of the word. They will write "I am" poems.
4. Give students an example of an "I am poem". Here is an example of an "I am" poem about a dam. "I am" poems begin and end with an "I am" statement.

I am a Dam.	Yo soy una presa.
I am very strong.	Yo soy muy fuerte.
I am built of thick walls.	Yo soy hecho de paredes gruesas.
I hold back water.	Yo detengo el agua.
I am dome shape or triangular.	Yo soy en forma de colina redonda o un triángulo.
I am a Dam.	Yo soy una presa.

1. Have students write one "I am" poem with a partner and then follow up with individual poems.
2. Invite students to share their poems and display them.

Evaluation: Poems should define the words students have chosen.

Lesson: The Rio Grande in Art

Objective: Students will search for art forms that focus on the Rio Grande and see the river for its aesthetic value.

Materials: collected photos, pictures of art, prints that have the Rio Grande as its theme, *New Mexico Magazine* and other periodicals with pictures and articles on the Rio Grande, River Journals, writing materials.

1. Tell students that they are going to look at the Rio Grande as a theme for artist. They will keep a list of the pieces of art that they encounter in their journal.
2. Have students divide a page in their journal in two halves lengthwise. They should label one side "Title" and the other "type of work."
3. Using gathered materials, demonstrate how students will gather information on the chalkboard.
4. Take students to art museums to look for the Rio Grande in the works. It is a good idea to call several museums and see if they have pieces with the Rio Grande represented.
5. After the field trip, have students share their findings.

Evaluation: This can be evaluated as a journal entry. But, the true evaluations of the lesson is if the students find value in the Rio Grande. Students could ask to respond to a hypothetical situation where a person or persons says, "So, what if the river dies? We will get water from other sources." Their responses could be oral or written in their journals.

Conclusion: The river science unit is part of a year long curriculum on the Rio Grande. Other parts of this curriculum will focus on animals and plants of the riparian zone. Culture will be emphasized in a unit on river celebrations. This part of the unit will focus on different celebrations people have as traditions in Hispanic and Native American cultures with the Rio Grande. Looking at herbs that grow naturally along the river, and in the garden at the Nature Center, students will learn to identify these herbs and how they are used traditionally as remedios (cures). This is just an opening to many other rich academic connections that can be made to the Rio Grande.

Documentation

District core curriculum standards for science implemented in this unit:

- identify questions that can be answered through science
- design and conduct a scientific investigation using proper safety procedures and techniques
- use appropriate tools and techniques to gather, analyze, and interpret data
- communicate scientific procedures and explanations
- identify the key elements of an ecosystem
- compare and contrast biomes from different regions around the world
- examine the impact humans have had on other species and natural systems over time

New Mexico state content standards for science implemented in this unit:

- Students will understand science concepts of order and organization.

- Students will understand the physical world through the concepts of change, equilibrium and measurement.
- Students will acquire the ability to do scientific inquiry.
- Students will know and understand properties of earth science.
- Students will use evidence, models, and explanations to explore the physical world.

Teacher Bibliography

Aquatic Project Wild. Bethesda, Maryland: Western Regional Environmental Education Council, Inc. 1987.

An activity guide for teachers, this book provides activities that promote environmental awareness and conservation.

Bosque Education Guide: An Environmental Program to Teach About the Riparian Forest Within The Middle Rio Grande Valley. Albuquerque, New Mexico, 1995.

Activities for students are well planned. It is a thorough curriculum.

Crawford, Stanley. *Mayordomo, Chronicle of an Acequia in Northern New Mexico*, Albuquerque, New Mexico: University of New Mexico Press, 1998.

Written in journal style, the book gives a first hand experience with acequia culture.

Horgan, Paul. *The Heroic Triad, Essays in the Social Energies of Three Southwestern Cultures*. Albuquerque, New Mexico: University of New Mexico Press, 1994.

Describes the people, cultures and environment along the Rio Grande.

Potter, Marne. *Tierras Aridas, Aguas Sagradas Selecccion de Actividades para Estudiantes*. Albuquerque, New Mexico, 1992.

This activity guide was produced by the New Mexico Museum of Natural History and Science. It has excellent lessons, readings, and vocabulary in Spanish. Literature for Children

Berger, Melvin and Gilda. *Water, Water Everywhere*, Nashville, Tennessee: Ideals Children's Book, 1995.

