An Ecological Assessment of Perennial Wadeable Streams in the Red River Basin of North Dakota

Aaron Larsen
Environmental Scientist
North Dakota Department of Health
Surface Water Quality Management Program

NORTH DAKOTA
DEPARTMENT of HEALTH

Introduction

- The natural, economic and recreational values of Red River basin rivers and streams are valuable public resources
- In order to protect, maintain and/or restore water quality and beneficial uses of these waterbodies, we first need to understand their current condition

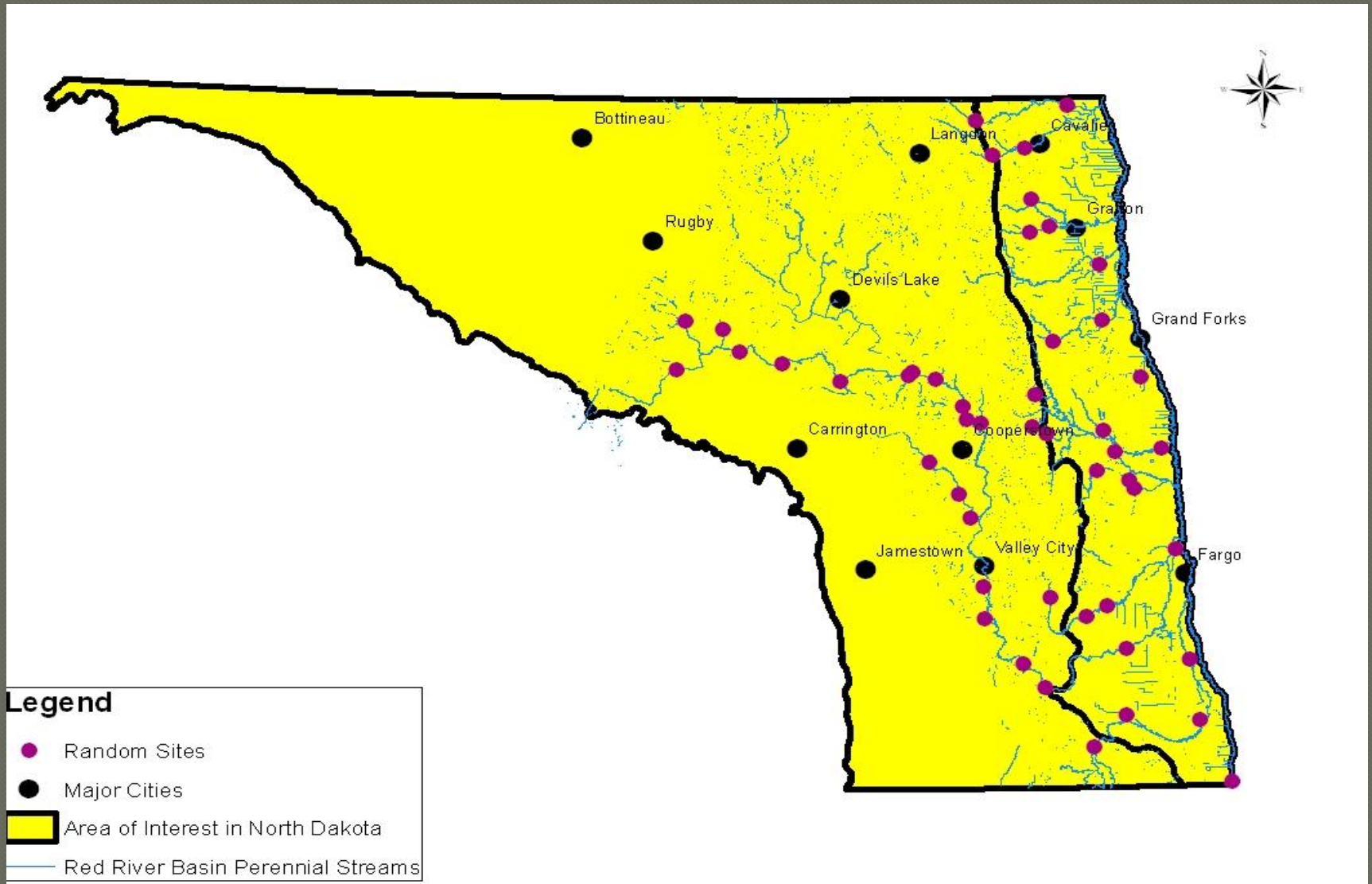
Objectives

- Assess biological, physical and chemical condition of Red River basin in North Dakota
- Assess current status of aquatic life use attainment
- Identify potential stressors to impaired aquatic life use
- Develop and refine multi-metric Indices of Biotic Integrity (IBI) for macroinvertebrates and fish

