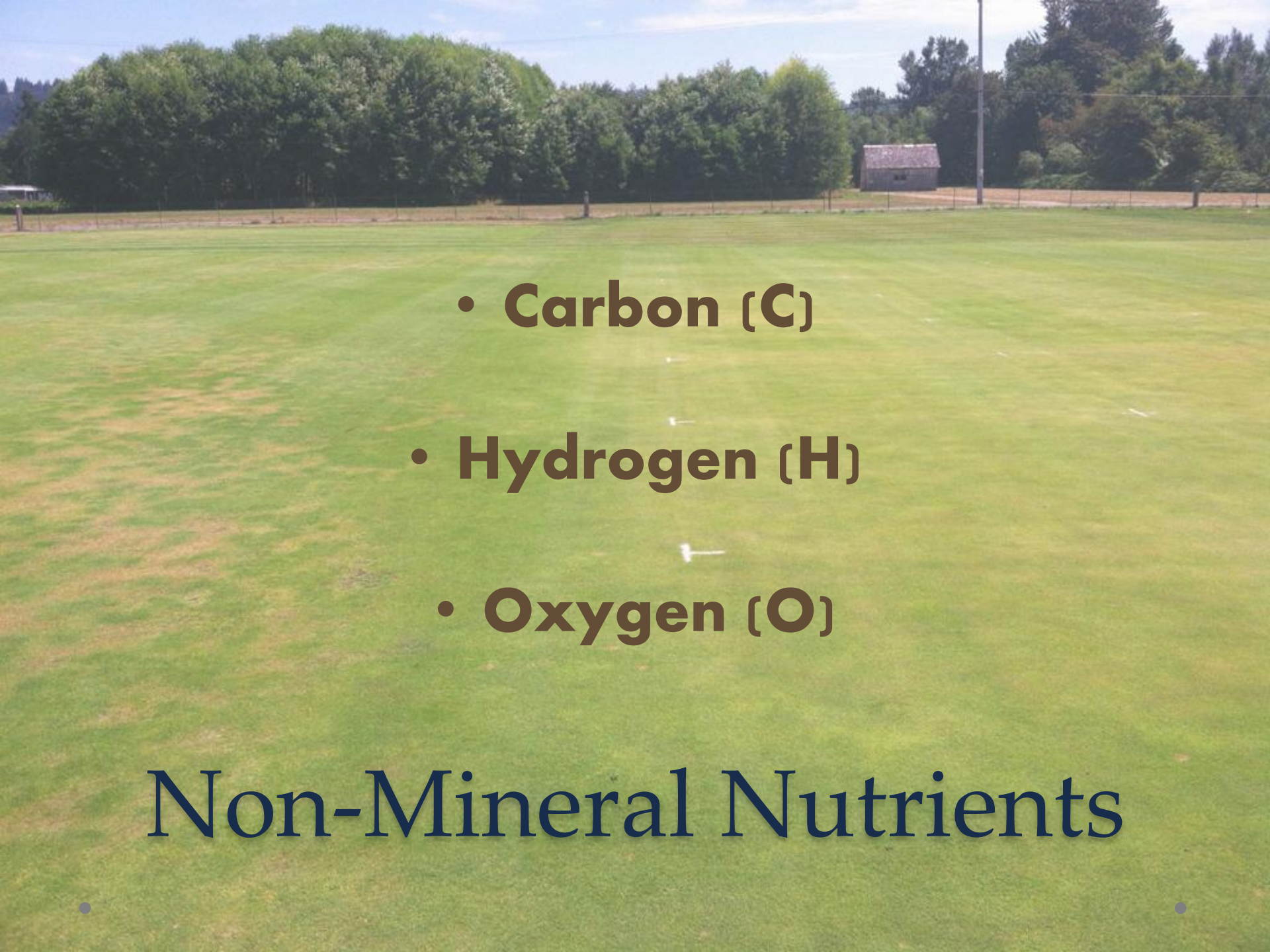
ORGANIC AND SYNTHETIC FERTILIZERS – WHAT THE SCIENCE SHOWS

And what it all means to you

Nathan Stacey

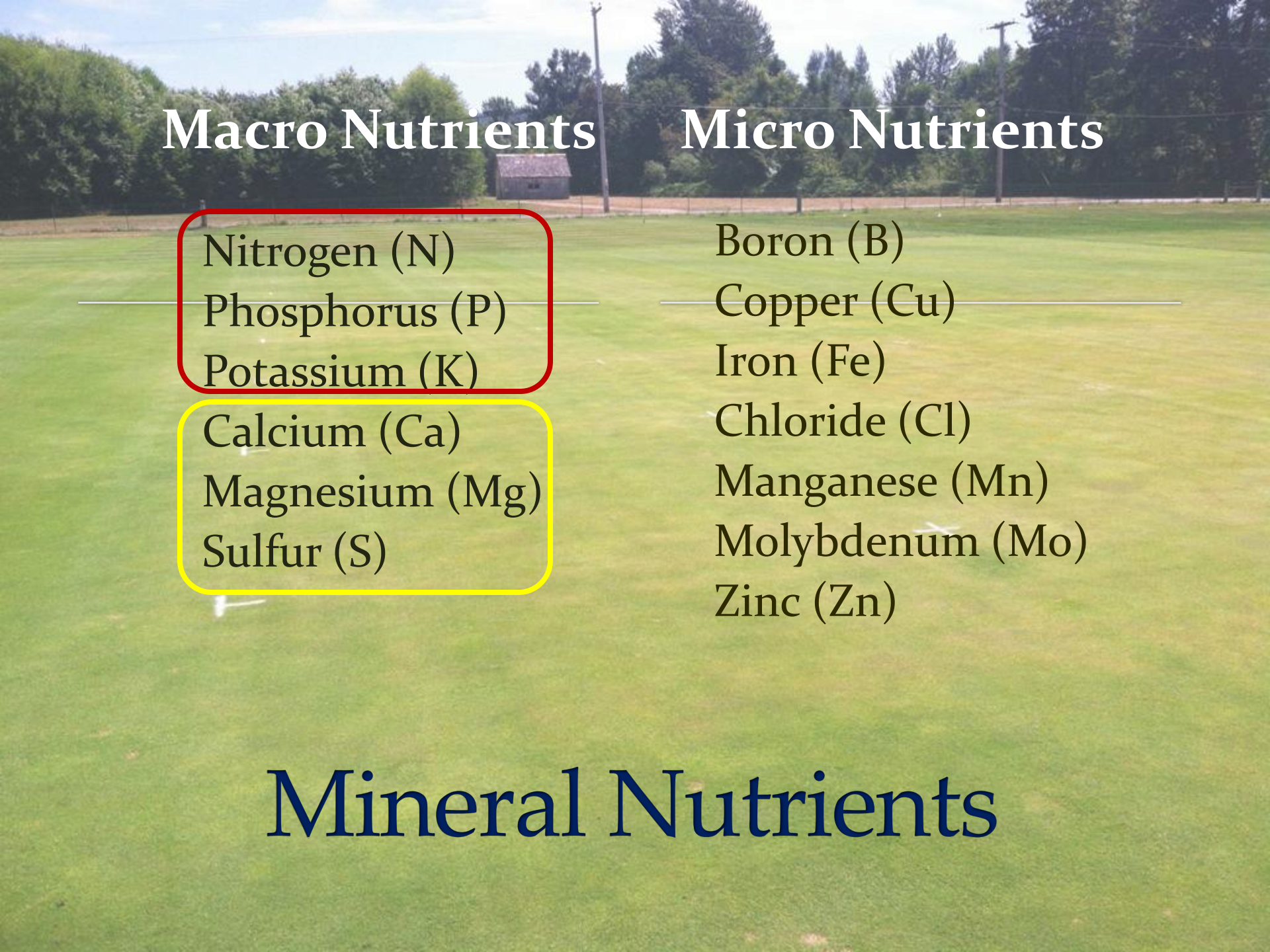
- Graduate Student/Research Technician – Washington State University
- Rutgers State University – Turf Program
- Technician – Seattle Golf Club, PGA West, Pole Creek Golf Club, Bellerive Country Club

