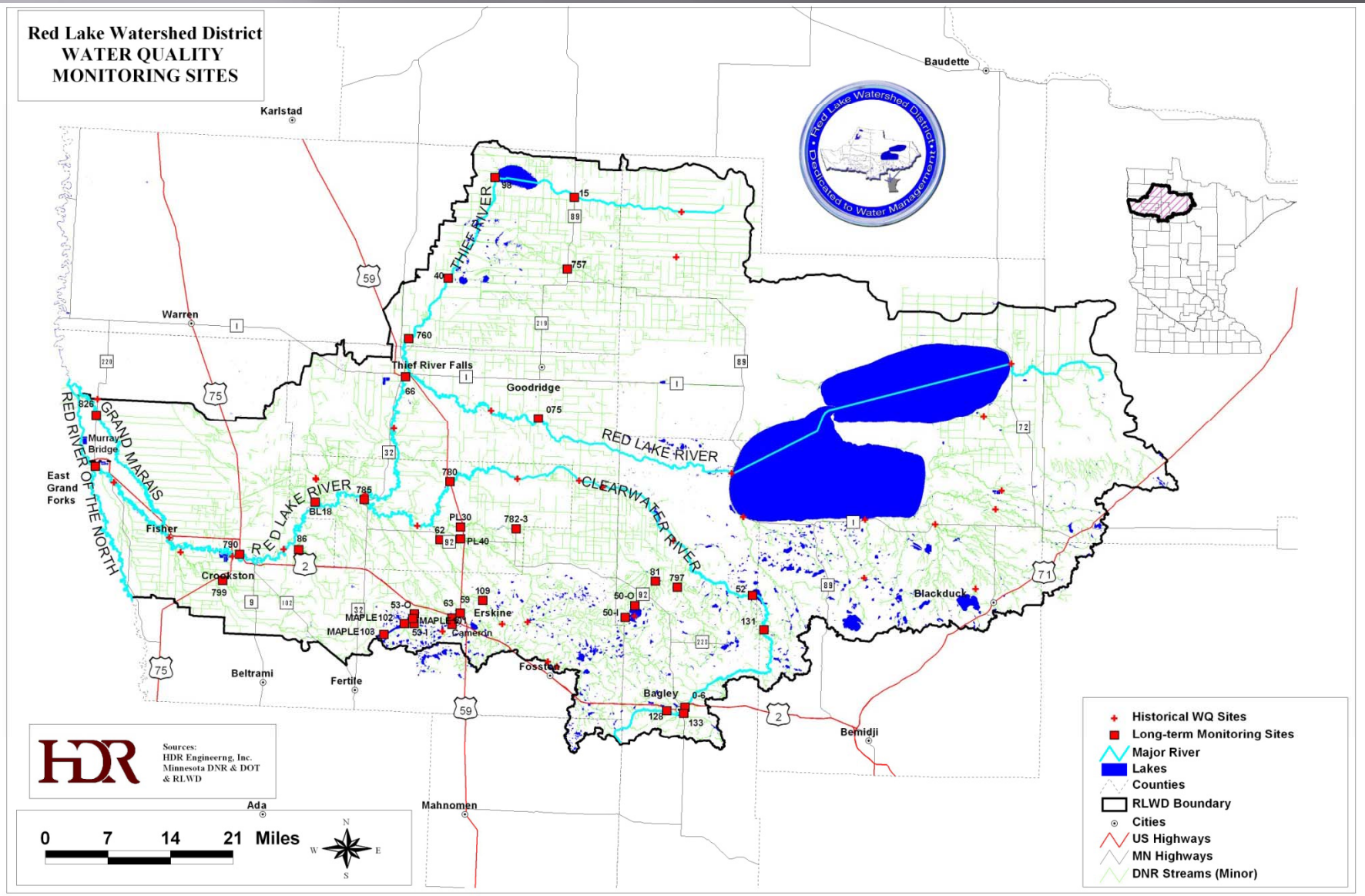
# CLEARWATER RIVER HABITAT AND BIOASSESSMENT

Corey Hanson
Water Quality Coordinator
Red Lake Watershed District

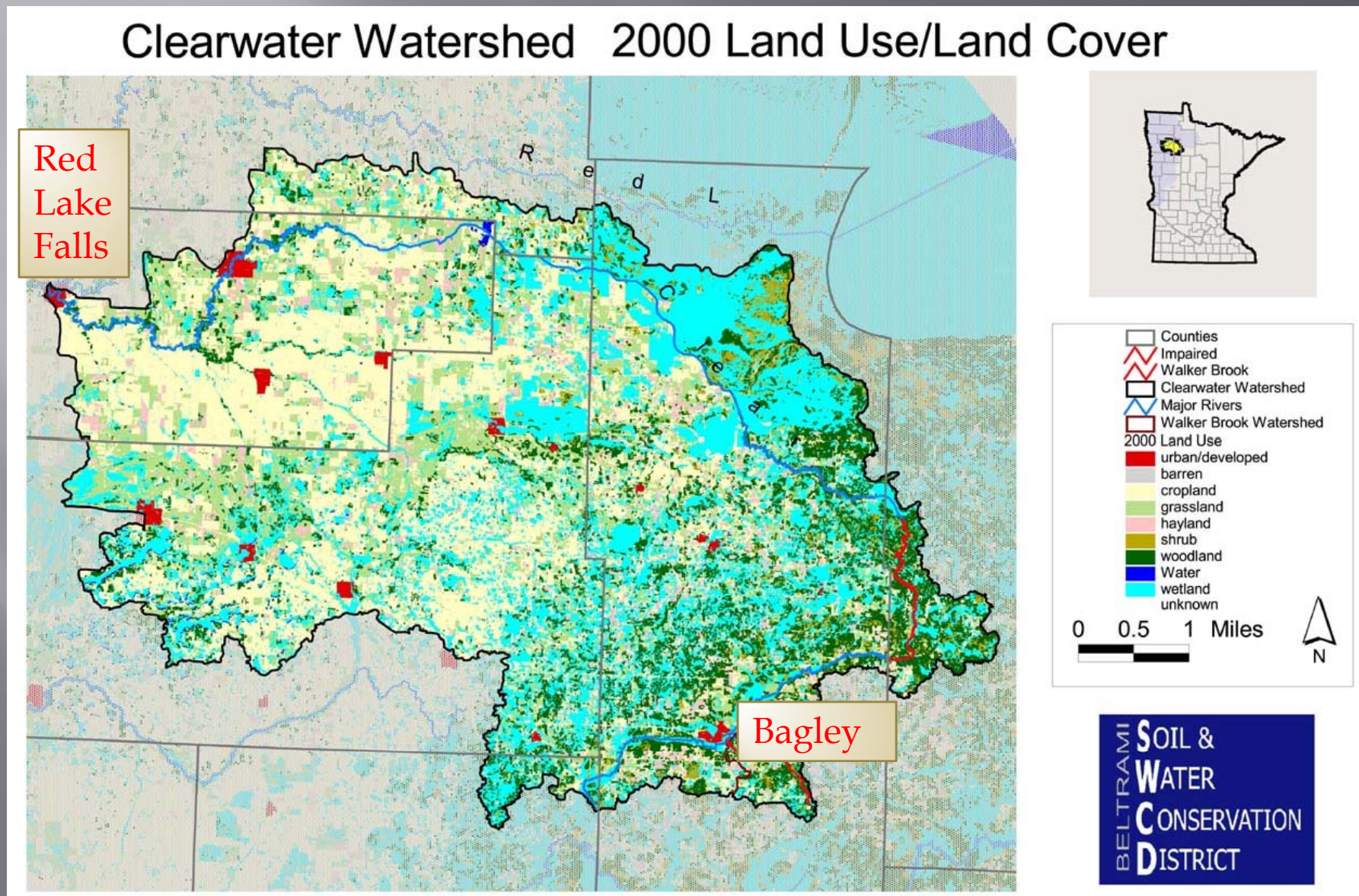
3rd International Water Conference



# Red Lake Watershed District

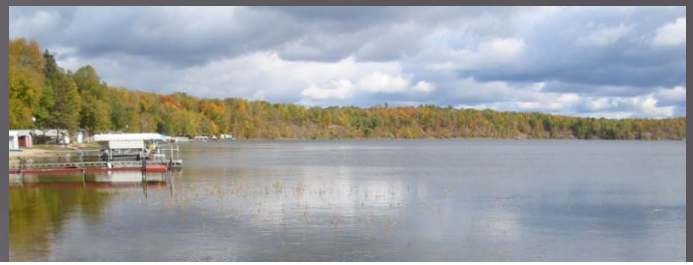


# Clearwater River Watershed



# Reason for the Project

- Clearwater Nonpoint Study recommendations
- Has channelization had an impact on biotic integrity?
- Do streambank stabilization/grade stabilization projects provide good habitat?
- Concern about a perceived degradation in water quality and fishing quality
