RIVER Xchange

Innovative, Long-Term Outreach Project Helps New Mexico Students Learn About Their Watershed and River Ecosystem

Presented to the New Mexico Watershed Forum

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Experiential EE, LLC

- New Mexico consulting firm owned by Katie Babuska
  - K-12 water resource education program development and management
  - teacher professional development
  - water resources outreach consulting
- Since 2006, we have produced water resources programs that have educated over 50,000 students and 2,500 teachers.

RiverXchange

- Innovative, long-term outreach project combines:
  - hands-on curriculum
  - guest presenters
  - computer technology
  - "high tech pen pal" partnership
- Uses local river as a focal point to teach about key water resources issues.
- Targets **New Mexico fifth** grade classes.

- Inquiry-based curriculum emphasizes critical thinking and writing skills.
- Runs full school year.
- Requires field trip to the river.
- Specific, measurable goals.
- On-line student and teacher assessments.
- Free of charge.
- Low cost, high impact.
- Created in 2007-2008.

Project Goals

- Deepen teachers' and students' understanding of and appreciation for their local river ecosystem and watershed.
- Motivate participants to protect local water resources by conserving water and keeping source water clean.
- Provide low cost, high impact water resources outreach opportunity for partner organizations.

Funding Partners

U.S. Bureau of Reclamation

- 15 ABQ/RR partnerships

Southern Sandoval County Arroyo and Flood Control Authority (SSCAFCA)

- 10 RR partnerships (on-going commitment)

Middle Rio Grande Stormwater Quality Team (MRG SQT)

- 10 ABQ partnerships (on-going commitment)

Santa Fe County

- 10 SF partnerships (two year commitment)

In-kind Partners

- Classroom guest speakers
- Field trip docents
- Resource materials
- Technology support

Albuquerque

ABCWUA
Bernalillo Co. Cooperative Extension
Bernalillo Co. Office of Environ. Health
Bernalillo Co. Open Space
Bernalillo Co. Public Works
Ciudad Soil & Water Conserv. District
MRG SQT
U.S. Bureau of Reclamation

Rio Rancho

CH2M Hill OMI
City of Rio Rancho
Keep Rio Rancho Beautiful
Friends of Rio Rancho Open Space
New Mexico Museum of Natural History & Science
SSCAFCA
Sandoval Co. Cooperative Extension

Santa Fe

Santa Fe County
Santa Fe Co. Cooperative Extension
Santa Fe Watershed Association
NMSU Small Farm Task Force/Alcalde Science Center
NM Environment Department/SWQB
NM State Land Office

NM Participants (45)

- Albuquerque – 22
- Rio Rancho – 13
- Santa Fe County – 10

Partner Classes (45)

- Canada: Calgary, Alberta
- Canada: Salt Spring Island, British Columbia
- Canada: Selkirk, Manitoba
- Italy: Aviano
- Italy: Sicily
- CT: Simsbury
- GA: Milledgeville
- ID: Garden City
- ID: Kuna
- IL: Glen Carbon
- KY: Lexington
- KY: Louisville
- KY: Richmond
- MA: Holden
- MA: Millis
- MA: Needham
- NC: Cherokee
- NC: Gastonia
- NC: Jacksonville
- NC: Sparta
- NH: Milan
- OH: Cardington
- OR: Canyon City
- OR: Redmond
- VA: Charlottesville
- VA: Washington
- WA: Bellevue
- WA: Camas
- WA: Leavenworth
- WA: Vancouver

Curriculum

Combines…

- existing public domain, hands-on activities and resources
- local guest speakers
- field trip/service learning experience
- student-to-student pen pal partnerships
- reinforcement of learning through writing
- *Big Water Questions* as outcomes
- On-line student and teacher assessments

Outcomes: *The Big Water Questions*

- Why is water so important to life?
- How do all living things depend on each other?
- What is the water cycle?
- What is a watershed?
- Where does my drinking water come from?
- Where does my wastewater go?
- What makes water dirty?
- How much water does my family use each day?
- Who are the other water users in our society?
- Who owns our water?
- How can *I* protect our water?

