



Integrating Tribal Stream Monitoring Data Sets into Regional Assessment Frameworks

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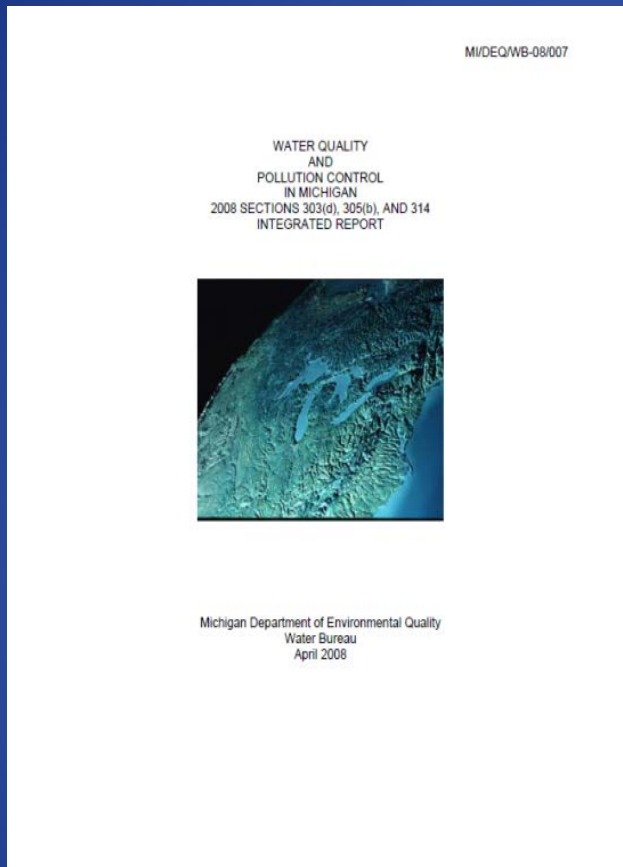
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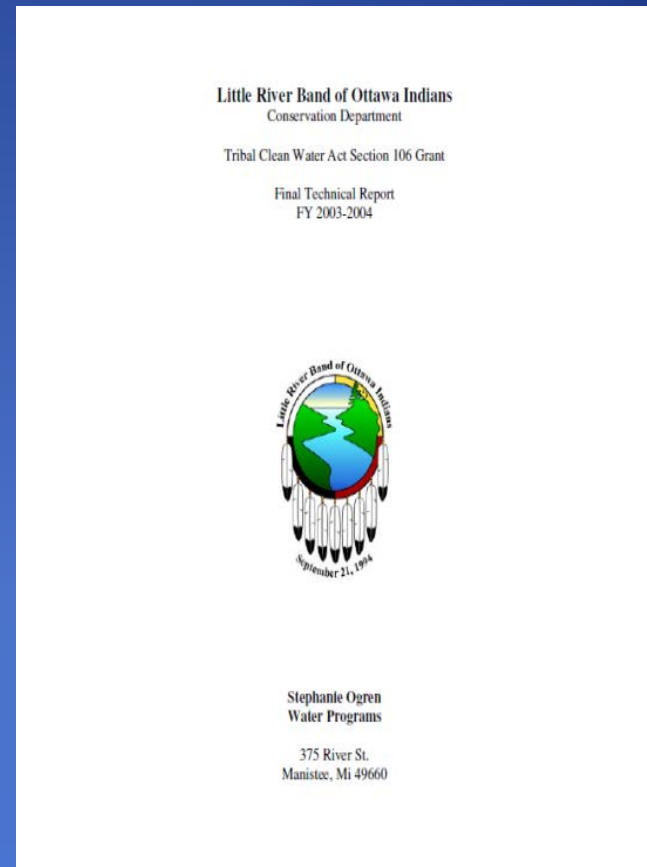


Fragmented Bioassessment Data

50 X



X 500





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Objectives

- 1) What datasets and frameworks are available?
- 2) Can we integrate Tribal datasets into frameworks?
- 3) What scale is appropriate?
- 4) Can we assess management activities?



Datasets





Frameworks for Analysis

- 1) Multivariate Analysis
- 2) Biotic Index
- 3) Index of Biotic Integrity
- 4) Biological Condition Gradient





Multivariate community response

- 1) Tools for analyzing multiple responses
- 2) Exploratory analysis – patterns in data
- 3) Interactions and environmental variables





Hilsenhoff Biotic Index

(Hilsenhoff 1987,1988)

- 1) Based on Tolerance Values (0-10)
- 2) Taxonomic Level - family level and genus level
- 3) Developed in WI

0-3.75 Excellent

3.76-4.25 Very Good

4.26-5.0 Good

5.01-5.75 Fair

5.76-6.50 Fairly Poor

6.51-7.25 Poor

7.26-10.0 Very Poor





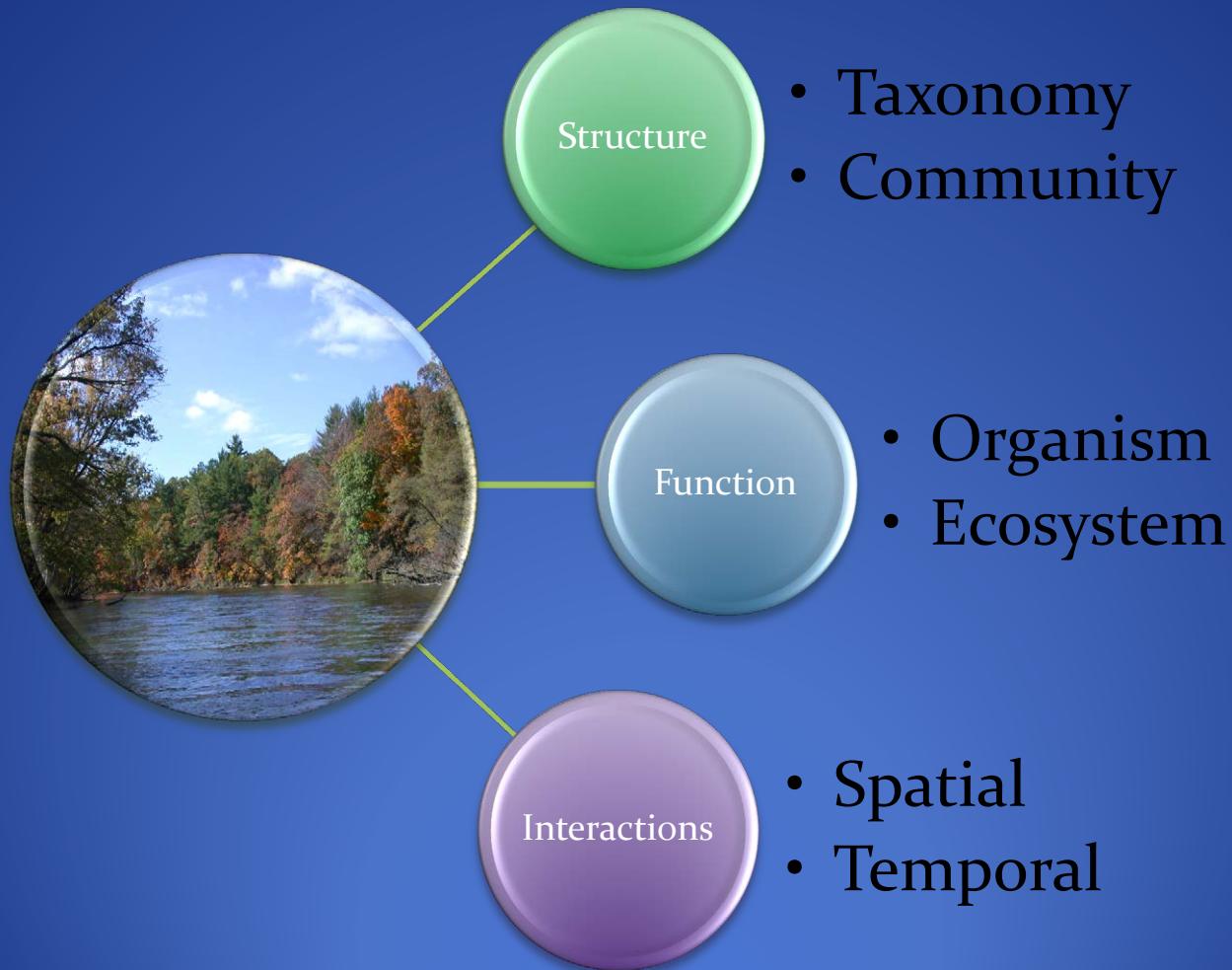
Index of Biotic Integrity

- 1) Regional
- 2) Multiple metrics
- 3) Reference condition



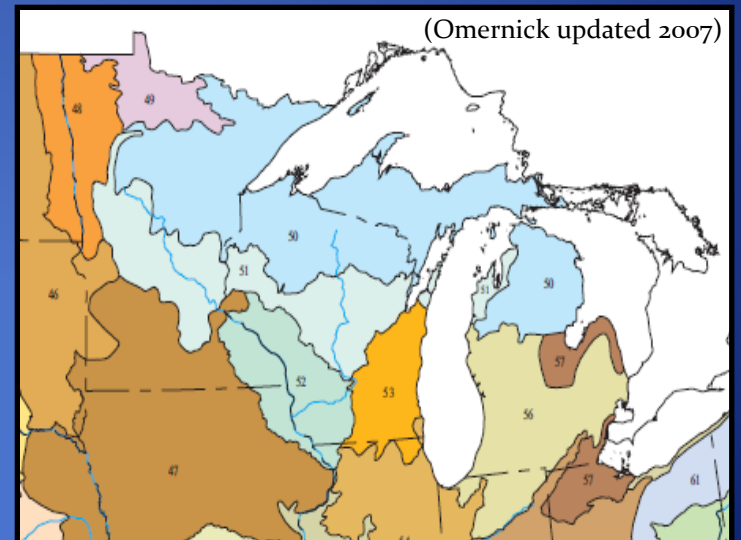
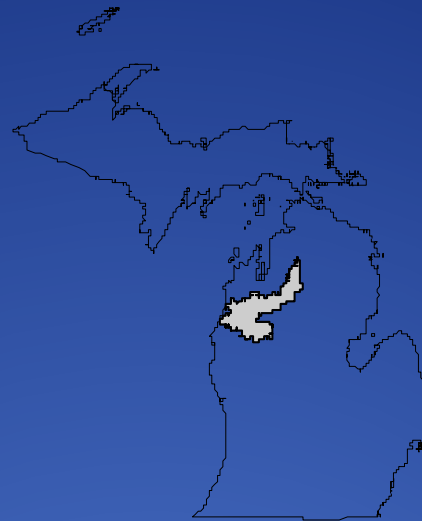


