McKinney Falls Ecology

Water Quality Study

Description: This field inquiry will excite students as they identify many aquatic invertebrates and make inferences based on their presence or absence to determine the quality of the water on the day of their field experience at McKinney Falls. OPTION: You may also wish to conduct chemical tests on the water. Emphasize that chemical testing is best done on a regular basis over a period of time to give a truer picture of the water quality. Testing done today is only a snapshot of the quality of the water on one day. The results of any chemical testing will serve to offer possible explanations of water quality determined by the visual and biological surveys the students will also be doing. This activity allows students to use field equipment, take data, and draw conclusions in a meaningful way.

Background: Water quality and quantity is a topic students have studied prior to this field experience. It is a topic of great concern to many Texans and will become even greater in the future as population increases, creating greater demands for water and greater impact on water quality. Understanding aquatic ecology and water issues now insures that when our students become voters they will have a sound basis from which to make decisions.

Materials

On-Site:

- "Bug Picking" student data sheet:http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_lf_k0700_1118b.pdf
- Collecting pans/containers
- Aquatic nets with fine mesh
- Tweezers
- Magnifiiers
- Pipettes
- Pencils

Bring:

- Water quality chemical test kits (LaMotte has an excellent kit)
- Footwear and clothing suitable for wading in shallow water
- Hats and sunscreen
- Change of clothing in case of soaking ☺
- Drinking water and snacks
- Field Data sheets (below)
- Student journals, optional
- Macroinvertebrate Field Guide (ask TPWD staff)

Procedures:

1. Begin by discussing safety rules with students, making sure they understand the boundaries of the investigation. Students cannot go in water more than knee deep without water safety equipment available.

2. Review by discussing how scientists get a picture of the water quality in a body of water (visual survey, biological survey, and chemical surveys). Ask which type of survey provides the best picture of overall stream health (biological) and why (for aquatic life to be healthy, it requires longer term good quality; a chemical survey may give different results day to day depending on many factors). From previous activities, students will know that some species are very sensitive to pollution and some are very tolerant and their presence/absence are good indicators of water quality.
3. Have students do a visual survey of the area according to the field data form.
4. Review with students the directions on the "Bug Picking" student sheet. Alternatively, you may wish to use student created data sheets.
5. Demonstrate how they will turn over rocks in the water or use nets to find the various invertebrates. Demonstrate also how they will look through debris in the nets to find the small animals and then place them in containers, categorizing them by their physical characteristics. To assist with identification, you may wish to make a "Critter Necklace" by copying and laminating pictures of macroinvertebrates from the TCEQ *Water Education Field Guide* http://www.tceq.state.tx.us/comm_exec/forms_pubs/pubs/gi/gi-026_165237.pdf or from the Water Quality PowerPoint http://www.statweb.org/outoftheclassroom/downloads/ppt/water_quality.ppt
6. Students transfer their macroinvertebrate data to their field data forms and categorize indicators of excellent, good, and poor water quality and make inferences based on their data.
7. Obtain a water sample. The sample should be collected by inverting a sample container into water at least elbow-depth and not too close to the shoreline. Water should not be collected at the surface as it will have an elevated temperature and will affect chemical test results.
8. Students conduct each of the tests on a sample and record results on the field data forms and make inferences on the quality of the water on this particular day.

Name of water body: _____
Latitude: **Longitude:**

Current Weather: (circle one)
CLEAR - PARTLY CLOUDY - FOG - OVERCAST - RAIN
Recent Weather: _____

Surface Conditions: (circle one)
CALM - LIGHT CHOP - HEAVY CHOP - SWELLS

Adjacent Shoreline Description: _____
(residential, marina, farm land, wooded, marina, wetland, etc.)

Condition of the river (Does it appear to be polluted with any debris or matter? Are there any fish or plants in the water? Is there none, a little, some, or a lot of algae in it? Etc.) _____
_____
_____
_____

Color and odor of the water: _____

Clarity/suspended material in water (clear, cloudy, muddy? Can you see many particles floating in the water?) _____
_____

Wildlife observations: (animals, reptiles, deer, birds, etc.) _____
_____
_____

Other observations you think are interesting or significant: _____
_____
_____

Water Sampling Tests

Water Temperature: _____ pH: _____

Dissolved Oxygen (DO): ___ppm Nitrates: _____ppm

Phosphates: _____ppm

Analyze Results

pH Level	Water Quality
Less than 5.5	Poor: Very Acidic
5.5-5.9	Fair
6.0 6.4	Good
6.5 7.5	Excellent
7.6 8.0	Good
8.1 8.5	Fair
Greater than 8.6	Poor: Very Alkaline/Basic may be impossible for fish and other organisms to survive

Factories and cars emit nitrogen oxides and sulfur oxides in the environment. When these combine with water vapor in the atmosphere, they form acids. These acids eventually fall to the earth as acid rain. Acid rain damages trees, crops, and buildings. It can make lakes and rivers so acidic that fish and other aquatic organisms cannot survive.

Nitrate Level	Water Quality
0 1.0	Excellent
1.1 3.0	Good
3.1 5.0	Fair
Greater than 5.0	Poor

Nitrates may come from fertlilizers, sewage, and industrial waste. They enter the water from runoff. **High levels reduce the amount of dissolved oxygen in the water.**

Phosphate Level (ppm)	Water Quality
0.0 1.0	Excellent
1.1 4.0	Good
4.1 9.9	Fair
10.0 or greater	Poor

Phosphates are in fertilizers and laundry detergent. They enter the water from runoff. Phosphates (like nitrates) make plants grow rapidly. **High levels reduce the amount of dissolved oxygen in the water.**

Dissolve Oxygen (DO) in ppm	Water Quality
0.0 4.0	**Poor**
4.1 7.9	Fair
8.0 12.0	Good
12.0 +	RETEST

Excessive plant growth and decay cause dissolved oxygen to be very low. A DO level of 9 – 10 ppm is very good and supports a diverse ecosystem; 4 ppm or less causes populations to decline.