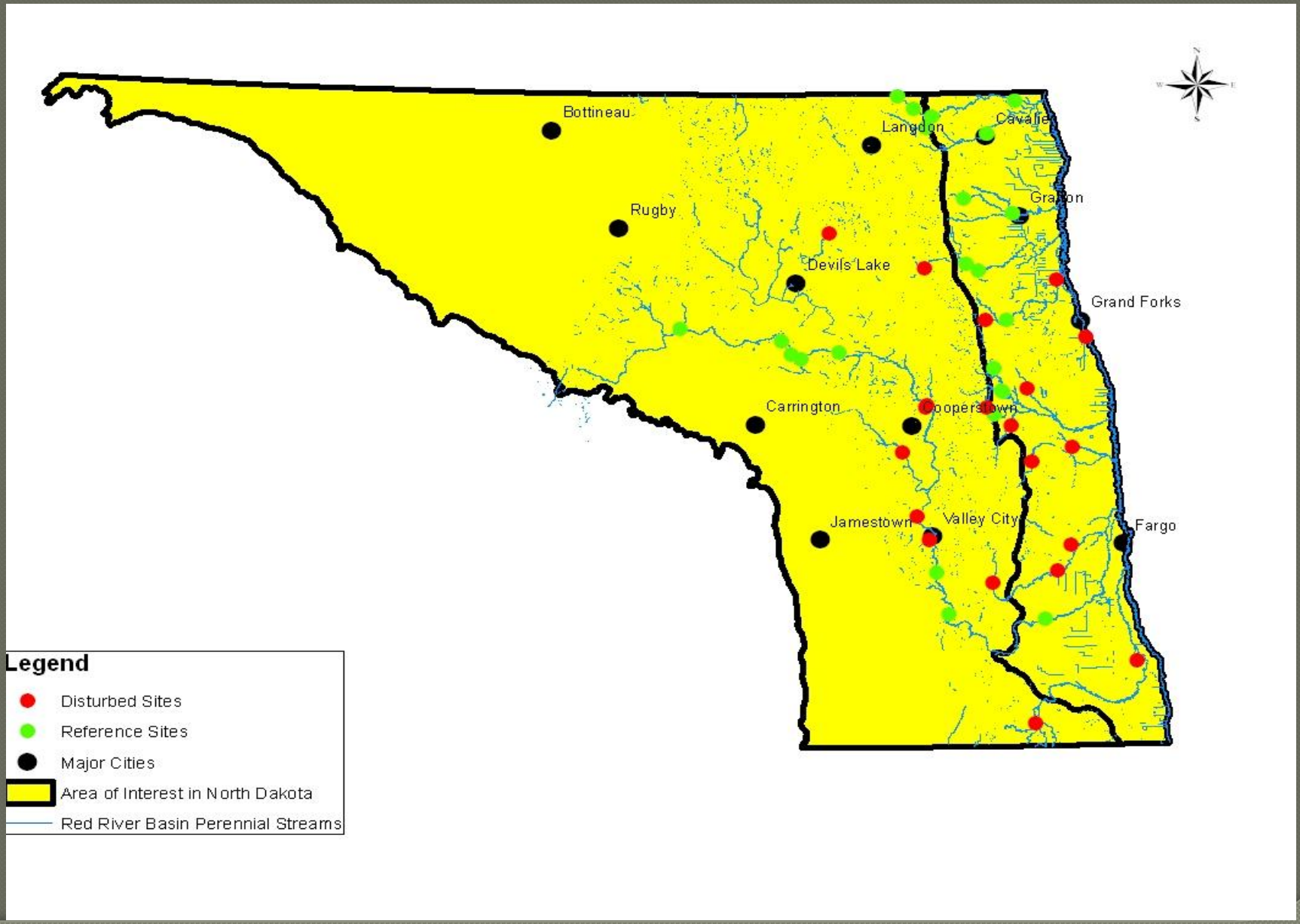
Study Design

- 50 random (probability) sites to provide condition class e
  - 25 – Lake Agassiz Plain
  - 25 – Northern Glaciated Plai
- 20 reference and disturb es to develop IBI's
  - 10 reference & 10 disturbed – Lake Agassiz Plains
  - 10 reference & 10 disturbed – Northern Glaciated Plains
- Sampling took place from 2005 - 2007

