

# Developing Tools for Wetland Assessment: Level 3-IBIs

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Control Agency**

# *IBIs - Introduction*

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Monitoring and assessment programs require a hierarchy of indicators

– Level 1: Landscape Assessment

- GIS & remote sensing

– Level 2: Rapid Assessment

- Simple, qualitative on-site data collection

– Level 3: Intensive Site Assessment

- Quantitative on-site data collection

**Accuracy of assessment vs. number of sites assessed**



# *IBIs - Introduction*

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## Biological Indicators

- Integrate multiple impacts over space & time

## Index of Biological Integrity (IBI)

- Multimetric Index
- Based on deviation from 'reference' conditions (least impacted sites)
- Measurement of wetland condition
- Macroinvertebrates & Plants



# *IBIs - Introduction*

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## IBI Development Components

- Wetland Classification
- Sampling
- Disturbance Gradient
- Metric Selection
- Metric Scoring
- Preliminary IBI
- Validation
- Precision
- Performance Criteria



# IBIs - Classification

## Reduce variation

- Apples:Apples

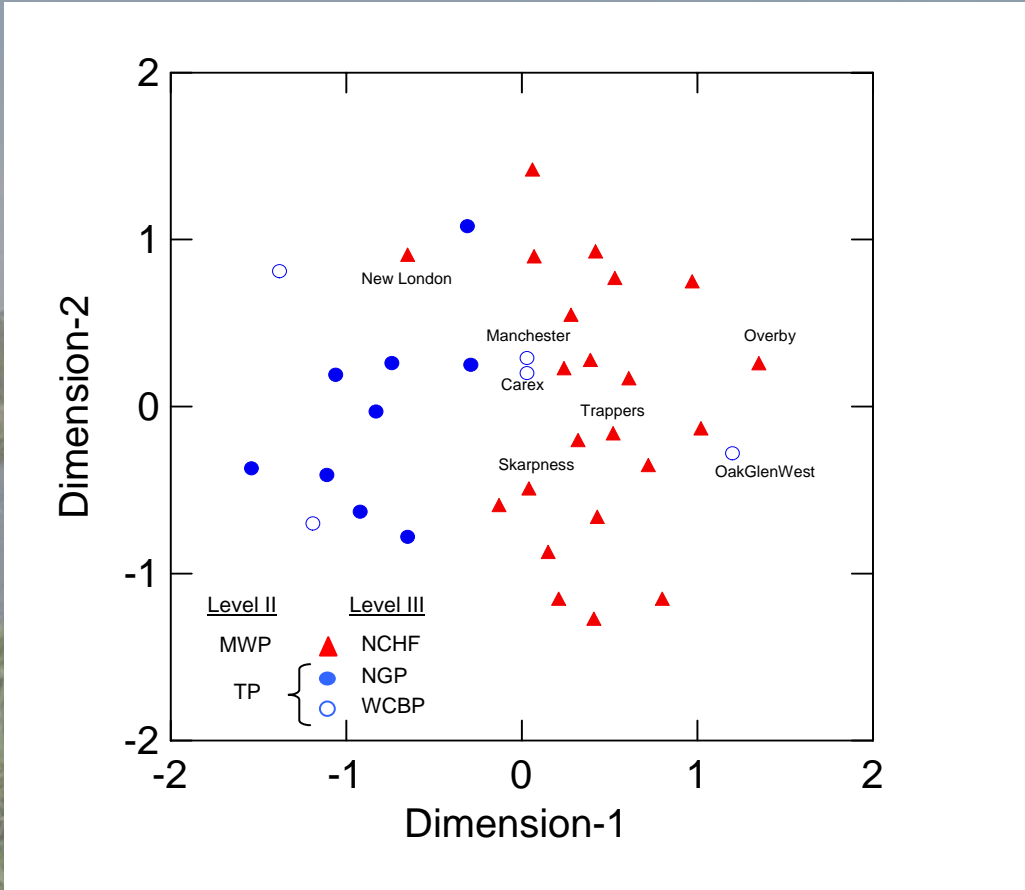
## 2 Aspects...

### 1) Type/Habitat

- Depressional Marshes

### 2) Geography

- Omernik Level 2 Ecoregions



# *IBIs - Sampling*

## Detecting impacts vs. sampling cost

- What is the minimum that I need to sample to detect change?

