# Biological Monitoring in North Dakota

Aaron Larsen
Environmental Scientist
ND Dept of Health
Division of Water Quality

NORTH DAKOTA
DEPARTMENT of HEALTH

# Outline

- What is Biological Monitoring?
- Why States have Biological Monitoring programs
- Field collection methods
- Historical sampling locations
- Results from Red River Valley
- Other projects
- Fish sampling summary across ND

# What is Biological Monitoring?

- Scientists take measurements and samples (fish, macroinvertebrates) from stream/river and compare them to a regional 'reference' condition and determines current condition (biological integrity)

  - Biological Integrity – areas that support biological communities that are balanced, integrated, adaptive and composed of organisms expected from a regions natural environment

    - What we would expect to find in areas with little/no human influence

# Why do State's Biomonitor?

- Clean Water Act
  - Goal is to restore chemical, physical and biological integrity of Nation's waters
  - States required to report on quality of waters
    - Section 305(b) Water Quality Assessment Report
    - Report status of beneficial uses of rivers and streams
    - Summarize impairments and causes
      - Low biological integrity
      - Total suspended solids, etc.

# Multi-Metric Approach

- Find attributes (metrics) of biological community that respond to human influence
  - Tolerant/Intolerant taxa (tolerance)
  - Total taxa (richness)
  - Dominant taxa percentage (composition)

- Meaningful metrics combined to form Index of Biotic Integrity (IBI)
  - Unitless score 0 – 100

# Biological Indicators

## Fish

- Public interest
- Sedentary during summer months
- Persistent populations that recover quickly
- Long life spans
- Important to Aquatic Life Use standards

## Macroinvertebrates

- Easy to collect
- Common
- High diversity
- Rapid colonization
- Sedentary
- Variability in tolerance
- Vital link in food web

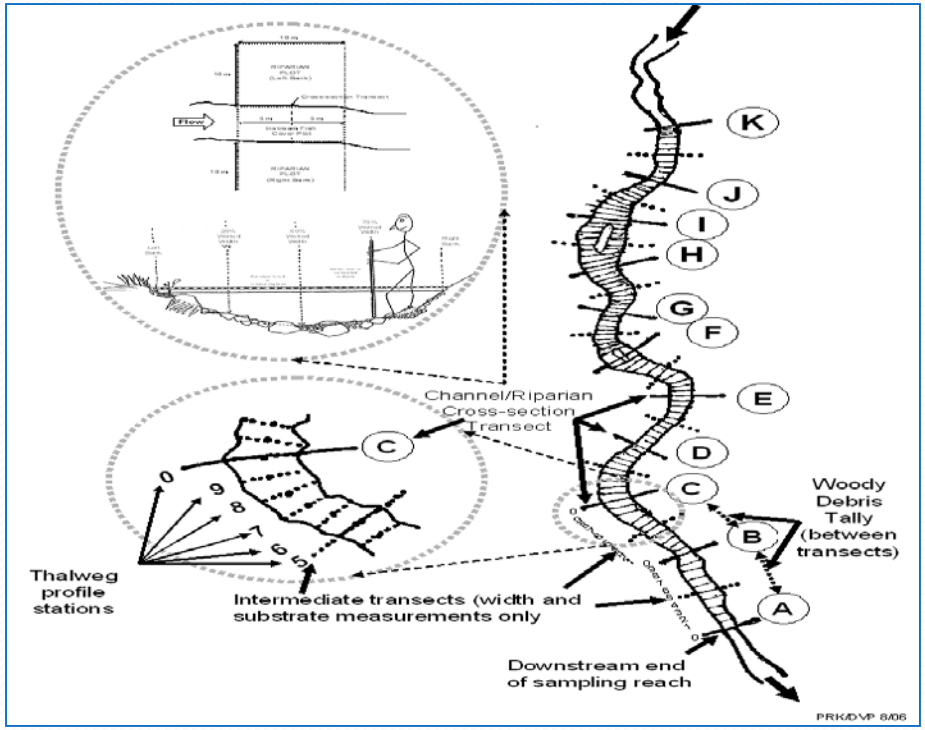
# Field Collection - Fish

- Long-line Electrofishing
- Sample all available habitat types


# Field Collection - Fish

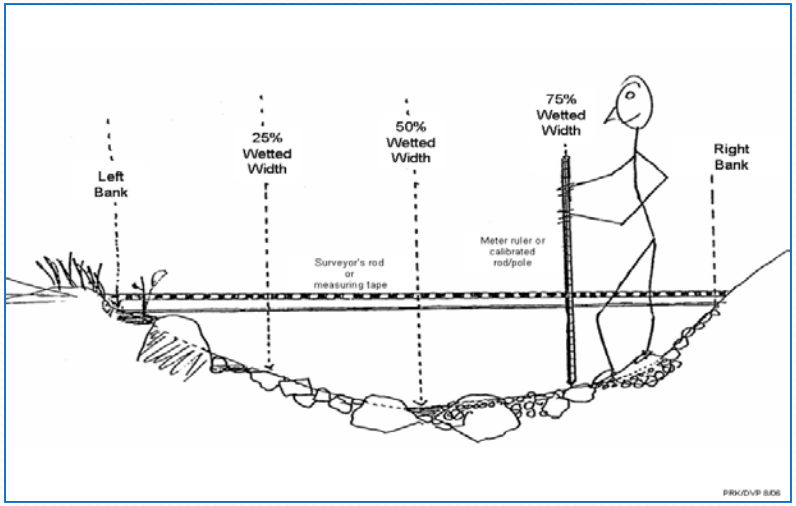
# Field Collection - Macroinvertebrates

- Modified D-frame dip net
- Sample collected at 11 transects (A-K)
- Combined into 1 composite sample, preserved with ethanol



