Stream Trailer Demonstration

Observe and interact with an evolving river and watershed.

Objectives: The Student Will-

- Understand the three components of a river system
- Understand the role erosion plays in a river system and wetland
- Label different variables that are related to a river system
- Create variable erosion patterns with the placement of vegetation
- Analyze the effects of erosion on water reservoirs

Materials:

1. Stream Trailer
2. Vegetation Props
3. Human Structure Props
4. Laminated Vocabulary Labels
5. 3 Foot 2 by 4 piece of wood
6. Ruler

TEKS

Science:
6th Grade: 6.1B 6.5B 6.12E
7th Grade: 7.8ABC 7.10AB 7.12A
8th Grade: 8.11B

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Activity Duration:

15-30 minutes

15 minutes	20 minutes	25 minutes	30 minutes
Introduction (5 minutes) TEKS: 6.1 B	**Introduction (5 minutes)** TEKS: 6.1B	**Introduction (7 minutes)** TEKS: 6.1B	**Introduction (7 minutes)** TEKS:6.1B

• Introduce the stream trailer
• Start with a meandering river
  ○ Old vs. new
• Why everyone should care about the river, drinking water, lakes
	• Introduce the stream trailer
	• Why everyone should care about the river, drinking water, lakes
	• Straight line river
	  ○ Ask for hypothesis on what they think will happen
	  ○ Old vs. new
	• Why this happened (explanation)
		• Introduce the stream trailer
		• Straight line river
		• Ask for hypothesis on what will happen with straight river
		• Why everyone should care about the river, drinking water, lakes
		• Old and new river systems
			• Introduce the stream trailer
			• Straight line river
			  ○ Ask for hypothesis on what they think will happen…
			• Explain what is happening
			• Show delta
			• Explain why people should care about their actions
			• Old & new river system

Middle (5 minutes) TEKS: 7.8B; 7.8C; 6.12E;6.5B;8.11B	**Middle (10 minutes)** TEKS: 7.8B;7.8A;7.8C; 8.11B	**Middle (12 minutes)** TEKS: 7.8A; 7.8B; 7.8C; 8.11B	**Middle (15 minutes)** TEKS: 7.8A;7.8B;7.8C; 8.11B

• 3 components of a river
  ○ Water
  ○ Sediment
  ○ Vegetation
• The effects of weathering, erosion, and deposition
• What groundwater is
  ○ Location
• Definition of surface water
	• Create a meandering river
	  ○ Explain sinuous, straight, & meandering
	• 3 components of a river
	  ○ Water
	  ○ Sediment
	  ○ Vegetation
	• Talk about effects of weathering, erosion, and deposition
	• Flooding (the effects), erosion, floodplain
	• Groundwater (what it is)
	• Urban effects (concrete)
		• Meandering river
		  ○ Explain difference btwn sinuous, straight, meander
		• What affects a meandering river
		  ○ Slope
		  ○ Size of particles
		  ○ Speed & amount of water
		• 3 parts of a river
		  ○ Water
		  ○ Sediment
		  ○ Vegetation
		• Flooding/effects on river
		  ○ Erosion
		  ○ Floodplain
		  ○ Weathering
		• Urban effects
		  ○ Concrete
		• Groundwater
		  ○ Definition
			• Meandering river
			  ○ Explain difference btwn sinuous, straight, meandering
			• What affects a meandering river
			  ○ Slope
			  ○ Size of particle
			  ○ Speed & amount of water
			• 3 parts of a river
			  ○ Water
			  ○ Sediment
			  ○ Vegetation
			• Flooding/effects on river
			  ○ Erosion
			  ○ Floodplain
			  ○ Weathering
			• Urban effects
			  ○ Concrete
			• Groundwater
			  ○ Definition
			• Surface water
			  ○ Difference from surface water

End (5 minutes) TEKS: N/A	**End (5 minutes)** TEKS: N/A	**End (6 minutes)** TEKS: N/A	**End (8 minutes)** TEKS: N/A
Game (tabs) Recap questions	Game Recap questions	Game (tabs) Recap questions	Game (tabs) Recap questions

Stream Trailer Demonstration

Procedures:

A few rules to remember as we go:

- Please be keep your hands out of the crushed buttons unless I have said otherwise
- If you have crushed buttons on your hands please do not wipe them off on the ground. It is plastic and we want to make sure it stays in the trailer.
- Always respect your classmates and instructor, listen carefully and participate fully. We need your help to make this lesson a success!

INTRODUCTION

Introduce the Stream Trailer

Start by introducing yourself with your name and where you work. Then continue with what makes up the trailer. Explain that the trailer has 1 tank that holds 50 gallons of water, then 2 pumps pump the water from the tank up into the pan of the trailer. The water goes down the river and through the black screen and back into the tank. Mention that we are recycling the water when we go out to events.

SETTING UP THE DEMO STREAM

Straight Line River System

How-to set up sand/water/channel:

To set up the sand, push the sand into the middle flattening it so that it is parallel with the top of the trailer. Take the piece of wood and push it through the middle of the sand. There should be a space creating 2 smaller rectangles of sand.

