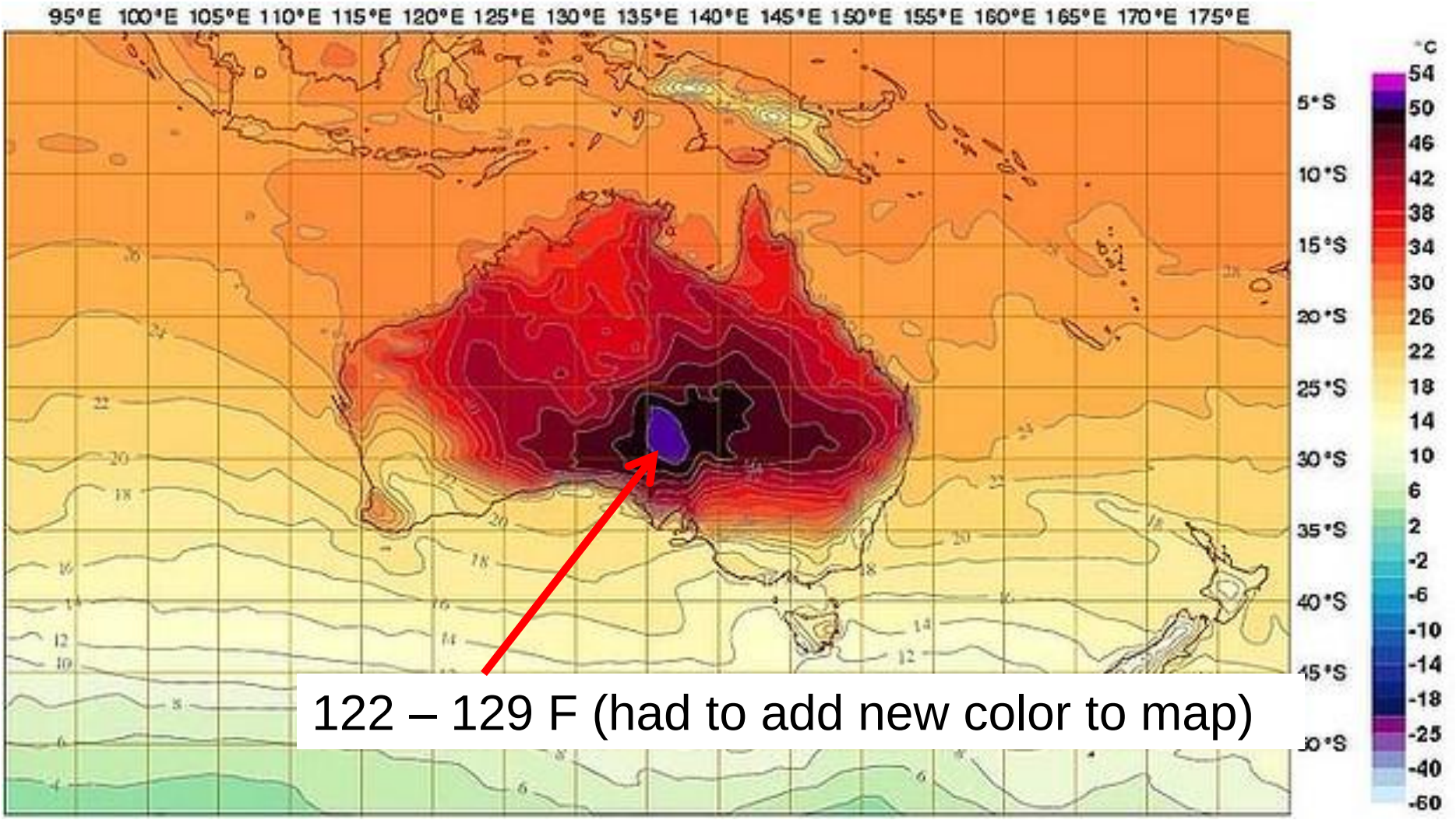
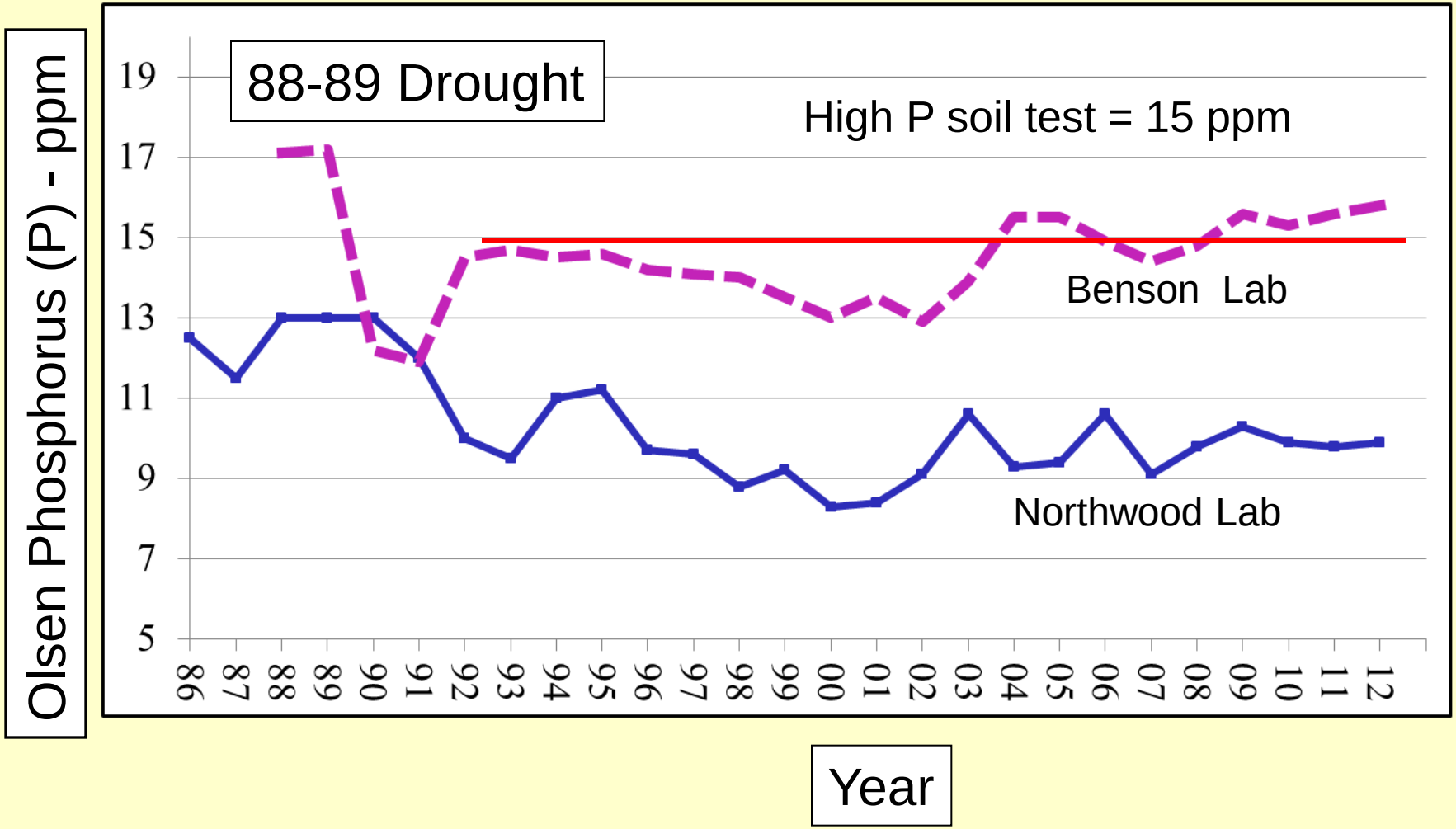
Were Soil Test Levels Affected by 2012 Drought?

- Immobile Nutrients
  - P, K, Zn, Cu
- Soil Properties
  - Salinity
  - Soil pH
- Mobile Nutrients
  - N, S, Cl,

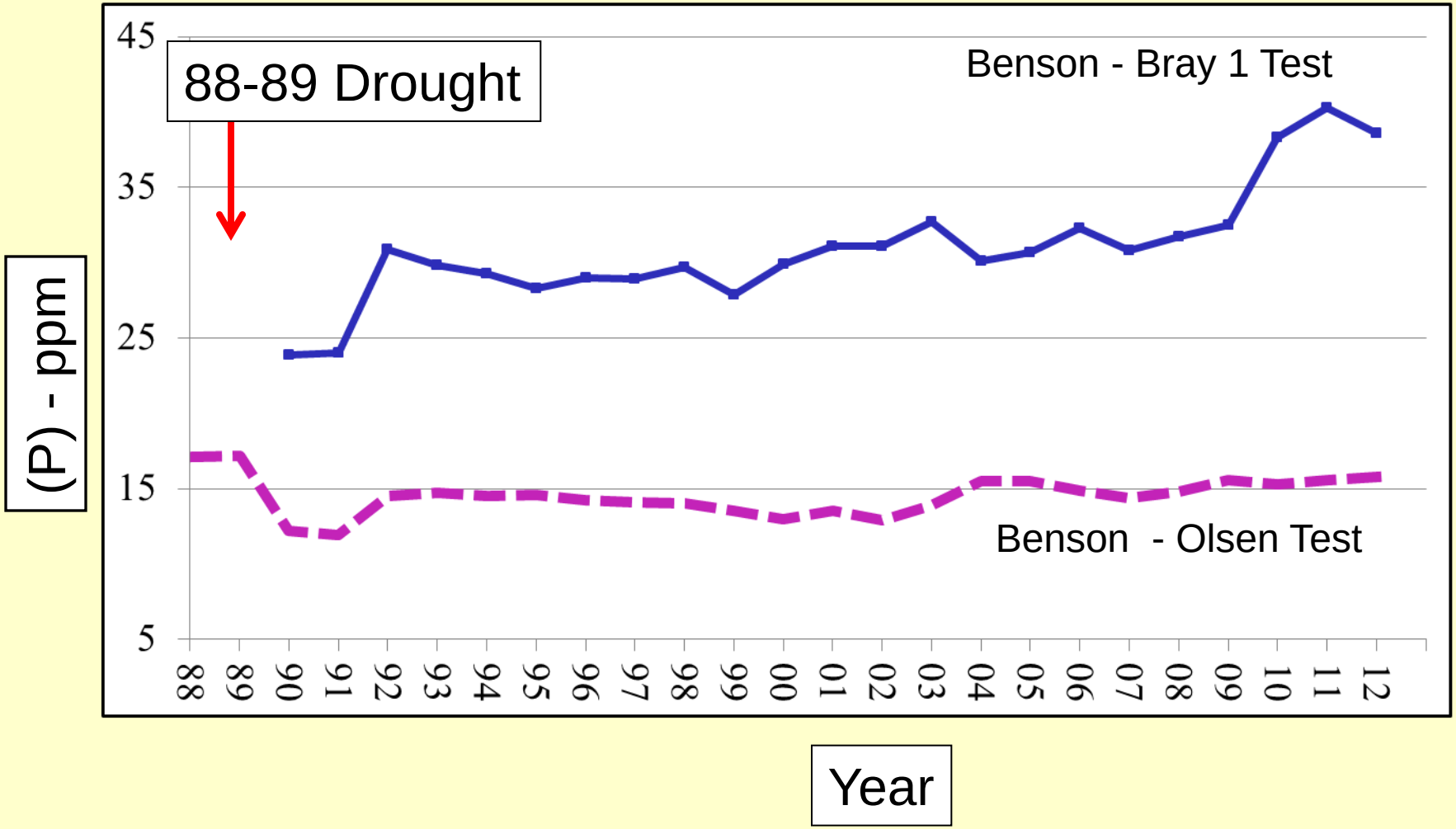
Temperatures exceed 120F in Australia!



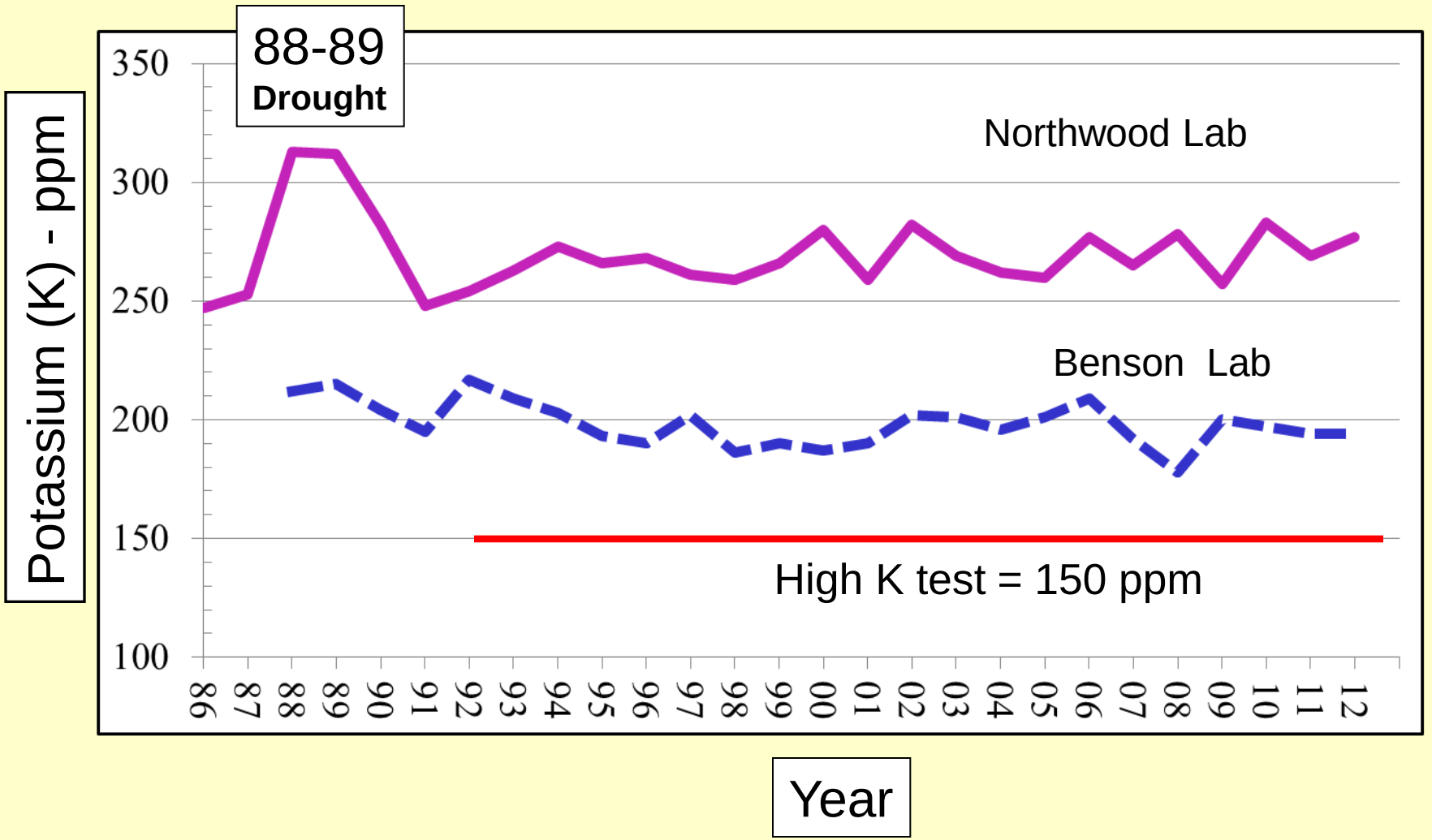
Soil Phosphorus (P) Test Trend
Ave. Olsen P test 1986-2012



