



IPNI North American Soil Test Summaries

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Large Cooperative Project

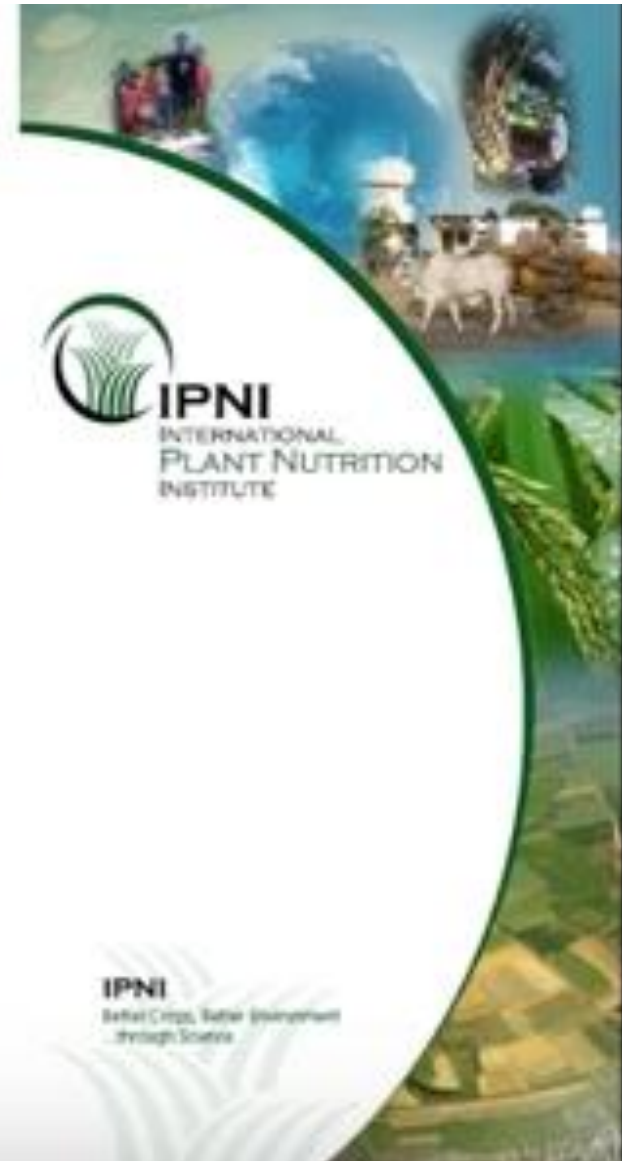
Results from the 2015 North American Soil Test Summary

IPNI:

Tom Bruulsema, Paul Fixen, Tom Jensen,
Rob Mikkelsen, T. Scott Murrell*, Steve Phillips,
and W. Mike Stewart

PAQ Interactive (paqinteractive.com):

Elle Williams, Anthony Erbe,
Ryan Williams, and Quentin Rund

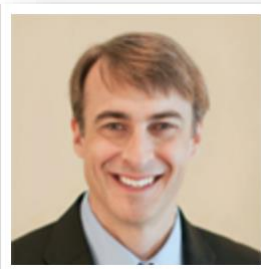


Acknowledge all cooperating
soil test laboratories,
especially AgVise





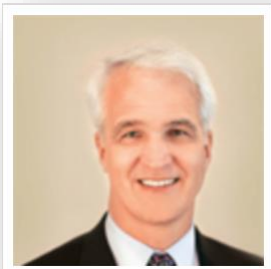
Tom
Jensen



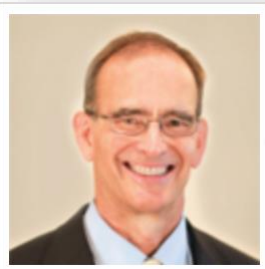
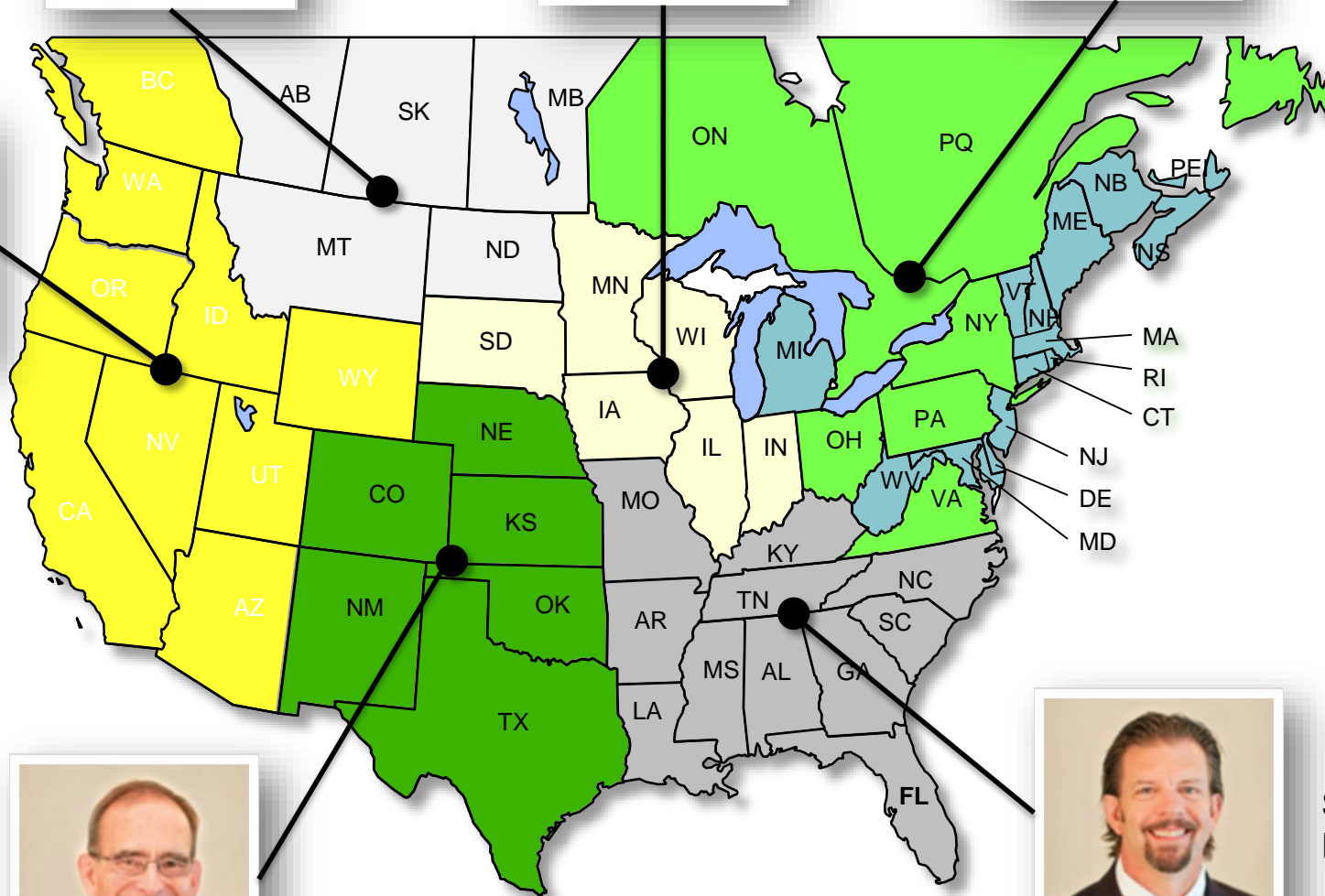
Scott
Murrell



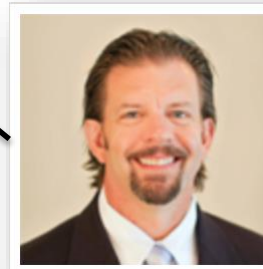
Tom
Bruulsema



Rob
Mikkelsen

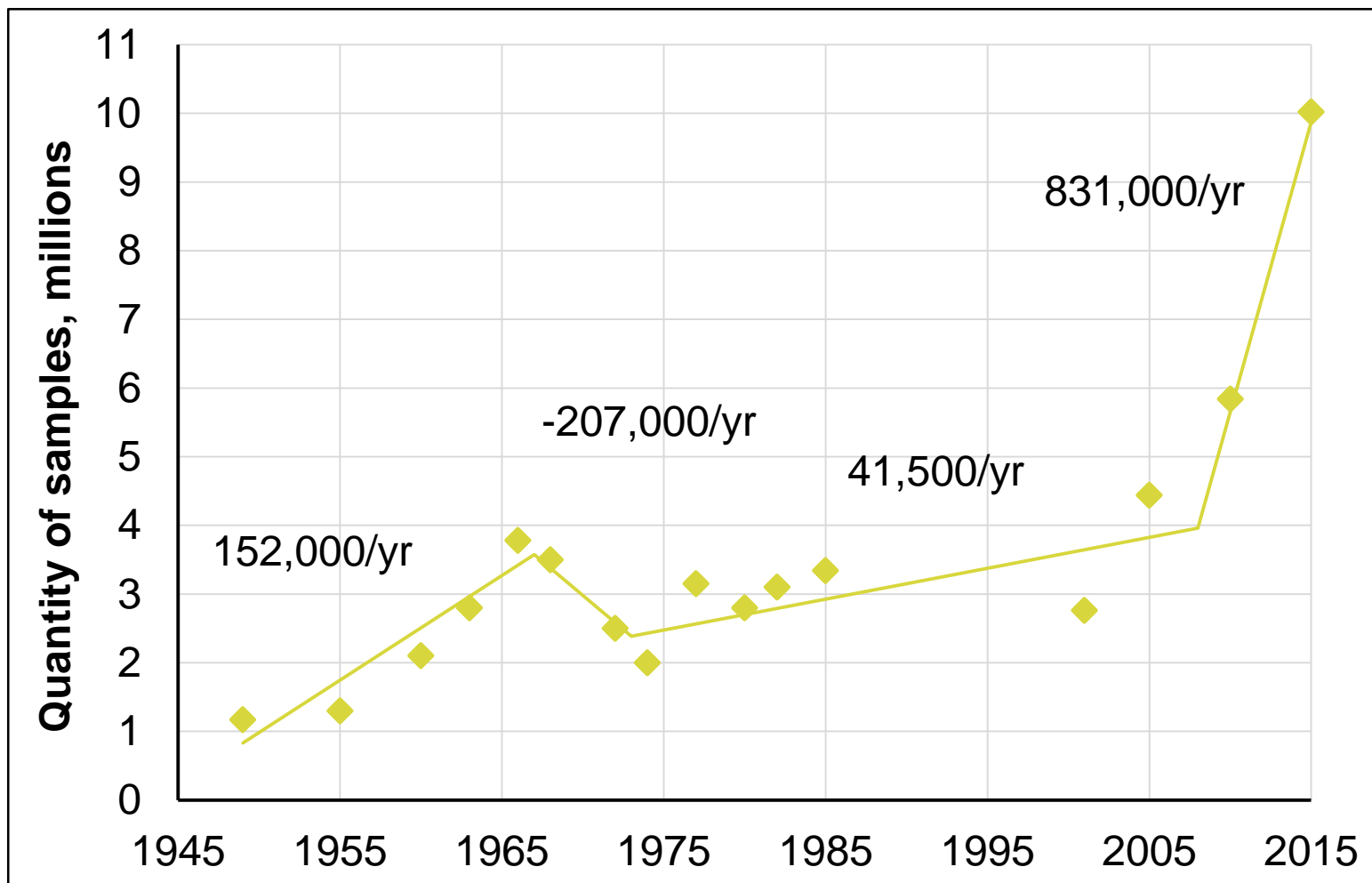


Mike
Stewart



Steve
Phillips

Soil sample volume in the U.S.: 1949-2015



Sample Counts for the 2015 Summary

Soil Test	Number of Samples
	(million)
Bray and Kurtz P1 Equivalent	7.6
Ammonium Acetate K Equivalent	7.3
1:1 Soil:Water Equivalent pH	7.2
Ammonium Acetate Mg Equivalent	5.9
Calcium Phosphate Equivalent S	4.9
DTPA Equivalent Zn	4.4
Water Equivalent Cl ⁻	0.4

