The University of New Mexico

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MSC03 2020
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Bosque Ecosystem Monitoring Program
Science, Education, and Stewardship

BOSQUE SCHOOL
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Middle Rio Grande Stormwater Quality Team

2014-2015 BEMP Stormwater Science Education Overview

The main objective of the *Stormwater Science* outreach education program is to teach students that the health of the Rio Grande is directly related to the health of the surrounding watershed. The *Stormwater Science* presentation is integrated into our series of 9 BEMP classroom programs that are shared with students throughout the year. This year the 1.5 hour classroom program was delivered to **1923 students** in **37 classrooms** at **21 different schools** in **Bernalillo, Rio Rancho, Albuquerque and Los Lunas.**

The main portion of the program uses a model of the Rio Grande Basin watershed constructed inside the classroom. The watershed has 5 different communities along the river: a cattle ranch, up-and-downstream eco-friendly towns, an urban city, and agricultural fields. Students add different 'runoff cards' to the river downstream of the community where they came from. Some of the runoff is naturally occurring (turbidity), and others are human caused (pesticides, oil).   The program runs through two different scenarios, a *before-the-storm* and *after-the-storm* river. They demonstrate the harmful effects storm water contamination can have on aquatic organisms and downstream communities. The program also encourages students to change their daily behavior in ways that can help to keep their watershed clean. Educators help to provide solutions as well as having students come up with ideas on their own. The handout to accompany this activity is included below.

In order to better connect with and serve a diverse audience, all BEMP curriculum has been translated into Spanish. Starting in January 2015, *Stormwater Science* was taught in Spanish in bilingual classrooms and all students were offered the opportunity to work off of a Spanish handout, whether or not the program was taught in Spanish.

246 students also took part in study trips. This field portion of the program is a four to five hour trip to the Rio Grande that focuses on how water moves over the landscape and students collect and interpret water quality data. The program starts with a trail/arroyo survey which examines and categorizes the amount of visible pollutants (plastics, paper, dog poop, animal scat, etc…) in the San Antonio arroyo in Albuquerque or the Arroyo de la Baranca in Rio Rancho, both of which empty into the Rio Grande.   In the arroyo, students measured the sides of the arroyo to calculate slope and determine where erosion happens fastest. When the students arrive at the bank of the Rio Grande they examine the water using a LaMotte water quality monitoring kit and search for macro-invertebrates. Students share their results and discuss what they could mean in terms of river health.

Many students also took part in *Stormwater Science* related activities at events or as part of another BEMP field activity. These activities included a discussion on urban runoff and a hands-on water quality investigation, either through chemical tests or macro-invertebrate identification.

Students are then asked to come up with ways they could prevent pollution from reaching the river. Events included BEMP Student Congresses, (where BEMP students to share their research and experiences in the Bosque) and Bosque School's Otter Day, (an event for first graders, hosted by high school students to teach about clean river habitats and endangered animals in New Mexico).

Students at Bandelier Elementary add runoff cards to a watershed model.

Middle school students identify aquatic macro-invertebrates after a discussion on how runoff enters the river.

Students from Chamiza Elementary walk through the San Antonio Arroyo, surveying for trash and scat.

(Hydrologist) Name: _____ Date: _____

Stormwater Science

What 2 sources does Albuquerque get it's drinking water from? What % comes from each?

1. _____ _____%

2. _____ _____%

A *watershed* is an area of land where all of the water that falls on it, or that is under it, drains to the lowest point.

WHAT IS A WATERSHED?
The Making of a River

Draw a line from the word to its definition

Turbidity

Nonpoint source pollution

E.coli

Point source pollution

Nitrates and phosphates

Impervious surface

Tributary

Macro-invertebrates

Urban runoff

♦ A stream or arroyo that brings water to the main channel of the river

♦ Water that has drained from man-made non-porous surfaces in urbanized areas

♦ Types of nutrients found in fertilizers that can lead to excess algae growth

♦ A single location where pollution is being leaked into the environment

♦ A type of *bacteria* found in warm blooded animal's intestines that can make people sick

