

Arroyo Colorado Watershed Model Model Use Guide and Sample Presentation

The physical watershed model is owned by the Nueces River Authority and is on permanent loan to the Arroyo Colorado Watershed Partnership and is available to all Partners. Demonstrators of the model should have basic knowledge of how water flows in the Lower Rio Grande Valley and have at least read the attached brochure. The following is a proposed script to help demonstrate the model.

Model Location: Estero Llano Grande State Park
154A Lakeview Drive, Weslaco, TX 78596

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Transportation and set-up of model

The 3.4' x 7.4' physical watershed model of the Arroyo Colorado is made of tough durable plastic with a metal frame. It does not fit in most vehicles but will fit in a Suburban size vehicle or truck. If the truck is not a long-bed it will be necessary to drop the tailgate and tie-down/secure the model so that there is no potential for it to slide out. Also limit exposure to sunlight to prevent fading.

It takes two people to handle and move the model. It is best to place the model on an 8 foot table at least 36" wide. Two 8 foot tables are recommended.

Materials

- Tie-downs
- Two 8' tables
- Paper towels
- Small trash bag
- Food Color Dye - diluted
- Water to fill the spray bottles
- Spray bottles (some set to spray a stream and some to spray a broad mist/rain shower)
- Felt strips to simulate wetlands
- Disposal plastic gloves for clean-up
- Large sponges for clean-up
- Bucket to sponge water into

Time needed: 25-30 minutes.
Ideal number of students: 20 maximum per group.

Please familiarize yourself with the model and this script prior to demonstrating it. Several waterbodies, cities and other locations are discussed in the script below and you will want to point to them on the Watershed Model as you introduce them or talk about them.

Before you begin, please make an effort to complete the sign in sheet including the number of people in your audience. Please send this information back to the Arroyo Colorado Watershed Coordinator (contact information is on the first page). Our continued use of this model is based on the number of people we educate so it is vital that we capture these numbers/information.

Introduction

My name is _____ and I work for _____.

This is a watershed model of the Arroyo Colorado in the Lower Rio Grande Valley. It shows the Arroyo Colorado, the Rio Grande, the Gulf of Mexico and the Lower Laguna Madre (LLM).

Question: Do you know where your water comes from and where it goes?

Question: Raise your hand if you've ever been to the Arroyo Colorado. Where did you visit and what did you do there?

One of the things that we do is travel around to classrooms with this watershed model to teach about how water flows in the Lower Rio Grande Valley, water quality and water pollution. This is a hands-on presentation, and everybody is going to get to participate.

In this demonstration, you're going to learn at least five things: (1) What is a watershed? (2) Where does your water come from? (3) Where does your water drain to? (4) What is nonpoint source pollution? and (5) What are some things that you can do to prevent nonpoint source pollution?

Presentation

So let's start...

Question: Does anybody know what a watershed is? (Take several answers until you get one that is close to correct.)

Answer: A watershed is an area of land that, when it rains, the water flows across the land and drains to a specific water body such as a stream, lake, bay or ocean. Watersheds are different sizes. Small watersheds make up bigger watersheds.

Question: Raise your hand if you live in a watershed.

Answer: Trick question. Everybody lives in a watershed! Everybody lives in an area of land that drains to a specific waterbody.

Question: Can anyone name the watershed we're in right now?

Answer: (Example, if the presentation were here in the LRGV). Most valley residents live in the Nueces-Rio Grande Basin, aka, Lower Laguna Madre Watershed. Remember, watersheds are different sizes and the Arroyo Colorado watershed is a sub-watershed or a smaller watershed that is part of the bigger Nueces-Rio Grande Basin/Lower Laguna Madre Watershed.

Question: What are some other names that we use to talk about or call the Arroyo Colorado?

Answer: The ditch, the Mission inlet, the Main Floodway, the Banker Floodway, Llano Grande, and the Arroyo Colorado.

Question: Where does the water from the faucet in your homes come from?

Answer: Most water flowing from our kitchen and bathroom taps is from the Rio Grande. Water in the Rio Grande is pumped out of the river and into reservoirs and irrigation canals to water treatment plants where the water is cleaned before your city distributes it (sends it through pipes) to your homes. Your parents pay for this service, i.e., water bills. A few of the cities/individuals get water from water wells and they call that groundwater.

