Cardno ENTRIX
Shaping the Future

Mercury in Woods Creek Lake Fish

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March 20, 2012

Woods Creek Watershed Committee

Crystal Lake, Illinois

Outline

- Why we care about mercury in fish
- How Woods Creek Lake fish compare
- Potential mercury sources for Woods Creek
- Project ideas for Woods Creek Watershed Management Plan

Why we care about mercury in fish

Mercury poisoning from eating fish is called Minamata Disease

- Minamata, Japan 1956
- Niigata, Japan 1965
- Dryden and Kenora, Ontario, Canada 1970
- Waswanipi, Quebec, Canada 1971
- Alamogordo, New Mexico, 1969*

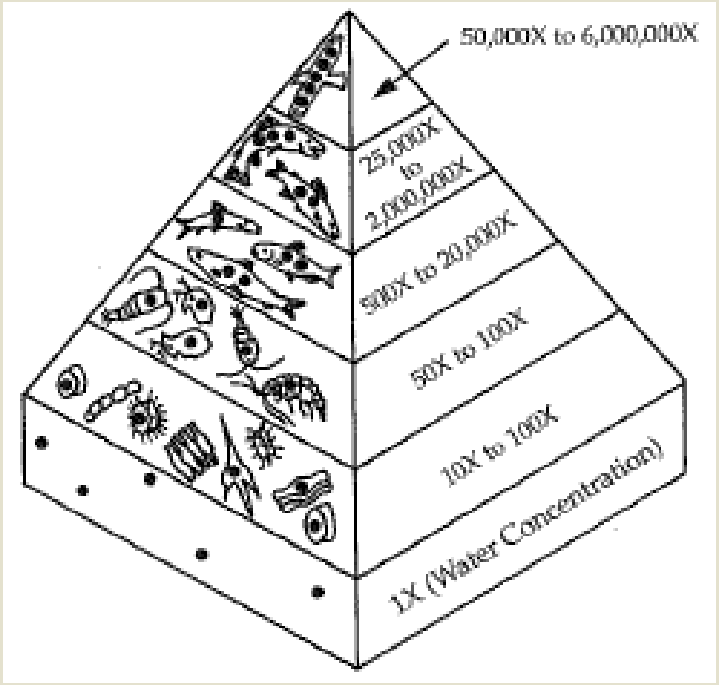
Illinois uses a Fish Consumption Advisory program to prevent Minamata Disease

Advisory	Men, Youth > 15, Women past child-bearing age	Children ≤ 15 yrs & Women of child-bearing age
Unlimited	≤ 0.15 mg/kg	≤ 0.05 mg/kg
1 meal per Week	0.16 to 0.65 mg/kg	0.06 to 0.22 mg/kg
1 meal per Month	0.66 to 0.99 mg/kg	0.23 to 0.99 mg/kg
Do Not Consume	≥ 1.00 mg/kg	≥ 1.00 mg/kg

Statewide advisory of one meal per week of predatory fish for women of child-bearing age and children

Summary of why Mercury is a Concern

- Persistent – can't destroy it; must manage it
- Binds to proteins & Biomagnifies in food webs
- Neurotoxin that affects babies & children



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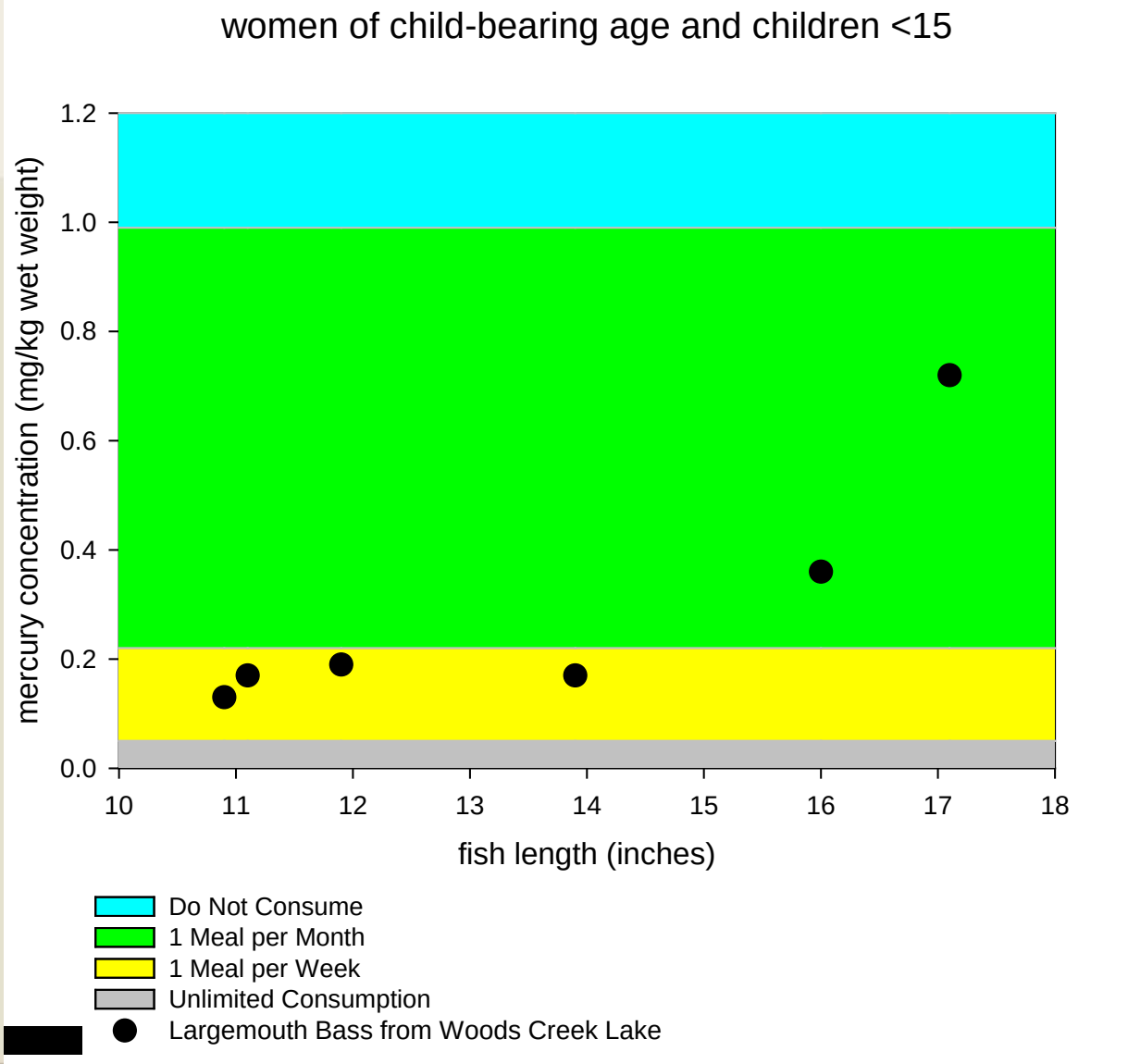
Woods Creek Lake Fish and Illinois FCA



