

HEALTH CONSULTATION

Evaluation of Mercury in Trout and White Fish From Lake Pend Oreille, Idaho

Bonner County, Idaho

Prepared by

**Idaho Department of Health and Welfare
Division of Health
Bureau of Community and Environmental Health
Under Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry**

Summary

As part of a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR), the Bureau of Community and Environmental Health (BCEH), Division of Health, Idaho Department of Health and Welfare (IDHW), prepared this health consultation to evaluate the potential health effects from exposure to mercury in Lake Pend Oreille fish. The State of Montana has a fish advisory for mercury contamination in Flathead Lake, which is upstream of Lake Pend Oreille. Over 90% of the water in Lake Pend Oreille flows from Flathead Lake and other lakes/reservoirs in Montana through the Clark Fork River. The Idaho Department of Fish and Game (IDFG) collected fish samples from Lake Pend Oreille to better understand the mercury contamination in the lake fish and any potential human health effects from eating the fish.

The majority of mercury in fish is methylmercury. Exposure to methylmercury is more dangerous for young children than for adults because methylmercury more easily passes into the developing brain of young children and may interfere with the developmental process. Critical periods of neonatal development and the early months after birth are times that are particularly sensitive to the harmful effects of methylmercury on the nervous system. Methylmercury can accumulate in fetal blood to concentrations higher than in the mother. Mothers who are exposed to methylmercury and breastfeed their infant may also expose the child through breast milk.

Based upon the available fish tissue data for mercury and other available information, BCEH has drawn the following conclusions and recommendations:

Conclusions:

1. For occasional fish consumers who only eat one meal (4-oz for children, 8-oz for adult) per month of trout or white fish from Lake Pend Oreille, the exposure to mercury in fish is a *no apparent public health hazard* according to ATSDR's public health hazard categories (Appendix C).
2. A *public health hazard* may exist for children, pregnant women, and general public who eat more than eight meals per month (two meals per week) of trout or white fish from Lake Pend Oreille.

Recommendations:

BCEH should issue a fish advisory for trout and white fish caught in Lake Pend Oreille based on the evaluation in this health consultation. BCEH should work with IDFG to post and distribute the fish advisory. Efforts should also be made by BCEH to educate the fishing community on the health implications of fish consumption. The advisory will include the following:

1. Children (6 year old or younger) should not eat more than one 4-oz meal per month of trout or two 4-oz meals per month of white fish from Lake Pend Oreille.
2. Pregnant women, including women planning to become pregnant, and nursing mothers, should not eat more than two 8-oz meals per month of trout or four 8-oz meals per month of white fish from Lake Pend Oreille.
3. General public should not eat more than three 8-oz meals per month of trout or four 8-oz meals per month of white fish from Lake Pend Oreille.

4. Do not eat other fish including commercial fish in the same month if you eat up to the recommended limit of trout or white fish from Lake Pend Oreille, since all fish contain various levels of mercury. To find the level of mercury in common commercially available fish, please check the national fish advisory (<http://www.epa.gov/waterscience/fishadvice/advice.html>).
5. People should eat smaller, younger fish. Typically, the bigger or older the fish, the higher the mercury concentration in the fish fillet.

Purpose

The Bureau of Community and Environmental Health (BCEH), Division of Health, Idaho Department of Health and Welfare (IDHW) has a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR) to conduct public health assessments and consultations for hazardous waste sites in Idaho.

In 2004, the Idaho Department of Fish and Game (IDFG) collected trout and white fish samples from Lake Pend Oreille for mercury analysis in fish tissue. As part of the cooperative agreement with ATSDR, BCEH prepared this health consultation to evaluate the potential adverse health effects associated with the consumption of fish from Lake Pend Oreille.

Background and Statement of Issue

Lake Pend Oreille, the fifth largest natural freshwater lake in the United States, and Idaho's largest lake, is located in Bonner County, Idaho (Appendix A, Figure A-1). The deepest part of the lake is 1200 feet and the lake has over 100 miles of shoreline. Fishing, waterskiing, sailing and windsurfing are all popular sports on the lake.