- Create Index of Biotic Integrity
- Identify aquatic life impairments
- Identify Problem Plant Growth on Clearwater Lake



# Potential stressors in the Clearwater River Watershed

- Channelized Reach
- Fish passage problem at the Clearwater Lake dam
- Erosion
- Lack of shade, especially in the channelized reach
- WWTPs*
- Stormwater*
- Low dissolved oxygen
  - Temperature related
  - Influence of low DO groundwater
- Discharges from wild rice paddies
- Intermittent Flow (tributaries)

*Projects have been implemented to address these problems

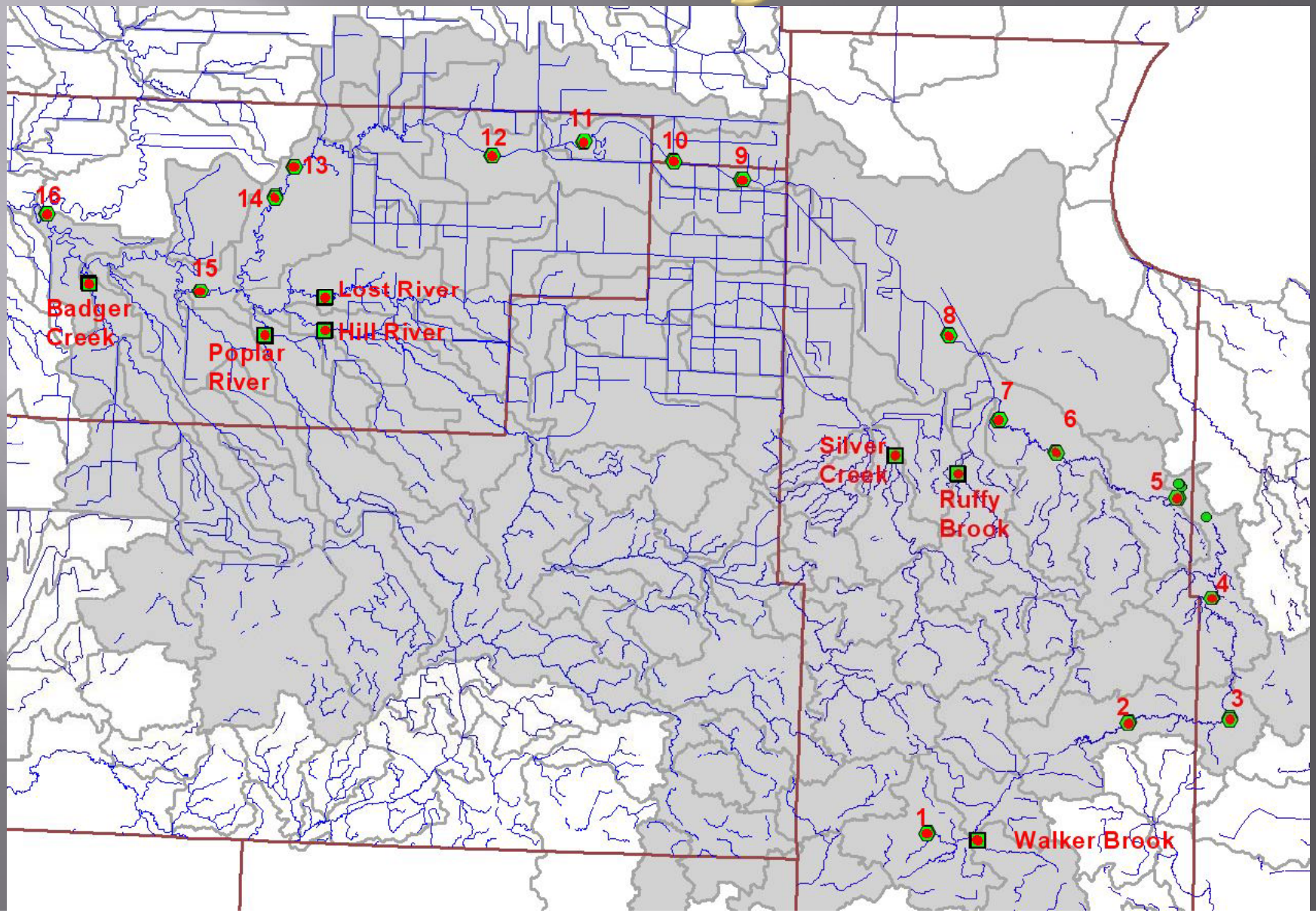
# Who was involved?

