



# Developing a Lake Management Plan

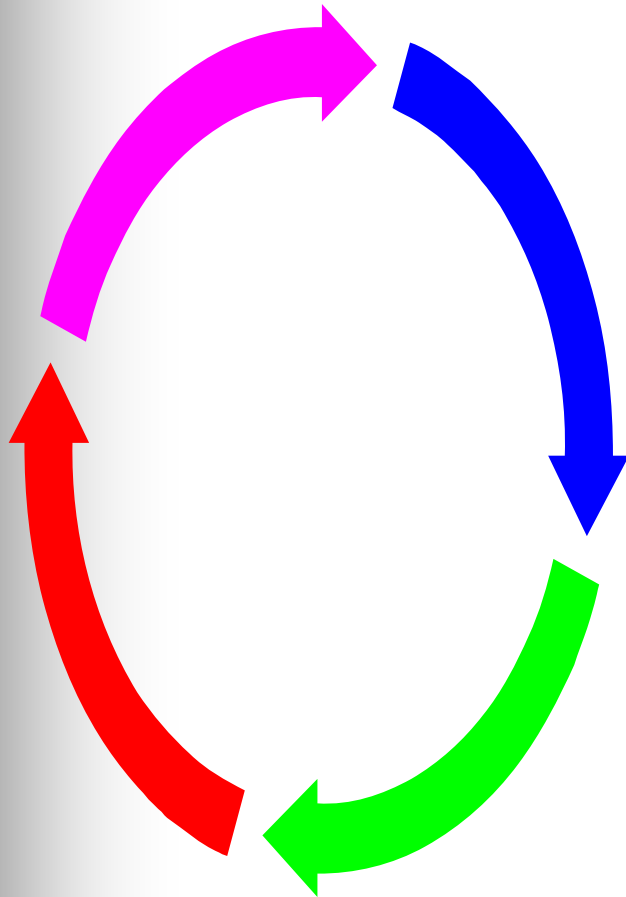


# Why Plan?





# **Basic Planning Process Elements**



**Goals**

**Inventory**

**Analysis**

**Alternatives**

**Recommendations**

**Implementation**

**Monitoring**

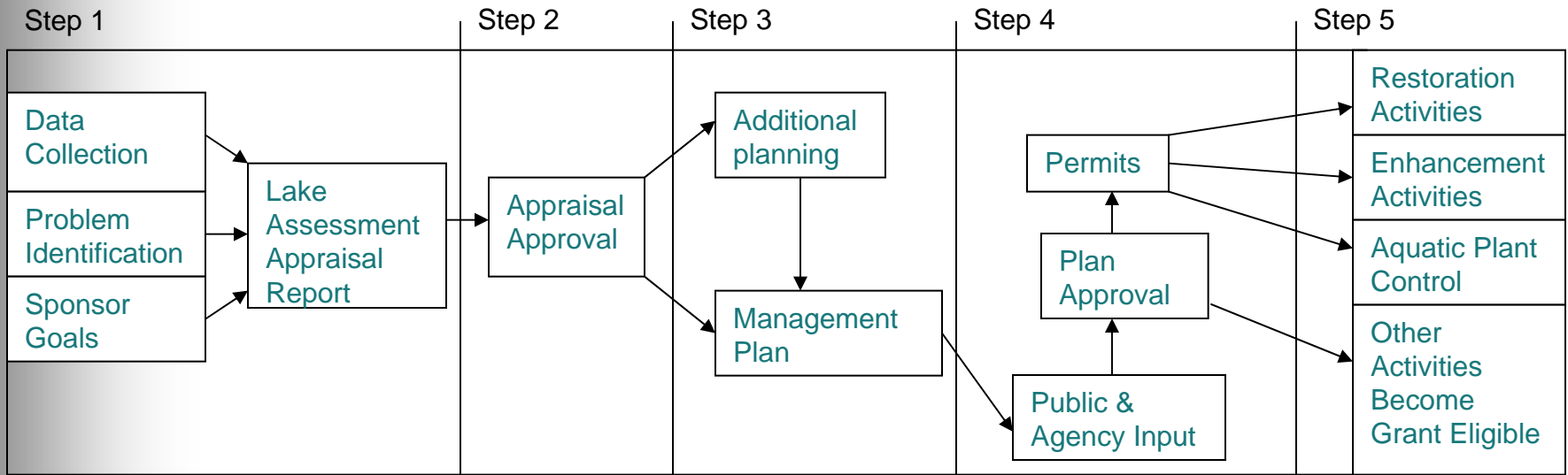


# Planning Approach for Lakes

## 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.





**Protection Grant Activities** – Land Acquisition, Wetland/Shore land Restoration, Ordinance Development are continuously eligible, however more planning enhances funding priority

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?