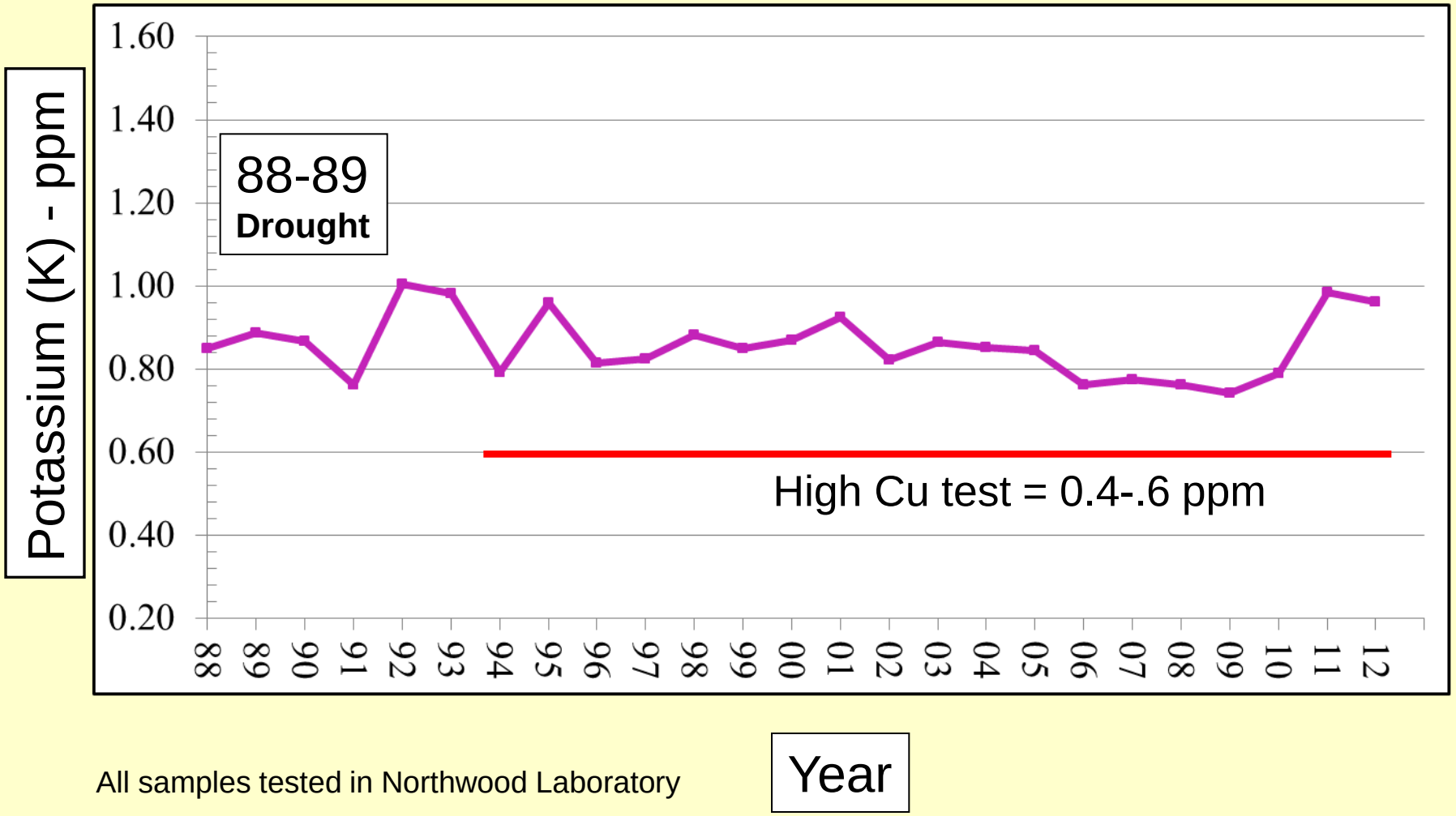
Soil Phosphorus (P) Test Trend
Ave. Bray and Olsen P 1986-2012



Soil Potassium (K) Test Trend
Ave. K test 1986-2012

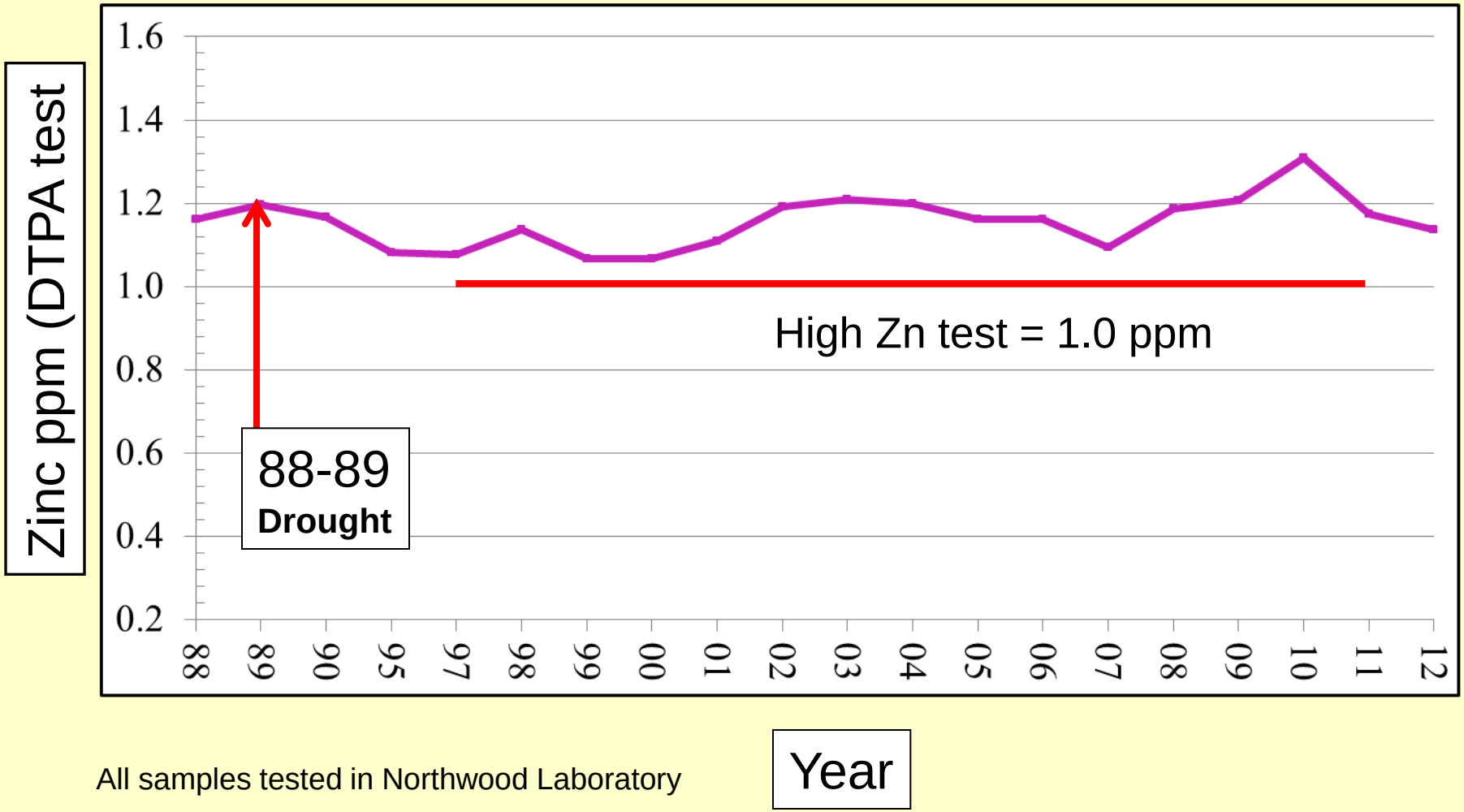


Soil Copper (Cu) Test Trend 1988-2012



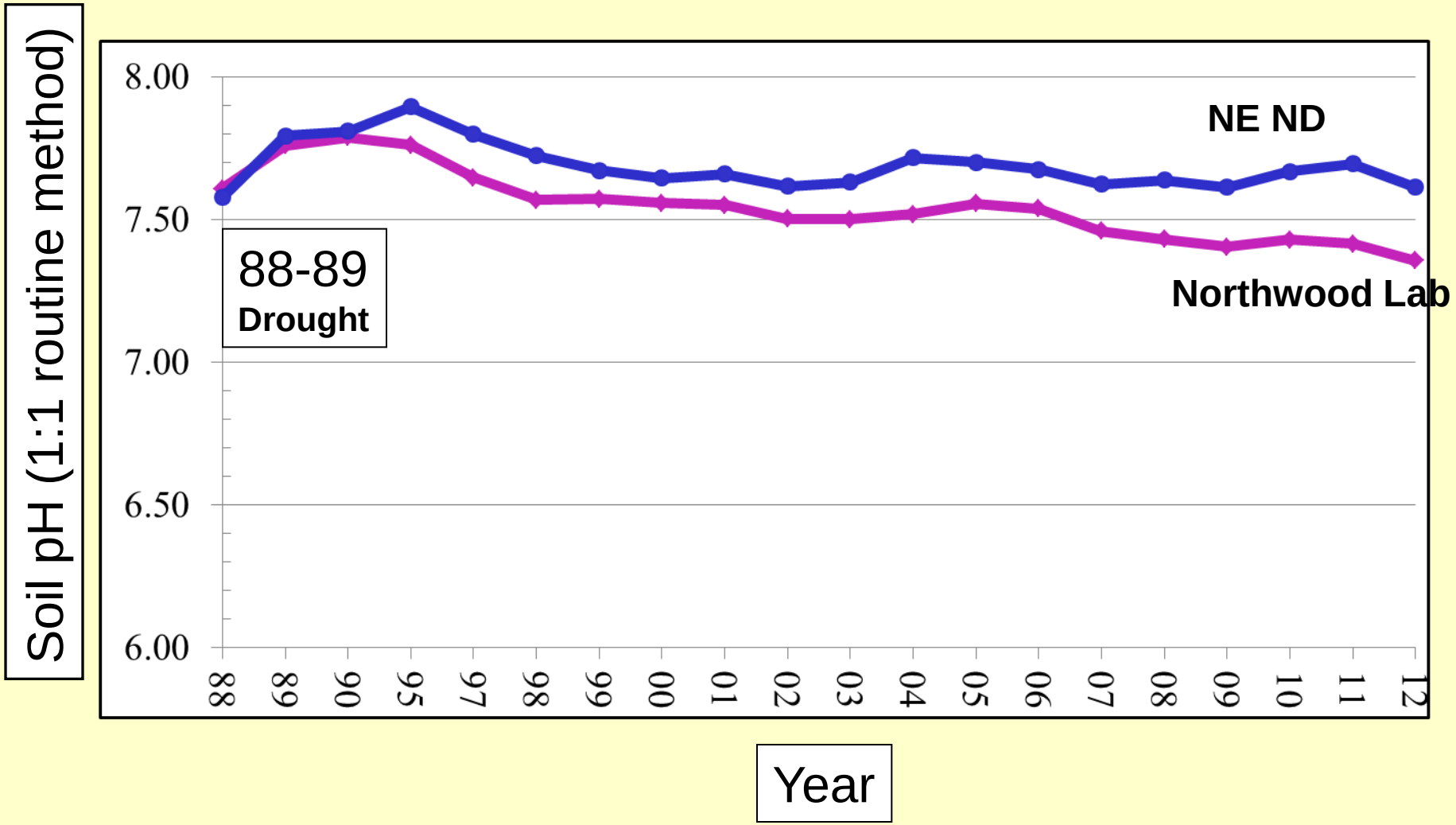
All samples tested in Northwood Laboratory