Nutrient Requirements



- **Carbon (C)**
- **Hydrogen (H)**
- **Oxygen (O)**

Non-Mineral Nutrients


Macro Nutrients
Micro Nutrients
Nitrogen (N)
Phosphorus (P)
Potassium (K)
Calcium (Ca)
Magnesium (Mg)
Sulfur (S)
Boron (B)
Copper (Cu)
Iron (Fe)
Chloride (Cl)
Manganese (Mn)
Molybdenum (Mo)
Zinc (Zn)
Mineral Nutrients

Plant Available

Nitrogen

- NH_4^+ (Ammonium)
- NO_3^- (Nitrate)

Phosphorus

- PO_4^{-3} (orthophosphate)

Form of Nutrient


What's the Point?
Environmental Fate
Leaching
Volatilization
Soil Erosion/Runoff
Plant Material

SOURCES (TYPICALLY)

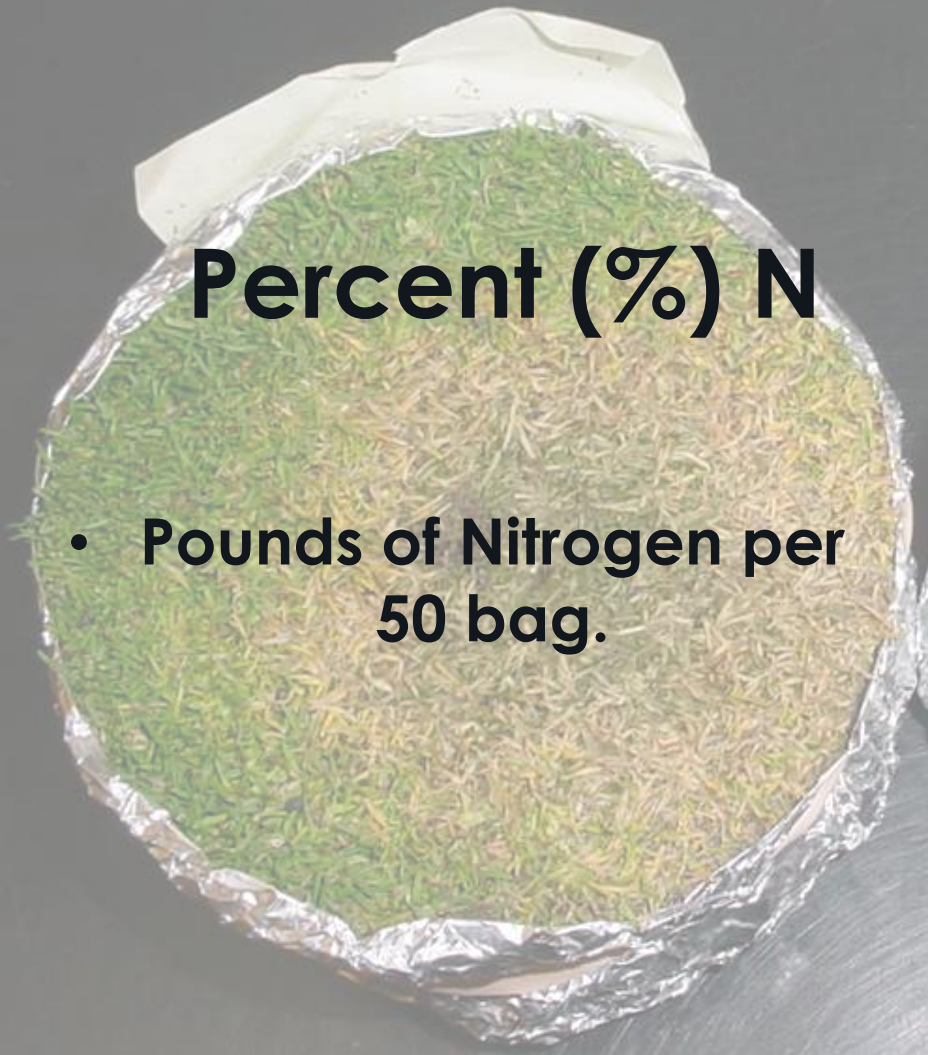
Synthetic

- Ammonium Sulfate
- Ammonium Nitrate
- Urea
- Urea Formaldehyde
- Methylene Ureas
- Sulfur-Coated Ureas
- Poly-Coated Sulfur-Coated Ureas