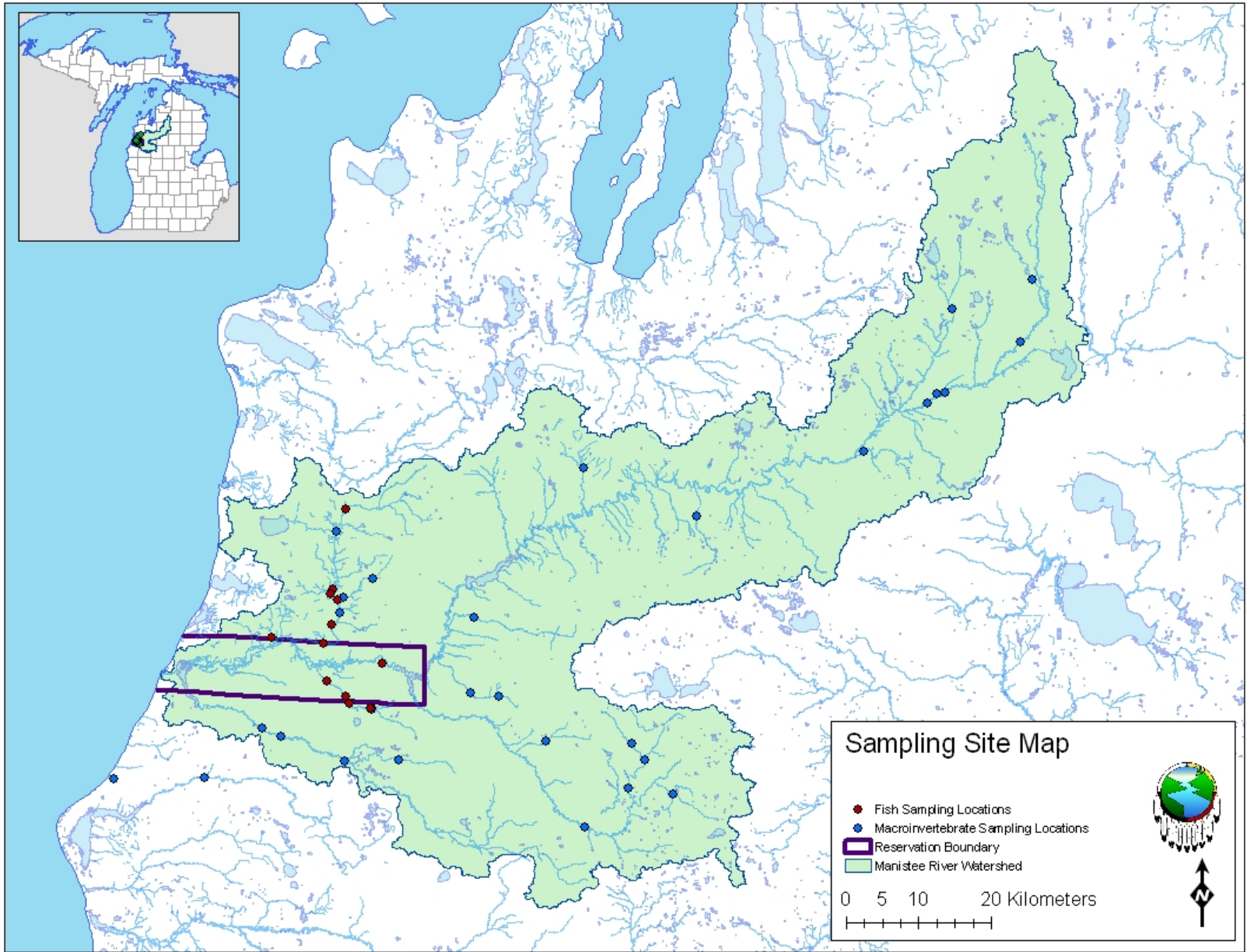
Biological Condition Gradient





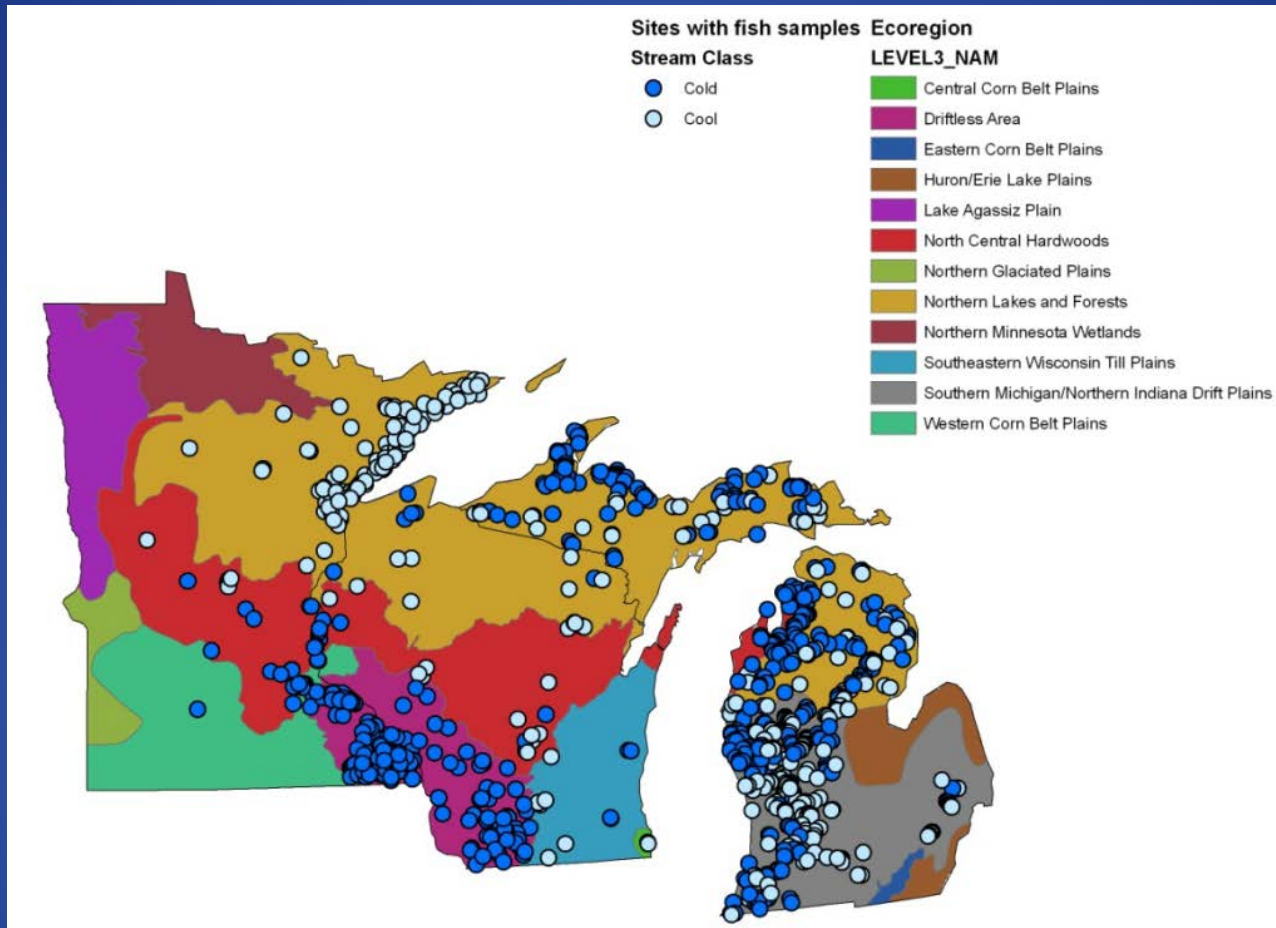
Scale







Temperature



(Stamp, 2011)



