

2008 – 2010 Lake Water Quality Assessment Project

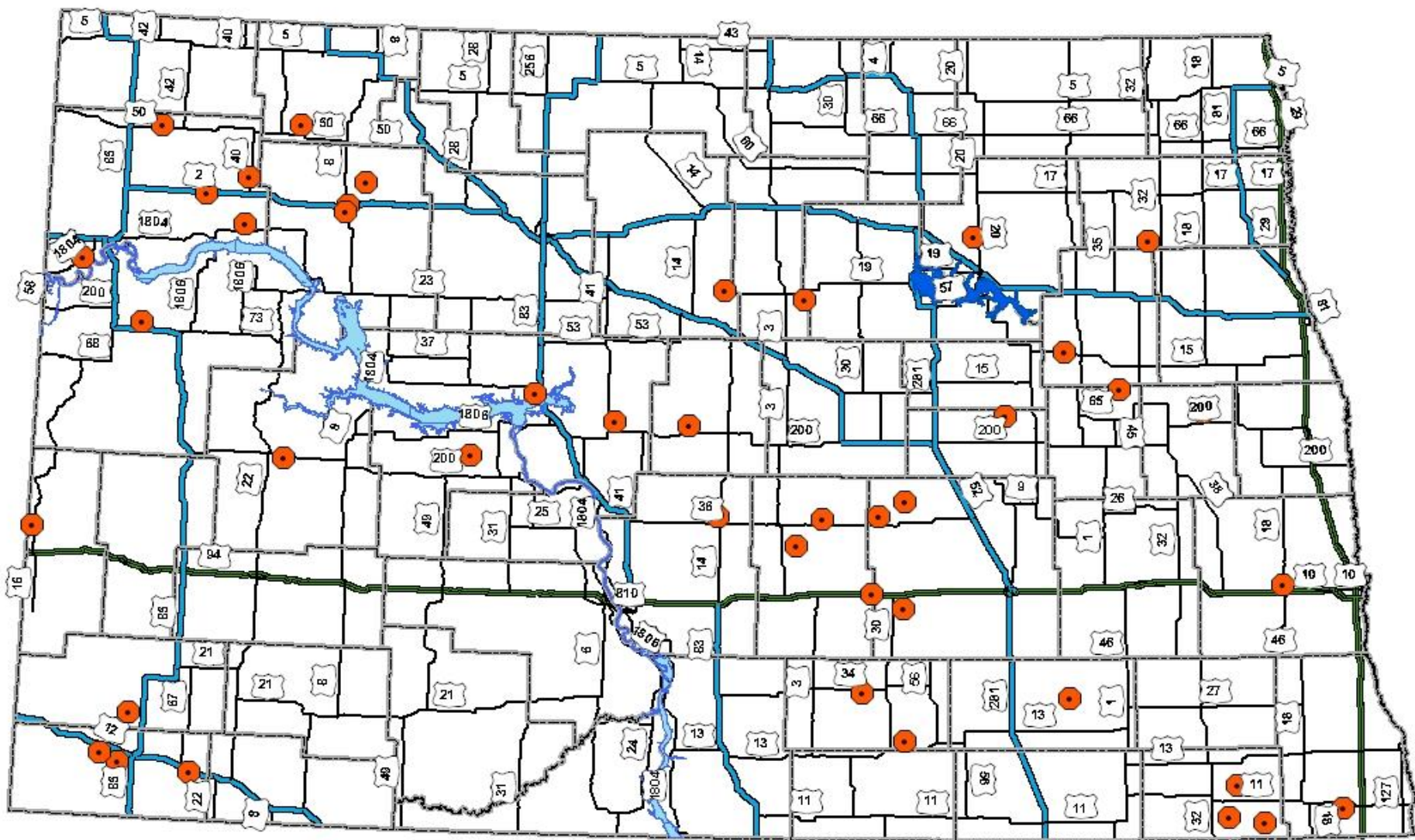
The 2008-2010 LWQA Project - is Part of NDDoH, Surface Water Quality Management Programs Continuous Statewide Tracking of Lake Health

- 1) The LWQA Project began in 1990**
- 2) Has been active in some form most years since**



43 Lakes sampled: A Subset of the 193 Lakes & Reservoirs
in the “Standards of Water Quality of the State of North
Dakota” - Lakes Without Previous Data were Targeted








Map Features

-  2008-2010 LWQA Lakes
-  Devils Lake 2004
-  Missouri River
-  County Boundaries

State Roads And Interstates

-  Interstate
-  Undivided and divided state
-  Paved



2008-2010 MONITORING GOALS

- 1) Chemical, Physical & Biological Condition
- 2) Estimate Trophic Status
- 3) Identify Temporal Trends
- 4) Report Findings



In 2008 2 Visits/Lake & In 2009-2010 3 Visit/Lake

- 1) Temperature, Dissolved Oxygen, Conductivity & pH Profile**
- 2) Major Cation-Anions and Trace Elements**
- 3) Phosphorus and Nitrogen species – Both Total and Dissolved**
- 4) Chlorophyll-a and b**





