

Manganese in California

Presented by
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*Study done by several
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Counties*

Why manganese?

- Essential **micronutrient**
 - Others are Cu, I, Co, Zn, Fe, Mo, F, Se
- Essential **macronutrients** are Ca, P, Na, Cl, Mg, K, S
- Supplementation is needed; cattle do not actively seek nutrients they are deficient in, aside from Na (salt)

Manganese not magnesium

- Manganese = reproduction
- Magnesium = grass tetany
- Manganese absorption can be as high as 17%, but retention may actually be as low as 2% (Grace, 1975)
- Absorption is not increased with deficiency (Keen et al., 1987)
- Plus copper and zinc are antagonists

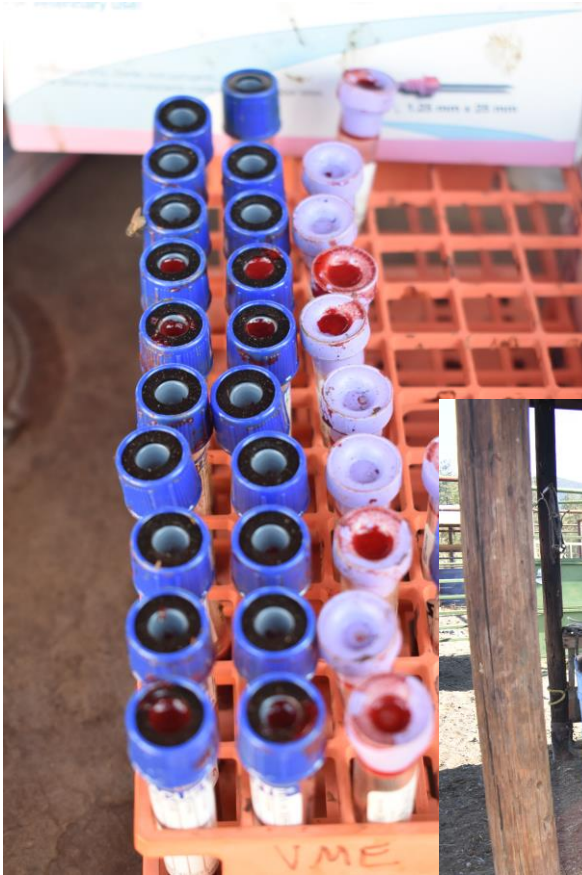
Manganese deficiency

- Abortion
- Altered estrus
- Seminal tubular degradation
- Small birth weight
- Limb and spinal deformities
- Increased services per conception
- Weakness
- Incoordination

Correction

- Cattle supplemented with manganese (Hansen et al., 2005, etc.)
 - Did not have better weight gain
 - Did show increased reproductive performance
 - Deficient cows had higher incidences of calves with skeletal problems

Is this a problem here?



How?

- Manganese is different
 - A liver biopsy does not reflect the diet
 - The heart is most accurate
 - Liver removes it readily from plasma
 - Thus levels can fluctuate with plasma testing
 - Levels vary between whole blood, plasma, and serum
 - Serum fluctuates the least
 - Thus it is our choice

Serum collection



Critical levels

- Essentially fed different diets and looked at the signs to develop this set
 - 0-5 ppb = deficient
 - 5-6 ppb = marginal
 - 6-70 ppb = adequate