- Red Lake Watershed District
- Beltrami County SWCD
  - Habitat Assessments
  - Macroinvertebrate Sampling
  - Physical Assessments
  - Lake Sampling
- Minnesota Department of Natural Resources
  - Additional fish sampling throughout the Red Lake River and Clearwater River Watershed
- Red Lake Nation Dept. of Natural Resources
  - Electrofishing

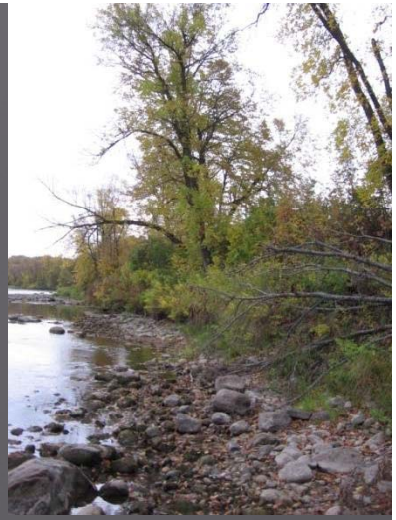

# Methods Used

- EPA *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish.* By Barbour et al
- Utilized road crossings for access.
  - One possible flaw in our methods
  - Downstream end of the sampling reach was >100 ft. upstream of the bridge to minimize the impact of the road crossing.
- GPS/GIS – iPaq with ArcPad
- Samples preserved in 99% Isopropyl Alcohol
- Analysis
  - *Macroinvertebrate Index of Biotic Integrtity for the Lake Agassiz Plain Ecoregion (48) of North Dakota* by Neil Haugerud
  - Google – There are many examples to sort through on the World Wide Web

# Monitoring Sites

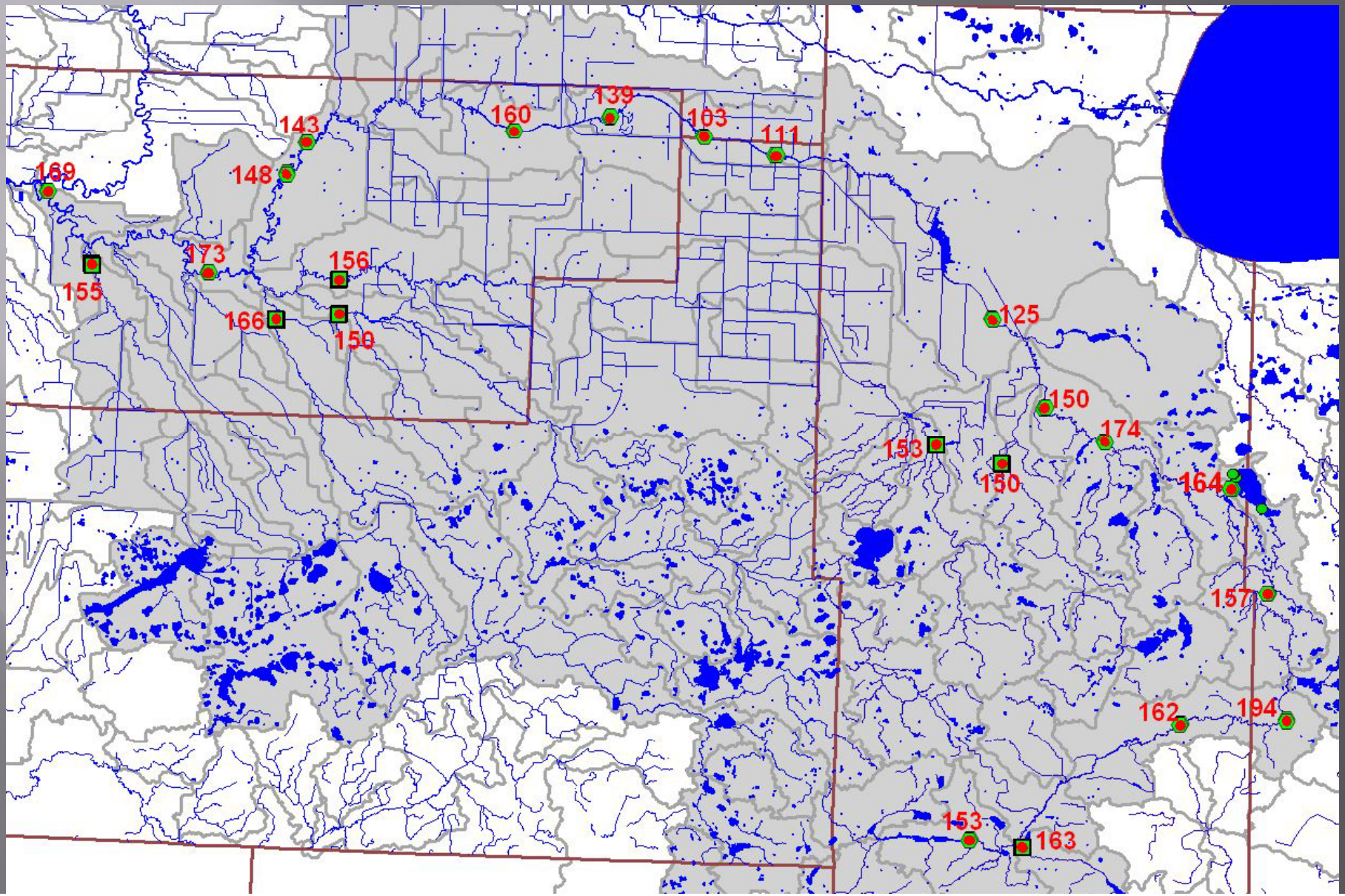


# Habitat Assessment



- Scores based on 10 metrics
- High Gradient
  - Epifaunal substrate, embeddedness, velocity/depth regime, sediment deposition, channel flow status, channel alteration, frequency of riffles or bends, bank stability, vegetative protection, riparian vegetative zone width
- Low Gradient (most of our sites)
  - Epifaunal substrate/available cover, pool substrate characterization, pool variability, sediment deposition, channel flow status, channel alteration, channel sinuosity, bank stability, vegetative protection, riparian vegetative zone
- Some categories verified with GIS

# Habitat Assessment Results



# Physical Assessment

- Watershed Features
  - Predominant land use, NPS pollution, local erosion
- Riparian Vegetation
- In-stream Features
  - Reach length, width, area, depth, velocity, canopy
- Large Woody Debris (cubic meters)
- Aquatic Vegetation
- Water Quality
  - Temp, Cond, Do, pH, Turbidity, odors, oils
- Sediment/Substrate