Rapid Sampling Procedures

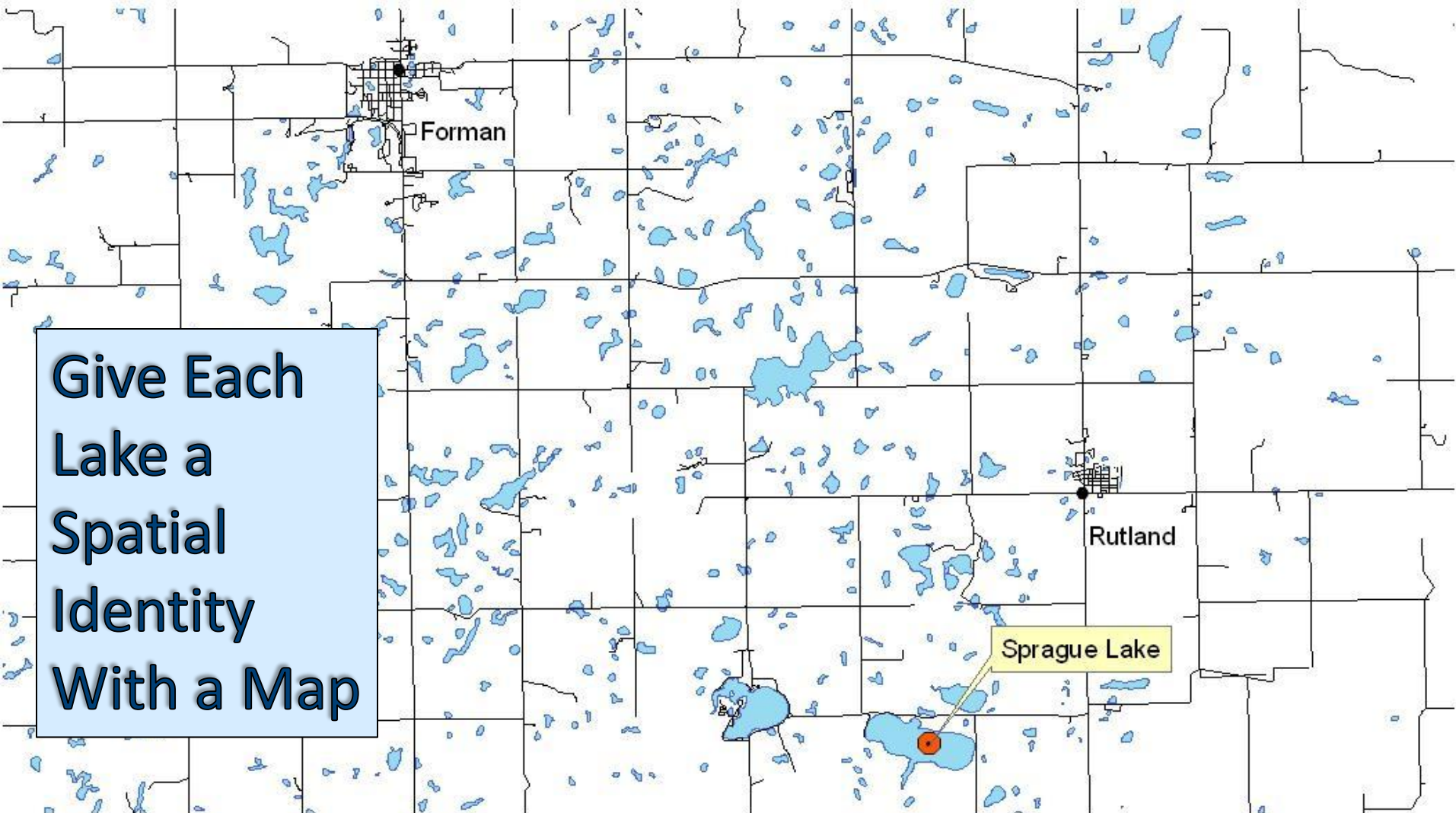
After 3 Years of Floating Around The State
The Project Generated - 9,407 Points Of Data