Unit 1: Understanding a Watershed

- What is a watershed/where is my watershed?
- What makes water dirty?
- What is the water cycle?
- How can *I* protect our water?
  - State geography, climate, flora, fauna, timing of precipitation, location of tributaries
  - Upstream/downstream
  - Nonpoint source pollution
  - Infiltration, runoff
  - Stormwater
  - Pollution prevention

Unit 2: Water in Our Society

- Where does our drinking water come from?
- Where does our wastewater go?
- How much water does my family use each day?
- Who are the other water users in our society?
- How can *I* protect our water?
  - Water issues in other parts of the world
  - Ground water
  - Surface water
  - Wastewater vs. stormwater treatment
  - Rivers and human settlements/culture
  - Prior Appropriation vs. Riparian water rights
  - Agriculture and irrigation

Unit 3: River Ecosystem

- Why is water so important to life?
- How do all living things depend on each other?
- Who are the other water users in our society?
- How can *I* protect our water?
  - Food webs
  - Macroinvertebrates
  - Natural vs. constructed wetlands
  - Erosion

Field Trip/Service Learning

- Albuquerque
  - Sanchez Farms
  - Open Space Visitors Center
  - Tingley Beach
- Rio Rancho
  - Willow Creek Open Space
- Santa Fe County
  - San Ysidro Park
  - NMSU Alcalde Sustainable Agriculture Science Center

Assessment

On-line teacher surveys

- NM and partner

On-line student surveys

- Units 1, 2, 3

Wiki content review

- Class activity information
- Student pages

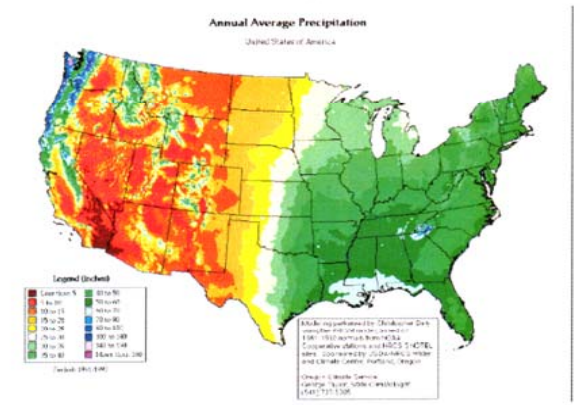
Student Survey

Unit 1

Greetings, RiverXchange students!

1. Try out your map skills ...

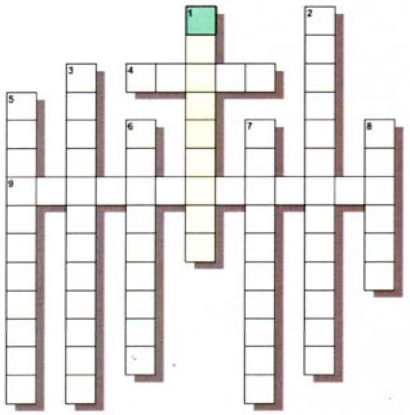
Answer the questions below by clicking on the picture.



2. Do you know these *water words?*

Solve the crossword puzzle.

Condensation
Delta
Desert
Evaporation
Headwaters
Pollution
Precipitation
Runoff
Transpiration
Tributary
Watershed



Across

4.) The mouth of a river, which is triangle-shaped like a Greek capital letter Delta

9.) All the water that falls from the sky, in solid or liquid, such as rain, snow or hail.

Down

1.) Dirt or poison in the environment.

2.) The process by which water comes out of the leaves of plants, primarily through openings in the leaves, and goes into the air.