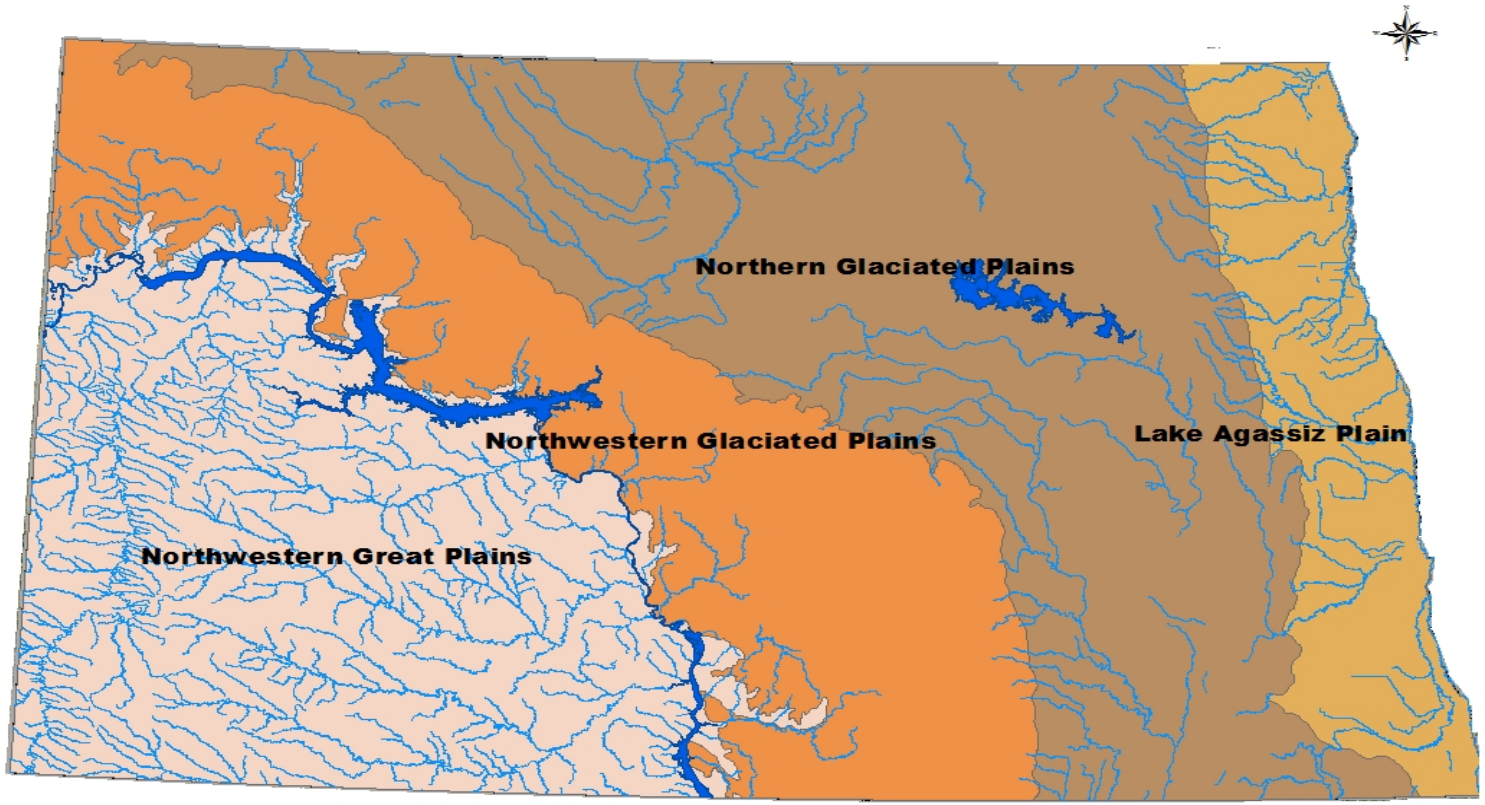
# Field Collection - Macroinvertebrates

# Water Quality and Physical Habitat

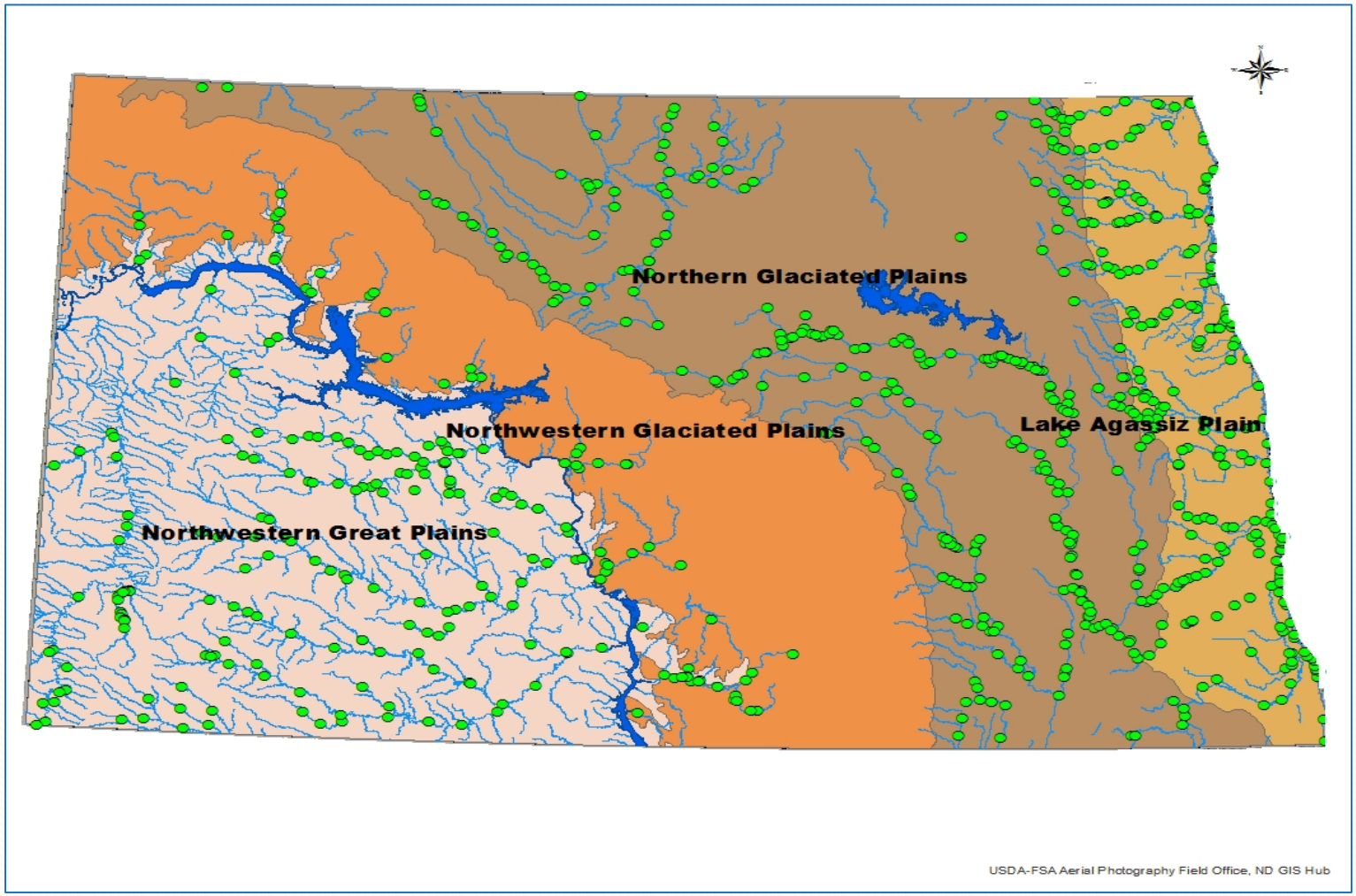