Natural Organic

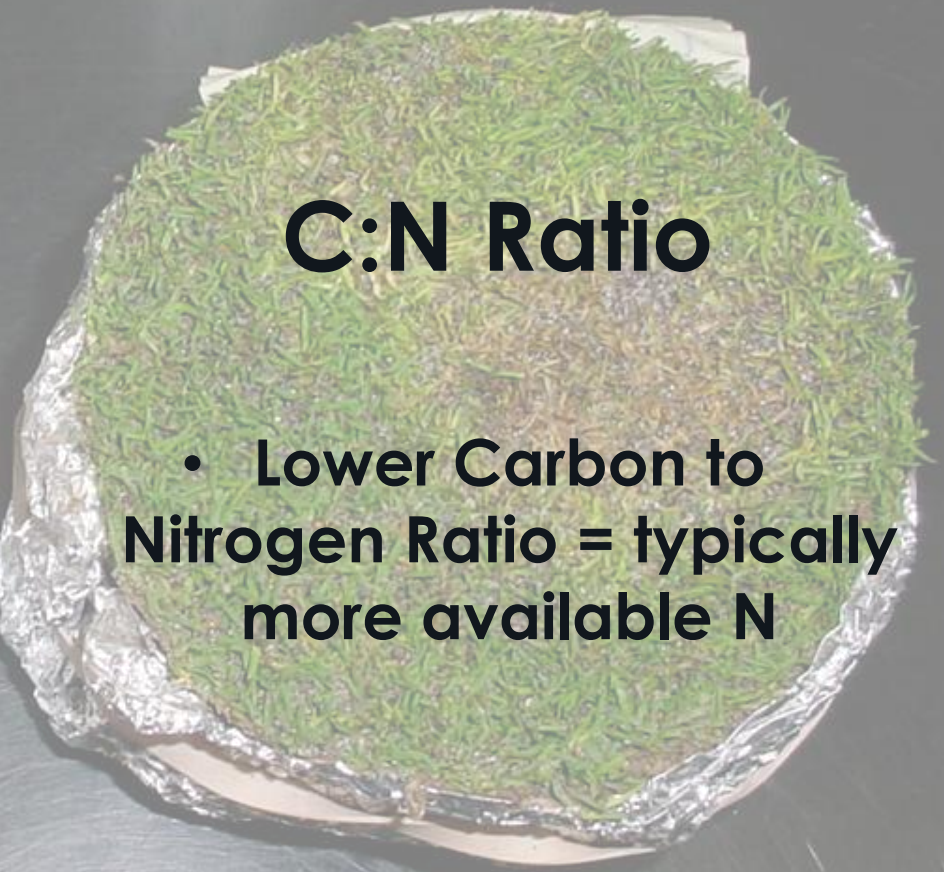
- Bone Meal
- Chicken Meal
- Blood Meal
- Hydrolyzed Feather Meal
- Bio-solids
- Compost Blends

Terminology difference



Percent (%) N

- Pounds of Nitrogen per 50 bag.



C:N Ratio

- Lower Carbon to Nitrogen Ratio = typically more available N

Bone Meal, Steamed Bone Meal, Fish Bone Meal

- 1% N, 20% P, 23% Ca
- slow release
- Dried, ground, steamed, pressure cooked to remove fat, proteins, fibers