The State of Montana has a fish advisory for mercury contamination in Flathead Lake, which is upstream of Lake Pend Oreille. Over 90% of the water in Lake Pend Oreille (Appendix A, Figure A-1) comes from the watershed of Flathead Lake and other lakes/reservoirs in Montana through the Clark Fork River (Personal communication: Chris Downs, fishery biologist, IDFG, phone, Feb. 18, 2005). Local fishermen expressed concern to IDFG about possible mercury contamination in Lake Pend Oreille fish. However, there were no mercury concentration data available for Lake Pend Oreille fish. After consulting with the Idaho Fish Consumption Advisory Program (IFCAP), the IDFG collected 14 trout and 15 white fish samples in February and March 2004 to better understand the mercury contamination in the fish of Lake Pend Oreille and any potential health effects from eating the fish. Whole fish samples were sent to IDHW's Bureau of Laboratories for tissue analysis. Fish samples were processed and analyzed for mercury concentrations in the fillets or meat. Sampling and analysis protocol developed by IFCAP (BCEH 2004) were followed.

Mercury occurs naturally as a mineral and is distributed throughout the environment by both natural processes and human activities. The natural global bio-geochemical cycling of mercury is characterized by evaporation of mercury from soils and surface waters, followed by atmospheric transport, deposition of mercury back to land and surface water, and sorption of the compound to soil or sediment particulates. Mercury deposited on land and open water is in part re-volatilized back into the atmosphere. This emission, deposition, and re-volatilization create difficulties in tracing the movement of mercury to its sources. Major human activities which release mercury to the environment include mining and smelting; industrial processes involving the use of mercury, including chlor-alkali production facilities; combustion of fossil fuels, primarily coal; production of cement; and medical and municipal waste incinerators and industrial/commercial boilers (EPA 1996).

Members of the general public with potentially high exposures to mercury include individuals who live in proximity to former mercury mining or production sites, secondary production

(recycling) facilities, municipal or medical incinerators, or coal-fired power plants. Some people may be exposed to higher levels of mercury in the form of methylmercury if they have a diet high in fish, shellfish, or marine mammals that come from mercury-contaminated waters. Methylmercury accumulates up the food chain, so that fish at the top of the food chain will have the most mercury in their meat. Of these fish, the biggest fish will have the highest levels of mercury (ATSDR 1999).

Discussion

Mercury Concentrations in Fish

Mercury was analyzed in 14 trout samples and 15 white fish samples collected from Lake Pend Oreille by IDFG in February and March 2004. The body weight of sampled trout ranged from 1.46 kilogram (kg) to 5.90 kg and the sampled white fish ranged from 0.52 kg to 0.94 kg (Appendix B, Table B-1). The range and the geometric mean of the mercury concentrations in the fish fillet are reported in Table 1. The geometric means of mercury concentrations in trout and white fish were 0.421 and 0.264 milligram per kilogram (mg/kg), respectively.

Table 1. Levels of Mercury Found in Fish Fillet from Lake Pend Oreille

| Fish Species | Number of Samples | Body Weight | | Mercury Concentration (mg/kg) | |
|--------------|-------------------|-------------|----------|-------------------------------|----------------|
| | | (kg) | (pound) | Range | Geometric Mean |
| Trout | 14 | 1.46-5.90 | 3.2-13.0 | 0.285-0.930 | 0.421 |
| White Fish | 15 | 0.52-0.94 | 1.1-2.1 | 0.163-0.354 | 0.264 |

Methylmercury constitutes over 99% of the total mercury detected in fish muscle tissue (fillet), with no detection of inorganic or dimethylmercury (Grieb et al. 1990; Bloom 1992). BCEH conservatively assumed that the total mercury values reported here (Table 1) to be all methylmercury. Methylmercury is the form of mercury most easily absorbed through the gastrointestinal tract (about 95% absorbed). Therefore, BCEH also assumed that the bioavailability of total mercury in fish were 100%.

Exposure Pathway

To determine whether people are exposed to mercury, BCEH considered five elements: the source of contamination; the movement of the contaminants in soil, air or water; the point at which people can come in contact with the contaminants; the routes of exposure (such as eating contaminated fish); and the population that can potentially be exposed. All five elements must be present for an exposure pathway to be complete.