This nonfiction book gives an explanation of how water is treated and delivered to houses.

Bramwell, Martyn. *Rivers and Lakes*. New York, New York: Franklin Watts Inc., 1986.

This nonfiction book is part of the *Earth Science Library* series. It gives a detailed explanation of rivers and their use. It provides a glossary and good descriptions of river vocabulary.

Carlisle, Norman and Madelyn. *Rivers*, Chicago: Childrens Press, 1982.

Part of the series *A New True Book*, it describes rivers and how they flow through land. It also describes how people use

rivers and the importance of keeping rivers unpolluted. It has a picture of the Rio Grande.

Cooper, Jason. *Agua, Secretos de La Ciencias*. Velo Beach, Florida: The Rourke Corporation, 1984.

Provides a simple explanation of water and its importance to life.

Haslam, Andrew. *Rivers*, Chicago, IL: World Book Inc, 1996.

Part of the *Make it Work!* series, pictures of landscape models are used to explain river concepts.

LaFarge, Oliver. *The Mother Ditch*. Santa Fe, New Mexico: Sunstone Press, 1983.

This is a bilingual children's book which explains New Mexico farm life and customs. The story is about a time when the acequia madre (mother ditch) went dry.

Prentice Hall Ciencia, Ecología: Recursos vivientes de la tierra, Englewood Cliffs, New Jersey: Prentice Hall, 1994.

This is the science text we use in class.

Rowland-Entwistle. *Rivers and Lakes*, Morriston, New Jersey: Silver Burdett Press, 1987.

Part of the *Our World* series, this informational text gives general information about rivers around the world and their uses.

Schmid, Elenore. *The Waters Journey*, New York: North South Books, 1989.

Beautifully illustrated, this picture book describes the water cycle as a descriptive journey.

Websites

Agua <http://beta.semarnap.gob.mx/>

This site is an informational site in Spanish. It was written for children. The language is simple and it provides basic information about water uses. The music is distracting. There are some games.

Aquifer Basics. <http://sr6capp.er.usgs.gov/aquiferBasics/index.html>

This site is an excellent site for explaining aquifers. It explains the different types of aquifers and where they are in the United States. It names the major aquifers of the US and gives a map for each aquifer.

El Ciclo del Agua: <http://www.contenidos.com/fisica/agua/>

This site is an excellent explanation of the water cycle in Spanish. It provides a graphic of the water cycle with labels of each part. The parts are linked to further explanation. It is an interactive site.

Ground water monitoring in Albuquerque.

http://nm.water.usgs.gov/alb_wl_pumpage_mon.html This site has a map of the wells in Albuquerque.

Know Your Groundwater.

<http://www.ctic.purdue.edu/KYW/Brochures/GroundSurface.html>

This site explains the relationship between groundwater and surfacewater.

Rio Grande - Five Things You Can Do To Help.

<http://www.seedballs.com/riogpa3.html>

This site list five ideas for people to help restore the river back to its natural state.

Rio Grande Restoration A Voice for the River.

<http://www.riogrande restoration.org/index.html>

This is an environmental site with emphasis on helping the river maintain its natural state. Projects are designed to restore the river. Teachers and students are invited to participate in these projects.

Rio Grande/Rio Bravo Basin Coalition. <http://www.rioweb.org/>

This site is available in Spanish or English. It has information on the Rio Grande with current articles linked to the site. It also has information on current projects to restore the river to a more natural state.

Water Science for Schools - USGS Water Information. <http://ga.water.usgs.gov/edu/>

This is an informational site on water in English. It is an excellent source for students and teachers. It is also linked to teacher resources, activities, and lessons.

Rúbrica Del Diario Del Rio

Nombre:Fecha:

Criteria	Las Puntas Posibles	Las Puntas Reales
Encabezamiento: fecha, tipo de entrada	0-10	
Creatividad e ideas	0-20	
Originalidad, Voz	0-10	
Evidencia del logro de Conocimiento	0-10	
Expresión de Actitudes	0-10	

Lo completó	0-10	
Escrito de Mano, Curviso	0-10	
Vocabulario	0-10	
Deletreo y gramática	0-10	
Total:	100	

Comentario:

Firma del evaluador: