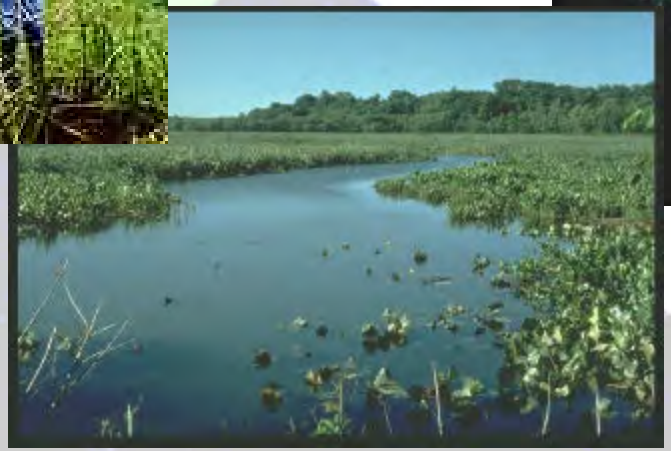
# Study Design for Wetland Monitoring



# Purposes of this talk:

- Monitoring design for the National Wetland Monitoring and Assessment Strategy
- Link BAWWG and the National Wetland Monitoring and Assessment Strategy
- Sampling approaches applicable to IBI development and to national wetland condition assessment

# An Adequate Study Design should. . .

- Identify, characterize, or measure wetland qualities (functions, benefits)
- Determine stressors to wetlands
- Determine changes to wetland condition over time
- Provide information useful in protecting and restoring wetlands

# Technical Guidance

- Statistically-valid, systematic, consistent methodology
- Focus on:
  - biological, physical, landscape measures
- Build on the developing biological assessment methods
- Incorporate existing approaches (e.g., functional assessment)