# **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

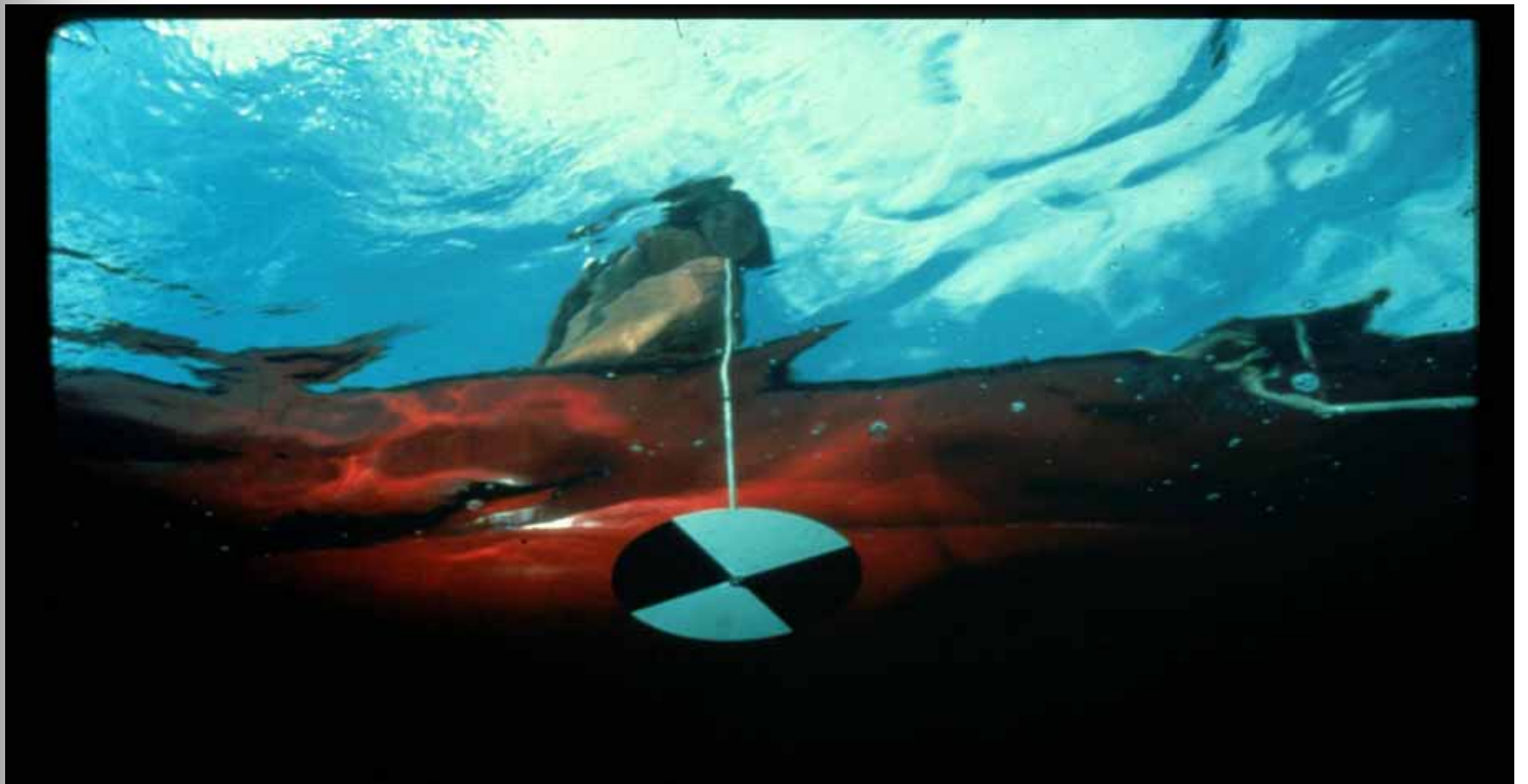
#### Metric

Nutrients  
Secchi  
Chlorophyll  
Temperature &  
Dissolved O<sub>2</sub>  
Sediment Nutrient  
Release Rates





# LOSS OF WATER CLARITY





# Problem Identification

## Assessing Current Conditions

### Watershed

#### Problem

Ag Land Runoff  
Urban Stormwater  
Runoff  
Barnyard Runoff  
Wetland Loss  
Critical Habitat Loss

#### Metric

Nutrient and Sediment  
Loads (lbs/acre)  
Land Use Assessment  
Land Management  
Assessment  
Surface and Groundwater  
Watershed Delineation



# LAND USE AND WATERSHED IMPACTS







# Problem Identification

## Assessing Current Conditions

Problem      **Recreation**

User Conflicts

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<sub>2</sub> Producers







# Problem Identification

## Assessing Current Conditions

### Fisheries

#### Problem

Unbalanced Fisheries  
Stunted Growth  
Rough Fish Dominance  
Poor Success