3.) The process by which water changes from vapor

Finish

3. Now **test your knowledge** about Watersheds!
4. If you have time, you can play this fun game... **Water Showdown!**

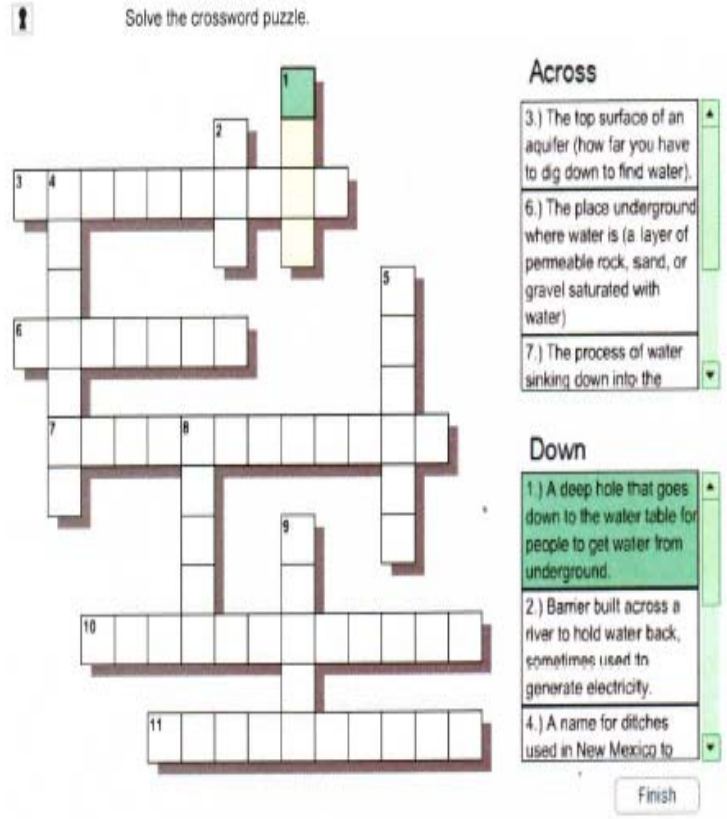
Student Survey

Unit 2

Greetings, RiverXchange students!

1. Watch this great cartoon - **The Story of Groundwater**!
2. Play this fun **WaterSense** game!
3. Do you know these *water words*?

Acequia
Aquifer
Arroyo
Conservation
Dam
Infiltration
Levee
Locks
Wastewater
Water Table
Well



4. Now **test your knowledge** about Water in Our Society!

Student Survey

Unit 3

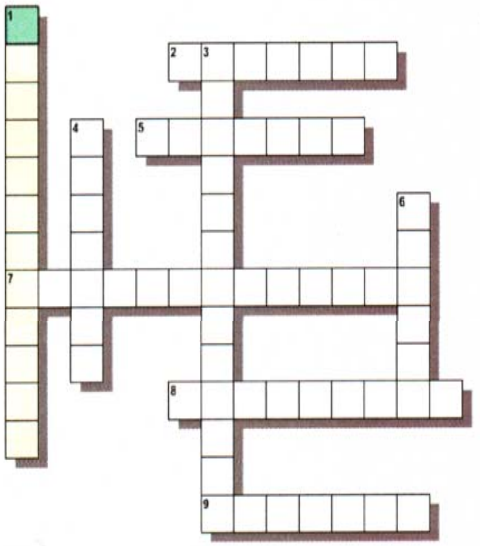
Greetings RiverXchange students! Test your River Ecosystem knowledge:

1. Watch Frogline News to learn about how frogs are affected by watersheds.

2. Do you know these *Water Words*?

Bosque
Ecosystem
Erosion
Exotic Species
Floodplain
Habitat
Native Species
Riparian Zone
Sandbar
Wetland

Solve the crossword puzzle.



Across

2.) Area such as a marsh or swamp that is covered with shallow water or where the soil is very wet all the time.

5.) The process in which a material (such as a river bank) is worn away by water or wind.