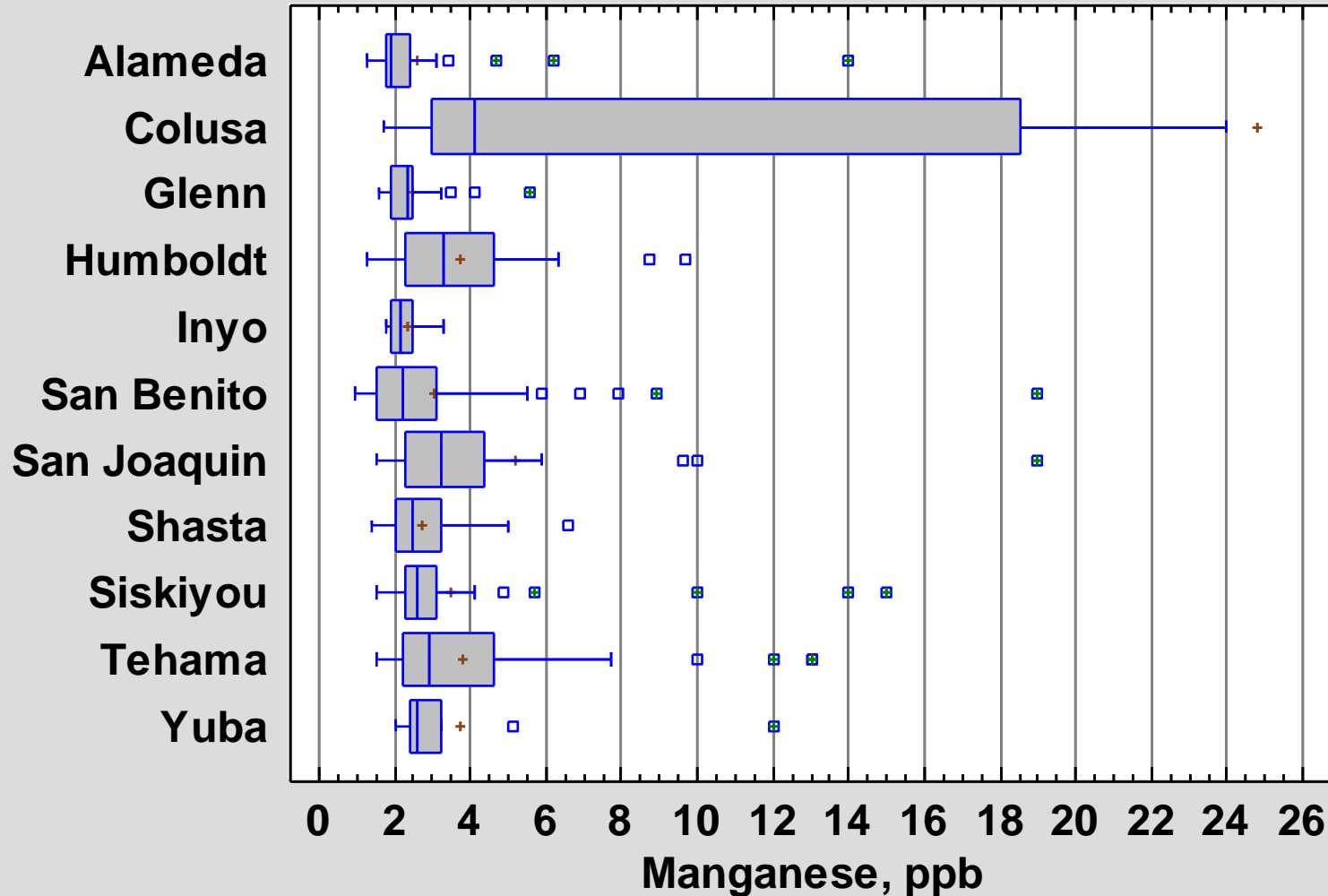


County	Head sampled
Alameda	30
Colusa	20
Glenn	30
Humboldt	30
Inyo	10
San Benito	50
San Joaquin	40
Shasta	80
Siskiyou	40
Tehama	80
Yuba	10