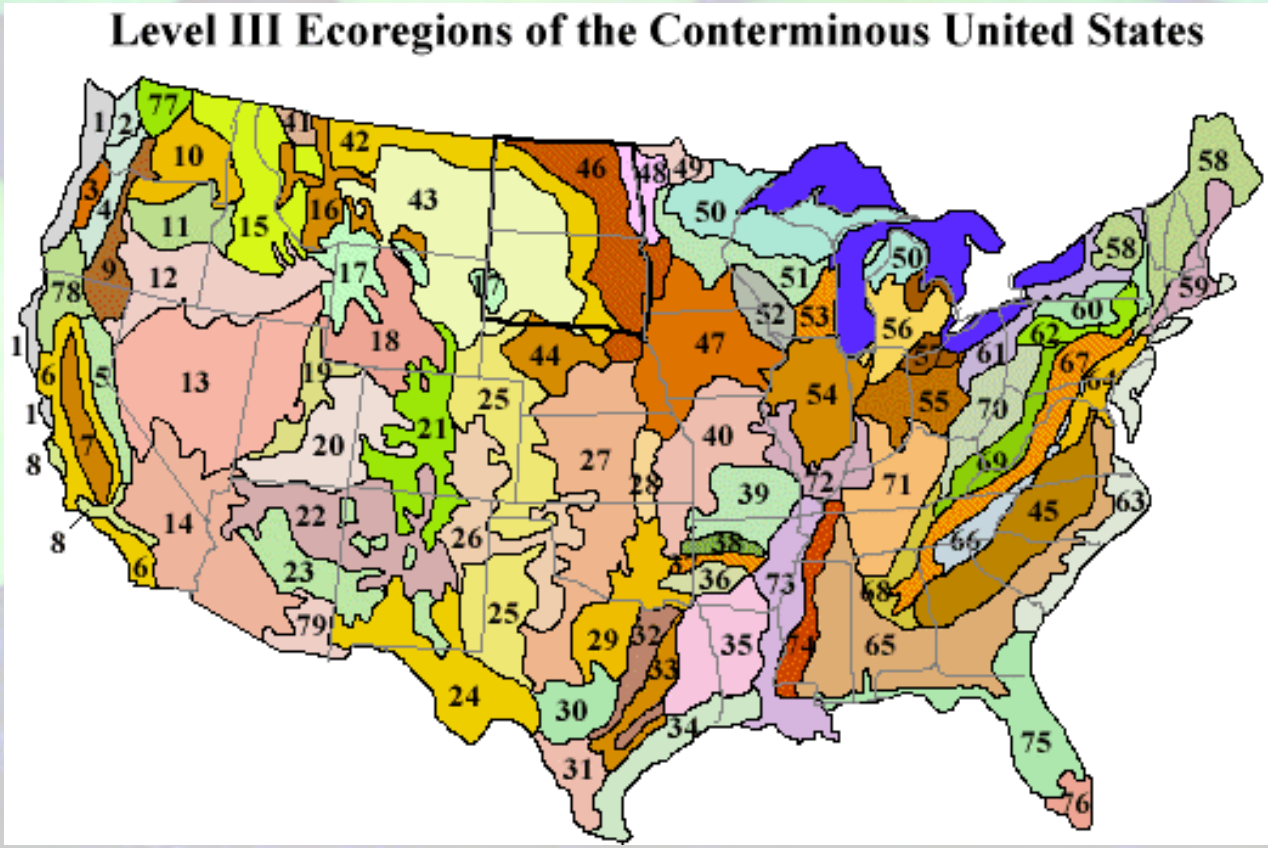
# Monitoring Approach

- **WATERSHED PRIORITIZATION:** use existing methods to rank watersheds
- **LANDSCAPE ASSESSMENT (Level 1):** use remote sensing and existing data (GIS)
- **RAPID ASSESSMENT (Level 2):** field review of land uses and stressors at wetland sites
- **INTENSIVE SITE ASSESSMENT (Level 3):** field and lab methods to collect specific data
- **DATA REPORTING**: provide data for building a picture of local/national wetland health

# Linking Methods to Assess Wetland Condition

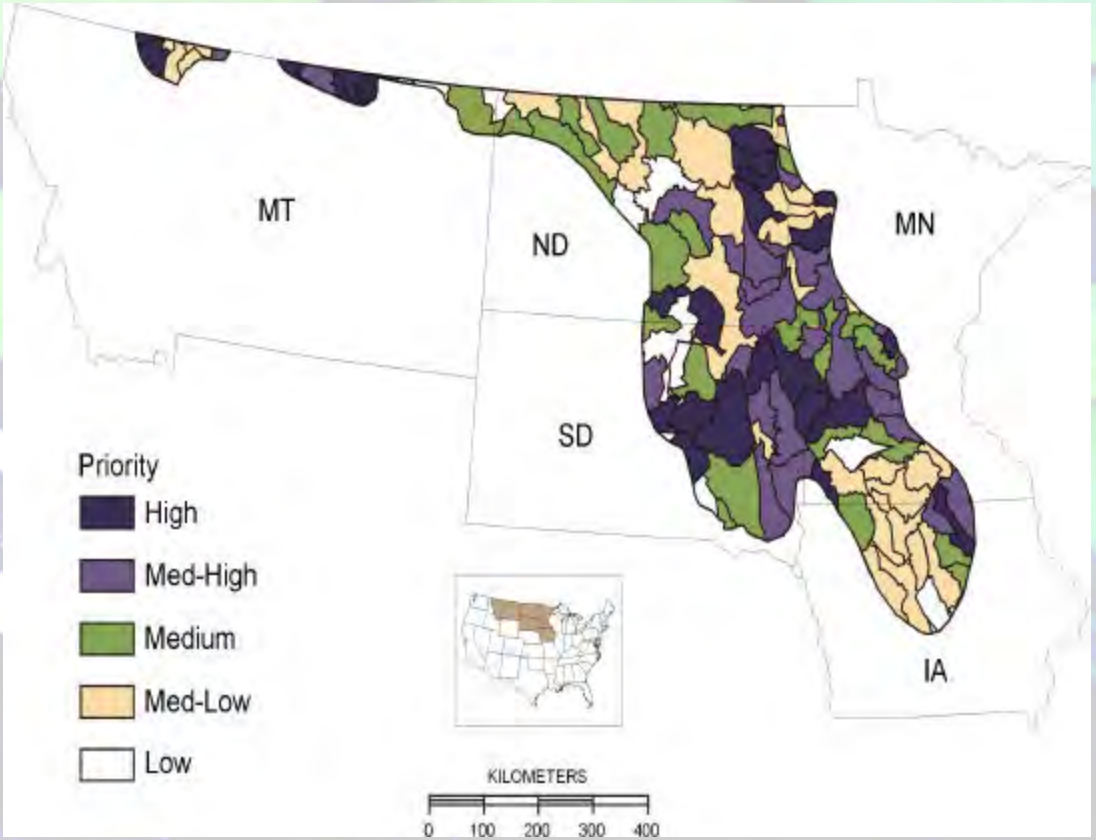
- Different methods provide different types of valuable information
- Need landscape level data to understand watershed condition impacting wetlands
- Need rapid assessment data to scope likely problems and useful parameters
- Need intensive site assessment methods to understand wetland condition