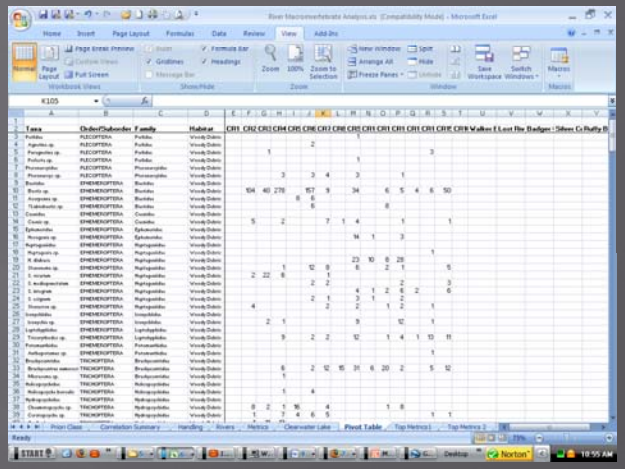
# Fish Sampling

- Permit acquired from the MN DNR
- Red Lake Nation DNR Backpack electroshocking equipment
- Additional Sampling by MN DNR
- All the sampling sites along the Clearwater River that were wadeable

# Macroinvertebrate Sampling

- D-frame nets
- All the same sites that were used for fish sampling plus…
  - One additional non-wadeable site on the Clearwater River (canoe)
  - Tributary sites
- Samples cleaned and sorted at the RLWD
- Majority of samples analyzed by the MN DNR Aquatic Invertebrate Biology Lab

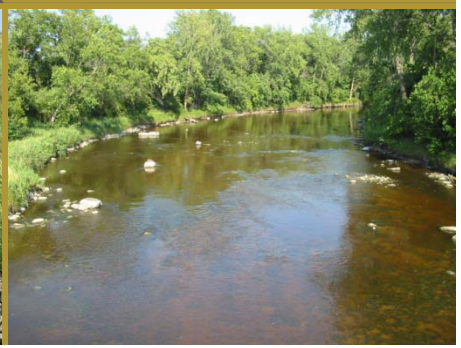
# What Do We Do With All This Data?



- Fish IBI Calculation
- Macroinvertebrate Metrics
  - IBI?
  - Correlate  metrics with habitat assessments and fish IBIs
    - Other methods of correlation
      - ND Dept of Health
        - Combined a Landscape Index (GIS) and RBP Habitat Assessments to estimate a Human Disturbance Index
  - Find Reference Site
  - Demonstrate impact of stressors in the watershed (channelization)

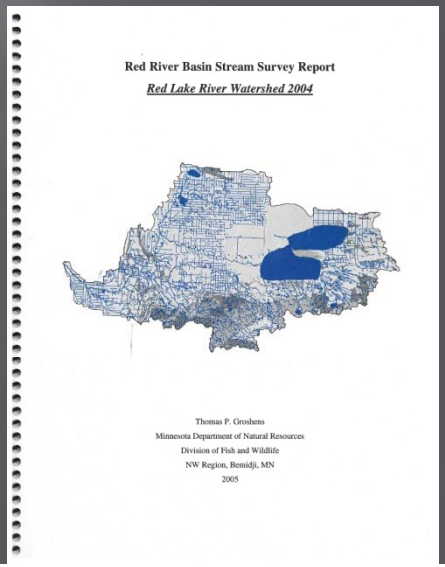
# Classification of Sites

- Find Reference Sites and Impaired Sites
  - Priori Classification (Hypothesized Reference Sites)
    - Used Habitat Assessment Scores
    - Evaluated known stressors
      - Turbidity or dissolved oxygen impairments, WWTPs, Stormwater Runoff, Fish Passage
    - Prior to the study, we expected the sites within the trout stream reach would have the best results, along with the site 6 downstream of Clearwater Lake and Sites.
  - Posteriori Classification (Based on Results)
    - Fish IBI
      - CR6 (Downstream of Clearwater Lake)
      - Trout stream sites
      - Lost River - reference tributary sites
      - Channelization – lasting effect
    - Macroinvertebrate IBI
      - Trout Stream Sites
      - Lower Clearwater River Sites
      - CR6
      - Waiting for more data