**Capturing
The Data
Into
Meaningful
Results!**



Give Each
Lake a
Spatial
Identity
With a Map



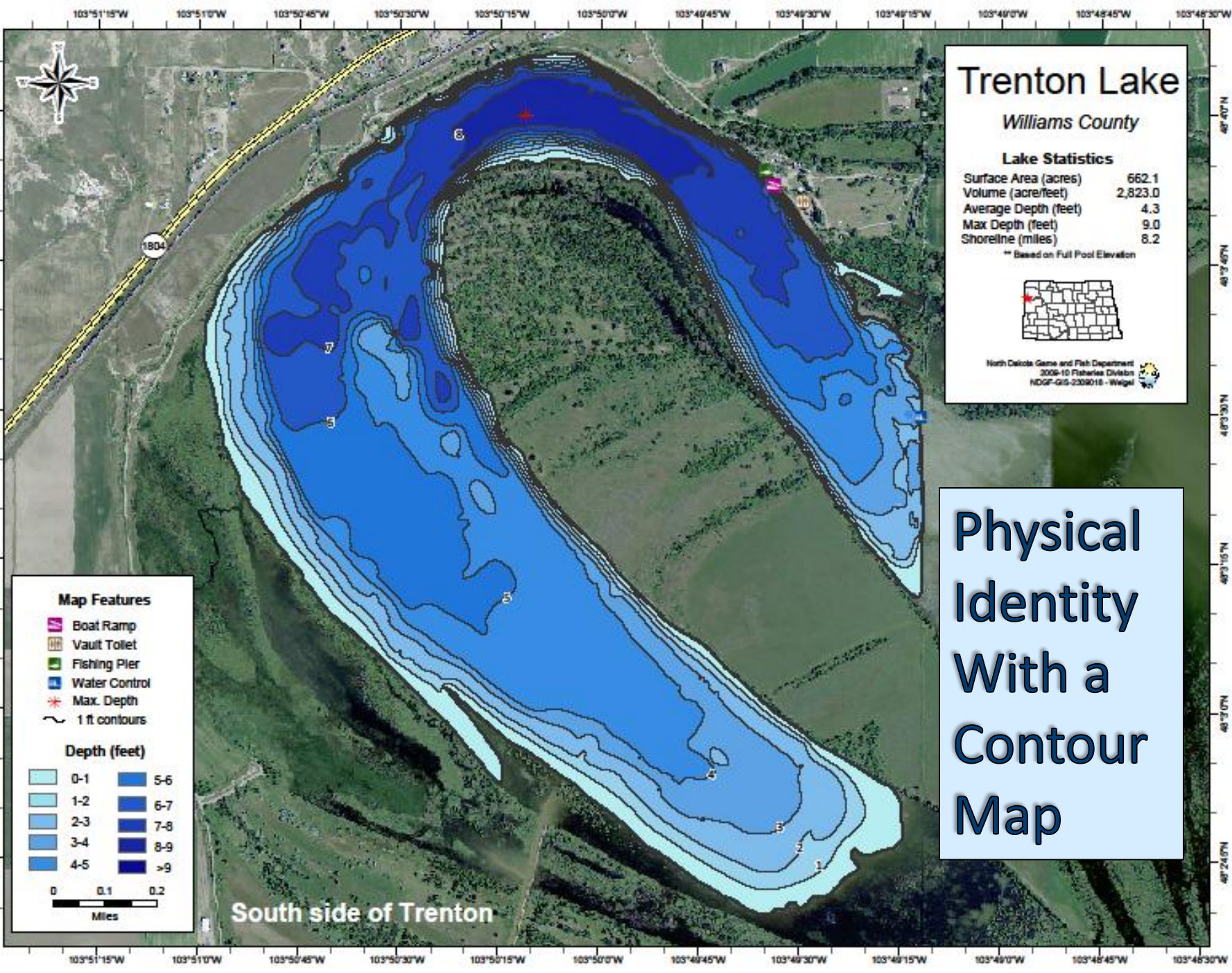
Map Features

- 2008-2010 LWQA Lakes
- County Boundaries

State Roads And Interstates

- Interstate
- Undivided and Divided State Highways
- State and County Roads





Trenton Lake

Williams County

Lake Statistics

Surface Area (acres)	662.1
Volume (acre/feet)	2,823.0
Average Depth (feet)	4.3
Max Depth (feet)	9.0
Shoreline (miles)	8.2

** Based on Full Pool Elevation

North Dakota Game and Fish Department
2009-10 Fisheries Division
NDGF-GIS-2308018 - Weigel

Physical
Identity
With a
Contour
Map

Map Features

- Boat Ramp
- Vault Toilet
- Fishing Pier
- Water Control
- Max. Depth
- 1 ft contours

Depth (feet)