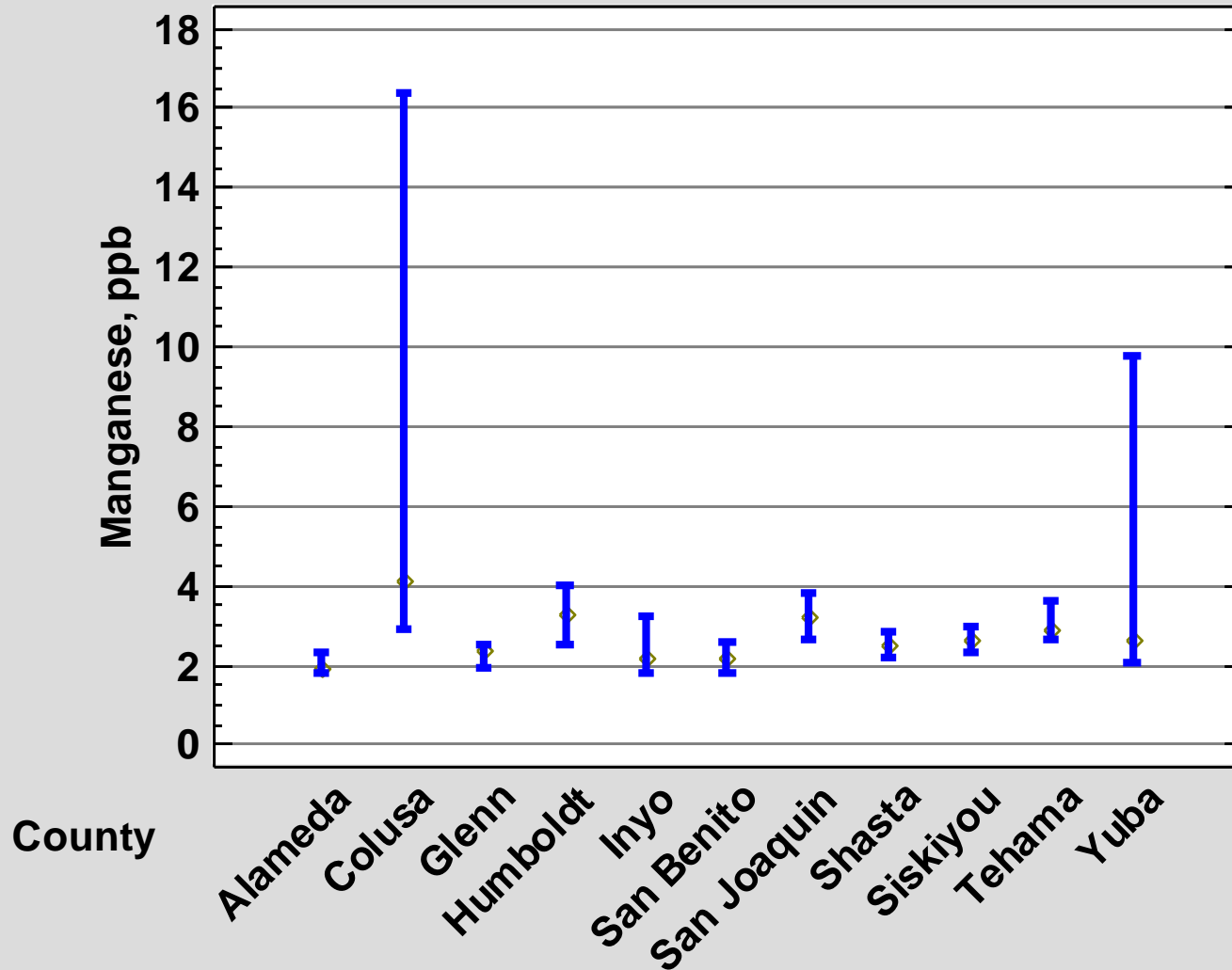
Remember what we're looking at

- This is median values of cattle that are supplemented
 - This does not diagnose deficiency
 - It tells us how supplementation is working

Manganese...I should show you like this but....



Manganese, median 95% CI



Summary manganese

- 420 cattle with results back
 - Average Manganese level is 4 ppb
 - 36 are marginal or better 9%
 - 28 are adequate 7%

