



Coeur d'Alene, Idaho
31 March – 4 April, 2003

LAKE BIOLOGICAL ASSESSMENTS AND CRITERIA

Course Presenters

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Introduction

Presented by

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Lake and Reservoir Bioassessment and Biocriteria Technical Guidance Document



Why lakes?

- Recreation
- Water supply
- Lakefront property
- Intrinsic ecological values

Why are lakes different?

- Bottom of watershed – receiving waters
 - Physical consequences of standing water
 - Retention time – much more sensitive to nutrients, organic pollution
 - Currents
 - Stratification – limited atmospheric exchange
 - Sedimentation
 - Biological characteristics
 - Plankton (zoo & phyto)
 - Vegetation (submerged & emergent)
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Lake stresses

- Cultural eutrophication (nutrients)
- Physical
- Acidification
- Toxic contamination
- Exotic species

Lake Biological Assessment

- Saprobic index 1920's-50's
- The Phosphorus controversy 1960's
- Vollenweider model 1966
- Algal indexes 1950's-60's
- Clean Water Act 1972
- Trophic State Index 1977
- Paleolimnology for acid dep 1980's
- Macroinvertebrate lake indexes (Ohio, Sweden, TVA) Early 90's
- EPA Lake bioassessment guidance 1998

Process

- Define the resource
- Preliminary classification
- Identify reference criteria and sites
- Select assemblages
- Sample reference and stressed lakes
- Final classification
- Estimate response of attributes and indicators to stressor gradient
- Develop and test indexes

Define the resource

- What is a lake/reservoir?
- Which ones do we care about?
- e.g.:
 - Mean depth > 1 m
 - Open (unvegetated) water > 0.25 ha
 - Hydraulic residence time > 14 days

Classification

- Region (ecoregion, physiographic)
- Size (area, depth)
- Water quality (natural)
 - Alkalinity, pH
 - Color
- Hydrology (retention, stratification)
- Lake origin (natural, impoundment)

Reference condition

- Definition
- Sampling/modeling
- Characterization

Issues: reference criteria

- Trophic state is not an *a priori* indicator (naturally eutrophic lakes exist), but cultural eutrophication is widespread in agricultural areas.
- Reservoirs: what is the desired condition of an artificial system?

Biological indicators for lakes

- Trophic state (chlorophyll, Secchi)
- Sedimented diatoms
- Phytoplankton
- Zooplankton
- Benthic macroinvertebrates
- Fish
- Submerged macrophytes
- Emergent vegetation