### Macroinvertebrates

- 3-5 Dip net efforts & timed field picking
- Contractors perform ID's
- 1-2 hours on site & 9-12 months for ID's

### Plants

- Single 100 m<sup>2</sup> plot
- Emergent/open water interface
- Plants ID'd & % cover
- ½-1½ hours on site & ½ hour for IDing unknowns

### Additional Sampling

- Water chemistry
- Stressor checklist



# *IBIs - Disturbance Gradient*

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Metrics need to be tested against an independent human disturbance gradient

- Should not use biology
  - Avoid circular reasoning
- Sites need to span entire range
  - little (reference) to heavily impacted (toilet tank)

## Human Disturbance Score (HDS)

- Semi-quantitative site rating
- 6 Factors
- Each factor rated according to narrative criteria & scored
- HDS = sum of 6 factor scores
- Ranges from 0 (pristine) to 100 (trashed)



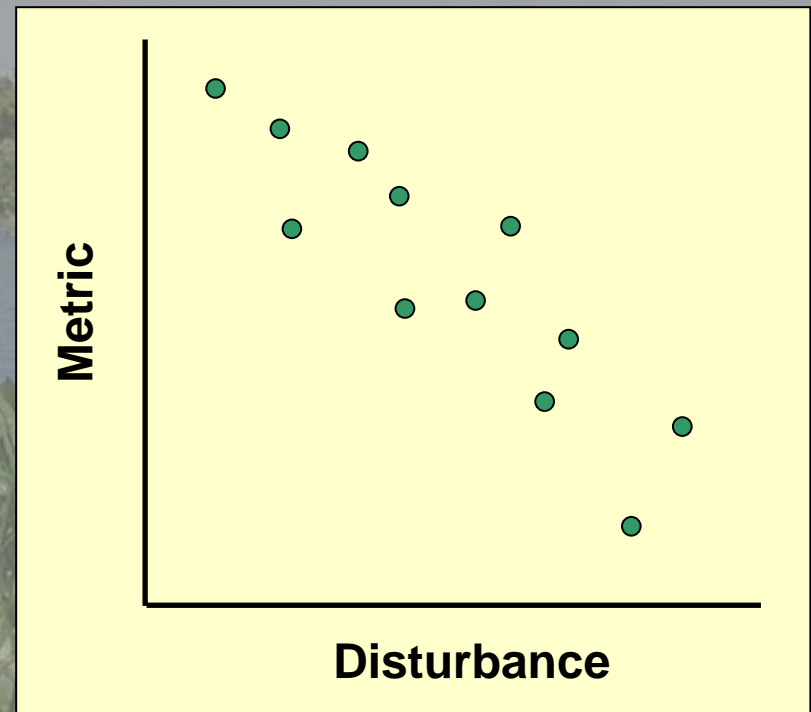
# *IBIs - Metric Selection*

Need to select metrics according to predetermined standards

- Base standards on basic indicator principles

## Metric Selection Criteria

- 1) Ecologically Meaningful
- 2) Easily Quantifiable
- 3) Sufficient Range
- 4) Disturbance Response
- 5) Minimize Redundancy
- 6) High Precision



# *IBIs - Metric Scoring*

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Why do metrics need to be scored?