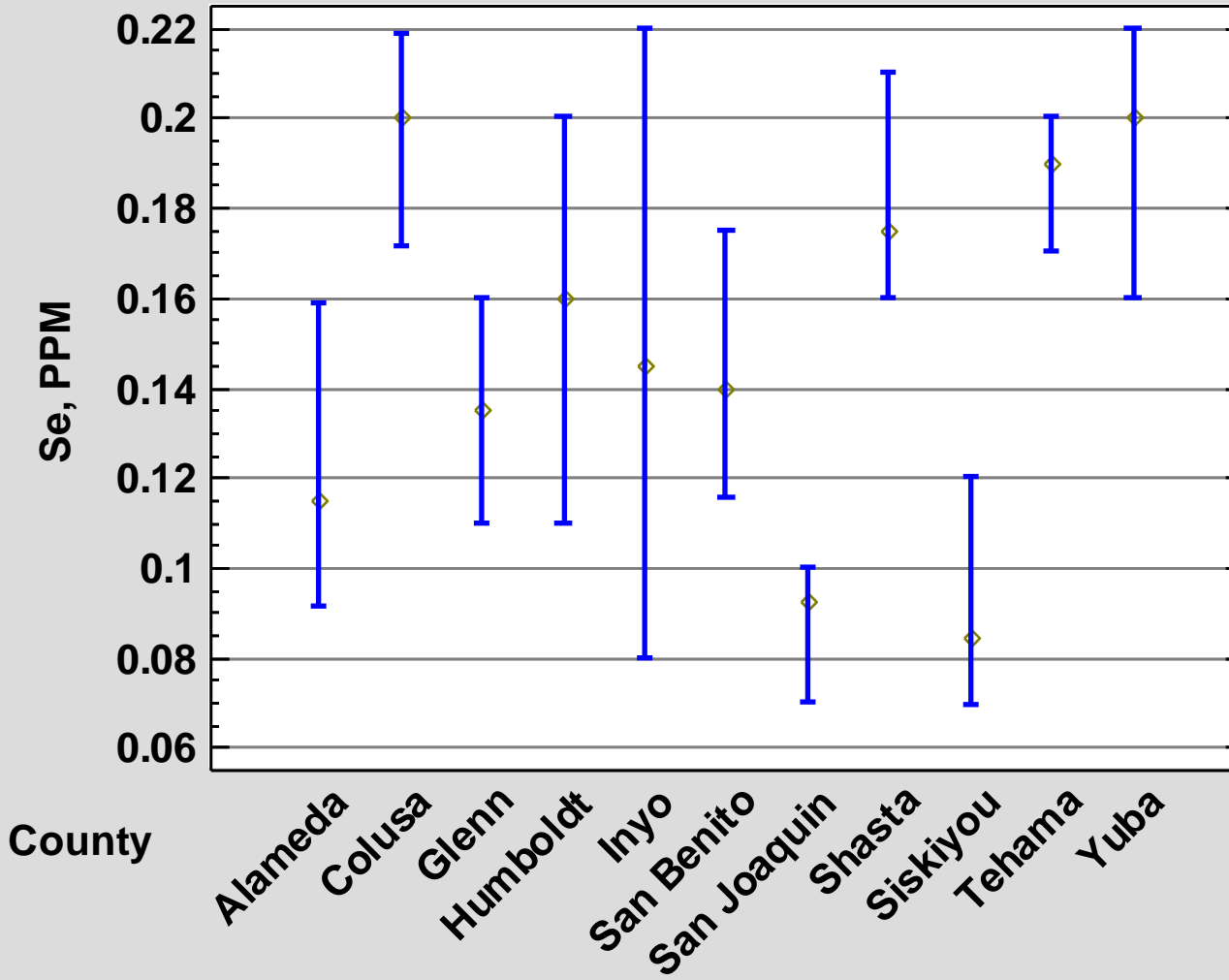
–93% below adequate

–91% deficient

If you already have a sample...

- Look at other minerals
- Selenium (Se)
 - Deficient in most of CA soils & forage
 - White Muscle Disease in newborns
 - Female reproductive health