# Ecoregion Classification



# Watershed Prioritization

- Expert judgment
- Unified Watershed Assessment
- Synoptic Approach



# Landscape Assessment Methods

- Uses GIS and existing data
- Preliminary view of condition
- Classify wetlands

# Landscape Indicators

- Evaluate indicators for a landscape view of watershed and wetland condition
- Typical landscape level indicators:
  - Land use
  - Land cover
  - Human population density
  - Buffer widths
  - Wetland connectivity

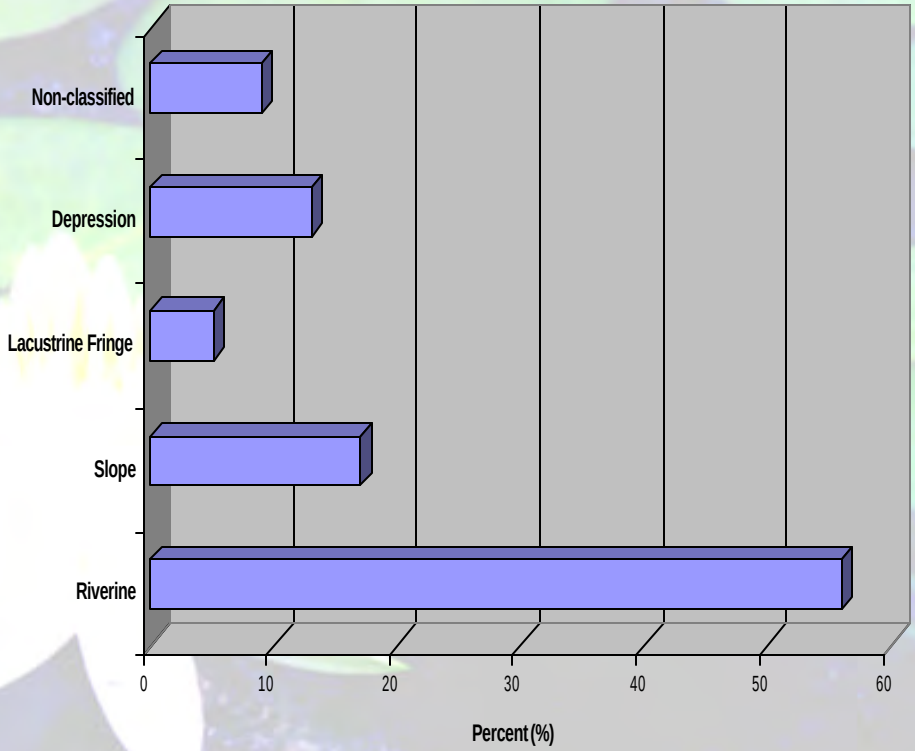
# Landscape Assessment Projects

- Maryland's "Green Infrastructure" using landscape tools to develop a conservation strategy

- Pennsylvania's "Cube of Water" using landscape data as the first step in wetland condition assessment

# Classify Wetlands

Landscape profile for naturally occurring wetlands in the Portland, OR metropolitan area by hydrogeomorphic class and sites that could not be classified (Gwin, et al., 1999).



# Rapid Assessment Methods

- Qualitative or semi-quantitative information
- Check-lists or relatively simple data collection approaches
- Conducted by trained personnel, not necessarily wetland scientists

# Rapid Assessment Uses

- Ground-truth wetland classification and other landscape level information
- Rapid and cost-effective approach to general wetland condition assessment
- May be a more quantitative assessment if developed in conjunction with intensive site assessment methods