Soil Zinc (Zn) Test Trend 1988-2012

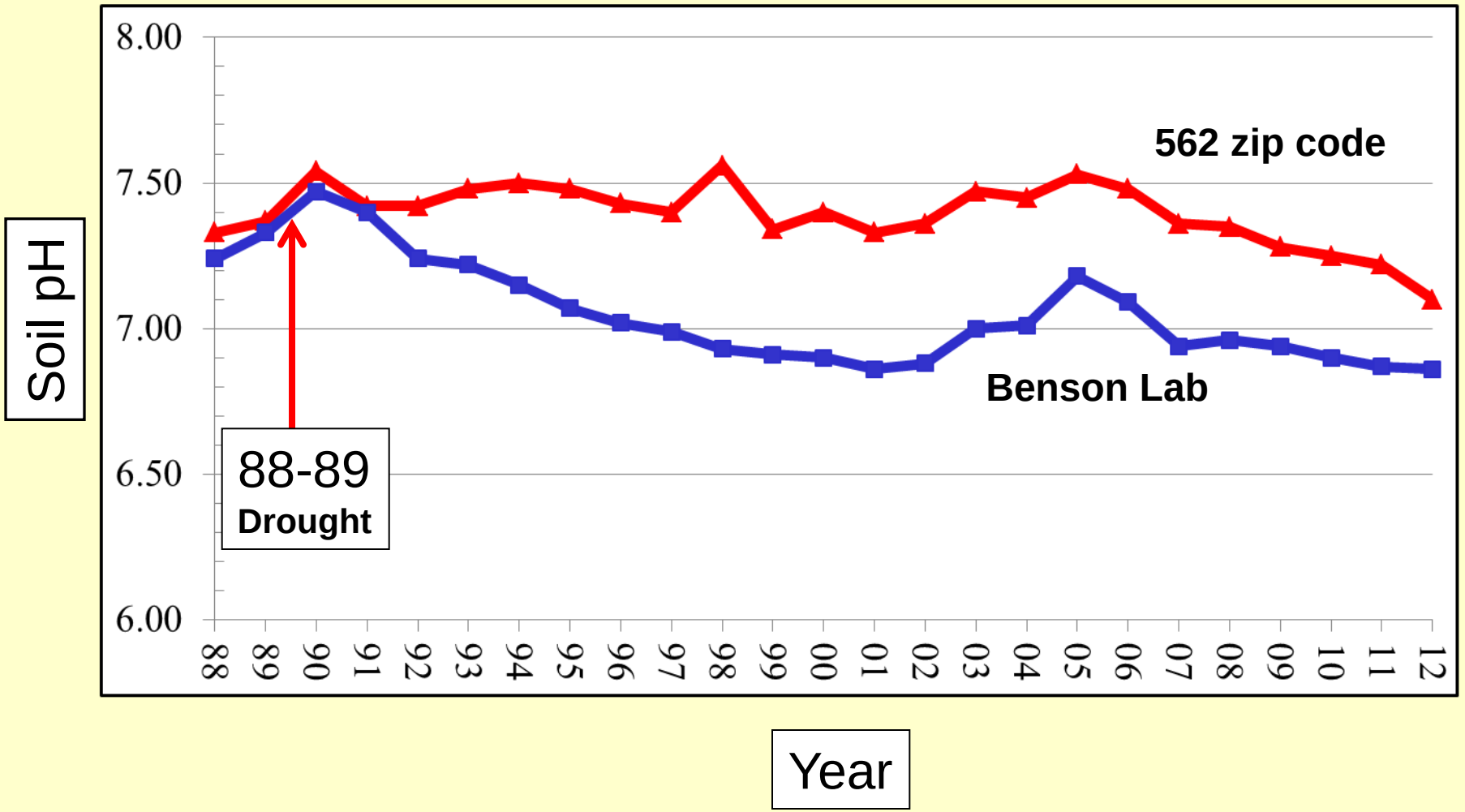


All samples tested in Northwood Laboratory

Soil pH Trend (0-6”) 1988-2012



Soil pH Test Trend
Benson Lab 1988-2012



% Soil Samples with Salts greater than 1.0

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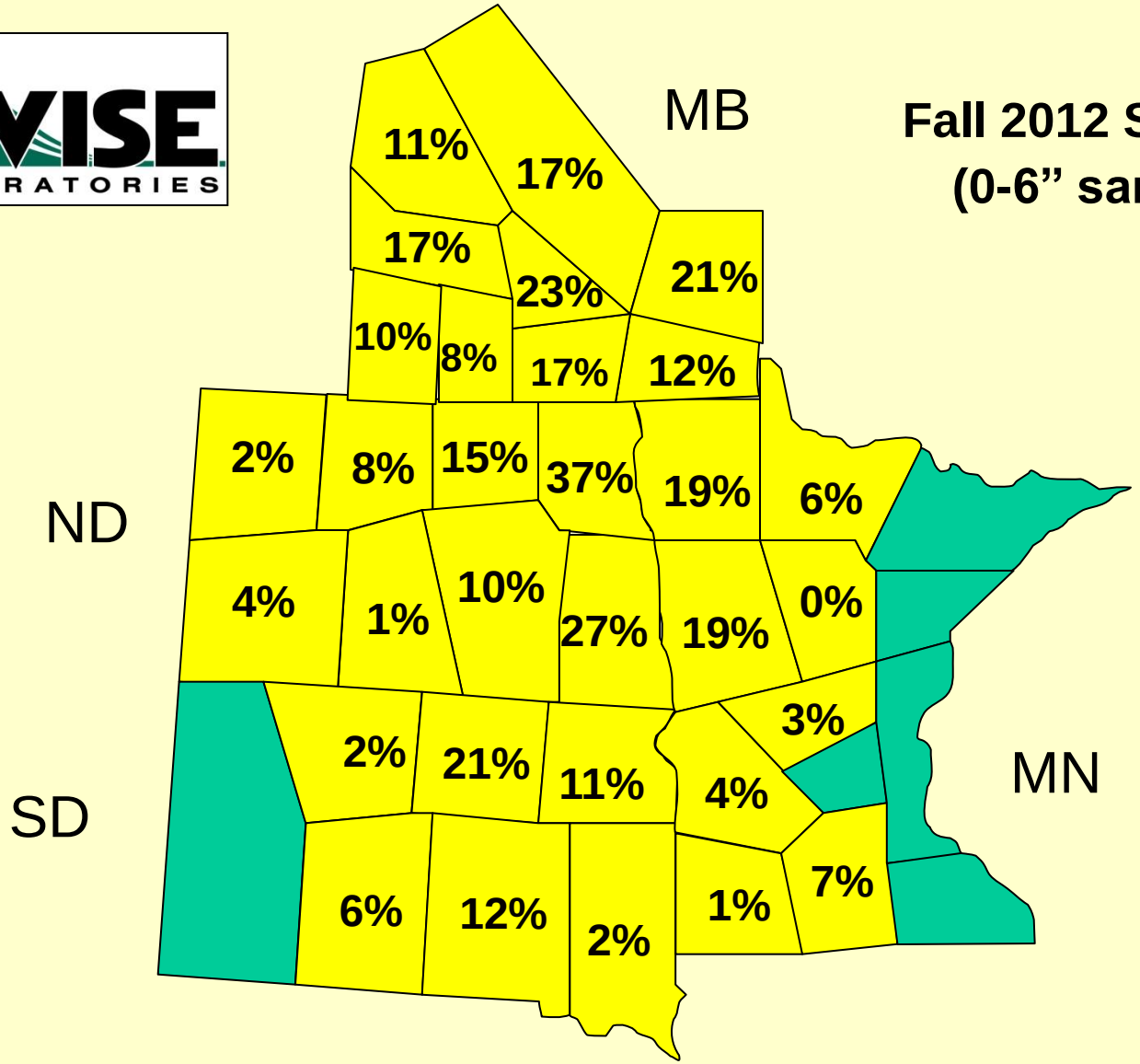
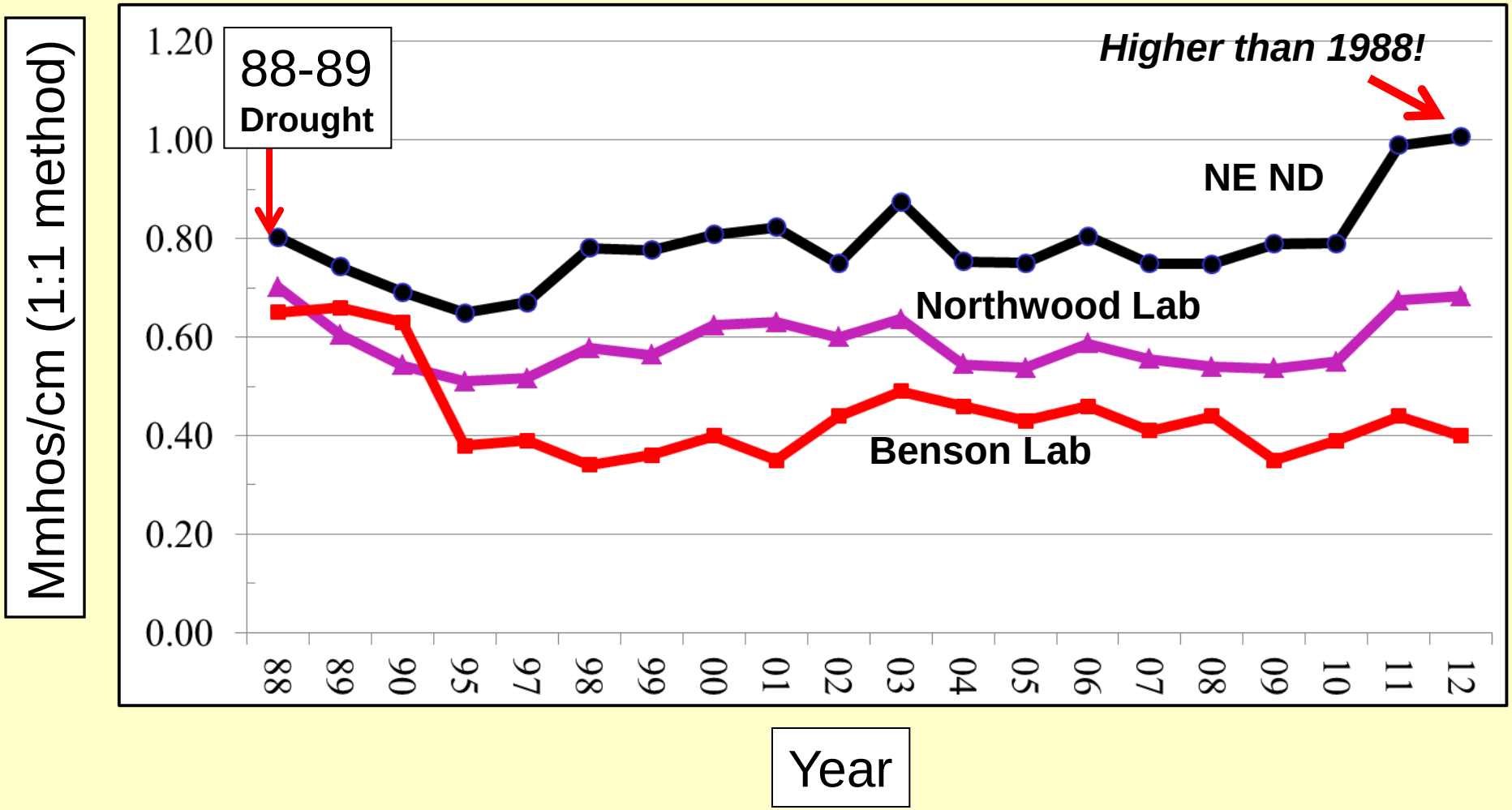
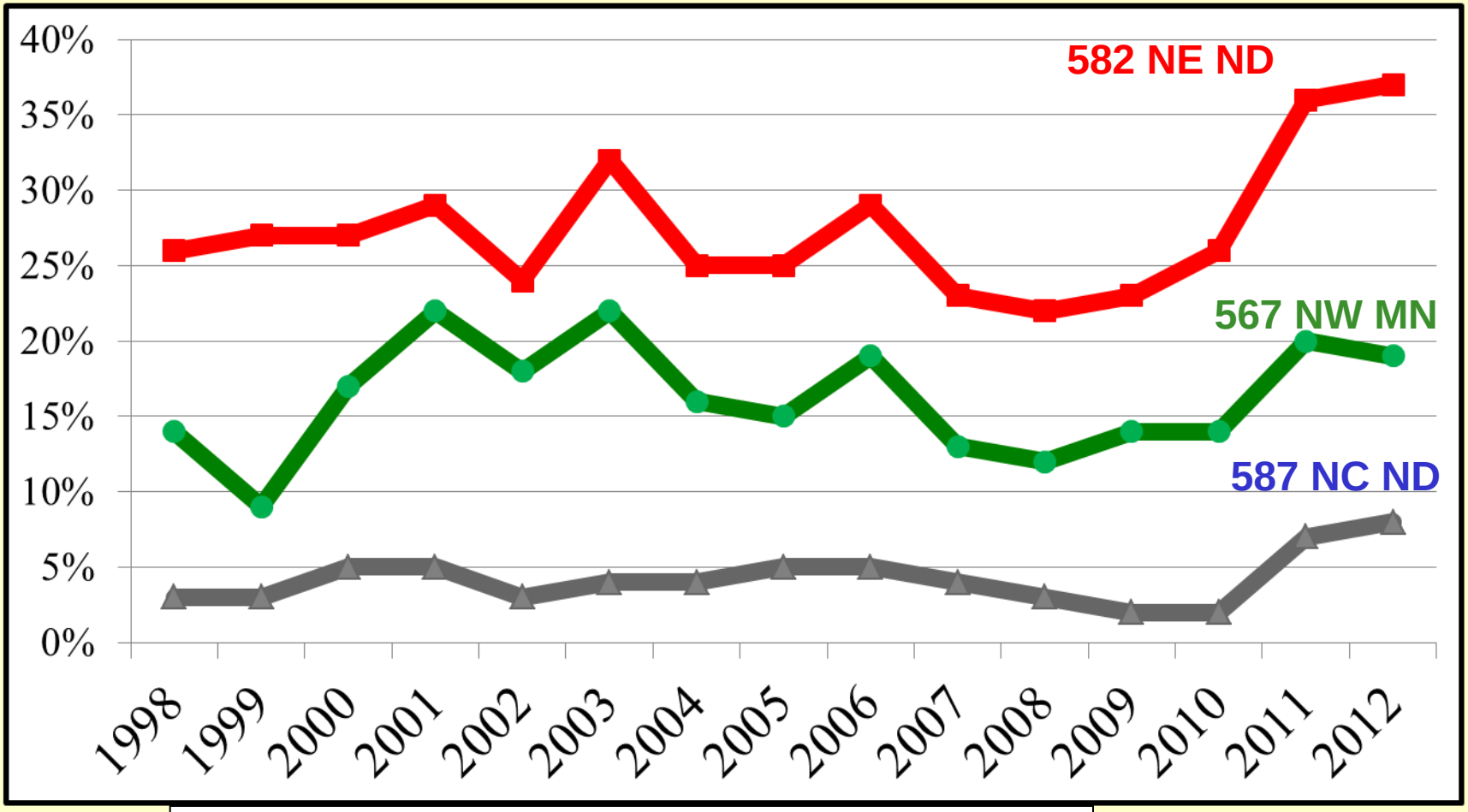


Fall 2012 Samples
(0-6” samples)

Average Salinity (0-6”) 1988-2012



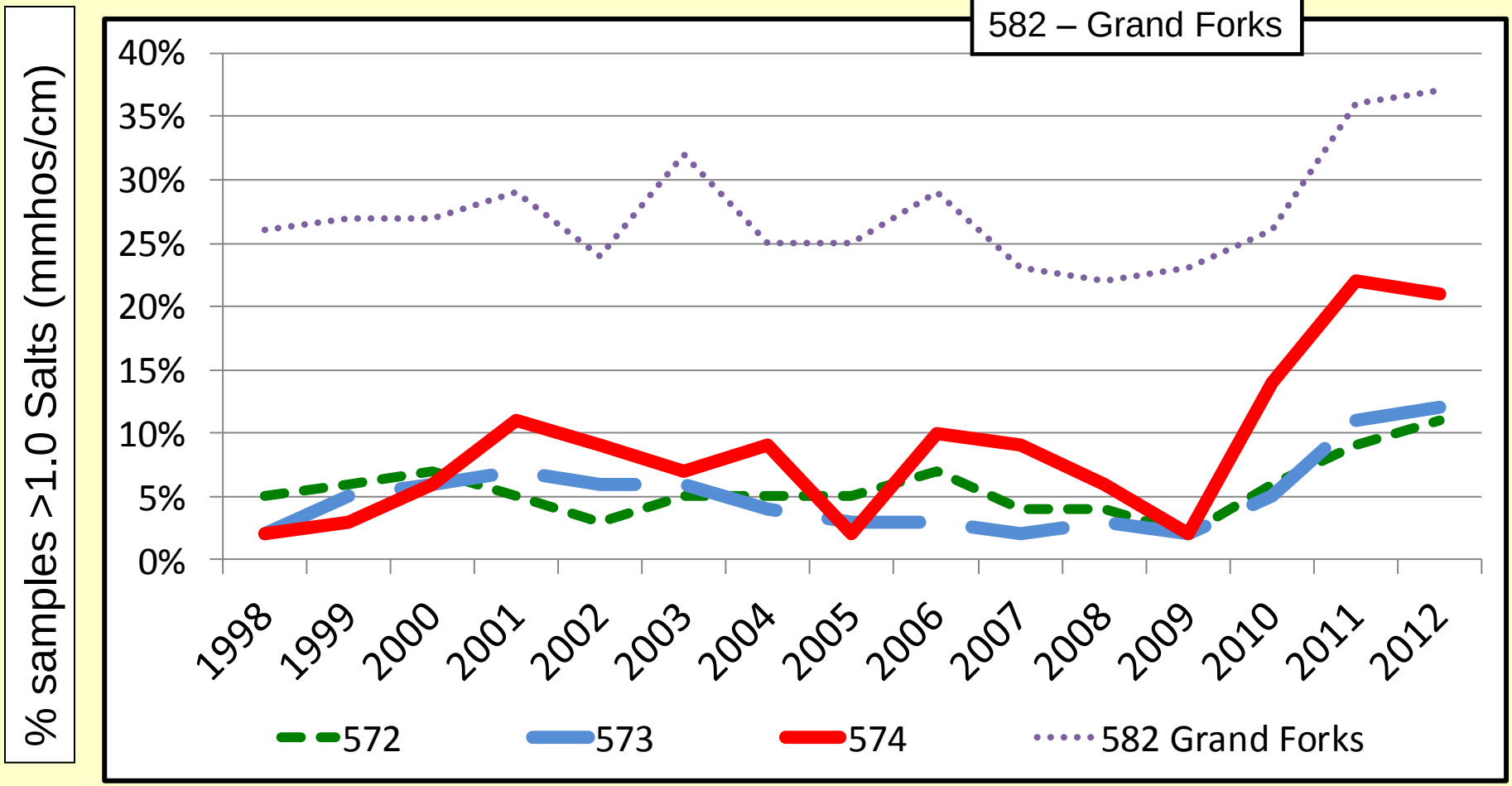
North Dakota & NW Minnesota
% Samples Testing with
Salts Higher Than 1.0



1:1 salt method – expressed as mmhos/cm

South Dakota - % Samples Testing with Salts Higher Than 1.0

572 – Watertown
573 – Huron
574 – Aberdeen
582 – Grand Forks



1:1 routine Salt Method

The Salt Problem may be Worse than we think?