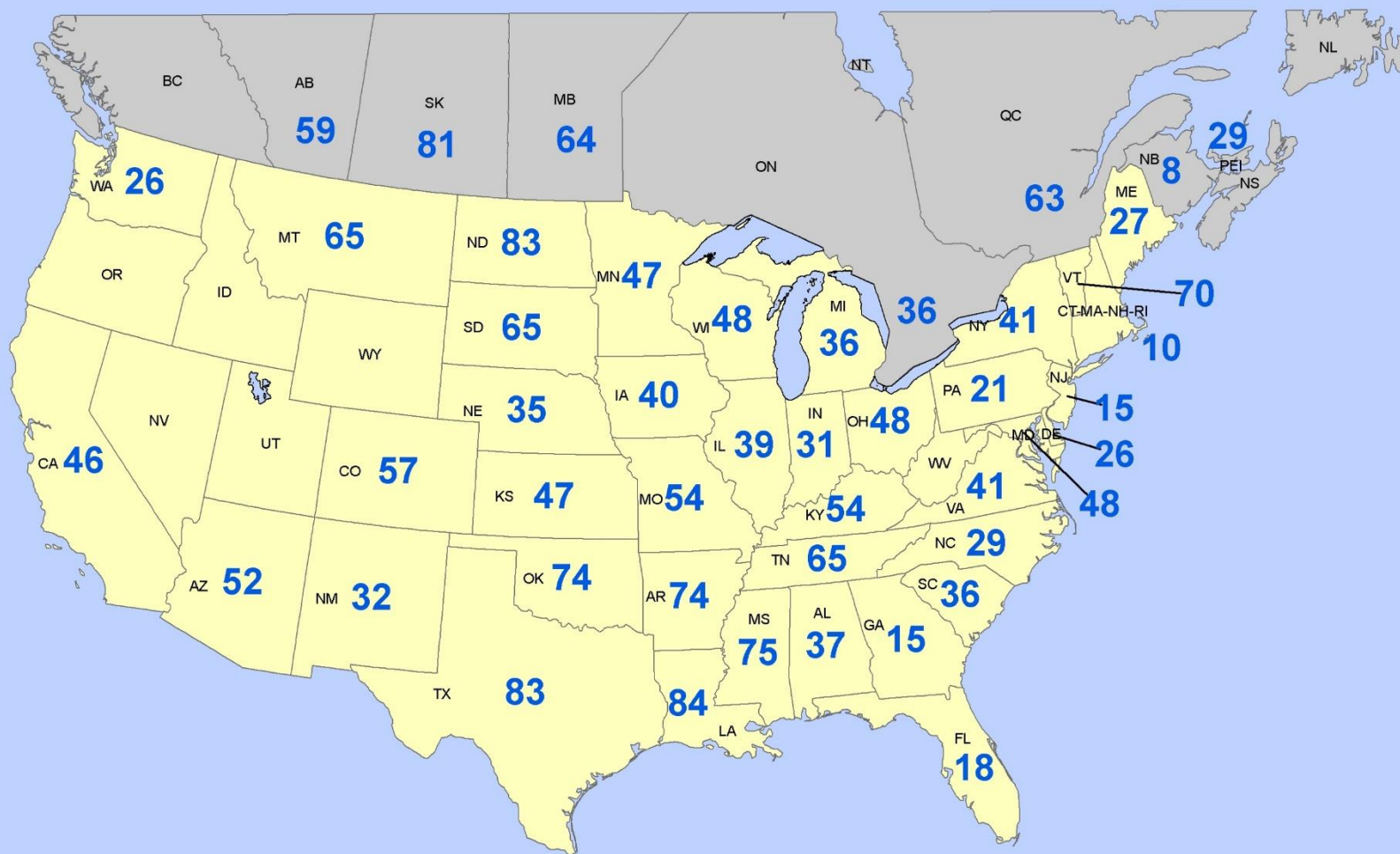
Summary Results: Phosphorus



What is a Critical Level?

A critical level is the soil test level below which nutrient inputs are required to meet soil fertility management objectives. These objectives vary among the states and provinces, with each representing considerations of short and long-term profit, market and environmental risks, accuracy and precision in soil fertility assessments, as well as many other factors. Critical levels therefore vary from state to state as various aspects of management receive different levels of emphasis.

II

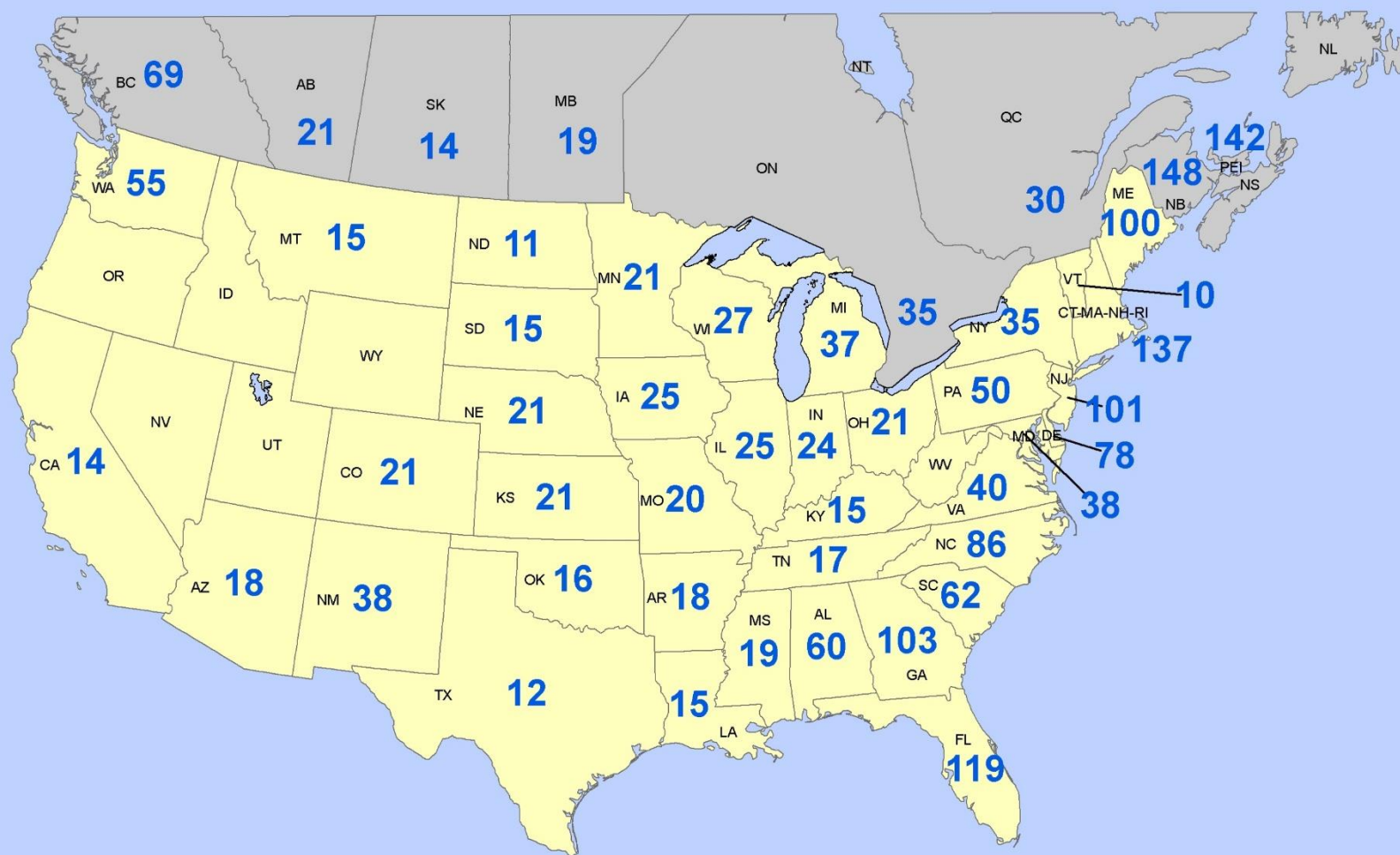


* Only states with 2,000 samples or more are shown on this map

Central Tendency: Median

The median is the level occurring in the middle when values are arranged in order of magnitude. By definition, half the samples are greater than and half are less than the median. The median is a more accurate indicator of central tendency than the average when data do not follow a normal, or bell-shaped, distribution.

