Developing a Lake Management Plan
Why Plan?
Basic Planning Process

Elements

- Goals
- Inventory
- Analysis
- Alternatives
- Recommendations
- Implementation
- Monitoring
Planning Approach for Lakes

Stepped iterative process

1) **Assessment/Appraisal** - “Ball parks” lake, provides focus, sets direction and appropriate level of planning.

2) **Comprehensive Management Planning** - Repeats process in detail to address specific management needs. Long term and broad vision.

3) **Action/Project Plans** – Focused short term (1-3 years) details with specific objectives. Implements Management plan.
Step 1. Appraisal - Collect existing easy to obtain data including one year of basic water quality data. ID what is known about the lake, perceived problems and what people desire. An assessment characterizes the resource, determines ecological potential and sets general management strategy. Lays the groundwork for all future activities. Protection Activities are continuously eligible - do not require plan approval. However, some data for application requirements.

Step 2. Appraisal Approval - DNR & partners agree on general lake management directions. Sets foundation for future management and avoids unnecessary planning. Check point for data entry into DNR system. Approved study plan including a commitment to phased planning grants.

Step 3. Management Plan - Creation of a management plan with specific management objectives. May proceed on single track i.e. APM, water quality, lake use, habitat or be comprehensive. Level of additional planning dependent on complexity of issues.

Step 4. Plan Approval - The sponsor adopts the plan after public and DNR and other agency’s input. Environmental Assessments and permits issued if required. Sponsor may apply for protection grants for implementation.

Step 5. - Implementation
Getting Started

- Advisory Committee or Study Team
- Define the Study Process
- Communication and Education Plan
- **General** Goals
- Identify Problems
Study Team

Stakeholders

• Lake Residents
• Lake Users
• Watershed landowners
• Government
• Tribes
• Business

Functional Needs

• Science & Technology
• Politics
• Finance
• Law & Enforcement
• Education & Communication
Goals: Maintain or Improve?

- Aquatic Plants
- Near Shore Habitat
- Fisheries & Wildlife
- Watersheds
- Water Quality
- Recreation
- Aquatic Plants
Inventory & Data Collection

Problem Identification
Assessing Current Conditions

- Lake natural features and limnological characteristics
- Watershed conditions
- Water quality
- Institutional and sociological information
- Historical information
- Previous studies, reports, maps
Sources of Information

Surface Water Integrated Monitoring System (SWIMS)

• DNR Regional Offices/ Service Center
• County Land Conservation, Zoning Office
• US Geological Society
• Regional Planning Commissions
• University of Wisconsin
• Historical societies, newspaper archives
• User and Opinion Surveys
Problem Identification
Assessing Current Conditions

Water Quality

Problem
Algae Blooms
Anoxic Hypolimnion
Fish Kills
Sedimentation
Internal Nutrient Loading

Metric
Nutrients
Secchi
Chlorophyll
Temperature & Dissolved O2
Sediment Nutrient Release Rates
<table>
<thead>
<tr>
<th>Problem</th>
<th>Metric</th>
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</thead>
<tbody>
<tr>
<td>Ag Land Runoff</td>
<td>Nutrient and Sediment Loads (lbs/acre)</td>
</tr>
<tr>
<td>Urban Stormwater Runoff</td>
<td>Land Use Assessment</td>
</tr>
<tr>
<td>Barnyard Runoff</td>
<td>Land Management Assessment</td>
</tr>
<tr>
<td>Wetland Loss</td>
<td>Surface and Groundwater Watershed Delineation</td>
</tr>
<tr>
<td>Critical Habitat Loss</td>
<td></td>
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</tbody>
</table>
LAND USE AND WATERSHED IMPACTS
Problem Identification
Assessing Current Conditions

Problem
User Conflicts

Recreation

Metric
Accident rates
User surveys
Boat per acre
Piers and access sites per acre
Problem Identification
Assessing Current Conditions

Aquatic Plants

Problem
Too many - impairs navigation or recreation
Too few - limited habitat
Exotics/invasives

Metrics
Percent Area Coverage
Species Composition
Density/Diversity
Floristic Quality Index
Biomass lbs/acre
AQUATIC PLANTS

- Habitat
- Energy Dissipation
- O$_2$ Producers
Problem Identification
Assessing Current Conditions

Fisheries

<table>
<thead>
<tr>
<th>Problem</th>
<th>Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unbalanced Fisheries</td>
<td>Species composition</td>
</tr>
<tr>
<td>Stunted Growth</td>
<td>Age length ratio</td>
</tr>
<tr>
<td>Rough Fish Dominance</td>
<td>lbs. or fish per acre</td>
</tr>
<tr>
<td>Poor Success</td>
<td>Catch per effort</td>
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</tbody>
</table>
FISH