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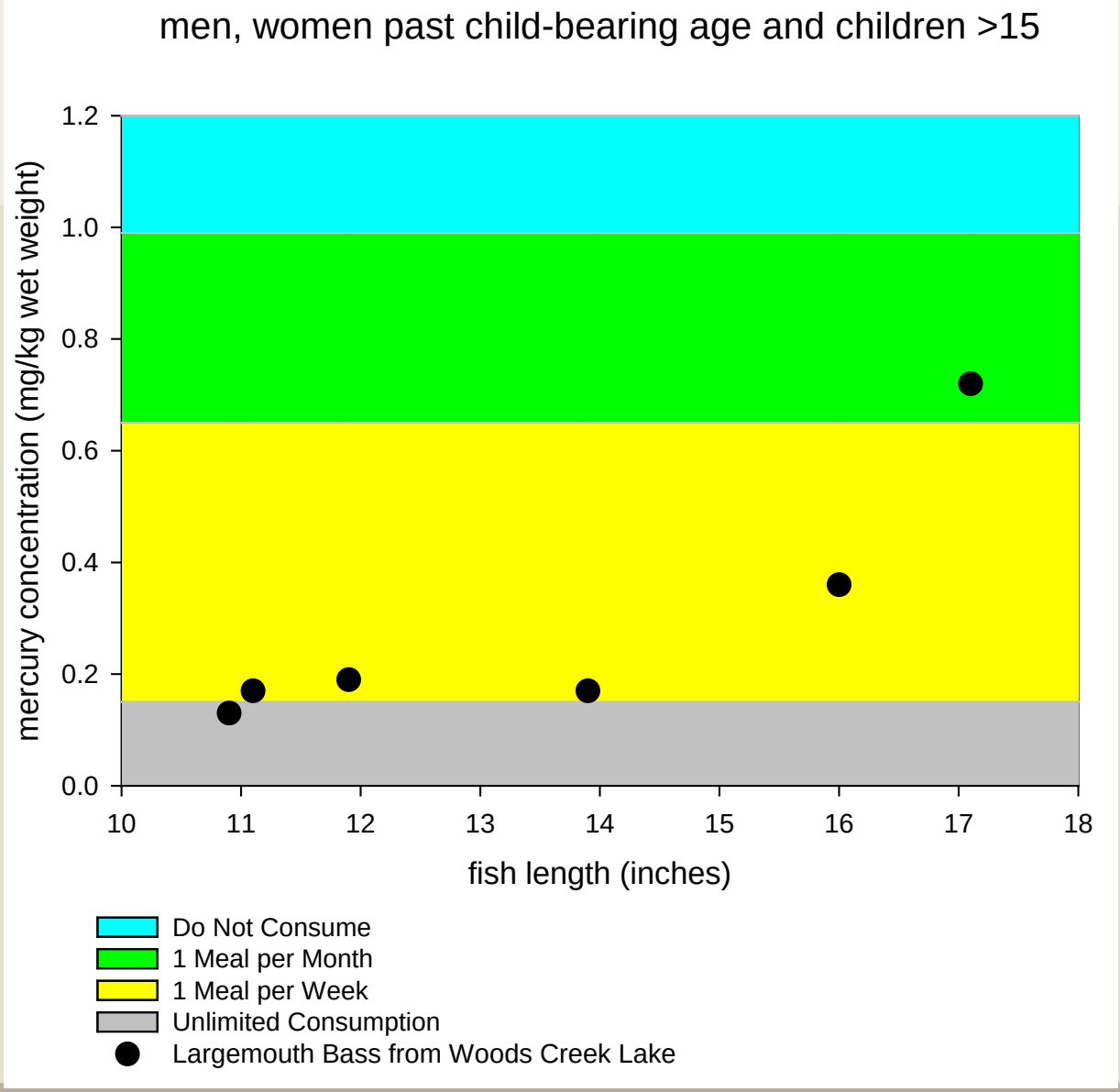
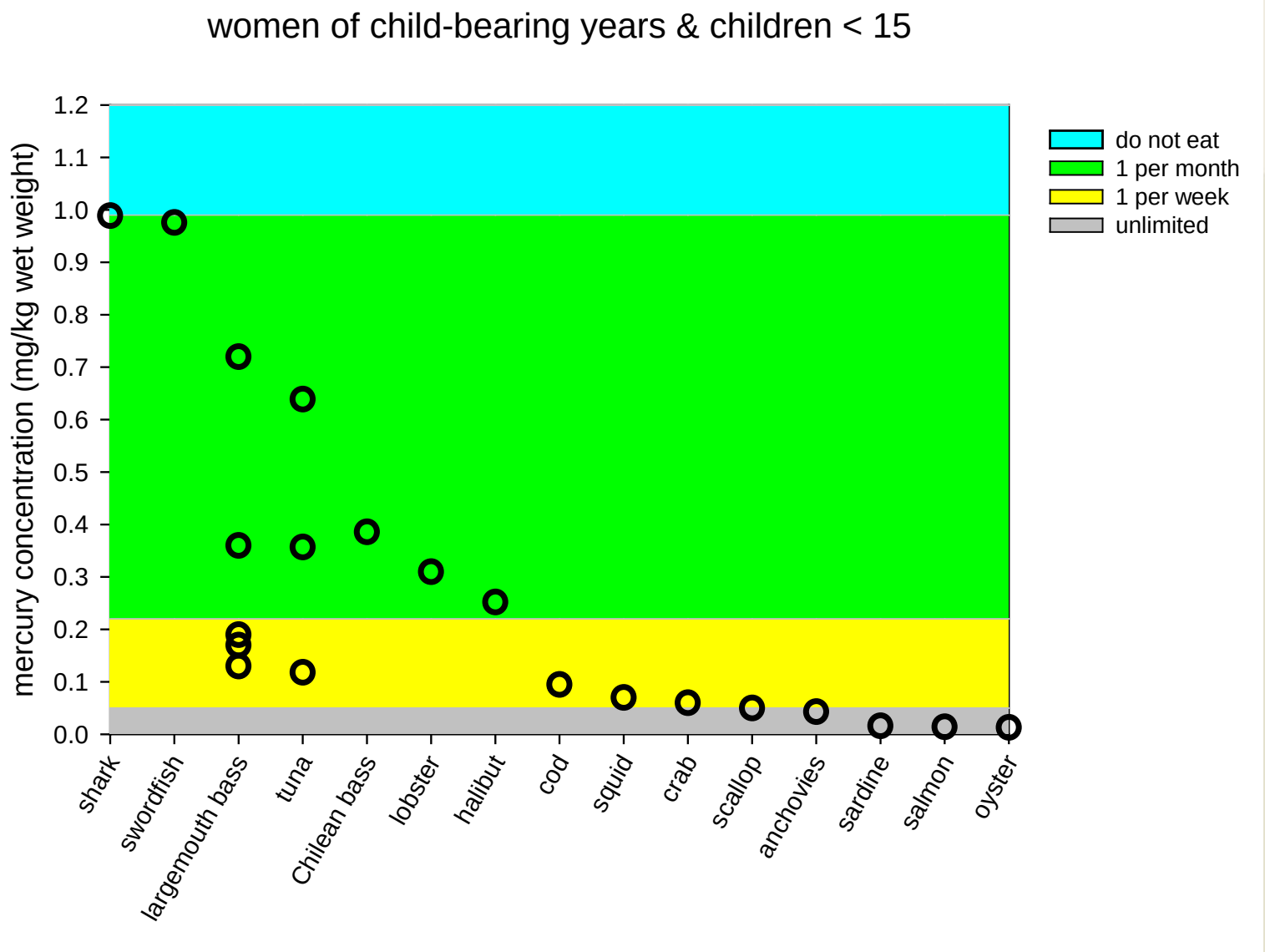