II

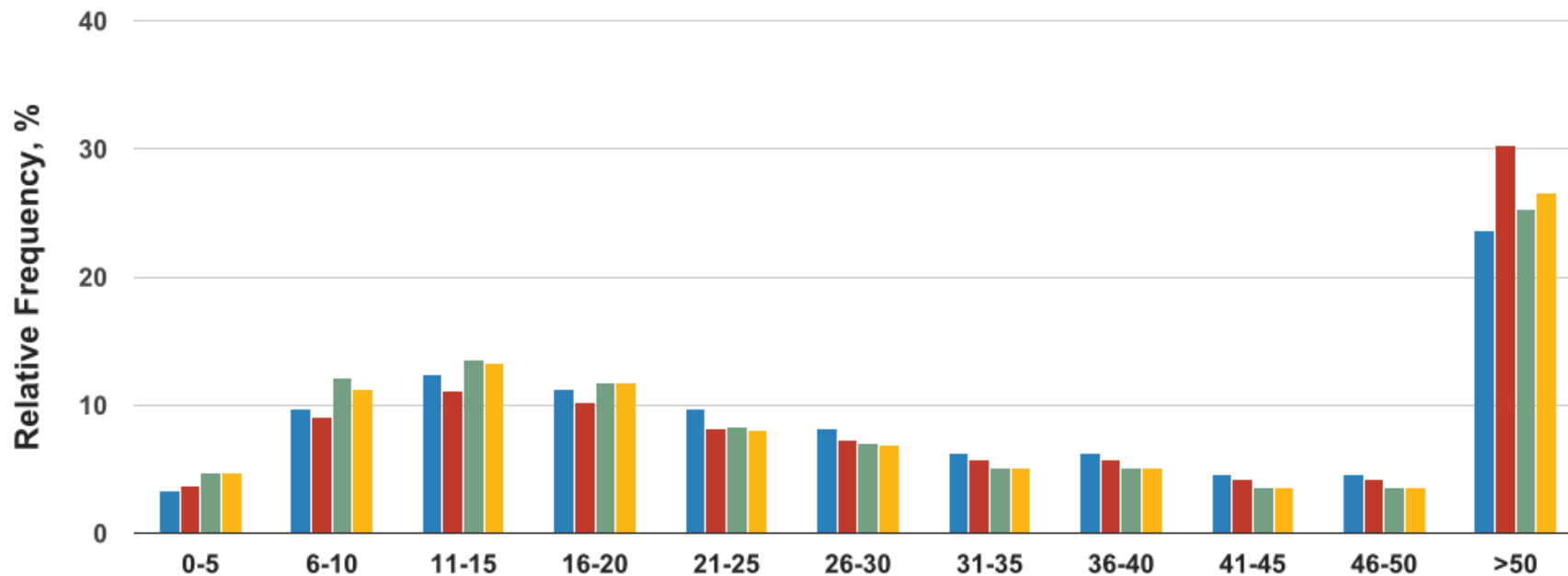


* Only states with 2,000 samples or more are shown on this map

North America: Phosphorus

Phosphorus sample distribution: North America

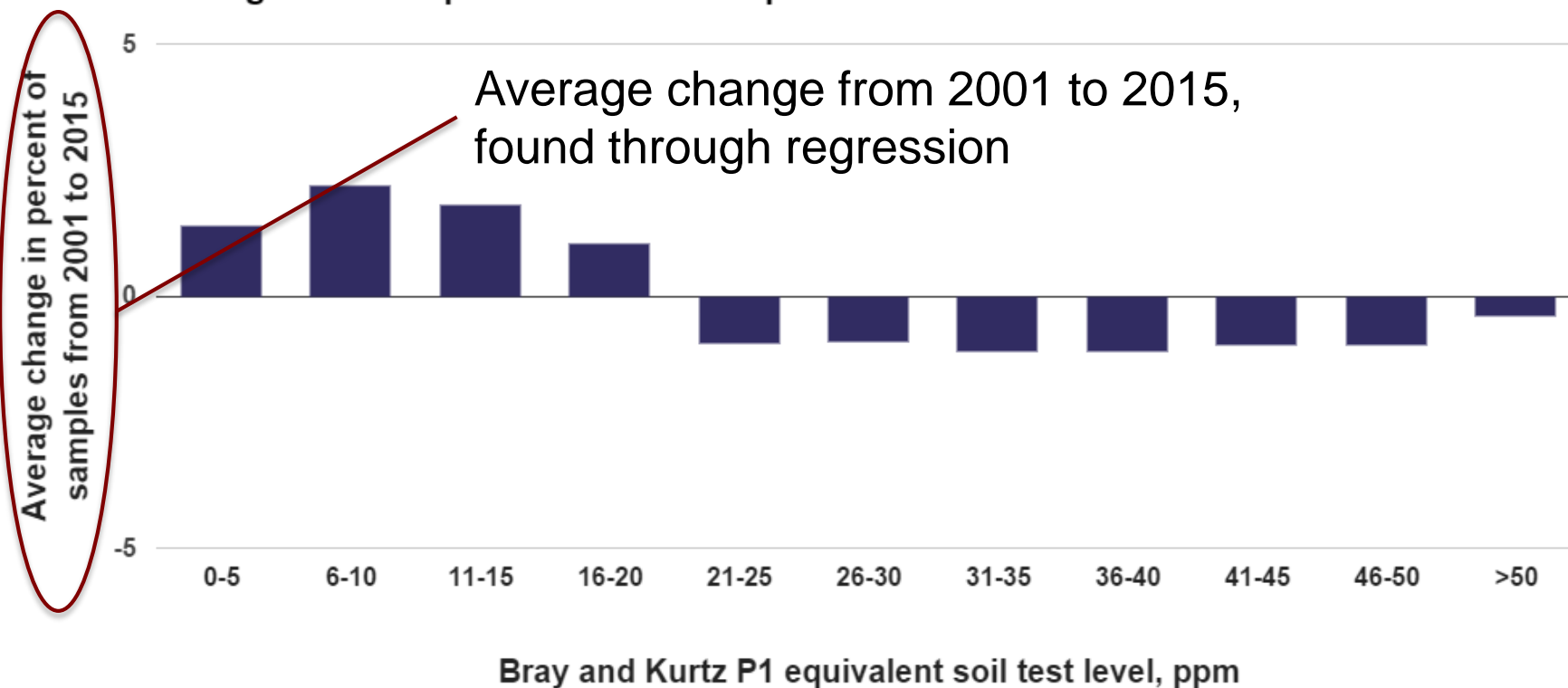
■ 2001; 2,070,609
 ■ 2005; 3,332,222
 ■ 2010; 4,378,442
 ■ 2015; 7,557,715



Bray and Kurtz P1 equivalent soil test level, ppm

North America: Phosphorus

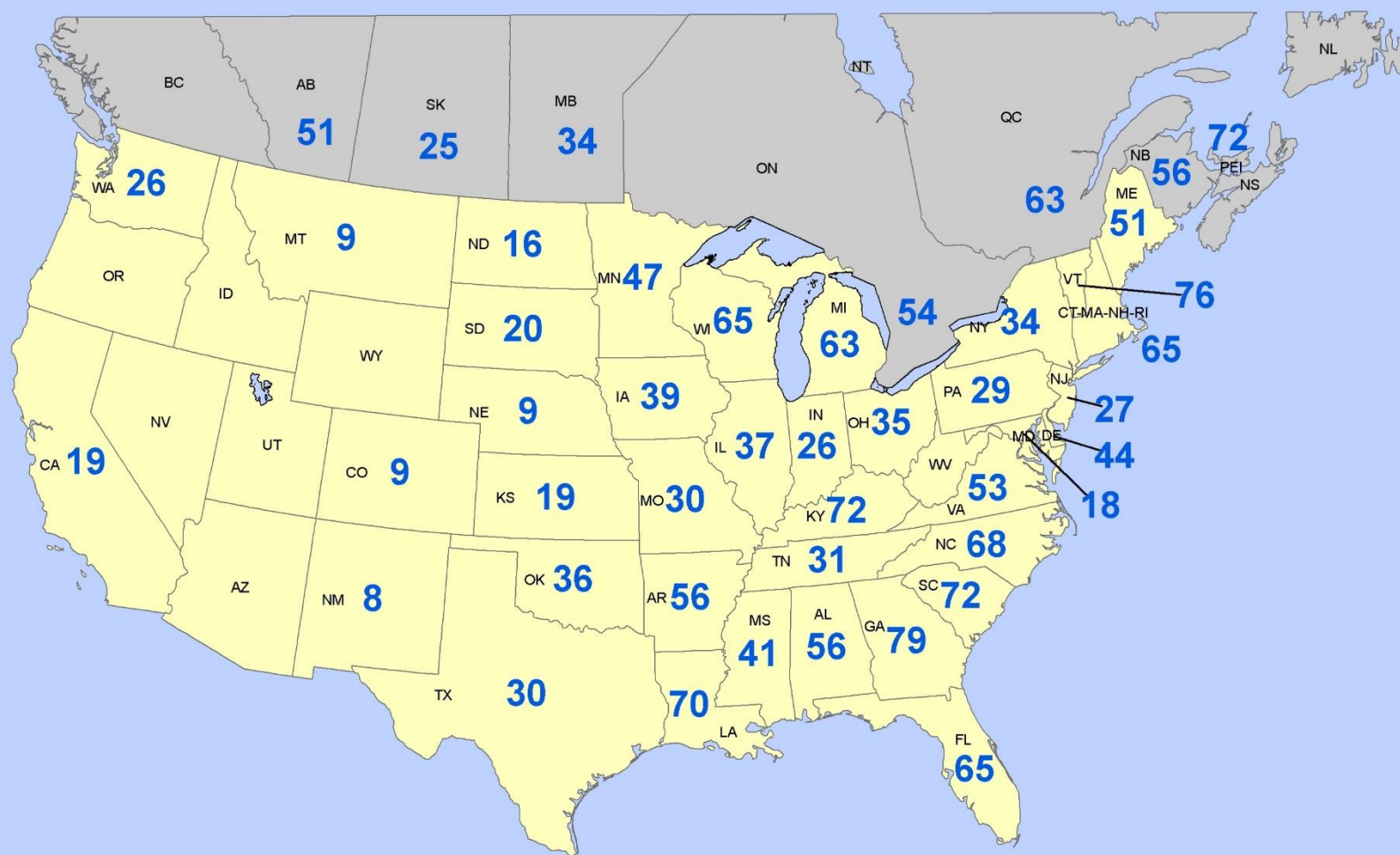
Changes in Phosphorus relative frequencies over time: North America