Exposure pathways are classified as a completed pathway, a potential pathway, or an eliminated pathway. If a pathway is complete, exposure is reasonably likely to have occurred in the past, is currently occurring, or is likely to occur in the future. If a potential pathway exists, exposure might have occurred, may be occurring, or may yet occur. A pathway is eliminated from further analysis when one of the five elements is missing and will never be present, or when no contaminant of concern can be identified.

Based on the exposure pathway analysis and environmental data, people are likely exposed to elevated levels of mercury through consumption of fish from Lake Pend Oreille. This constitutes a completed exposure pathway.

Exposure Assumption

The amount of fish eaten by people can vary widely depending on their age, sex, lifestyle, health status, and other factors. To estimate the exposure dose for different lifestyles (occasional fish consumers, recreational fish consumers, contemporary tribal subsistence fish consumers, and traditional tribal subsistence fish consumers), BCEH applied different fish consumption rates (one meal per month, two meals per week, one meal per day, and two meals per day, which responds to 7.5, 64.8, 227, and 454 grams per day respectively for the general public) (Table 2).

Based on IFCAP protocol (BCEH 2004), BCEH applied a body weight of 20, 70, and 80 kg for children (6 years old or younger), pregnant women (including women planning to become pregnant, and nursing mothers), and general public, respectively. The meal size of uncooked fish fillet used was 4 ounce (oz) for children and 8 oz for adults (Table 2).

Table 2. General Risk Assessment Assumptions for Estimation of Mercury Exposure Doses

| Population | | Children ^a | Pregnant Women ^b | General Public |
|--------------------------------------|--|-----------------------|-----------------------------|----------------|
| Body Weight ^c | (kg) | 20 | 70 | 80 |
| | (pound) | 44 | 154 | 176 |
| Meal Size Uncooked (oz) ^d | | 4 | 8 | 8 |
| Fish Ingestion Rate | Occasional Fish Consumer | One meal per month | | |
| | Recreational Fish Consumer | Two meals per week | | |
| | Contemporary Subsistence Fish Consumer | One meal per day | | |
| | Traditional Subsistence Fish Consumer | Two meals per day | | |

a: children 6 years old or younger

b: pregnant women, women planning to become pregnant, and nursing mothers

c: adjusted from Idaho Behavioral Risk Factors (BVRHS 2001)

d: 1 oz = 0.0283 kg; 4 oz = 0.1134 kg; 8 oz = 0.2268 kg

Public Health Implications

BCEH used the following equation to calculate the exposure dose of mercury from eating fish for each ingestion category:

$$EED = \frac{Conc \times IR}{BW}$$

Where,

EED: Estimated Exposure Dose (mg/kg/day)
Conc: Geometric Mean of Mercury Concentration in Fish (mg/kg)
IR: Ingestion Rate of Fish (kg/day)
BW: Body Weight (kg)

ATSDR has developed a chronic oral minimal risk level (MRL) of 0.0003 milligram per kilogram per day (mg/kg/day) for methylmercury (ATSDR 1999). The U.S. Environmental Protection Agency (EPA) derived an oral reference dose (RfD) of 0.0001 mg/kg/day for methylmercury.

ATSDR's MRL is based on the Seychelles Child Development Study of over 700 mother-infant pairs in the Seychelles Islands. This population eats a large quantity and variety of fish, with 12 fish meals/week being typical. Developing fetuses were exposed *in utero* through maternal fish ingestion during pregnancy. Newborn children continued to be exposed during breastfeeding and after their shift to a fish diet (ATSDR 1999). In the 66-month evaluation period of the Seychelles study, several developmental tests were conducted. None of these indicated adverse effects of methylmercury exposure. The study also mentioned positive benefits of the fish diet. ATSDR derived a no-observed-adverse-effect level (NOAEL) of 0.0013 mg/kg/day from the highest exposure group in this study. The MRL was derived by applying an uncertainty factor of 3 for human variability and a modifying factor of 1.5 to account for the specific findings in the Faroe Islands study (ATSDR 1999).