Woods Creek Lake Fish and Seafood



Woods Creek Lake Fish and Minamata Fish

- Largemouth bass from Woods Creek Lake range from 0.118 to 0.730 mg/kg

- Fish from sites where Minamata Disease occurred in subsistence fishing populations ranged from 10 to 50 mg/kg, with many samples in the 20 to 40 mg/kg; tens to hundreds of times greater than our fish

Woods Creek Lake Fish Summary

- Much lower than concentrations associated with Minamata disease, and we eat less fish
- Largemouth Bass have a Special Consumption Restriction for Mercury
  - One meal per month for women & children
  - One meal per week for men
- Comparable to tuna and other commercially-available seafood

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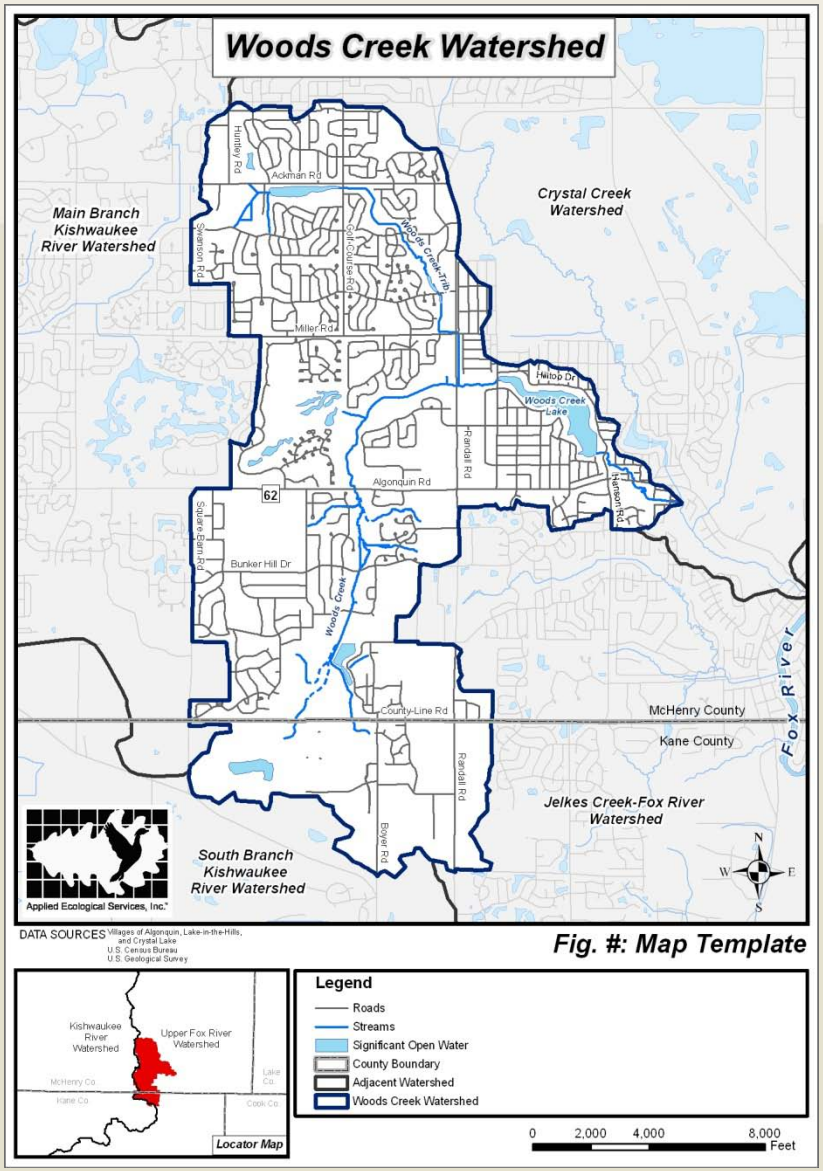
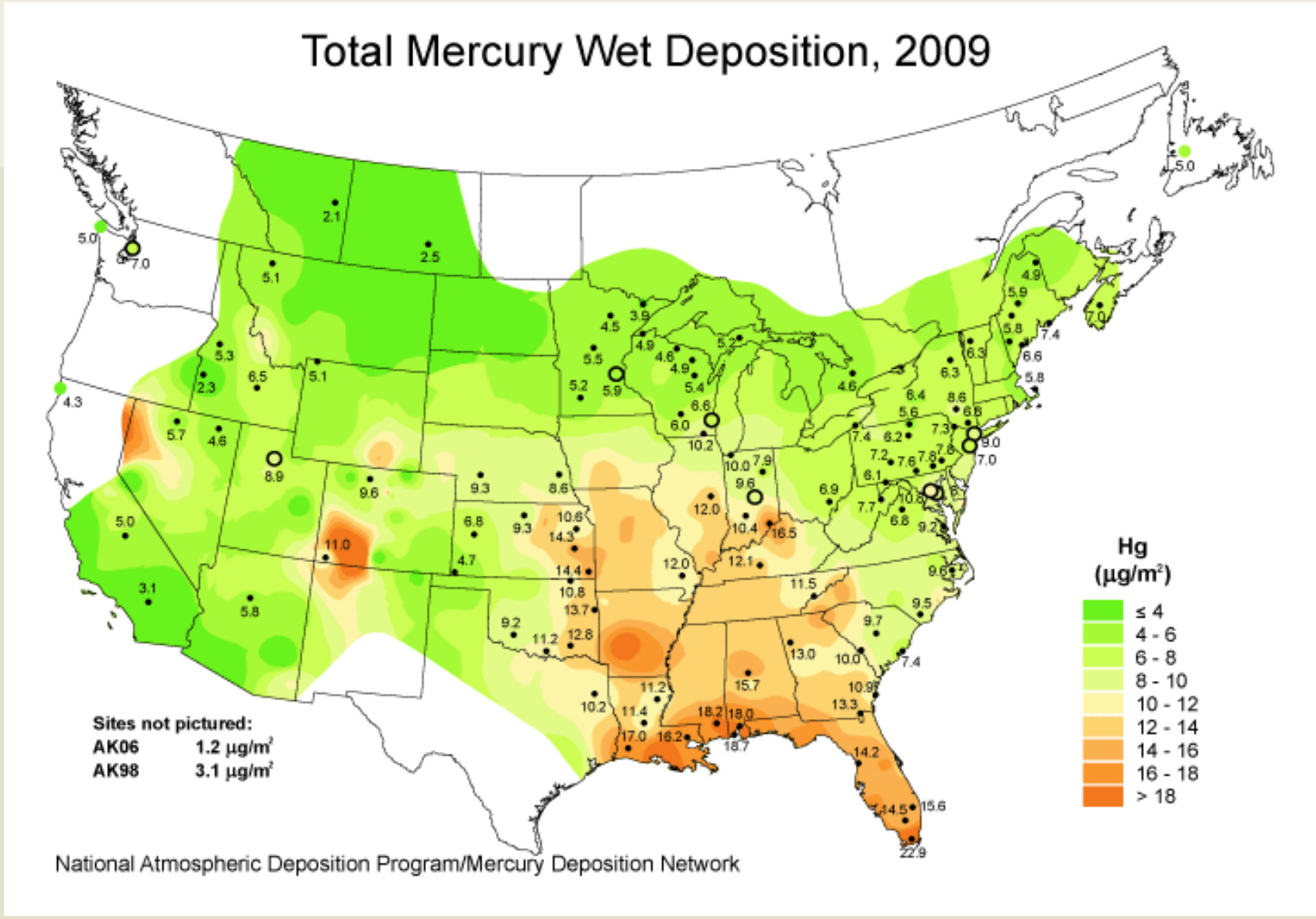
3 Potential Mercury Sources for Woods Creek Lake