	0-1		5-6
	1-2		6-7
	2-3		7-8
	3-4		8-9
	4-5		>9

0 0.1 0.2
Miles

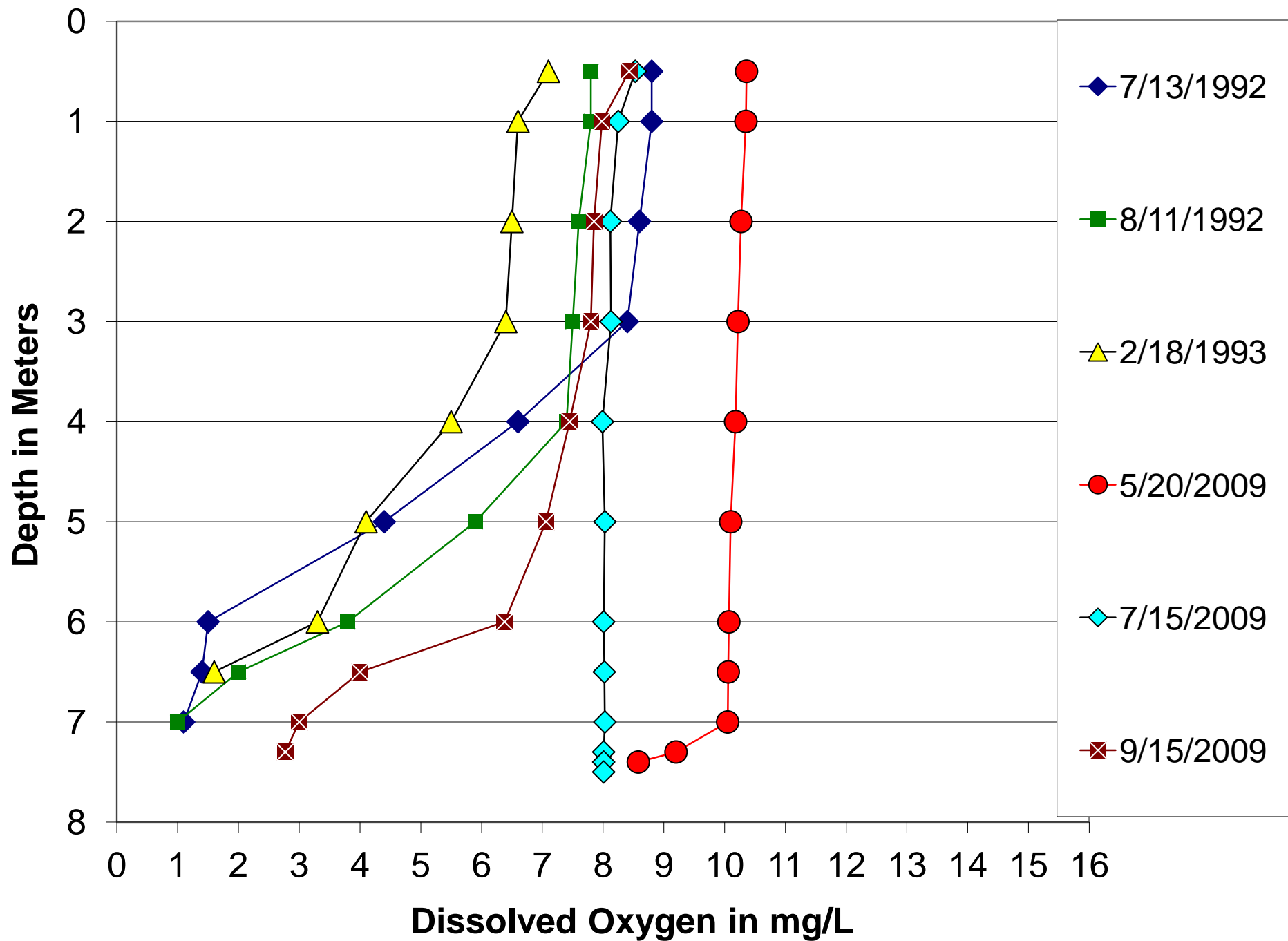
South side of Trenton

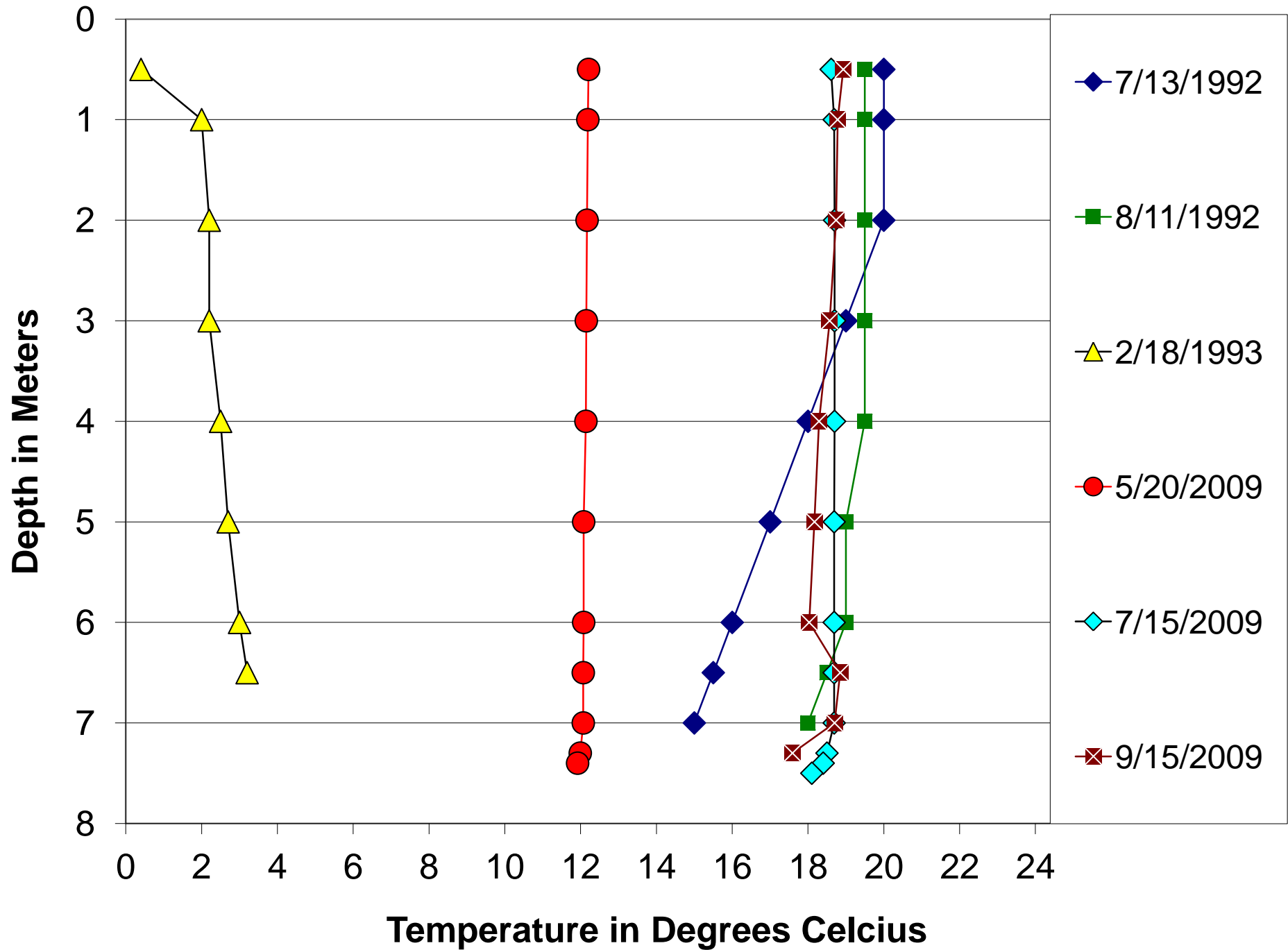


What is
the Fishery



What
Are The
Facilities





Reduced Data Parameters

Physical

Dissolved Oxygen

Temperature

pH

Specific Conductance

General Chemistry

Sodium

Potassium

Magnesium

Calcium

Iron

Hardness

Alkalinity

Bicarbonate

Carbonate

Hydroxide

Chloride

Sulfate

Nutrients

Total Nitrogen

Total Phosphorus