- Common scale
- Opposite responses

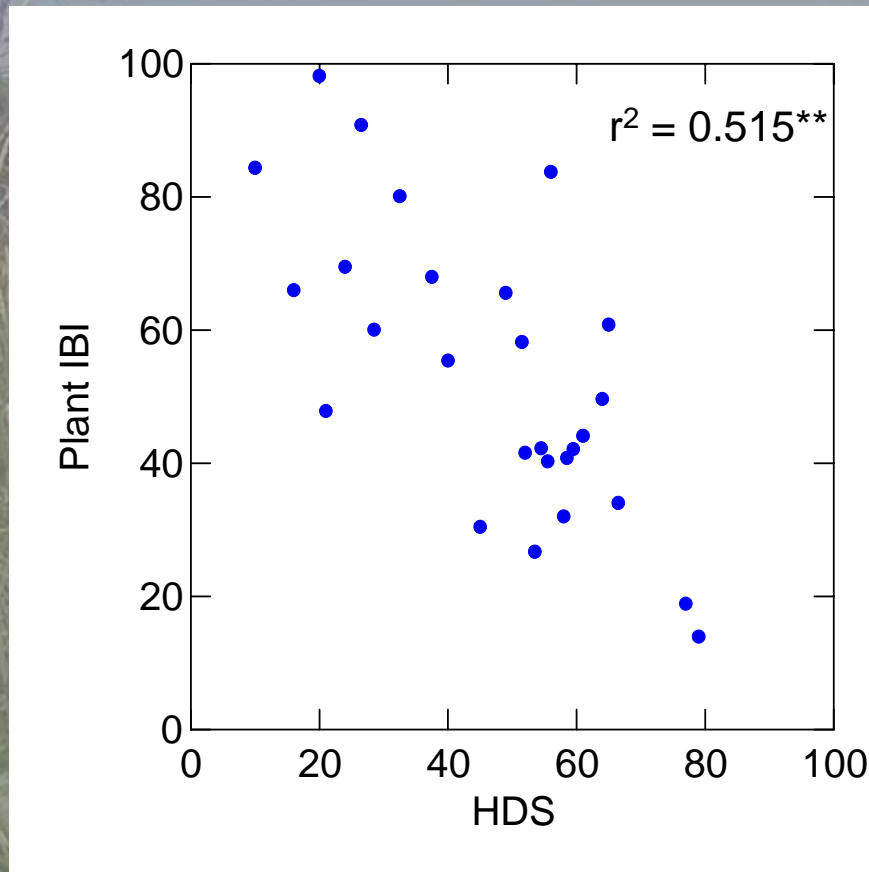
Types of metric scoring

- Categorical (e.g., 0, 3, 5)
  - Mathematical division (e.g., trisection)
  - Graphical interpretation
- Continuous (e.g., 0-5)
  - Mathematical scaling



# IBIs - Preliminary IBI

Once metrics are scored they can be summed to compute the IBI



## Temperate Prairies Plant IBI

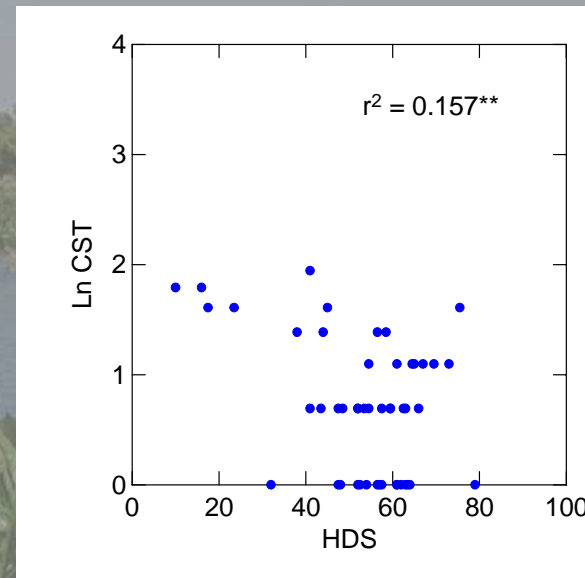
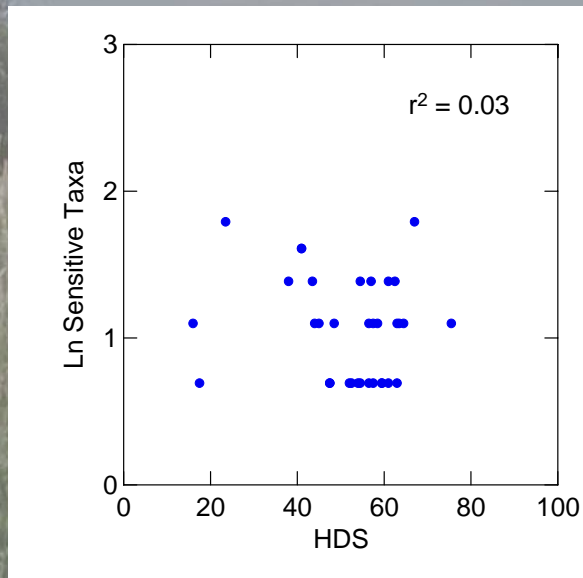
- 9 metrics
- 4 metric types
- Scored continuously
- Scaled: 0-100



# IBIs - Validation

IBI should be robust

- Validate IBI & metric responses with an independent dataset
- Metrics that do not show consistent response should be adjusted or eliminated