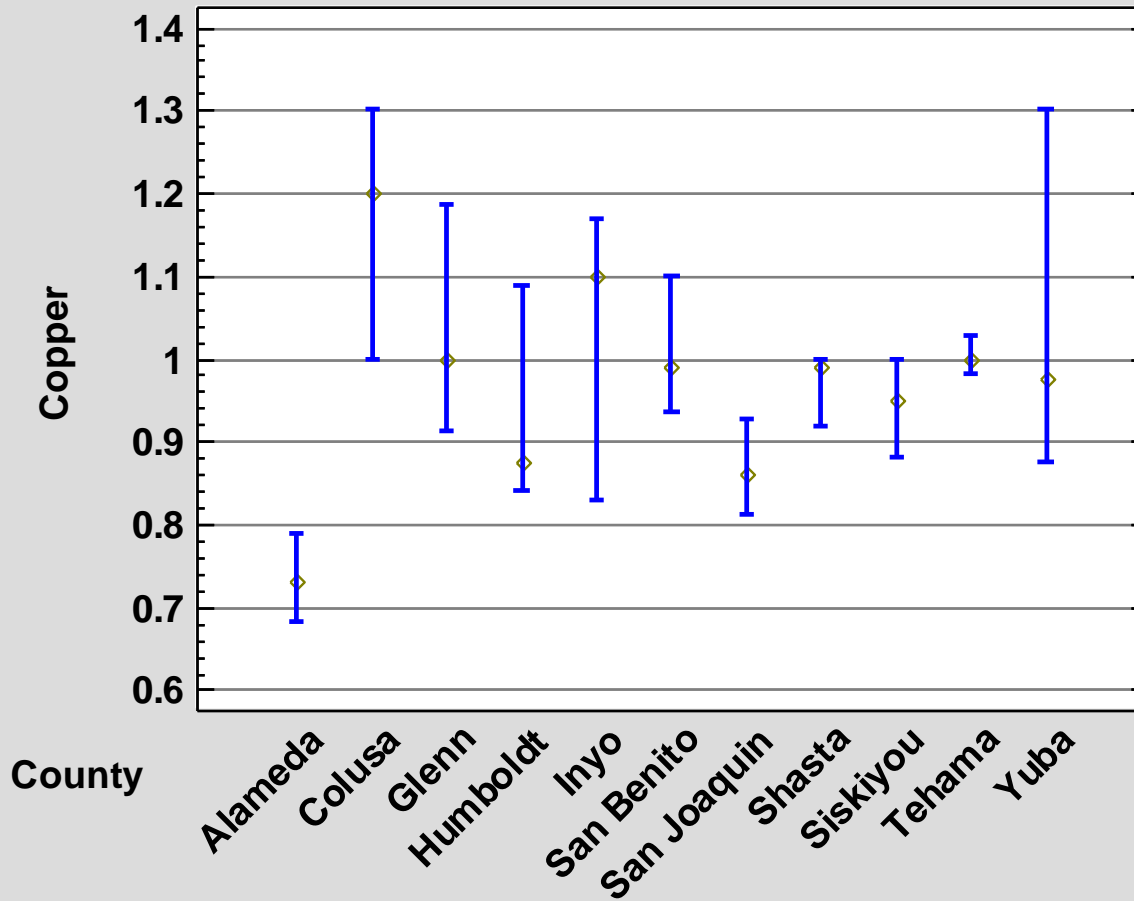
Selenium, ppm



If you already have a sample...

- Copper (Cu)
 - Important for disease resistance, immune response, fertility
 - Sulfur, Molybdenum and Iron can reduce Cu absorption
 - Can be toxic at relatively lower levels (>100 ppm)