- Composite Field Samples
  - Teach samplers to avoid areas that don't represent most of the field (white areas avoided)
- Zone sampling
  - The salty zones often do not get tested or fertilized
- Many salty fields don't get tested at all!

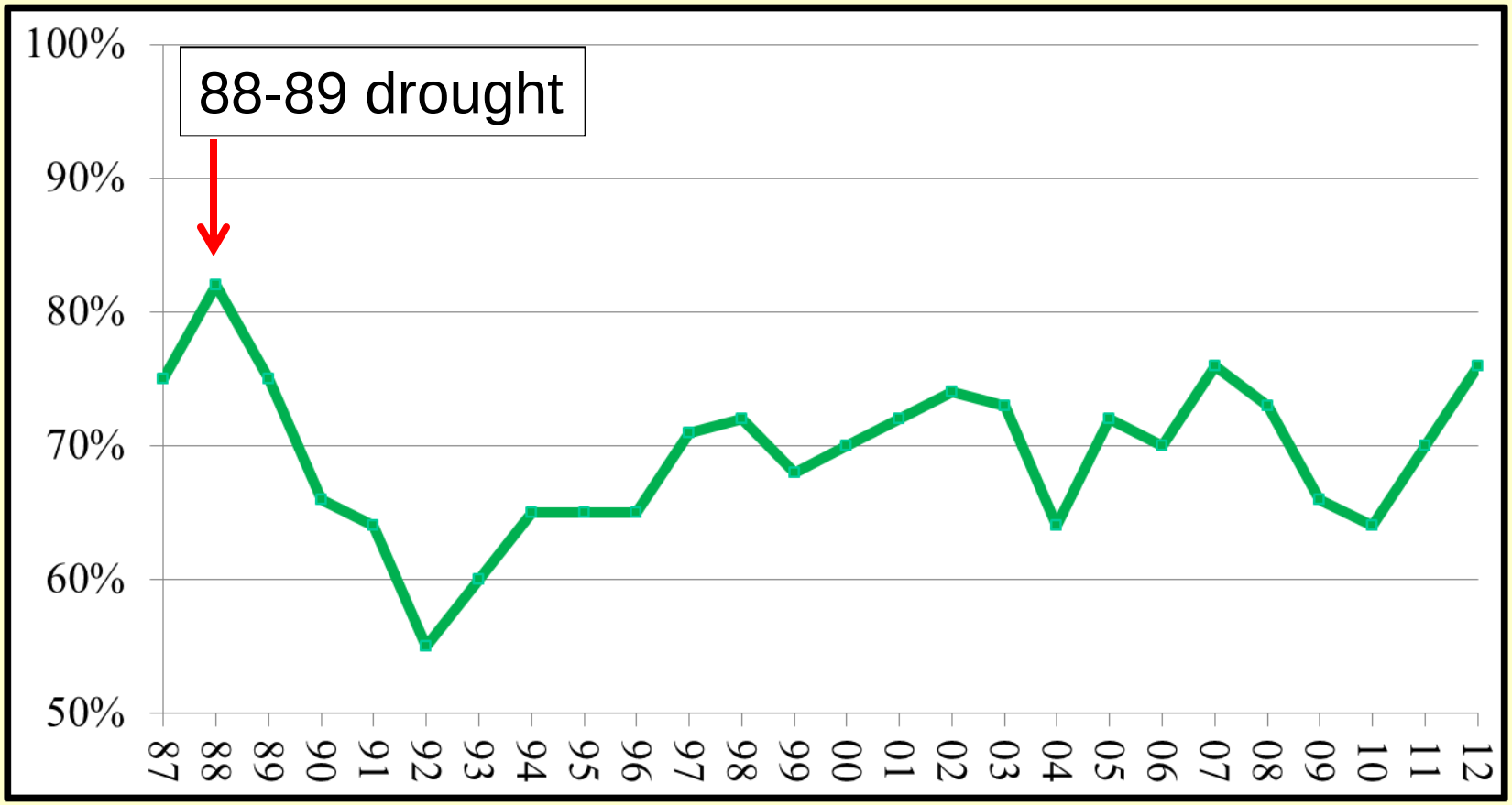
Mobile Nutrients

(Move with water)

- ***Sulfur ($SO4^-$)***
- ***Chloride (Cl^-)***
- ***Nitrogen ($NO3^-$)***

Sulfur Soil Test Trends

% of Samples testing High (> 15 lb/a S in topsoil)



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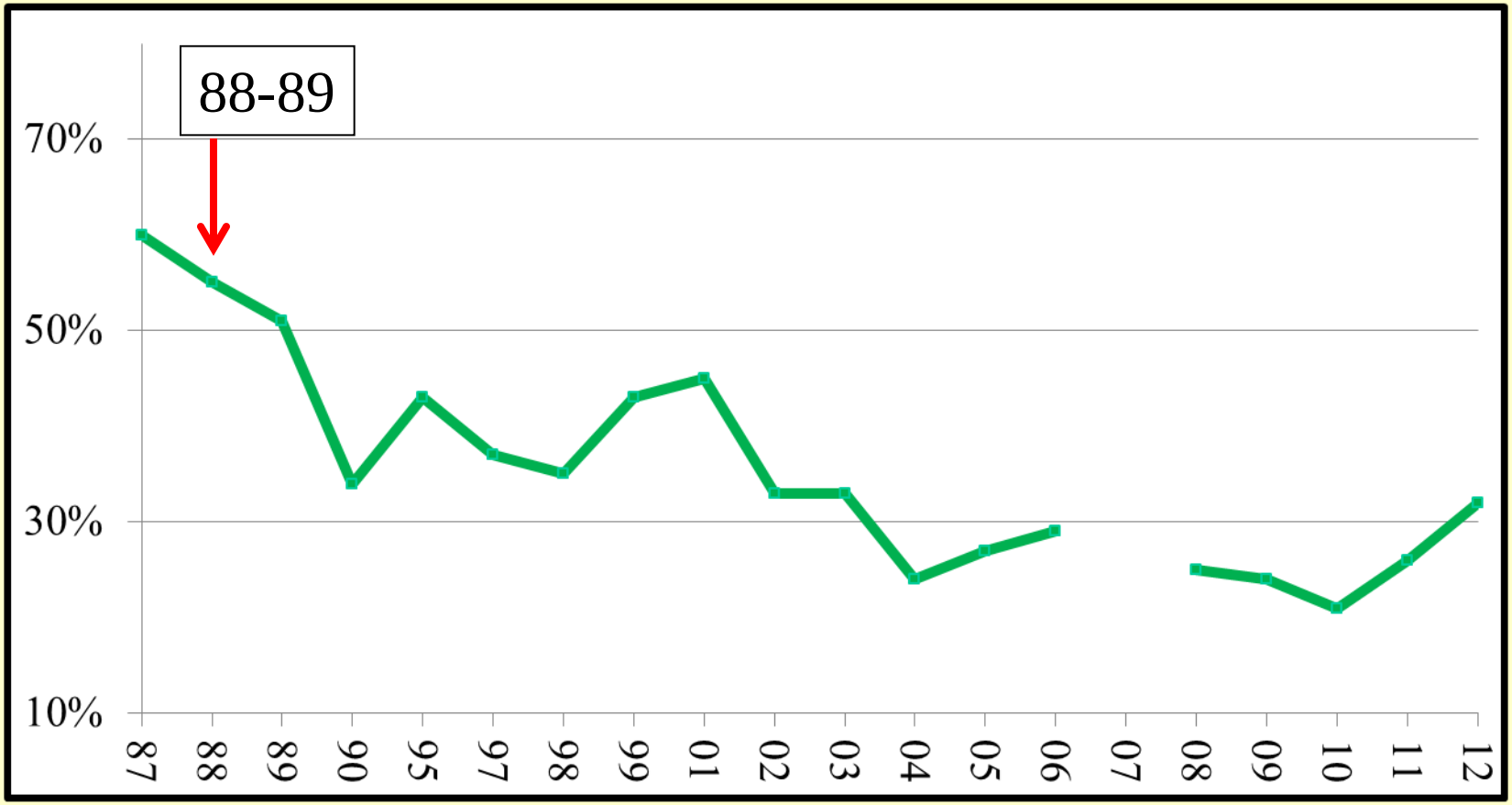
Chloride Soil Test Trends

%Samples Testing Higher Than 60 lb/a in 0-24”



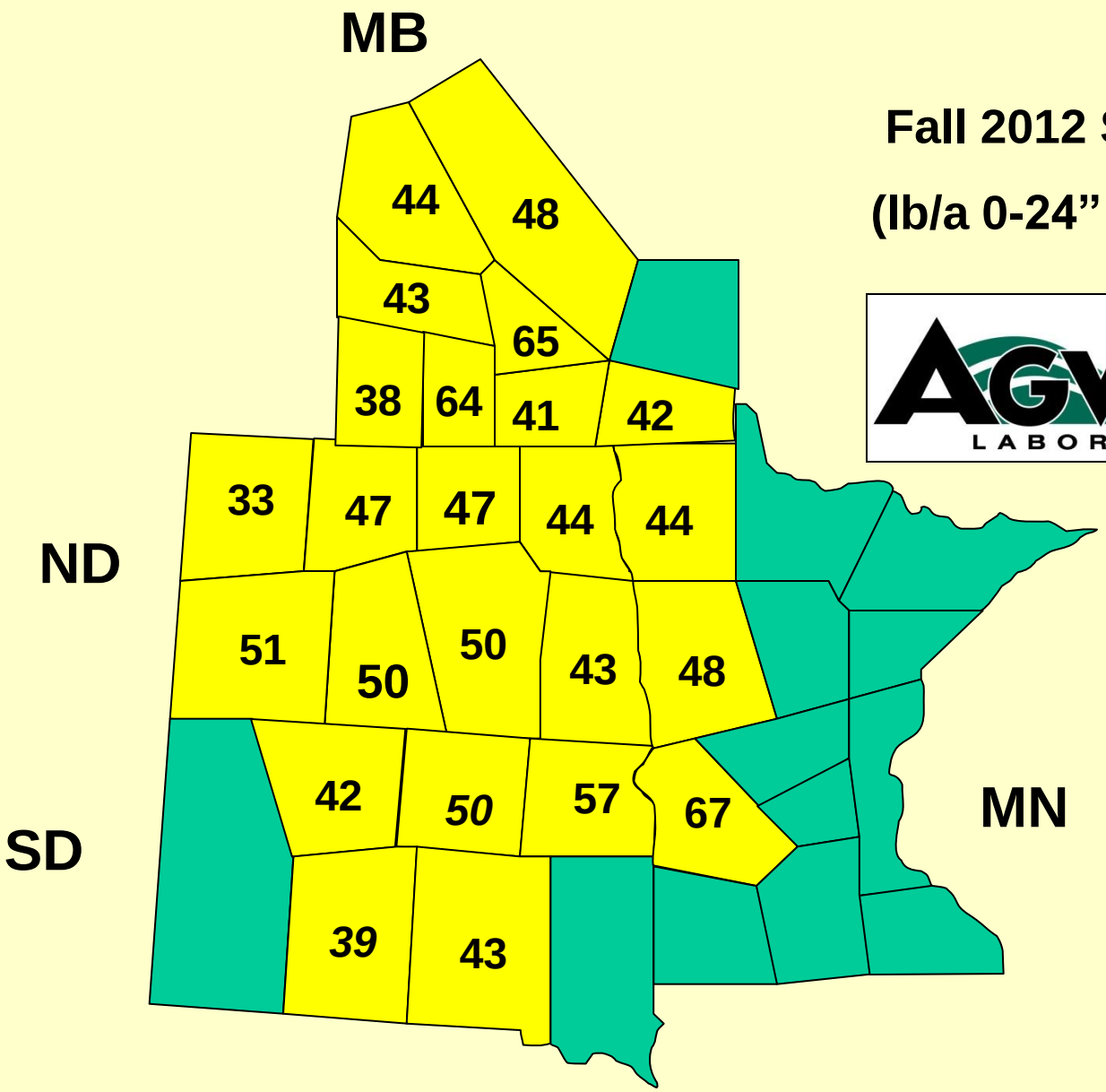
Northwood Laboratory

*2007 data – chloride testing was limited after Northwood tornado

Residual Nitrate Following Hot and Dry 2012

- Higher Residual Nitrate Levels Common
  - High N Fertilizer rates with early seeding
  - Higher N Mineralization (warm)
  - Lower crop use (yield reduction)
  - No N losses to excess rainfall
    - Leaching
    - Denitrification

Average Soil Nitrate following Wheat in 2012



Fall 2012 Samples

(lb/a 0-24” samples)

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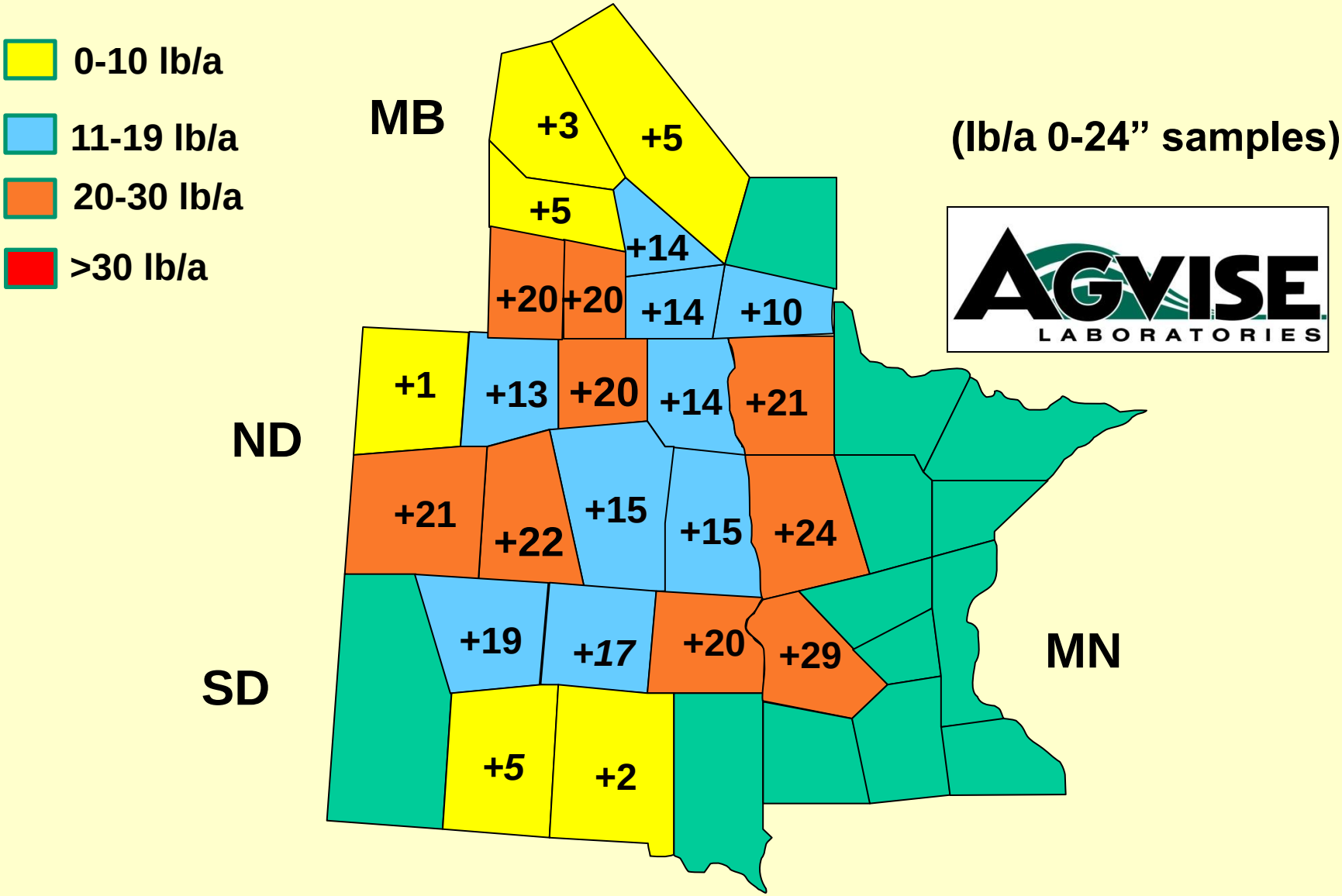
Average 2012 Soil N Following Wheat Increase Over 2009 (normal year)



