TAKE CARE OF TEXAS: EDUCATOR MATERIALS

LESSON PLAN

Testing Water: On-Site Stream Sketch

Objectives

Students will sketch the survey area and surrounding lands. Students will identify different aquatic habitats.

Prerequisites

Students should complete Water Pollution lesson before starting this lesson.

Duration

60 minutes

Materials

- Protecting Texas Waters video
- Protecting Texas Waters handout
- Protecting Texas Waters word search
- Stream Sketch Student Reference Tables (copy per pair or small group)
- On-Site Stream Sketch Survey Student Sheet (copy for each student)
- **PRIOR TO LESSON:** Select a safe area with a stream or creek that students can safely visit.

Introduction

Show students the Take Care of Texas video, "Protecting Texas Waters" Virtual Field Trip once through then pass out the "Protecting Texas Waters" Handout and show the video again while students work to complete the handout. Once the handout is completed, discuss with students what was learned through the video. Ask the following questions:

- What are some sources of water pollution?
- What is the Edwards Aquifer Protection Program?
- What are some things they check for?
- What are some types of pollutants?
- How can we protect Texas waterways?

To review vocabulary pass out the Protecting Texas Waters word search and have students complete.

LP09 (10/25)

How is our customer service? www.tceq.texas.gov/customersurvey

Procedure

Discuss the appropriate safety procedures and inform the students there is to be no water contact during this lesson. At the survey area, explain they may see some of the following aquatic habitats, such as—

Pool: an area relatively deep and wide with slow-moving water compared to a riffle. Pool areas support fish, aquatic invertebrates, and aquatic plants.

Riffle: the shallow portion characterized by relatively fast-moving, turbulent water with bottom materials composed of cobble, gravel, or bedrock. Riffle areas of streams are important habitats for many aquatic insects and small fish that require flowing water (for feeding) and high oxygen levels.

Aquatic plants: generally found in sheltered areas and provide habitat for a variety of invertebrates and small fish.

These habitats (along with the depth and flow of the water) are key factors in determining the type of aquatic organisms you will find in the survey area. The Reference Tables can help you determine if there is possible pollution in your stream by using just your senses. Use Table 1—Physical Indicators of Water Pollution to help determine the possible pollutant and then use Table 2—General Land Uses That Might Affect Water Quality to help determine the possible pollution source.

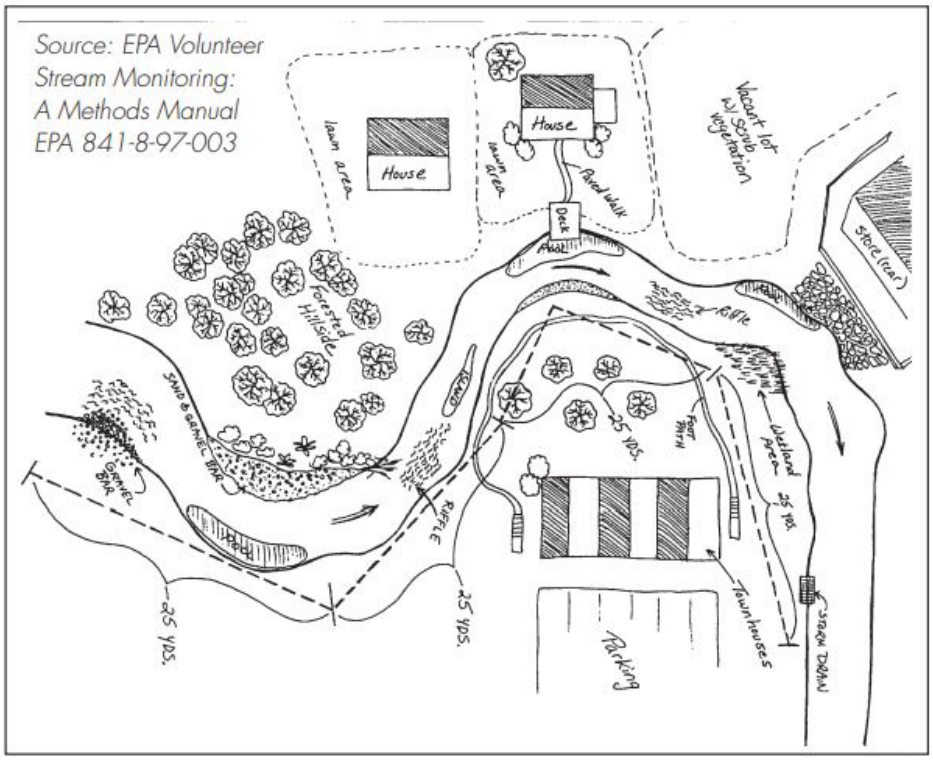
Explain to students they will be conducting a visual survey. Break into groups of 2-3. Pass out the handouts below, walk around the survey area and take notes of what you see and smell. After, you will sketch the survey area and surrounding lands. *Remember that the information you collect now will help later in future lessons when finding potential pollution sources.* Give students plenty of time to complete the survey.

