

# Great Flathead Lake Ecosystem

## Mystery

by Dan O'Brien and Dave Fitzpatrick

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**Grade level** 10–12

**Time required**

Two to four 50 minute class periods, depending on depth of discussion and research

**Materials/Technology**

Lab worksheet

**Summary**

After reading about a local ecological disaster and graphing all available data on the subject, the student will construct a detailed food web of the problem ecosystem while looking for factors that may have contributed to its instability. The student will then use this data to construct a formal problem statement and then offer a hypothesis as to the probable cause of that problem. Finally, the students will offer their own suggestions as to a management plan that would best promote the survival of the culturally significant bull trout.

**Objectives**

The student will:

- 1) develop skills in data manipulation (graphing and web diagramming) and interpretation.
- 2) use available information to propose a mitigation plan for a local ecological problem.

**Montana Science standards addressed**

- 1) Students design, conduct, evaluate and communicate scientific investigations.
- 2) Students demonstrate knowledge of characteristics, structures, and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment.

**Assessment**

Evaluate the student's successful completion of the necessary graphs and food webs as well as the step-by-step, cause and effect analysis of the food web collapse and its best future management plan.

**Background**

Caution: the following is instructor background information only. Do not allow students to study or discuss this material prior to attempting to do this activity.

Opossum Shrimp (*Mysis relicta*) were introduced to the Flathead Lake watershed in 1968 to promote the growth of the kokanee salmon industry. They first appeared in Flathead Lake in 1981. Unfortunately, the *Mysis* turned out to be more efficient than the kokanee at capturing the salmon's own food supply (Cladocera). As their food supply dwindled, the kokanee died out. With the loss of the kokanee, there was no longer a reason for the eagles to stop at Flathead Lake. Without the competition from the kokanee, the lake trout and whitefish populations increased, at the expense of the bull trout.

The food chains involved in this ecosystem problem are:

<u>Original</u>	<u>Intended changes 1968</u>	<u>Actual result</u>
1 Bald eagles	1 Bald eagles	1 <i>Mysis</i>
2 Kokanee	2 Kokanee	2 Cladocerans
3 Cladocerans	3 <i>Mysis</i> and Cladocerans	3 Phytoplankton
4 Phytoplankton	4 Phytoplankton	

Note: Some organisms may feed lower on a chain as a juvenile.

Note - the Lake Whitefish & Lake Trout were also present during this time but now have been able to take a more dominant role in the food web of today, at the expense of the culturally significant Bull Trout.

### **Procedural Notes**

- 1) This activity seems to work best using a small group (3-4) format. There are many clues and links between the species in this activity.
- 2) The student will have the best initial success by attempting to produce a graphical representation of the problem by drawing a large food web. Watch that they do not limit themselves to the most obvious “large eats small” paths in their food chains. Also note the size specs under the sketches. Students should also remember that a species’ food preferences may change as it develops. For example, one species may feed on another only while a juvenile. Remind them that many clues will be found by very careful reading of the animal descriptions. Don’t let them skip over the questions scattered throughout the text.
- 3) Important clues can be discovered from the data tables. Watch for sudden population changes. Give your students clues to help them figure out that the *Mysis* avoid the warm temperatures above the thermocline during the summer thus providing a safe haven for the Cladocera. However, when the thermocline breaks up in the fall, the Cladocera undergo a winter diapause (like a hibernation at the bottom). Help them notice that as a result it is by no coincidence the one species without a diapause (*D. longiremis*) has been wiped out by the superior predatory skills of the *Mysis* (better than its kokanee competition) and its lack of anywhere to run.
- 4) Invite a tribal professional from the Natural Resources’ Environmental Quality Division or Shoreline Protection Division to meet with your class to discuss the Tribes’ perspective on Bull Trout and the current status of the Flathead Lake ecosystem. Call 675-2700.

### **Further information**

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## References

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