Scenario A: *Return of the Clowns*
Scientific and Historical Background for the Teacher

The North American river otter (*Lutra canadensis*) was once found in riparian habitats and coastal areas in all of the continental United States and Canada. It is an aquatic member of the weasel family, with a long, slender body, short legs, webbing between the toes of all four of its wide feet, and thick dark brown fur. Fast and graceful swimmers, otters obtain their food from the water. They are the top carnivores in their habitats, preferring fish species that are slow and found in warm water such as sunfish, carp, suckers and minnows. Depending on the season and available supply, otters also feed on crawfish, frogs, snakes, snails, mussels, insects, muskrats and aquatic plants.

Even as adults, otters are curious and playful and are known as the "clowns of the stream." They wrestle with each other in the water as well as on land, and slide on their bellies on mud and snow.[1] Because they are secretive and mostly nocturnal, otter populations are frequently surveyed by researchers spotting their mud slides on embankments and characteristic latrine sites.

Valued for their thick fur coats, otters were subject to unrestricted trapping and hunting in the 1700's and 1800's. River otters are considered an indicator species of clean streams. Polluted water from acid mine drainage, untreated sewage and industrial wastes rendered hundreds of miles of streams in Pennsylvania and other states unsuitable as otter habitat because of poisoned or absent food supplies and biomagnification of toxins.[2] Loss of healthy riparian habitat as a result of land development also reduced the dwindling population of river otters. By 1952, river otters were added to the protected species list in Pennsylvania. At that time, the few otters remaining were only found in the Pocono Mountains region located in the northeastern portion of the Commonwealth.

Since the 1980's the Pennsylvania Game Commission, Wild Resource Conservation Fund, Penn State University and other partners have undertaken reintroduction of the river otter into river basins in the north central, central and western parts of the state. Hundreds of individuals were captured from the Poconos, Louisiana and Virginia and released into riparian habitat with clean water that supports fish and other aquatic species. [3] Ongoing monitoring indicates that the otter population in Pennsylvania is increasing and expanding, with migration occurring into watersheds adjacent to those where original restocking took place. Delaware, Maryland, New York, Virginia and West Virginia allow limited trapping as a means of managing and stabilizing their otter populations and providing income to resident trappers. The Pennsylvania Game Commission does not permit trapping at this time. [3]

B*iomagnification* is the "result of the process of bioaccumulation and biotransfer by which tissue concentrations of chemicals in organisms at one trophic level exceed tissue concentrations in organisms at the next lower trophic level in a food chain." (4) The *More is not Always Better* activity in Learning Experience #1 is a simple model of biomagnification of a persistent toxin such as methyl mercury as it travels through an aquatic food chain. The loss of energy to the environment from one trophic level to the next is usually assumed to be 90%, but this activity uses a transfer of 50% of calories and structural molecules, since there will be variables such as consumption of structural compounds by the next predator as well as loss of some of the molecules of toxin to the environment by excretion. We recommend the EPA web site for information regarding biomagnification through a food web and specific persistent toxins that occur in the air, soil and water. http://www.nlquery.epa.gov/eparesearch?/quesrytex.

Bibliography

[1] Chuck Fergus, Pennsylvania Game Commission, Wildlife Note-11, "River Otter," www.pgc.state.pa.us.

[2] National Wildlife Federation, 6/22/2011, Anne Bolen, "Weakening the Clean Water Act Would Be Otter Nonsense" from Wildlife Promise

[3] Pennsylvania Game Commission, www.pgc.state.pa.us.

[4] Environmental Protection Agency, 2010. Retrieved June 18, 2014 from http://www.nlquery.epa.gov/eparesearch?/quesrytex.

This project was funded in part by the U.S. EPA Environmental Education Program. Although this project was funded in part by the Environmental Protection Agency, it does not necessarily reflect the opinion or position of the EPA.