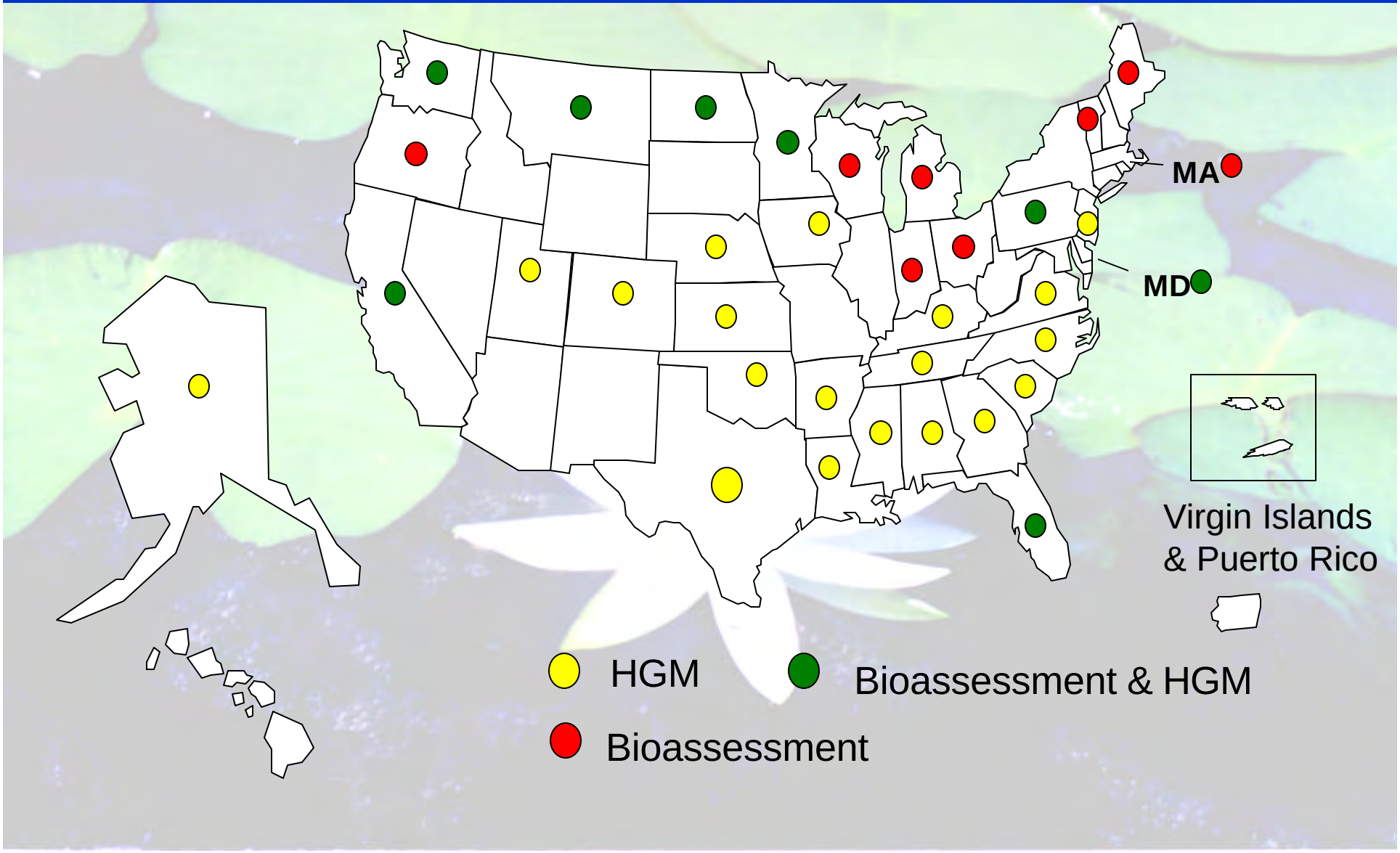
# Rapid Assessment Methods

- Ohio Rapid Assessment Methodology (ORAM)
- Wisconsin Rapid Assessment Methodology (WI RAM)
- Wetland Rapid Assessment Procedure (WRAP)
- Many, many more

# Intensive Site Assessment Methods

- Usually designed to collect data on individual wetland sites
- Typically are quantitative
- A wide range of methods exist

# Wetland Monitoring Pilot Projects



# Intensive Site Assessment Uses

- Provides quantitative data on wetland condition within an assessment area
- Used to refine rapid assessment methods
- Used to diagnose the causes of wetland degradation
- Used to design management practices to remedy the effects of human influences

# IBI Methodolgy

- **Measure ecological attributes of the system**
- **Measure gradients of human influence in the ecological system**
- **Determine metrics, attributes that track the influence gradients in a predictable manner**

# Sampling Design Considerations

- Objectives of the monitoring
- Stratification by wetland class
- **Site selection: How to select wetlands for sampling**
- Sampling frequency (temporal)
- Sampling intensity (spatial)
- Sampling location by habitat type
- Precision of estimates (QA/QC)
- Existing capabilities

# Approaches to Wetland Selection

- Stratified Random Sampling
- Targeted Design
- BACI (Before/After, Control/Impact)

# Stratified Random Sampling

- **Probability sampling: Chances of including any wetland in the sample are >0**
- **Used by EMAP for assessing water resources on nation-wide scale**
- **Stratified random sampling: A statistically powerful way to answer specific questions**