# Where – all perennial waters

# Ecoregions of North Dakota



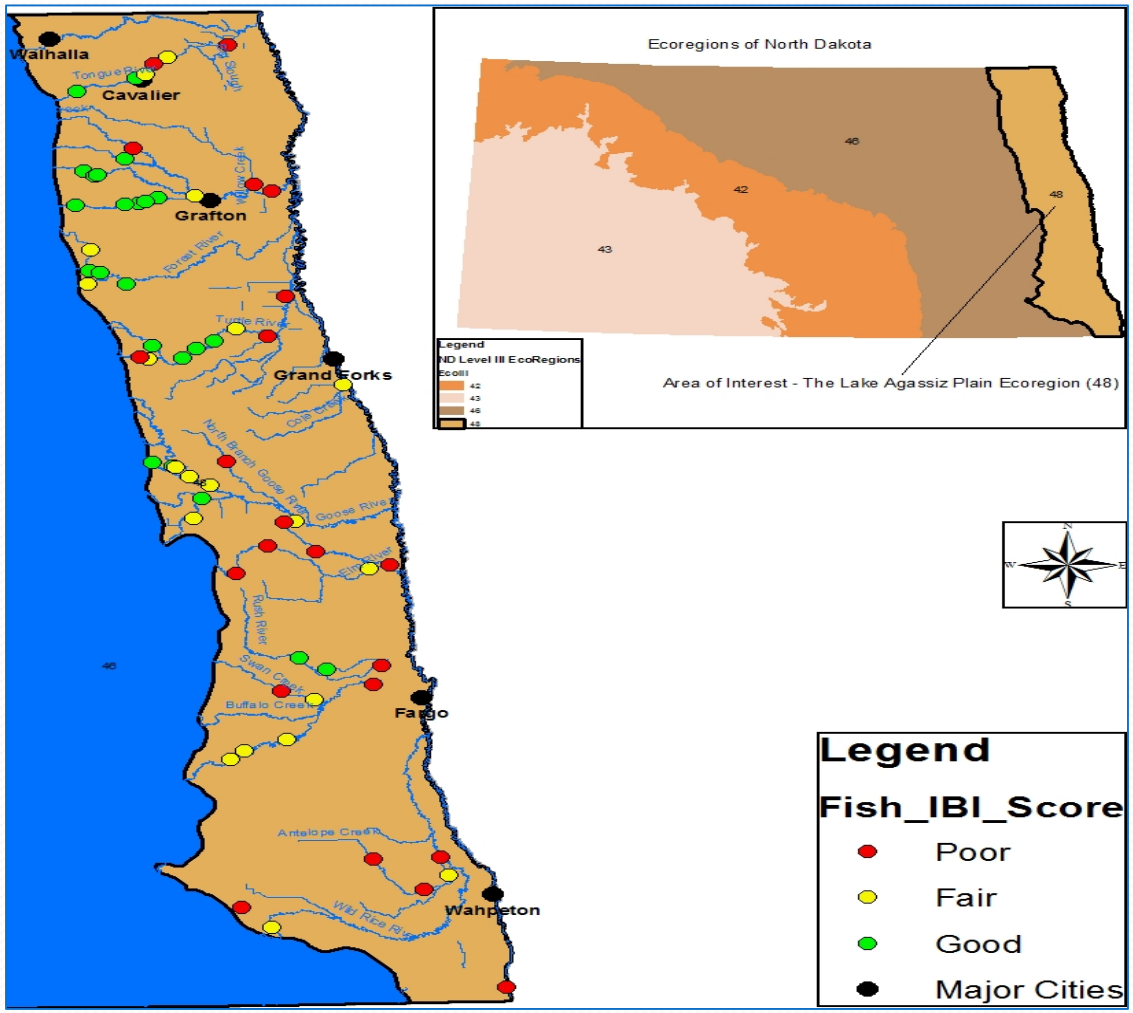
# Sampling Sites



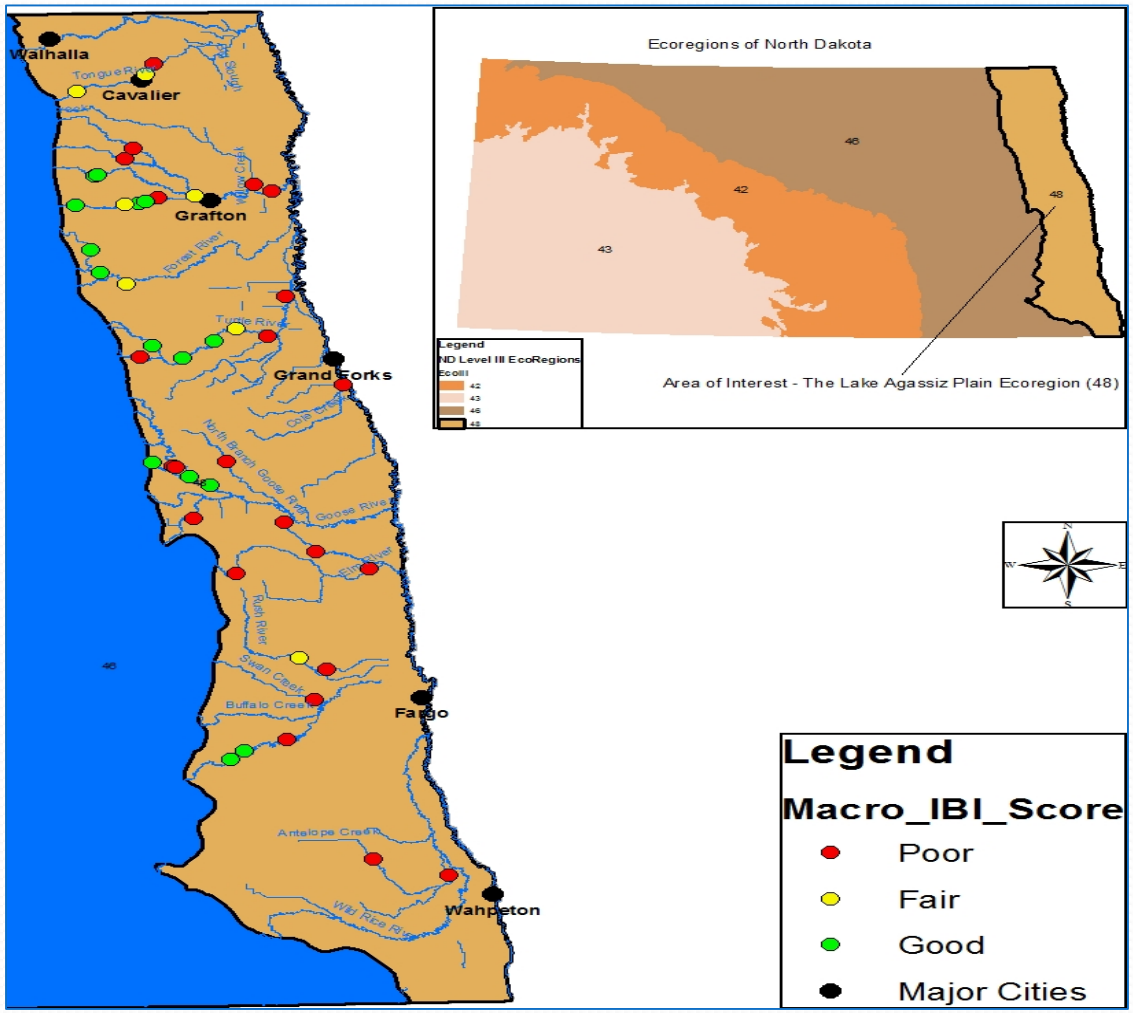