EPA's methylmercury RfD is based on a benchmark dose analysis of developmental and neurological impairment. The RfD and the MRL differ by a factor of three, but they are in the same concentration range. Although derived by different methods, the RfD and the MRL are both relevant to Lake Pend Oreille, especially given concerns about preventing adverse fetal and infant exposures to methylmercury.

Based on the average mercury concentration of 0.421 mg/kg in trout from Lake Pend Oreille, only the estimated exposure doses of mercury for occasional fish consumers (one meal per month), including children, pregnant women, and the general public, were below ATSDR's MRL (0.0003mg/kg/day) and EPA's RfD (0.0001 mg/kg/day). For recreational (two meals per week), contemporary subsistence (one meal per day), and traditional subsistence fish consumers (two meals per day), the estimated exposure doses of mercury from eating trout were all above ATSDR's MRL and EPA's RfD (Table 3).

The geometric mean of mercury concentrations in white fish was 0.264 mg/kg. For occasional fish consumers (one meal per month), the estimated exposure doses of mercury were all below the MRL and RfD. For contemporary subsistence fish consumers (one meal per day) and traditional subsistence fish consumers (two meals per day), the estimated exposure doses of mercury were all above both the MRL and RfD. For recreational fish consumers (two meals per week), the estimated exposure dose of mercury for children was above the MRL and RfD, while the estimated exposure doses for pregnant women and the general public were above the RfD but the below MRL (Table 3).

Table 3. Estimated Exposure Doses (mg/kg/day) of Mercury from Eating Fish

| Fish Species | Mercury Concentration in Fillet (mg/kg) | Life Style | Children^a Exposure Dose | Above RfD/MRL | Pregnant Women^b Exposure Dose | Above RfD/MRL | General Public Exposure Dose | Above RfD/MRL |
|---------------------|--|--|---|------------------------|---|---------------------------|-------------------------------------|----------------------|
| Trout | 0.421 | Traditional Subsistence Fish Consumer | 0.004774 | Yes^c | 0.002728 | Yes | 0.002387 | Yes |
| | 0.421 | Contemporary Subsistence Fish Consumer | 0.002387 | Yes | 0.001364 | Yes | 0.001194 | Yes |
| | 0.421 | Recreational Fish Consumer | 0.000682 | Yes | 0.000390 | Yes | 0.000341 | Yes |
| | 0.421 | Occasional Fish Consumer | 0.000078 | No^c | 0.000045 | No | 0.000039 | No |
| White Fish | 0.264 | Traditional Subsistence Fish Consumer | 0.002994 | Yes | 0.001711 | Yes | 0.001497 | Yes |
| | 0.264 | Contemporary Subsistence Fish Consumer | 0.001497 | Yes | 0.000855 | Yes | 0.000748 | Yes |
| | 0.264 | Recreational Fish Consumer | 0.000428 | Yes | 0.000244 | Yes/No^c | 0.000214 | Yes/No |
| | 0.264 | Occasional Fish Consumer | 0.000049 | No | 0.000028 | No | 0.000025 | No |

a: children 6 years old or younger

b: pregnant women, women planning to become pregnant, and nursing mothers

c: A single yes indicated that the respective estimated exposure dose was above the MRL (0.0003 mg/kg/day) and the RfD (0.0001 mg/kg/day). A single no indicated that the respective estimated exposure dose was below the RfD and the MRL. Yes/no indicated exposure doses were above the RfD and below the MRL.

The above discussion indicated that adverse health effects could result from exposures to mercury in fish from Lake Pend Oreille for recreational (two meals per week), contemporary subsistence (one meal per day), and traditional subsistence fish consumers (two meals per day), including children, pregnant women and general public.

ATSDR Child Health Concerns

Children differ from adults in their physiology (e.g., respiratory rates relative to body weight), pharmacokinetics (i.e., distribution, absorption, metabolism, and excretion of chemicals), and pharmacodynamics (i.e., susceptibility of an organ to the exposure). Therefore, it is always important to address chemical exposures of these sensitive populations. Infants and children may be more vulnerable to the toxic effects of chemicals for the following reasons:

- 1) children are more likely to play outdoors and bring food into contaminated areas;
- 2) children are closer to the ground (shorter), resulting in a greater likelihood to breathe dust, soil, and heavy vapors laying on the ground;
- 3) children weigh less, resulting in higher doses of chemical exposure per body weight; and
- 4) children's developing body systems can sustain permanent damage if toxic exposures occur during critical growth stages.