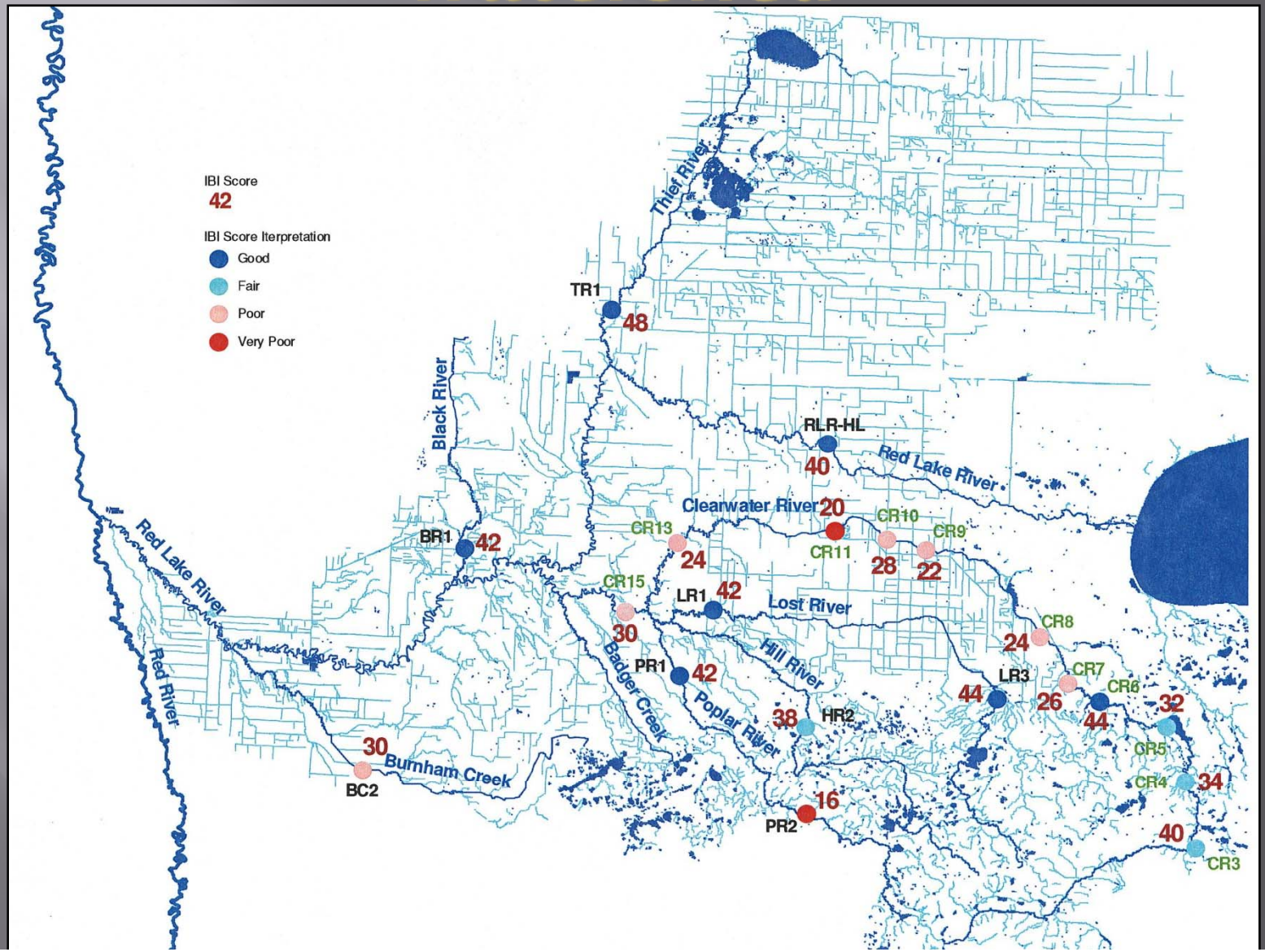


# Fish Index of Biotic Integrity

- IBI calculated using:
  - *Development of Index of Biotic Integrity Expectations for the Lake Agassiz Plain Ecoregion* by Niemala et al
- Completed by Tom Groshens of the MN Department of Natural Resources for the *Red River Basin Stream Survey Report – Red Lake River Watershed 2004.*



# Fish IBI Scores Throughout the Watershed



# Calculating Metrics

- Quantitative Measurements of Macroinvertebrate Populations
- Classifications
  - Family/Taxa
    - Chironomidae, coleoptera, diptera, ephemeroptera, etc.
  - Functional Feeding Groups
    - predator, collector, filterer, scraper, shredder
  - Habit/Behavior Designations
    - Burrower, climber, slinger, sprawler, swimmer
- Number of Taxa - 21 different calculations
- Percent Abundance – 28 different calculations
- Indexes (Hilsenhoff, Simpson's) – 5 different
- Correlating Metrics
  - Vs. Habitat Assessment Results
  - Vs. Fish IBI Results

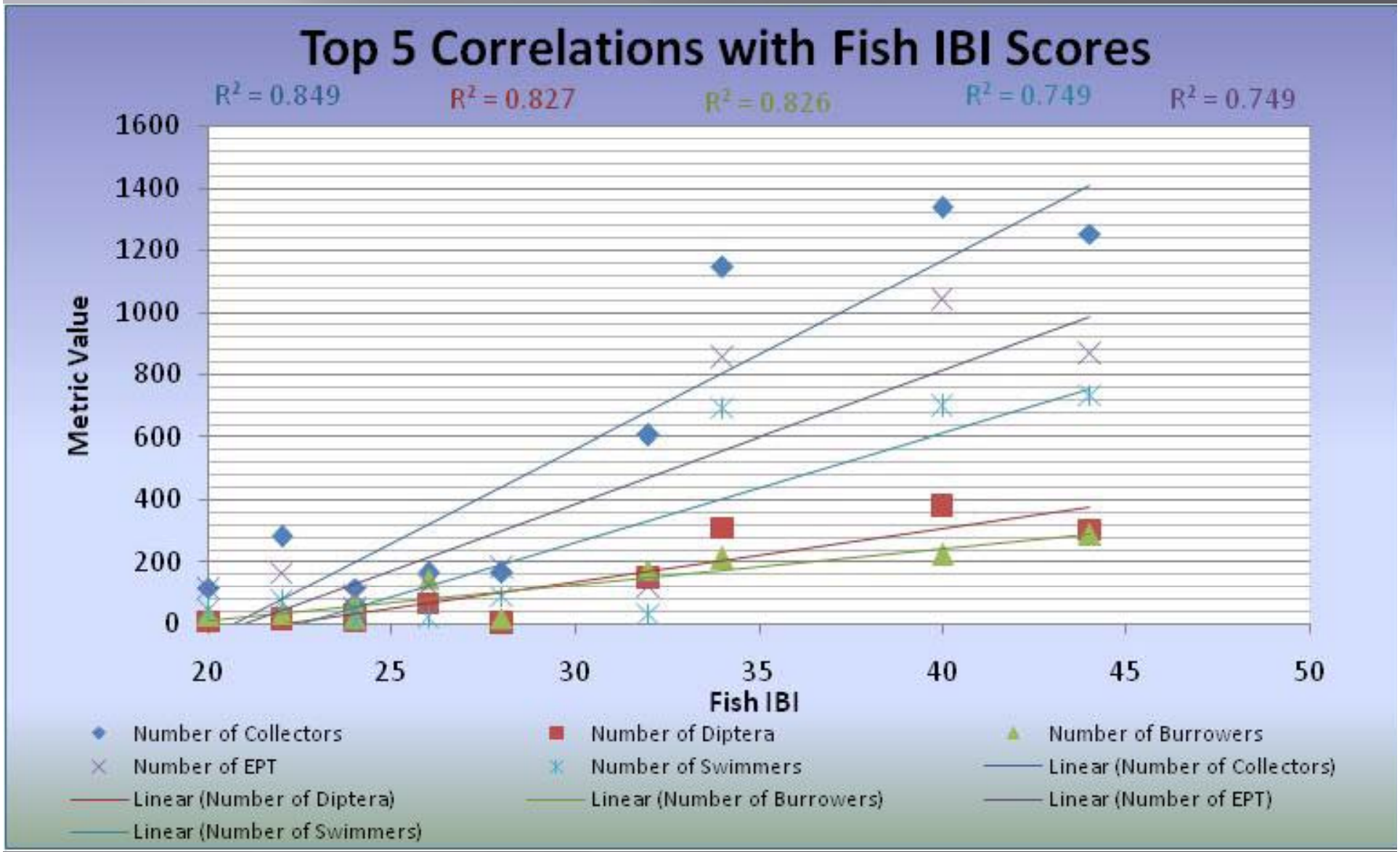
# Top 10 Metrics – Correlated to Fish IBI Scores

1. Number of Collectors
2. Number of Diptera (flies and midges)
3. Number of Burrowers
4. Number of Swimmers
5. Number of EPT (Ephemeroptera + Plecoptera + Trichoptera)
6. Number of Clingers
7. Number of Predators
8. Number of Ephemeroptera
9. Number of Climbers
10. Number of Trichoptera

