

## Wisconsin's Healthy Watersheds Framework



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## Outline



- Overview – Goals & Benefits
- Watershed Health & Vulnerability metrics
- Developing the index
- Example Results & Potential uses

## Goals of Healthy Watersheds Assessments

National EPA effort to:


- Identify healthy watersheds using methods that are science-based & indicator driven.
- Improve understanding of the linkages between the six attributes of watershed health.
- Help states and others to evaluate watershed health and make strategic decisions for protection.

## Benefits & Outcomes

- Increase communication between programs.
- Foster protection strategies that are coordinated, multi-agency, and statewide.
- Encourage leveraging of resources across state agencies and with other partners.
- Increase understanding of the connection between landscapes and aquatic system health.
- Prioritize individual watersheds for targeted assessments and protection efforts.

## Six Categories Used for Ranking

- 1 Landscape condition
- 2 Geomorphology
- 3 Hydrology
- 4 Water Quality
- 5 Biological integrity
- 6 Habitat







## Spatial and Temporal Scale

- Screening-level assessment
- Broad spatial/ temporal scale
- USGS 12-Digit Hydrologic Unit Code (HUC12) subwatersheds
  - Preferred management unit
  - HUC system is hierarchical
  - Average 30 square miles
  - 1,853 HUC12 subwatersheds
- Recent, long-term average conditions

## Indicators of Watershed Health

Landscape Condition	Hydrologic Condition	Geomorphic Condition	Habitat Condition	Water Quality	Biological Condition
Natural Land Cover at Watershed	Total Seasonal Exchange	Watershed-wide Geomorphic Change in the Active River Area	Aquatic Connectivity	Nitrogen (SW/GW)	Fish IBI
Natural Land Cover in Active River Area		% streams canopy/ditches	Absence of reed canopy grass	Phosphorus	Macro-invertebrate IBI
Wetlands Remaining		Physical habitat database	Absence of Eurasian water milfoil and cryptic pondweed	Salmon	Absence of spring waterfowl and zebra mussels
				Lake Clarity	

## 1. Landscape Condition

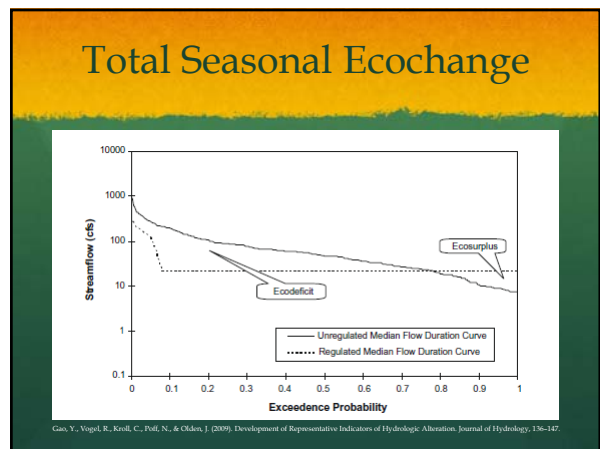
Natural vegetative cover stabilizes soil, regulates watershed hydrology, and provides habitat to terrestrial and riparian species.

- Indicators:
  - Percent natural land cover in the watershed.
  - Percent natural land cover in the Active River Area.
  - Percent wetlands remaining in watershed.

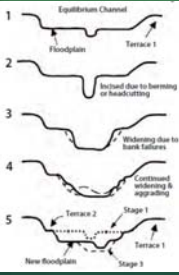
## 2. Hydrologic Condition

The Natural Flow Regime organizes and defines river ecosystems.

- Indicator:
  - Total Seasonal Ecochange - Difference between pre-development and current flow duration curves.
  - Statistical modeling will be used to estimate pre-development and current flow duration curves for all streams in the state.



### 3. Geomorphic Condition



- Evaluate changes in elevation using satellite data from 2 time periods:
  - Erosion
  - Deposition
- % of streams that are canals/ditches
- Field indicators of physical habitat where available

**Geomorphic Condition**


- Watershed-wide Geomorphic Change in the Active River Area
- % stream canals/ditches
- Physical habitat database

### 4. Habitat Condition

**Habitat Condition**

- Aquatic Connectivity
- Absence of reed canary grass
- Absence of certain water milfoil and curly-leaf pondweed

- Aquatic Connectivity
  - Road/stream crossings
  - Dams
- Absence of Aquatic Invasive Species that impact habitat:
  - Reed Canary Grass
  - Eurasian Water Milfoil
  - Curly-leaf Pondweed




### 5. Water Quality

**Water Quality**

- Nitrogen (BN/GW)
- Phosphorus
- Sediment
- Lake Clarity

- Phosphorus - Streams
- Nitrogen - Streams and Groundwater
- Sediment - Streams
- Lake Clarity - via Remote Sensing data
- Statistical modeling to evaluate water quality statewide




### 6. Biological Condition

**Biological Condition**

- Fish IBI
- Macroinvertebrate IBI
- Absence of spiny waterflea and zebra mussels

- Fish IBI
- Macroinvertebrate IBI
- Absence of aquatic invasive species that change trophic state of lakes:
  - Zebra mussel
  - Spiny waterflea



### And...Watershed Vulnerability

Changes that will increase as population grows and are known to have widespread, long-term consequences for aquatic ecosystems and their watersheds:

- Climate
  - Projected change in runoff
  - Projected change in nutrients & sediment
  - Projected fish distribution changes
- Land Use
  - Projected land cover change
  - Protected areas
- Water Use
  - High Capacity Water Withdrawals
  - Groundwater Dependent Ecosystems

### Multimetric Index

- What is a multimetric index?
  - "A dimensionless numeric combination of scores derived from ecological measures called metrics. A metric is a characteristic of the ecosystem that can be scored according to conditions."
- Benefit: Summarizes complex information into one overall score.
- Drawback: Summarizes complex information into one overall score.

## Index Development

- Directionally align each indicator so that higher values equal greater health.
- Normalize each indicator so that they are all on the same scale (e.g., 0 – 100)
  - Define thresholds if appropriate (healthy/unhealthy)
- Determine whether weighting should be applied
- Calculate Index

## Example Results: Vermont

Watershed Health

Watershed Vulnerability

## Management Guidance for Vermont Watersheds

## Application Ideas: Program-Specific Uses

- Prioritize grant funding - Runoff grant scoring
- Prioritize which watersheds need further monitoring
- Target TMDL implementation efforts
- Target wetland mitigation efforts
- Inform watershed planning process
- Track trends over time
- Identify nutrient reduction needs
- Inform land acquisitions
- Use Active River Area delineation as a new tool for land use planning

## Application Ideas: Communication Uses

- Communicate economic benefits of protecting HWs to “sell” the value of environmental programs
- Build public support for protection by informing people about vulnerabilities in certain watersheds
- Educate the public about areas vulnerable to groundwater/well issues
- Use in interactions between DNR and county staff during county land and water management plan development