Critical periods of neonatal development and the early months after birth are times that are particularly sensitive to the harmful effects of methylmercury on the nervous system. Exposure to methylmercury is more dangerous for young children than for adults because methylmercury more easily passes into the developing brain of young children and may interfere with the development process (ATSDR 1999). Methylmercury can accumulate in fetal blood to concentrations higher than in the mother. Mothers who are exposed to methylmercury and breastfeed their infant may also expose the child through breast milk. Abnormal heart rhythms have been seen in children who ate grains contaminated with very high levels of methylmercury. Methylmercury that enters the body can be converted to inorganic mercury and result in kidney damage.

Consumption Advisory for Fish from Lake Pend Oreille

Fish are an excellent protein source and are associated with reduced risk of coronary heart disease. The benefits of eating fish have been associated with omega-3 fatty acids. Saturated fats are linked with increased cholesterol levels and risks of heart disease. Fish also provide a good source of some vitamins and minerals.

To get the benefits of eating fish while limiting any adverse health effects from the mercury contamination in fish from Lake Pend Oreille, BCEH calculated the recommended meals per month people could safely eat using the following equation.

$$\text{Meals / Month} = \frac{\frac{RfD \times BW}{Conc} \times 30.44 \text{days / mo}}{MS}$$

where,

RfD: Reference Dose for methylmercury (0.0001 mg/kg/day)

BW: Body Weight (kg)

Conc: Fish tissue mercury concentration (mg/kg)

days/mo: Days per month

MS: Meal Size (kg)

The calculated limited meals for children, pregnant women and general public are listed in Table 4. Children (6 year old or younger) should eat no more than one 4-oz meal per month of trout or two 4-oz meals per month of white fish from Lake Pend Oreille. Pregnant women (as well as women planning to become pregnant, and nursing mothers) should eat no more than two 8-oz meals per month of trout or four 8-oz meals per month of white fish from Lake Pend Oreille. General public should eat no more than three 8-oz meals per month of trout or four 8-oz meals per month of white fish from Lake Pend Oreille.

Table 4. Fish Advisory for Lake Pend Oreille

| Species | Mercury Concentration (mg/kg) | | Limited Meals | | |
|------------|-------------------------------|----------------|--------------------------|-----------------------------|-----------------------------|
| | Range | Geometric Mean | Children ^a | Pregnant Women ^b | General Public ^c |
| Trout | 0.285-0.930 | 0.421 | One 4-oz meal per month | Two 8-oz meals per month | Three 8-oz meals per month |
| White Fish | 0.163-0.354 | 0.264 | Two 4-oz meals per month | Four 8-oz meals per month | Four 8-oz meals per month |

a: children 6 years old or younger (body weight of 20 kg)

b: pregnant women, women planning to become pregnant, and nursing mothers (body weight of 70 kg)

c: general public (body weight of 80 kg)

Conclusions

1. Using ATSDR's public health hazard categories (Appendix C) and available fish mercury data, BCEH concludes that *no apparent public health hazard* exists for occasional fish consumers who only eat one meal (4 oz for children, 8 oz for adult) per month of trout or white fish from Lake Pend Oreille.
2. A *public health hazard* may exist for children, pregnant women, and general public who eat more than eight meals per month (two meals per week) of trout or white fish from Lake Pend Oreille.