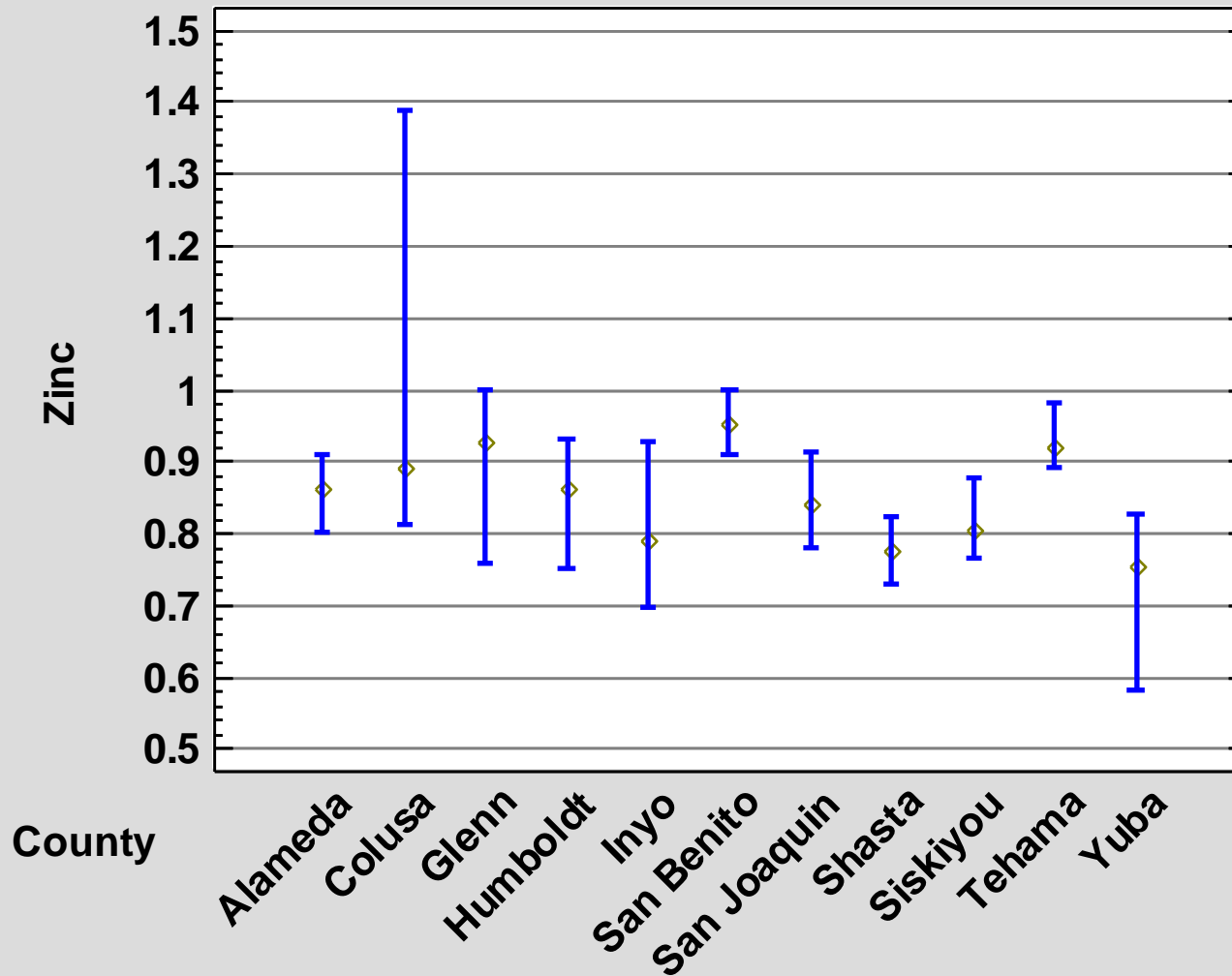
Copper, ppm



If you already have a sample...

- Zinc (Zn)
 - Helps with immune response, skin & hoof health
 - And reproduction, especially bulls
 - Supplementation necessary, poor retention/storage
 - High iron can reduce absorption

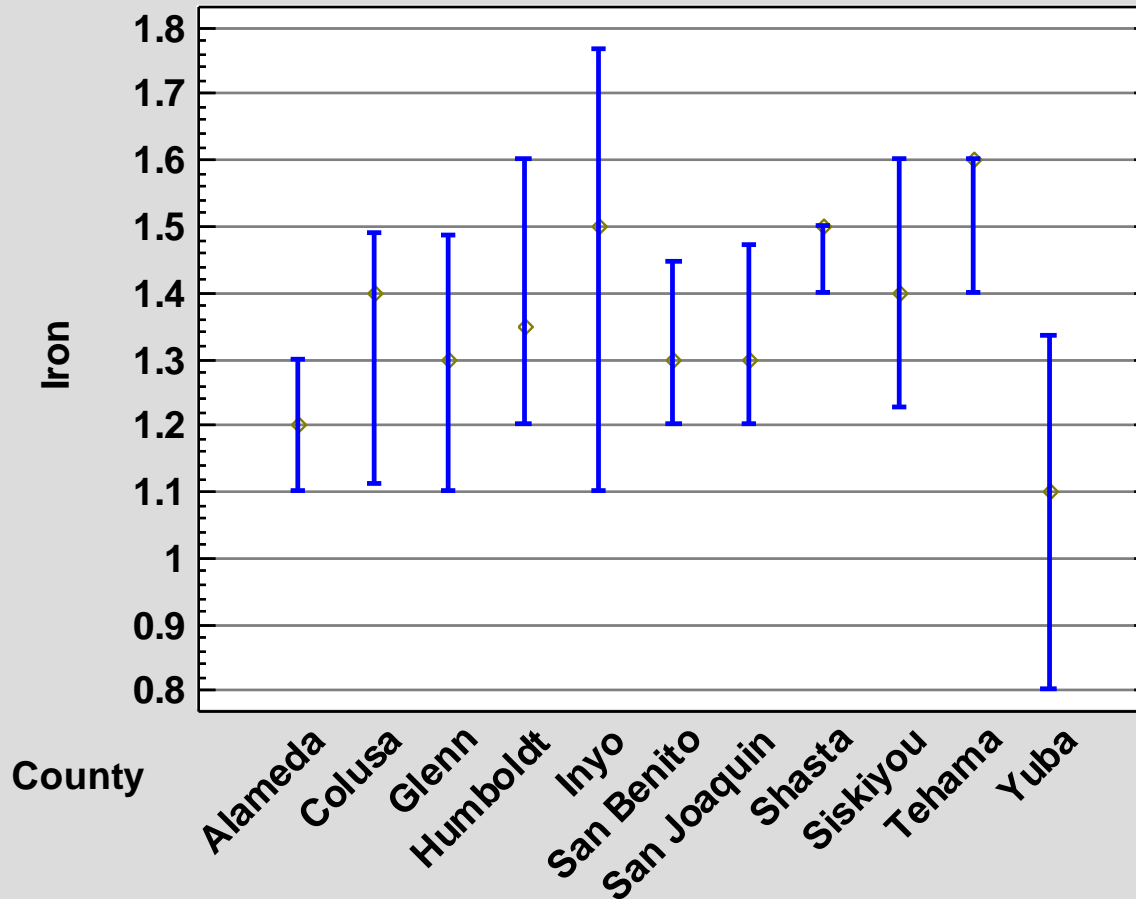
Zinc, ppm



If you already have a sample...