Random Sites

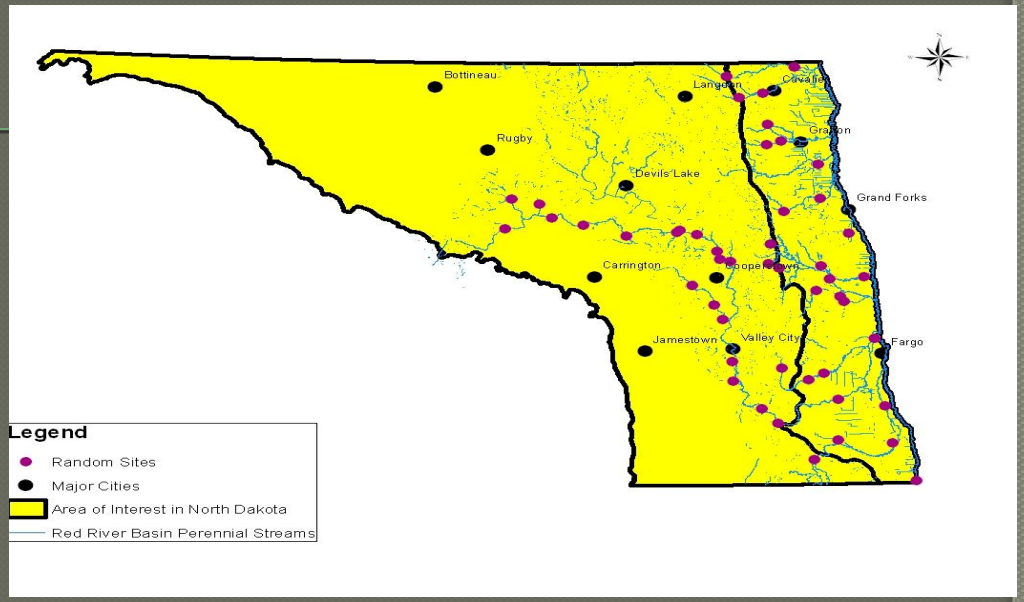


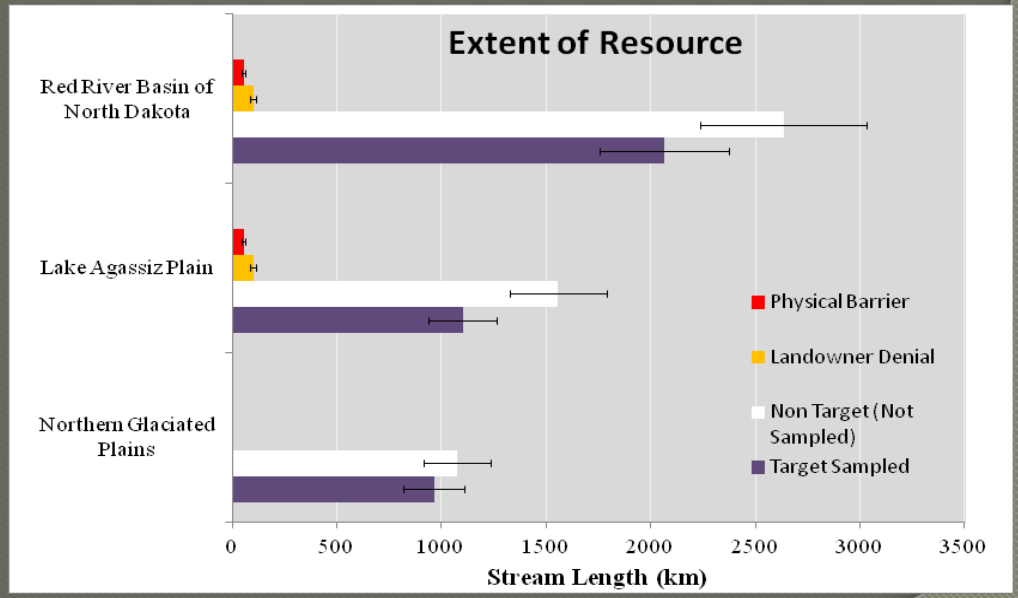
Targeted Sites



Condition Class Estimates

- Based on random (probability) sites
- Each site has a known 'weight'
- Collectively, random sites represent the population of perennial waters in the region
  - 4855 km in RRB of ND