# Reference Site

# Disturbed Site

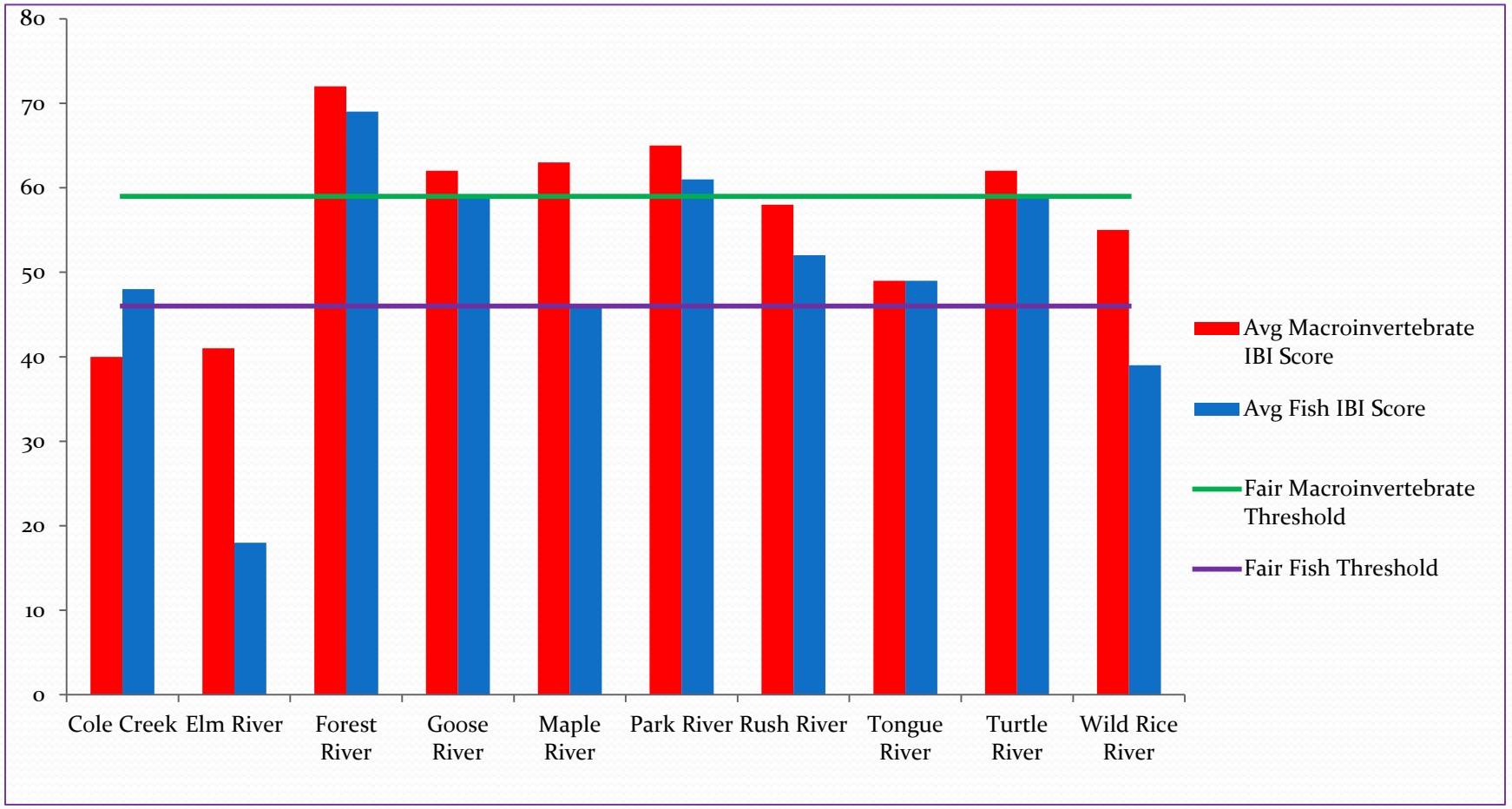
# Results – Fish IBI



# Results – Macroinvertebrate IBI



# Average IBI Score by Drainage – Lake Agassiz Plain



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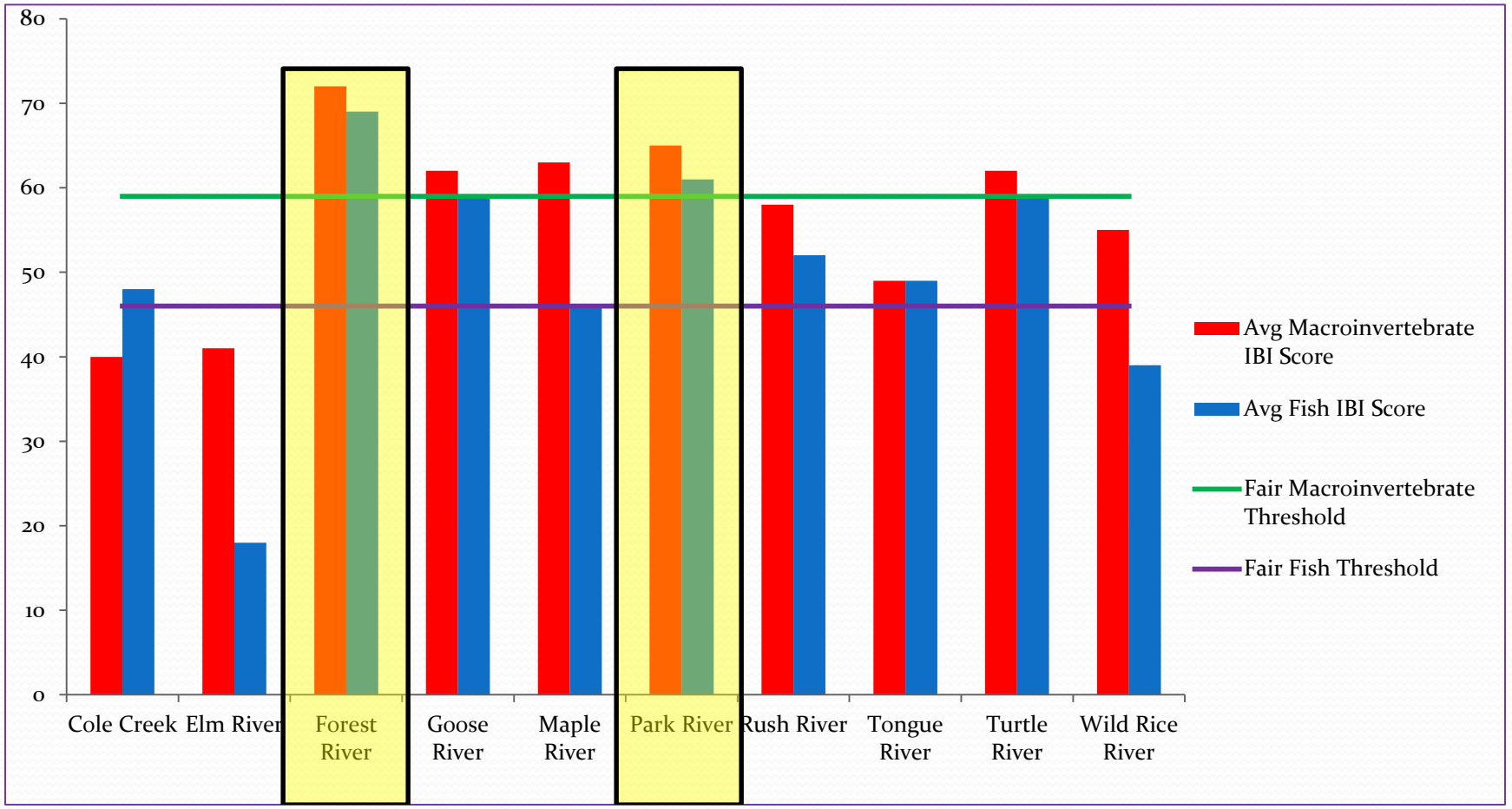
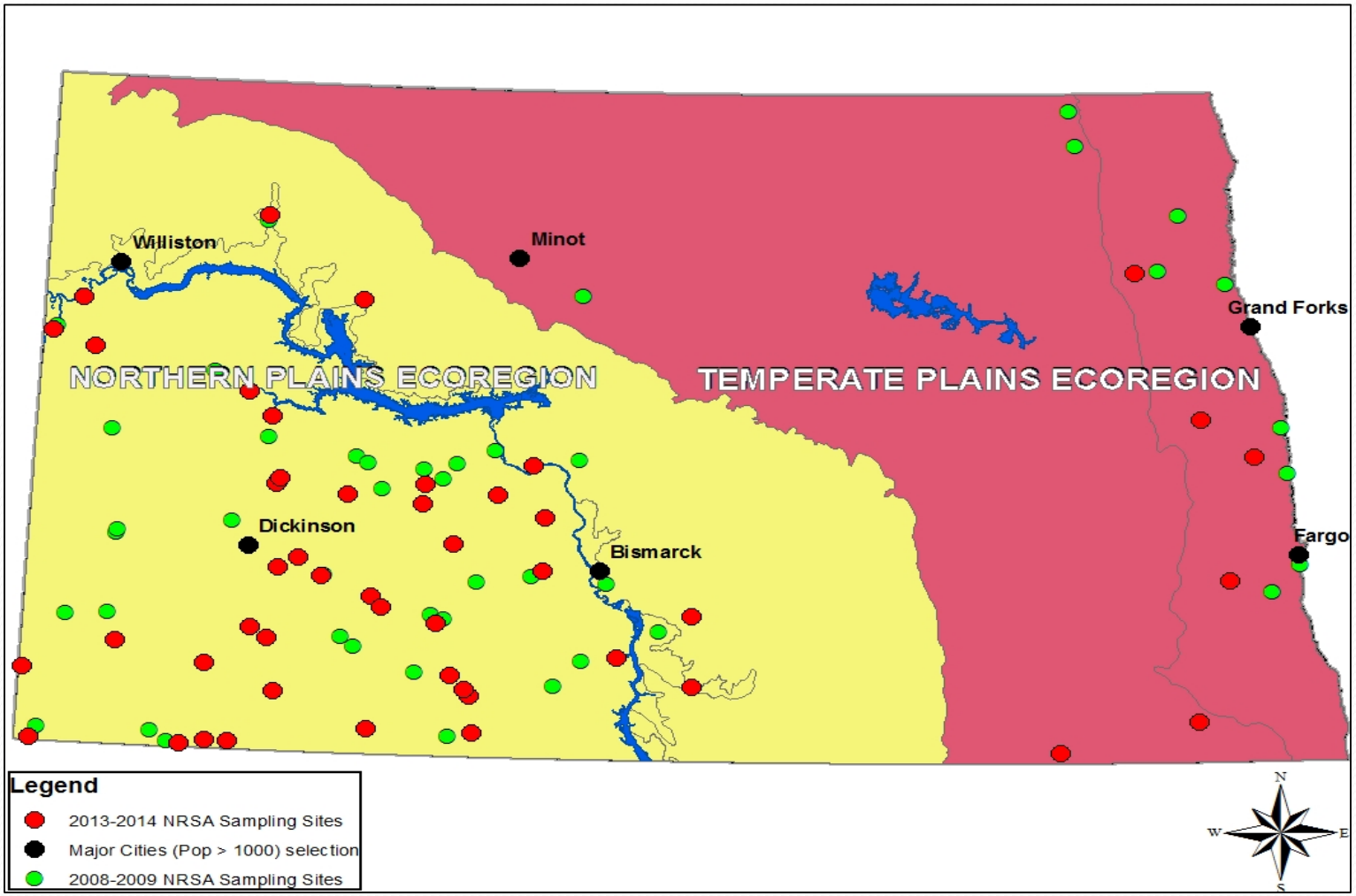