Recommendations

BCEH should issue a fish advisory for trout and white fish caught in Lake Pend Oreille based on the evaluation in this health consultation. BCEH should work with IDFG to post and distribute the fish advisory. Efforts should also be made by BCEH to educate the fishing community on the health implications of fish consumption. The advisory will include the following:

1. Children (6 year old or younger) should not eat more than one 4-oz meal per month of trout or two 4-oz meals per month of white fish from Lake Pend Oreille.
2. Pregnant women, including women planning to become pregnant, and nursing mothers, should not eat more than two 8-oz meals per month of trout or four 8-oz meals per month of white fish from Lake Pend Oreille.
3. General public should not eat more than three 8-oz meals per month of trout or four 8-oz meals per month of white fish from Lake Pend Oreille.
4. Do not eat other fish including commercial fish in the same month if you eat up to the recommended limit of trout or white fish from Lake Pend Oreille, since all fish contain various levels of mercury. To find the level of mercury in common commercially available fish, please check the national fish advisory (<http://www.epa.gov/waterscience/fishadvice/advice.html>).
5. People should eat smaller, younger fish. Typically, the bigger or older the fish, the higher the mercury concentration in the fish fillet.

Public Health Action Plan

BCEH will provide fish consumption advisory information to the public around the Lake Pend Oreille area.

References

- [ATSDR] Agency for Toxic Substances and Disease Registry. 1999. Toxicological profile for mercury. Atlanta: US Department of Health and Human Services. Available at URL: <http://www.atsdr.cdc.gov/toxprofiles/tp46.html>.
- [BCEH] Bureau of Community and Environmental Health. 2004. Idaho Fish Consumption Advisory Program protocol. Boise: Idaho Department of Health and Welfare.
- Bloom NS. 1992. On the chemical form of mercury in edible fish and marine invertebrate tissue. *Can J Fish Aquat Sci* 49(5): 1010-1017.
- [BVRHS] Bureau of Vital Records and Health Statistics. 2001. Idaho Behavioral Risk Factors. Boise: Idaho Department of Health and Welfare.
- [EPA] US Environmental Protection Agency. 1996. Mercury study report to Congress- Volume II: An inventory of anthropogenic mercury emissions in the United States. Washington, DC: US Environmental Protection Agency. EPA452/R-96-001b.
- Grieb TM, Driscoll CT, Gloss SP, et al. 1990. Factors affecting mercury accumulation in fish in the upper Michigan peninsula. *Environ Toxicol Chem* 9: 919-930.

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Certification

This Lake Pend Oreille, Idaho, Health Consultation was prepared by the Idaho Bureau of Community and Environmental Health under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodologies and procedures existing at the time the health consultation was initiated. Editorial review was completed by the Cooperative Agreement partner.

Technical Project Officer, CAT, SPAB, DHAC

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.