♦ A surface material that does not allow water to soak through it

♦ Tiny 'water bugs' whose species are an indication of water quality

♦ Any type of pollution that comes from *many different* sources

♦ A measure of water clarity based on the amount of suspended solids

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Upstream Eco-friendly town

Cattle Ranch
_____
_____
_____

Agricultural Fields
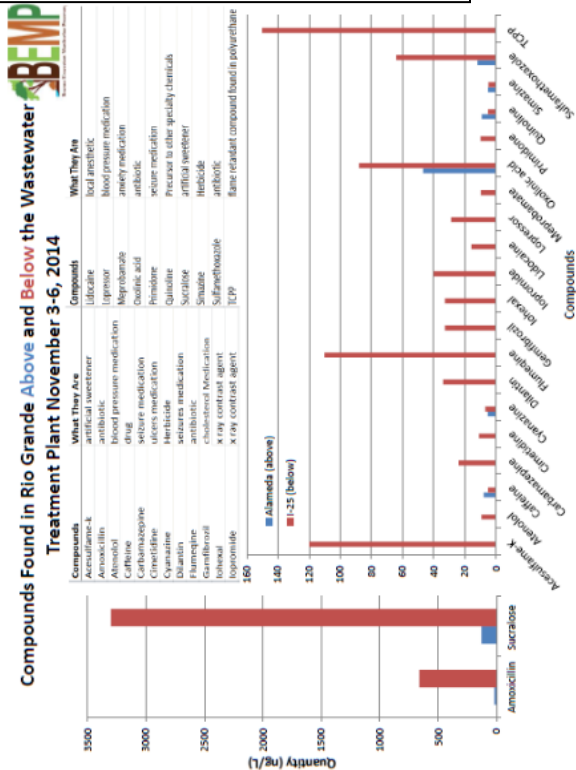_____
_____
_____

Write the main type(s) of runoff that come from *each* of the 5 communities along this river. Are they naturally occurring or not?

Urban City
_____
_____
_____

Downstream Eco-Friendly Town
_____
_____
_____

Write down a few things that YOU can do to help keep our watershed clean!

1._____
2._____
3._____
4._____
5._____

Compounds Found in Rio Grande Above and Below the Wastewater Treatment Plant November 3-6, 2014

Compounds (with "What They Are" list):

Compounds	What They Are
Acesulfame-K	artificial sweetener
Amoxicillin	antibiotic
Atenolol	blood pressure medication
Caffeine	drug
Carbamazepine	seizure medication
Cimetidine	ulcers medication
Cyanazine	herbicide
Dilantin	seizures medication
Flumequine	antibiotic
Gemfibrozil	cholesterol Medication
Iohexol	x ray contrast agent
Iopromide	x ray contrast agent
Lidocaine	local anesthetic
Lopressor	blood pressure medication
Meprobamate	anxiety medication
Oxolinic acid	antibiotic
Primidone	seizure medication
Quinoline	Precursor to other specialty chemicals
Sucralose	artificial sweetener
Simazine	Herbicide
Sulfamethoxazole	antibiotic
TCPP	flame retardant compound found in polyurethane

Legend: Alameda (above); I-25 (below)

Y-axis (top chart): Quantity (ng/L) — 160, 140, 120, 100, 80, 60, 40, 20, 0
Y-axis (bottom chart): Quantity (ng/L) — 3500, 3000, 2500, 2000, 1500, 1000, 500, 0 — Amoxicillin, Sucralose

List two things that *you* can do to help keep our watershed clean....(besides picking up trash)

1.) _____

2.) _____

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Prickly Pear	SCAT	Harvester Ants	Evidence of Fire
Nutrients: Plant *food* from decaying leaves	Animal Tracks	Porcupine	River Pollution
Birds — Largest source of E. coli to the river	Flying insect	Beaver or Porky sign	Cumulus Clouds: puffy like cotton candy
Evidence of Erosion	Macro-Invertebrates	Arroyo	Spider or Web

Litter Survey

The San Antonio Arroyo collects water from all over the west side of Albuquerque. Anything that ends up in these arroyos could travel to the river.