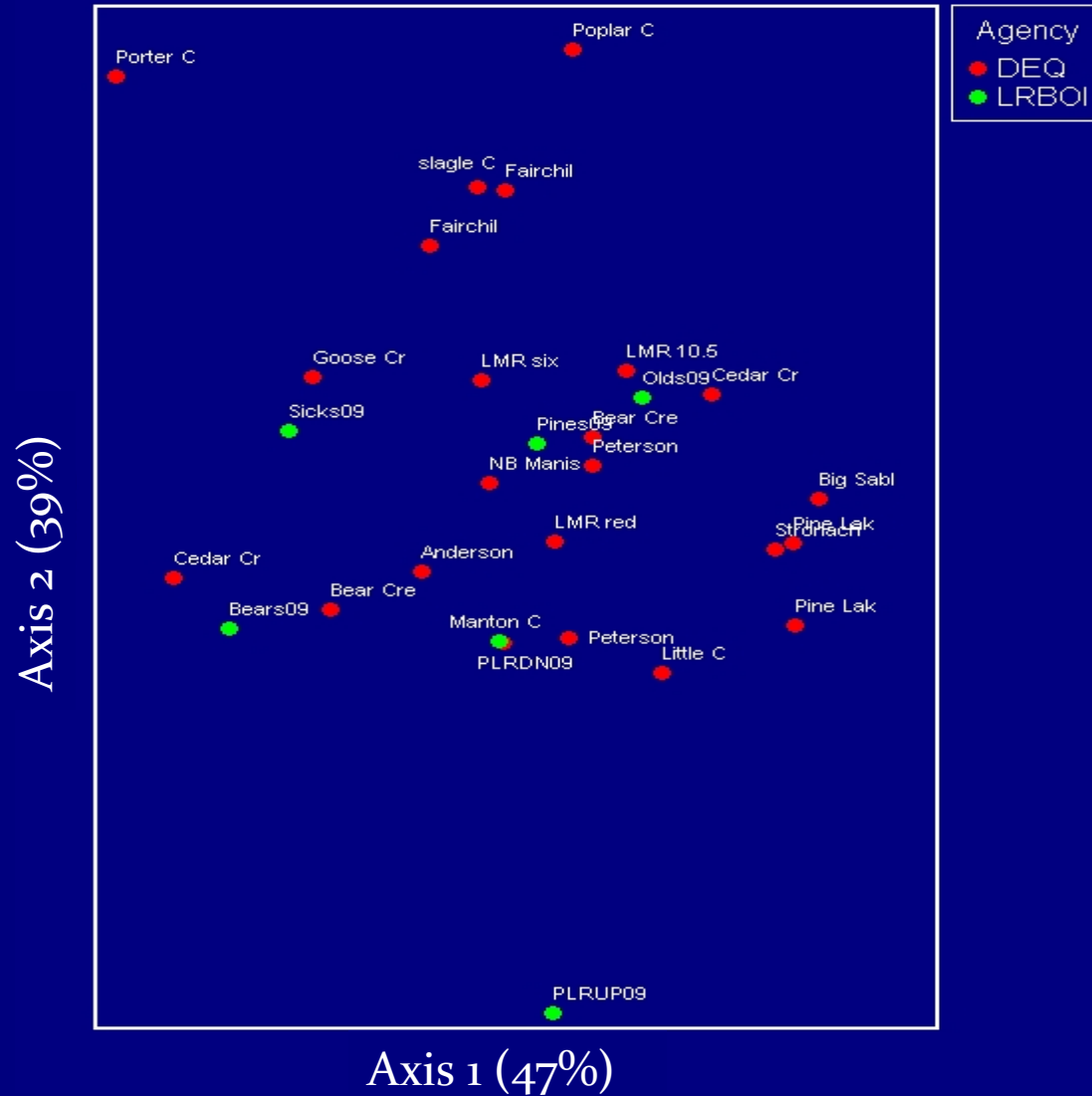
Macroinvertebrate Data

- Multivariate Community Response
- Hilsenhoff Biotic Index (Hilsenhoff 1987,1988)
Family and Genus level
- Northern Lakes and Forest IBI (NLFIBI, Butcher et al. 2003)
- Biological Condition Gradient (EPA workgroup)



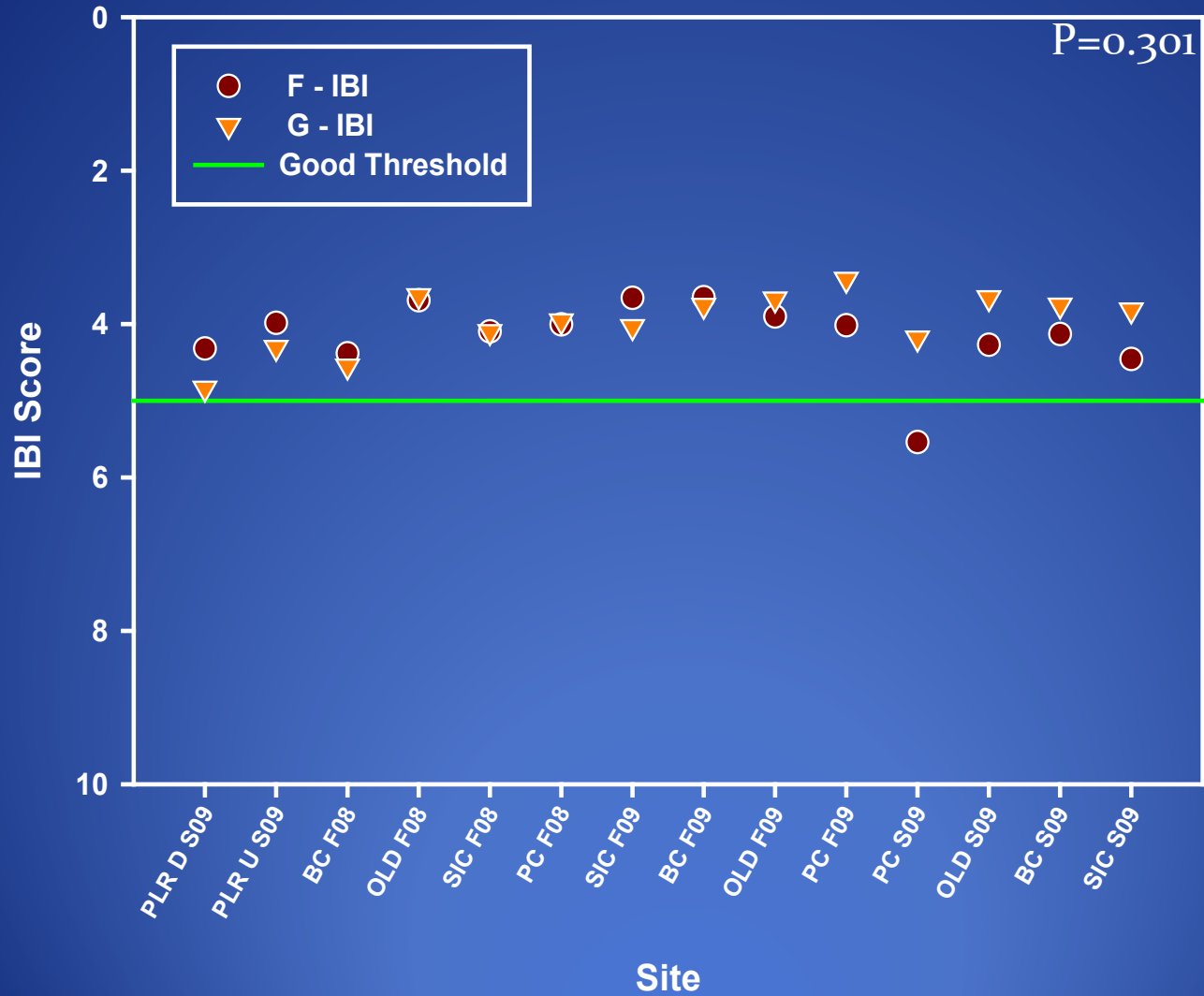


Macroinvertebrate Sites - NMDS





FBI vs GBI





Northern Lakes and Forest IBI (NLFIBI)

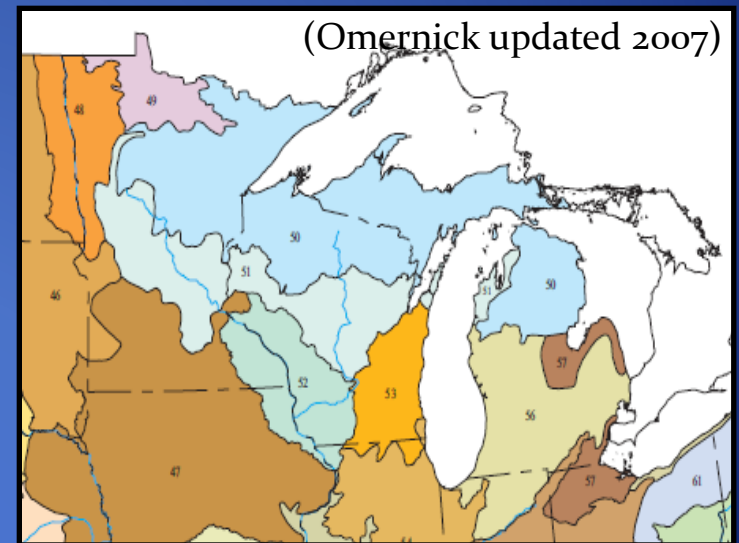
(Butcher et al. 2003)