- Iron (Fe)
 - Deficiency can indicate anemia
 - High amounts can interfere with other nutrients

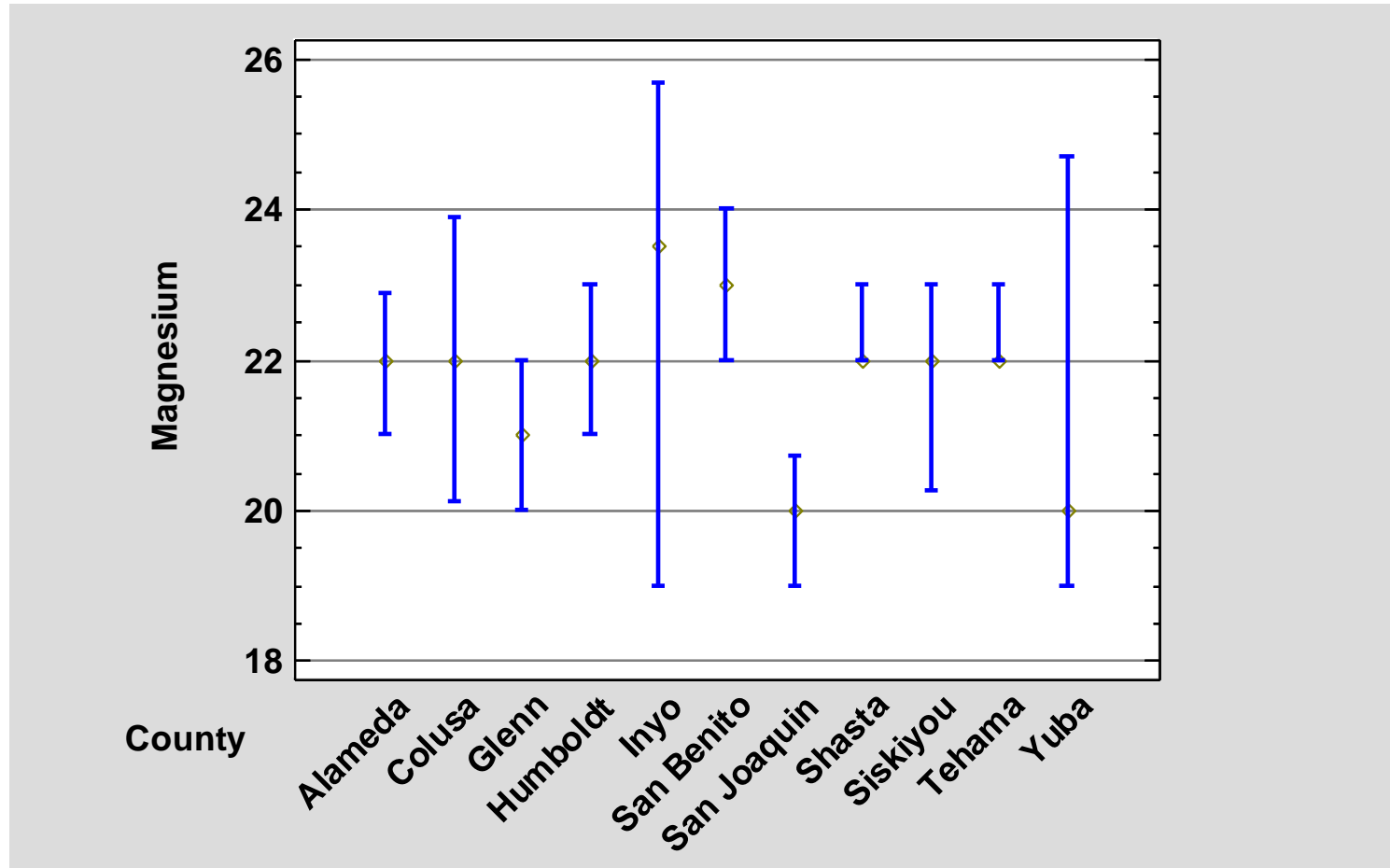
Iron, ppm (1.3-2.5)



If you already have a sample...