(lb/a 0-24" samples)

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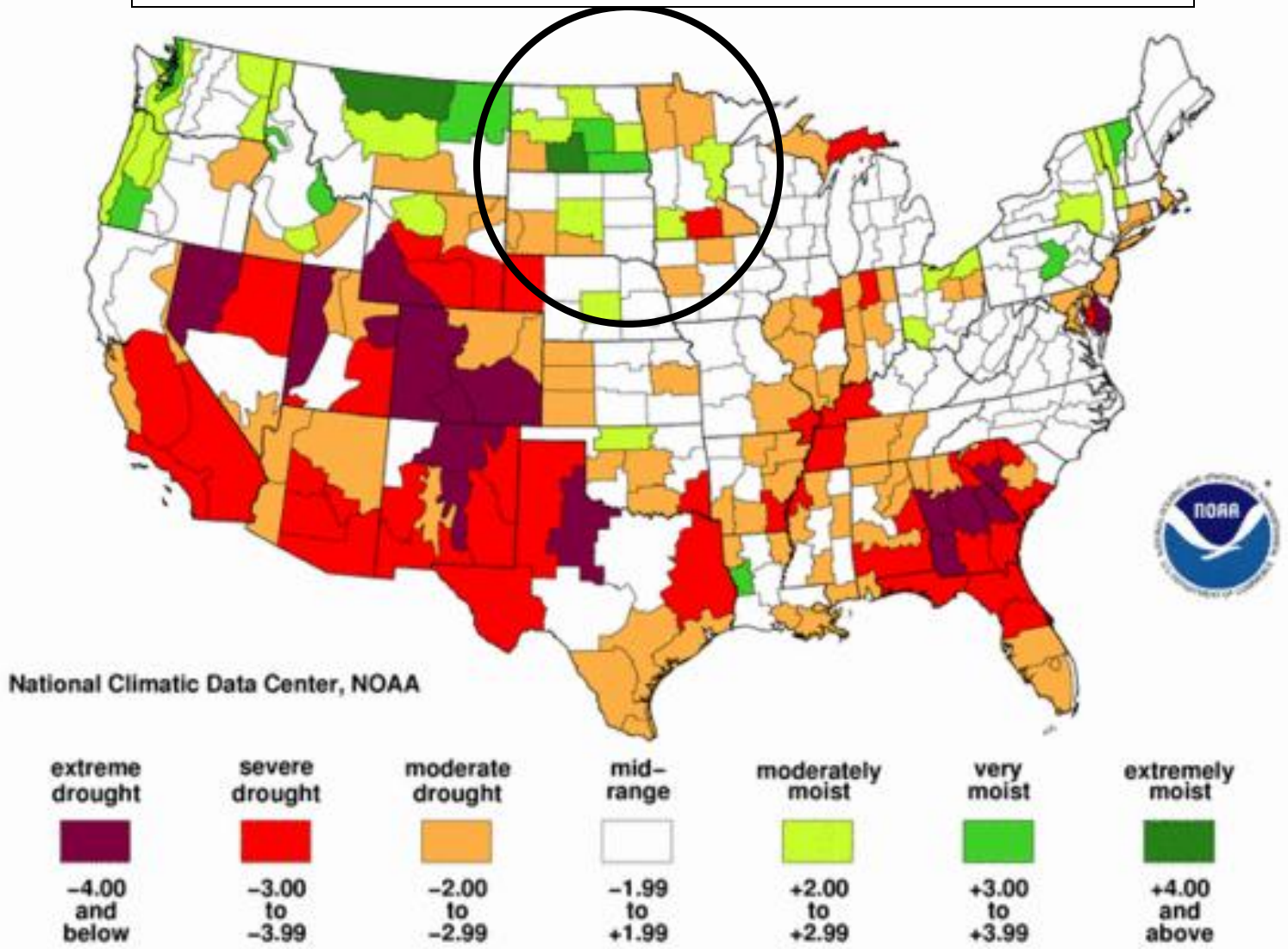
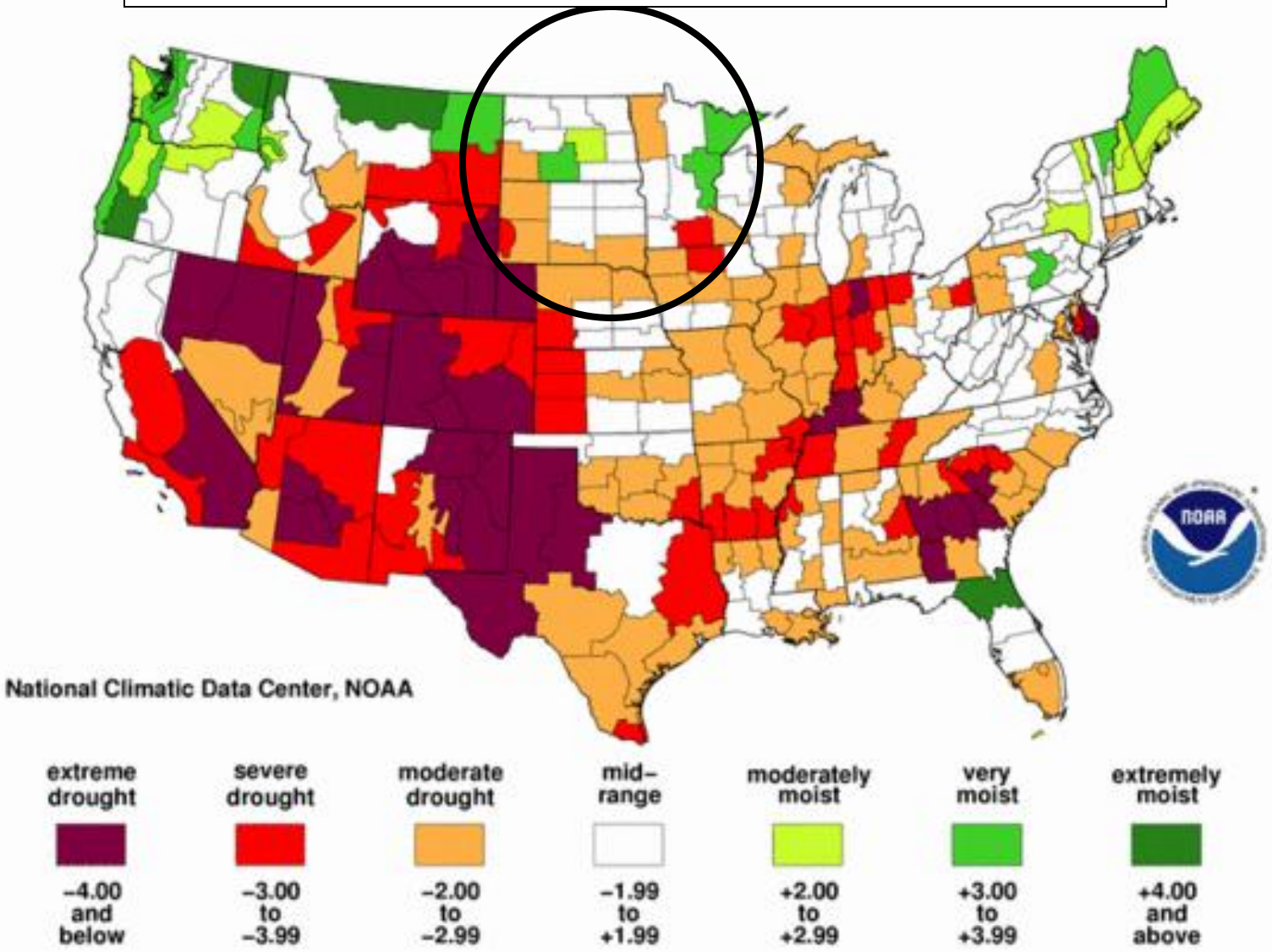
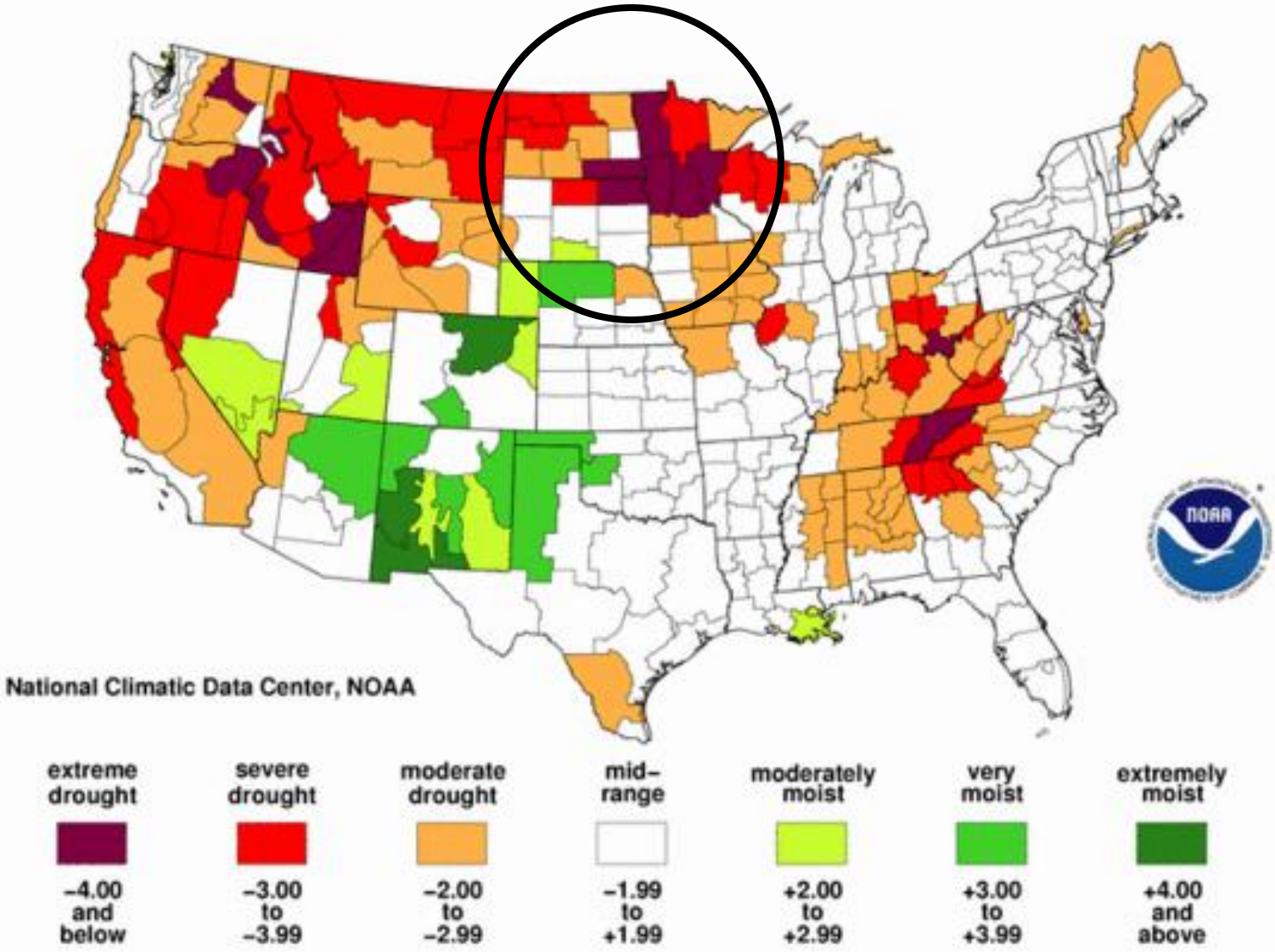
Palmer Drought Severity Index
May, 2012



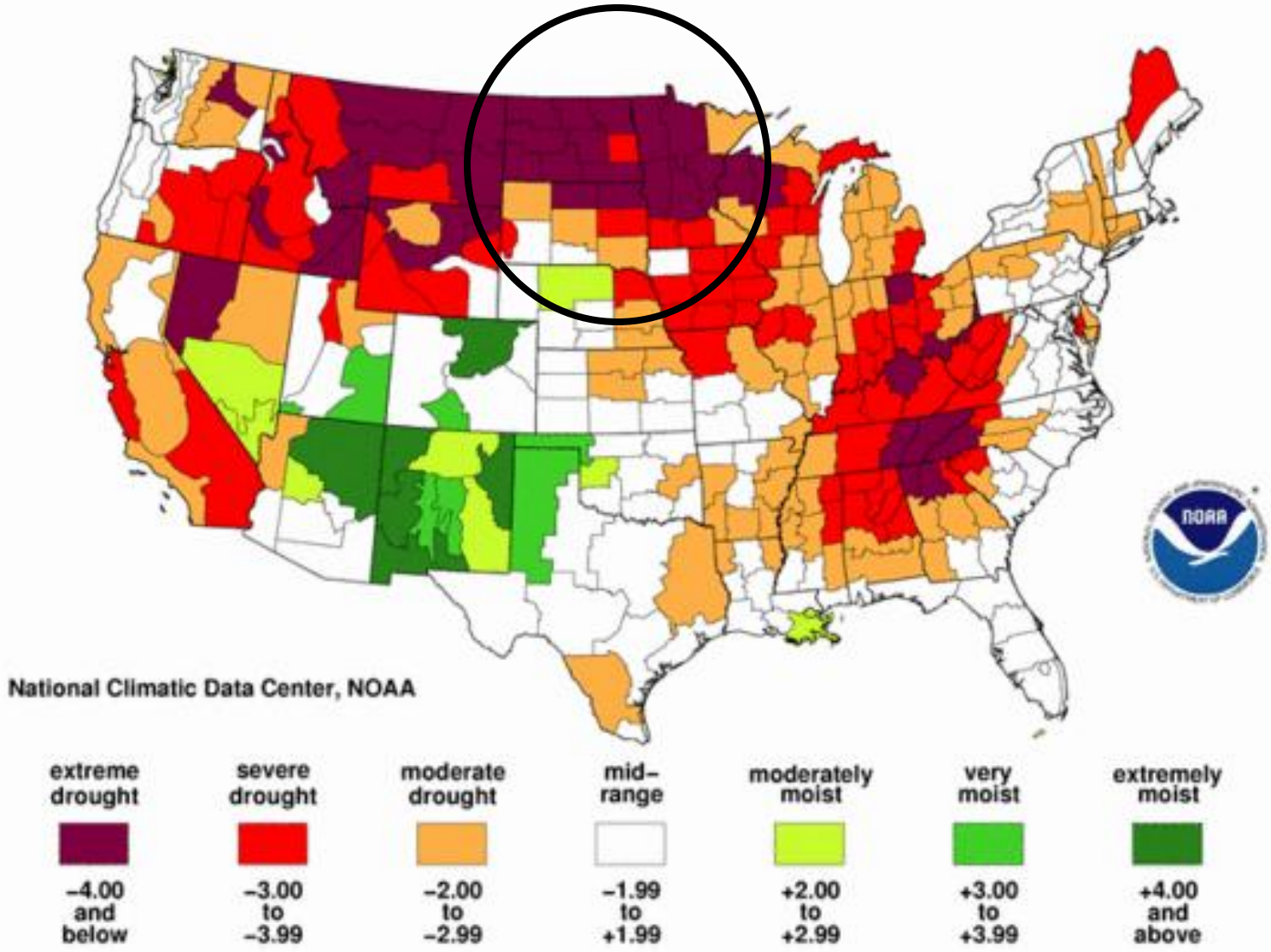
Palmer Drought Severity Index
June, 2012