Ecoregion Approach

Metric Selection

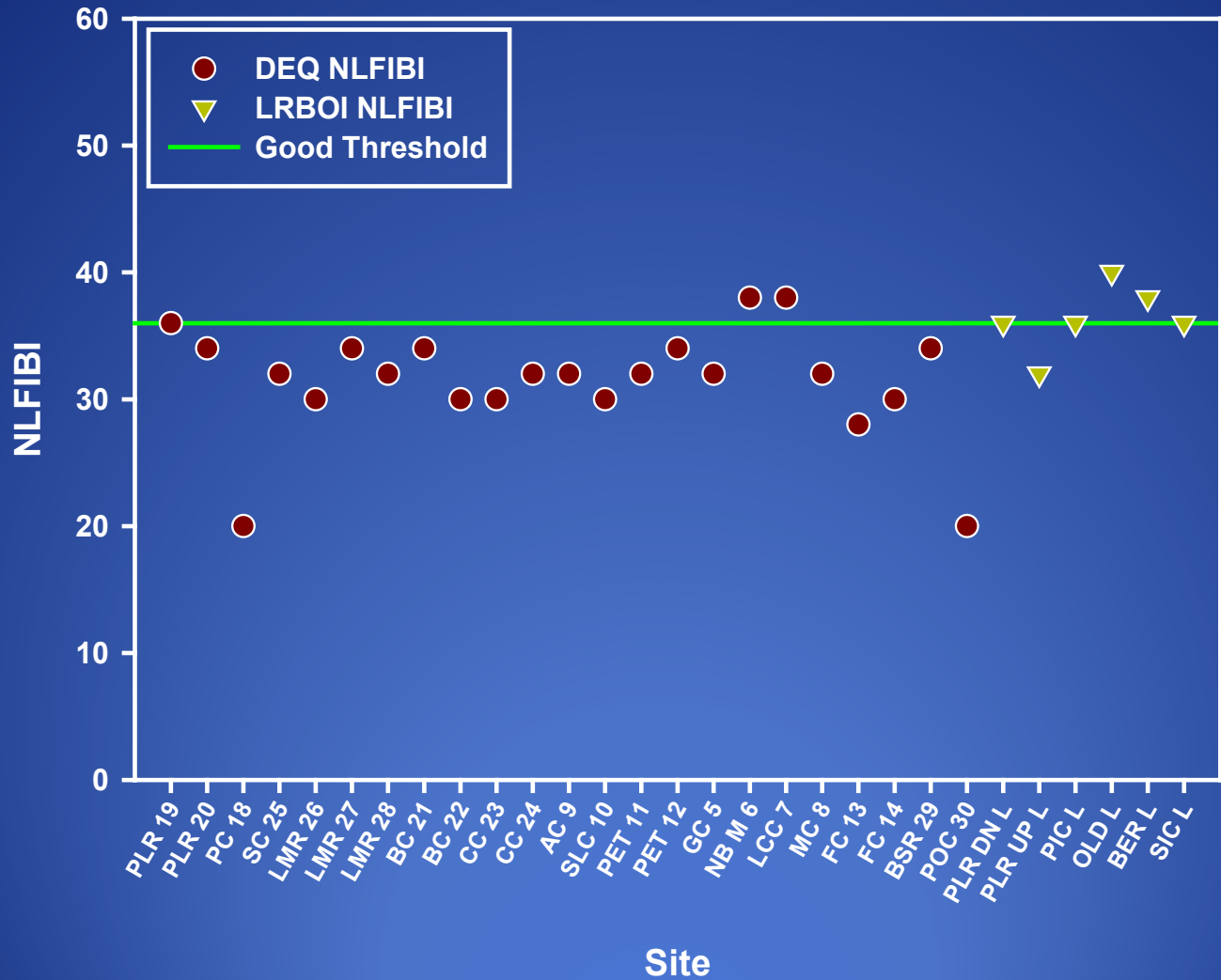
- Structural metrics
- Functional metrics
- Stream Condition metrics