Summary Results: Potassium

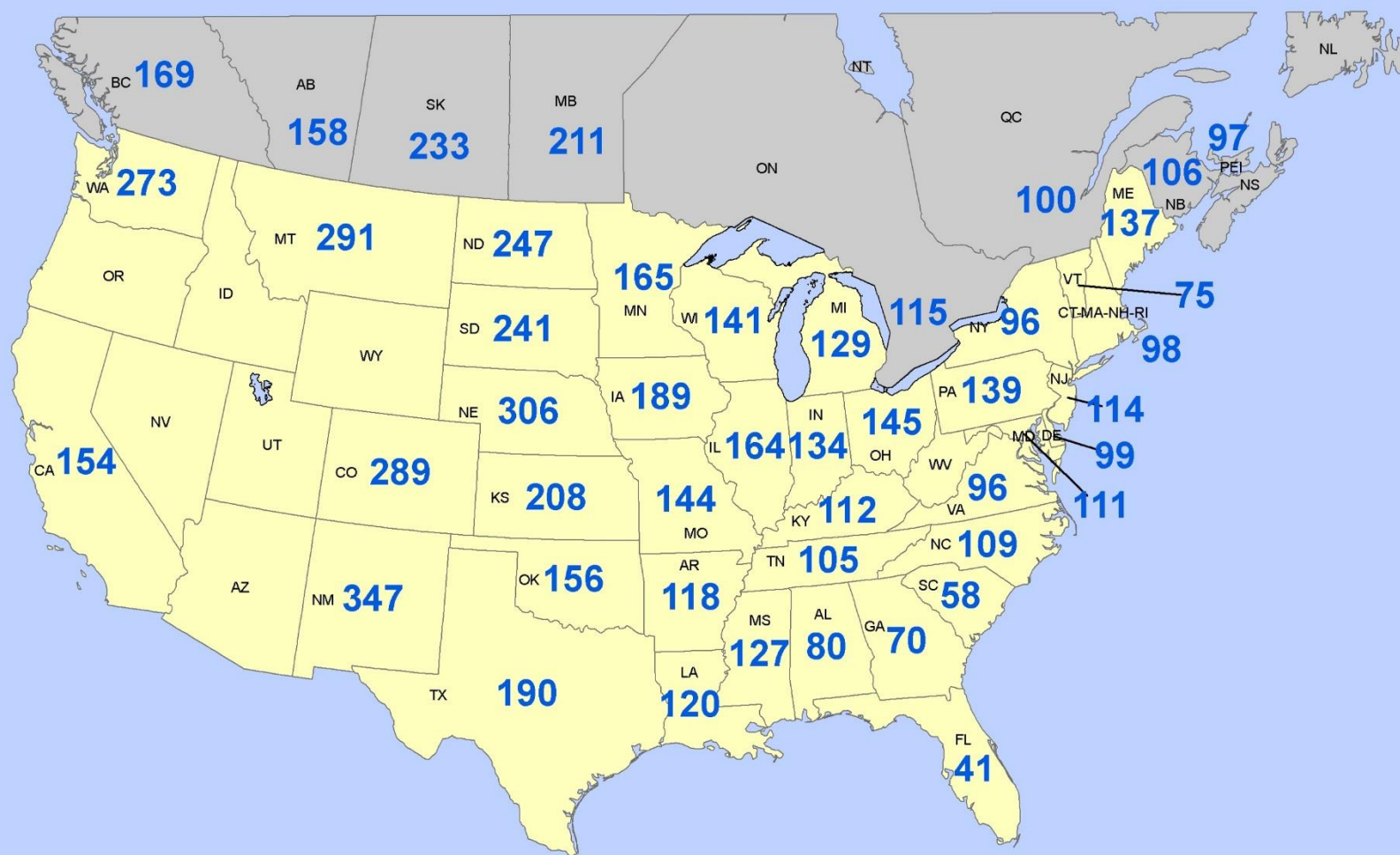


Percent of Samples Testing Below Critical Levels for K in 2015



* Only states with 2,000 samples or more are shown on this map

Median Soil Test K Levels 2015, Ammonium Acetate K Equivalent, ppm

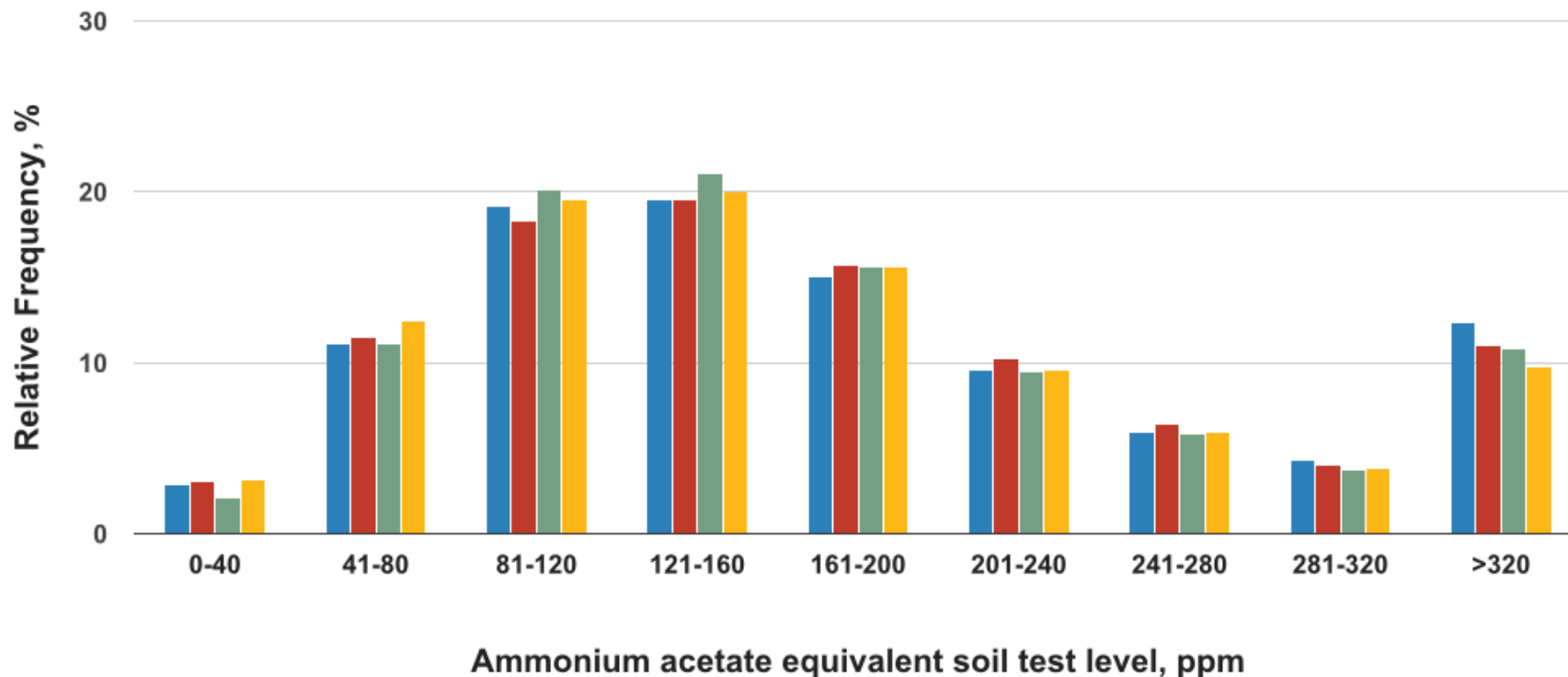


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North America: Potassium

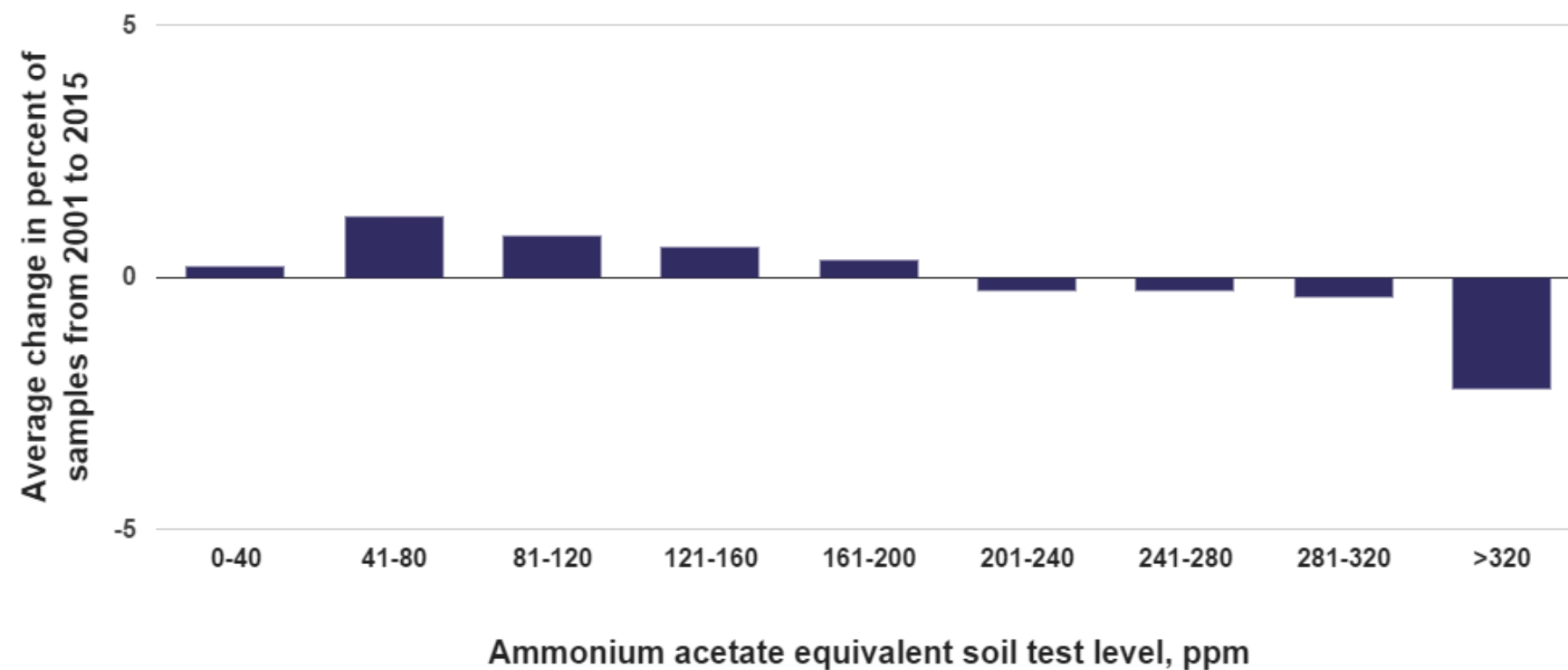
Potassium sample distribution: North America