- Magnesium (Mg)
 - Most common form of deficiency = grass tetany
 - Important for metabolism and nervous system
 - Potassium can interfere with absorption

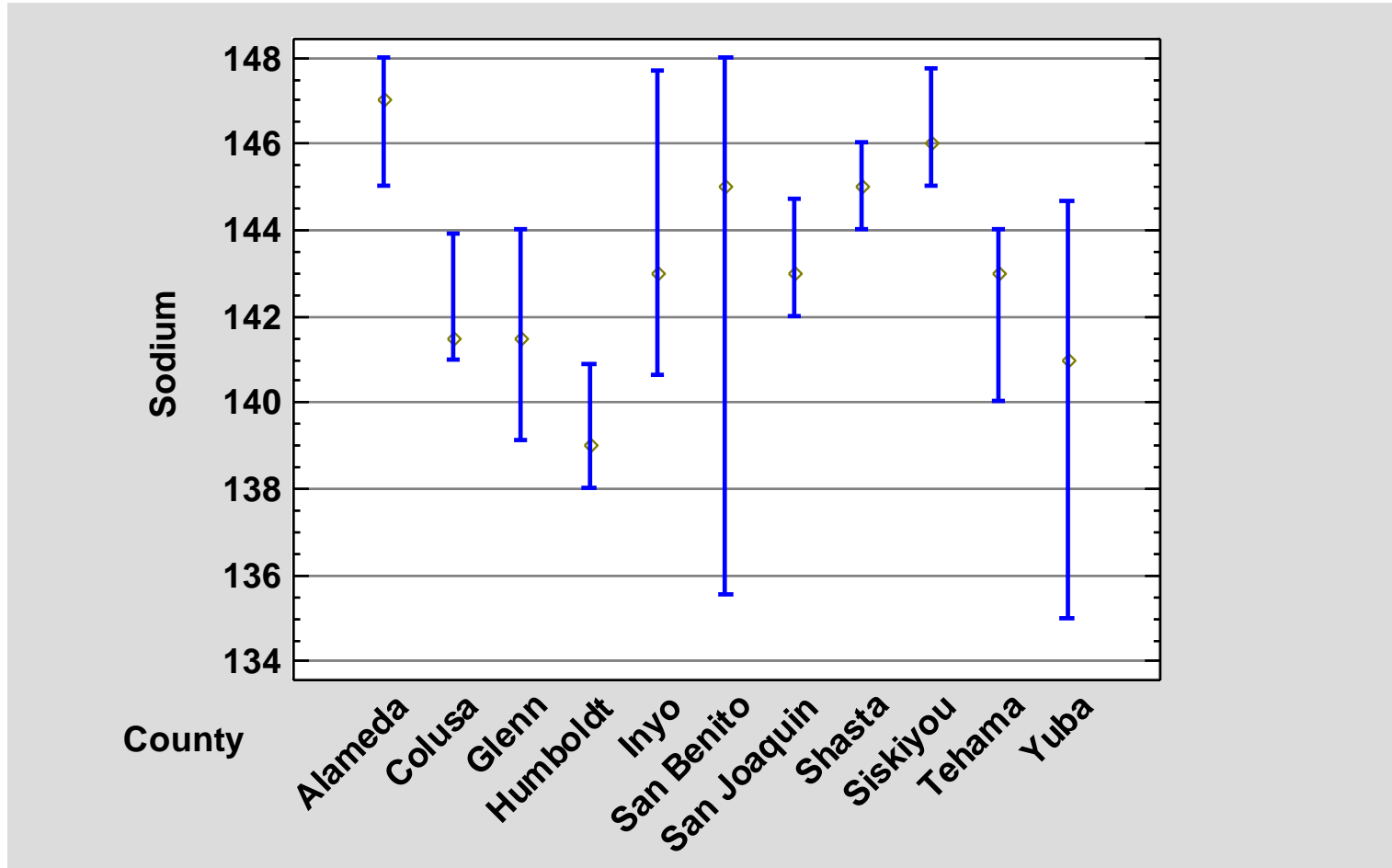
Magnesium, ppm (18-35)



If you already have a sample...

- Sodium (Na)
 - Check if animals eating enough salt
 - If deficient, can increase risk of grass tetany even with adequate Mg

Sodium, ppm (135-150)



Summary

- Most cows look good for Se, Mg, and Cu - these mineral programs are working
- Zinc levels likely need to be increased >5,000 ppm
- Manganese is almost always deficient
 - Differing supplement levels indicate it may take as high as 1% to have adequate serum levels.

Summary

- Remember that correct sampling is very important!
- We may be tying up our manganese
 - Copper and zinc
- We are looking into trials that feature correction of manganese levels

Thank you

- Thank you to the Rustici Range Research Endowment

Questions?