Team Lead, CAT, SPAB, DHAC, ATSDR

Appendix A

Map of Lake Pend Oreille

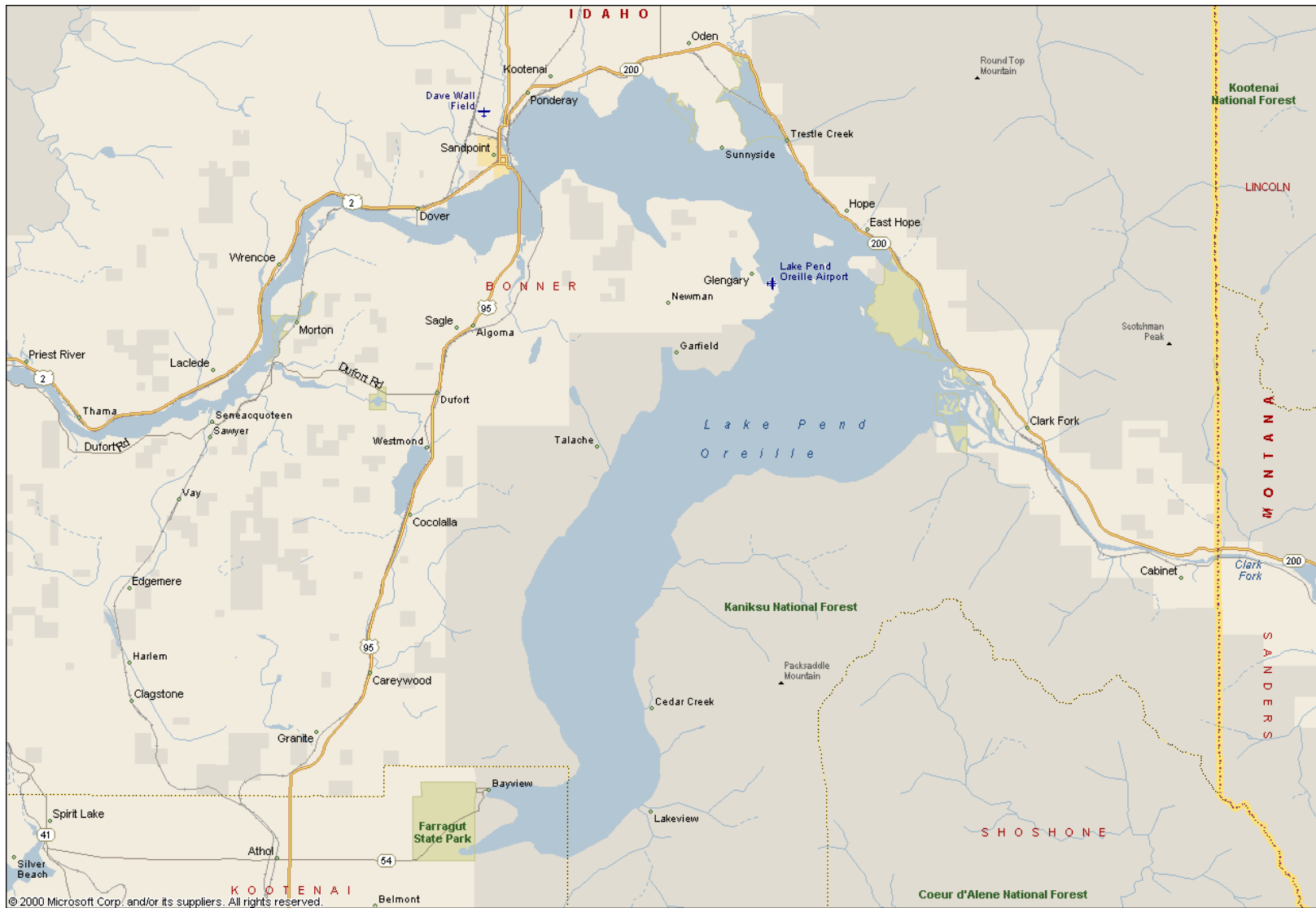


Figure A-1. Map of Lake Pend Oreille, Idaho

Appendix B

Fish Mercury Concentration Data from Lake Pend Oreille

Table B-1 Fish Mercury Concentration Data from Lake Pend Oreille

| Species | Body Length (cm) | Body Weight (kg) | Sample Site | Sampling Date | Concentration (mg/kg) |
|----------------|-------------------------|-------------------------|--------------------|----------------------|------------------------------|
| Trout | 56 | 2.27 | Anderson Pt | 3/11/2004 | 0.930 |
| Trout | 84 | 5.90 | Garfield Bay | 3/11/2004 | 0.568 |
| Trout | 80 | 4.99 | Anderson Pt | 3/18/2004 | 0.547 |
| Trout | 73 | 4.31 | Whiskey Rock | 3/16/2004 | 0.538 |
| Trout | 79 | 4.78 | Warren Isl | 2/26/2004 | 0.424 |
| Trout | 68 | 3.40 | Garfield Bay | 3/11/2004 | 0.411 |
| Trout | 42 | 1.46 | | 2/26/2004 | 0.409 |
| Trout | 76 | 4.31 | Garfield | 3/11/2004 | 0.406 |
| Trout | 73 | 4.31 | Warren Isl | 3/18/2004 | 0.356 |
| Trout | 63 | 2.81 | Anderson Pt | 3/11/2004 | 0.343 |
| Trout | 70 | 3.74 | Anserson Pt | 3/18/2004 | 0.342 |
| Trout | 57 | 2.95 | Anderson Pt | 3/11/2004 | 0.328 |
| Trout | 55 | 2.27 | Warren Isl | 3/18/2004 | 0.308 |
| Trout | 69.2 | 2.82 | | 2/26/2004 | 0.285 |
| White Fish | 45.2 | 0.82 | | 3/25/2004 | 0.354 |
| White Fish | 44 | 0.78 | | | 0.332 |
| White Fish | 46.1 | 0.86 | | | 0.307 |
| White Fish | 44 | 0.69 | Garfield Bay | 3/11/2004 | 0.302 |
| White Fish | 45.4 | 0.84 | | 3/25/2004 | 0.300 |
| White Fish | 43.5 | 0.80 | | 3/25/2004 | 0.299 |
| White Fish | 42.1 | 0.66 | Idlewilde Bay | 3/30/2004 | 0.280 |
| White Fish | 45.2 | 0.72 | | 3/25/2004 | 0.269 |
| White Fish | 45 | 0.78 | Idlewilde Bay | 3/30/2004 | 0.261 |
| White Fish | 42.3 | 0.60 | Idlewilde Bay | 3/30/2004 | 0.259 |
| White Fish | 46.2 | 0.80 | Idlewilde Bay | 3/30/2004 | 0.250 |
| White Fish | 47.9 | 0.86 | Idlewilde Bay | 3/30/2004 | 0.245 |
| White Fish | 48.3 | 0.94 | | 3/25/2004 | 0.208 |
| White Fish | 44.6 | 0.80 | Idlewilde Bay | 3/30/2004 | 0.199 |
| White Fish | 39 | 0.52 | Idlewilde Bay | 3/30/2004 | 0.163 |