■ 2001; 1,987,882
 ■ 2005; 3,296,914
 ■ 2010; 4,217,365
 ■ 2015; 7,292,206

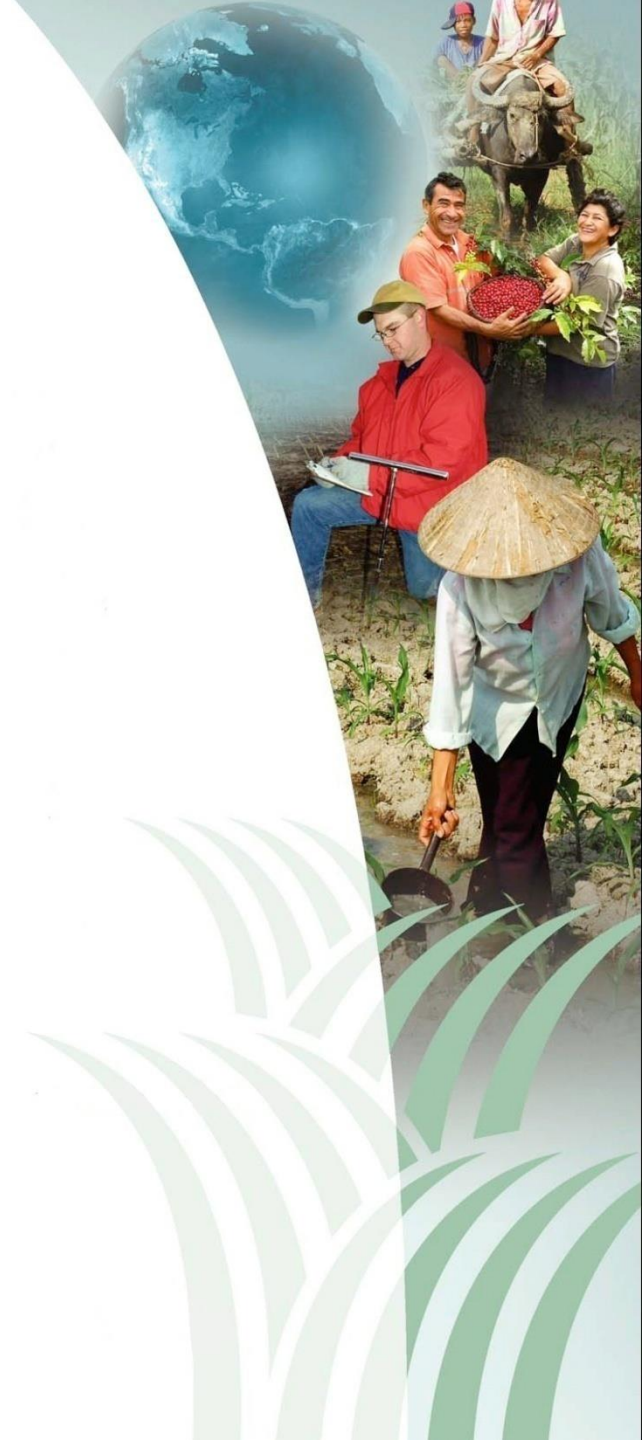


North America: Potassium

Changes in potassium relative frequencies over time: North America



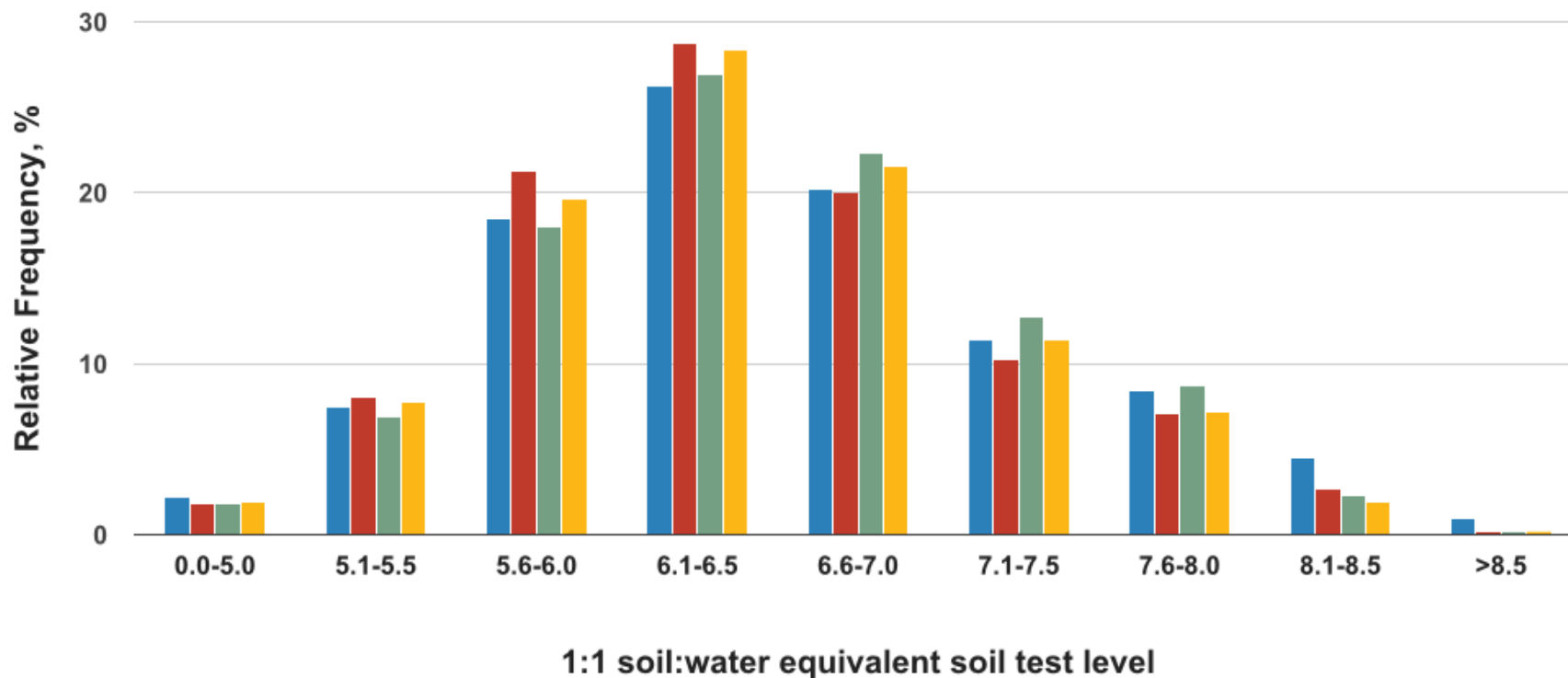
Summary Results: Soil Acidity



North America: pH

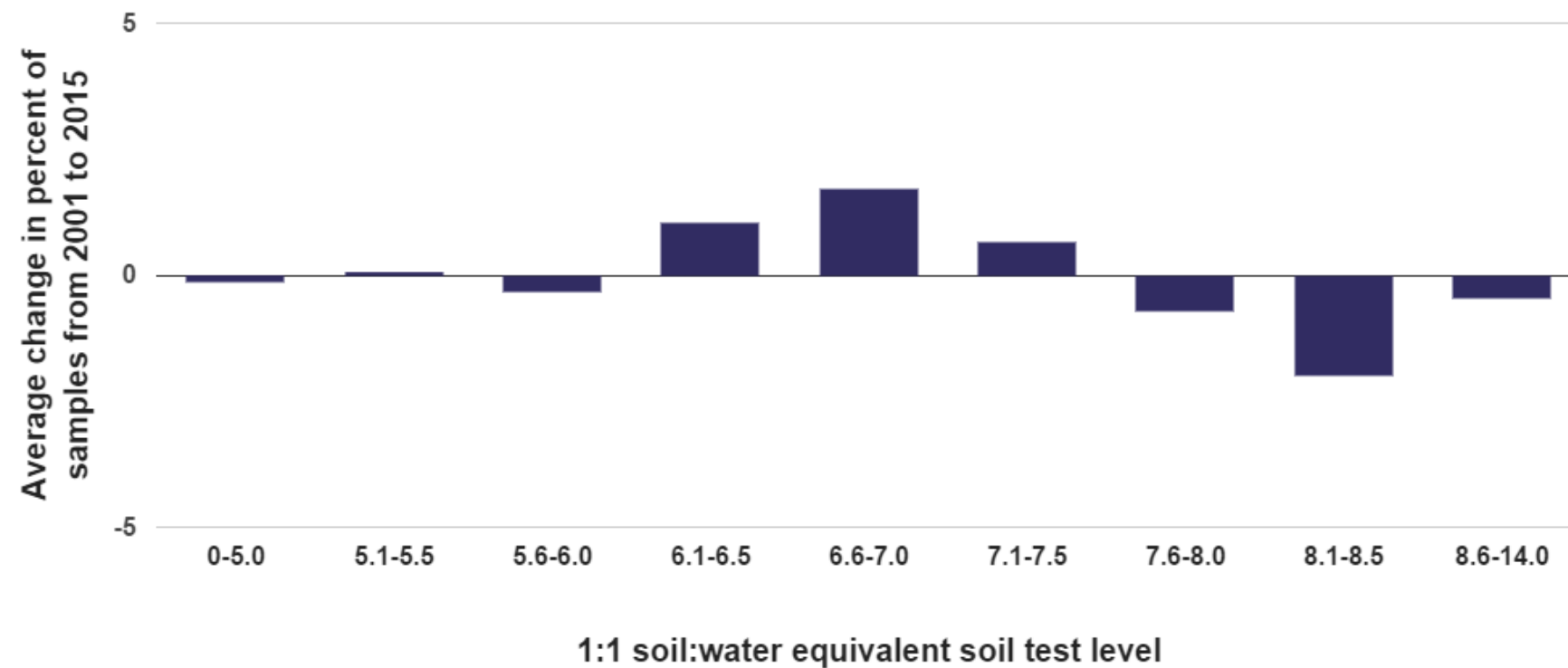
pH sample distribution: North America

2001; 1,897,902 2005; 3,402,344 2010; 4,280,746 2015; 7,241,327