Palmer Drought Severity Index
May, 1988

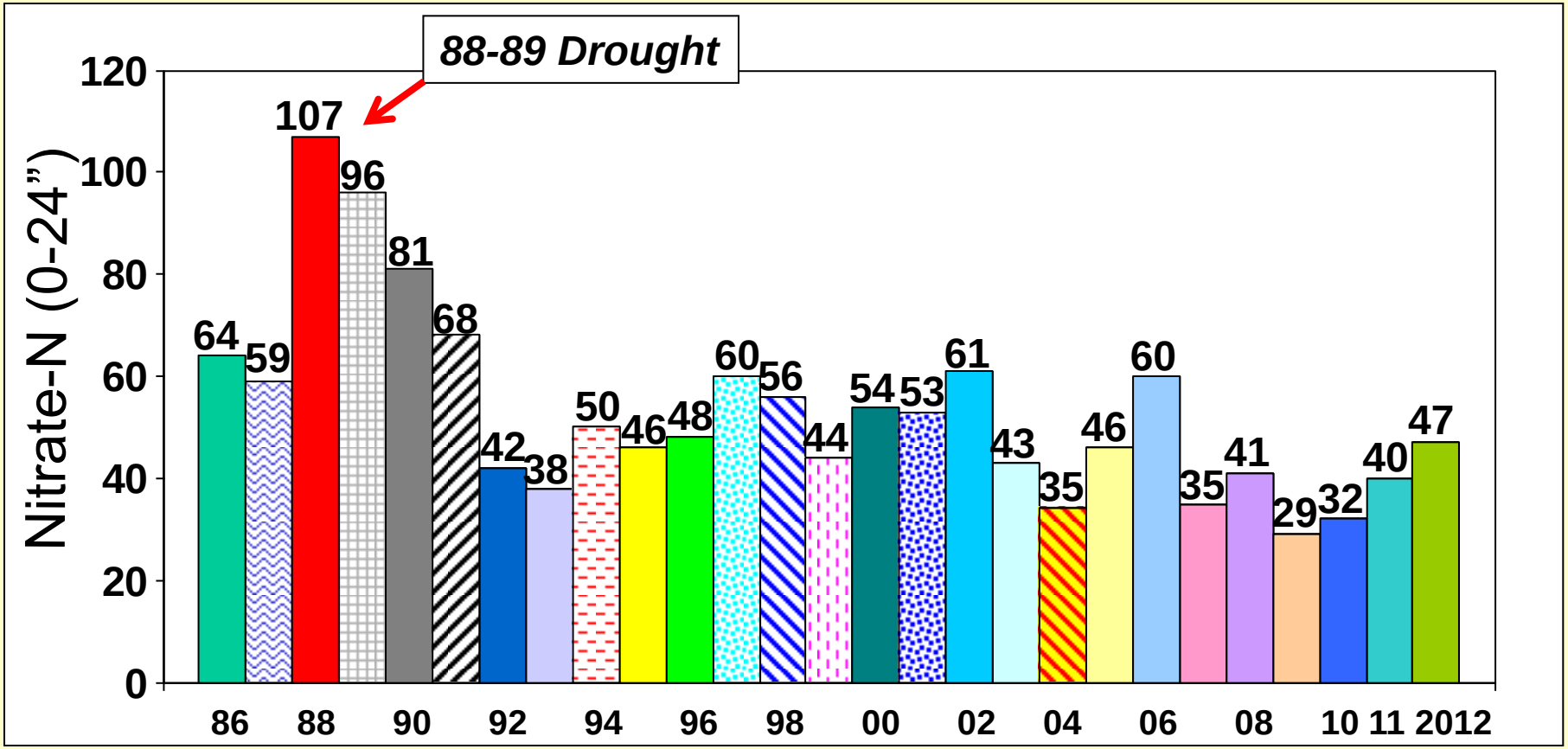


Palmer Drought Severity Index
June, 1988

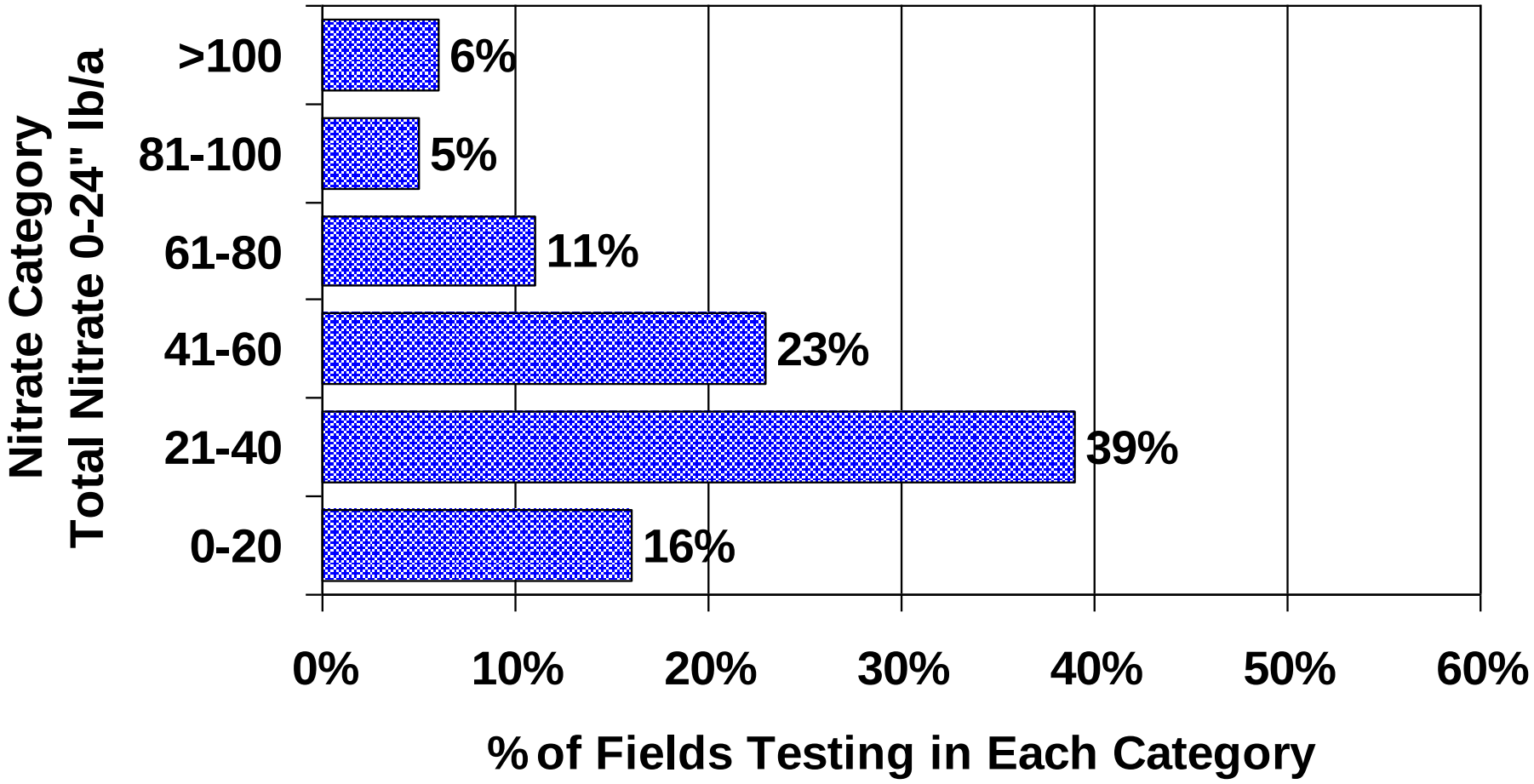


Average Soil Nitrate Following "WHEAT" 1986-2012

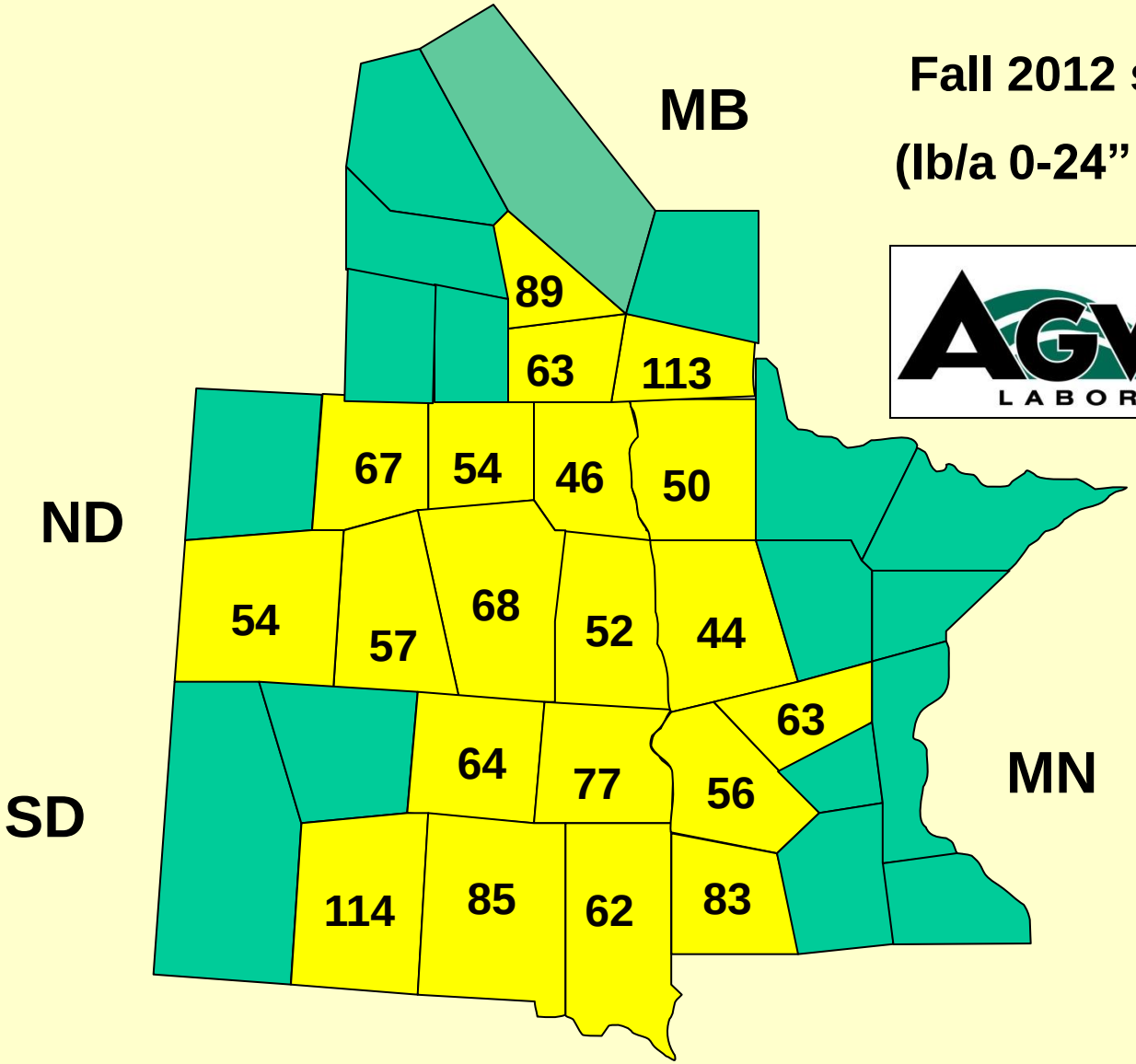
27 Years of history!



