

Urban Creek Observations

Summary: *Students examine a creek and its surroundings to assess the health of the creek.*

Background

Land uses in, and adjacent to, the **riparian zone** (the area of land adjacent to the creek) can disturb the stream. Disturbance in the riparian zone include roads and other paved surfaces, homes, industry, stream channelization and/or culverts, livestock, agriculture, and other human activities. These practices disrupt the natural balance of the creek by compacting the soil, removing or altering streamside vegetation, altering the stream's natural flow and path, and adding foreign materials to the riparian habitat. Potential effects are increased runoff and erosion, increased sedimentation, reduced water clarity, increased water temperature, faster rates of flow, and reduced water quality.

Suggestion: Consider taking your students out to the same creek more than once over the course of the school year (perhaps every month or every few months) to track what happens to the creek over a longer span of time.

Note: Before you take your students to the local creek, visit it ahead of time and take note of any possible safety concerns. Always make sure students are supervised while visiting the creek, both for their safety and for the protection of the creek itself.

Note: In this activity, students do not enter the creek. If students will be entering any creek, please check [this map](#) to see if invasive New Zealand Mud Snails may be present. If so, students must scrub their boots and sterilize with Lysol before entering any other creek or a different location of the same creek.

Grades: 4-12

Time: 1 creek visit/2 class sessions

Setting: Classroom and creek

Materials:

- Urban Creek Observation worksheet, one per student or group
 - Introductory version - pages 6-7
 - Advanced version - pages 8-10
- Directions for tests, one per group
 - Water Odor - page 4
 - Water Appearance - page 5
- Glass jars, one per group
- Field guides (optional)

Guiding Question: How can we assess the health of a creek?

Key Concept:

Water quality, and creek health, can be evaluated by sight, smell, and by tests

Objectives:

Students will:

- Conduct a visual survey of a creek and its surroundings
- Assess the creek, including its smell, using a rubric to gauge water quality

Activity

In the classroom (30 mins):

1. Ask students to share ideas about why observations are useful. What are some different senses we can use to make observations?
2. Connect to why students will be conducting creek observations.
 - a. Creek observations are good ways of comparing different streams or sections of the same stream, or getting baseline level data for the creek. Through creek observations, it is possible to get an idea of the health of the creek.
 - b. During an initial assessment, students will assess the appearance and odor of the water, describe creek flow, creek banks, substrate, and visible human alterations to the riparian zone.
 - i. Define **riparian zone** - the area of land next to the creek.
 - c. Students will also quantify the amount of vegetation, types of in-stream habitat, and amount of trash that can be seen.
 - d. Explain to students that they will be making an extremely detailed observation of the creek and its surroundings. Everyone should be encouraged to observe the natural features of the creek, as well as human impacts on the creek environment, as closely as they can. All of these observations together will help with the overall creek assessment.
3. Go over the Urban Stream Observation worksheet with students.
 - a. Depending on your students, you can choose to use:
 - i. The introductory version of the worksheet (pages 6-7, recommended for elementary school aged students)
 - ii. Or the advanced version of the worksheet (pages 8-10, recommended for middle school to high school aged students)
4. If students are conducting the Water Odor and Water Appearance tests, go over the handouts in the classroom and make sure each team has the materials necessary to appropriately assess these conditions.
 - a. Introduce how students will assess Water Odor (page 4).
 - i. Pass out a copy of the Water Odor handout, one per team, for students to read through and refer to when they are out in the field making observations.
 - ii. Demonstrate the protocol in front of the class.
 - b. Introduce how the students will assess Water Appearance (page 5).
 - i. Pass out a copy of the Water Appearance handout, one per team, for the students to read through and refer to when they are out in the field making observations.
 - ii. Demonstrate the protocol in front of the class (you can use water with food coloring in it as an example).
5. Divide students into teams of 2-4. Each team will work together to assess the health of a site along the stream, as designated by the teacher.
6. Share with students your safety guidelines about being by the creek, and what they should do if they see pollution, trash, hazardous materials, etc.
7. Invite students to talk in their groups about their predictions about what they will see at the creek and their ideas around creek health. Ask each group to come up with 1-2 questions they have about the creek that could be answered through observation. Record questions on the board or poster paper.

At the creek (60+ mins):

8. At the creek, designate different sections or reaches for each team to observe.
 - a. Consider assessing one section of the creek as a whole class to demonstrate how to go through the worksheet first, then let students work with their groups on their assigned sections of the creek.
9. Students can work through the following activities as a way of collecting different types of information about the creek and riparian zone:
 - a. Urban Stream Observation Worksheet
 - b. Make a sketch of the creek and label the locations of riffles, pools, bends, snags, etc. on their sketch.
 - c. Students may also choose to collect information on any trash or pollution they notice when observing the creek (either noting the location of it on their map or making a list or a tally of what they have found).

Reporting Pollution Incidents:

Including this as part of the activity with your students is up to you. Conduct some research ahead of time on your city or county's protocols on reporting pollution at creeks.