Ranked in Relation to Reference



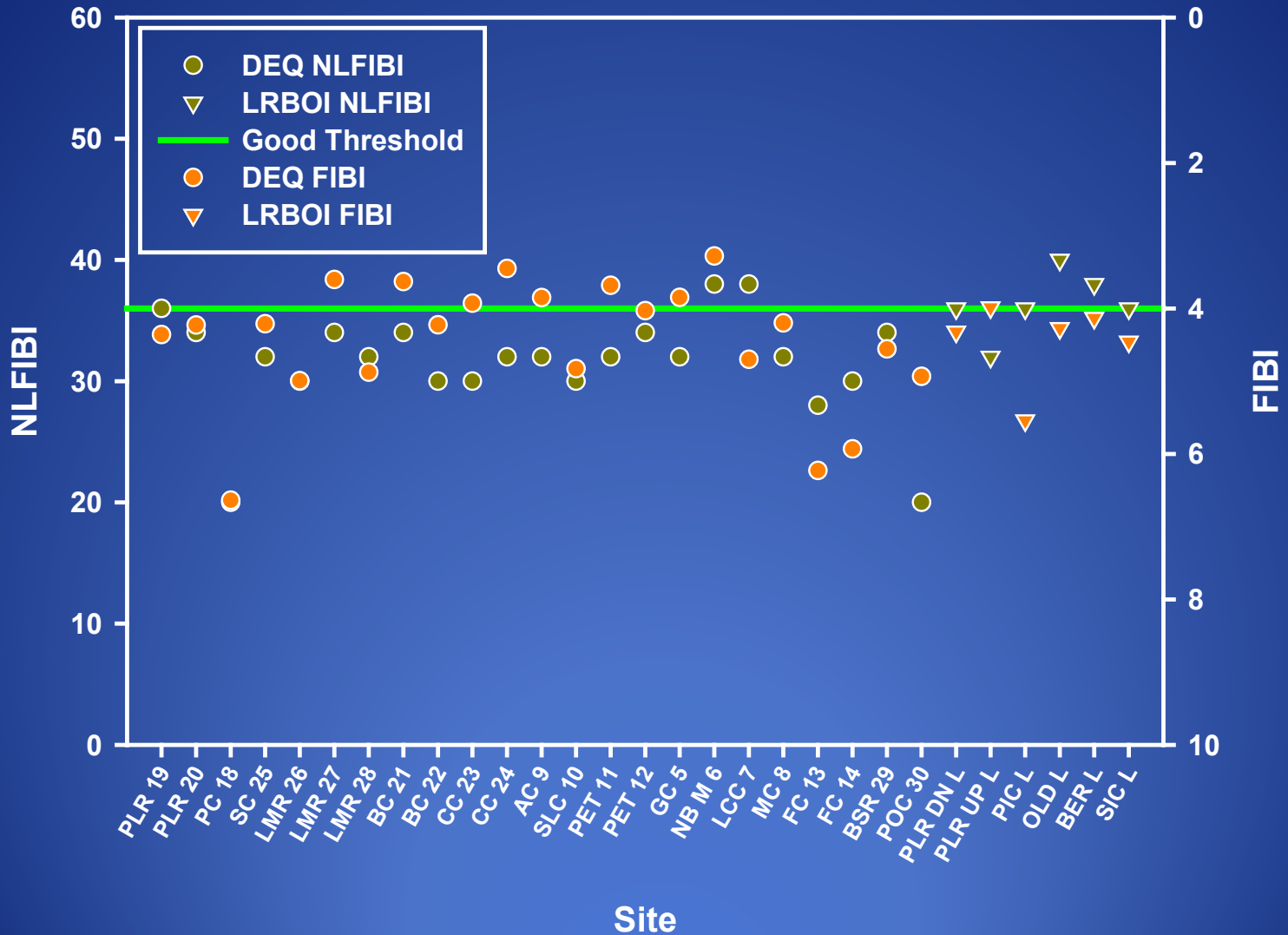


NLFIBI



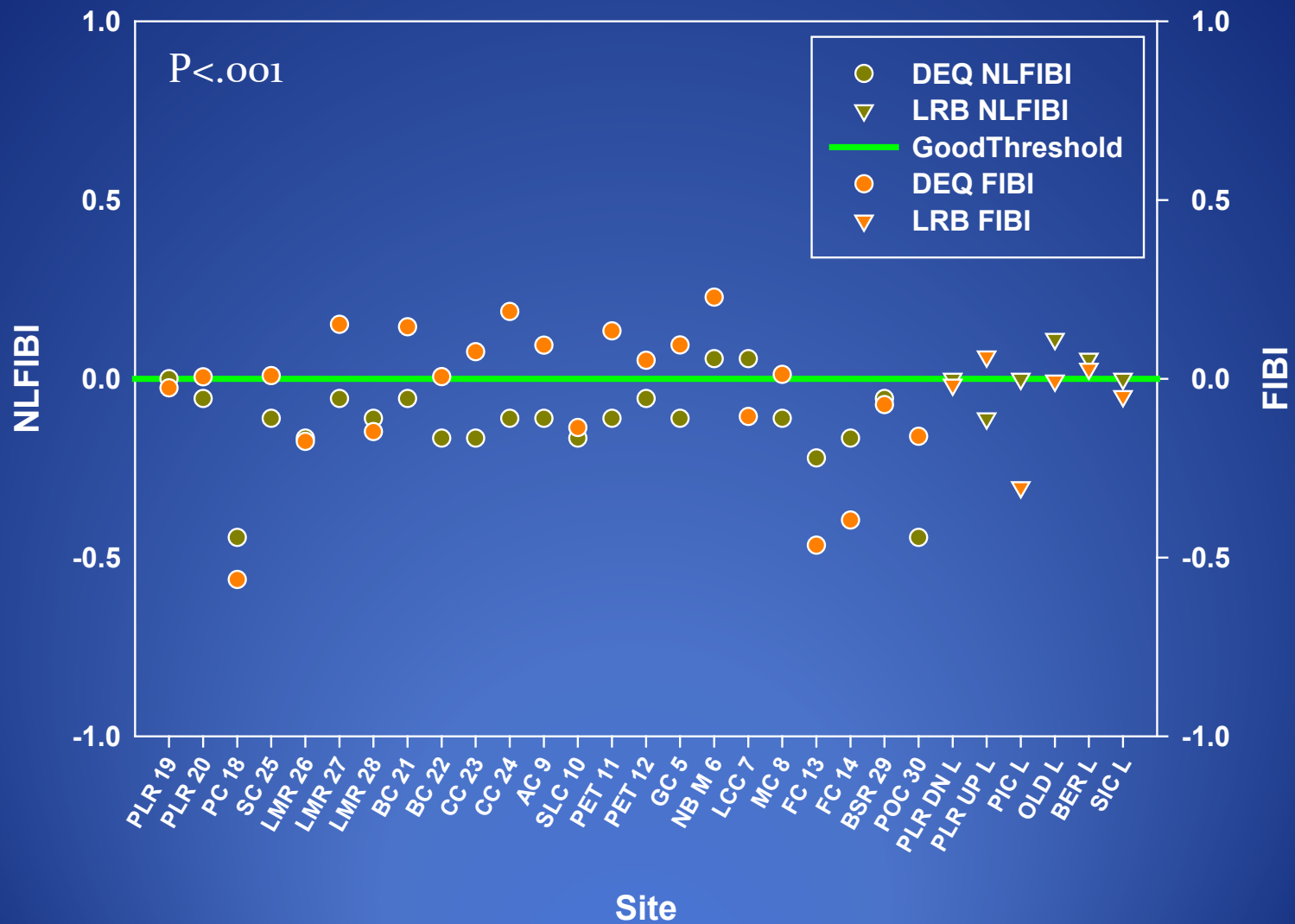


NLFIBI and FIBI



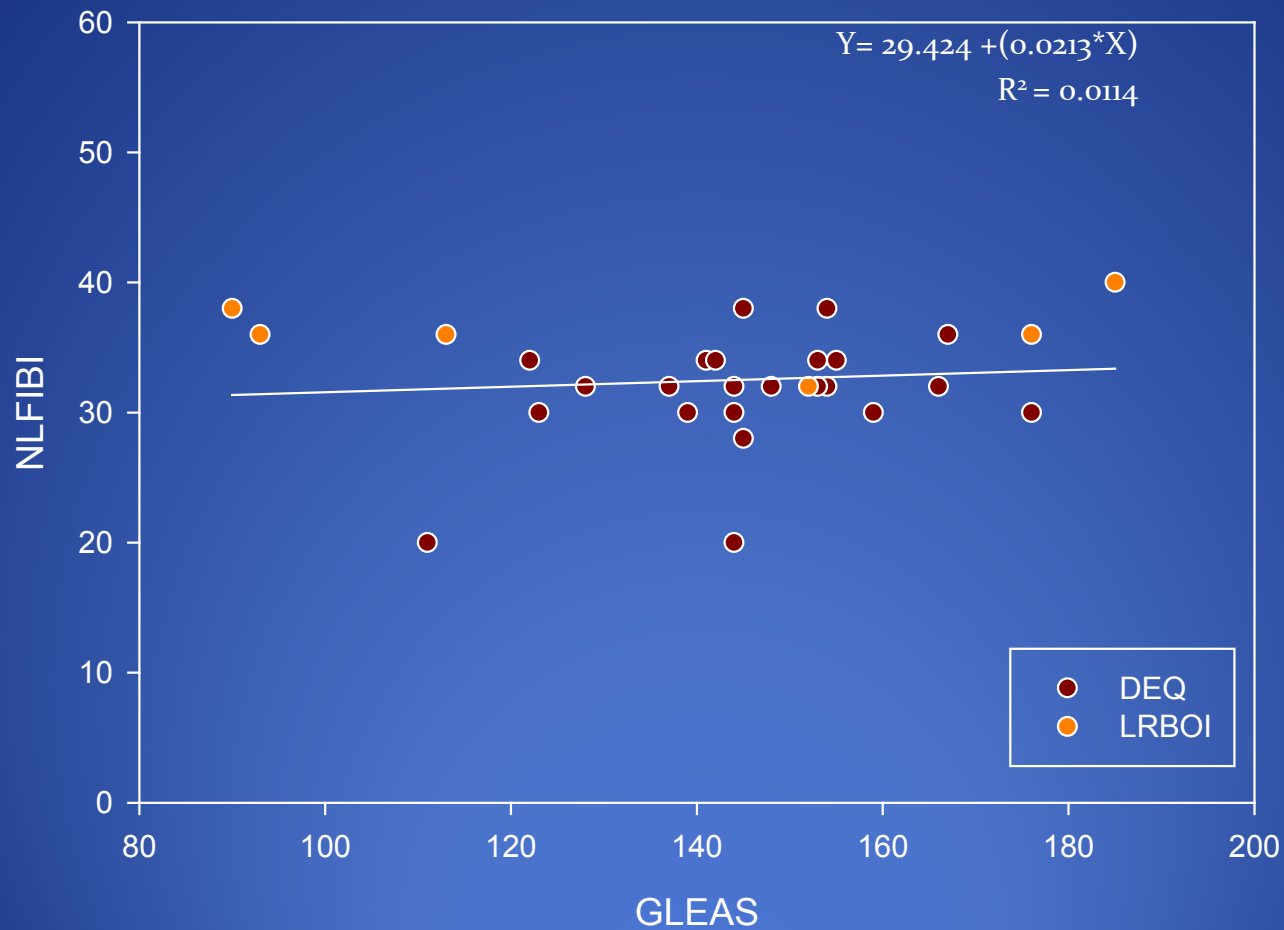


NLFIBI and FIBI





Habitat (GLEAS) Score





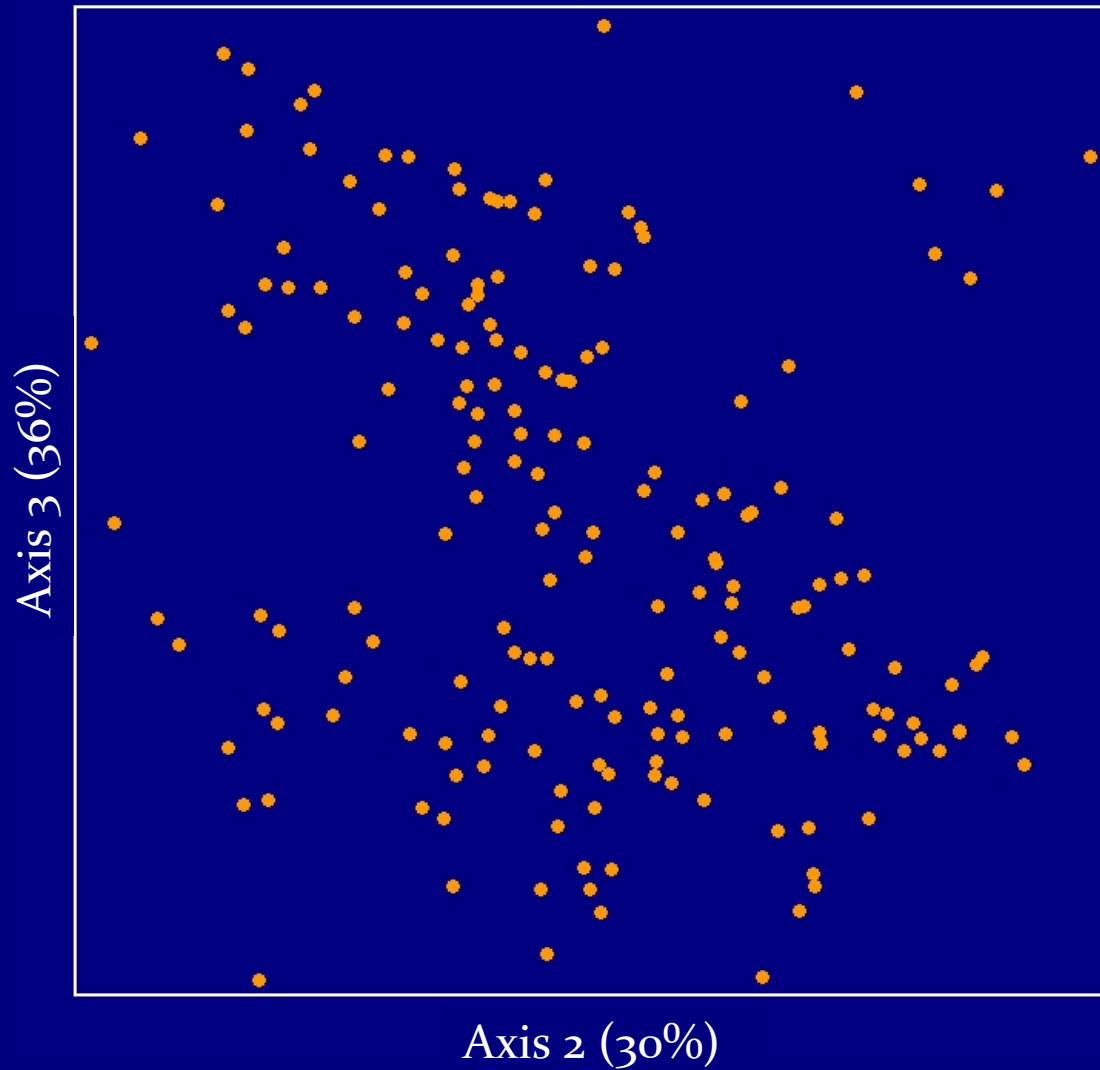
Fish Data

- Multivariate Community Response
- Coldwater IBI (Lyons et al. 1996)
- Coldwater IBI (Mundahl and Simon 1999)
- “Transitional” IBI (Lyons 2011 DRAFT)
- Biological Condition Gradient (EPA workgroup)