# Other Projects

- National Aquatic Resource Surveys (NARS)
  - Random site selection provides statistically valid ecological results
  - Periodic assessments sponsored by US EPA
    - 2008-2009 National Rivers and Streams Assessment (NRSA)
    - 2013-2014 National Rivers and Streams Assessment (NRSA)

# NRSA


Williston
Minot
Grand Forks
NORTHERN PLAINS ECOREGION
TEMPERATE PLAINS ECOREGION
Dickinson
Bismarck
Fargo
Legend
2013-2014 NRSA Sampling Sites
Major Cities (Pop > 1000) selection
2008-2009 NRSA Sampling Sites
N
W
E
S

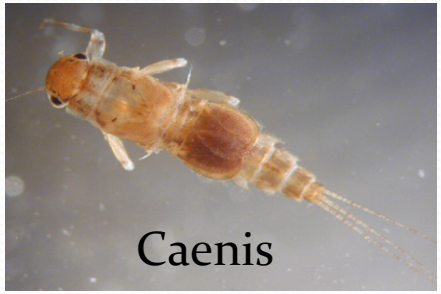
# Results: 2008-2009 NRSA

- Total fish collection
  - 10,949 individuals
  - Species richness ranged from 1 – 19 with an average of 8.
  - 54 species
    - Fathead minnow – 1301 (11.9%)
    - Common carp – 1145 (10.5%)
    - Sand shiner – 1120 (10.2%)
    - Gizzard shad – 1059 (9.7%)
    - White sucker – 864 (7.9%)

# Results: 2008-2009 NRSA

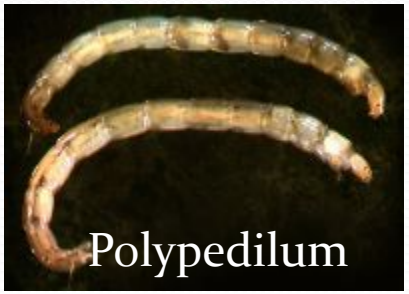
- Species richness ranged from 6 – 42 with an average of 27.
- 204 taxa
  - Genus level
- Most dominant taxa
  - Hyalella (scuds)
  - Caenis (mayflies)
  - Simulium (black fly)
  - Chironomus (bloodworms)
  - Polypedilum (midge)


