NJ Fish Index of Biotic Integrity

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Program Objectives

- Determine the current Status of fish communities, which reflect overall ecological integrity of the water resource.
- Integrate Fish IBI with existing benthic macroinvertebrate environmental indicator.
- Establish a routinely monitored network, so that Trends in ecological integrity can be determined.

Program Objectives (cont.)

- Verify <u>Compliance</u> with primary goals of Clean Water Act
- Evaluate the <u>Causes</u> of degraded water resources and the relative contribution of pollution sources.
- Evaluate <u>Effectiveness</u> of restoration programs and control strategies.

WHY Do We Monitor?

USEPA National Guidance, "Elements of a State Water Monitoring and Assessment Program", adopted March 2003, requires development of long term monitoring strategy

- To include assessment of all waters of state (rivers, lakes, streams, reservoirs, estuaries, oceans, wetlands & groundwater)

USEPA Strategic Elements

Strategy must include discussion of 9 basic elements for each waterbody type

- Monitoring objectives
- Monitoring design
- Core & supplemental water quality indicators
- Quality assurance
- Data management
- Data analysis/assessment
- Reporting
- Programmatic evaluation
- General support and infrastructure planning

Core & Supplemental Water Quality Indicators

Biological Indicators

- Provide measure of biological condition that integrates chemical and physical stressors over larger spatial and temporal scales than direct measurements
- At least 3 different principal indicators recommended, including benthic macroinvertebrates, fish, and periphytic algae
  - Need three to integrate different levels of integration due to mobility and life history characteristics

What is a Fish Index of Biotic Integrity?

- Using fish assemblages to assess the overall health of a stream ecosystem
- A scoring system based on multiple attributes (metrics) of a fish assemblage
- Individual metrics are summed and overall score used to determine health of a water body
- Metrics selected based on how well they indicate anthropogenic stressors

Why Use Fish as Biological Monitors?

- Fish are long-lived and are therefore good indicators of long-term disturbances
- Fish assemblages generally consist of a number of trophic levels
- Fish are at the top of the food chain in aquatic environments
- Fish are easy to collect and identify
- The NJ Fish IBI is a true Index of Biotic Integrity