Back in the classroom (30 mins):

1. Pair student groups who observed different sections of the creek together. Invite them to compare their data. Together, students should come up with an overall creek health assessment based on their data.
2. Invite groups to share with the class.
3. Return to the questions students asked before visiting the creek. See if students can offer any answers to the questions. Ask: what do we still wonder about? What additional data do we need?

Water Odor

Odor in water may be due to natural or human causes. Natural causes include decaying weeds and algae, or the presence of microorganisms. When organic matter decomposes, gases like ammonia and hydrogen sulfide are given off. Sewage and industrial wastes contain halogens, sulfides, or other chemical compounds and are also responsible for odor in water. Odor is undesirable in drinking water and certain industrial processes. Soil acts as a filter as water passes through it. Contaminants in the soil may end up in the water body. Thus, soil smell will suggest pollutants that might exist only at trace levels in the water.

Procedure for testing Water Odor:

- Collect a sample of water in a large-mouthed jar.
- To test the odor of the water, use your hand to wave or waft the air above the water sample toward you. Use the list of odors to describe what you smell.
- Record the odor and intensity of the smell (faint, distinct, or strong) in your Urban Creek Observations worksheet.
- To measure the odor of the bank soil, disturb bank sediment and note any odor it gives off.

Note: Do these procedures on the site immediately after collecting the water sample. Samples may lose their odor over time. Sense of smell varies from person to person. For good results, have several students smell the samples separately and write down their observations *before* sharing them out loud.

Odor (<i>smells like</i>)	Possible explanations for smells:
Sulfur, hydrogen sulfide (<i>rotten eggs</i>)	May indicate the presence of organic pollution, such as domestic or industrial wastes
Musky (<i>decomposing straw, damp cellar</i>)	May indicate presence of sewage discharge, livestock waste, decaying algae, or decomposition of other organic pollution
Harsh (<i>septic, stale sewage, dead algae</i>)	May indicate the presence of industrial or pesticide pollution
Chlorine or chemical (<i>pool</i>)	May indicate the presence of over-chlorinated effluent from a sewage treatment facility or a chemical industry
No unusual smell	Not necessarily an indicator of clean water. Many pesticides and herbicides from agricultural and forestry runoff are colorless and odorless

Water Appearance

Color

Color in river water may result from naturally occurring materials such as soil particles, dissolved or suspended clay, or decaying organic matter (tannins, peat, algae, fungi, weeds). Some industries, such as textile and leather processors, that use colors in their manufacturing, are also responsible for adding color to water bodies. Seepage from a wastewater treatment facility may give the water a green, green-blue, brown or red appearance. Some of these color sources are harmful, some are not.

Foam in the water

Excessive foam is usually the result of soap and detergent pollution. Moderate levels of foam can also result from decaying algae, which indicates nutrient pollution.

Procedure for testing Water Appearance:

Verbal descriptions of apparent water color can be unreliable and subjective. *If possible, create a color chart that is reproducible for each group.* By establishing color standards, people in different areas can compare their results.

- Take a sample of water in a clear glass jar. You can also use the sample from the odor test.
- Visually inspect the sample in adequate light against a white piece of paper.
- Record what you observe on the Urban Creek Observations Worksheet

Water Appearance	Possible explanations
Green, green-blue, brown, or red	Indicates the growth of algae, which is usually caused by high levels of nutrient pollution. Nutrient pollution can come from organic wastes, fertilizers, or untreated sewage.
Light to dark brown	Indicates elevated levels of suspended sediments, giving the water a muddy or cloudy appearance. Erosion is the most common source of high levels of suspended solids in water. Land uses that cause soil erosion include mining, farming, construction, and unpaved roads.
Dark reds, purple, blues, blacks	May indicate organic dye pollution from clothing manufacturers or textile mills.
Orange-red	May indicate the presence of copper, which can be both a pollutant and naturally occurring. Unnatural occurrences can result from acid mine drainage or oil-well runoff.
Blue	May indicate the presence of copper, which can cause skin irritations and death of fish. Copper is sometimes used as a pesticide, in which case an acrid (sharp) odor might be present.
Multi-colored (oily sheen, iridescent)	Indicates the presence of oil or gasoline floating on the surface of the water. Oil and gasoline can cause poisoning, internal burning of the gastrointestinal tract, and stomach ulcers. Oil and gasoline pollution can be caused by oil drilling and mining practices, leakage in fuel lines and underground storage tanks, automotive junk yards, nearby service stations, wastes from ships, or runoff from impervious roads and parking lot surfaces
No unusual color	Not necessarily an indicator of clean water. Many pesticides, herbicides, chemicals, and other pollutants are colorless, or they produce no visible signs of contamination.
Foam	Excessive foam is usually the result of soap and detergent pollution. Moderate levels of foam can also result from decaying algae, which indicates nutrient pollution.