7.) A species that naturally

Down

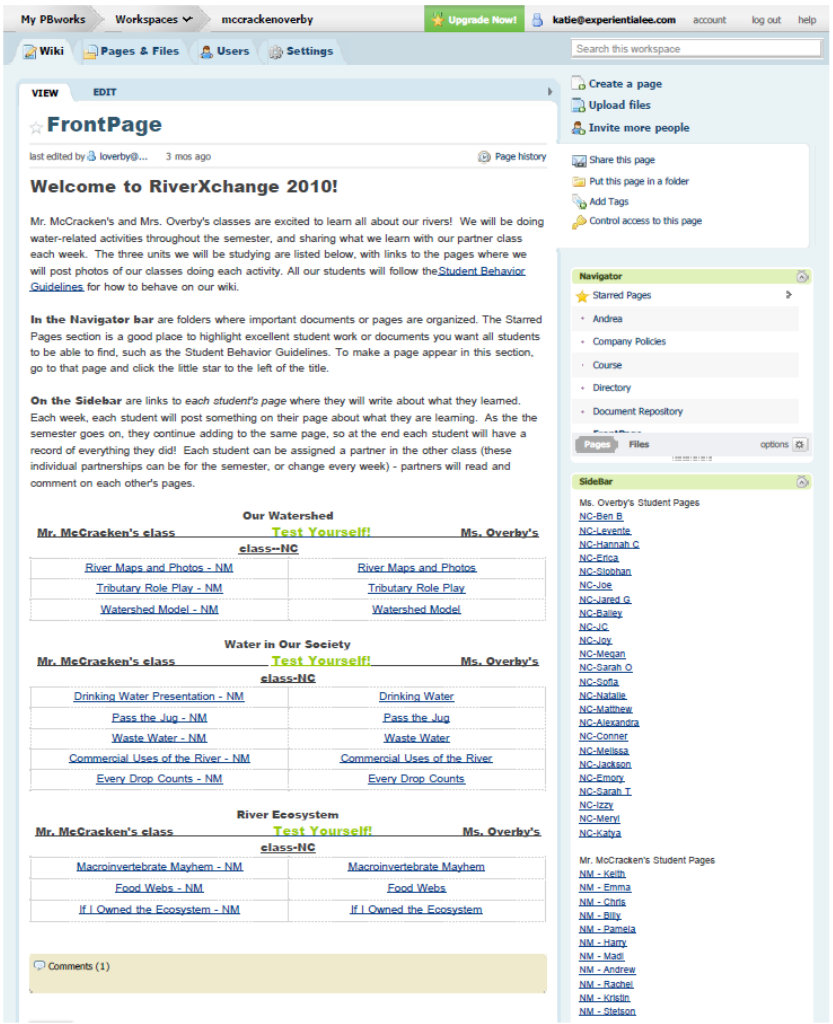
1.) The area around the banks of a natural body of fresh water.

