



## Student Worksheet: River Health and Indicator Species



Mink frogs (*Lithobates septentrionalis*).  
Credit: Allan G. Austin

### Activity 1: Biodiversity and Indicator Species

Watch the video **The Importance of Documenting Biodiversity** in which Canadian Museum of Nature scientist Noel Alfonso talks about biodiversity and indicator species.

[http://nature.ca/education/cls/video/vimportance\\_e.cfm](http://nature.ca/education/cls/video/vimportance_e.cfm) (2 min. 52 sec.)

**1.1** One of the roles of the Canadian Museum of Nature is to document biodiversity over time by keeping records of which species live where. How can this help scientists identify potential environmental problems?

**1.2** Why is the Brook Silverside considered an indicator species?

### Activity 2: Data Analysis

The Rideau River in eastern Ontario flows from the Rideau Lakes to the Ottawa River. Along the way, shoreline land use varies, reflecting land uses commonly found along the shores of rivers across Canada. You have been asked to see how these different land uses might be affecting the health of the river, and you have decided to use data provided by the Canadian Museum of Nature to help you answer this question. Take a look at the data set below, which is based on fish sampling conducted by research scientist Noel Alfonso.





The columns represent samples taken from five different sections of the Rideau River, and the rows refer to the number of individuals of particular fish species found in those sections. Refer to this data in order to answer the questions that follow.

### Samples from the Rideau River

| Fish Species   | Section 1 | Section 2 | Section 3 | Section 4 | Section 5 |
|--|-----------|-----------|-----------|-----------|-----------|
| <b>Fallfish</b><br>( <i>Semotilus corporalis</i> )         | 0         | 3         | 1         | 0         | 0         |
| <b>Bluegill</b><br>( <i>Lepomis macrochirus</i> )          | 7         | 4         | 78        | 209       | 95        |
| <b>Pumpkinseed</b><br>( <i>Lepomis gibbosus</i> )          | 12        | 9         | 170       | 114       | 88        |
| <b>Yellow Perch</b><br>( <i>Perca flavescens</i> )         | 4         | 230       | 52        | 42        | 36        |
| <b>Northern Pike</b><br>( <i>Esox lucius</i> )             | 1         | 2         | 3         | 1         | 2         |
| <b>Walleye</b><br>( <i>Sander vitreus</i> )                | 0         | 1         | 1         | 0         | 0         |
| <b>Logperch</b><br>( <i>Percina caprodes</i> )             | 7         | 110       | 3         | 19        | 2         |
| <b>Smallmouth Bass</b><br>( <i>Micropterus dolomieu</i> )  | 15        | 18        | 11        | 2         | 0         |
| <b>Largemouth Bass</b><br>( <i>Micropterus salmoides</i> ) | 0         | 2         | 29        | 14        | 15        |
| <b>Brown Bullhead</b><br>( <i>Ameiurus nebulosus</i> )     | 0         | 1         | 10        | 1         | 16        |
| <b>Spottail Shiner</b><br>( <i>Notropis hudsonius</i> )    | 3         | 28        | 3         | 0         | 0         |
| <b>Brook Silverside</b><br>( <i>Labidesthes sicculus</i> ) | 0         | 2         | 27        | 9         | 3         |
| <b>Fathead Minnow</b><br>( <i>Pimephales promelas</i> )    | 0         | 0         | 34        | 9         | 4         |
| <b>White Sucker</b><br>( <i>Catostomus commersonii</i> )   | 0         | 1         | 1         | 0         | 0         |
| <b>Rock Bass</b><br>( <i>Ambloplites rupestris</i> )       | 66        | 102       | 14        | 11        | 6         |
| <b>Banded Killifish</b><br>( <i>Fundulus diaphanus</i> )   | 47        | 0         | 9         | 2         | 27        |
| <b>Johnny Darter</b><br>( <i>Etheostoma nigrum</i> )       | 2         | 6         | 8         | 1         | 1         |
| <b>Common Carp</b><br>( <i>Cyprinus carpio</i> )           | 2         | 4         | 2         | 3         | 0         |
| <b>Common Shiner</b><br>( <i>Luxilus cornutus</i> )        | 0         | 318       | 20        | 0         | 0         |
| <b>Golden Shiner</b><br>( <i>Notemigonus crysoleucas</i> ) | 7         | 2         | 50        | 5         | 1         |



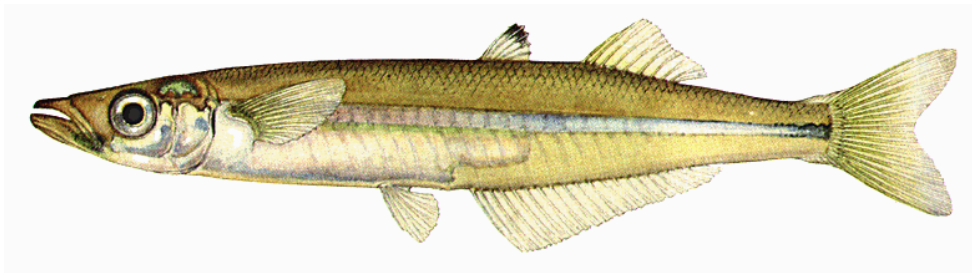


**2.1** How many species of fish were found in each of the five sections?

**2.2** What kind of graph would you use to present these totals and why?

**2.3** Create a graph representing the number of fish species found in each section. You can use a computer programme or do it manually using graph paper. Remember to label and title your graph. You can print out a sample of graph paper at <http://nature.ca/education/pdf/graphpap.pdf>.