Feather meal, hydrolyzed poultry feather meal

- 13% N
- Slow release
- Feathers processed at 285F

Soybean Meal

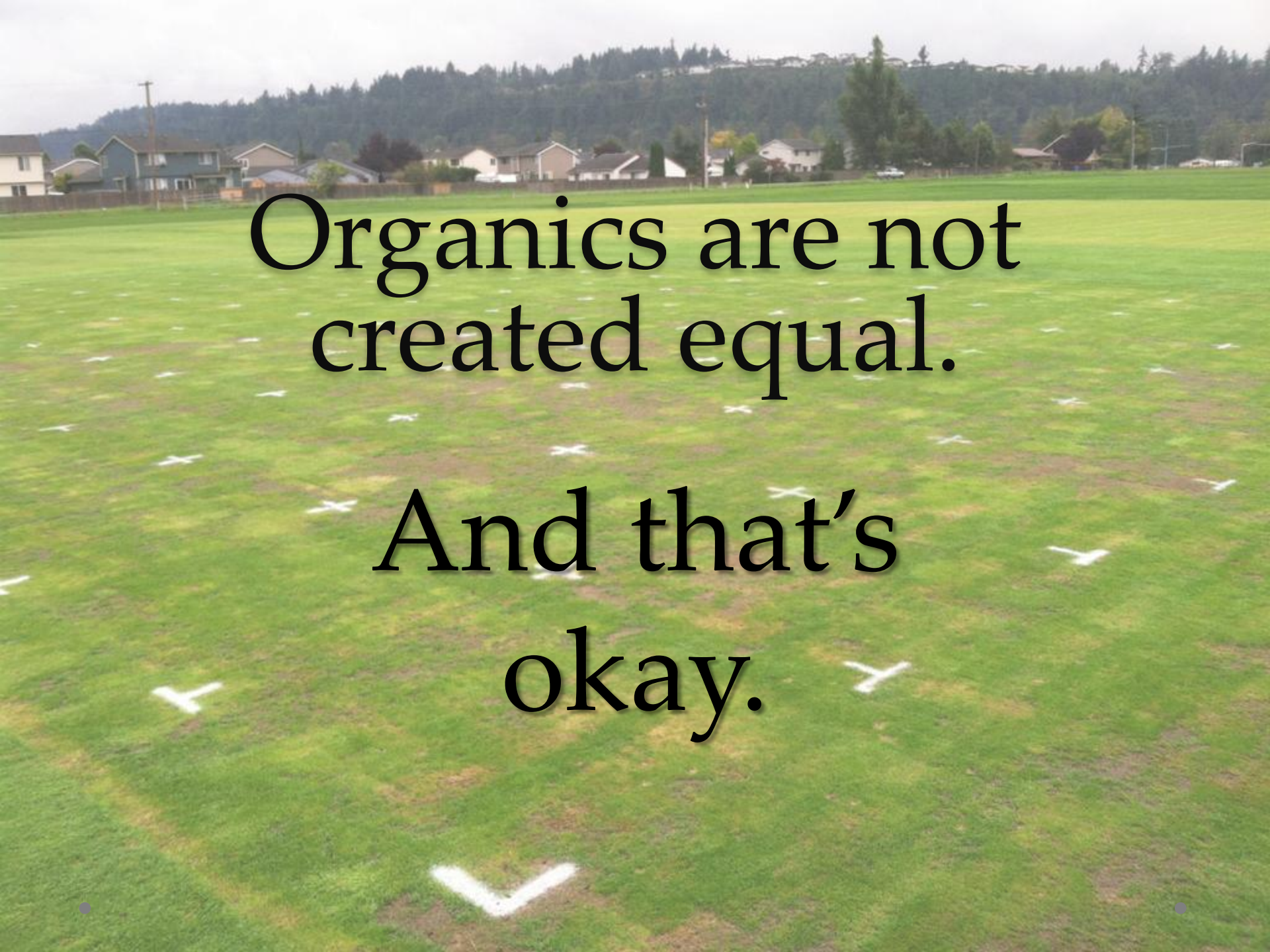
- 7% N, 2% P, 1% K
- Slow release
- Remaining product following extraction of oil from the beans.

Alfalfa Meal

- 3% N, 1% P, 2% K
- Slow release
- Dried, ground, pelletized alfalfa

Seaweed extract

- Also called kelp powder
- 1% N, 2% K
- Slow release
- dried, ground


Organics are not created equal.
And that's okay.

Natural versus Organic (1997)

- 2 Natural Organics
  - Activated Sewage Sludge
  - Bone Meal, Blood Meal, Wheat Germ, Hydrolyzed Poultry Feather Meal.
- 2 Natural Organics blended with synthetics.
- Urea.

Carrow, Robert. Agronomy Journal, Vol. 89, May-June 1997

Natural versus Organic (1997)

- N1 and N2 lower visual quality ratings (initially) over two years as compared to Urea.
- N1 less total growth and less mowings.
- Overall lower ratings in initial, and intermediate timeframe, **but** similar long-term performance (61-90 days).