Urban Creek Observations

Name: _____ Date: _____

City, County, State: _____

Creek/Site Location: _____

What is the weather like today? (circle your answers)

Clouds: no clouds; partly cloudy; cloudy sky **Precipitation:** none; misty; foggy; drizzle; rain

Wind: calm; breezy; windy

1. **Where does the creek go? Where does the creek come from? Which direction is downstream?**

2. **What does the water look like?**

3. **How does the water move? How fast is the water moving? Make notes about riffles/rapids, pools (still water), bends in the creek, etc.**

4. **How does the creek smell? (no smell, swimming pool smell, sewage smell, rotten egg smell, etc.)**

5. **What is in the riparian zone (the sides or banks of the creek)? (plants, mud, cement, etc.)**

6. **Do you see any evidence of erosion?**

7. **What animals do you see or hear? (birds, insects, etc.) Is there other evidence of animals? (tracks, feathers, etc.)**

8. **What types of plants do you see? (trees, shrubs, grasses, etc.)**

9. **What evidence is there of humans? (trash, walls, pipes, etc.)**

10. **Draw a picture of the creek below. Add labels of what you see and/or smell.**

Urban Creek Observations

Name: _____ Date: _____

City, County, State: _____

Creek/Site Location: _____

What is the weather like today? (circle your answers)

Clouds: no clouds; partly cloudy; cloudy sky **Precipitation:** none; misty; foggy; drizzle; rain

Wind: calm; breezy; windy

1. How does the water smell?

Rotten egg or sulfur

Chlorine

Musty, moldy, damp

Other: _____

Earthy or grassy

None (no unusual smell)

What do these smells indicate about the health of the stream?

2. What does the water look like?

Scummy (green)

Foamy

Muddy (brown)

Cloudy (not clear)

Clear

Colored sheen (oily/rainbows on surface)

Other: _____

What does the appearance of the water indicate about the health of the stream?

3. How is water moving in the creek? Within your assessment area, how many of each of the following is the water moving through?

___ pools (still water)

___ riffles/rapids

___ waterfalls/cascades

___ bends

___ snags (fallen branches, log piles) # ___ other: _____

How do you think water movement affects water quality?

4. Look at the bottom of the creek through the water. What is the creek bottom made up of?

- | | |
|----------------------------|-------------------------|
| Silt (very fine sand/dust) | Sand |
| Gravel | Cobbles (small pebbles) |
| Boulders | Bedrock |
| Cement | Other: _____ |

What effect do you think the type of creek bottom has on the overall health of the creek?

5. What is along the riparian zone (the sides or banks of the creek)?

- | | | |
|----------------|--------------|-------------------|
| Mud | Sand | Plants/vegetation |
| Rocks | Rocky ledges | Tree roots |
| Logs or stumps | Cement | |

What effect do you think the type of creek bank has on the overall health of the creek?

6. Is there algae growing in the creek? Where do you see it?

- | | |
|-----------------------|--|
| Everywhere | Attached or growing on the creek bottom |
| Floating in the water | Emergent (rooted in the streambed, growing to the surface) |
| No algae in the creek | |

Describe the shape and color of the algae you can see:

7. Note the different kinds of plants that are growing on the creek banks.

- | | |
|----------------------------------|-------------------|
| Trees | Shrubs |
| Grasses | Herbaceous plants |
| Vines | Other: _____ |
| No vegetation on the creek banks | |

How does the type and amount of vegetation affect the health of the creek?

8. What human influences exist in or adjacent to the creek?

- | | | |
|---------|--------------------|------------------|
| Dams | Storm drain infall | Creek diversions |
| Bridges | Concrete channels | Trash or debris |
| | Retaining walls | |

How do these affect the health of the creek?

9. How is the land around the creek used?

- | | | | |
|-------------|-----------|---------------|------------|
| Farming | Logging | Commercial | Industrial |
| Parks | Mining | Water storage | Grazing |
| Residential | Factories | Natural areas | |

How do you think each of the land uses by the creek affect the creek health?

10. Is there trash in or by the creek? Approximately how many of each of the following can you see in or around the creek?

- | | | | |
|------------------|-----------------------|--------------|--------------|
| Paper/newspapers | Plastic/food wrappers | Cans/bottles | Large items |
| 0-5 | 0-5 | 0-5 | 0-5 |
| 6-10 | 6-10 | 6-10 | 6-10 |
| 11-20 | 11-20 | 11-20 | 11-20 |
| More than 20 | More than 20 | More than 20 | More than 20 |

How does the presence of trash affect the health of the creek?

11. What are the visible sources of water pollution?

Freeway

Industrial (waste, dumping)

Residential

Restaurant

Trash

Other: _____

Could there be some non-visible sources of pollution affect the creek? Name some examples.

12. Can you find any evidence that animals use the riparian zone? Are there any animals that are here right now? Look for tracks, scat, homes, chewed leaves, half-eaten nuts, feathers, skin, bones, etc.

Macroinvertebrates: _____

Fish: _____

Amphibians: _____

Reptiles: _____

Birds: _____

Mammals: _____

What could the presence of certain types of animals tell us about the health of the creek?

Make a sketch of the creek below. Add notes about what you see.