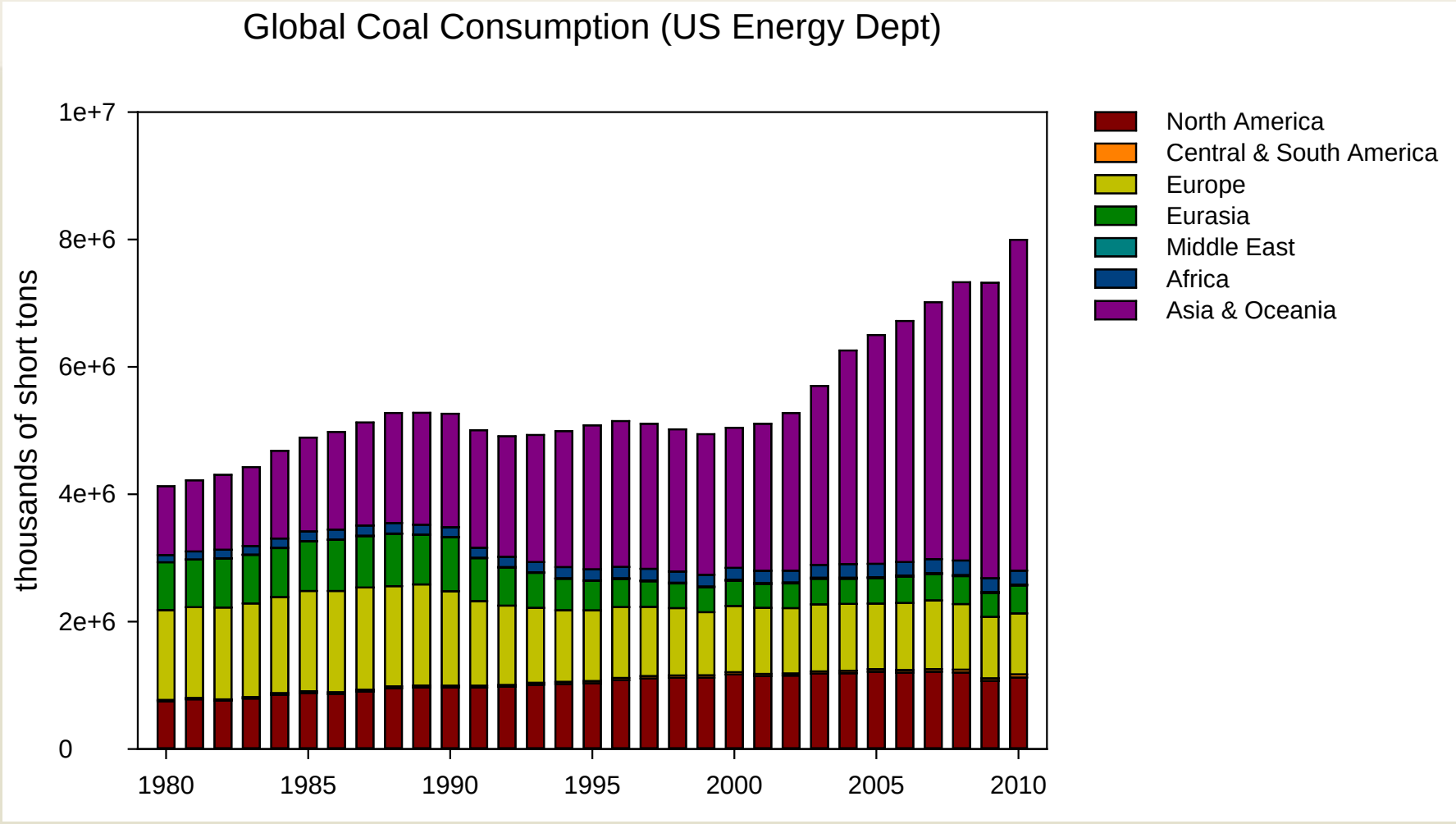
1. Atmospheric Deposition
2. Drawdown and Re-Flooding
3. Historic Discharges?