	Type of Pollutant	In the arroyo	In the bosque	Total
1	Paper trash			
2	Plastic trash			
3	Glass or aluminum			
4	Other trash			
5	Dog poop			
6	Coyote scat			
7	Other types of scat			
8	Evidence of erosion			
9	Cigarette butts			
10	Chemicals			

What is the main type of pollutant you found today? _____

How many of these items could have been recycled? _____
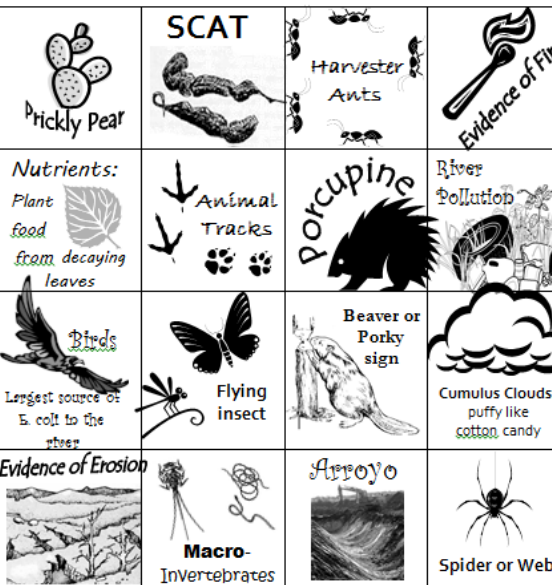
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Weather Report

Time: _____ am / pm

Cloud Cover: _____ %

Humidity: _____ %

Temperature:
It feels like _____ °F
It actually is.... _____ °F
_____ °C

N W E S (compass)

Circle the direction the wind is coming *from*

Wind: Speed: _____ Km/hr

Scoop the Poop — Keep the RIO Grand

Water Chemistry

	Results
Temperature	0-2 3-5 6-10 >10 _____ °C
Turbidity	0 0-40 40-100 >100 _____ JTU
Nitrate	1-4 5 20 40 _____ ppm
Phosphate	0 4 8 _____ ppm
pH	4 5 6 7 8 9 10
Fecal Coliform	Present / Not
Dissolved O2	0 4 8 _____ ppm _____ % saturation
Copper	0 0.3 0.6 1.0 3.0 _____ ppm
Iron	0 0.3 0.5 1 3 5 ppm

What grade would you assign to this section of the river? _____

Phosphate:	Nitrate:	Turbidity:	Dissolved Oxygen:
1ppm (Excellent)	1-4 ppm (Good)	0 JTU (Excellent)	91-100% (Excellent)
2ppm (Good)	5ppm (Fair)	1-40 JTU (Good)	71-90% (Good)
4ppm (Fair)	20ppm (Poor)	39-100 JTU (Fair)	51-70% (Fair)
6ppm (Poor)	40ppm (Xtra Poor)	>101 JTU(Poor)	<50% (Poor)

Temp: Good 0 - >10 ºC Poor

Copper: (Good) 0 – 0.3 – 0.6 – 1 – 3Poor)

Iron: (Good) 0 - .03 - .05 – 1 – 3 – 5 (Poor)