Hyalella


Caenis

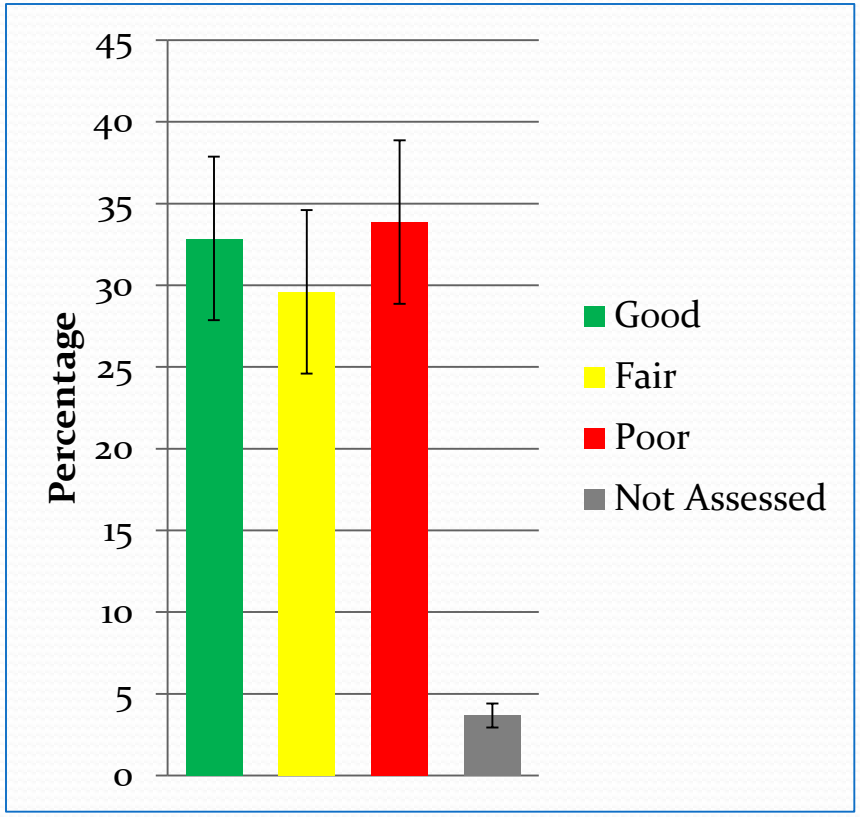

Simulium


Chironomus

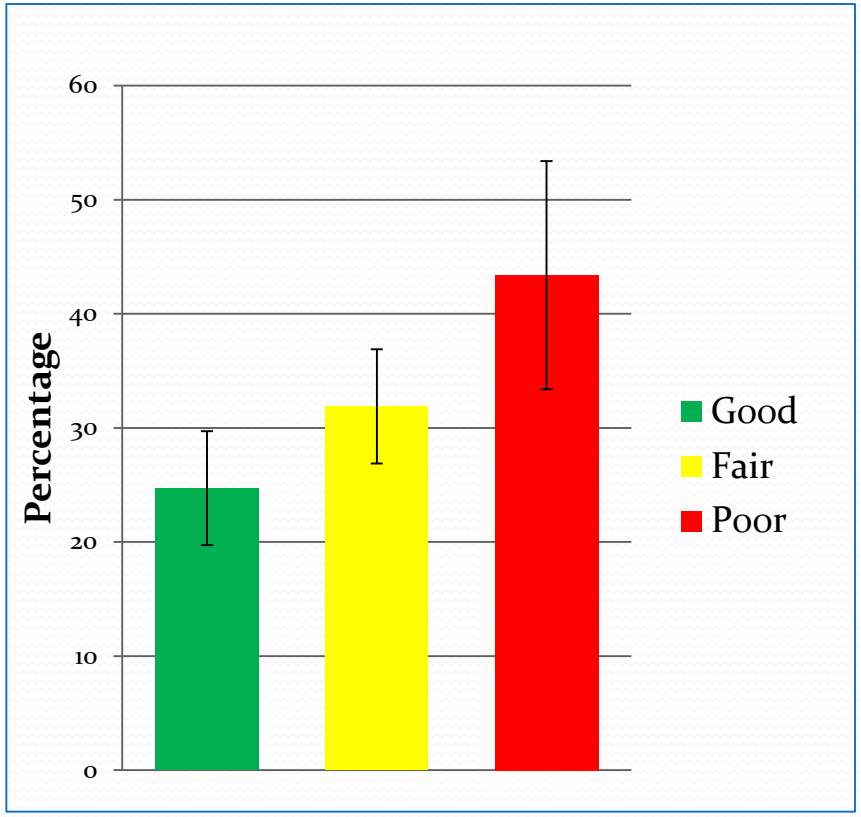

Polypedilum

# Results: 2008-2009 NRSA

## Fish Condition

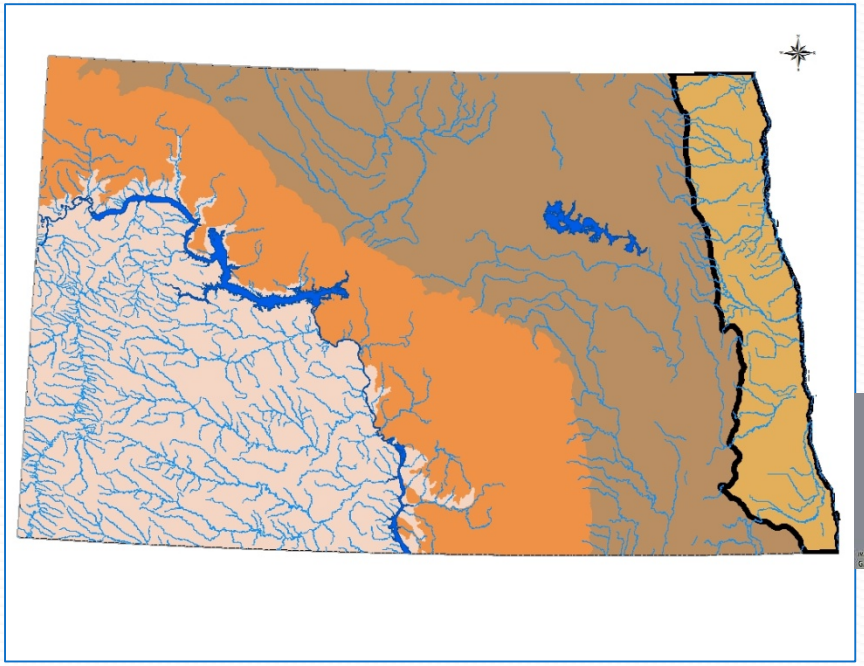



## Macroinvertebrate Condition



# Access

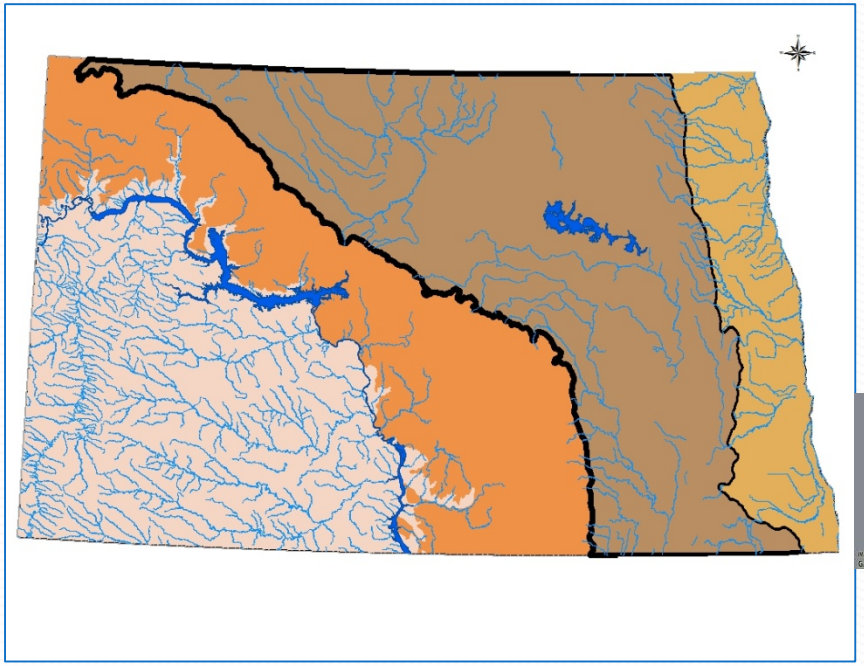
# Lake Agassiz Plain



## Fish Summary

- 54,966 Individuals
- 62 species
- Most abundant numerically
  - Fathead minnow (19.8%)
  - Common shiner (16.7%)
  - Blacknose dace (10.1%)

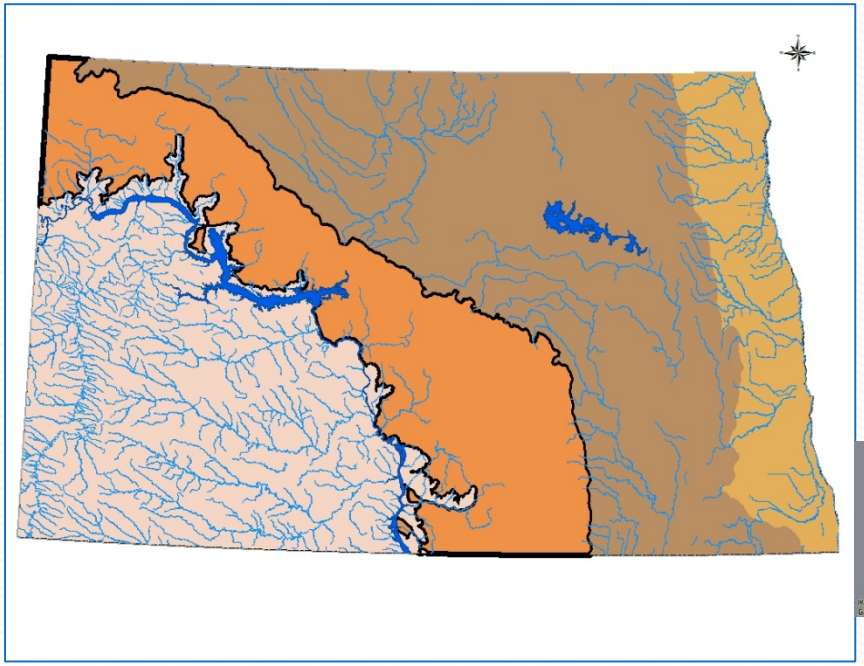

# Northern Glaciated Plains



## Fish Summary

- 32,914 Individuals