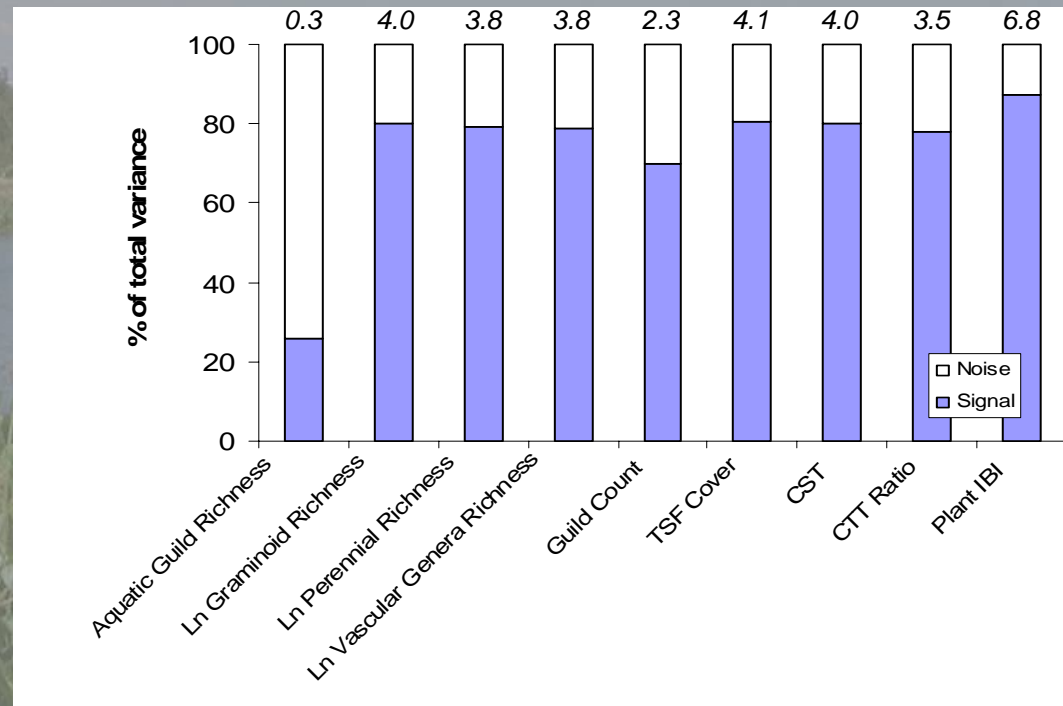
# IBIs - Precision

IBI must be able to detect changes due to human impacts in the face of natural variability

## Variance Components

- Sampling error
- Within-site
- Intra-annual
- Inter-annual

Components can be estimated with replicate sampling and ANOVA



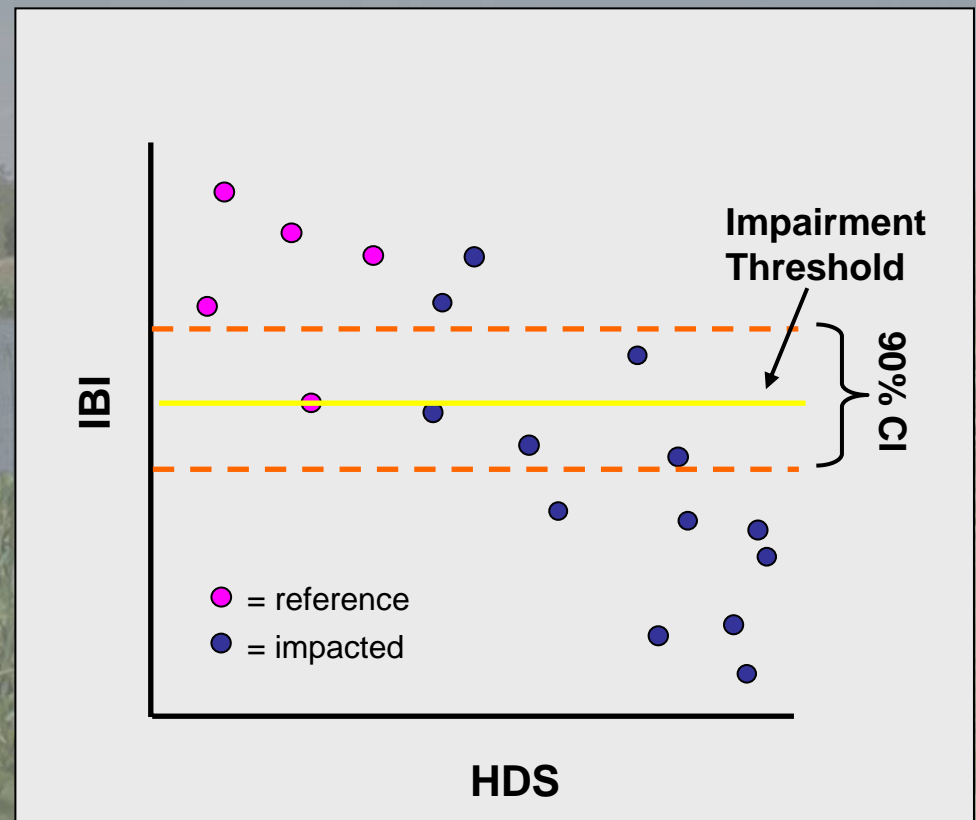
# IBIs - Performance Criteria

Performance criteria are needed to interpret the IBI and make the assessment

- Subjectivity is unavoidable
- Make an informed & defensible decision

## IBI assessment

- Impairment threshold
  - Lowest scoring reference site
- Confidence Interval



# *IBIs - The Broader Context*

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- High level of confidence in the assessments
- Requires greater implementation resources (time, money, expertise)
- Very good at indicating condition
- Not good as a diagnostic indicator
  - Specificity required
  - Integrating properties of the biological community works against specificity
- Use to develop/test/validate levels 1 & 2