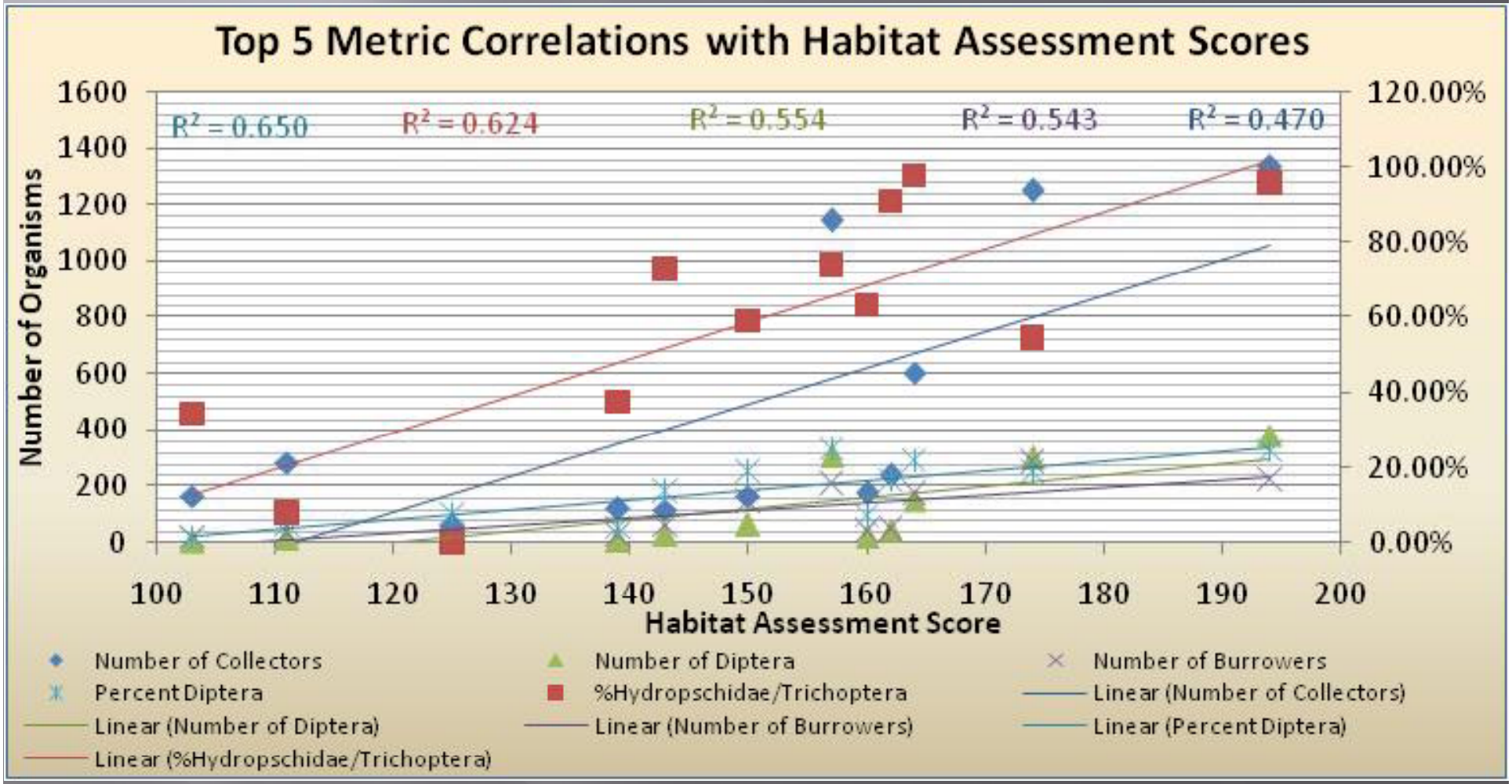

# Top 10 Metrics – Correlated to Habitat Assessment Scores

1. Number of Diptera
2. Percent Hydropsychidae/Trichoptera
3. Percent Diptera
4. Number of Burrowers
5. Number of Collectors
6. Number of Trichoptera
7. Number of Chironomidae
8. Number of Clingers
9. Number of EPT
10. Number of Swimmers