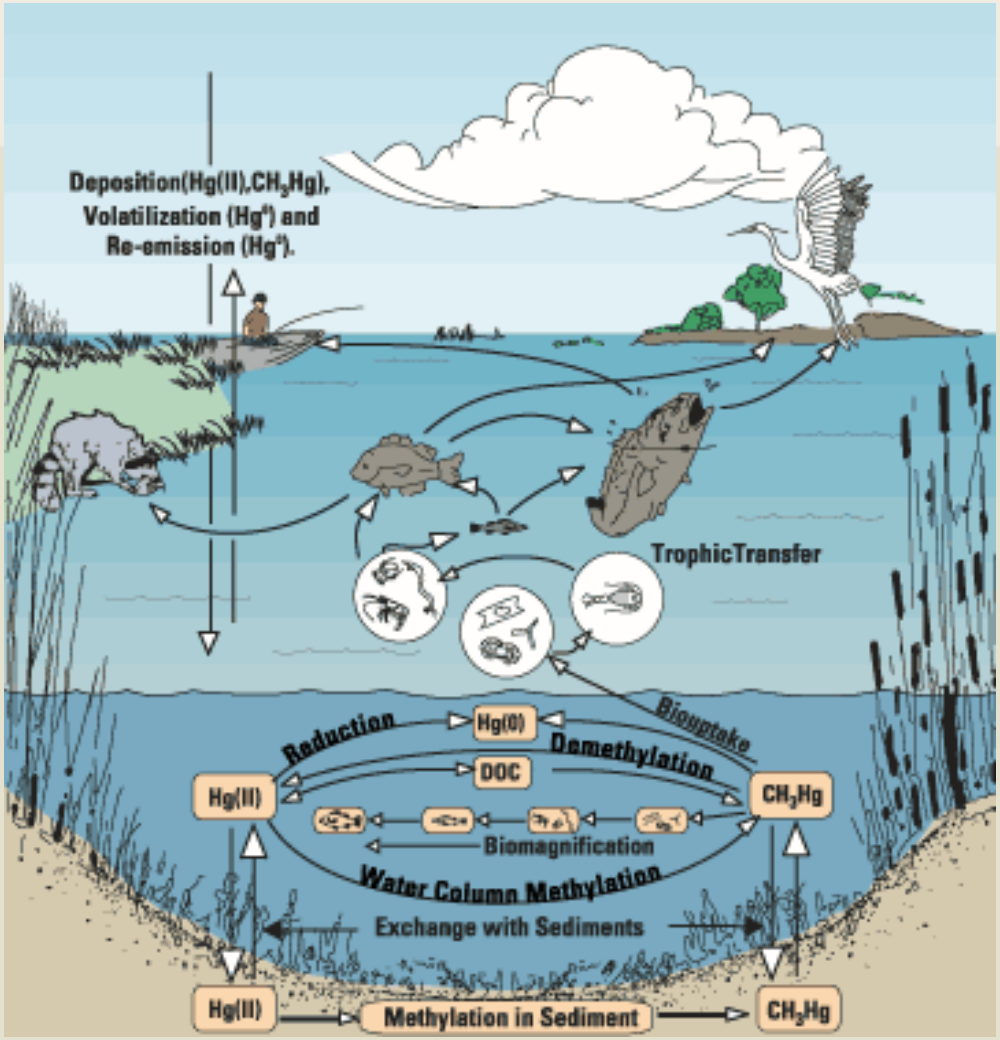
1. Atmospheric Deposition of Mercury



Coal Combustion is a Major Source for Atmospheric Mercury

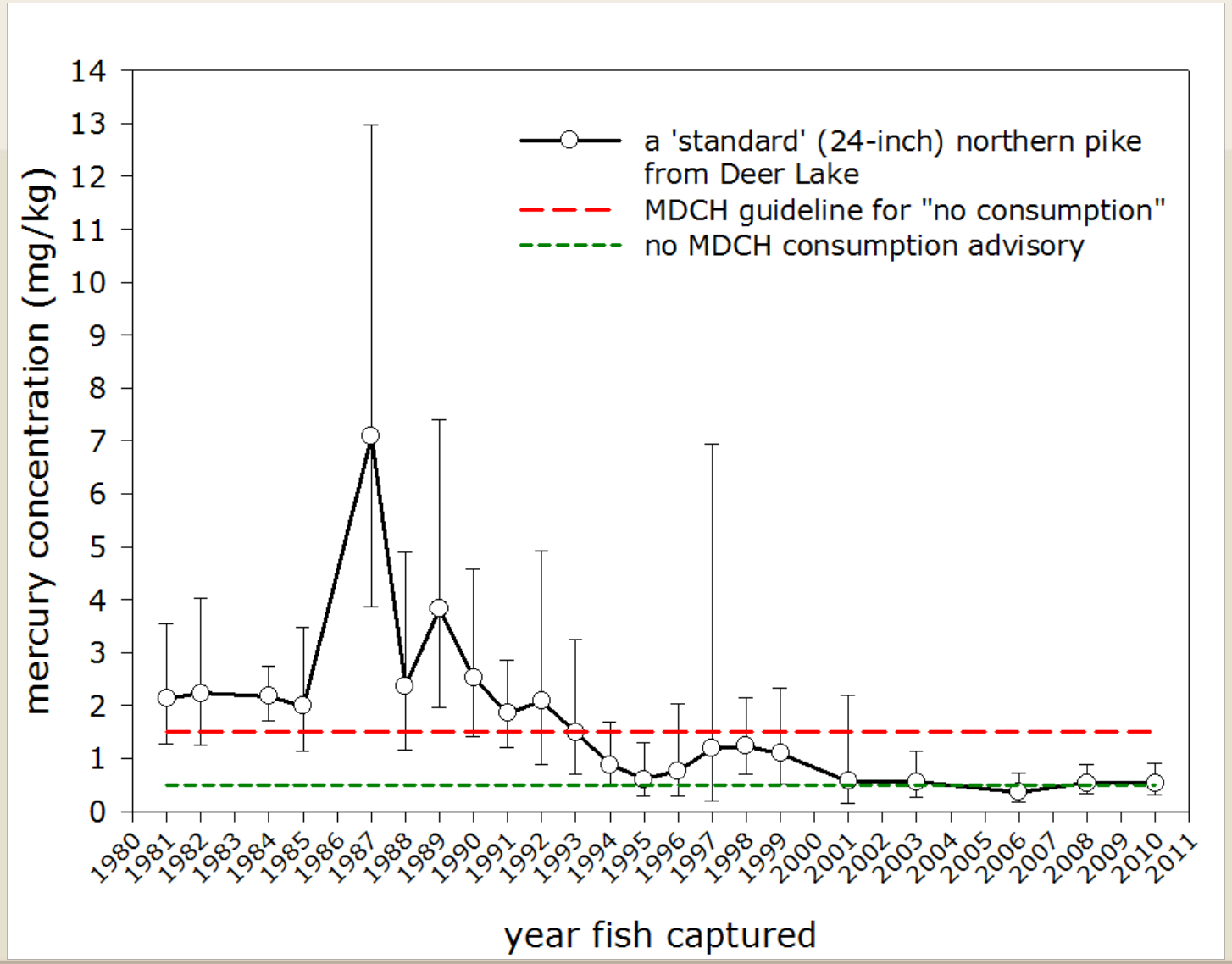


Mercury cycling in Lakes is Complex (USGS)

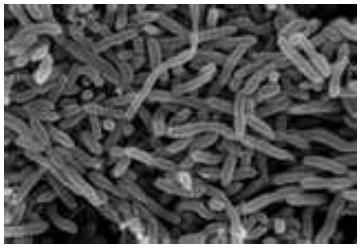


Mercury Methylation in Forested Wetlands

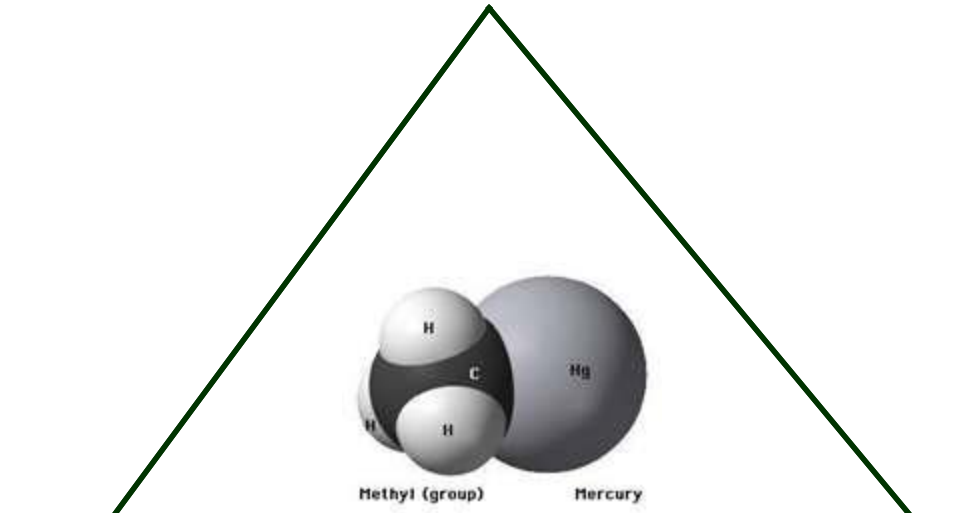
2. Drawdown and Re-flooding