ORGANIC VERSUS SYNTHETIC (2004)

- At establishment leachate in Nitrogen = high. Year two no difference from Control except for dairy compost.
- P – loss in year one –only swine and dairy compost significant (possible due to N based program). Year two – no differences from control.

Easton, Zachary and Petrovic, A. Martin. Journal of Environmental Quality, Vol. 33, March-April 2004.

ORGANIC VERSUS SYNTHETIC (2004)

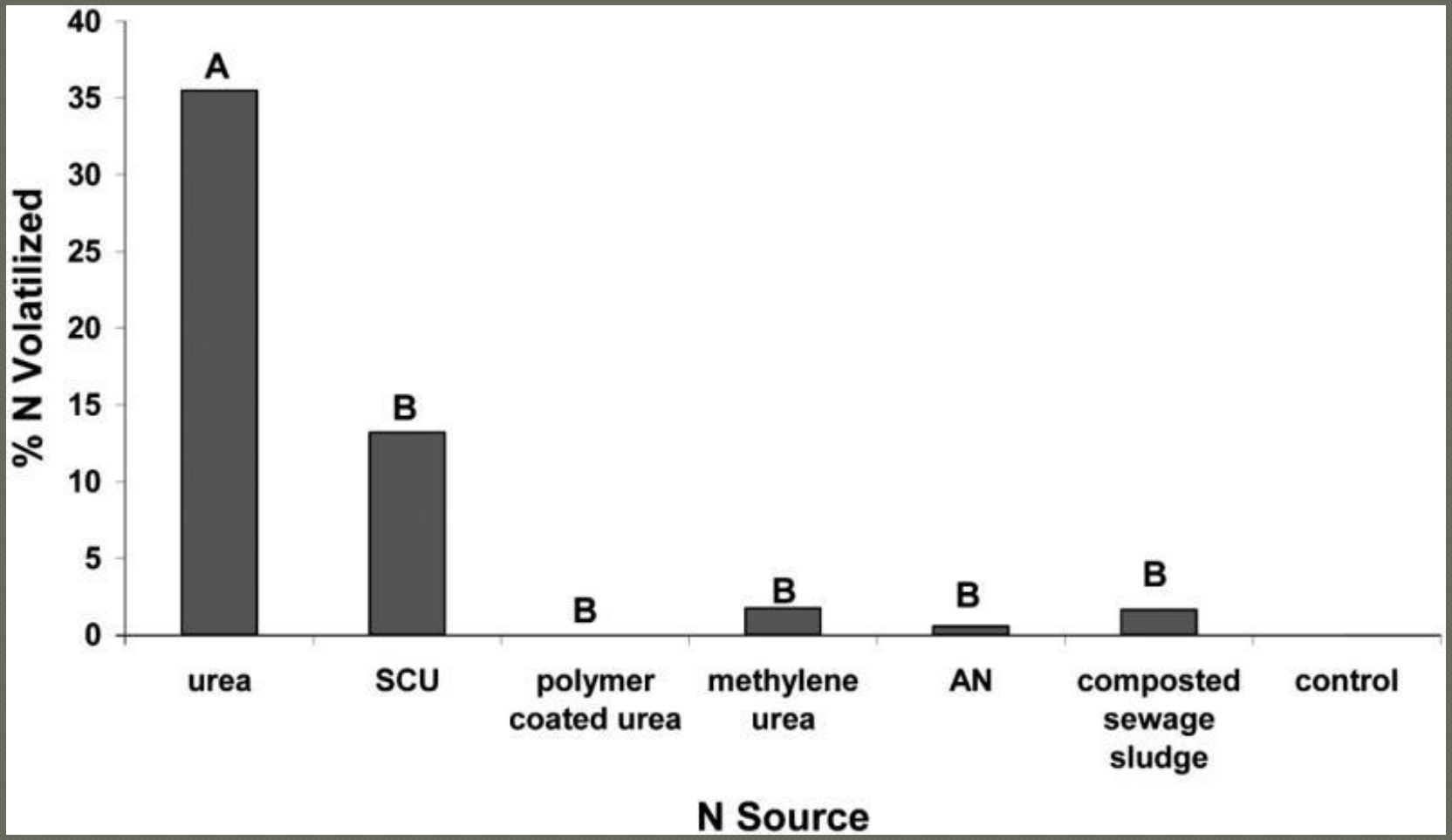
- Solubility plays a role in leachate (duh).
- There is some type of loading in the soil system whereby N and P from organic sources are “stored” in the soil. Possible future leaching? (tissue uptake)