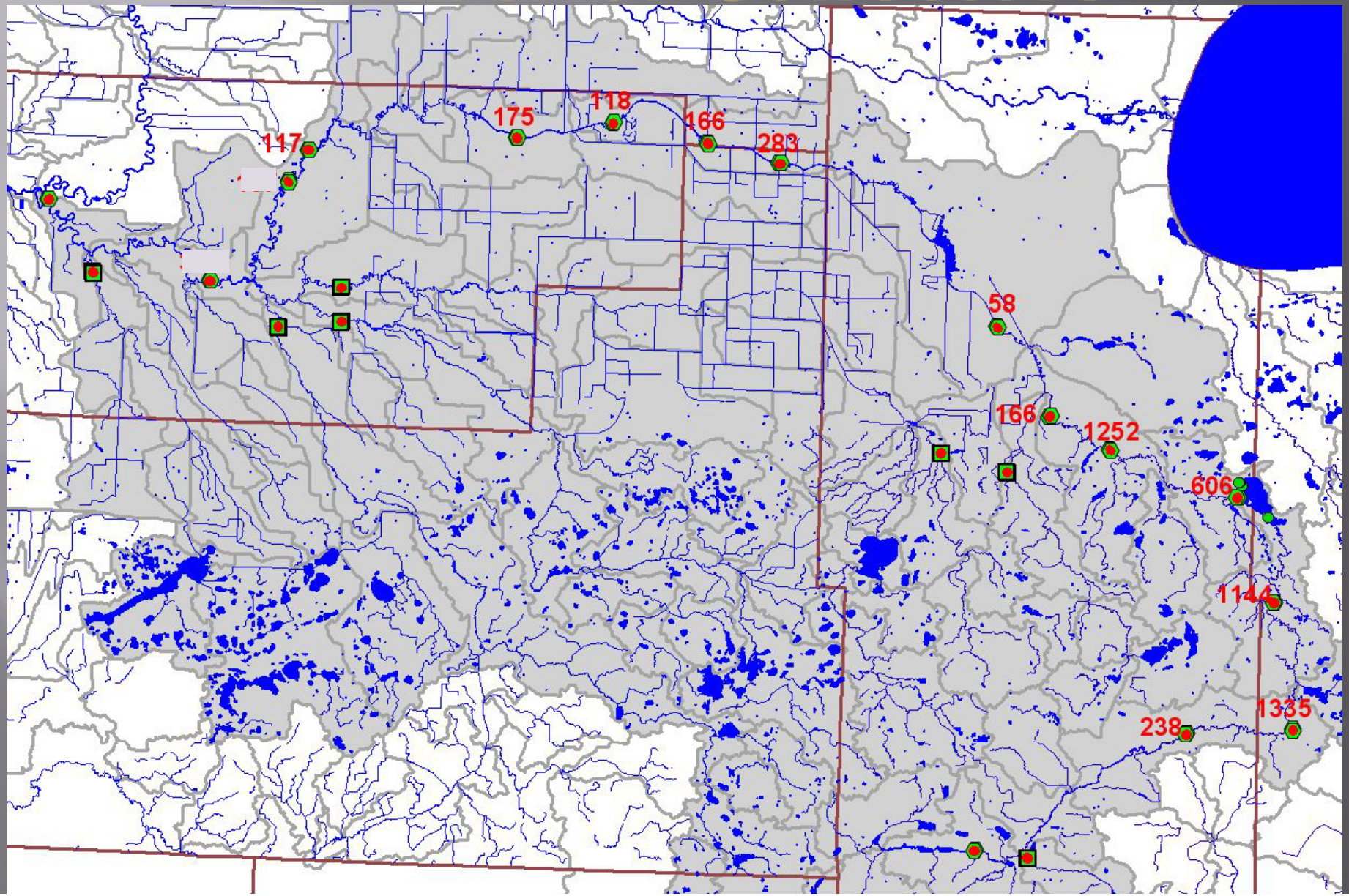

# Correlations for Top 5 Metrics



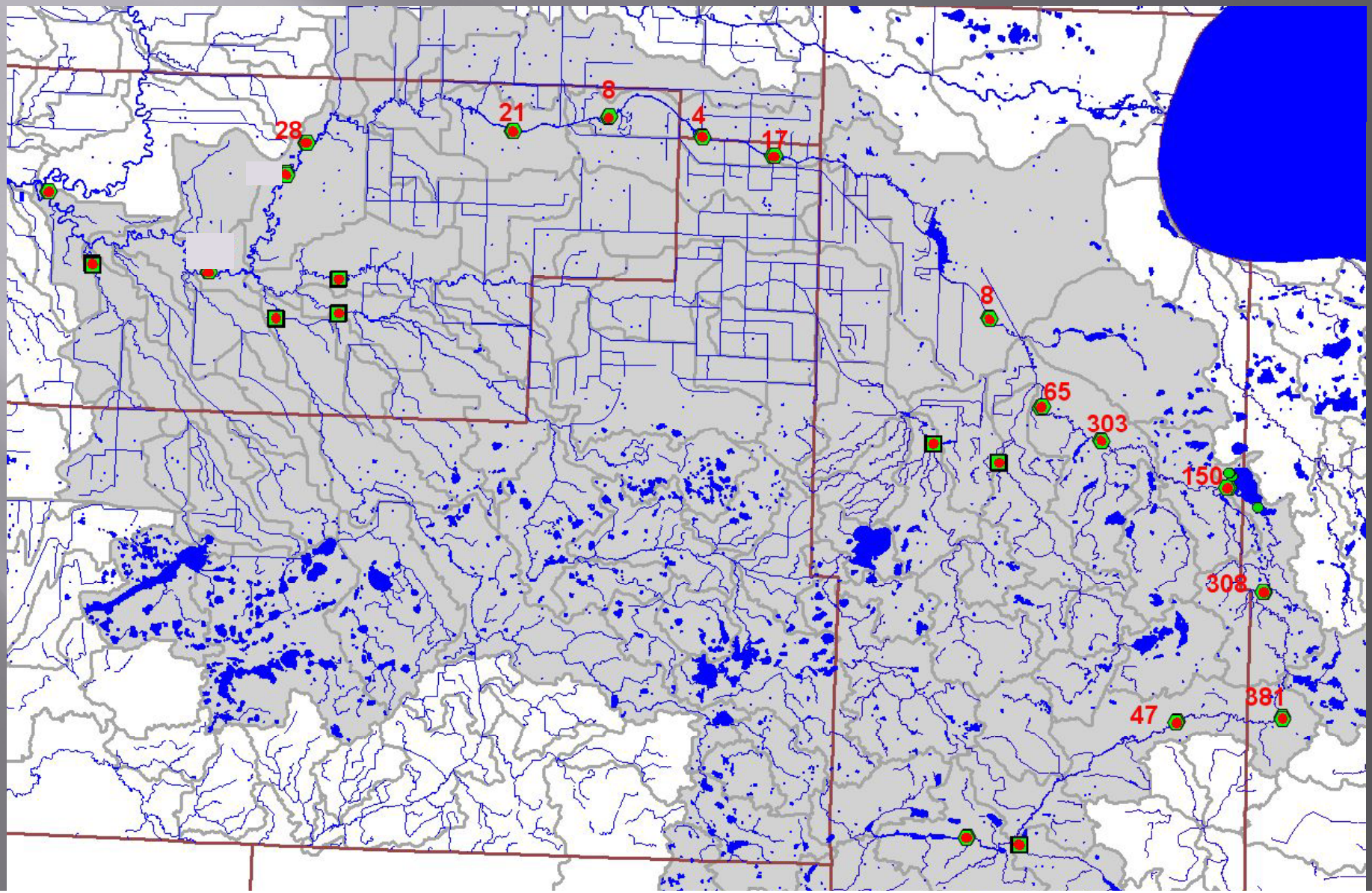
# Correlations for Top 5 Metrics



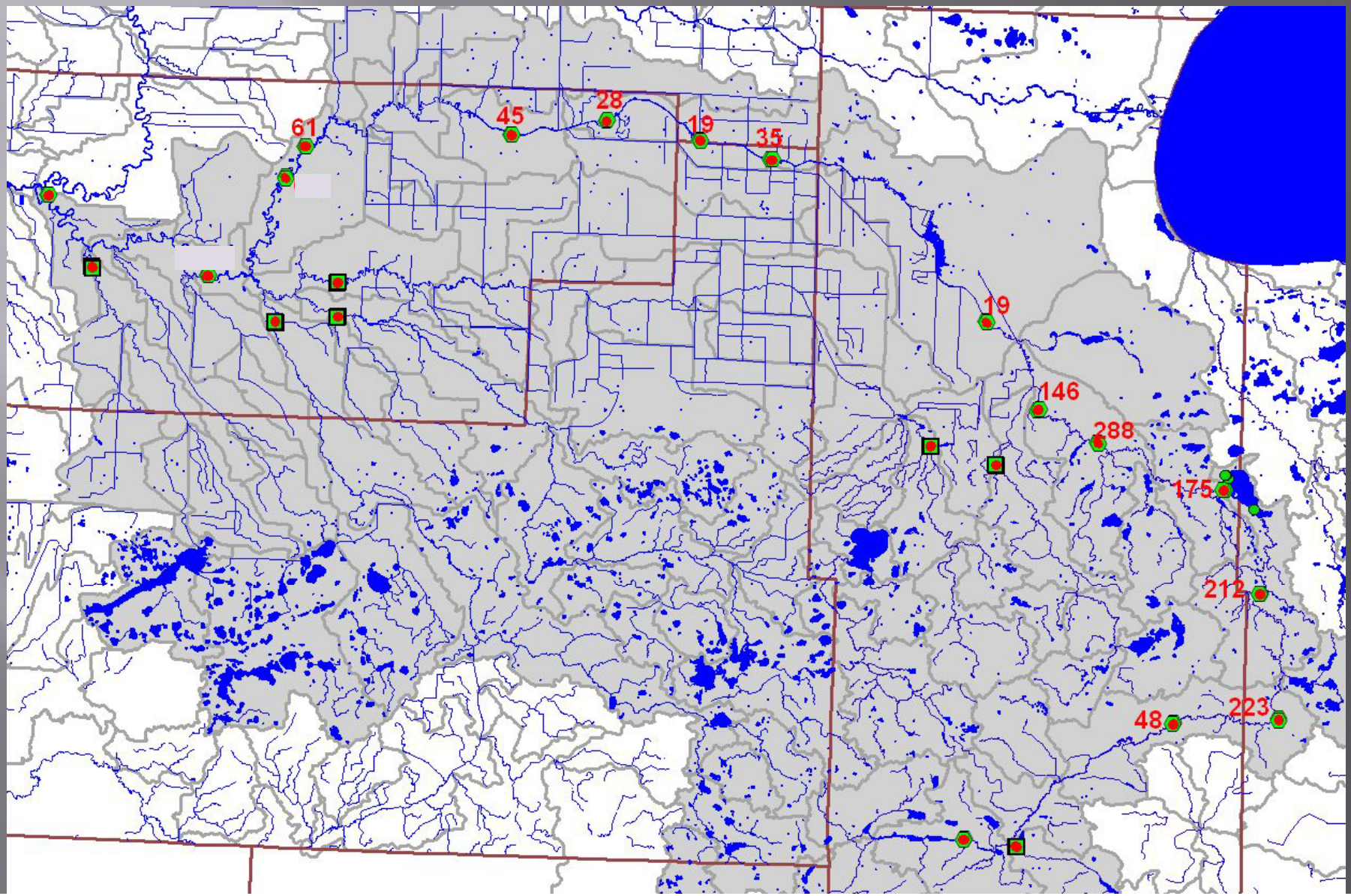
# Number of Collectors



# Number of Diptera



# Number of Burrowers



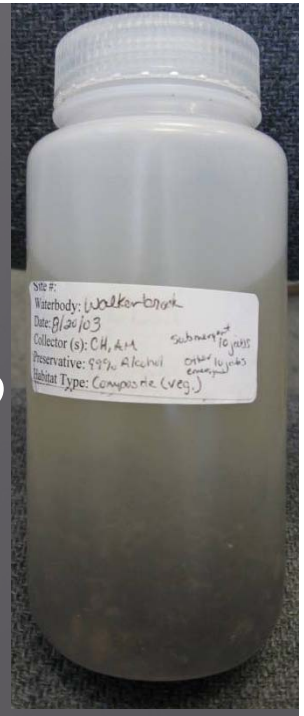
# Benefits of this Project

- Learning experience
- Shows biology is being impacted in areas where water quality monitoring alone may not be enough to discover a problem
- Baseline data
- More proof of the negative impact of channelization – even 50-75 years after the river was dredged.

# Biological Monitoring Obstacles

- Time Consuming
  - Dedicating time (backseat to other projects)
  - Sample and data analysis
- Lack of macroinvertebrate guidance specific to the Red River Basin
- Which metrics should we use?
  - Mix of #, %, and Indexes?
  - Different metrics may work better in different areas
  - Large range of R squared values – 0.000 – 0.849
- Not enough data to create reliable IBI scoring system for macroinvertebrates…yet