Once students have completed the survey, have students sketch their survey in their notebook. Have students include the following:

a. any noticeable pollution (use the Reference Tables for assistance)
b. the direction the water is moving
c. substrate characteristics (example: rocks, clay, sand, mud, etc.)
d. bridges and other structures in the area (example: homes, fences, roads, sidewalks, etc.)
e. surrounding land use (example: lawn areas, parking lots, exposed soil, forest, park, etc.)
f. gravel, sand, dirt, or vegetated banks
g. outlets for pipes, storm sewers, etc.
h. any channelization and its substrate (example: ditches)

2. The sketch does not have to be a perfect likeness of the stream, but it should include the major habitat types, dams, bridges, location of discharge pipes, and dumps. Sketch the stream and surrounding area. Show in your sketch the different habitats in the stream (pool, riffles, etc.) structures that disrupt the flow of water (such as dams and bridges), human-built structures (buildings, roadways, etc.), any point sources (such as a discharge pipe), and the north arrow. Make sure to describe the characteristics of the stream bank, riparian zone, and adjacent land uses. Take notes on any unusual stream odors or colors. Below is an example:

Stream Sketch



Glossary

- **Aquatic Plants** – generally found in sheltered areas and provide habitat for a variety of invertebrates and small fish.
- **Pool** – an area relatively deep and wide with slow-moving water compared to a riffle. Pool areas support fish, aquatic invertebrates, and aquatic plants.
- **Riffle** – the shallow portion characterized by relatively fast-moving, turbulent water with bottom materials composed of cobble, gravel, or bedrock. Riffle areas of streams are important habitats for many aquatic insects and small fish that require flowing water (for feeding) and high oxygen levels.

Applicable TEKS

Science TEKS

- **6th Grade** – §112.26.b. 1A-H; 3A-C; 5A-G; 11A-B; 12A-C.
- **7th Grade** – §112.27.b. 1A-H; 3A-C; 5A-G; 11A-B; 12A-B.
- **8th Grade** – §112.28.b. 1A-H; 3A-C; 5A-G; 12A-C.

References

- Take Care of Texas **Protecting Texas Waters video** https://www.youtube.com/watch?v=7_7Comd1gC0&t=1s%C2%A0
- Take Care of Texas **Protecting Texas Waters handout** https://takecareoftexas.org/resources/protecting-texas-water
- Take Care of Texas **Protecting Texas Waters word search** https://takecareoftexas.org/resources/protecting-texas-waters-word-search

Stream Sketch Student Reference Tables

Table 1 — Physical Indicators of Water Pollution

If you see the color (s)...	The issue could be ...
Muddy tan to light brown	Suspended solids (silt and clay) due to: • upstream erosion of the banks and substrate due to channelization, • stormwater from logging or construction sites with inadequate erosion and sediment controls, or • Stormwater from one or more areas with soil erosion, such as poorly maintained croplands and rangelands, riparian zones with removed vegetation, exposed banks, etc.
Pea green, bright green, yellow, brown, brown-green, brown-yellow, blue-green	An algal bloom due to high nutrient content (phosphorus, nitrogen, or both). Water color is dependent on the dominant plankton type.
Tea or coffee	Dissolved decaying matter originating from the organic portion of the soil. This is usually seen in woodland or swampy areas.
Milky white	Paint (from a construction site) or milk (from a food processing site).
Dark red, purple, blue or black	Fabric dyes or inks from paper or cardboard manufacturers.
Milky gray or black	Oxygen depletion from raw sewage or other oxygen-demanding substance. a rotten-egg or hydrogen sulfide odor might be present.
Clear black	Turnover of oxygen-depleted bottom waters or sulfuric acid spill.
Orange-red	Deposits on stream beds often associated with oil-production areas, but not always (check for petroleum odor). The color could be due to iron in the water.
White, crusty deposits	Common in dry or arid areas where the evaporation of water leaves behind salt deposits. These deposits are also associated with brine water discharge (from oil production areas); check to see if the stream has a petroleum odor or an oily sheen along the banks.

If you smell …	The odor is from …
Rotten eggs or hydrogen sulfide	Raw sewage (oxygen-demanding substance) or oxygen-poor sediment.
Chlorine	Treated effluent, swimming pool overflow, or industrial discharges.
Sharp, pungent odor	Chemicals or pesticides.
Musty odor	Presence of raw or partially treated sewage or livestock waste (organicdemanding substances). Musty odor could also be caused by algae.
If you see on the surface …	**Possibly caused by …**
Tan foam	Water containing organic materials with high flow or wave action. This harmless foam can be in small patches to very large clumps.
White foam (thin or billowy)	Soap in treated effluent, possibly around a wastewater outfall.
Yellow, brown, black film	Pine, cedar, and oak pollens that form a film on the surface of ponds, backwater areas, or slow-moving water of streams.
Rainbow film	Oil or other fuel type. Sheens are common after rains when oil and gas residue wash off streets. Other sources include spills, pipelines, and oil and gas-production areas.