Question: Do you know what water body the Rio Grande drains into?

Answer: The Gulf of Mexico. The Rio Grande starts in Colorado and flows through New Mexico and then flows between Texas and Mexico. Most of the rain or runoff from these areas will end up in the Rio Grande.

Question: Where does the Arroyo Colorado drain to?

Answer: The Lower Laguna Madre. The “Big Ditch” (*not on the model*), the North Floodway, and a number of other coastal streams also drain into the LLM.

So, watersheds exist for all these rivers you’ve just named. They also exist for all the smaller streams that drain into each of these rivers. Now, take a look at this model.

Question: First of all, what is a model?

Answer: It’s a representation of something much larger in the world.

Suggested demonstration for younger kids:

Have each kid hold out their hands side by side (together) and face up to make kind of a bowl shape.

Question: What have you just made?

Answer: You’ve just made a tiny model of a watershed.

Question: What happens if it rains in an upper part of the watershed? Where does the water flow?

Use the spray bottle to squirt a little “rain” onto an upper side of their tiny watersheds.

Question: Which way is the water flowing?

Answer: Downward, toward the line in the middle of their cupped hands. The middle of the cupped hands represents a lake or a stream. It's a leaky one, though!

Now shake the water off your hands, and take a look at this bigger watershed model.

Question: If it rains on this upper portion of the model, which way is the water going to flow?

Answer: Some water will fall in the Rio Grande Watershed and flow to the Gulf of Mexico, but the majority of the water flows down the Arroyo Colorado and the North Floodway and into the LLM.

Question: Why? What force is acting on the water?

Answer: Gravity. Water flows downstream and we all live downstream of someone.

Question: Who lives upstream in the Rio Grande Watershed?

Answer: People from Mexico and the US including people from Colorado, New Mexico and West Texas. That is why it is important to work with our neighbors to protect and improve water quality.

Question: Who lives in the most upper part of the Arroyo Colorado watershed?

Answer: People from Penitas, Mission, and McAllen. The most upper part of a watershed is referred to as the headwaters.

Question: What do these bumps/higher areas represent?

Answer: Higher ground. Note that everything slopes downward to the east (or to the Gulf and LLM).

Who has gone fishing in Rio Hondo and Arroyo City?

Rio Hondo and Arroyo City are located in the lower reach of the watershed and water from as far west as Mission flows by Pharr, San Juan, Alamo, Weslaco, Mercedes, La Feria, Harlingen, Rio Hondo and Arroyo City into the LLM.

Sometimes we pollute the water, which can cause a lot of problems including hurting the fish we try to catch or even making them unsafe to eat. Let's look at some of the effects of pollution on this watershed. First, let's identify the different ways land is used in the LRGV.

Question: Imagine driving through the Valley. What do you see?

Answer: Will include: houses/residential, farm/agricultural, drainage ditches, irrigation canals, businesses, roads/transportation, animals including birds, dogs, and cows.

It's important to notice the different kinds of land use because each one will produce different kinds of water pollution. There are many specific kinds of pollution but you can put them into two broad categories called "point source pollution" and "nonpoint source pollution."

Question: Can anyone guess what "point source pollution" is?

Answer: Pollution that comes from one specific point that you can clearly see.

An example of point source pollution is a city wastewater treatment facility (WWTF) and every city has at least one. There are 18 major WWTFs in the LRGV that release their water into the Arroyo Colorado. Edinburg and some of the city of McAllen treated wastewater is routed into the North Main Drain that flows through Lyford, the North Floodway and through lots of drainage ditches.

Pass out the squeezable water bottle that shoots out a stream to simulate point discharge from a wastewater treatment plant. Have different kids pick different cities and squirt the stream of water onto the model directly in the Arroyo Colorado or other drains and watch how the water flows. Have them take turns identify the different communities on the map.

Question: What do you think this water has in it?

Nutrients like nitrogen and phosphorus. Nutrients are not necessarily a bad thing because they help plants grow. But too many nutrients in the water makes algae, a tiny plant, grow too much. A big group of algae, called an algal bloom, is bad because algae takes oxygen out of the water and this could cause fish to die.