Total Kjeldahl Nitrogen

Nitrate + Nitrite

Total Ammonia

Biological

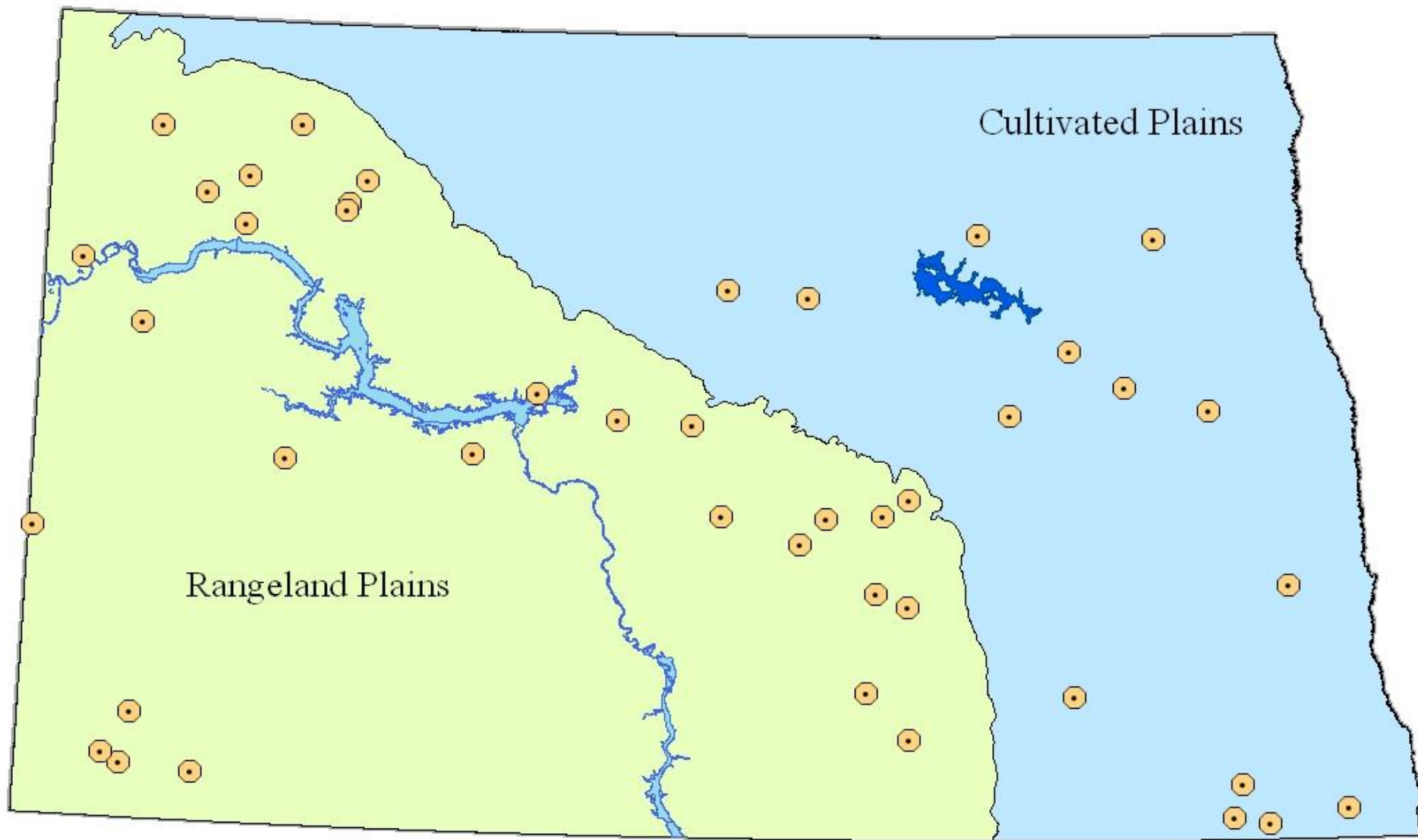
Chlorophyll-a

**IS IT
GOOD?**

**IS IT
BAD?**

**OR
WHAT?**





Map Features

-  2008-2010 LWQA Lakes
-  County Boundaries
-  Cultivated_Plains
-  Devils Lake 2004
-  Rangeland_Plains
-  Missouri River



RESERVOIRS



NATURAL or NATURAL BUT ENHANCED



Statistical Summary of Water Quality Data² Collected from Natural and Enhanced Lakes in the Rangeland Plains Ecological Region of North Dakota