- 49 species
- Most abundant numerically
  - Fathead minnow (39.4%)
  - Sand shiner (9%)
  - White sucker (8.9%)

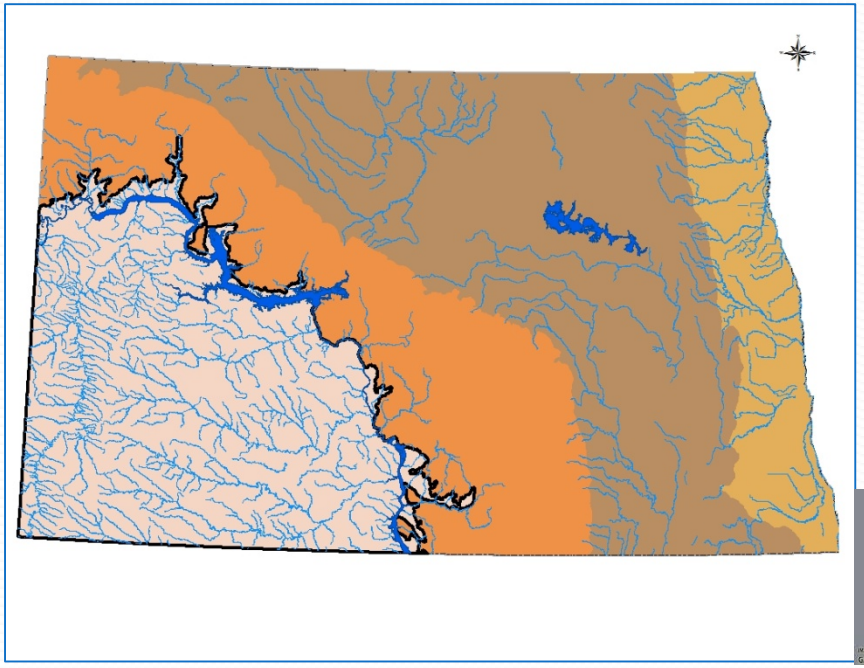

# Northwestern Glaciated Plains



## Fish Summary

- 7,314 Individuals
- 23 species
- Most abundant numerically
  - Fathead minnow (44.9%)
  - Creek chub (18%)
  - White sucker (17.9%)


# Northwestern Great Plains



## Fish Summary

- 19,928 Individuals
- 47 species
- Most abundant numerically
  - Fathead minnow (34.2%)
  - Sand shiner (14.8%)
  - Flathead chub (10.4%)



Questions?