Soil Nitrate Variability Between Fields Following "WHEAT" in 2012



Average Soil Nitrate following Corn in 2012



Fall 2012 samples

(lb/a 0-24” samples)

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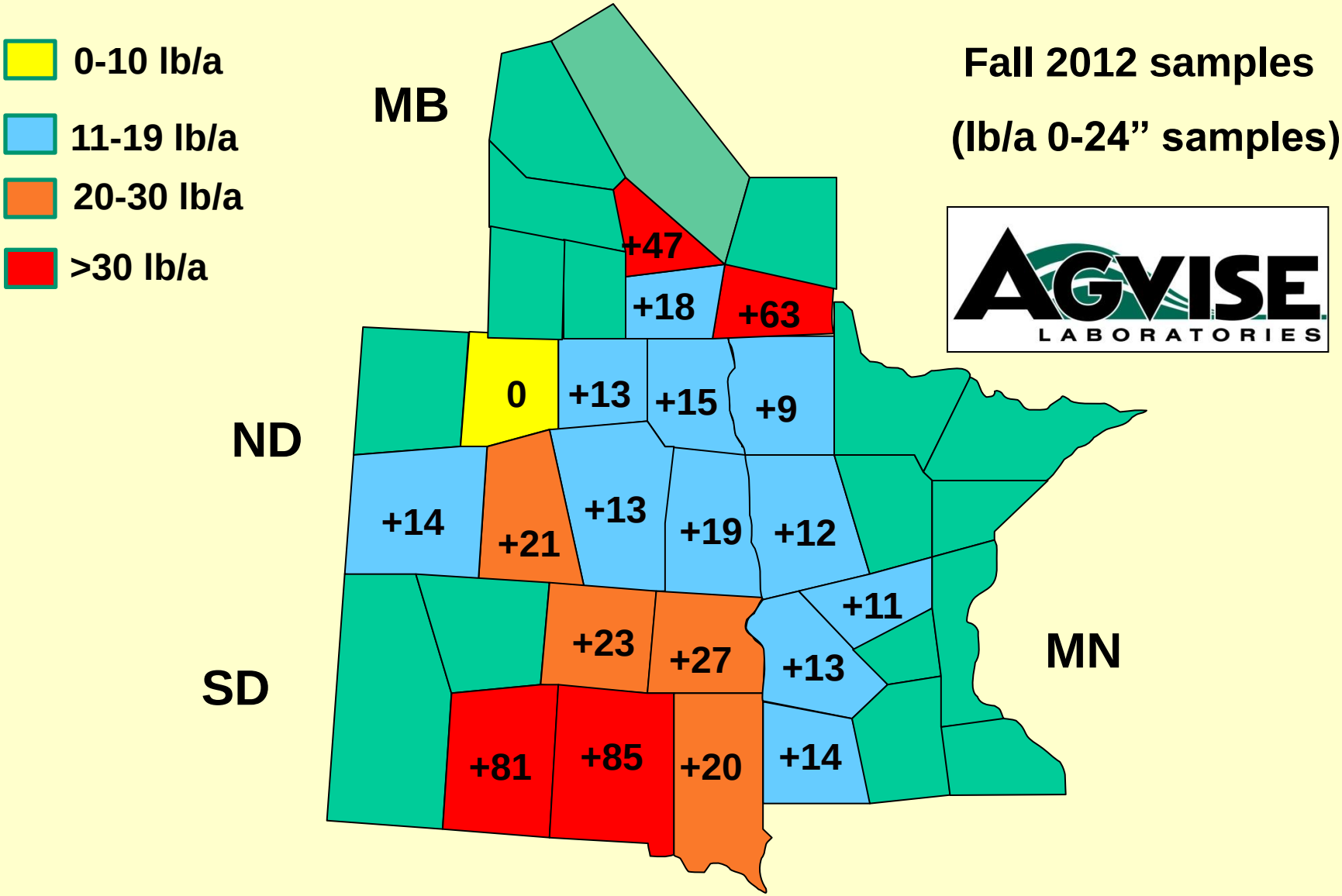
Average Soil N Following Corn Increase Over 2009 (normal year)



Fall 2012 samples

(lb/a 0-24" samples)

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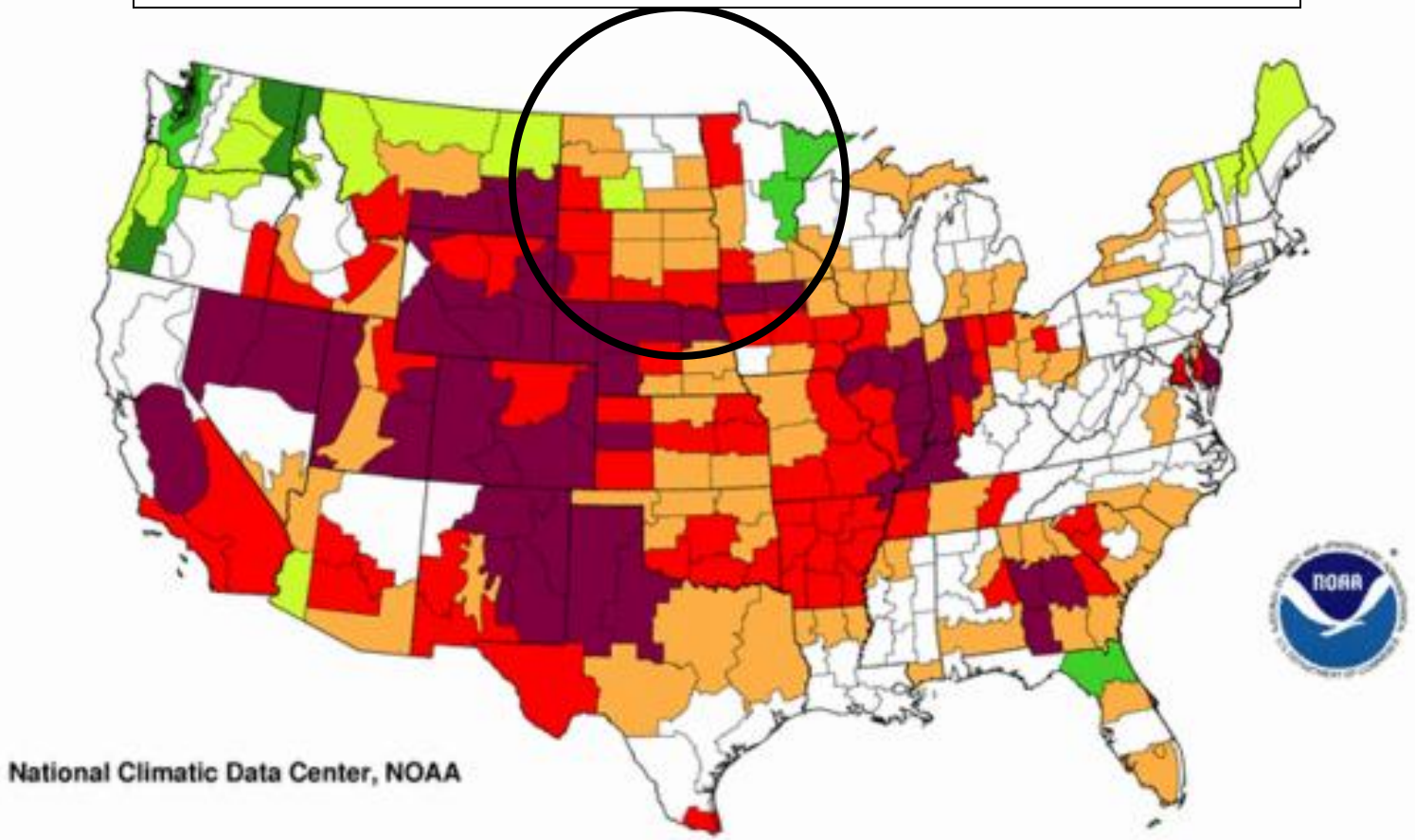
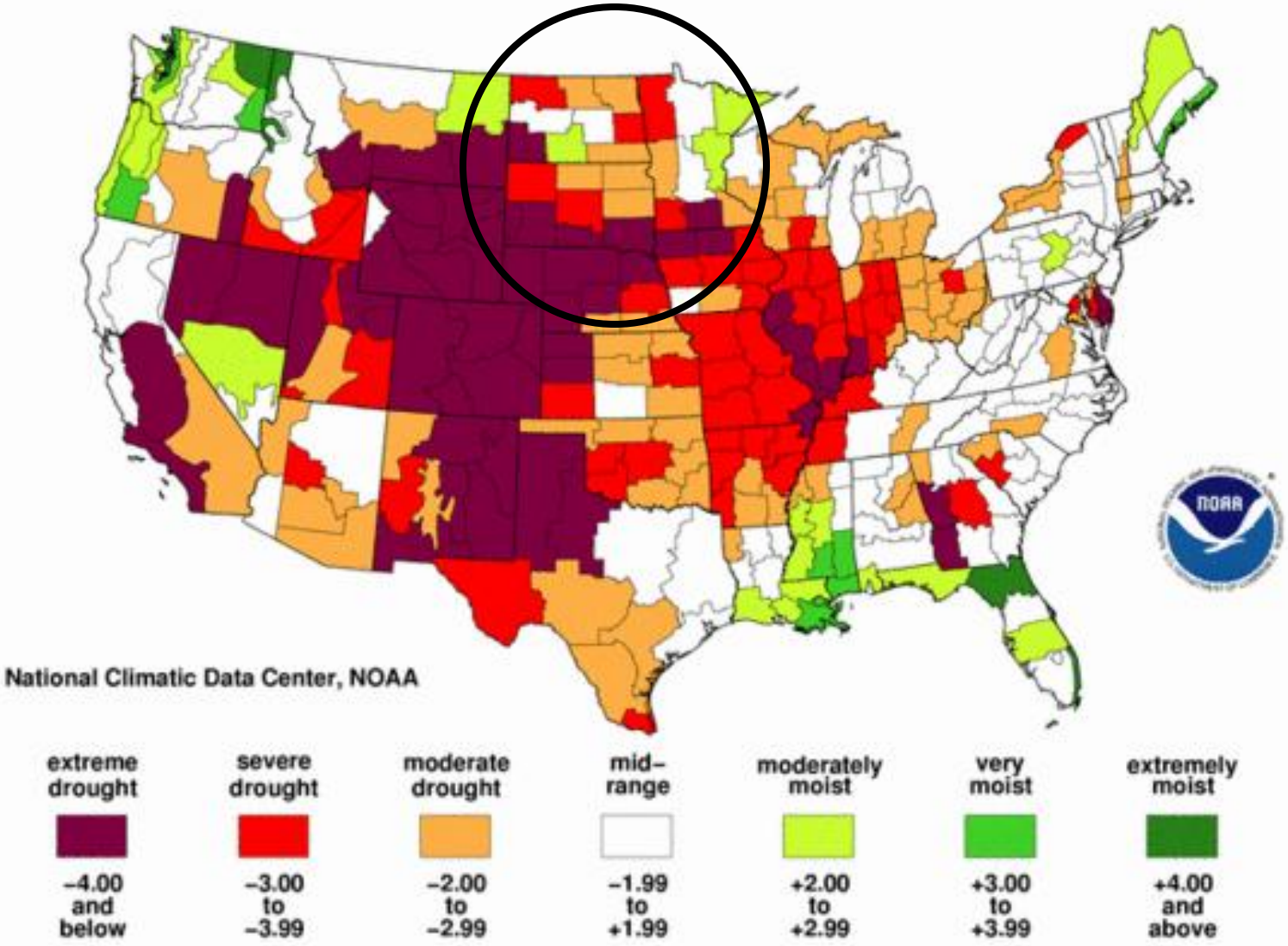
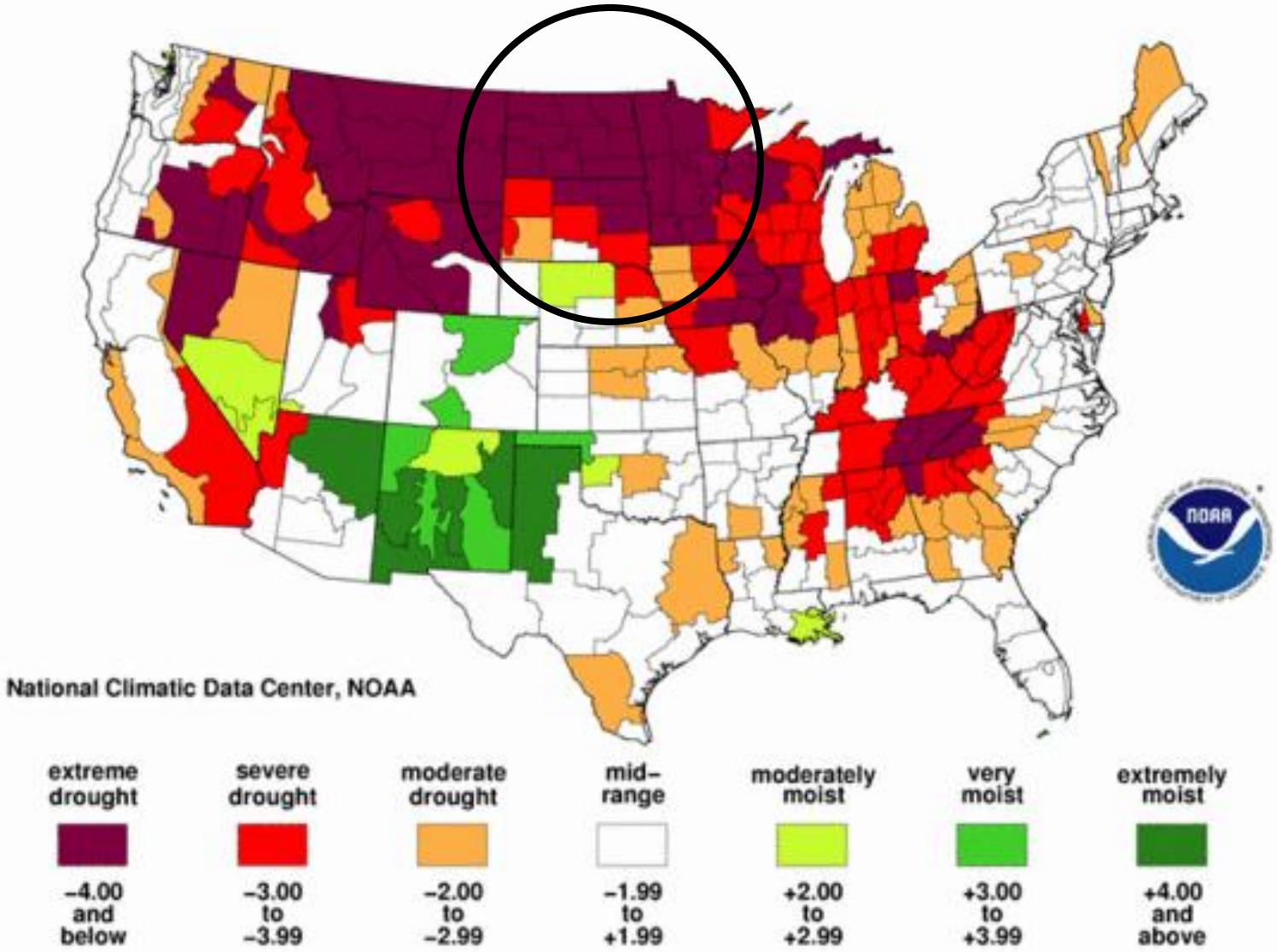
Palmer Drought Severity Index
July, 2012



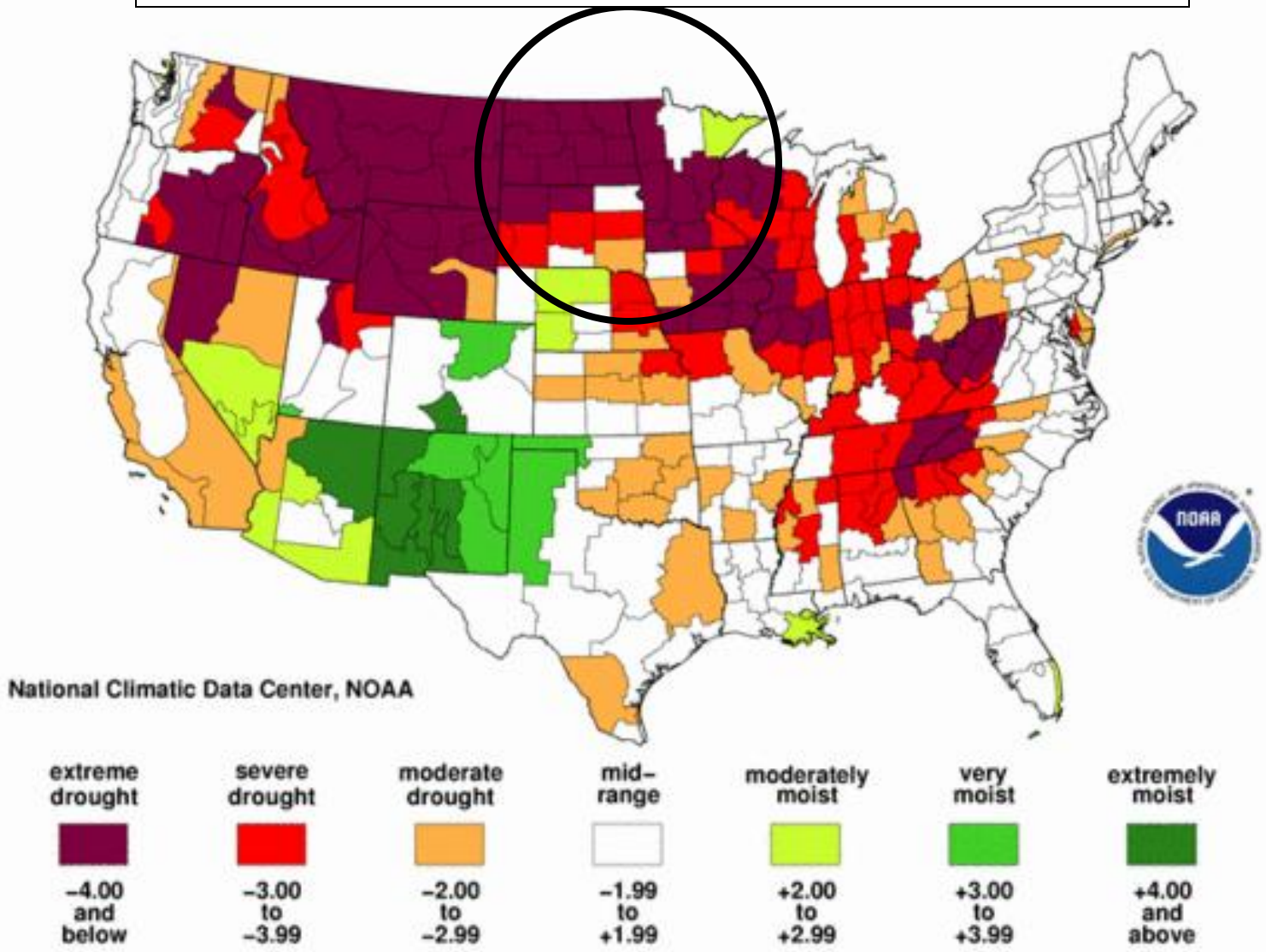
Palmer Drought Severity Index
August, 2012