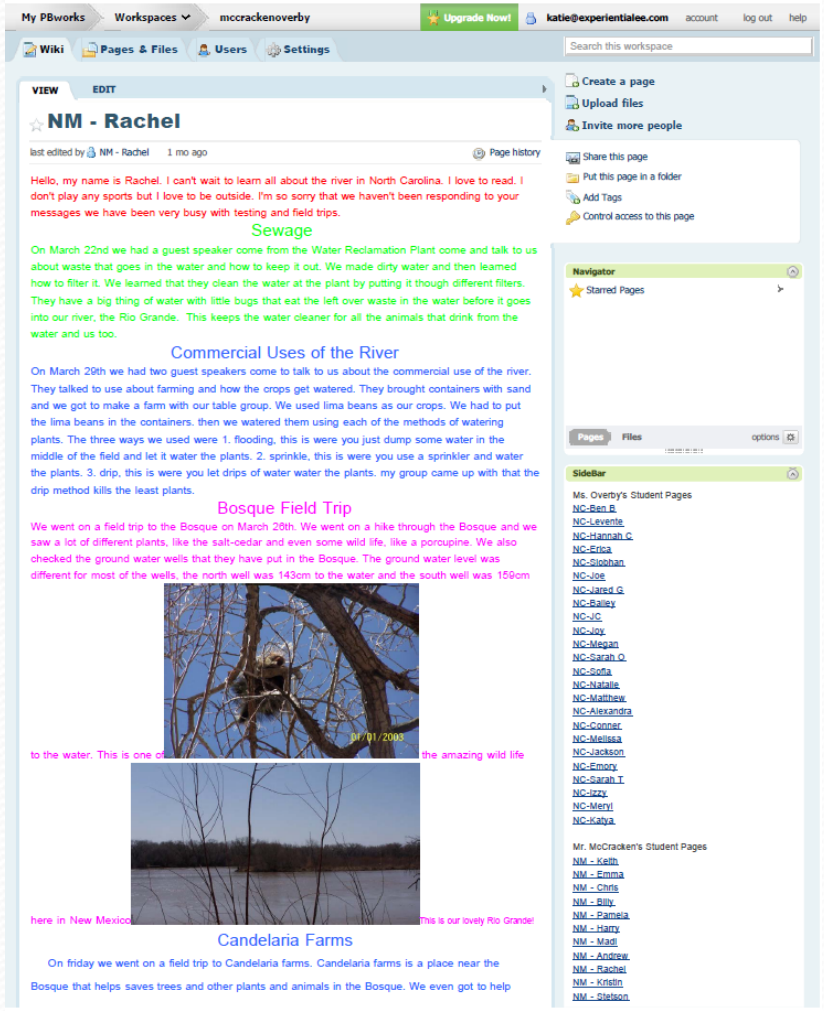
3.) A plant or animal introduced from a different area that competes with native species. They sometimes become invasive and take over an area.