Reference vs. Disturbed

Biological Indicators

MACROINVERTEBRATES

Fish – Lake Agassiz Plain only

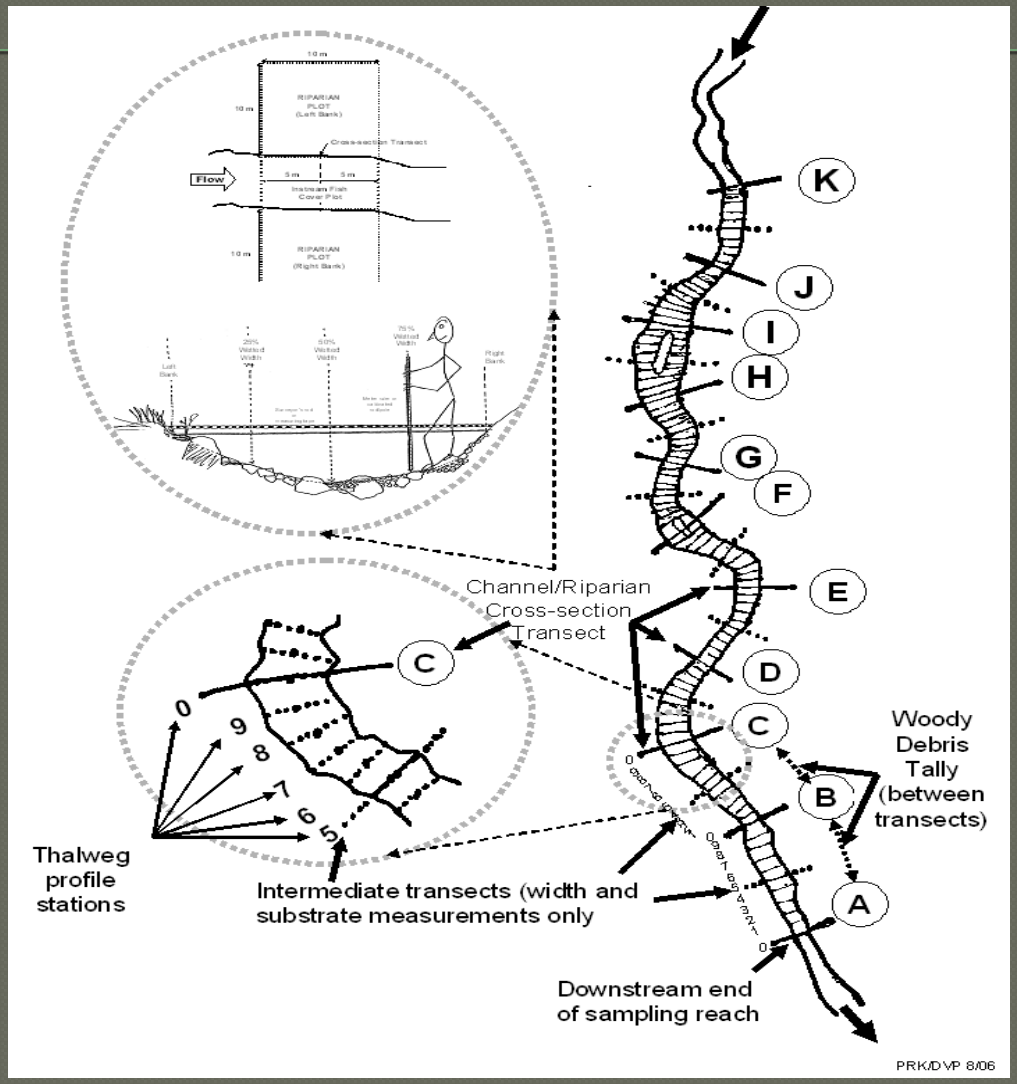
Macroinvertebrates

- Relatively Easy to collect
- Common
- High Diversity
- Rapid Colonization
- Sedentary
- Variability in tolerance
- Vital link in food web

Fish

- Public interest
- Persistent populations that recover rapidly
- Long life spans
- Important to aquatic life use standards