Healthy Fish Community


Brook Trout


Smallmouth Bass


Swallowtail Shiner


Satinfin Shiner


Margined Madtom


Cutlips Minnow


Slimy Sculpin

Impaired Fish Community

Methods

Backpack Electrofishing

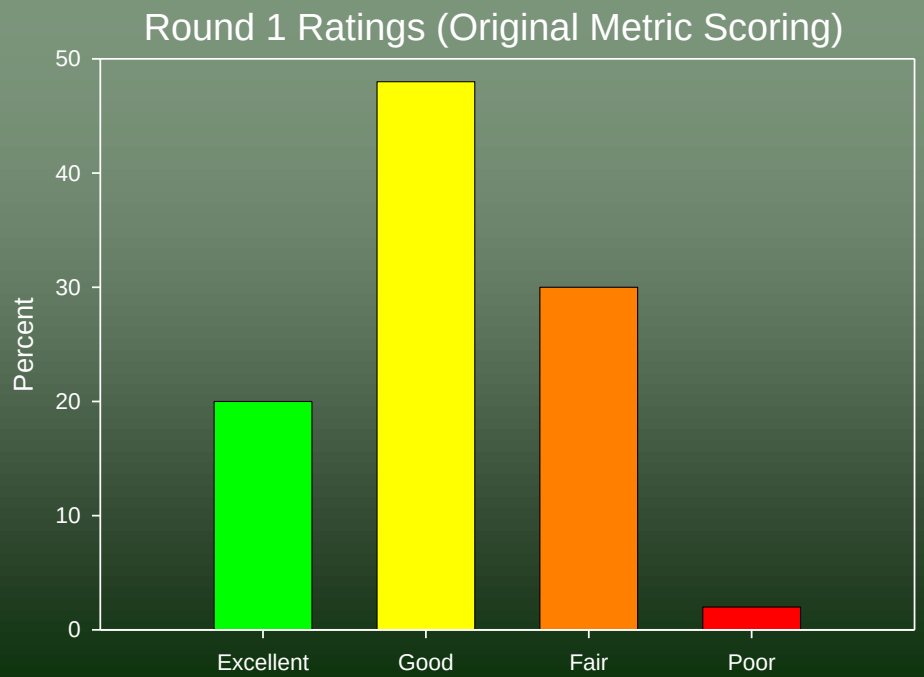
Barge Electrofishing

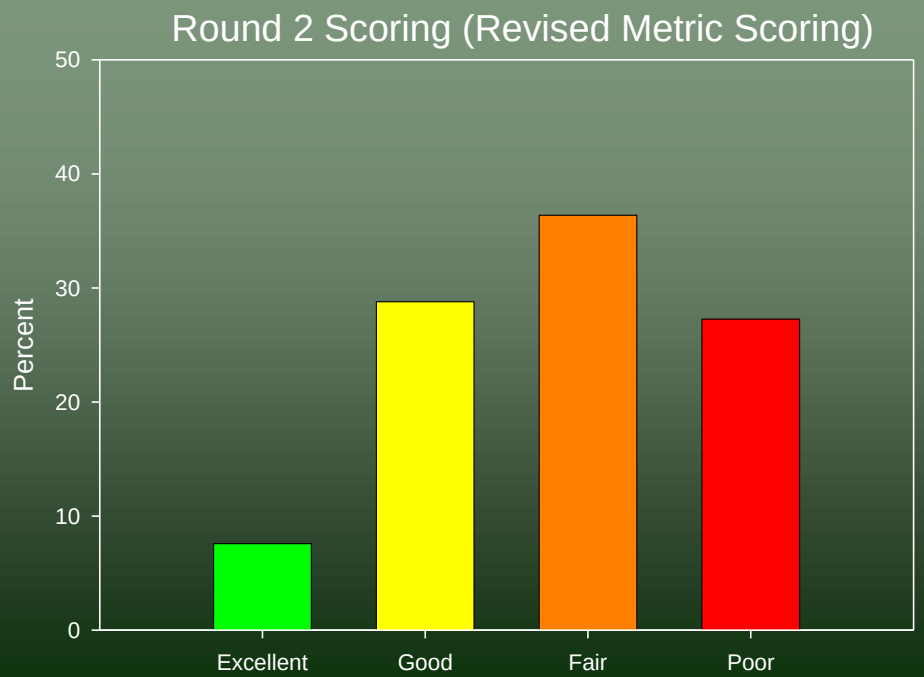
Northern IBI

- Program Implemented in 2000
- 100 Fixed Site Network
- 20 Sites per Year, 5 Year Rotation
- Index Period – June through Mid-October
- Round 2 Sampling Initiated in 2005

Metric Recalibration

- Round 1 sampling completed in 2004
- Metrics recalibrated in 2005 by BFBM using Round 1 data
- Analysis and modifications reviewed by Fish IBI Workgroup (USEPA, USGS, NJDEP-BFF, NJDEP-BWQS&A)
- Final metric revisions greatly increased sensitivity to anthropogenic stressors





Integrated Report

2006 Integrated Water Quality Monitoring and Assessment Report

http://www.state.nj.us/dep/wms/bwqsa/integratedlist2006Report.html

- Fish IBI data is used, in concert with available benthic macroinvertebrate data, to help the Department measure aquatic life designated use attainment, as elaborated in the *2006 New Jersey Integrated Water Quality Monitoring and Assessment Report*

Integrated Report

2006 Integrated Water Quality Monitoring and Assessment Methods document

http://www.state.nj.us/dep/wms/bwqsa/docs/2006AppendixGIntegratedWQMAMethodology.pdf

- Sites with an FIBI rating of "poor" are considered to be impacted significantly enough that, for purposes of the Department's Water Quality Monitoring and Integrated Assessment Report (40 CFR 130.7 and N.J.A.C. 7:15-6f), they will be categorized as "impaired"

Waters Needing Special Attention C1 Anti-degradation

- Category 1 waters: antidegradation designation - no measurable or predictable water quality change
- One basis - Exceptional Ecological Significance
- Monitoring data used - macroinvertebrates, fish IBI, aquatic-dependent T&E species, habitat, physical / chemical, & impervious cover

Other Studies

Stressor Identification

- Provides supplemental information
- In 2006, 2 sites were sampled (Beaver Brook and Drakes Brook)
- Numerous sites on Drakes Brook were evaluated

- Fish IBI enables quick assessment
- No laboratory analysis
- Useful tool for pinpointing stressed areas

Case Studies

Whippany River – FIBI009
FW2-NTC2
Sampled in 2000 & 2005
FIBI Score – Poor (26)
Habitat Score – Sub-optimal

- Numerous habitat impairments
- No riparian buffer
- Numerous outfalls
- Urbanization (48%)
- 14% impervious cover
- Run-off from roads & parking lots
- High conductivity
- Numerous abnormalities
- No insectivorous cyprinids

Case Studies

Green Brook – FIBI097a
FW2-NTC2
Sampled in 2005
FIBI Score – Poor (22)
Habitat Score – Marginal

- No riparian buffer
- Severe bank erosion
- Heavy siltation
- Urbanization (65%)
- 22% impervious cover
- Run-off from township park
- High conductivity/low D.O.
- Low benthic insectivore abundance

Case Studies

Ireland Brook – FIBI051
FW2-NTC2
Sampled in 2003 & 2007
R2 FIBI Score – Poor (26)
R2 Habitat Score – Optimal

- **No obvious habitat or water quality impairments**
- **Good riparian buffer/bank vegetation**
- **Headwaters mainly urbanized (55%)**
- **19% impervious cover**
- **Severe storm water run-off in headwaters**

Case Studies

Spruce Run – FIBI036
FW2-TPC1
Sampled in 2001 & 2006
R2 FIBI Score – Fair (34)
R2 Habitat Score – Sub-optimal

- **Bridge construction just upstream**
- **Impairments to benthic community**
- **Insectivorous cyprinids decreased from 66% in 2001 to 16% in 2006**
- **Flash flooding**
- **<4% impervious cover**
- **Limited riparian buffer**
- **Newly formed sediment bars**

Southern IBI

- Lower Delaware River Drainage
- Developed by NJ Fish & Wildlife
- Piloted by BFBM in 2007
- Index Period – June through Mid-October

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http://www.state.nj.us/dep/wms/bfbm/index.html

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Index by Topic

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Any
Questions?