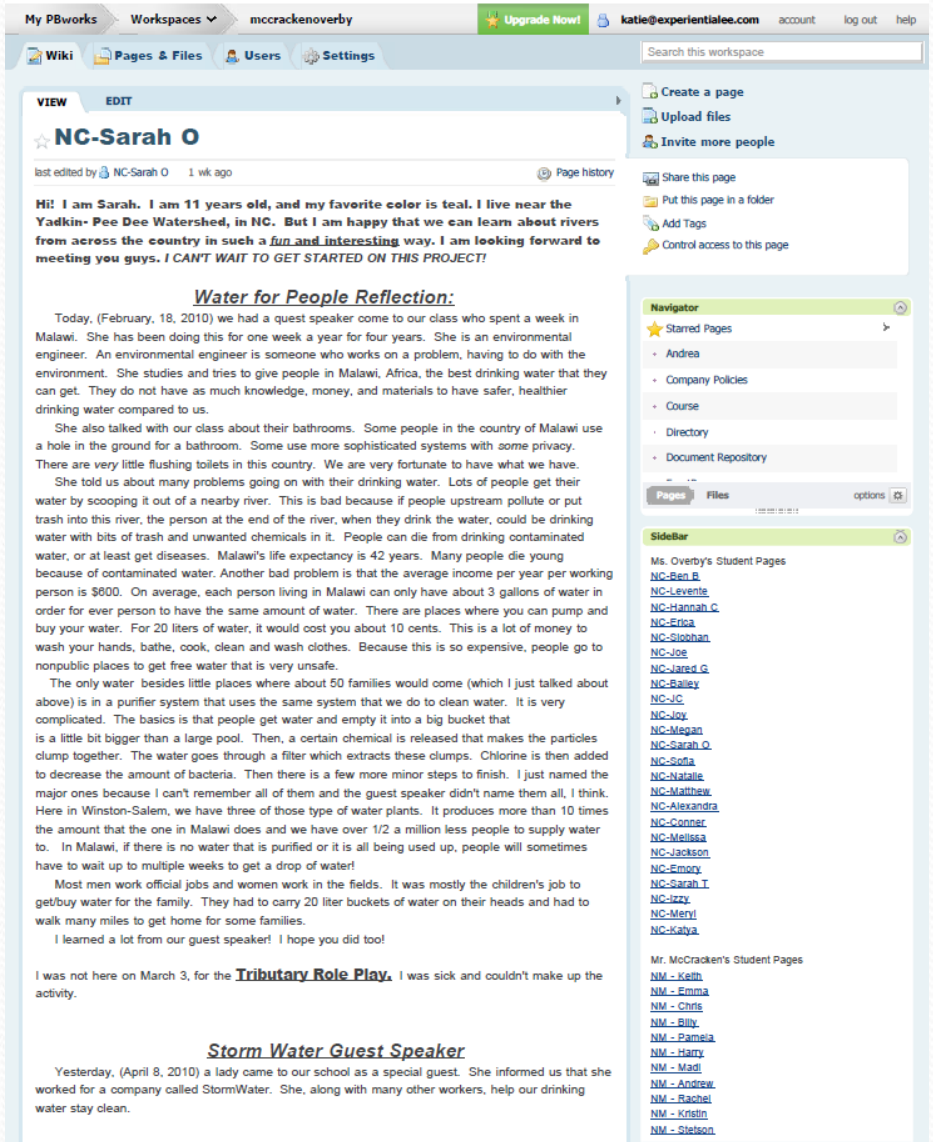
Finish

3. Now test your knowledge about River Ecosystems!

Wiki Samples







What is it?

Did you know that the purified water that we use from our toilets, showers, sinks, and everywhere else all goes to one place.

Where does it go?

That one place is the sewer. First it flows through our piping system then the neighborhood's piping and keeps flowing until it reaches a place that it is sloshed into a huge bucket. All the chunky lumps, if you know what I mean, are sorted out and the rest keeps going further into the purification system.

Her model

One of the things that she brought with her was a model showing an average town with a normal river flowing alongside of it. She demonstrated how people can pollute water. She also tied in one or two erosion issues. I can't remember all of it but she started off with a guy who lived in a small house with a giant dog that had some pooping problems. He pooped everywhere on the man's yard. You might think that this is not a problem because we use cow manure to fertilize our land. Dog poop kills the land because dogs are carnivores. Cows don't eat meat so herbivore poop has minerals in it that are different to a dog's. Dog poop contains a harmful chemical that will give you stomach aces or diarrhea if you enter water with dog poop in it. This substance is called E coli. So to symbolize dog poop she squirted some watered-down brown paint onto the mans yard.

The poop was sitting and killing the grass beneath it while another guy in town decided to change the oil in his car. Instead of taking it to a recycling center, he disposed of 4 quarts of oil into the river nearby. Just one gallon of oil can pollute more than a million gallons of water. See how much one man's carelessness can affect so much water?!

The ground is getting pretty bare now, and the water is getting grosser, but the world doesn't seem to notice, much less, care about our own drinking water. A farmer planted corn nearby but it looked like it couldn't grow very well so he decided to add some fertilizer and pesticides. The ground can only absorb a certain amount of those so the rest just sits on the topsoil. The watered down paint was used to show the pesticides and excess fertilizer.

So now, the poop and the fertilizer are just laying there while someone decided to build a school beside the river. (UGH! A school!! Why couldn't it be like a video game store or something!) But when they dug up the soil, some got sloshed around everywhere, outside the construction site. This was also represented by brown dots.

Although there is a law that you can't pour toxic chemicals into water, a nearby factory did it anyways. Sometimes, too much of it can turn the water pure BLACK! So the lady squirted some more of that brown paint on the factory's yard.

Now, you have noticed that there has been a terrible drought in this town. Finally it rained and washed away everything in its path towards the lowest elevation in town; the river. Also, this rain was so heavy that the steep slopes of the river caved in leaving the water muddy and dirty. That must taste really bad! I'm glad they try to purify it! But, the rain washes the pesticides, fertilizer, the dog poop and the soil from the school. All of that plus more things to pollute he water are rushed into the river, picking up even more things on its way. Not only can pollution kill us but it can kill the aquatic life trying to survive.