#### Metric

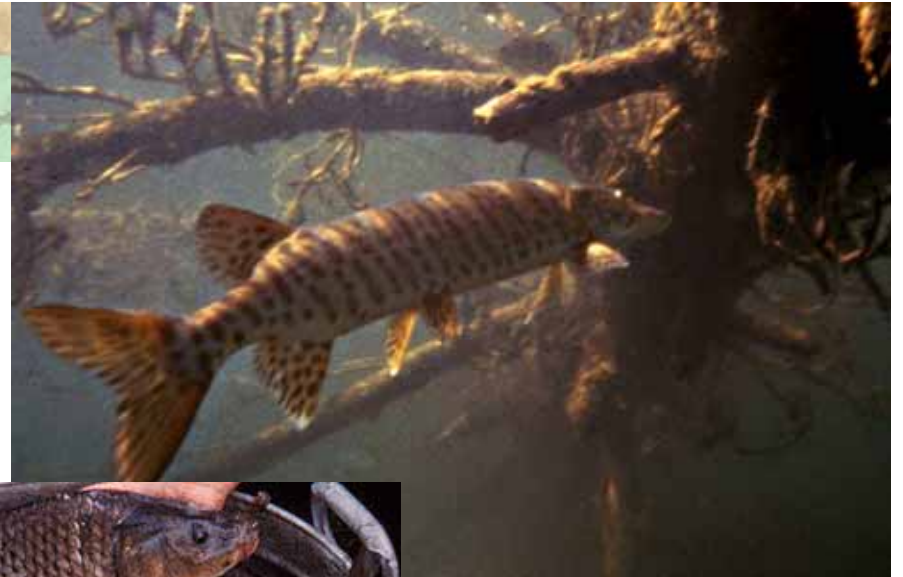
Species composition  
Age length ratio  
lbs. or fish per acre  
Catch per effort

# 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 Models

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





# Lake Conditions

Good

Bad



Protect

Manage

Restore

## Management Strategy



# 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](http://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/](http://www.uwsp.edu/cnr/uwexlakes/ecology/)
- How's the Water? Planning for Recreation Use on WI  
Lakes and Rivers - UWEX [www.uwsp.edu/cnr/uwexlakes/publications/](http://www.uwsp.edu/cnr/uwexlakes/publications/)
- 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/](http://www.dnr.wi.gov/org/water/fhp/lakes/under/)
- Lake Models [www.dnr.wi.gov/org/water/fhp/lakes/laketool.htm](http://www.dnr.wi.gov/org/water/fhp/lakes/laketool.htm)
- Assessment and Sampling Methods - DNR

*Lake Planning Manual Under Development*