pH: 1-2-3-4-5-6-7-8-9-10-11-12-13-14
poor   good   poor
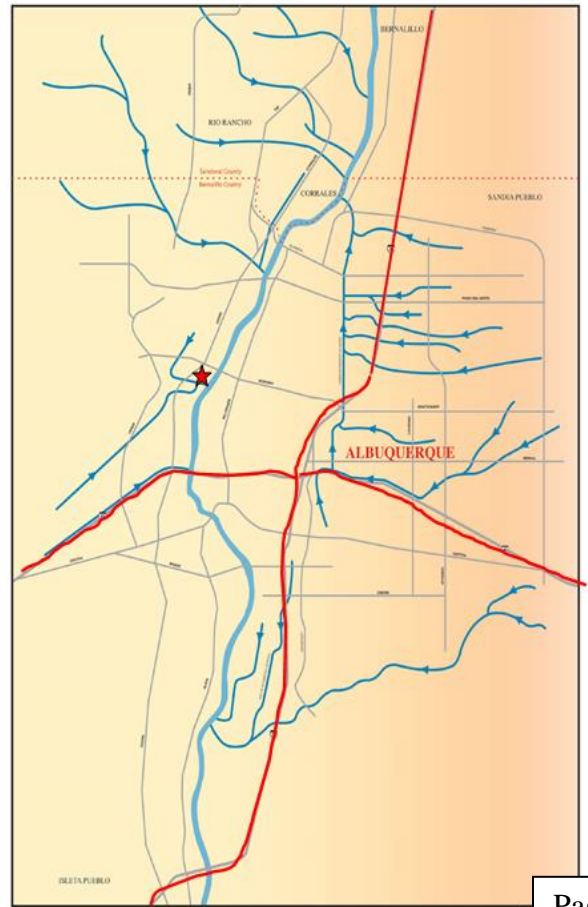
E.coli: Present (poor) / Absent (good)

Journal Space

For the next few minutes you get to sit alone and relax! Enjoy the sounds of nature, write or draw what you see, hear and experience here.
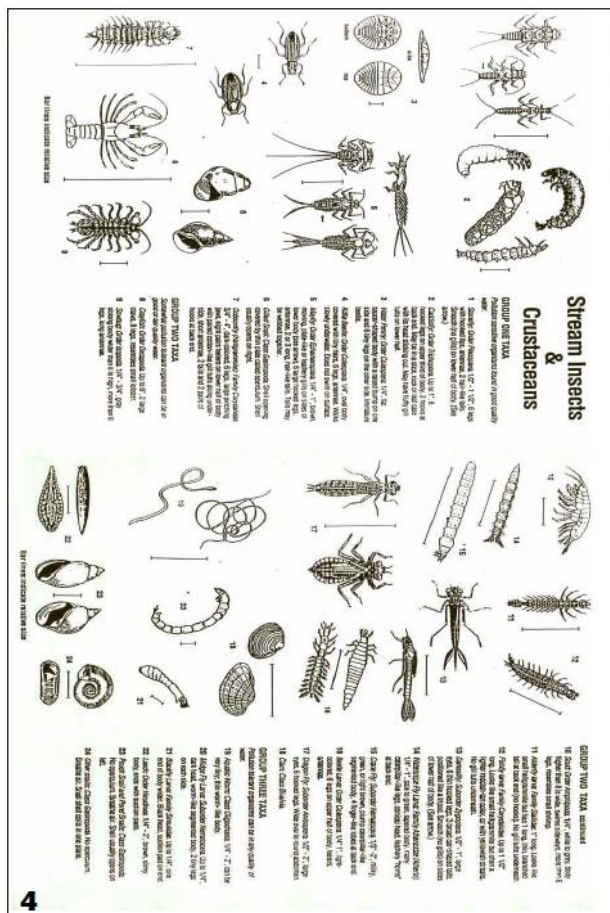
How long will it take? Answers:
1=H, 2=F, 3=G, 4=E, 5=C, 6=B, 7=A, 8=D

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BERNALILLO

RIO RANCHO

Sandoval County
Bernalillo County

CORRALES

SANDIA PUEBLO

ALBUQUERQUE

ISLETA PUEBLO

Stream Insects & Crustaceans

GROUP ONE TAXA

GROUP TWO TAXA

GROUP THREE TAXA

4

How long will it TAKE?

Every piece of trash has a face... where, and from WHO did it come from? It takes just a moment for an item to be carelessly discarded or blown by wind into a river, but it can take many, many years for it to completely decompose. Test your knowledge about decomposition times below by drawing a line from the item to its decomposition time.

1. Banana peel
2. Cigarette filter
3. Milk carton
4. Styrofoam cup
5. Aluminum can
6. Fishing line
7. Glass bottle
8. Plastic bottle

A. 1 million years

B. 600 years

C. 450 years

D. 80-200 years

E. 50 years

F. 1-5 years

G. 3 months

H. 2-5 weeks

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