Meandering River System

How-to set up sand/water/channel:

Setting up the sand, push the sand into the middle flattening it so that it is parallel with the top of the trailer. Then using your hand, draw out an S shape making sure to put the excess sand on the sides. You should be able to see the bottom of the trailer.

CONCEPTS

**After presenting the straight line river topic, there is no specific order that the topics have to be taught. It is at the discretion of the presenter to decide which order of topics flow together. This being said, we have provided an outline of how TRWD usually presents these topics. **

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Straight Line River

Start with a straight line down the middle. Inform them that they are going to pretend that there are 2 reservoirs in the trailer. The first one is up at the top where the pumps are and the second is at the other end by the black screen. Have the students hypothesize what they think will happen when the water is turned on. Now, turn the pumps on and wait between 30-60 seconds for the water to reach the end of the trailer. After it reaches the reservoir, ask the students to describe what they are seeing. ASK: was your hypothesis the same as what happened? ASK: what is one of your vocab words that describes what is happening? ANSWER: erosion

Once the students connect erosion to what is happening in the river, have them point to where it is occurring. This leads to ASKING: what is falling into the water due to erosion and where does it end up? ANSWER: sediment; ends up in the lakes

Old vs. New River

First, you will grab the aerial map of the Red River on one side and South Bear Creek on the other side. Have the students look at the map that you are holding. Show them that the Red River has very defined curves. ASK: what are those curves called? OR Can you tell me the name of the curves? ANSWER: meanders. After you have defined what a meander is, explain how the more defined the meander is the older the river. Have them compare the Red River to the river in the stream trailer. ASK: Compare the 2 rivers and tell me which river you think is older. Have the students explain why they believe one river is older than the other river. ANSWER: the Red River is older because it has more defined meanders. Depending on the time restraint and the age of the group, the presenter can go into more detail if they desire.

Why Everyone Should Care

Connect erosion to time, energy, and money. You can see that as the time goes on erosion is occurring and the soil is falling into the river and being swept into the reservoir. ASK: “why do you think this is a bad thing?” while having them look at the “bottom” reservoir. Go on to say that the reservoir is where they get their drinking water. ASK: “would you want to drink that water that has the sediment?” After you finish asking questions, summarize why it is important to slow down erosion.

What Affects a Meandering River?

Slope: The slope of the land affects the meandering river by increasing or decreasing the amount of energy the water has. The more slope a river has the more energy the water will have. SHOW: bend your arm at a 90 degree angle and raise it so that it is horizontal. ASK: “Will the water be flowing very fast if there is no slope?” Tilt your arm so that your fingers are going towards the sky. ASK: “I increased the slope of the river, will the water be flowing faster or slower?” ANSWER: the flow of the water will increase.

Size of the particle: there are many different size particles of sediment that are flowing through the river. These include gravel, sand, silt, and clay. The larger the particle size, the more energy needed to move the particle through the river.

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Speed of water: speed of the water depends on the slope of the land, the size and shape of the river bed, the amount of water, and the amount of material carried by the water. The more slope the river has the faster the water will flow. The more curves or meanders a river has to move through the decrease in the speed of the water.

Different Shapes of a River

Sinuosity: a measure of the wiggle or meander of a stream channel. Increase in sinuosity increases length of the river and results in energy dissipation. Indicators of energy dissipation: rocks, woody material, vegetation, adequate floodplain size, and overflow channels.

Straight: the river has no wiggle or meander in the stream channel. The water moves faster because there are no meanders in the river for the flow of the water to slow down. The water goes straight through which increases the flow.

Meandering: the curves of the river. The more defined the curves are the older the river system is. The meanders are formed when sediment from the outer curve of each meander erodes and deposits it on the inner curve further downstream. SHOW: aerial picture of the Red River and Trinity River

3 Components of a River System

Three components of a river system: water, sediment, and vegetation. The **water** accumulates in the channel which is the deep part of the stream where water collects to flow downstream. **Sediment**: Proper name for dirt is soil and when it enters into a body of water it is called sediment. Sediment is any bit of rock or soil, such as mud, clay, silt, sand, or gravel- even boulders. Excess sediment blocks out light, killing aquatic plants or preventing their growth. Sediment covers up the nooks and crannies where aquatic organisms live. It smothers fish by clogging their gills and by reducing the amount of dissolved oxygen in the water. **Vegetation** is an important part of the river it helps hold soil in place, trap sediment, filter and cool the water, dissipate energy, slows the velocity of floodwater, the floodplain/riparian sponge is enlarged, increase in groundwater recharge, and the base flow is sustained over time.

Flooding

Flooding: A floodplain is the relatively flat land extending outward on both sides of a stream or a river. This is where water will flow over the river channel during flood events. Sediment is deposited onto the floodplain every time there is a flood.