Her example was a great way to learn about pollution.

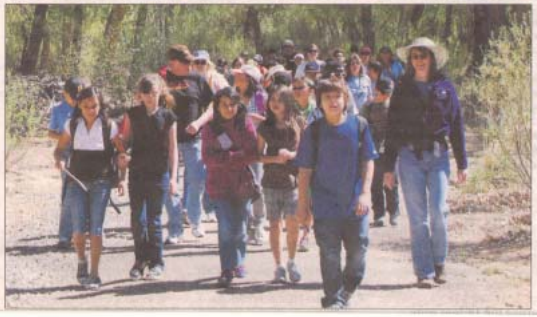
The Cuyahoga River

She also showed us three photos of the Cuyahoga River in Ohio about 50 years ago and it is flammable! In one of the pictures, some of the river was on fire because of all different types of pollution. In another picture a man put his hand in the water and when he took it out, it was black and covered with mud and polluted water. Nothing could live in that water pretty much. The last picture showed a sign that originally said Cuyahoga River but after the fire happened, they added another sign above it that said "Flammable". I am really glad the Yadkin River isn't like that because that is where we get all our drinking water.

Us

All our water and unfortunately runs into Muddy Creek, the lowest point of elevation. But everyone knows that actions speak louder than words! I can't believe how much pollution is going on! And to think, the model was shown of an every-day town. If we all just *don't* dump a gallon of oil into a river, that is more than a million gallons not polluted saved by you!
If each person does their part, we can all enjoy a tall glass of non-polluted water! So let's get *helping* our water rather than talking about ways *to* pollute it.

2010 News Coverage



RIO RANCHO OBSERVER — GARY HERRON PHOTOS

Bosque bound

Two fifth-grade classes from Maggie Cordova Elementary headed to the bosque last Friday to learn about the watershed, wildlife and more. At upper left, Marian Wragge, an environmental programs manager with the city, points out an owl's nest. Above, Joel Fullerton jots down a few notes. At left, students walk along a path, enjoying a day outdoors.

BOSQUE FIELD TRIP

MARLA BROSE/JOURNAL

Under the shade of an umbrella, Susan McGrady and Ramona Hallum hike in the bosque during a field trip with their classmates from Maggie Cordova Elementary School on Friday.

Hiking in the Habitat

About 49 fifth-grade students spent Friday morning walking through the Willow Creek Open Space along the Rio Grande near the Rivers Edge neighborhoods.

The walk was part of Rio Rancho's RiverXchange program, a collaboration between the city's Water Conservation office and Keep Rio Rancho Beautiful.

It gave students an opportunity to learn about the bosque habitat and ongoing efforts to monitor the groundwater. Students will share what they learned about the river with students in other states via the Internet.

Josiah Castandeda, center, raises his hand while on a field trip to the bosque. Casteneda and Josh Foley were among the Rio Rancho students who participated in the program.

Next Steps

- Identify more local field trip/service learning locations.
- Expand local guest speaker pool.
- Improve technical support for all teachers.
- Expand classroom resources (e.g., age appropriate DVDs, exhibits, lesson plans).
- More support for partner classes, such as funding to cover the cost of their field trip transportation.

Don't Trash Our Rio!

Water-math activity created using info from 9/7/10 article

Albuquerque Journal Sept. 7, 2010

TRASH IN THE ARROYOS

Water Sifted CLEAN

Structures remove debris from storm drains before it gets into the river

Chris Cordova, center, and Herman Gavaldon, right, clean up debris captured in one of the trash traps dotting Albuquerque's flood control system.

By John Fleck
Journal Staff Writer

You can tell the Albuquerque flood control channels that lie downstream from golf courses by the little white balls heading downstream in a storm. Plastic water bottles, though, know no geographic boundaries. They show up everywhere.