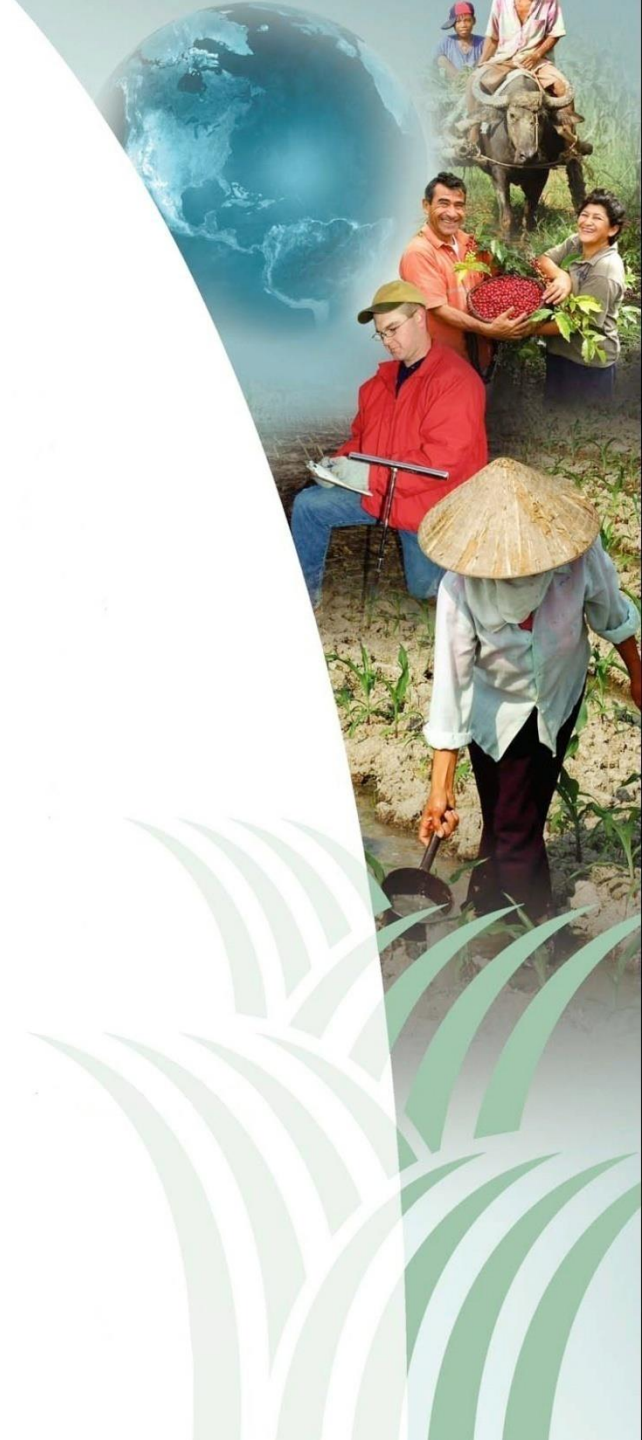


North America: pH

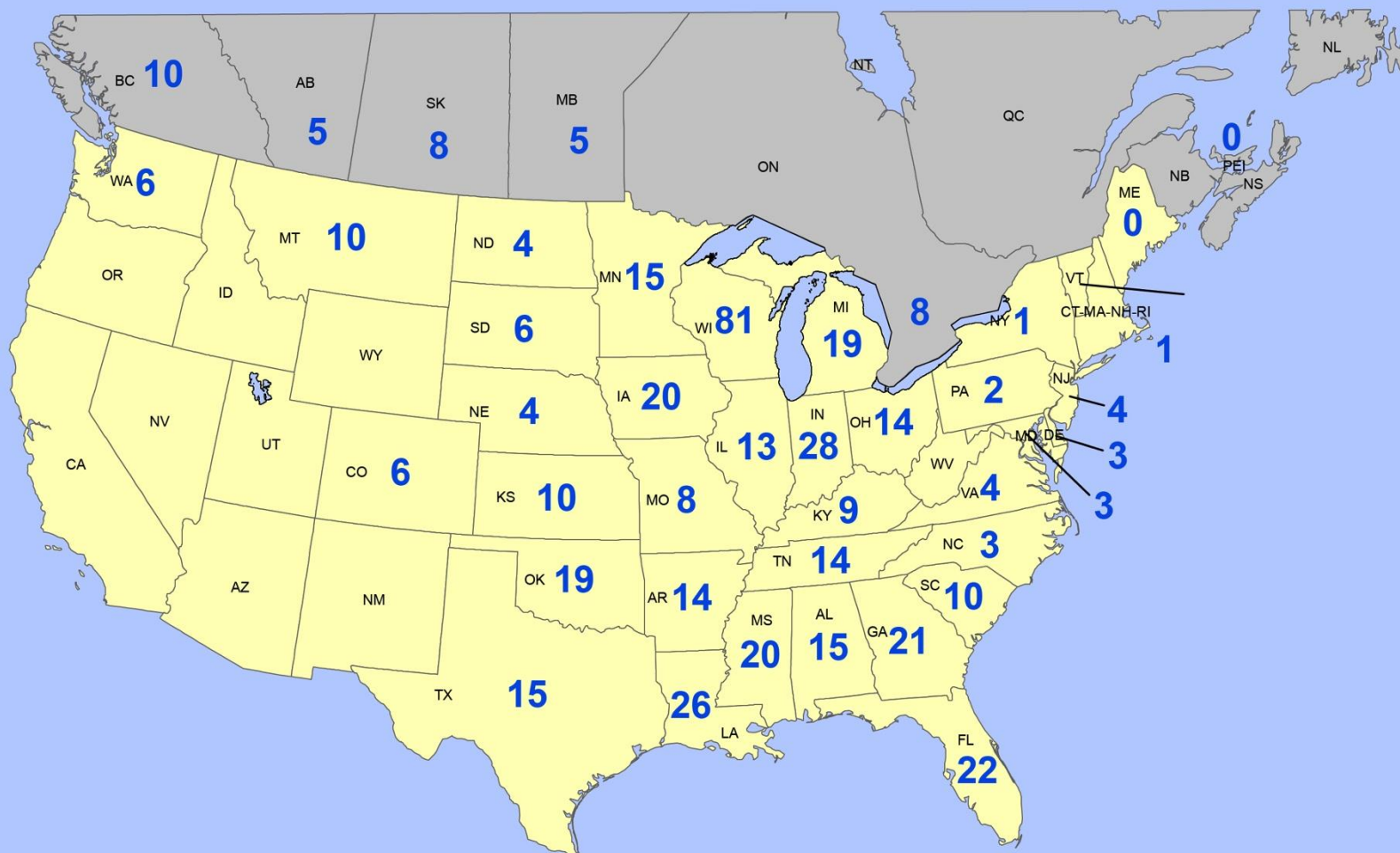
Changes in pH relative frequencies over time: North America



Summary Results: Sulfur



**Percent of Samples Testing Less Than 3 ppm Calcium Phosphate extractable S,
or 6 ppm Mehlich 3 S in 2015**



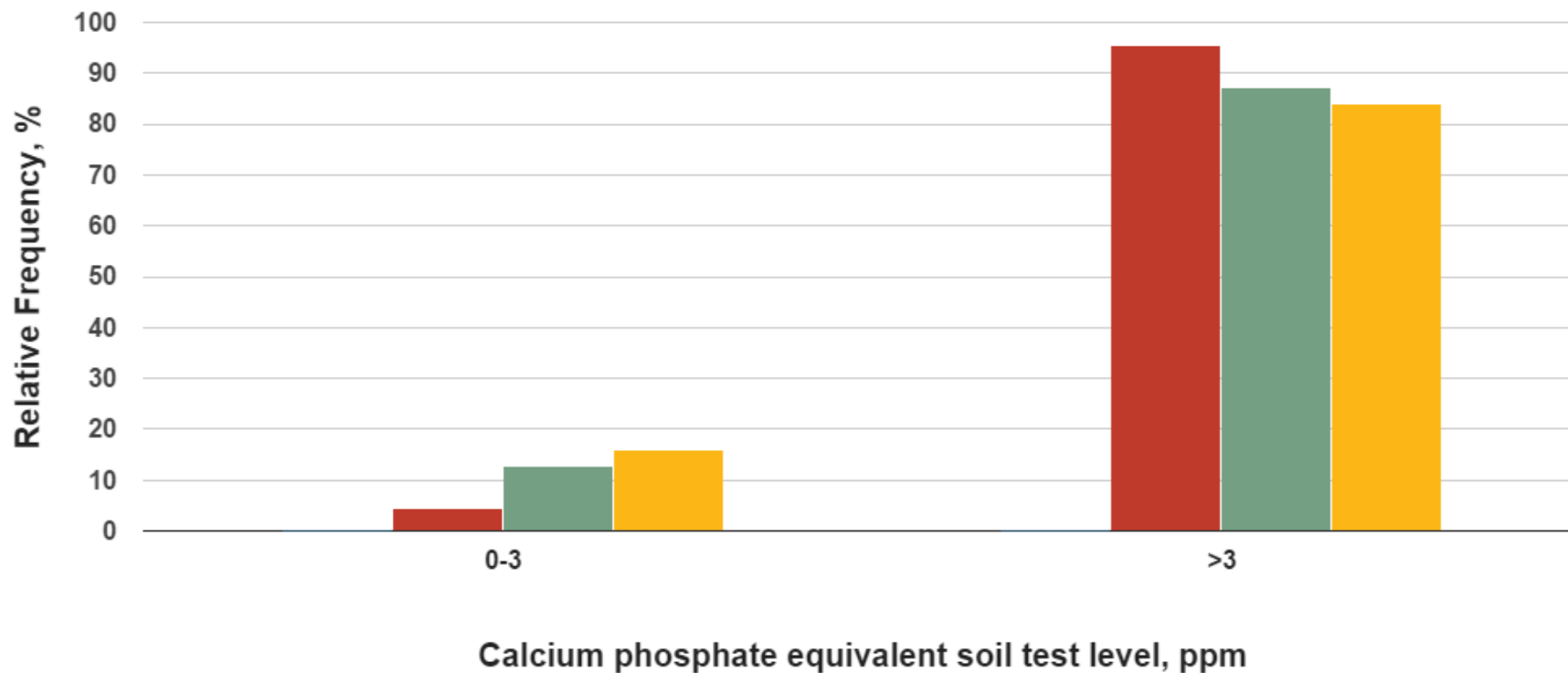
* Only states with 2,000 samples or more are shown on this map