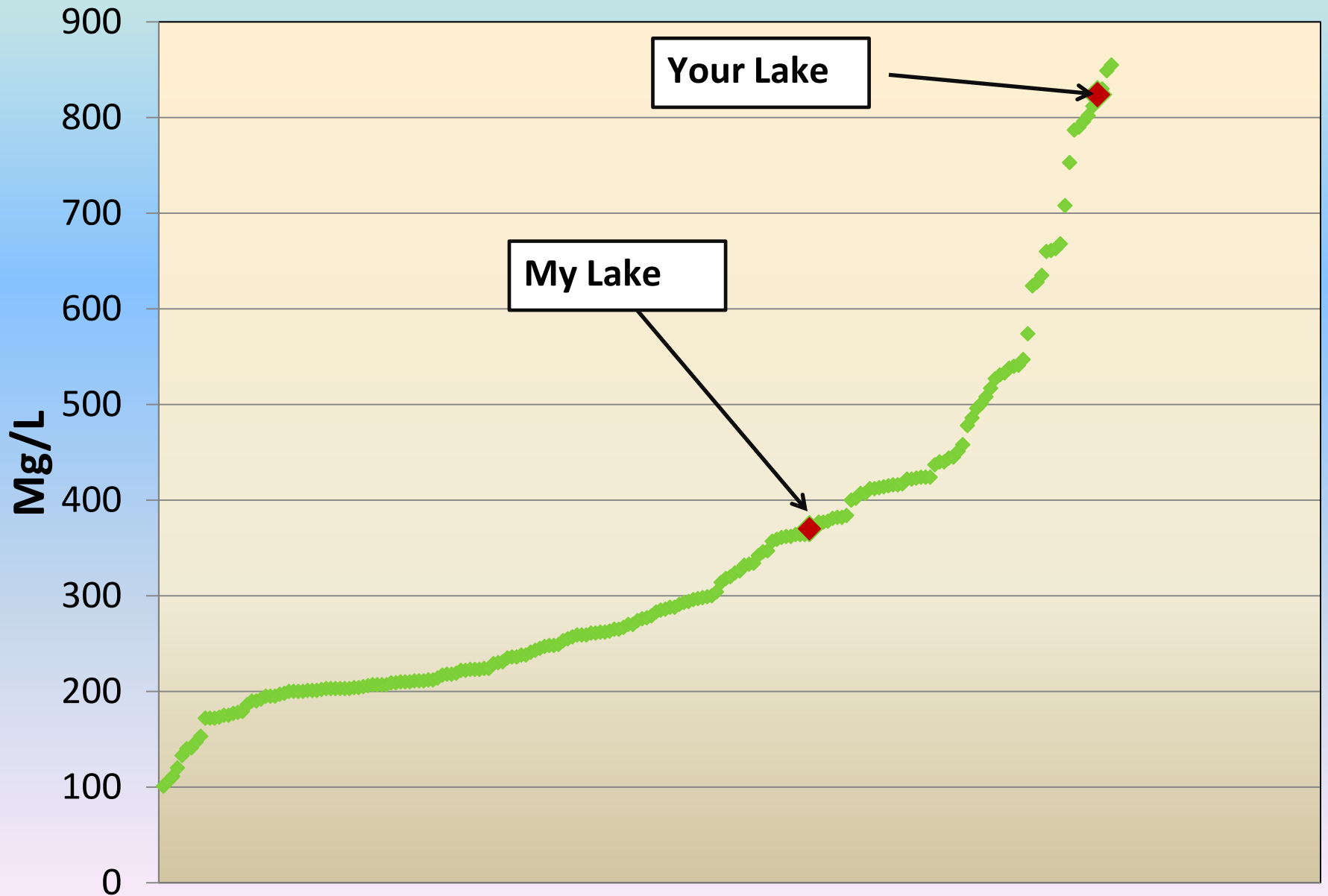
¹Equal to the lower reporting limit

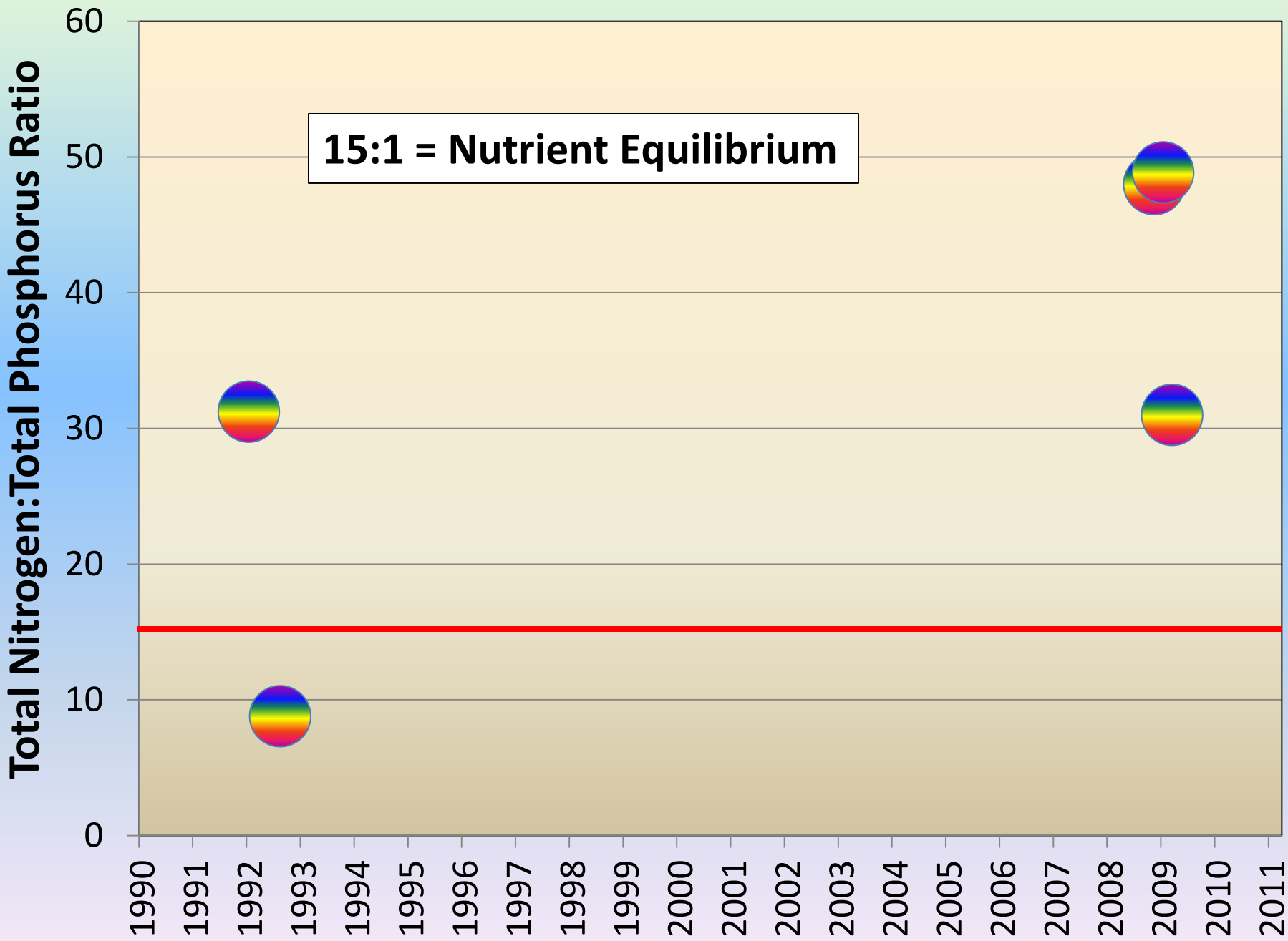
²Data collected from 64 natural and enhanced Lakes between 1991 and 2010