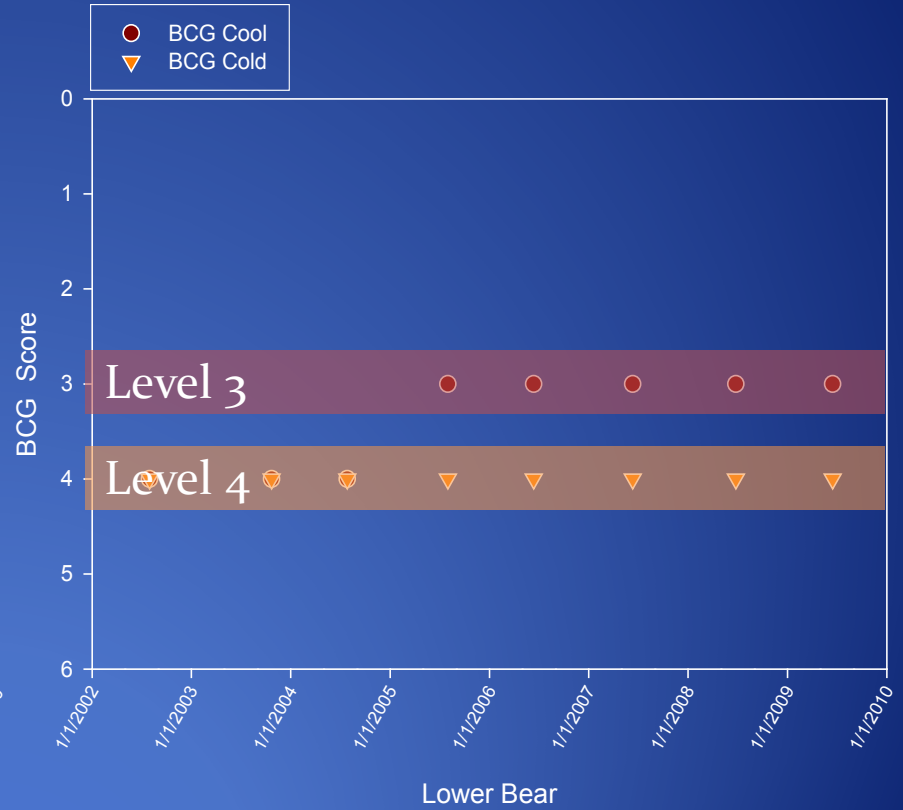
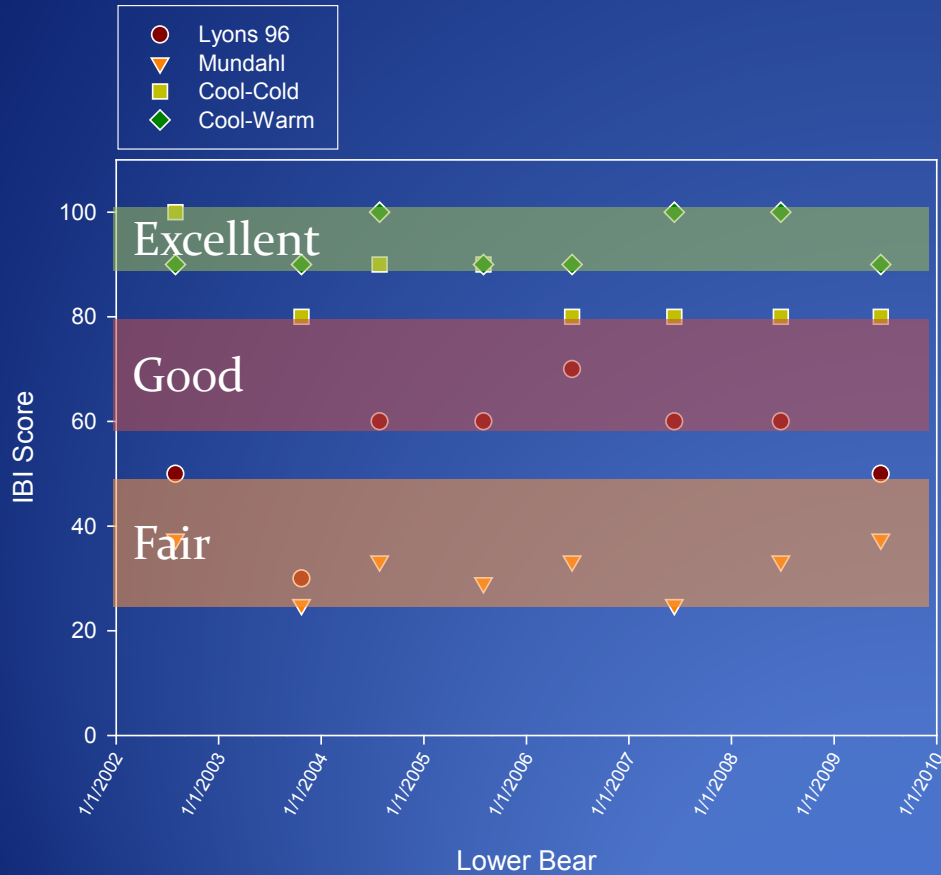