Map Produced by
PAQ Interactive for IPNI
11:46:10 PM 2/12/2016

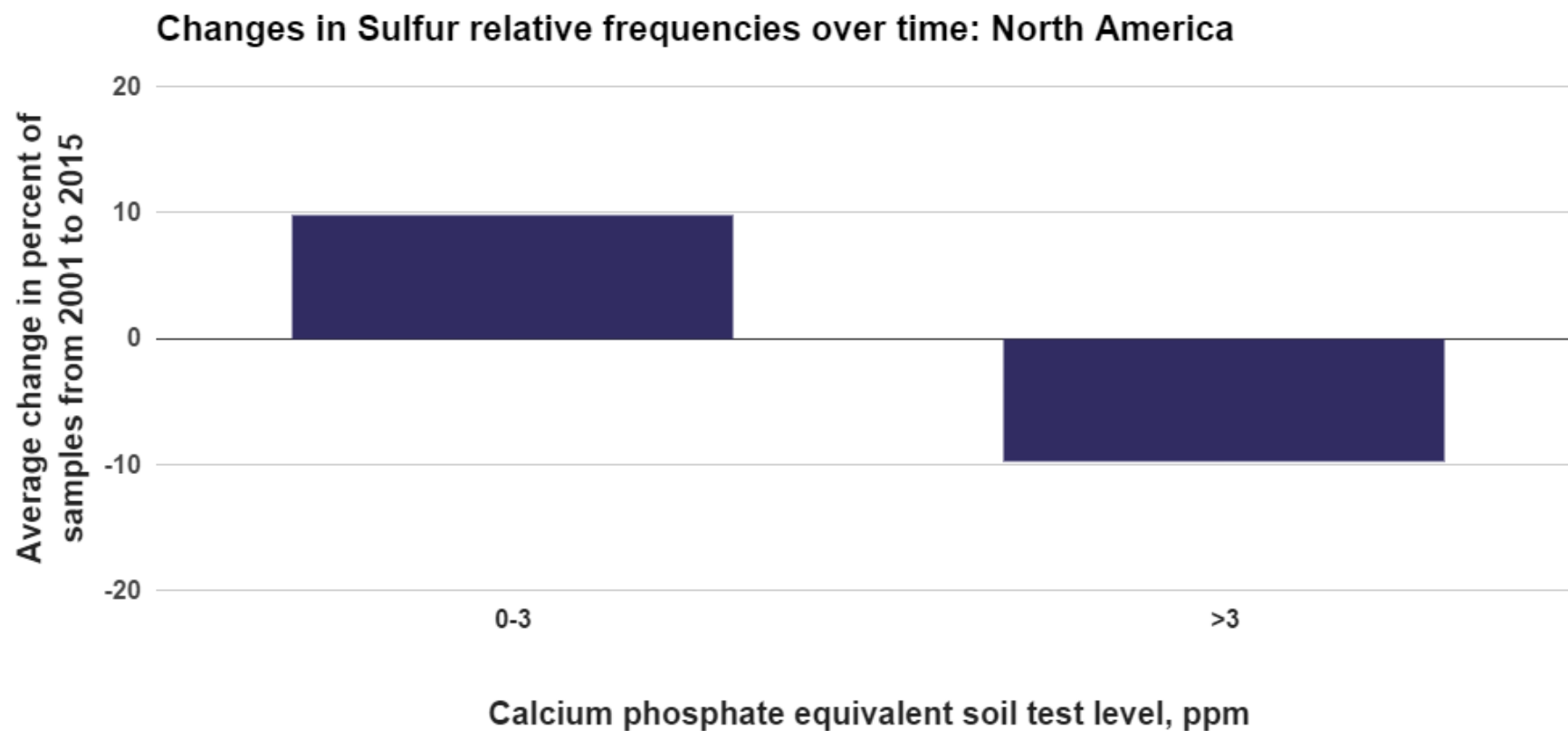
North America: Sulfur

Sulfur sample distribution: North America

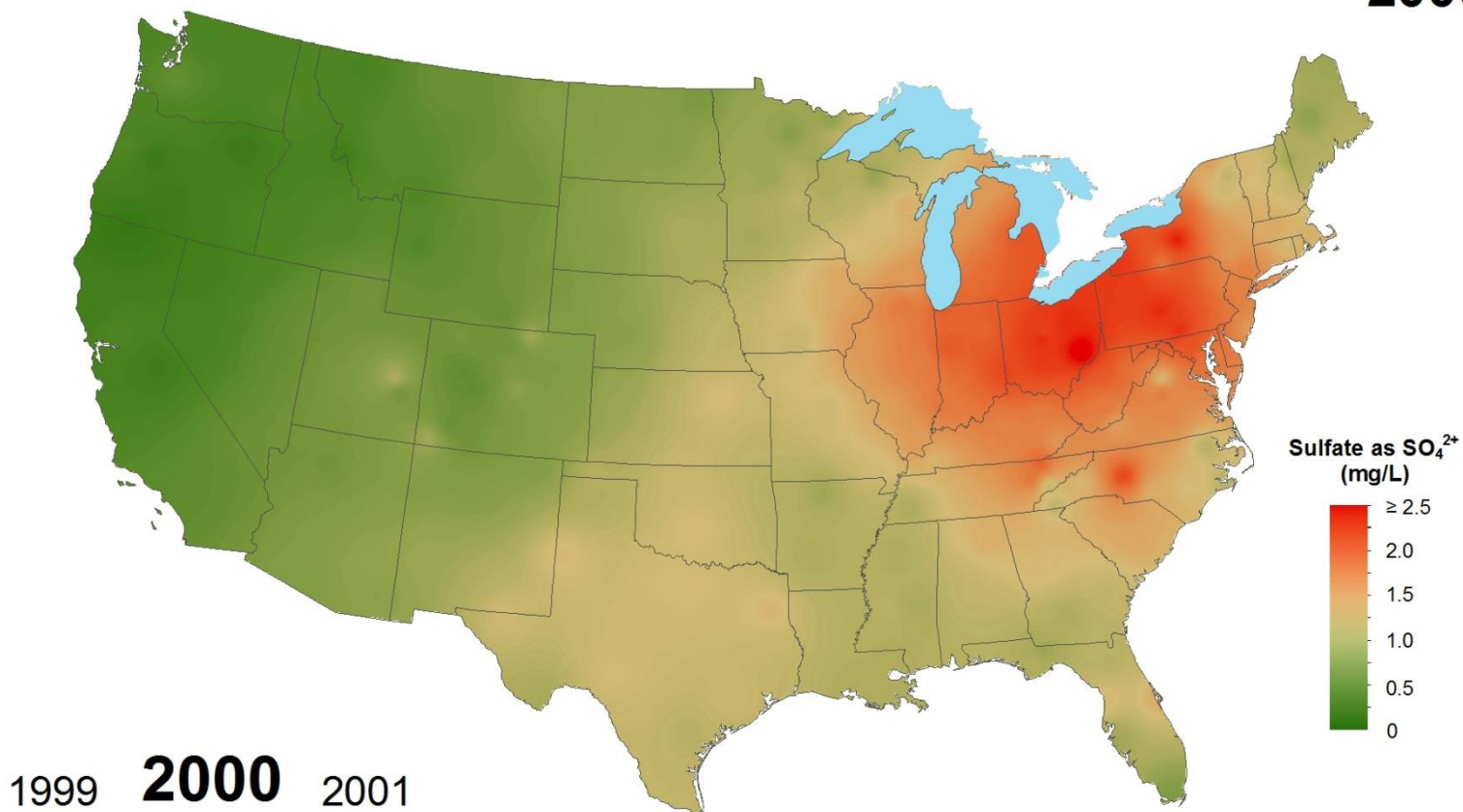
2001; 0 2005; 1,126,230 2010; 2,462,801 2015; 4,863,549