Planktivore
Piscivore
Benthivore
Problem Identification
Assessing Current Conditions

Problem
Limited habitat
Aesthetics

Near Shore Habitat

Metric
Substrate
Woody Cover
Structure of Vegetation
Structures/mile
Variation in Depth and Gradients
Analysis

Determining Management Objectives
Compare Current Conditions to Reference or Benchmark Conditions

- Historical Conditions
- Establish Standards or Guidelines
- Comparison to Similar Lakes
- Expected or Predicted Conditions Using Models
- Revisit Goals and User Survey Results
- Sensitivity Analysis
Appraisal Tools

WISLEAP Ecoregion Model

Compares the lake in question against a set of reference lakes for the Ecoregion.

Includes a statistical framework to compare against Ecoregion means for TP, Chl a and Secchi depth.
Other Appraisal Tools

- Methods using the plant community structure
- Methods using the fish community structure
- Methods using dissolved oxygen
- Methods using the waterfowl community structure
- Methods using amphibian community structure
Lake Appraisal Report

Preliminary Analysis

• Characterize the lake’s conditions
• Identify beneficial and desired uses
• Problems, impairments or threats
• Potential causes or sources
• Possible actions to be taken or evaluated
• Determine if protection, management or restoration mode
Protection Alternatives

Good to excellent conditions

Focus on maintaining or modest improvement of existing conditions

Watershed planning, i.d. critical sites,

Most protective lake class for shoreland zoning

Enforcement and implementation of existing regulations

Education strategies to promote stewardship

Baseline monitoring to detect changes

Establish lake water quality and habitat goals
Management Alternatives

Generally good conditions - few signs of decline or problems to be addressed

Include protection strategies to halt degradation & manage specific problems

Additional inventory and analysis work to diagnose problems and develop specific management plan.

Watershed, recreation, aquatic plants, exotic species, etc.

Establish water quality and habitat goals
Water Quality Objective Setting

WI Lake Modeling Suite (WiLMS)
A Windows application:
• 13 empirical lake models.
• A simple watershed phosphorus export module.
• An internal load estimator and a trophic response module.
• Partition sub watersheds
• Inventory current and future land uses
• Identify potential sources, problems areas
• Calculate loadings
• Develop best management practices plan
Restoration Alternatives

Poor conditions, nuisance algae blooms aquatic plants, unbalanced fishery, not meeting beneficial uses. Complex lakes Recommend protection and management strategies
More detailed planning to diagnose problems and determine feasibility of management actions.
Establish water quality and habitat goals
Restoration Objective Setting

- Diagnostic and Feasibility Study
- Complex modeling
- Detailed data collection and monitoring needs
- Enhancement versus restoration
Alternative Selection

Achievability Analysis

• What is reasonable given lake potential?
• What management activities are feasible?
• Will action be effective?
• Will it be cost effective?
• Will it be acceptable to public?
• Will water quality and habitat goals be achieved?
Recommendations
Plan Development

• Appraisal Report – Assessment of Lake Conditions
• Water Quality and Habitat Goals
• Management Objectives
• Analysis and Methods
• Alternatives Considered
• Recommendations
• Public/Agency Comment
• Implementation – General Timeline and Costs
Adoption and Approval

- Public Input Throughout
- Public & Agency Comment on Draft Plan
- Consider Comments
- Finalize
- Adopt locally
- DNR final review & approval
Implementation

- Priorities
- Schedule/time line
- Funding
- Roles and responsibilities
- Admin
- Legal
- Finance
- I&E
Monitor & Modify

• Long term monitoring plan
• Evaluation - How to track if objectives are being met
• Update periodically
How the process fits lake grants

• Small Scale Planning Grants - $3,000
  – Organize, Prepare and Augment

• Large Scale Planning Grants - $10,000
  – Appraisal Report/Lake Assessment
  – Phased Plan Development

• Lake Protection Grants - $200,000
  – Diagnostic/Feasibility
  – Implementation

• Other Sources
Key Guidance

- Managing Lakes and Reservoirs – NALMS/EPA  www.nalms.org
- A Model Lake Plan for a Local Community – UWEX Publication G3606
- Aquatic Plant Management in Wisconsin – UWEX www.uwsp.edu/cnr/uwexlakes/ ecology/
- Vilas County Lake Resource Guide – Vilas Co. LCD
- Lake Planning Checklist - DNR
- Understanding Lake Data – UWEX pub G3582 www.dnr.wi.gov/org/water/fhp/lakes/under/
- Lake Models www.dnr.wi.gov/org/water/fhp/lakes/laketoold.htm
- Assessment and Sampling Methods - DNR

Lake Planning Manual Under Development