Sample Reach Layout

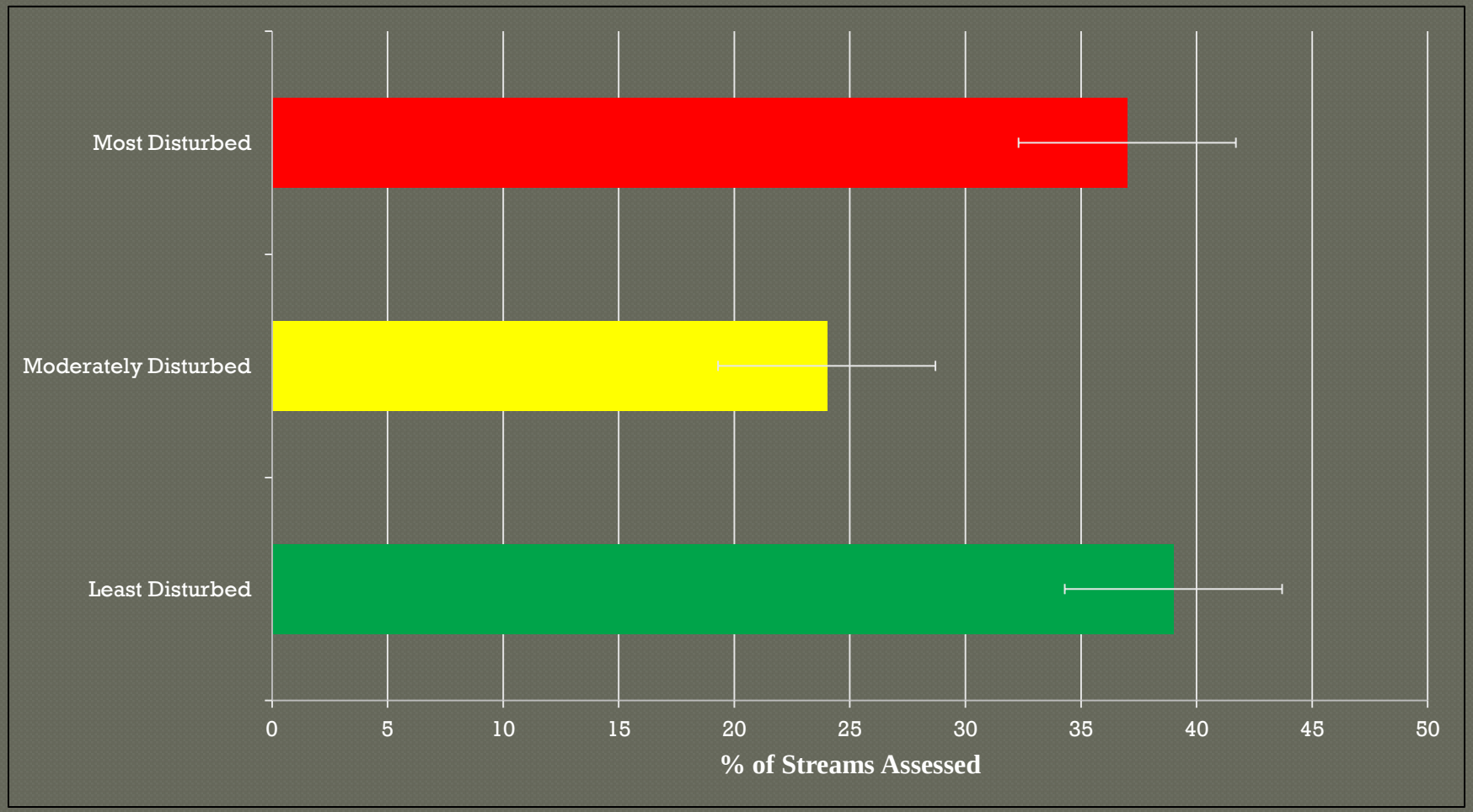


Adapted from NRSA field operations manual. 2009

IBI Thresholds

	Least Disturbed	Moderately Disturbed	Most Disturbed
Lake Agassiz Plain Macroinvertebrate IBI Score	> 71	≤ 71 - ≥ 60	< 60
Northern Glaciated Plains Macroinvertebrate IBI Score	> 70	≤ 70 - ≥ 59	< 59
Lake Agassiz Plain Fish IBI Score	> 62	≤ 62 - ≥ 47	< 47

Fish Condition – Lake Agassiz Plain



Red River Basin Macroinvertebrate Condition

Turtle River @ TRSP

Indicator	IBI Score	Condition
Fish	90	Least Disturbed
Macroinv.	95	Least Disturbed

North Branch Elm River

Indicator	IBI Score	Condition Class
Fish	20	Most Disturbed
Macroinv.	30	Most Disturbed