Question: Now, are these point sources of pollution a bad thing? What is good about pollution that comes from a point source?

Answer: Yes, point source pollution is bad. But a good thing about point source is we can see exactly where the pollution is coming from (point it out on the model).

Question: And why is that a good thing?

Answer: We can ask our cities to clean the water to the best of their ability. In other words, we can regulate point source pollution by monitoring the pollutants coming out of the pipe (the point source) and making laws that limit how much pollution they can discharge into the streams.

Most cities treat (clean) their wastewater to the highest level of required treatment. And many of them are going the extra mile to reuse and put that water to good use. Some are even working on constructing wetlands to clean the water even better by allowing plants to take up and use the nutrients before it is released back into the Arroyo Colorado or other waterway.

Place the felt strips in the Arroyo Colorado and other low areas to represent wetlands.

Question: So if point source pollution is pollution that comes from one specific point that you can clearly identify, can anyone tell me what “nonpoint source pollution” is?

Answer: Nonpoint source pollution is pollution that comes from many, many different sources spread all across the watershed. It’s not coming from a wastewater treatment plant or some type of industrial plant, but it’s coming from things that ordinary people like you and your neighbors and your parents might be doing, even without knowing it.

So let’s take a look at some specific examples of nonpoint source pollution.

Demonstration

Who would like to volunteer as readers?

Pass out several “situation cards” depending on time remaining for demonstration.

Situation #1

Question: Who has Situation #1? Read nice and loud, and everyone else please listen closely.

Reader: Juan lives over in this house in Harlingen. He drives his car that is leaking oil to work in McAllen, and then drives home again later that day. He does this every day of the week.

Drive the car to the work and back on the map with your finger showing the route.

Who'd like to volunteer to be Juan? (A different volunteer than the reader.)

Hand over one of the food coloring bottles to 'Juan' and have them squeeze small drops on the road everywhere that Juan has driven.

Cars not only leak oil on occasion, but also can leak radiator fluid, metals from brake pads, and windshield fluids. These are all sources of nonpoint source pollution.

Question: Now think about this. How many roads and people do we have in the Valley?

Answer: Almost one million people were estimated to be living in Hidalgo and Cameron Counties in the year 2000 (this is much of the Arroyo Colorado Watershed). And the LRGV is estimated to have almost 1.5 million in the year 2020. So how many cars will we have on the roads?

Question: Of those million, how many people do you think are driving cars that are leaking oil, radiator fluid, windshield cleaner solution, metals from car brakes on the roads?

Answer: It's difficult to know, but at least hundreds or maybe even thousands.

Hand out a few more food coloring bottles and have other kids dot other roads.

Question: Can you imagine the pollution from thousands of cars just like Juan's, making trips in the watershed every single day of the year? How polluted will the roads get?

Answer: Very polluted!

Question: What can you do to limit this type of pollution?

Answer: Maintain your car; fix any leaks. Limit driving, if possible, if you can not maintain your car or take public transportation. Use environmentally safe windshield washer fluid that is low in phosphates.

Situation #2

Question: Okay, who's got Situation #2? Read nice and loud, and everyone else please listen.

Reader: Clay is working on building new homes and he has two loads of dirt dumped at the work site near McAllen for example. He doesn't block the surrounding storm drains or put up a silt fence or berm around his work site to keep the dirt from running off of the site and down the drains and into the nearby creek.

Who'd like to volunteer to be the dirt? (A different volunteer than the reader.)

Pass out another food color bottle and have a student put additional drops around the cities and in neighborhoods that represent construction sites.

Question: What can you do to limit this pollution from construction sites?

Answer: To prevent erosion and movement of dirt/soil from construction sites, install some type of containments like a silt fence, strawbale berm, or compost sock. Clean up any chemicals or trash on the construction site to avoid unnecessary runoff during possible storms.

Situation #3

Question: You all are doing great! Who has Situation #3? Read nice and loud, and everyone else please listen.

Reader: Peggy the painter just finished a job painting the gym floor at the middle school. Because she is in a hurry to get to her next job, she does not want to take time to dispose of the paint correctly. So, before she leaves to her next site, she dumps the bucket of paint and a can of paint thinner into the street.

Who'd like to volunteer to be Peggy? (A different volunteer than the reader.)