- Tolerance values

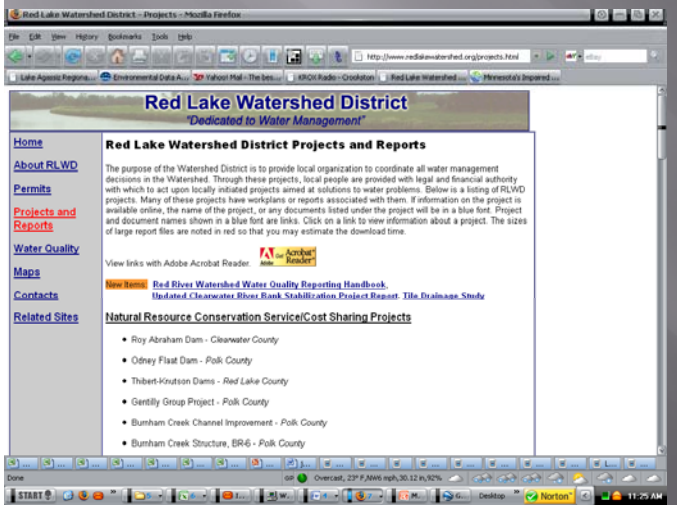
# What's Next?



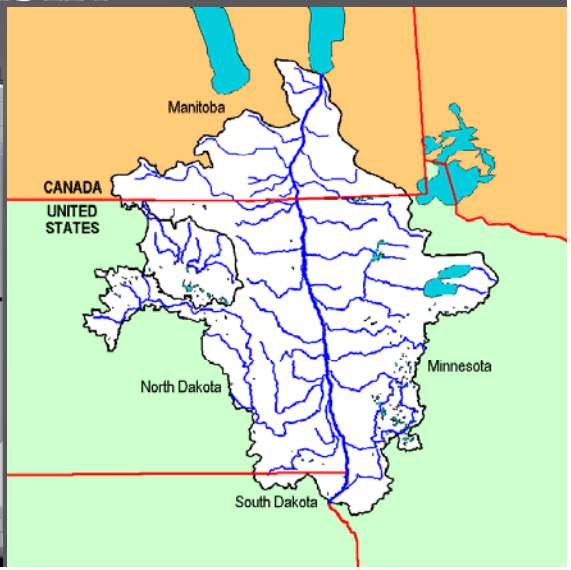

- Analyze Remaining Samples at VCSU Lab
- Complete Report
  - Still have lake data to analyze
- Future Monitoring
  - Recommendations
    - Subsample prior to cleaning and sorting
    - Don't rely on road crossings
    - Coordinate with other sampling efforts
    - Repeat measurements of some sites
- Buffer/restoration projects are badly needed in the channelized reach of the Clearwater River

# Needs within the Red River Basin

- Sharing of Information
  - Report will be on the RLWD website
  - DNR Stream Survey Reports are currently not available online.
- Need a macroinvertebrate IBI scoring system and guidance for the Red River Basin







# Contact Information

Corey Hanson
Water Quality Coordinator
Red Lake Watershed District
102 Main Avenue North
P.O. Box 803
Thief River Falls, MN 56701
Phone: 218-681-5800
Email: coreyh@wiktel.com
Website: www.redlakewatershed.org