

CONCLUSIONS AND RECOMMENDATIONS

Are fish safe to eat at the four lakes sampled on the Navajo Nation?

Based on the data available, the Navajo people can and should feel comfortable consuming fish on a recreational basis from Asaayi, Wheatfields, and Morgan Lakes (that is, at no more than 14 meals of fish per year). However, some fish in Red Lake may contain mercury at levels that may pose health risks to certain people who eat fish frequently – especially women of childbearing age, nursing mothers, infants and young children. Additionally, selenium concentrations in fish from Morgan Lake may also pose health risks to certain people who eat those fish frequently. To reduce exposure to these contaminants, individuals may want to consult the Navajo Nation and seek advice from doctors to help make choices about which fish to eat and how often to reduce any health risks.

Individual people and communities, as well as ecological systems, are subjected to many stressors. Most risk assessment calculations, including those used in this study, take a single-source–single-effect approach, thereby ignoring this complexity. In the final analysis, it will be important to consider not only the potential adverse effects of mercury, but also the potential nutritional benefits of fish consumption. There could be critical need by the local population for food security and traditional diet containing fish that warrant consideration. Any anticipated dietary composition changes by fish consumption advisories must be considered in light of the public health challenges faced by the Navajo community.

How can the human health risks be reduced?

The Navajo Nation has the primary responsibility for protecting their residents from the risks of eating contaminated fish. After reviewing the relative health risks and benefits of fish consumption, the Navajo Nation can issue fish consumption advisories for the general population (including for recreation or those that eat a lot of fish) or for sensitive subpopulations (such as pregnant women, nursing mothers, and children), or take no action. Fish consumption advisories are meant to inform people about unacceptable concentrations of chemical contaminants that have been found in local fish. They also can recommend limiting or avoiding consumption of certain fish species from specific waterbodies or, in some cases, identify those lakes where fish consumption would be considered beneficial.

One of the most important techniques to manage human health risks is to identify those whose diets contain a large portion of fish and communicate any risks posed by mercury or other contaminants to them while considering the nutritional role fish plays in their diet.

What about mercury in the air?

Although most of the largest and most direct sources of mercury releases to water and air have been regulated in the U.S., the levels of mercury in fish continue to be a concern. The Navajo Nation may want to monitor atmospheric depositions of mercury onto the Navajo Nation's land and water. Over time, the Navajo Nation, along with others, may need to establish effective source control and management programs to reduce the widespread

mercury contamination of their aquatic environments. Such actions could eventually reduce mercury contamination so that fish consumption advisories can be removed, but this process could take decades, and would need to be an effort coordinated with others.

How can bioaccumulation of mercury in lakes and wetlands be reduced?

Pollution prevention is one of the most effective means of reducing fish contamination, therefore it is important to identify any sources and their magnitudes, so that they can be better managed or reduced. For instance, methylmercury concentrations were highest in the southern portion of the Red Lake and further reconnaissance of this portion of the lake may be warranted. If necessary, oxygenation, increasing the pH, riparian shading, excavation, sulfate reduction, flood peak minimization, vegetative uplands, riparian filter strips, increased filtration, species management, and recreational fisheries management may alter the forms and bioavailability of mercury and thereby reduce the mercury burden within fish.

What about other contaminants of concern and protective water quality criteria?

Water quality criteria for aluminum developed for waters of the Navajo Nation may need to consider exposure to aluminum particles in the development of a site-specific standard for aluminum in certain recreational lakes. Selenium contamination within Morgan Lake may be reducing the reproductive success of fish and wildlife. The sources of this selenium contamination should be identified and if necessary, protective water quality criteria could be designed in order to reduce the potential population impacts to fish and wildlife residing at Morgan Lake. Current Navajo Nation water quality criteria do not consider the pathway of consumption of mercury in fish to predatory wildlife, and therefore the aquatic life criteria for mercury may not be fully protective of wildlife. Criteria to protect piscivorous birds and mammals from mercury toxicity through fish consumption are warranted. It is also important to note that other environmental contaminants, such as polychlorinated biphenyl compounds and organochlorine pesticides, were not quantified in the fish collected, and these contaminants could present additional hazards to people and wildlife. An additional fish tissue quality-monitoring program that includes these contaminants is recommended.

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