Pass out another food color bottle and have a student put additional drops around cities and in neighborhoods that represent the dumping of chemicals into streets.

Question: What can you do to limit pollution from used paint buckets and brushes or other materials?

Answer: To prevent paint and other chemicals from entering storm drains and waterways, take all chemicals used to wash buckets and brushes as well as any unused paints and chemicals to a proper recycling and disposal facility. Your city may have a facility or if no facility exists, hazardous waste collection events are scheduled regularly locally to handle these materials.

Situation #4

Question: Who has Situation #4?

Reader: The home owners in this neighborhood are competing with each other for the greenest and prettiest lawn. Mike decides to spread plant food (fertilizer), but he doesn't read the instructions and puts out too much plant food in his yard.

Who'd like to volunteer to be Mike?

Pass out another bottle of food color and have them put more drops around cities and neighborhoods.

Question: What can you do to keep your lawn from being a source of fertilizer (nutrient) pollution?

Answer: To keep your lawn from being a source of fertilizer (nutrient) pollution, limit the amount of chemicals and nutrients applied to your lawn.

If you buy inorganic fertilizers from your local hardware and garden store, follow directions and apply only the amount specified. Every fertilizer is different in terms of nutrient content and availability so check the label to see how much of each nutrient the fertilizer contains and buy accordingly. More is not better and timing is another factor. Another option is to use compost made from recycled yard and food wastes; make your own or buy from a local distributor like the City of McAllen or local garden stores.

Do not apply any soil amendment just before a big rain as you can lose the nutrients and chemicals in runoff from your yard. **The best advice is to regularly (once a year or every other year) obtain a soil test to determine the exact nutrient and other needs of your yard.**

Situation #5:

Question: Who has Situation #5?

Reader: There is a summer festival in the park. About 2,000 people attend and buy a lot of popcorn, sodas, and cotton candy. Thinking the city workers will pick up the trash, most folks just toss their wrappers and cans on the ground. That night a huge rainstorm moves through.

I need a few folks who would volunteer as people who went to the festival. (Different volunteers than the reader.)

Add more drops around cities.

Question: What can you do to limit this type of pollution?

Answer: Do not throw trash of any kind on the ground. Better yet, pick up trash even if it is not yours. Remember, cigarettes buds are trash also. Do not tolerate littering! Report illegal trash dumpers to your local sheriff's department.

Situation #6

Question: Y'all are doing great! Who has Situation #6?

Reader: Farmer Joe lives right outside the city. In the winter time, he doesn't use his fields to grow crops. Without plants to cover the field, the loose soil is carried away by wind and water into the nearby stream.

Who would like to volunteer to be Farmer Joe and his fields?

Have the student put drops in open areas outside the cities.
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Question: What can Farmer Joe do to avoid polluting his watershed?

Answer: Support agricultural best management practices that prevent soil and nutrients from running off the fields. Some examples of best management practices include: residue management that prevents soil erosion from wind and water; soil testing to determine actual fertilizer needs of the crop; field leveling that keeps irrigation water on the field rather than allowing it to carry residue and soil off of the field.

Situation #7

Question: Okay, Who has Situation #8? Remember, read nice and loud, and everyone else please listen.

Reader: Many of the families that live here have dogs. These families like to take their dogs out for walks around the neighborhood. When the dogs poop, the families don't pick up after them and instead leave the poop on the ground.

Who walks a dog? Who likes to pick up dog poop? Would you like to volunteer to be the dog walker that does not pick up their dog's poop?

Have the students put drops in areas around the cities and rural areas.

Question: What can you do as a pet owner to limit this type of pollution?

Answer: To prevent this type of pollution, pick up your pet's poop and throw it away in a trash can. To collect the waste, take a plastic bag with you on your pet's walks or anytime you take your pet out in public.

Situation #8

Question: Boy, this model is getting colorful, huh? Who has Situation #9?

Reader: John's neighbor doesn't take care of his septic system properly. When flooding occurs the nutrients and waste from the septic tank seep into the groundwater.

Many people who live in Arroyo City and along the banks in this area have septic systems.

We need some volunteers to be residents of Arroyo City.

Have the students put additional drops along the Arroyo Colorado in this area.
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Question: What can residents do to make sure their septic system is not polluting the watershed?

