



Monitoring Persistent Contaminants at Grand Portage

Importance

Atmospheric deposition has contaminated national parks in the Great Lakes region with several potentially harmful metals and organic chemicals. Aquatic food webs are principal pathways for exposure of humans and wildlife to many toxic substances, and some contaminants can concentrate in food webs to levels that adversely affect health and reproduction. In particular, the deposition of mercury has exposed fish and wildlife in northeastern Minnesota to methylmercury, a highly toxic compound that can biomagnify to harmful levels in aquatic food webs.

This monitoring program is assessing contamination of aquatic food webs to identify water bodies where concentrations of measured contaminants may be harmful to fish, wildlife, or fish-eating humans, and to identify patterns and trends of contamination.

Status and Trends

Predatory fish (rainbow trout and creek chub), prey fish (central mudminnows, slimy sculpin, blacknose dace, and longnose dace), and larval dragonflies were collected in June 2009 from Poplar Creek (south branch), Grand Portage Creek (lower reach), and Snow Creek (beaver pond and lower reach). Biologists with the Grand Portage Band of Chippewa collected rainbow trout from two other streams (Reservation River and Hollow Rock Creek) in July 2009 and provided those for analysis. Muscle tissue (fillets) from the predatory fish is analyzed for mercury, lead, polychlorinated biphenyls (PCBs), the insecticide DDT (and its metabolites DDE and DDD), perfluorinated compounds (PFCs), and polybrominated diphenyl ethers (PBDEs). This group of contaminants accounts for most of the impairments of surface waters in the nine Great Lakes Network parks. Prey fish, which are important in the food-web transfer of methylmercury to predatory fish and wildlife (including bald eagles and common loons), are analyzed whole for mercury. Larval dragonflies, which are widespread predatory invertebrates, are being analyzed to assess their utility as biosentinels for assessing methylmercury contamination in fishless aquatic and wetland environments or in situations where sampling of fish is not logistically feasible.

Mercury concentrations in 20 rainbow trout fillets collected in 2009 were less than 0.1 part per million (ppm) wet weight. The U.S. Environmental Protection Agency criterion to protect the health of humans who eat noncommercial fish is 0.3 ppm wet weight. Concentrations of lead in composite samples of rainbow trout fillets averaged 13 parts per billion (ppb) wet weight and ranged from 4 to 23 ppb. DDT and its metabolites (DDD and DDE) were not detected. PCBs were not detected in 4 of 7 composite samples of rainbow trout fillets; the maximum concentration of total PCBs in the other three composite samples was 9.3 ppb wet weight. PBDEs were not detected in 5 of 7 composite samples of rainbow trout fillets; the maximum concentration of total PBDEs in the other two composite samples was 3.1 ppb wet weight.

Management Implications

The analyses of contaminants in edible fillets of rainbow trout will provide information useful for health-risk assessment and for providing fish consumption advice to persons who eat fish from streams in the park. The potential risk of the measured contaminants to fish and fish-eating wildlife will also be evaluated by comparing thresholds for adverse effects with concentrations of contaminants measured in fish. Financial support from the Great Lakes Restoration Initiative is allowing for annual sampling of the same four lakes in 2010, 2011, and 2012. After that time, sampling will occur every three years.



Grand Portage Creek.



Biologists use a backpack shocker and dip nets to collect small prey fish from Poplar Creek. Photo by Roger Haro.