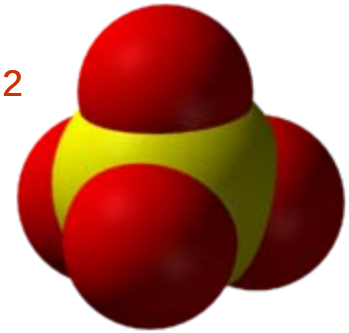


3 critical requirements for mercury methylation

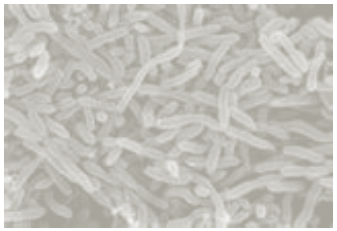


Anaerobic (sulfate-reducing) bacteria





In a full reservoir, bacteria convert sulfate to mineral form, and can not compete for food (carbon)



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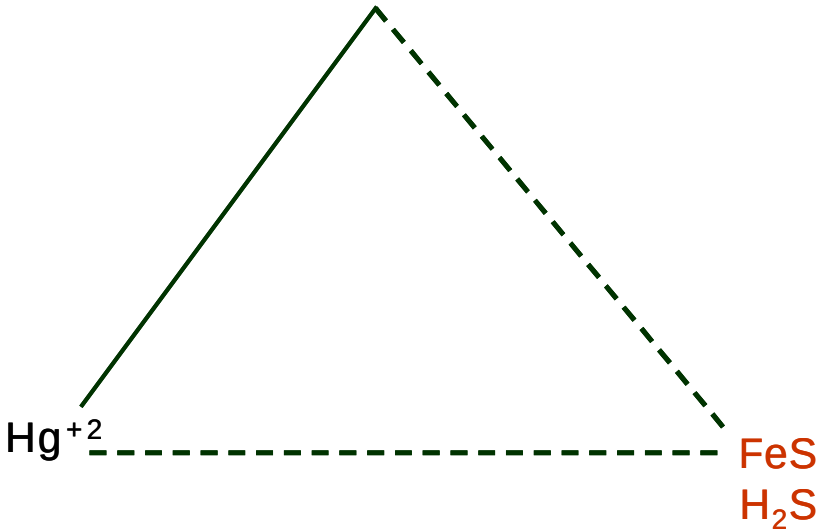