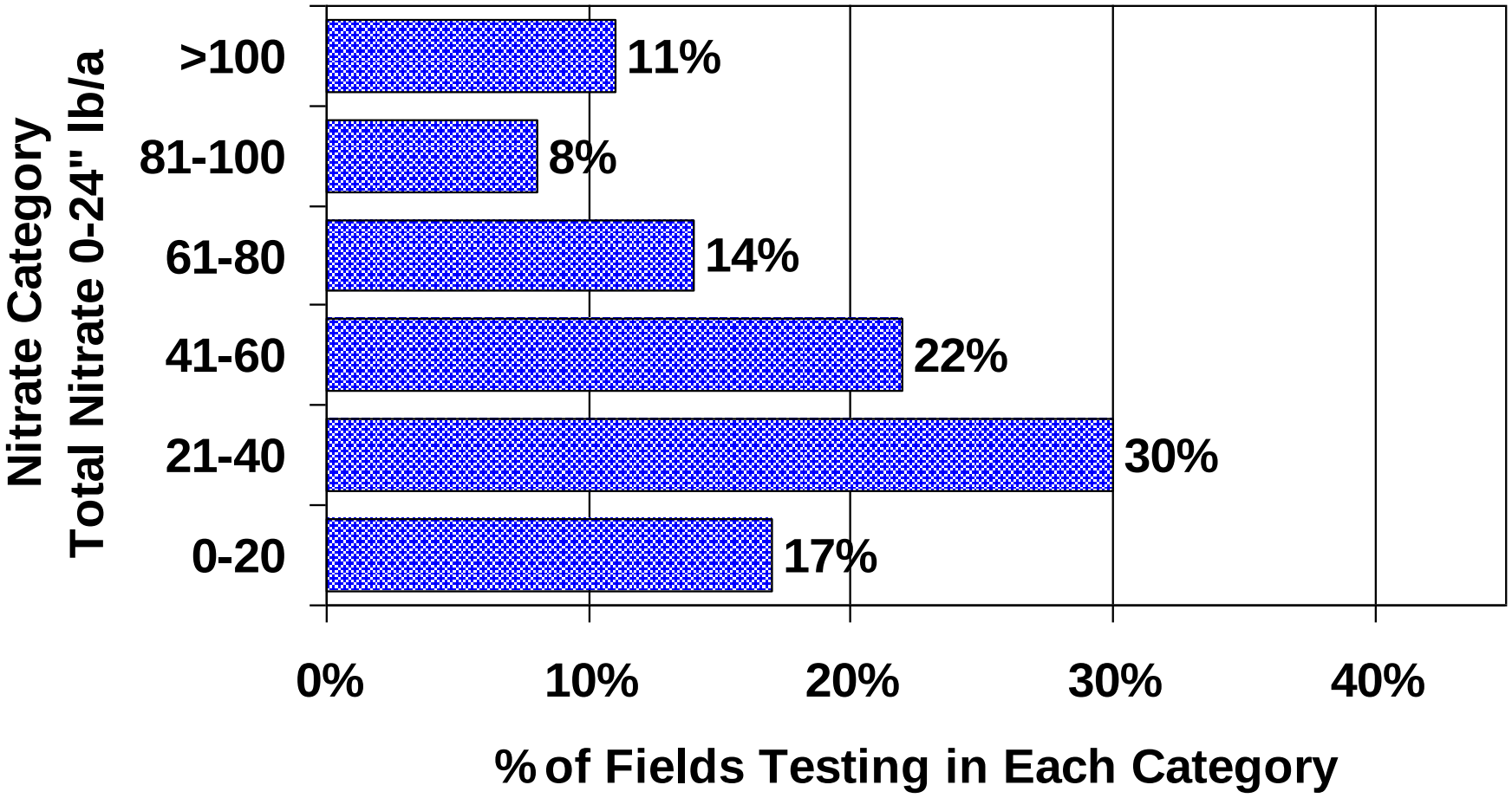
Palmer Drought Severity Index
July, 1988



Palmer Drought Severity Index
August, 1988



Soil Nitrate Variability Between Fields Following "Corn" in 2012



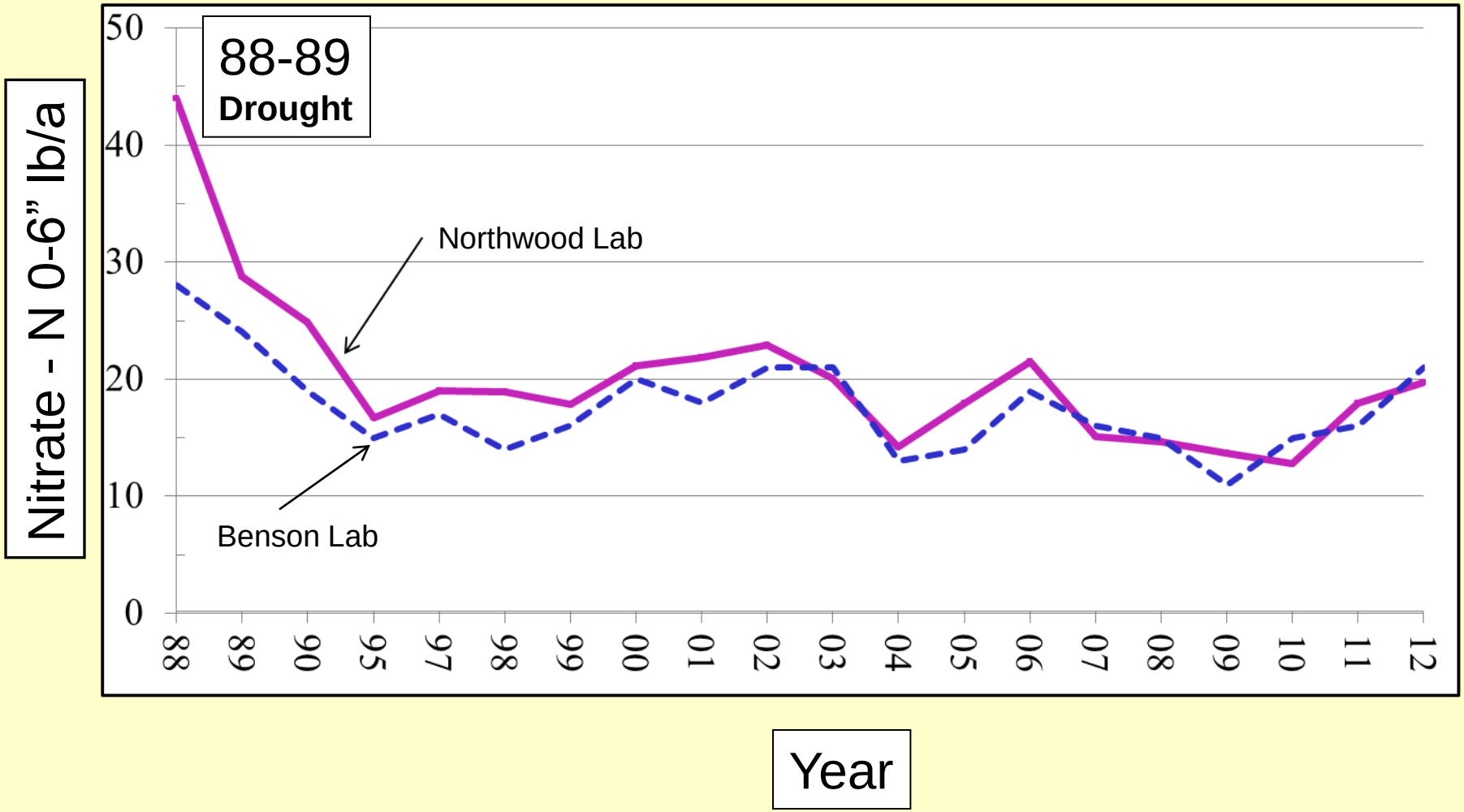
Higher Soil N Test = Money Saved!

If soil test is 20 lb/a higher that means $10-$12 less N fertilizer needed for each acre

Topsoil N – Higher after Dry 2012

Crop Year	Crop Grown	Crop Grown
	Wheat 2012	Corn 2012
	Ave. 0-6” N	Ave. 0-6” N
2012 (hot and dry)	22 lb/a	25 lb/a
2009 (normal)	12 lb/a	13 lb/a

Average Topsoil N (0-6”) 1988-2012



Why So Much Topsoil "N"?

- Topsoil Got Dry- Few active roots in topsoil
- Some Fertilizer N not used (stranded)
- Mineralization
  - Higher Mineralization Rates - Warm Season
- No N losses (hasn't happened for many years)
  - Denitrification
  - Leaching
- Crops Used N and Water Below 24"
  - Some crops down to 6-8 feet

Denitrification Risk Higher With Lots of Nitrate in Topsoil?

- Denitrification: Loss of N to the atmosphere under wet conditions
- Denitrification requires
  - Saturated surface soil
  - Nitrate-N close to surface
  - Common bacteria (Thiobacillus)
  - Plentiful organic matter
  - Moderate temperatures

Estimated Denitrification losses by soil temperature and days of saturation

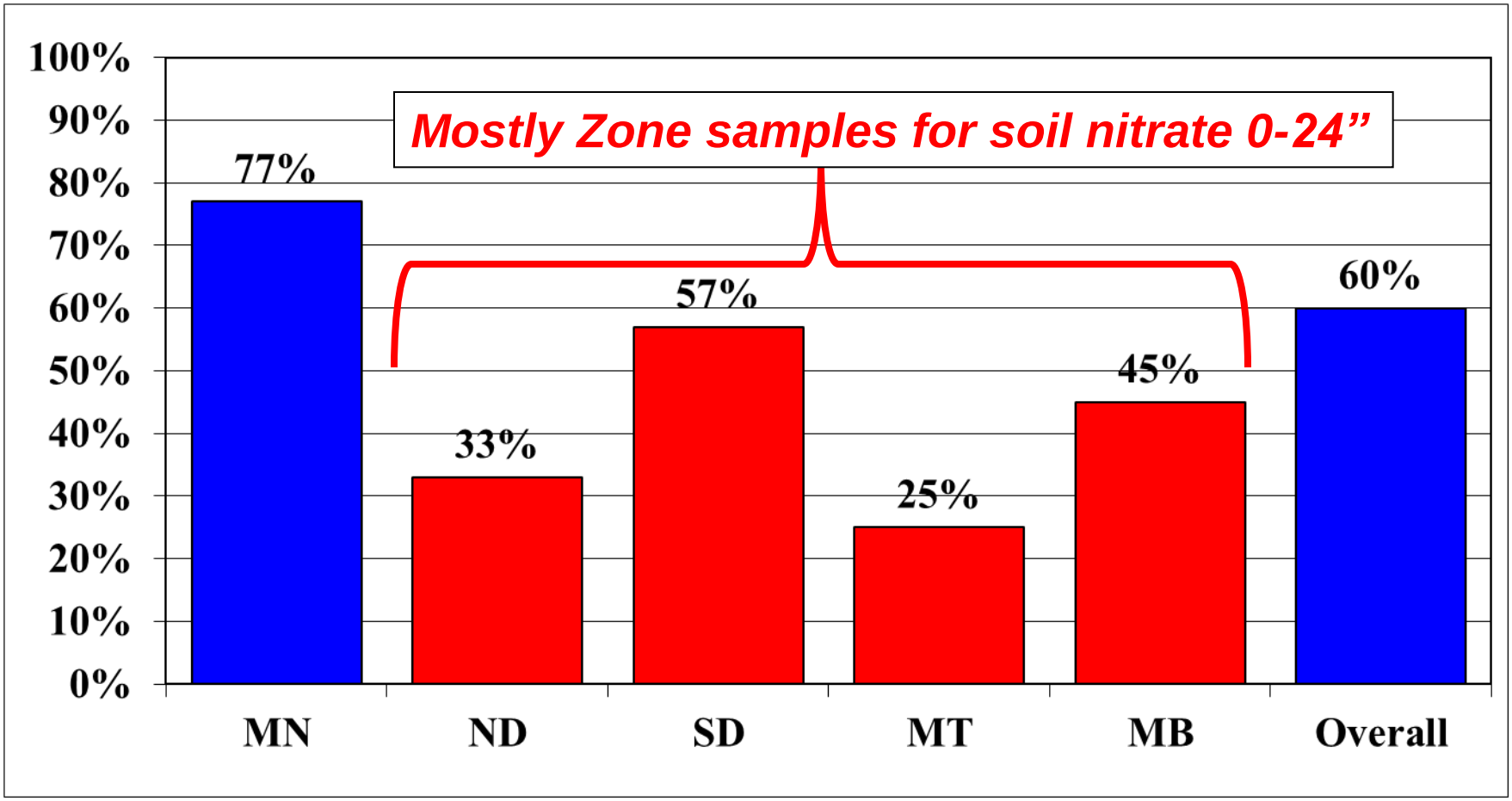
Soil Temperature (F)	Day Soil Saturated	Nitrate Loss %
55-60	5	10%
	10	25%
75-80	3	60%
	5	75%
	7	85%
	9	95%

University of Nebraska

U of Illinois estimates 4-5% of nitrate lost per day with 65 F soil temperature

AGVISE Laboratories

%Zone or Grid Samples Tested Compared to Conventional Whole Field Composite Samples in 2012



Soil Testing Drought Conditions

- Soil Testing is Critical
  - Nitrogen residual is higher due to dry 2012
  - Most nutrients not greatly effected by Drought
  - Soil Salinity does increase following dry years
- Management Decisions
  - Drought causes more variability of N in fields
  - Zone Soil Testing provides better information on N variability


Questions?

Thank You!

- Please be sure to sign in and out for CEU’s
- Drive Safe