Organic Versus Synthetic (2007)

- 5 synthetic fertilizers compared with dehydrated sewage sludge.
- Measuring volatilization in Bermudagrass

Ellen C. Knight, Elizabeth A. Guertal and C. Wesley Wood. Crop Science. Vol.47, July, 2007.

Organic Versus Synthetic (2007)



What did we find?

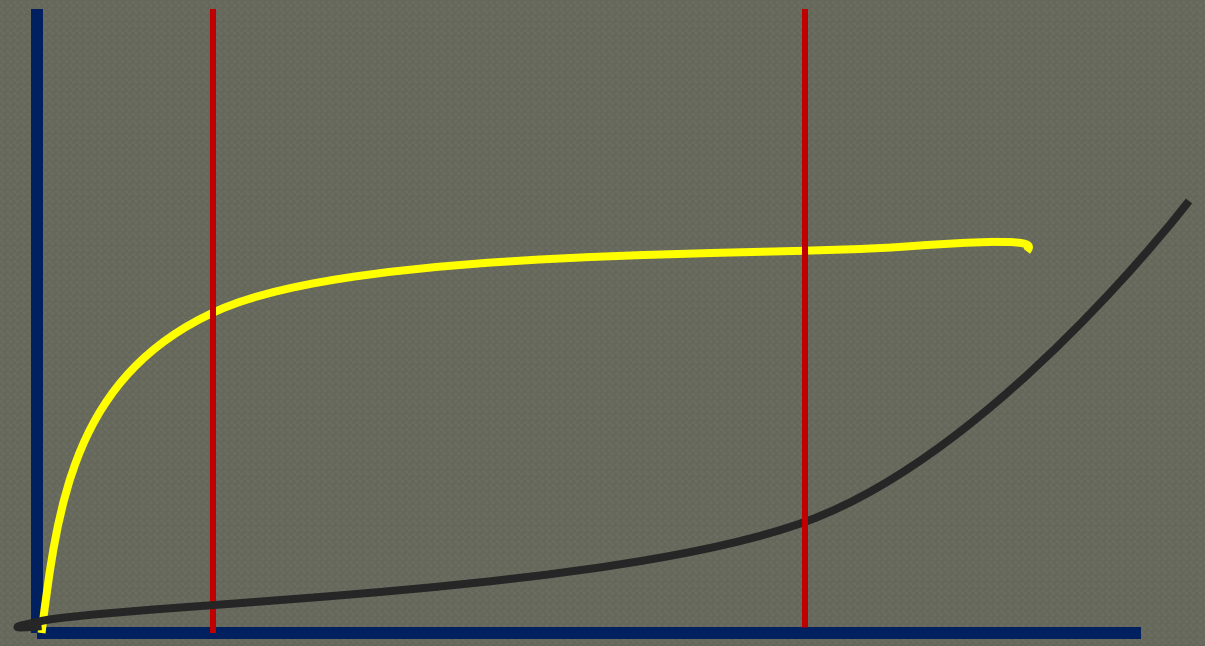
- Organic Nitrogen releases slower (less control).
- Reduced Leaching
- Reduced Volatilization

Phosphorus Consideration.

- Adding fertilizer to meet Nitrogen requirements on sand.
- Phosphorus levels have a potential to reach leach thresholds.

Stahnke et. al. Applied Turfgrass Online. March 15, 2013.

Phosphorus in Plant & Soil.



Practical Thoughts.

- Nitrogen is available – just slower.
- Less soluble.
- Microbes like heat. Soil temperature is important.

Practical thoughts.

- Mulching clippings does add Nitrogen.
- Timing is going to be important.
- Can use a blend for upfront N, and slow-release organic.