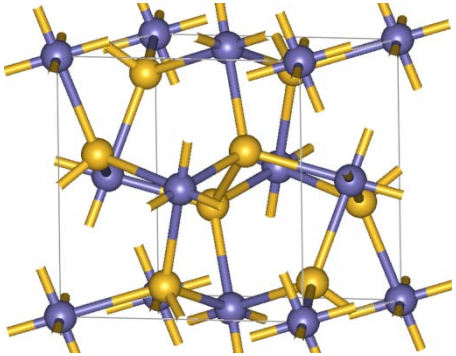

3. Historic Mercury Discharges?

- None of the known mercury sources have been identified within the Woods Creek watershed
  - Gold, Silver, Mercury or Iron Mining
  - Chloro-Alkali Production
  - Acetaldehyde Production
  - Pulp & Paper Mill
  - Municipal Wastewater

Summary of 3 Potential Mercury Sources for Woods Creek Lake

1. Atmospheric Deposition – Likely source; some possibility of local management

2. Drawdown and Re-Flooding – Likely source; manageable at local level

3. Historic discharges – Unlikely source, based on available Information

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√ Why we care about mercury in fish

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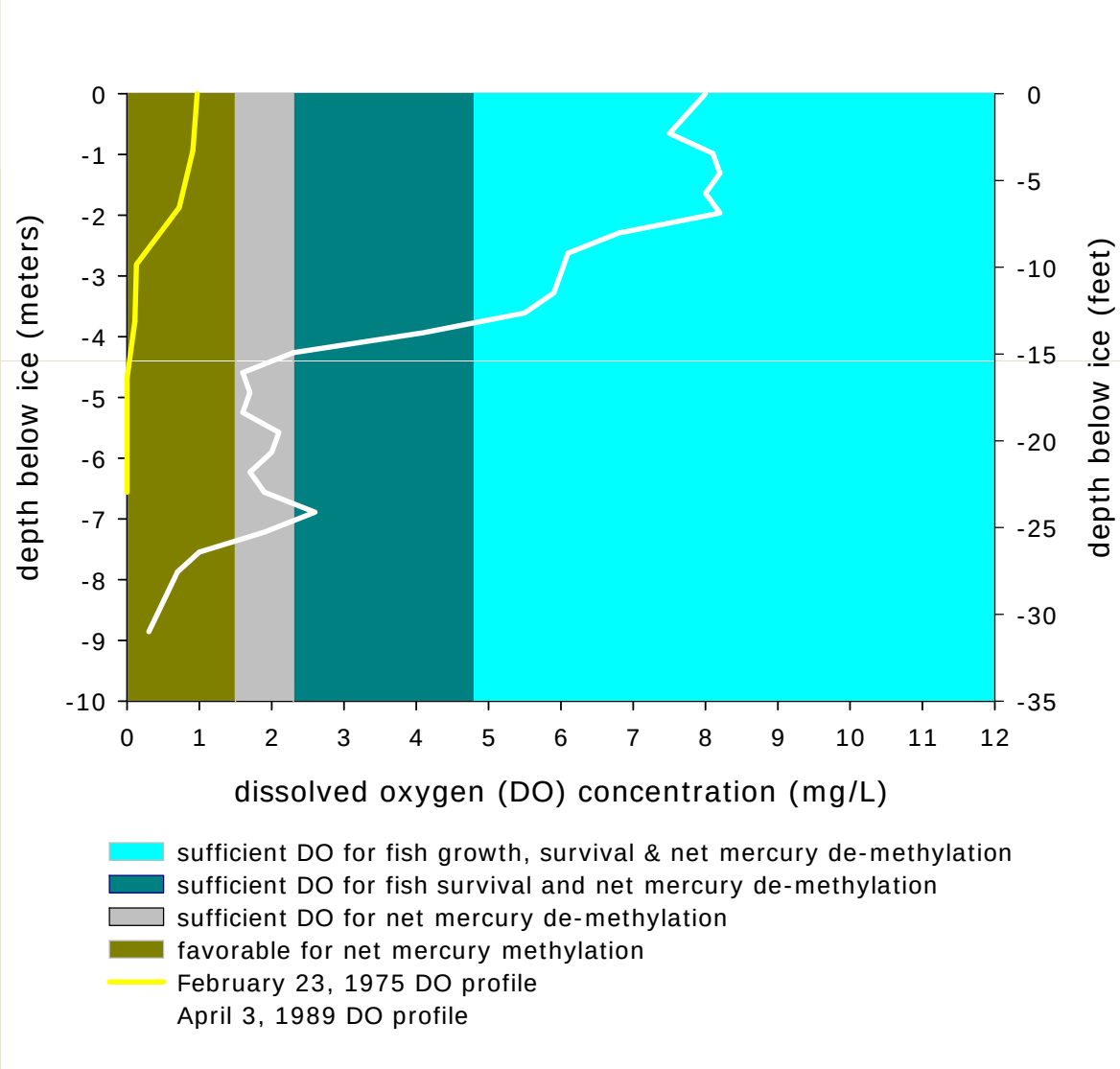
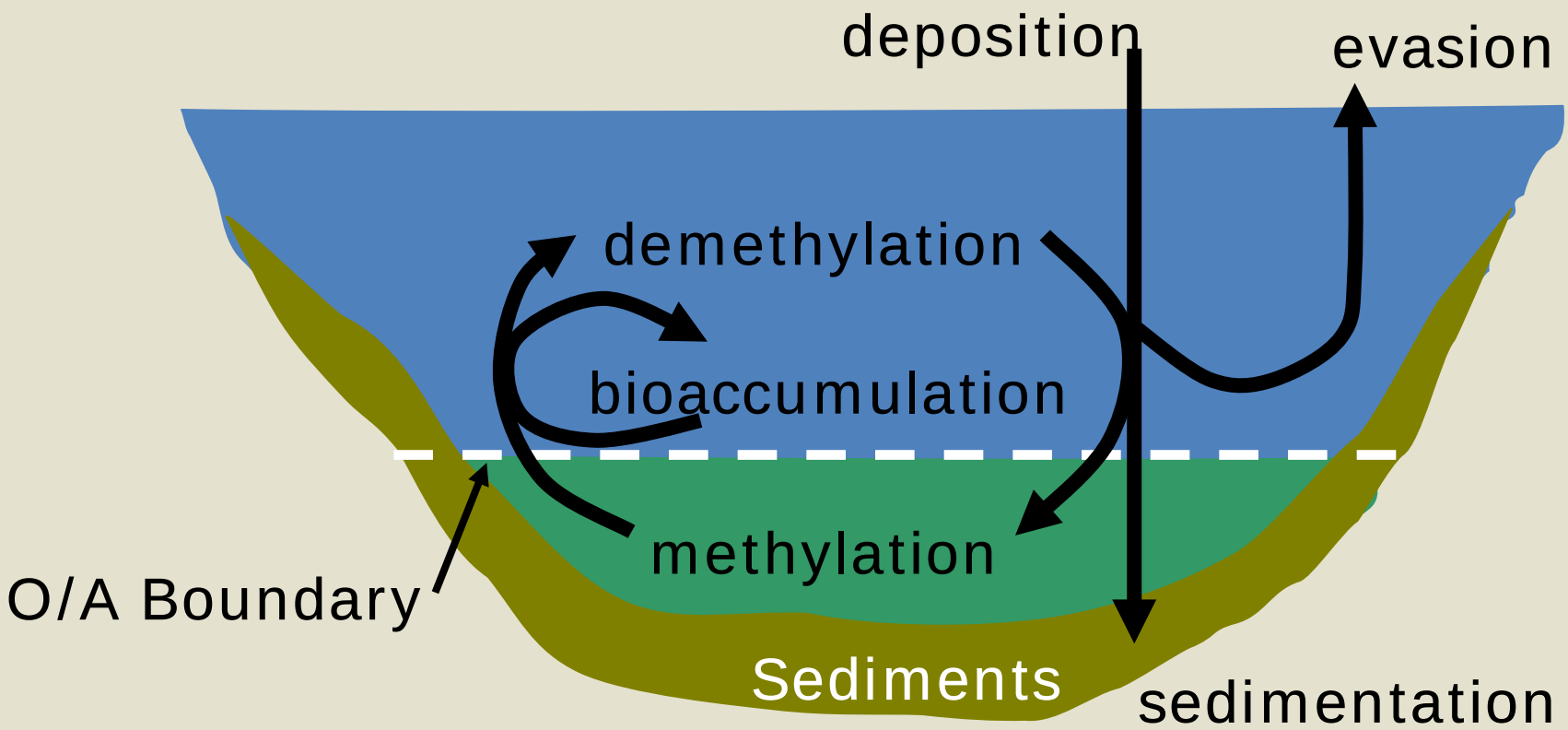
Potential Woods Creek Watershed Management Plan Projects