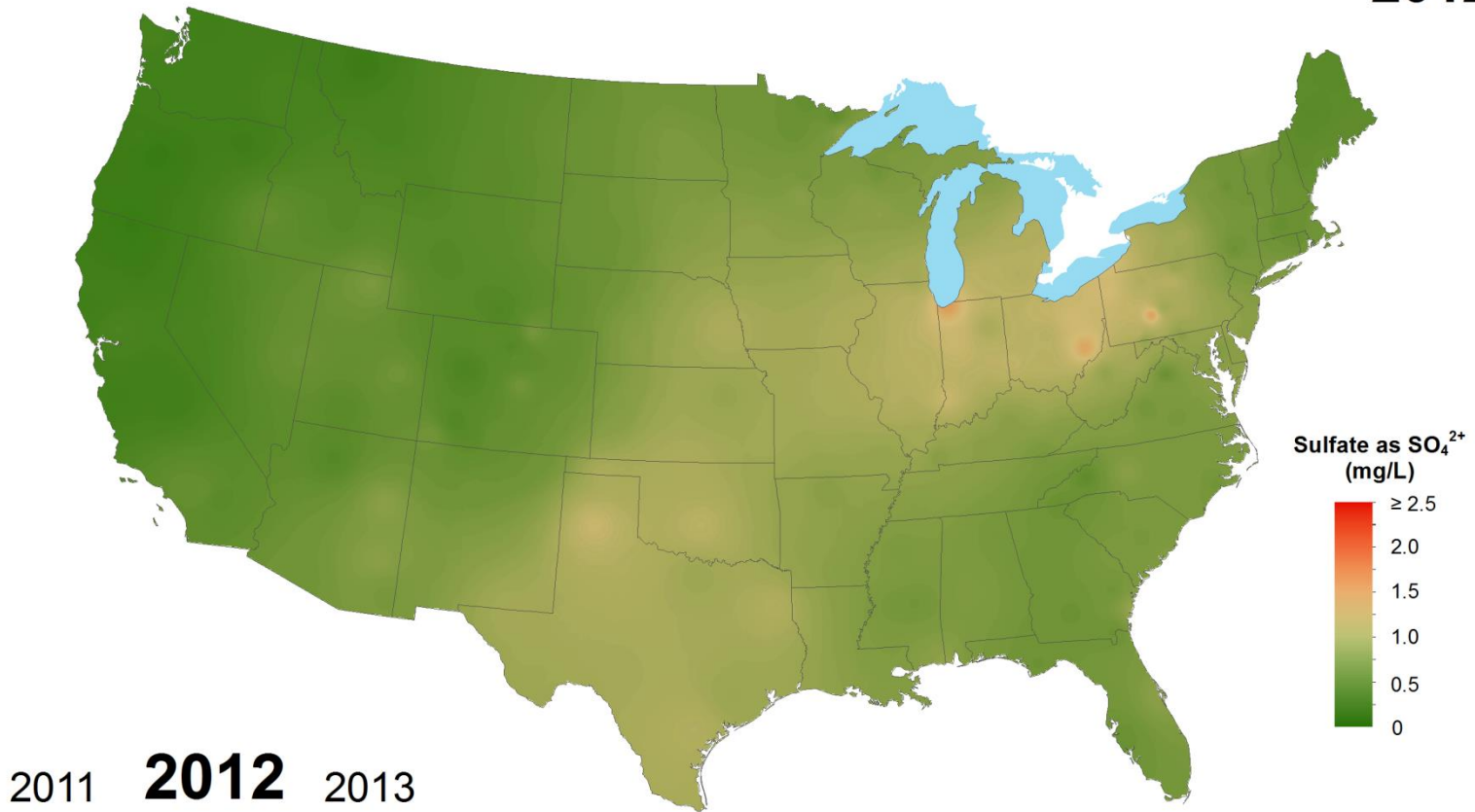
North America: Sulfur



Sulfate ion concentration 2000

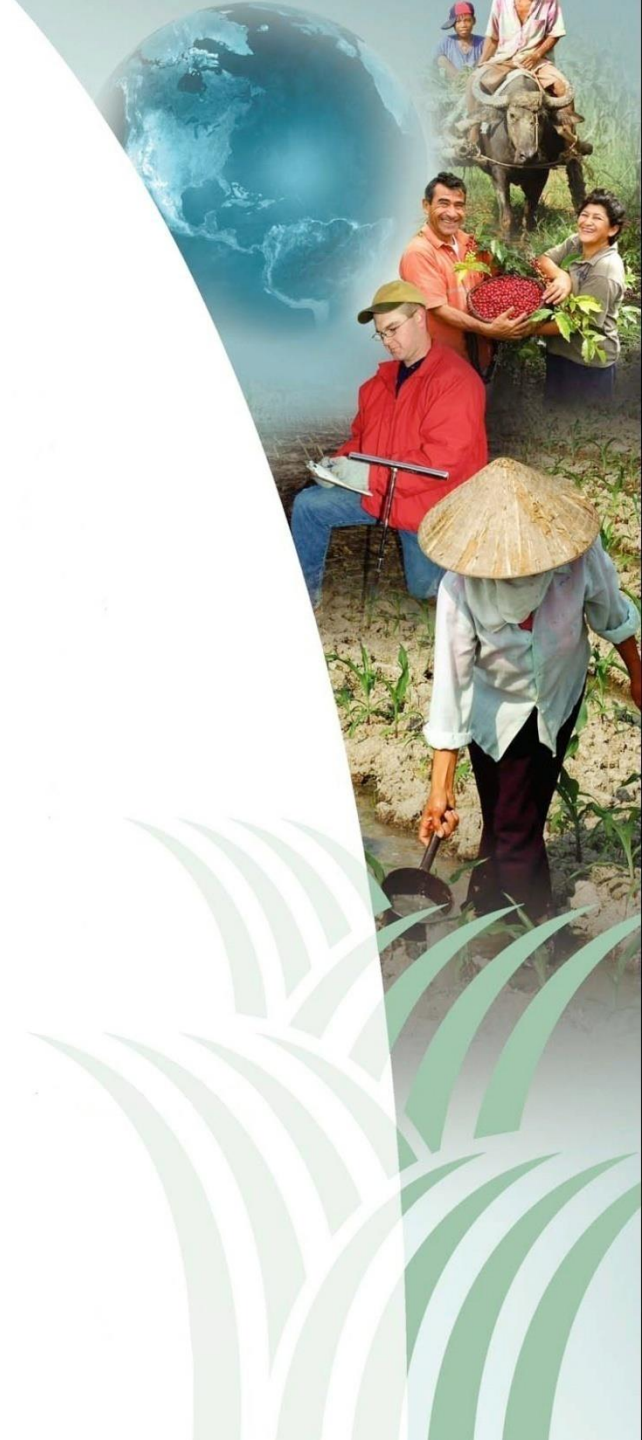


Sulfate ion concentration 2012

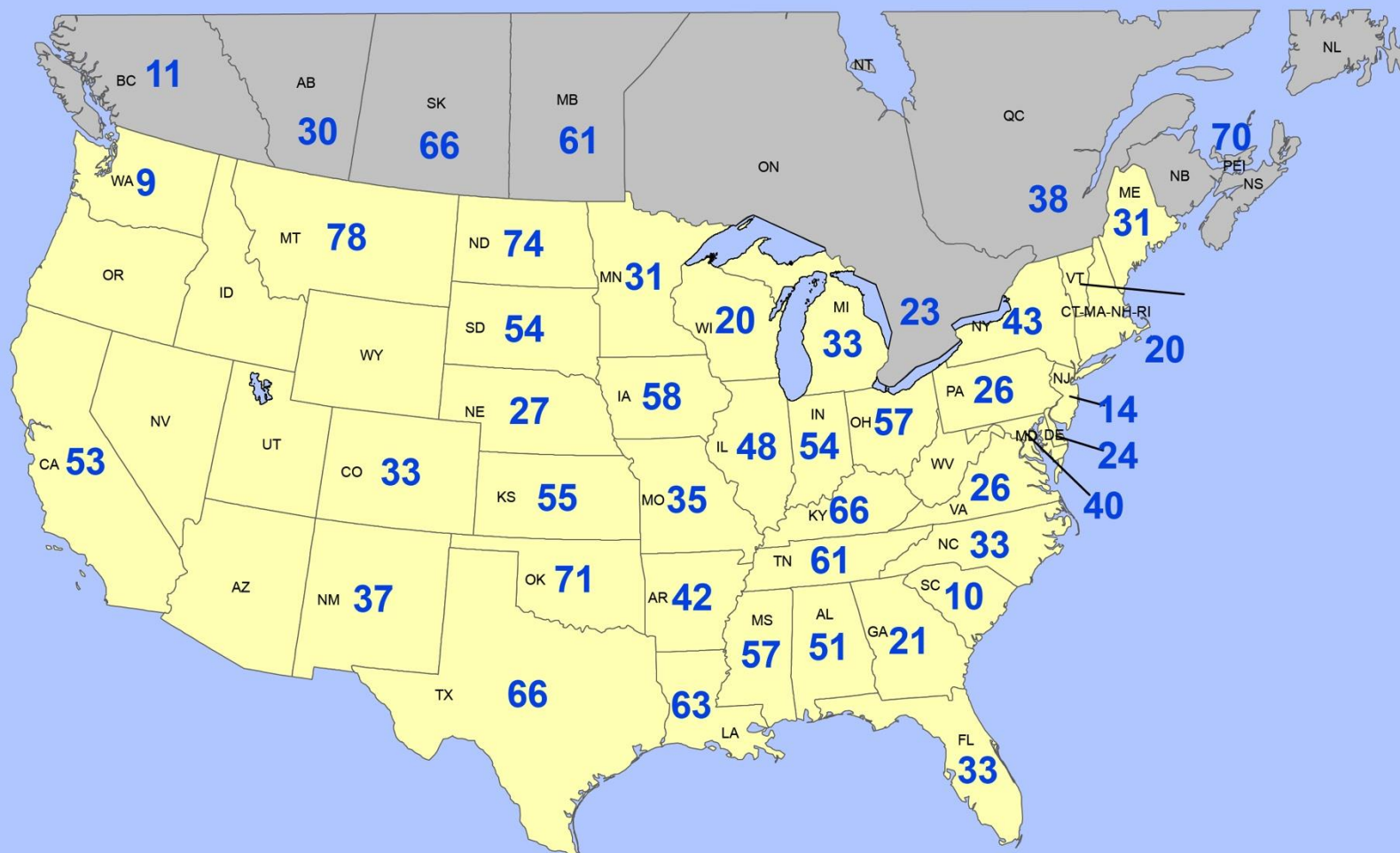


National Atmospheric Deposition Program/National Trends Network
<http://nadp.isws.illinois.edu>

Summary Results: Zinc



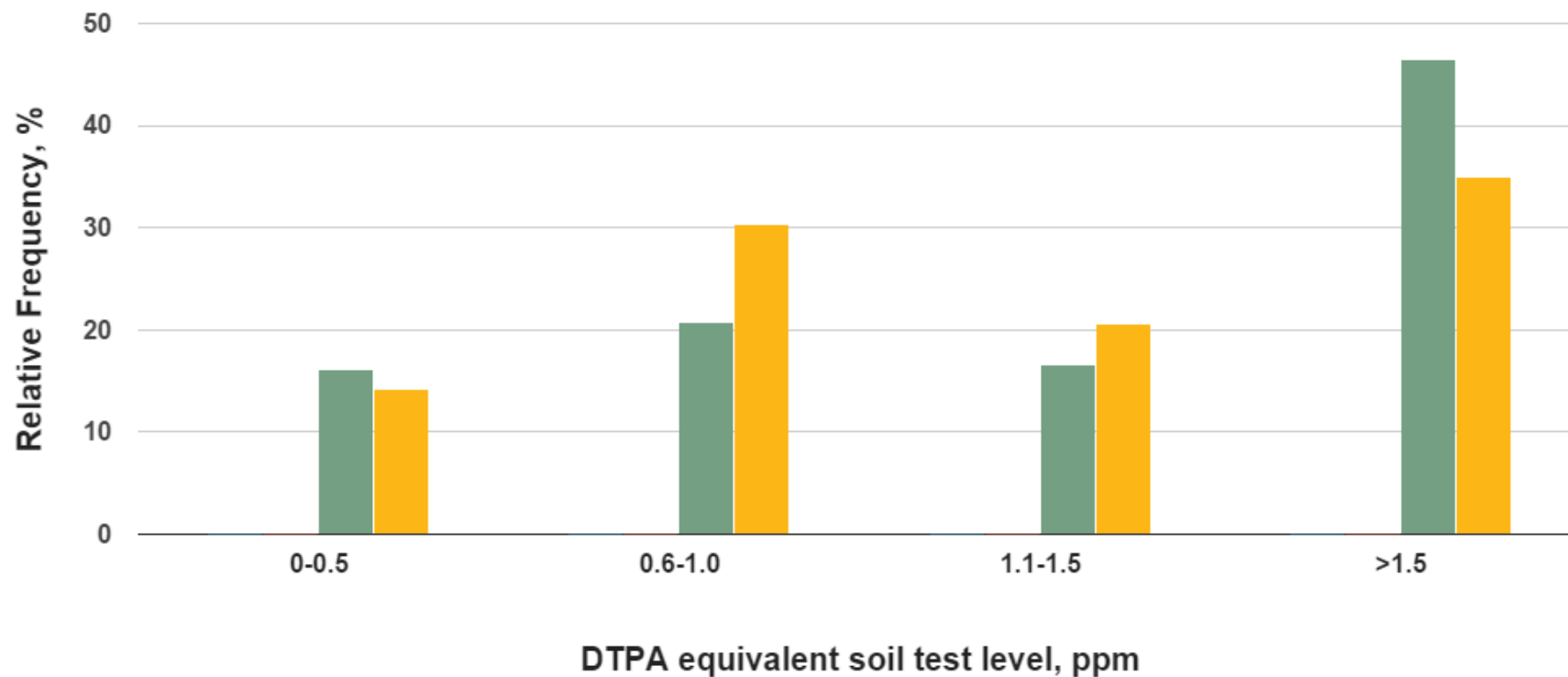
Percent of Samples Testing Less Than 1.0 ppm DTPA equivalent Zn in 2015



North America: Zinc

Zinc sample distribution: North America

2001; 0 2005; 0 2010; 1,393,430 2015; 4,357,170



Summary Statements for North America

- **Phosphorus.** Over the period 2001 to 2015, NA data indicate fewer samples testing higher in P and more samples testing lower. Many states in the eastern Corn Belt and Cotton Belt showed increased need for P in 2015, while the western Corn Belt and the west showed decreased needs, but the levels of need in these western areas were much higher than in the east.
- **Potassium.** Similar to P, the trend from 2001 to 2015 in NA was toward more samples testing lower and fewer samples testing higher. In the northern Corn Belt, many states had a decreased need for K while many states in the Cotton Belt had an increased need.

Summary Statements for North America

- **Soil Acidity.** Across the summary years 2001 to 2015, more samples tested in the range where crop growth and nutrient availability are greatest: pH 6.1 to 7.5 In general, small decreases were observed in lower, more acidic ranges and larger decreases in higher, more basic ranges.
- **Magnesium.** Summary data for NA from 2005 to 2015 indicate a trend toward increasing Mg levels.
- **Sulfur.** From 2005 to 2015, more samples tested lower in S – a trend consistent with lower wet deposition of sulfate from the atmosphere. Sulfur soil tests are not well correlated to probabilities of yield response, so agronomic interpretations are unclear.

Summary Statements for North America

- **Zinc.** Although local interpretation is required, data from 2015 indicate many states and provinces may require Zn fertilization.
- **Chloride.** The Northern Great Plains has a high frequency of soils with low levels of Cl^- . In 2015, fewer samples tested in the lowest category where probabilities of crop response to Cl^- fertilization are highest.

soiltest.ipni.net



An interactive tool for displaying soil nutrient levels across North America over time.

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Further Questions

IPNI Soil Test Summary

- 2015 is the 4th summary that provides descriptive statistics of soil test levels
 - Median P, K, and pH values
 - Relative frequency across soil test ranges for P, K, pH, Mg, S, Zn, Cl⁻
- Previous summaries:
2001, 2005, 2010