Fish Community – NMDS



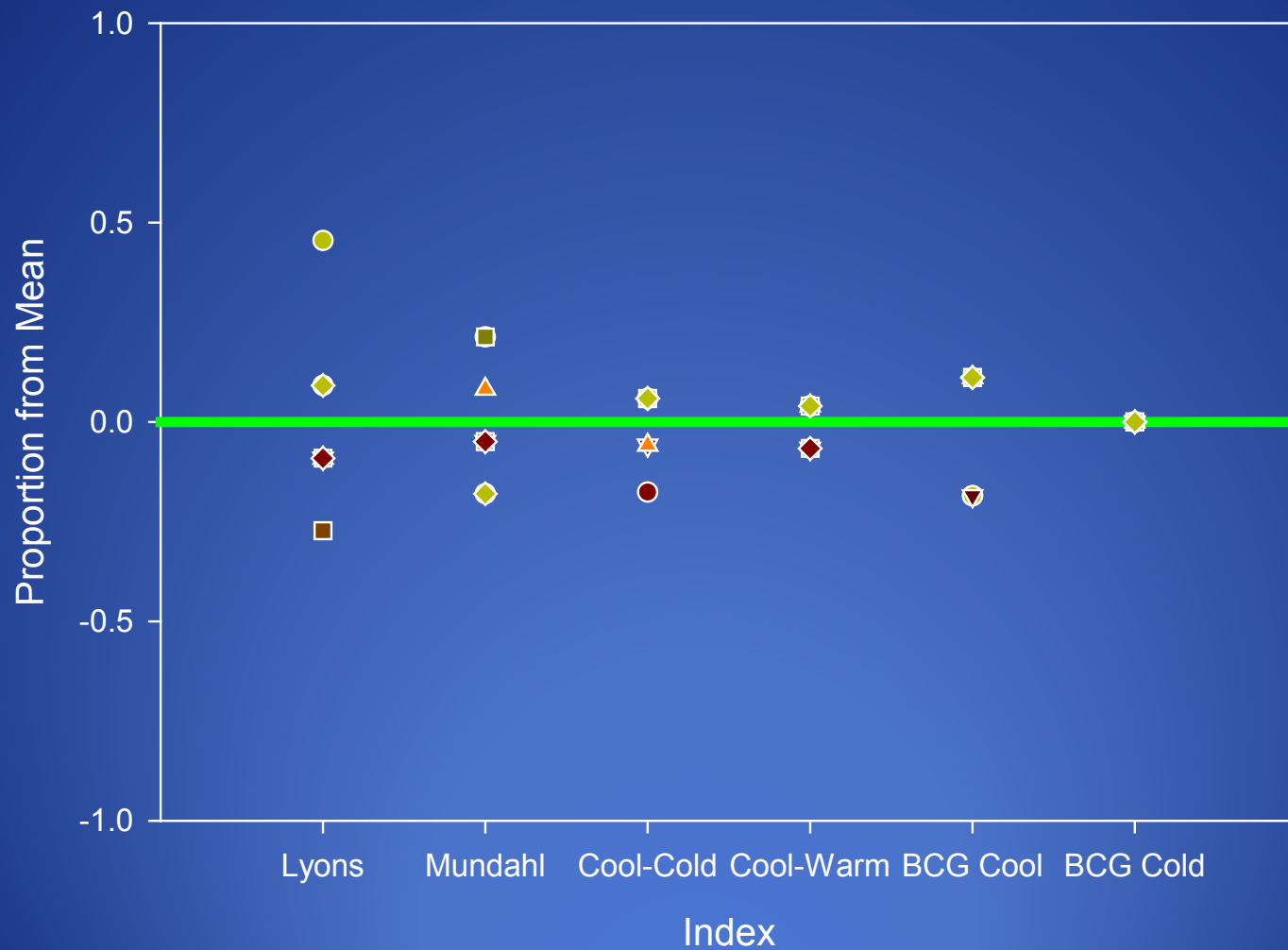


Fish scores over time



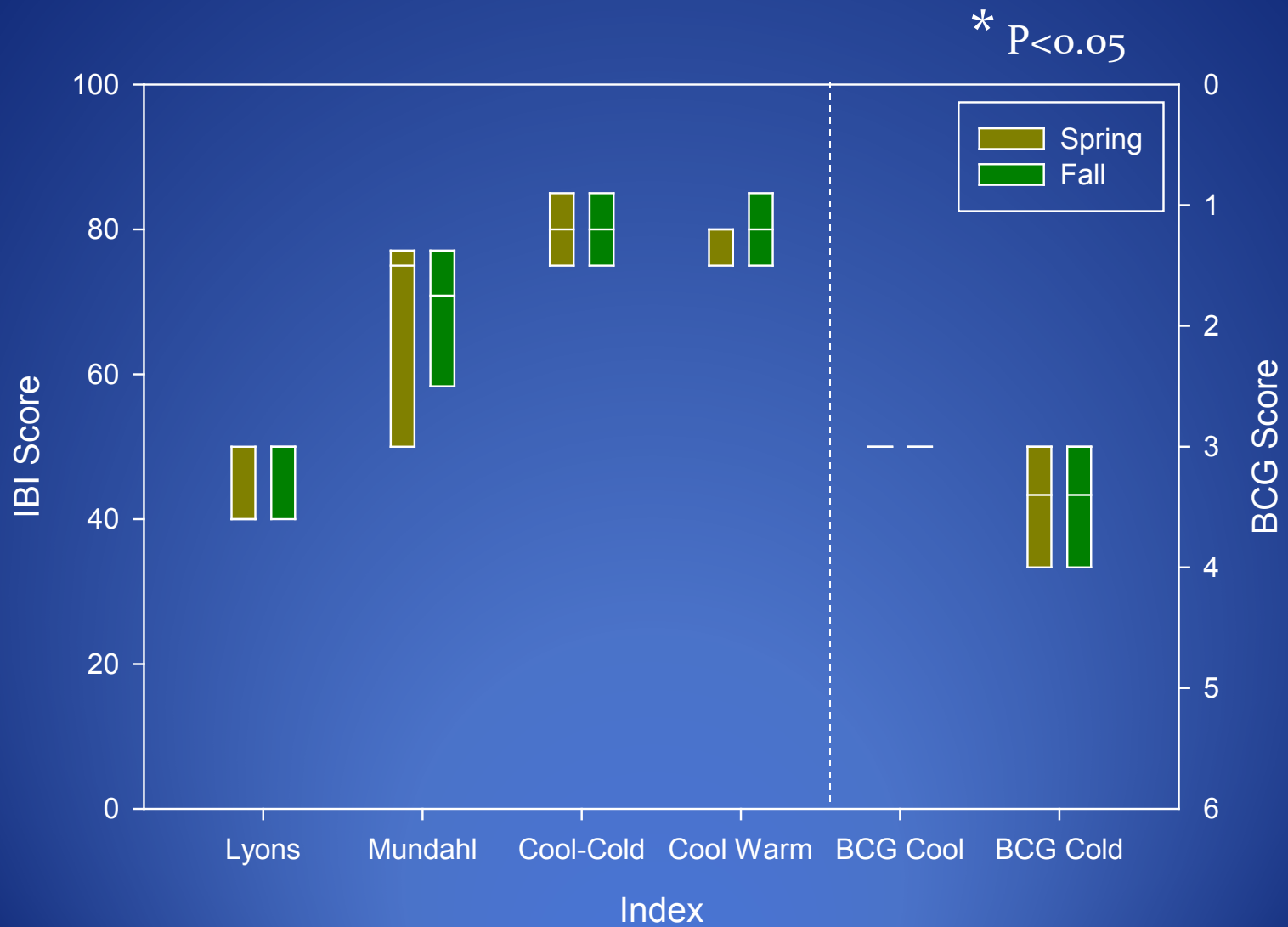


Variation over time



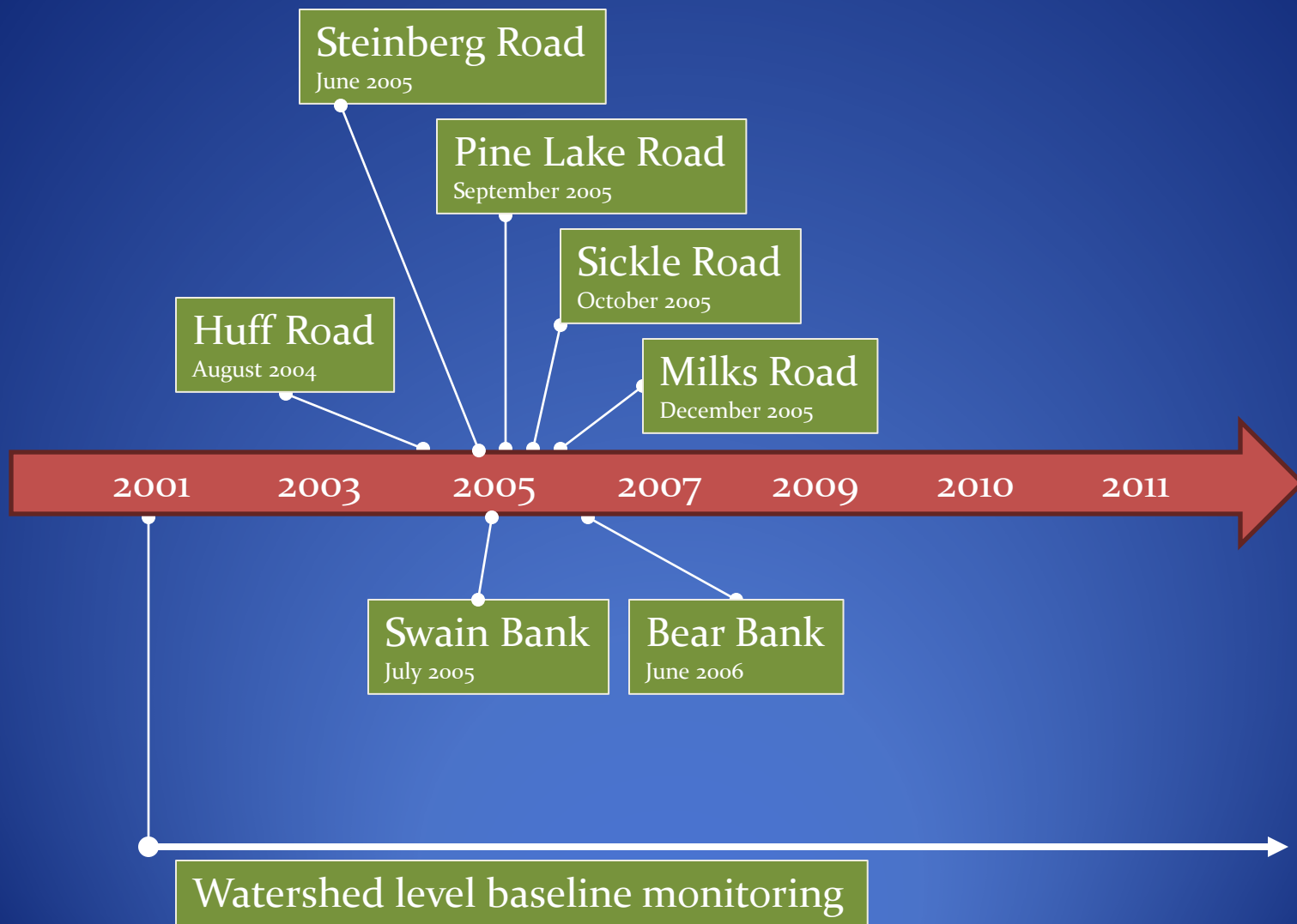


Fish seasonal data





Restoration Timeline



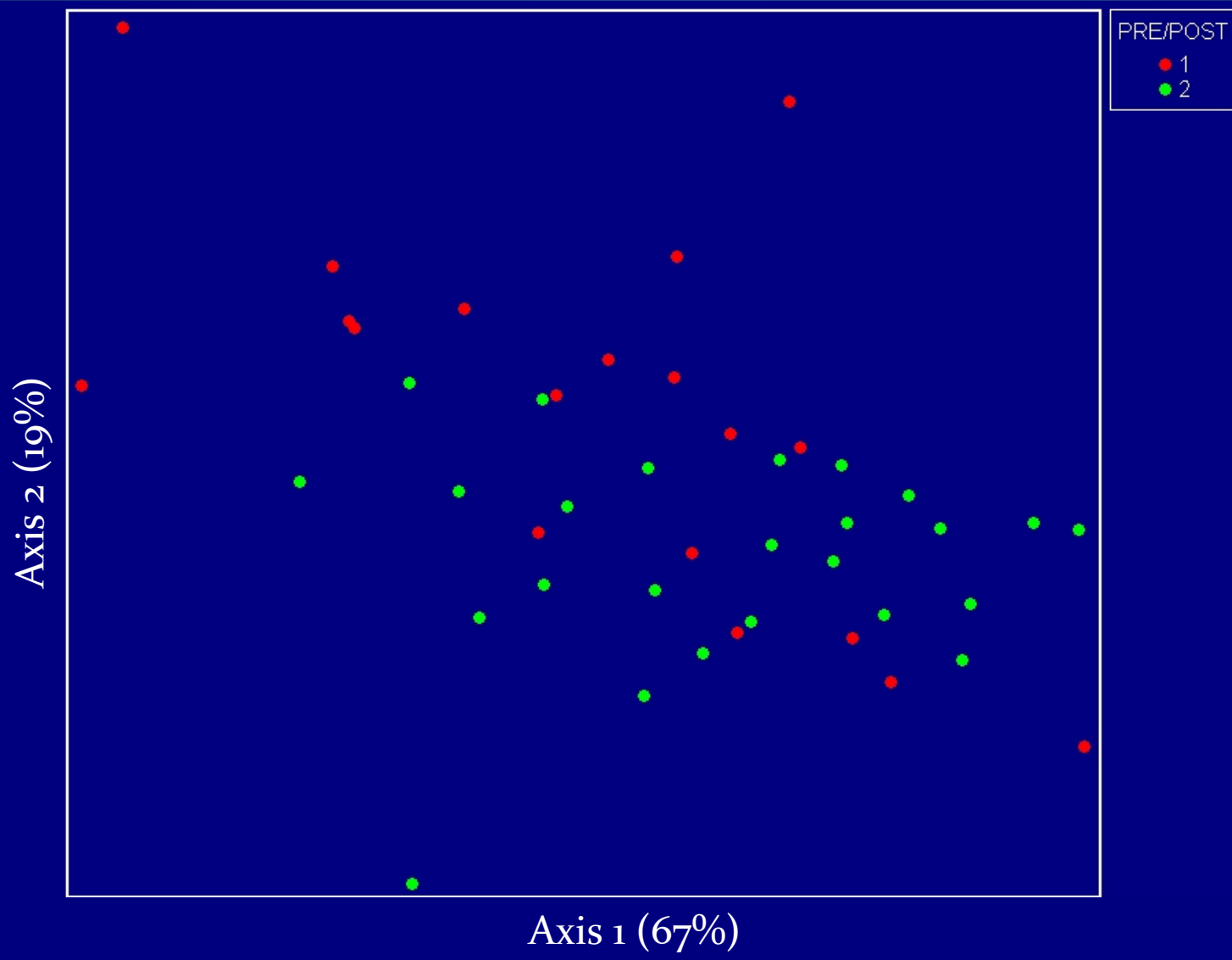


Restoration



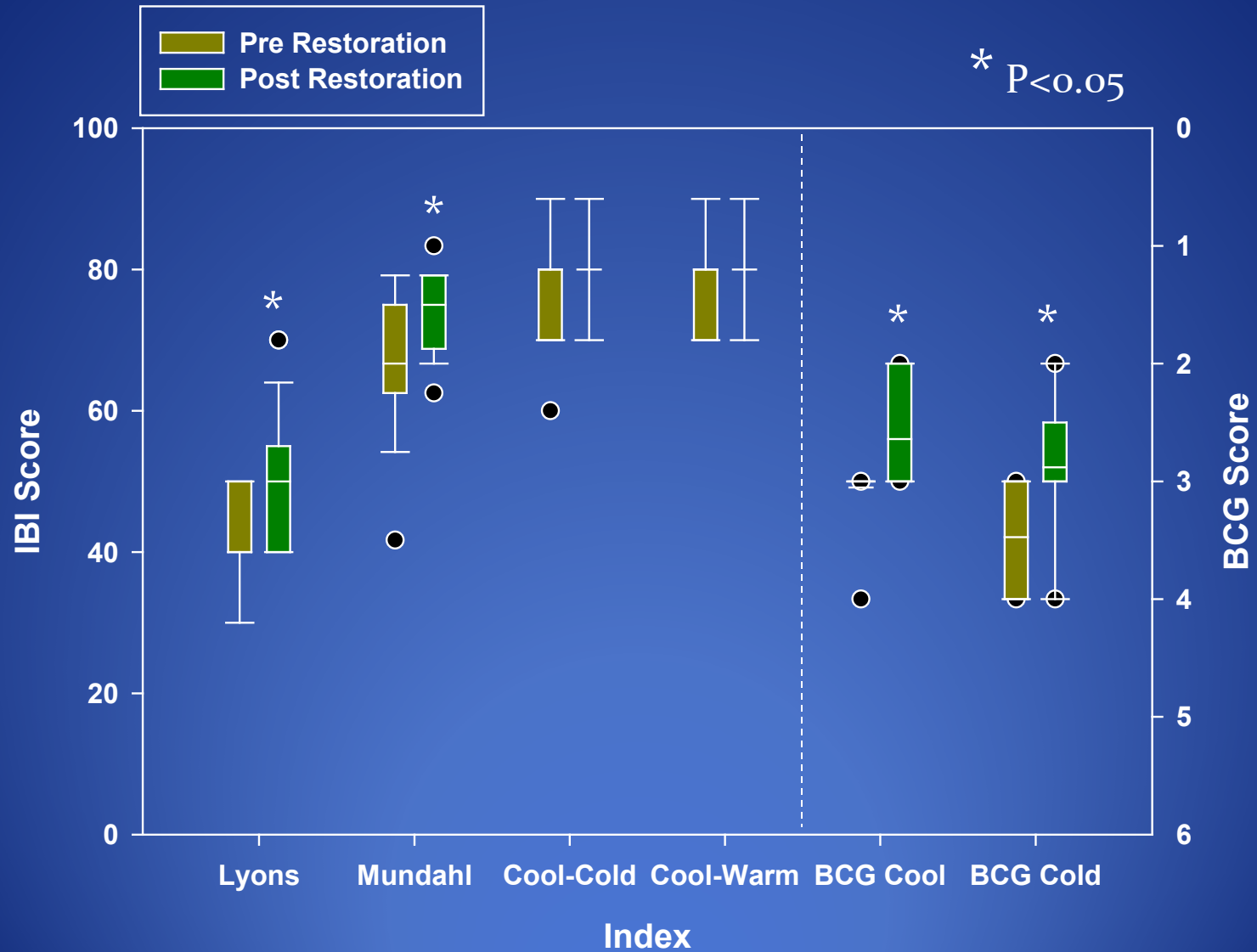


Restoration



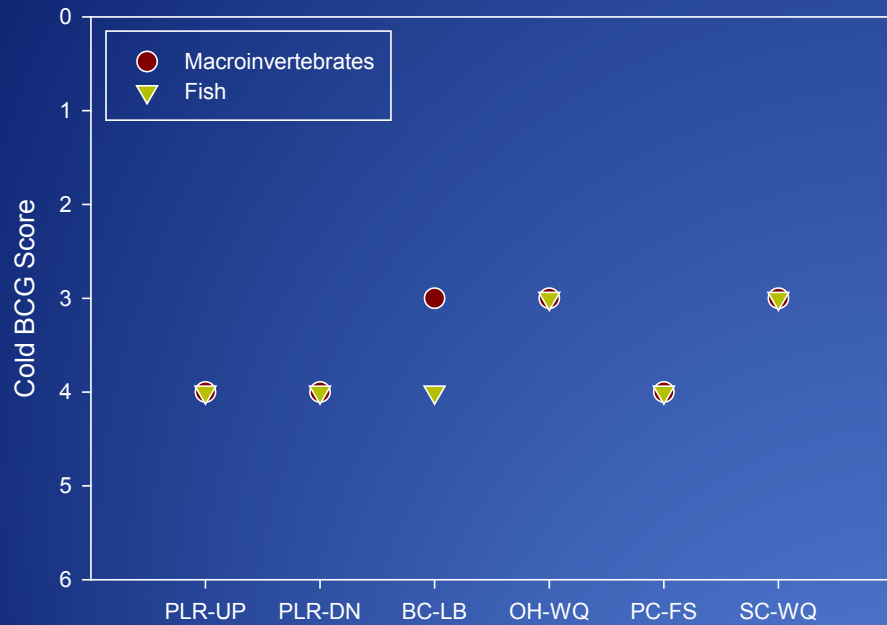


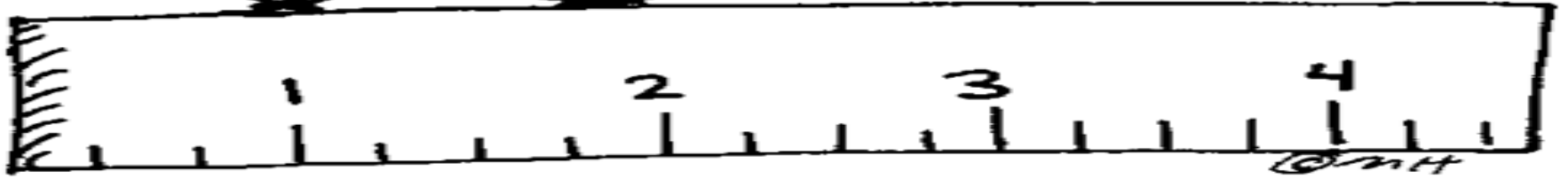
Restoration





Macroinvertebrates and Fish - BCG







Thank You !

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| Betsy Nightingale | EPA Region 5 |
| Chris Yoder | Midwest Biodiversity Institute (MBI) |

Temperature Regimes

| Reference | Name | data |
|------------------------|--|--|
| Lyons et al 1996 | Coldwater | Daily mean <22 C |
| Mundahl and Simon 1999 | Coldwater | Daily mean <22 C |
| Lyons et al 2009 | Coolwater Steams*** Mark as subsets | June- Aug mean 17.0-20.5 C and max daily mean of 20.7-24.6 C |
| | cold transition | July mean 17-19.5 C |
| | warm transition | July mean 19.5-21 C |

Temperature Regimes