- Dissolved oxygen profiles in summer and winter
- Evaluate Drawdown & Water Flow Regimen
  - Maintain a stable water level
  - Release water at bottom of dam
- Sediment sampling at mouth of Woods Creek and at deepest point in basin

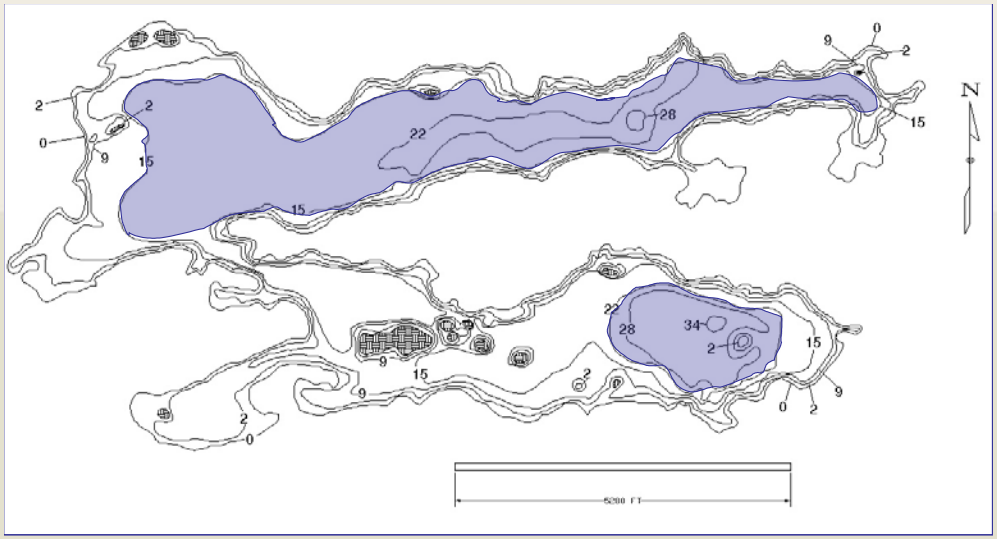
Example Deer Lake Winter Profiles (Casey & Evans 1989)

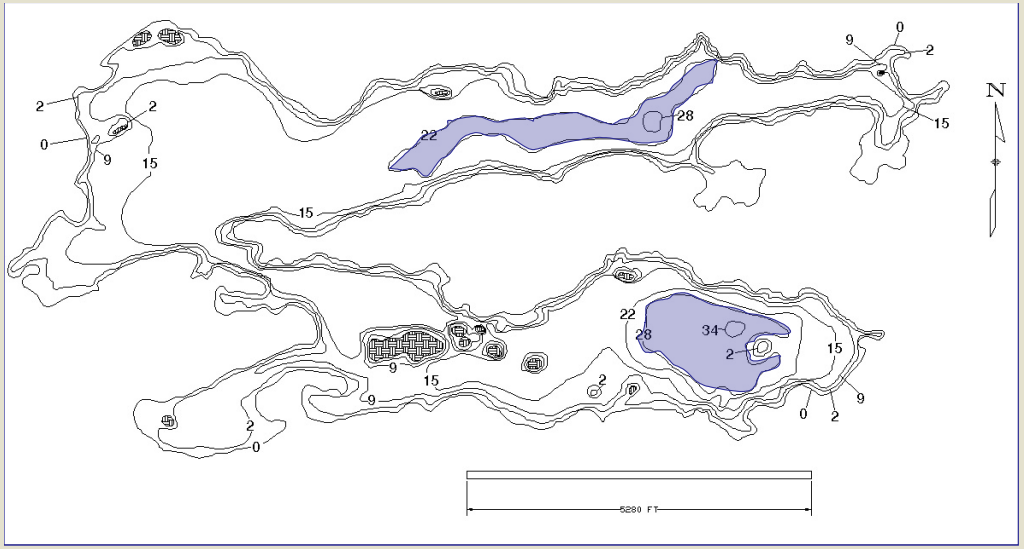


Mercury Cycling Model for Lakes (Watras and Huckabee, 1994)



Flow Management at Deer Lake





Potential Sediment Sampling Locations

Thank You

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