**2.4** Which section of the river has the most species of fish present?



Brook Silverside (*Labidesthes sicculus*).  
Credit: New York Department of Environmental Conservation

**2.5** Does this necessarily mean that this section of the river has the best water quality? Why or why not?

**2.6** Look for the data on the Brook Silverside. This fish is an indicator of good water quality. How many individuals of this species were collected in each of the five sections of the river?

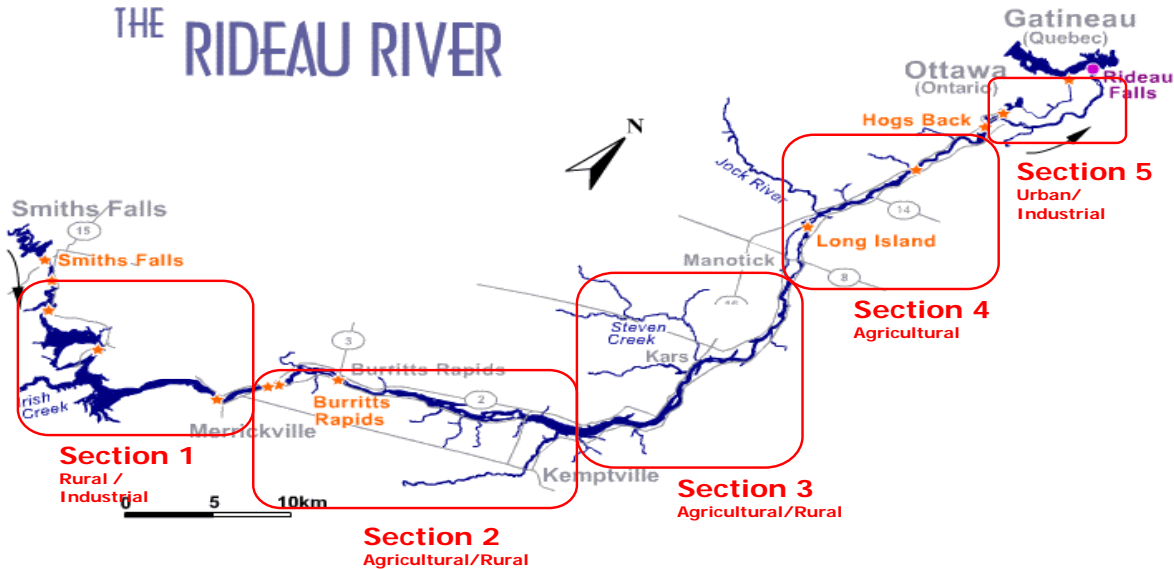




**2.7** Create a graph representing the number of Brook Silversides found in each section. You can use a computer programme or do it manually using graph paper. Remember to label and title your graph.

**2.8** Which section seems to have the best water quality?

### Activity 3: Land Use



**3.1** How does land use relate to the diversity of fish species and the number of Brook Silversides found in each section? Use the map, and the information below regarding land uses along the river, to help you answer the question.

#### Section 1

In this section, the river flows through the municipality of Smiths Falls. The municipality is a commercial centre for the region and includes a variety of industries such as agriculture, forestry, mining, utilities, construction and manufacturing, among others.





### Section 2

In this section, the shoreline is lined with agricultural fields, forested areas, parks, and wetlands characterized by large expanses of cattails and marshy inlets.

### Section 3

In the upstream half of this section, the shoreline is lined with wetlands. The downstream half is heavily developed, with houses, summer cottages, manicured lawns and retaining walls.

### Section 4

Along parts of this section, the shoreline is being eroded because crops are grown right to the water's edge. This provides no protection from motorboat wakes or runoff from heavy rain. Closer to Hogs Back, the shoreline includes residential houses with manicured lawns and retaining walls, and a public beach.

### Section 5

This section of the river is relatively undisturbed because the Rideau River divides here into canal and river, and boat traffic is restricted to the canal. Along the river section, shoreline is lined with parklands.



Cattle in a river.  
Credit: Paul Hamilton

## Activity 4: Exploring the Issues

Visit the web site **Diving In** at [http://nature.ca/explore/di-ef/wcef\\_e.cfm](http://nature.ca/explore/di-ef/wcef_e.cfm) and look for information about water pollution. Then answer the following questions:





**4.1** Where do toxic pollutants in rivers come from?

**4.2** How do toxic pollutants spread through the food web?

**4.3** How might water quality and river health be improved?

[http://nature.ca/education/cls/lp/lpismqsw\\_e.cfm](http://nature.ca/education/cls/lp/lpismqsw_e.cfm)