| BCG FISH | Michigan | Wisconsin | Minnesota |
|---------------------------|--|--|--|
| Cold | Cold stream ($<80 \text{ mi}^2$, $<17.5^\circ\text{C}$) | Cold mainstem ($<80 \text{ mi}$, $<17.5^\circ\text{C}$) | Southern groundwater coldwater small ($<35 \text{ mi}^2$, $<16^\circ\text{C}$) |
| | Cold small river ($80\text{-}300 \text{ mi}^2$, $<17.5^\circ\text{C}$) | NA | NA |
| Cold-Cool Transitional | Cold transitional stream ($<80 \text{ mi}^2$, $17.5\text{-}19^\circ\text{C}$) | Cool stream ($<80 \text{ mi}^2$, $17.5\text{-}19^\circ\text{C}$) | Northern surface coldwater small ($<35 \text{ mi}^2$, $<19^\circ\text{C}$) |
| | Cold transitional small river ($80\text{-}300 \text{ mi}^2$, $17.5\text{-}19^\circ\text{C}$) | Cold small river ($80\text{-}300 \text{ mi}^2$, $17.5\text{-}19^\circ\text{C}$) | Southern groundwater coldwater large ($35\text{-}300 \text{ mi}^2$, $<19^\circ\text{C}$) |
| | Cold transitional large river ($>300 \text{ mi}^2$, $17.5\text{-}19^\circ\text{C}$) | | Northern surface coldwater large ($>35 \text{ mi}^2$, $<19^\circ\text{C}$) |

Table modified from Stamp, J. 2011