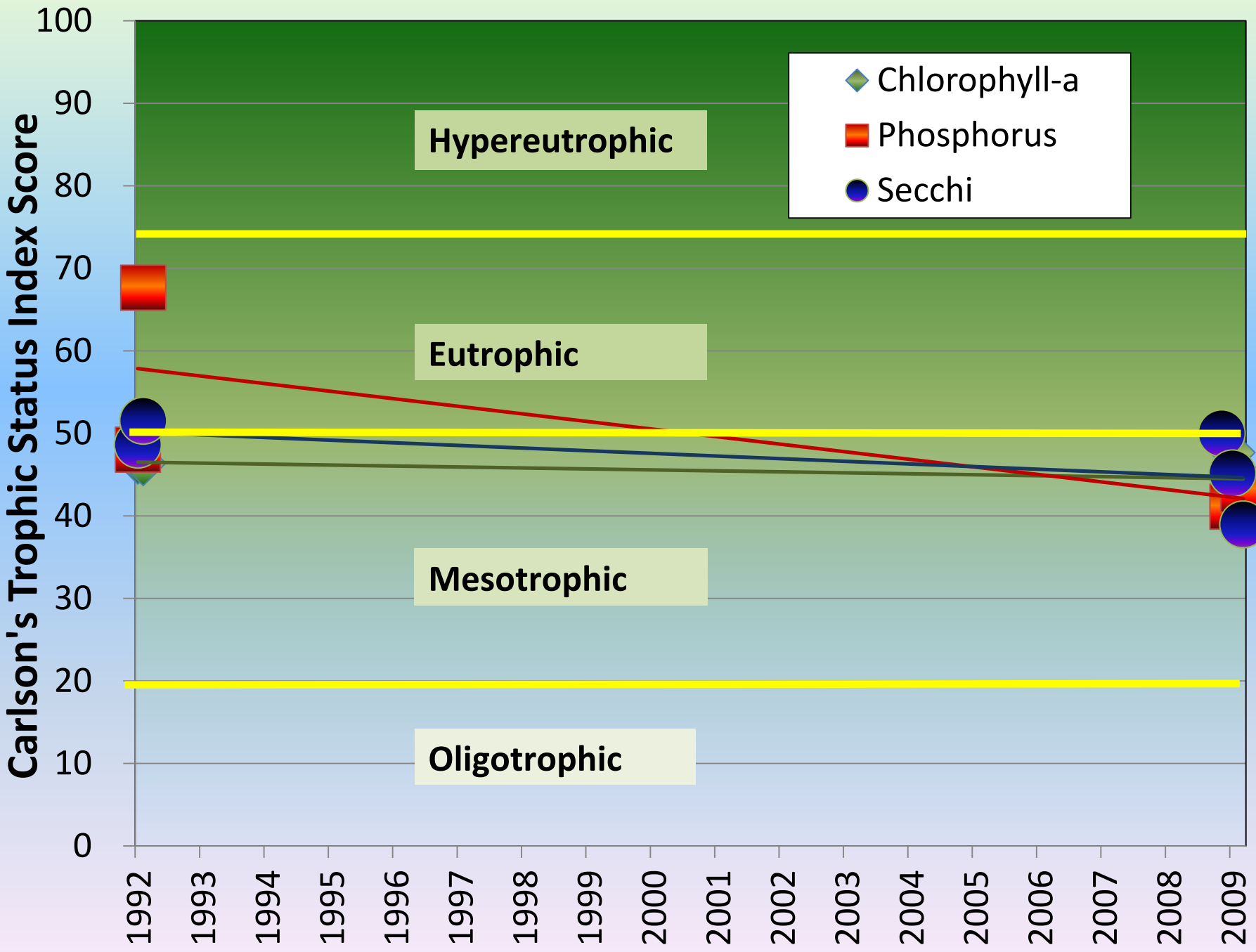
Parameter	Units	n	Average	Minimum	Maximum	Standard Deviation
Total Alkalinity (CaCO₃)	mg/L	383	513	111	4770	487
Total Ammonia as N	mg/L	494	0.105	0.001 ¹	2.230	0.229
Bicarbonate (HCO ₃)	mg/L	383	469	60	2990	320
Calcium (Ca)	mg/L	384	41.1	0.5	282.0	34.4
Carbonate (CO ₃)	mg/L	377	79	1 ¹	1420	148
Chloride (Cl)	mg/L	383	44	3 ¹	1070	103
Chlorophyll-a	µg/L	346	22.5	1.5 ¹	292.0	37.4
Specific Conductance	µmhos	383	2028	424	20100	1976
Total Dissolved Solids	mg/L	383	1466	227	18200	1717
Total Hardness as (CaCO ₃)	mg/L	384	529	74	2370	295
Hydroxide (OH)	mg/L	322	1.0	0.0 ¹	1.0	0.2
Iron (Fe)	mg/L	385	0.245	0.001 ¹	7.070	0.543
Magnesium (Mg)	mg/L	384	103.6	8.5	567.0	70.9
Nitrate + Nitrite as N	mg/L	491	0.04046	0.001 ¹	0.54	0.054
Total Kjeldahl Nitrogen as N	mg/L	463	1.876	0.080	8.500	1.073