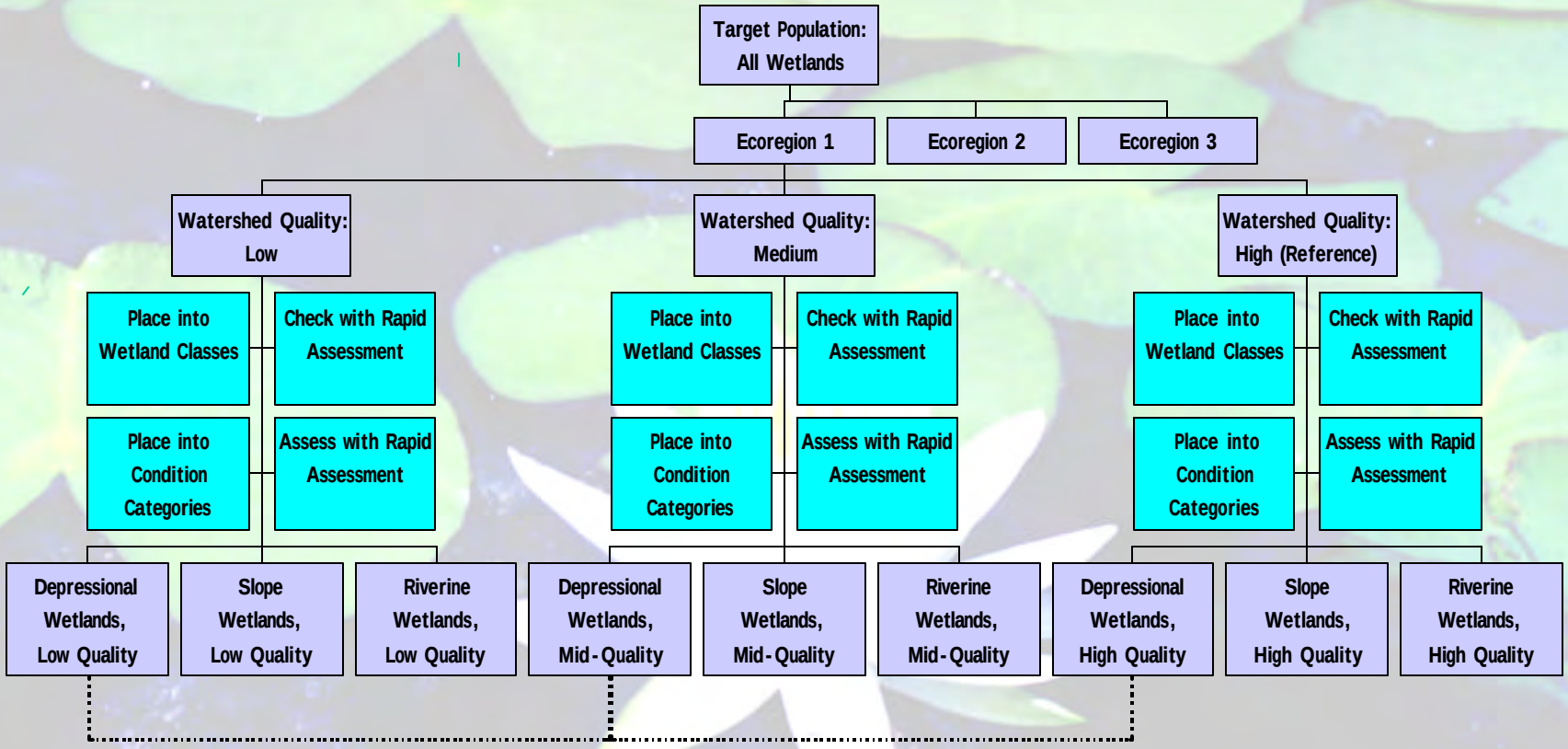
# Targeted Sampling

- **Targeted sampling for IBI development is a specialized case of stratified random sampling (Parker)**
- **Stratify by wetland condition over a gradient of human influence, then sample randomly**
- **Watch out for judgment or convenience based targeted sampling—it's not random**

# Range of Condition

- Evaluate wetlands through sampling
- Characterize degree of degradation
- Place in condition categories
- Sample wetlands at random in each condition category to develop metrics

# Stratified Sampling Structure




Sample wetlands randomly within class across risk categories to measure a range in wetland quality due to human influences.

# Intensive Site Assessment Study Design

- **Develop an IBI for a wetland type:**
  **Use a stratified random sampling approach that targets the entire range of wetland conditions**

- **Infer the overall condition of the wetland resource:**
  **Use a probability-based or a stratified random sampling design**

# Wetland monitoring by design...



...to help us protect, manage, and restore our wetlands