Table 2 — General Land Uses That Might Affect Water Quality

Land Use Type	Potential Effects
Woodland	Erosion from logging, road construction, or clear cutting may cause muddy waters.
Agricultural Land (croplands, pastures, feedlots, etc.)	Fertilizers or manure draining into a stream may increase the nutrient content and cause excessive algal and aquatic plant growth. Sedimentation may occur from soil erosion. Streams may also receive pesticides and herbicides in the runoff.
Cities and Towns	Depending on the activities occurring in the city or town, urban runoff might carry a variety of contaminants such as oil, pesticides, metals, and chemicals.
Industry	Industries have numerous types of chemicals and products that could cause color changes to the water, excessive algal growth, odors, absence of aquatic life, fish kills, elevated organic matter levels, and sewage fungus.
Wastewater-Treatment Plants	Effects may include excessive algal growth, white foam, sludge deposits (fluffy dark brown or gray solids), absence of fish and insects (or the abundance of tolerant forms), variable dissolved-oxygen levels, chlorine odor (and possible bleached vegetation near the outfall), sewage fungus, and elevated levels of E. coli.
Construction	Runoff from construction sites can cause water to become muddy and turbid.
Residential	Runoff from residential areas may contain fertilizers (nutrients), oil drained from cars (toxic substances), raw sewage from septic systems that overflow or leak (oxygen-demanding substances), detergents used to wash cars (toxic substances), and even litter (cans, bottles, paper, etc.).

On-Site Stream Sketch Survey Student Sheet

Date:	Time:	Air Temperature:
Team Member Names:		
Stream Name:		
Stream Location:		
Weather Conditions: ❑ Clear ❑ Cloudy ❑ Raining ❑ Other: _____		

Stream Characteristics

Appearance:	Bed Coating:	Odor:
❑ Scum (color: _____)	❑ Orange to red	❑ Rotten eggs
❑ Foam (color: _____)	❑ Yellowish	❑ Musky
❑ Muddy (color: _____)	❑ Black	❑ Pungent
❑ Milky (color: _____)	❑ Dark brown	❑ Chlorine
❑ Clear	❑ Brownish tan	❑ Other: _____
❑ Oily sheen	❑ No coating	❑ None
❑ Other: _____		

Habitats:

❑ Pool	❑ Undercut banks	❑ Log piles
❑ Riffle	❑ Rock ledges	❑ Plant beds
❑ Wetlands	❑ Tree roots	❑ Large boulders
❑ Backwaters	❑ Logs or stumps	❑ Artificial objects

❑ Other: _____

Substrate composition is mostly:

❑ Clay/silt ❑ Sand ❑ Gravel ❑ Cobble ❑ Bed rock ❑ Other: _____

Cover:

❑ Fully exposed (0% to 25% of the stream is shaded from the sun)
❑ Partially exposed (25% to 50%)
❑ Partially shaded (50% to 75%)
❑ Fully shaded (75% to 100%)

Bank Vegetation:

Trees: _____%	Plants: _____%	Exposed: _____%
Shrubs: _____%	Root mats: _____%	

Structures or Barriers:

❑ Upstream dam	❑ Downstream dam	❑ Bridge(s)
❑ Island(s)	❑ Waterfall(s)	❑ Other: _____

Litter (estimated amount by size):

Paper, items smaller than a can:	❑ 0–5	❑ 5–10	❑ 10–50	❑ +50
Can-, bottle-sized items:	❑ 0–5	❑ 5–10	❑ 10–50	❑ +50
Items bigger than a can (tires, carts, etc.):	❑ 0–5	❑ 5–10	❑ 10–50	❑ +50

Biological Characteristics

Algae location: ❑ Everywhere ❑ In spots

The algae are: ❑ Attached ❑ Floating ❑ Other: _____

Animals:

❑ Fish ❑ Amphibians ❑ Reptiles

❑ Shore birds ❑ Waterfowl ❑ Mammals

❑ Mollusks (clams, etc.) ❑ Insects ❑ Crustaceans (crayfish, etc.)

Types of animals present: _____

_____

_____

Water Sources

Watershed (runoff from):

❑ Pasture, grazing lands ❑ Croplands ❑ Woodlands

❑ Homes, residential areas ❑ Factories ❑ Stores

❑ Surface mining ❑ Underground mining ❑ Logging

❑ Roads

❑ Construction activities (explain): _____

❑ Other: _____

❑ Channelized areas (explain): _____

Channelized substrate composition: ❑ Concrete ❑ Cobble ❑ Vegetation

❑ Mud ❑ Other: _____

Channelized bank composition: ❑ Concrete ❑ Cobble ❑ Vegetation

❑ Exposed soil ❑ Other: _____

Point sources (outfalls or discharge pipes from):

❑ Wastewater-treatment plant ❑ Industry (explain): _____

❑ Residential (explain): _____

❑ Unknown ❑ Farm lots ❑ Other: _____

Water Uses

Intake pipe takes water to:

❑ Water-treatment plant (drinking water)

❑ Industry (explain): _____

❑ Irrigation system ❑ Livestock ❑ Unknown

❑ Other: _____

Recreational Activities:

❑ Swimming ❑ Fishing ❑ Other: _____