Total Nitrogen as N	mg/L	401	1.794	0.240	5.520	0.897
pH		383	8.80	7.40	9.87	0.36
Total Phosphorus as P	mg/L	501	0.233	0.002 ¹	1.940	0.336
Potassium (K)	mg/L	384	34.0	3.1	356.0	37.0
Sodium (Na)	mg/L	384	299.6	16.9	4680.0	514.5
Sulfate (SO ₄)	mg/L	383	625	34	10500	885

Alkalinity of Natural Lakes - Rangeland Plains

383 Samples from 206 Lakes

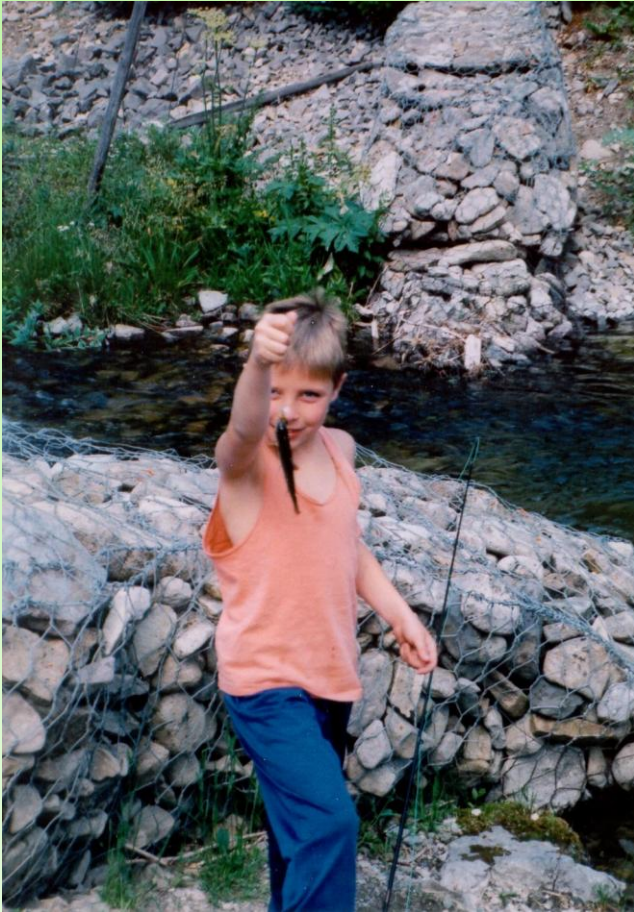






DID WE ACHIEVE OUR GOALS?

Go to: www.ndhealth.gov/WQ/SW/A_Publications.htm



North Dakota nd.gov Official Portal for
North Dakota State Government



NORTH DAKOTA
DEPARTMENT *of* HEALTH



USGS

Kathleen Rowland

THANKS:

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Jeff Hendrickson
Jason Lee
Scott Elstad
Many More

Summer Interns

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Andy McDonald

QUESTIONS?