Stressors

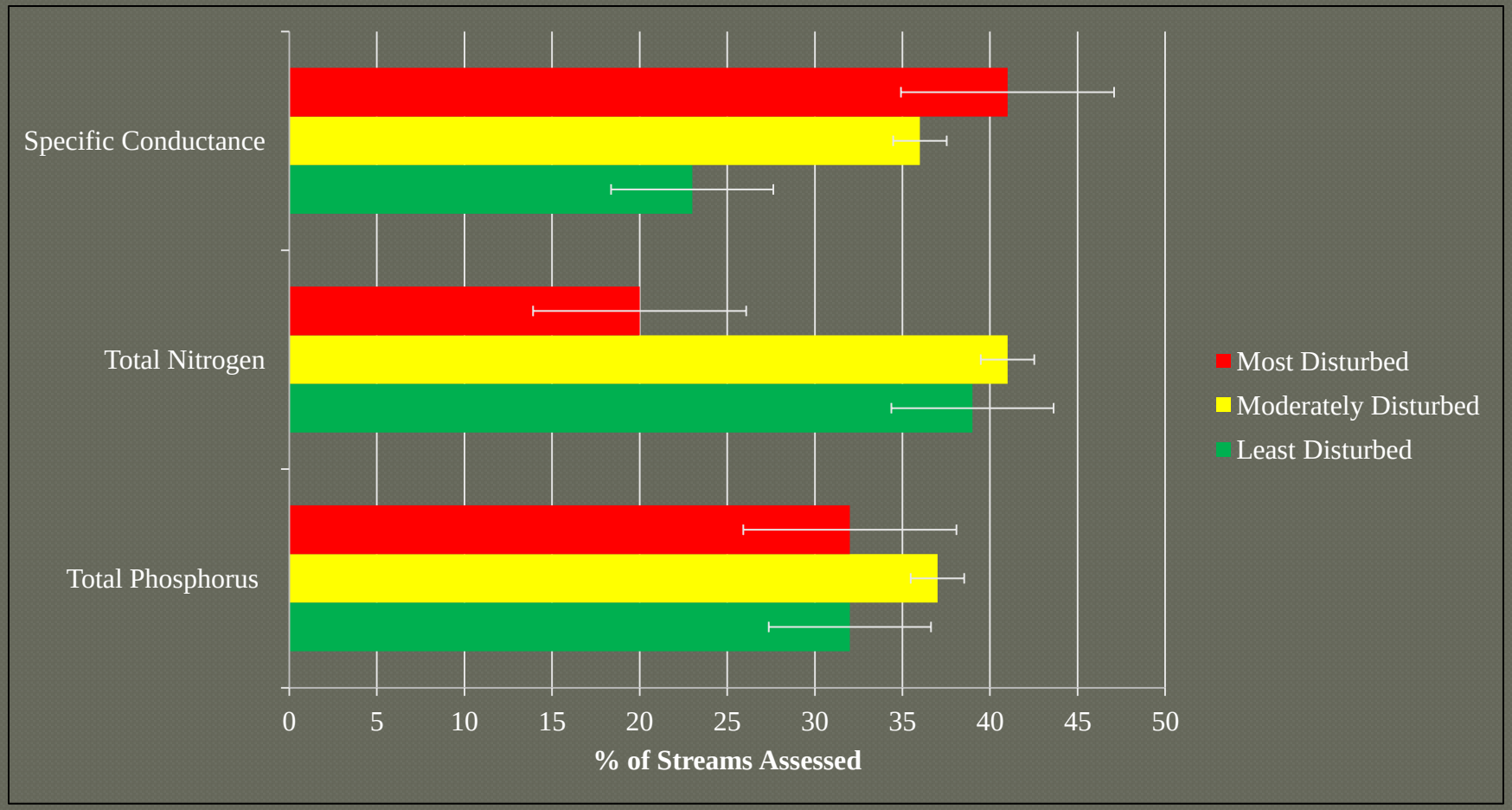
CHEMICAL

- Specific Conductance
- Total Nitrogen
- Total Phosphorus

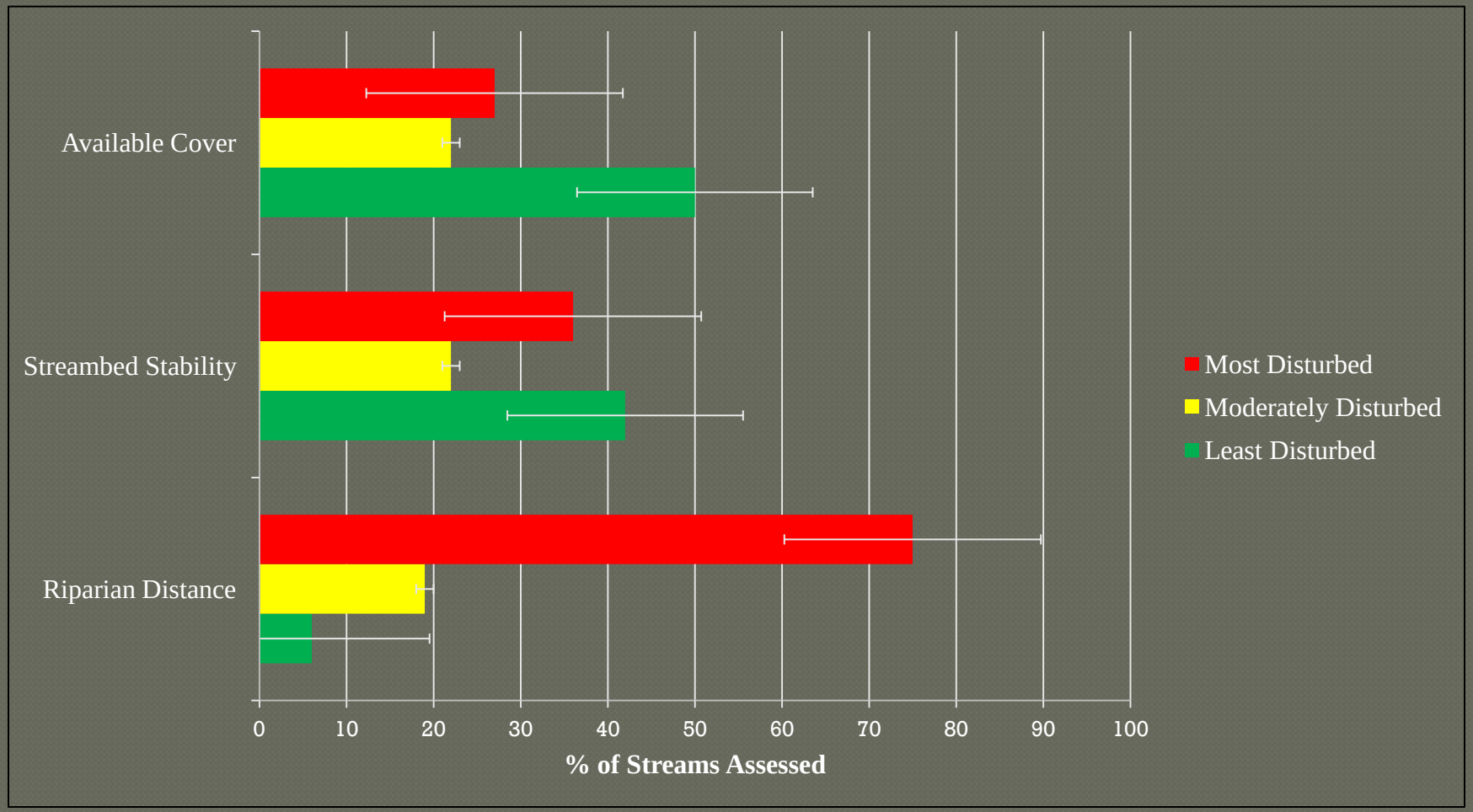
PHYSICAL

- Available Cover
- Streambed Stability
- Riparian Distance

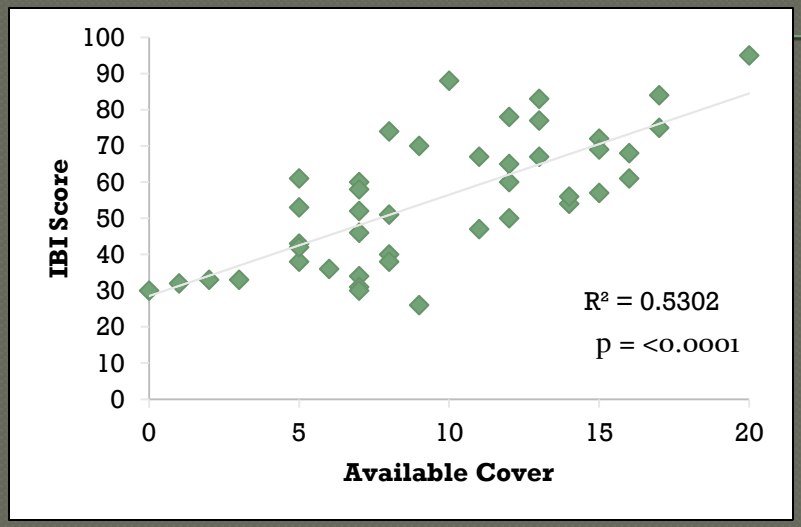
Water Quality Stressors

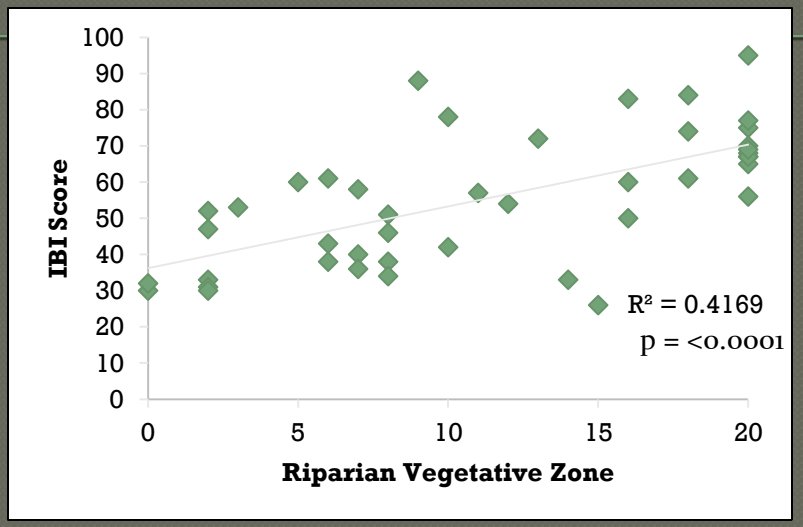


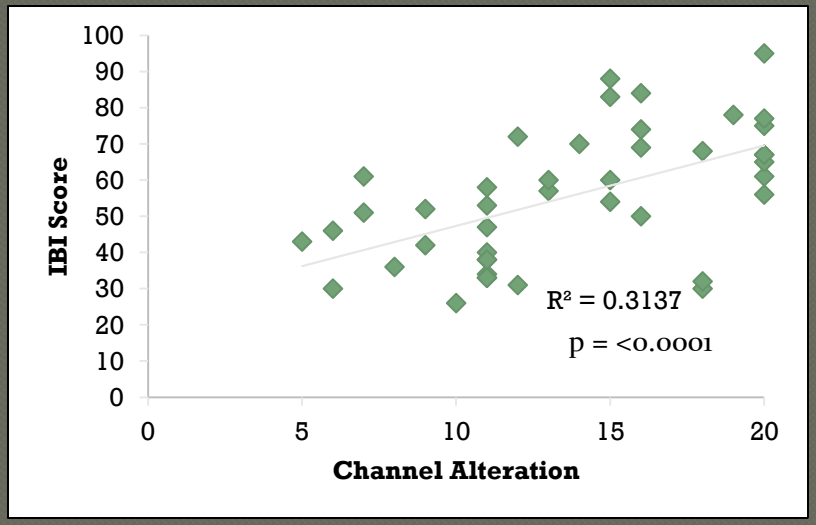
Physical Habitat Stressors



RBP Variables








Altered Stream Channel
(Straightened)
Lack of In-Stream Habitat
(Available Cover)
No Riparian Zone

Summary

- Results are comparable to other large-scale studies such as EMAP-West
  - Plains region tends to yield high estimates of Most Disturbed Condition
- Macroinvertebrate indicator reveals a majority of streams in most disturbed condition
- Water quality stressors reveal most streams are least or moderately disturbed condition
- Riparian disturbance is the greatest physical habitat stressor

Did We Meet our Objectives??

- Assess biological, physical and chemical condition of Red River basin
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- Identify potential stressors to impaired aquatic life use
- Develop and refine multi-metric Indices of Biotic Integrity (IBI) for macroinvertebrates and fish

What's Next?

1) 2010 and 2011 data will be added to these results in order to refine IBI's and existing thresholds

2) Continue to develop Aquatic Life Use criteria for State Water Quality Standards

Acknowledgements

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Questions??