Appendix C

ATSDR Interim Public Health Hazard Categories

Table C-1. Interim Public Health Hazard Categories

| CATEGORY/DEFINITION | DATA SUFFICIENCY | CRITERIA |
|---|--|---|
| <p>Urgent Public Health Hazard</p> <p>This category is used for sites where short-term exposures (<1year) to hazardous substances or conditions could result in adverse health effects that require rapid intervention.</p> | <p>This determination represents a professional judgment that is based on critical data, which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.</p> | <p>Evaluation of available relevant information* indicated that site-specific conditions or likely exposures have had, are having, or are likely to have in the future, an adverse effect on human health that requires immediate action or intervention. Such site-specific conditions or exposures may include the pre of serious physical or safety hazards.</p> |
| <p>Public Health Hazard</p> <p>This category is used for sites that pose a public health hazard due to the existence of long-term exposure (>1year) to hazardous substance or conditions that could result in adverse health effects.</p> | <p>This determination represents a professional judgment that is based on critical data, which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.</p> | <p>Evaluation of available relevant information* suggests that, under site-specific conditions of exposure, long-term exposures to site-specific contaminants (including radionuclides) have had, are having, or are likely to have in the future, an adverse effect on human health that requires one of more public health interventions. Such site-specific exposures may include the presence of serious physical or safety hazards.</p> |
| <p>Indeterminate Public Health Hazard</p> <p>This category is used for sites in which “critical” data are insufficient with regard to extent of exposure and/or toxicological properties at estimated exposure levels.</p> | <p>This determination represents a professional judgment that critical data are missing and ATSDR has judged the data are insufficient to support a decision. This does not necessarily imply all data are incomplete; but that some additional data are required to support a decision.</p> | <p>The health assessor must determine, using professional judgment, the “criticality” of such data and the likelihood that the data can be obtained and will be obtained in a timely manner. Where some data are available, even limited data, the health assessor is encouraged to the extent possible to select other hazard categories and to support their decision with clear narrative that explains the limits of the data and the rationale for the decision.</p> |
| <p>No Apparent Public Health Hazard</p> <p>This category is used for sites where human exposure to contaminated media may be occurring, may have occurred in the past, and/or may occur in the future, but the exposure is not expected to cause any adverse health effects.</p> | <p>This determination represents a professional judgment that is based on critical data, which ATSDR considers sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.</p> | <p>Evaluation of available relevant information* indicates that, under site-specific conditions of exposure, exposures, exposure to site-specific contaminants in the past, present, or future are not likely to result in any adverse impact on human health.</p> |
| <p>No Public Health Hazard</p> <p>This category is used for sites that, because of the absence of exposure, do NOT pose a public health hazard.</p> | <p>Sufficient evidence indicates that no human exposures to contaminated media have occurred, none are now occurring, and none are likely to occur in the future.</p> | |

* Such as environmental and demographic data; health outcome data; community health concerns information; toxicological, medical, and epidemiological data; monitoring and management plan