

## Look Closely for Water Quality/Science Lesson

This lesson is adapted from Benthic Bugs and Invertebrates as Indicators in Project WET's *Healthy Water Healthy People Curriculum Guide* with permission from Arizona Project WET.

### Objectives

1. Students will be able to analyze water samples from various sources by comparing and contrasting macroinvertebrates found in the water samples to a dichotomous key.  
\_\_\_\_\_ Students observed and correctly classified macroinvertebrates in their water sample.
2. Students will be able to evaluate water quality based on the types of macroinvertebrates found in the water.  
\_\_\_\_\_ Students were able to correctly interpret data from a macroinvertebrate bio-assessment.

### Arizona Science Standards Addressed

#### Science Strand 1: Scientific Inquiry

Concept 1: Observation, Questions, Hypothesis

Concept 2: Scientific Testing

Concept 3: Analysis and Conclusion

#### Science Strand 4: Life Sciences

Concept 3: Organisms and their Environments

Concept 4: Adaptations

### Preparation

Organize a field study to take the students to a place where they can sample water from the natural environment. This could be done in conjunction with your trip to the Tempe Center for the Arts. Some good spots to visit would be the Rio Salado Audubon Riparian Preserve or the Gilbert Riparian Preserve, both allow students to do water sampling.

Preview [Look Closely for Water Quality PowerPoint](#)

### Resources and Supplies

[Look Closely for Water Quality PowerPoint](#)

Water Sampling Kit: buckets, ice cube trays, petri dishes, white or clear bins, nets, hand lenses or 3-way viewers for water testing. (Note: Arizona-based teachers can call the UA Maricopa Cooperative Extension office (602-827-8200 x333) to check out a sampling kit of viewers and nets to use with students for free. Personnel can recommend places to take your classes for the activity.

[Look Closely for Water Quality Worksheet](#) (one for each student)

Dichotomous keys

[Pond Key](#)

[River Key](#)

## **Activities**

1. Engage students by asking them some questions to get them thinking about the lesson.
  - How many have been to a lake or river before?
  - Was the river or lake healthy? How did you know?
  - Was anything that you saw there alive?
  - Were there aquatic insects in the water?
  - Do you believe that aquatic insects could help us learn about the health of the water?
2. Show students the Look Closely at Water Quality PowerPoint.
3. Take students to a local body of water to conduct macroinvertebrate sampling.
4. Back in the classroom, have students draw conclusions about the health of the river. You may like to review the last few slides of the PowerPoint presentation again. If possible, allow students to collate their data as a class to get a more representative sample of the macroinvertebrates that were present in the water body.
5. Higher Level Option: Have students write an essay about how they can take actions to protect water quality for humans and other plants and animals that depend on clean water in Arizona.

## **Vocabulary**

Water quality

Macroinvertebrate

Tolerant/intolerant

Sensitive

Sample

Impact

Dichotomous Key

## **Interdisciplinary Ideas**

**Literacy:** Have students write an essay about how they can take actions to protect water quality for humans and other plants and animals that depend on clean water in Phoenix.

**Math:** Students could calculate the percentage of tolerant and intolerant bugs they found in their water sample. Contact the local water department for copies.

**Extension (Optional Research)**

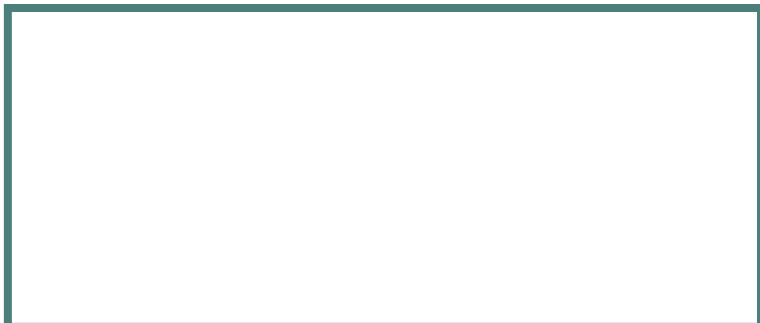
Travel to your city's water treatment center and research your area's water quality.

# Look Closely at Water



## Student Data Worksheet

1. Collect a water sample using a bucket. Scrape the net along the bottom of the water body if possible (macroinvertebrates like to live on the bottom of the stream and under rocks).
2. Draw a picture of your water sample:



3. Using a dichotomous key, identify as many types of macroinvertebrates as possible in your water sample. Also, count the number of each type of macroinvertebrate and record that, too.

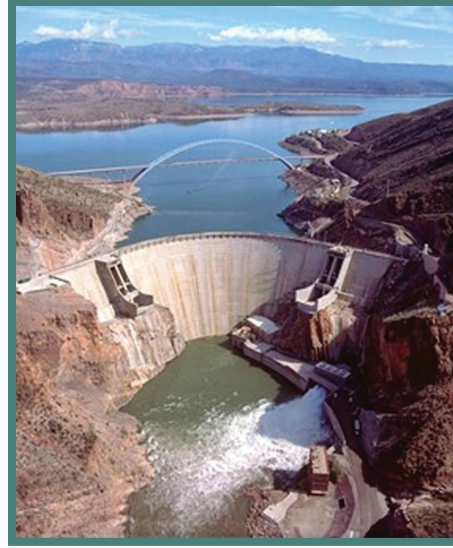
Picture	Name of Macroinvertebrate	How many of this type are in your sample?	Is this organism tolerant (red square) or intolerant (green star)?

4. Go back to your chart and classify the macroinvertebrates you identified as either tolerant (T), moderate (M) or intolerant (I). (Hint: Stoneflies, mayflies and caddisflies, are intolerant of any stressor; dragonflies, damselflies, scuds and craneflies are moderate; midges, leeches, pouch snails and tubifex worms are tolerant of many stressors.)
5. Conclusion: How healthy is the water you sampled? Write a paragraph and justify your answer.

# Questor Questions



## About Theodore Roosevelt Dam



Look carefully at both of the pictures of Theodore Roosevelt Dam. Use the pictures to help you answer these questions: What is the purpose of dams? (i.e. What do dams do?) Hint: look at the water in front of and behind the dam. Why do you think we need dams in central Arizona?

The first photo shows Theodore Roosevelt Dam as it appeared after initial construction. The second photo shows Theodore Roosevelt Dam as it looks today. There were some major changes made to the dam in 1996 which made it safer and able to store more water.

Compare the two photos. What differences can you identify? (Hint: look especially closely at the height of the water as compared to the road on the right hand side of the photo.)

Learn about the major changes that were made to Theodore Roosevelt Dam in 1996. How many of these changes were you able to notice in comparing the photos?

- Bridge – Cars no longer drive over the top of the dam to get across. A new bridge was built for cars to bypass the dam.
- Height is Taller – The height of the dam was raised 77 feet, which effectively doubled the capacity of water storage in the lake. However, part of that space is never filled. It exists to protect us against major floods.
- Smoother Surface – The entire face of the dam was overlain with concrete ranging in thickness from 10 to 50 feet. The helped reinforce the original stonework to make the dam safer.
- New Spillways – The new spillways are deeper and narrower, allowing for larger water releases during floods.

**Interpret:** Why do you think Theodore Roosevelt Dam was built?  
What do you think life would be like without Roosevelt Dam?