Weathering, Erosion and Deposition

Weathering, Erosion, and Deposition: Erosion- the wearing away of land surface materials, especially rocks, sediments, and soils, by the action of water, wind, or ice; usually includes the movement of such materials from their original location. Soil particles are more likely to be dislodged and carried away by water. Erosion and deposition are in balance when eroded bank material is being deposited not far downstream, building a new or expanded point bar and helping create sinuosity. Erosion of topsoil build-up in streams and lakes can harm aquatic life. Degradation- a geologic process that lowers the stream channel due to erosion. Also known as down cutting. Aggradation- the geologic process by which a stream bottom or floodplain is raised in elevation by the deposition of material

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Human Impacts

Human impacts: the USGS did a study on the effects of urban development on stream ecosystems in 9 metropolitan study areas. One study area was the Dallas and Fort Worth Metropolitan area. The study states that there was an increase of contaminants in the water with urban development. Urban development increases the amount of water entering a stream after a storm, while decreasing the time it takes for the water to travel over altered land surfaces before entering the stream. In urban areas, water must quickly be drained from roads and parking lots in order to reduce flooding. This increases the amount of water that is entering into a river within a shorter period of time. This increase can lead to stream flashiness and altered stream channels. Stream flashiness is when streams rise and fall due to the response to storms. The quicker a stream rises and falls the flashier it is. Since the runoff water is flowing quickly, there is a decrease in the amount of water available to infiltrate the soil and recharge the aquifers. When the hydrology of the stream is altered, the physical habitat of a stream becomes degraded from channel erosion.

Groundwater and Surface Water

Difference between surface water and groundwater

Groundwater and surface water: Groundwater- water that flows or collects beneath the Earth's surface in saturated soil or aquifers. Groundwater can also be extracted through a well drilled into the aquifer. A well is a pipe in the ground that fills with groundwater. This water can be brought to the surface by a pump. Shallow wells may go dry if the water table falls below the bottom of the well. Some wells, called artesian wells, do not need a pump because of natural pressures that force the water up and out of the well. Surface water is water that collects on the surface of the ground. It is the top layer of a body of water. Rivers, lakes, and streams all have surface water. **Surface water**- precipitation that runs off the land surface and is collected in ponds, lakes, streams, rivers, and wetlands.

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Assessment Activities:

Vocabulary Game with Tabs

	MEANDER		MEANDER
	FLOODPLAIN		FLOODPLAIN
	CHANNEL		CHANNEL
	POINT BAR		POINT BAR
	SEDIMENT		SEDIMENT
	LARGE WOODY DEBRIS		LARGE WOODY DEBRIS
	WETLAND		WETLAND
	GROUND WATER		GROUND WATER
	DEPOSITION		DEPOSITION
	EROSION		EROSION
	WATER		WATER
	VEGETATION		VEGETATION

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Background Information:

Texas Water Development Board

http://www.twdb.texas.gov/surfacewater/rivers/river_basins/trinity/index.asp

National Resources Conservation Service

http://www.nrcs.usda.gov/wps/portal/nrcs/detail/?ss=16&navtype=SubNavigation&cid=nrcs143_023499&navid=220120000000000&pnavid=220000000000000&position=Not%20Yet%20Determined.Html&ttype=detail&pname=Living%20in%20Harmony%20with%20Wetlands%20|%20NRCS

Texas Parks and Wildlife

http://tpwd.texas.gov/education/water-education/Watershed%20Viewer

Environmental Protection Agency

https://www.epa.gov/hwp/learn-about-healthy-watersheds-their-assessment-and-protection

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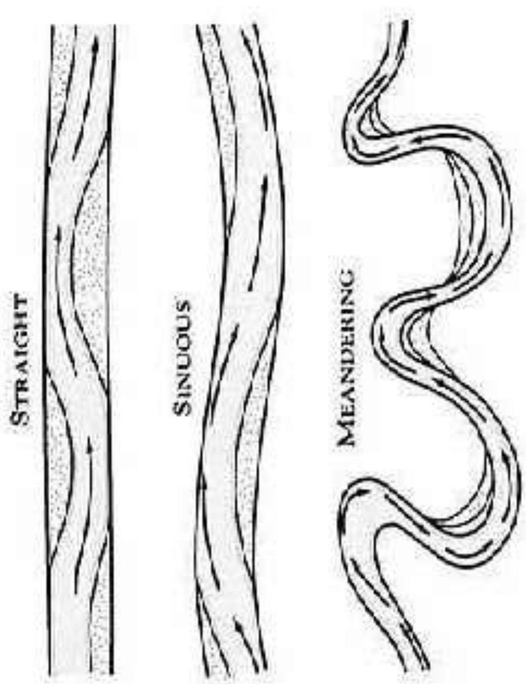
Student Journal Sheet:

How Streams Flow

RIVERS DON'T RUN STRAIGHT

Balance between EROSION and DEPOSITION

- Channel slope
- Size of moving particles
- Speed and amount of water



SEDIMENT

- Holds plant roots
- Small particles hold pollutants
- Reduces light and oxygen

Why is sediment important to a stream?

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STREAM BANK VEGETATION

Riparian areas protect banks from erosion.

- Traps sediment
- Reduces erosion
- Filters and cools water

How does vegetation help stop erosion?

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Tarrant Regional Water District Stream Trailer v.1/29/2015