Answer: First of all, ensure your septic tank and drain field is not too close to a stream or drainage ditch. Also, maintain you septic system properly and have it regularly checked.

Situation #9

Question: Now lets read situation #10? Who has that one?

Reader: Mr. Jones owns a resort near the Arroyo Colorado. He wants to have a beautiful lawn for his guests, so he uses fertilizer ("plant food") and other chemicals on the grass. But, Mr. Jones didn't read the directions and he put the fertilizer on the grass when it didn't need any food so instead of being used by the grass, the fertilizer just stayed on the ground.

Who would like to volunteer as Mr. Jones?

Have the students put drops in around and in the cities.
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Question: What should Mr. Jones have done differently to limit pollution from his yard?

Answer: To keep your lawn from being a source of fertilizer (nutrient) pollution, limit the amount of chemicals and nutrients applied to your lawn.

If you buy inorganic fertilizers from your local hardware and garden store, follow directions and apply only the amount specified. Every fertilizer is different in terms of nutrient content and availability so check the label to see how much of each nutrient the fertilizer contains and buy accordingly. More is not better and timing is another factor. Another option is to use compost made from recycled yard and food wastes; make your own or buy from a local distributor like the City of McAllen or local garden stores.

Do not apply any soil amendment just before a big rain as you can lose the nutrients and chemicals in runoff from your yard. **The best advice is to regularly (once a year or every other year) obtain a soil test to determine the exact nutrient and other needs of your yard.**

You can make up other situations and ask the kids to think of others.

Making it Rain

Now, take a look at this watershed.

Question: Is this a clean or a dirty watershed?

Answer: Dirty!

Question: Is this the kind of watershed you would like to live in?

Answer: No!

Question: Is this the kind of watershed that you actually do live in?

Answer: Yes, in fact it is, because people are producing all kinds of nonpoint source pollution in many places every single day.

Question: Now, I'm going to have you make a hypothesis. What is going to happen to all this pollution when it rains?

Answer: It will flow downhill through the streams and end up in the LLM or Gulf of Mexico.

Okay, let's see if you are correct.

Hand out all the bottles that spray a mist.
Tell them that everyone is going to get a chance to make it rain. They will take turns.

Okay, make it rain, rain, rain!

After a minute or two, say "Stop! Now switch to a new person." and continue the rainstorm.

Look carefully at the model and watch what is happening. Where is the pollution going!? Lets keep raining.

After a minute or two, say "Stop! Raise your hand if you haven't had a chance to rain."
Redistribute the spray bottles and repeat until each kid gets a turn at making it rain.
After another minute or two, say "Stop! End of rainstorm. Collect all the spray bottles.

Now, take a look at this model.

Question: First of all, was your hypothesis correct?

Answer: Yes. The pollution ran downward into the LLM and the Gulf of Mexico.

Question: Take a look at the ponding water. What if this was the source of your drinking water? (Kids will say “Ewww!”) What if this was where you like to go and swim in the summer? What if you were a fish trying to live your life in this lake?

Question: So if water pollution is a bad thing, what are some things that you can do to prevent this from happening in your watershed?

Answer: (See what examples the students come up with based on the situations, or if they can think of any additional ones themselves. These will include: repair any leaks in your car, pick up litter and throw it in the trash can, follow the instructions when you use fertilizer, put a fence up around construction sites, pick up dog poop, use agricultural best management practices, promote SmartGrowth in cities.)

Review and Clean-up

Question: Okay, now think about what we’ve talked about. Raise your hand if you understand what a watershed is. Don’t worry, I won’t call on you, just think of the answer in your head.

Question: Now, raise your hand if you understand what nonpoint source pollution is.

Question: Now, raise your hand if you can think of at least two things that you can do to prevent nonpoint source pollution.

Congratulations! Now give yourselves a nice big round of applause.

The last thing today is that you now get to become stewards of the environment and clean up this watershed.

Pass out plastic gloves and the big sponges. Have them sponge the colored water into the bucket and flush that water down the toilet. Collect the paper towels in a garbage bag.

Thank you!

Please do not forget to sign the Watershed Model Use Sheet and FAX to the Arroyo Colorado Watershed Coordinator.