It happens every time the flood control system gets what its engineers call the "first flush," the rush of water across the metro area in the first rain after any sizable dry spell.

Anything that can float, and some things that don't, gets washed off the city's streets, parking lots and driveways and into the 211 miles of channels and pipes built to carry floodwater out of the city and into the Rio Grande without washing our houses away.

The channels, owned by the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) and a host of other agencies, are primarily intended to get floodwaters safely out of the city.

But in recent years, the system's managers have become increasingly involved in a second mission — catching trash and other pollutants before they can reach the Rio Grande.

"You can see that it's working," said Kurt Wagener recently as he peered into one of the system's latest trash-catching structures, a Rube Goldberg-looking contraption on the edge of Albuquerque's Balloon Fiesta Park.

The La Cueva Water Quality Feature sits at the end of a concrete arroyo that catches water from a broad area of Albuquerque's north side, and it held the contents of a "first flush" from a recent thunderstorm that had swept across Albuquerque after a weeks-long dry spell.

Upstream, a concrete wall catches storm flows and diverts them into the trash trap, where a maze of concrete walls has been designed to capture the what Wagener and his colleagues call "floatables" while the water flows on into the North Diversion Channel.

A survey now under way by AMAFCA, required by the metro area's stormwater permit, is attempting to quantify how much trash ends up in the system, and what kind.

ROBERTO E. ROSALES/JOURNAL

Water from a summer thunderstorm streams into a trap intended to keep empty water bottles and other trash from reaching the Rio Grande.

The "how much" is enormous.

Last year, AMAFCA crews fished 26,000 cubic yards of trash from the flood control system — somewhere between 600 and 1,000 garbage truck loads, depending on the size of the truck.

Kevin Daggett, AMAFCA's stormwater quality engineer, is still totalling up the numbers from his ongoing trash study, but his initial take on the problem is that disposable plastic water bottles are the biggest current culprit.

"The vast majority of the floatables were plastic water bottles," Daggett said. "You buy your plastic water bottle and it ends up in the Rio Grande."

Or, if we're lucky, Daggett and his colleagues can stop it and fish it out before it gets to the river.

Trash left behind after floodwaters subside shows how much of what we throw away ends up heading toward the river. The structure was built near Balloon Fiesta Park to capture debris floating down the arroyos.

A steel screen in northeast Albuquerque allows stormwater to filter through while diverting floating trash so Albuquerque Metropolitan Arroyo Flood Control Authority workers can keep it from reaching the Rio Grande.

RIVER Xchange

This one-of-a kind project will provide a rich and multidisciplinary learning experience for your 5th grade students (approximately 10-11 years old). It's hands-on and brains-on! It's fun! It's **FREE**!

Students in New Mexico, U.S.A., will become high tech pen pals with students in another part of the U.S.A. or world. Each class will share what they are learning throughout the school year about their **local river or tributary** via a private computer workspace once or twice per month. The program will improve your students' confidence and skills in many areas:

Communication	Organization
Writing	Geography
Math	History
Science	Computer technology

- ✓ We will match a New Mexico class with a partner class.
- ✓ We will provide a teacher professional development workshop for New Mexico teachers and online training for partner teachers.
- ✓ We will provide ongoing technical support for all teachers.
- ✓ We will help New Mexico teachers coordinate classroom speakers and the field trip.
- ✓ All teachers are to take a field trip to their local river or tributary. We will cover the cost of this field trip for New Mexico teachers.

Participation is limited!
For more information, visit our website: www.waterfestnm.com.

Questions?
Contact Amy White
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505-235-8342 (USA)

RiverXchange is a project of the New Mexico Water Conservation Alliance and is produced by Experiential EE, LLC. See 2010-2011 sponsors below.

Activity Time!

- Simulated partnership & activity
- *How Do We Treat Our Wastewater?*