How to Manage Your Soil: Nitrogen and Phosphorus

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Main Strategy

1. Soil test

2. Follow the soil test recommendations

So we can all go home and relax?

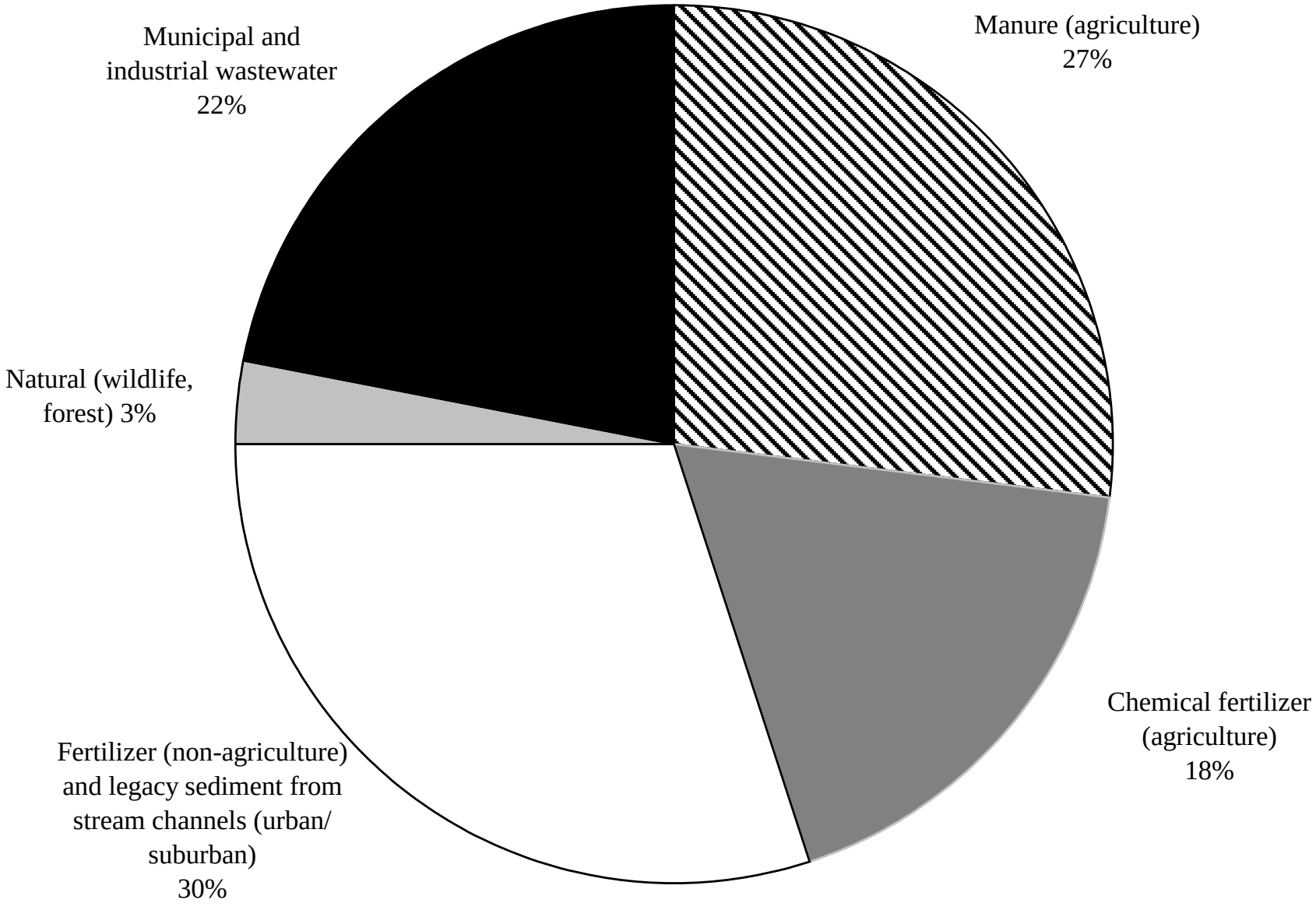
Questions

- Predict plant available P and K by soil testing, but not reliably N – why?
- Nutrient requirements are not the same for all flower beds/ yards – why?
- Nutrient management harder with organic sources than chemical fertilizer?
- If we know 55ppm P in soil is adequate for most plants, why do soil tests range from 2-2000ppm? Where are they?
- Do urban areas contribute much P and N to the Chesapeake Bay? If so how?
- From what depth do you take a soil sample?

True or False

- You need to apply phosphorus fertilizer every year "for the roots"
- You need to apply nitrogen fertilizer every year "for the shoots"
- 10-10-10 fertilizer - the last of these numbers tells you how much lime it contains
- You only need to soil test turf every 3 to 5 years
- You can only soil test in the spring
- Soil sample from established turf should be taken from 2-4" depth

Phosphorus contributions to the Chesapeake Bay (Bay Model)

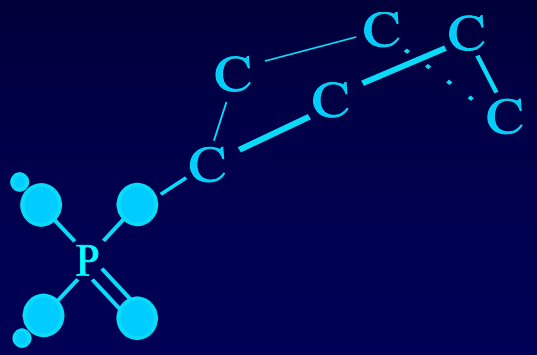


Nitrogen Transformations

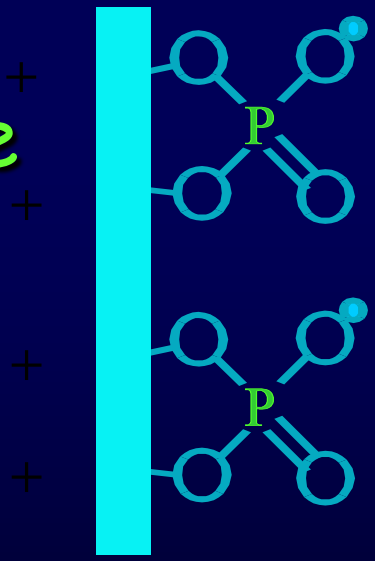
- Mineralization: Conversion of organic-N to ammonium-N [Soil Organic Matter: 97 to 99% of total soil N]
- Nitrification: Conversion of ammonium-N to nitrite and to nitrate by soil bacteria [plant available]
- Losses of N from soil
  - Uptake
  - Leaching and runoff
  - Volatilization
  - Denitrification

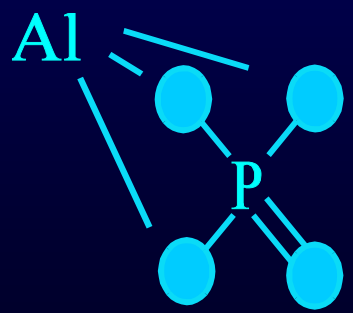
Phosphorus Transformations

- Organic P (30-50%)



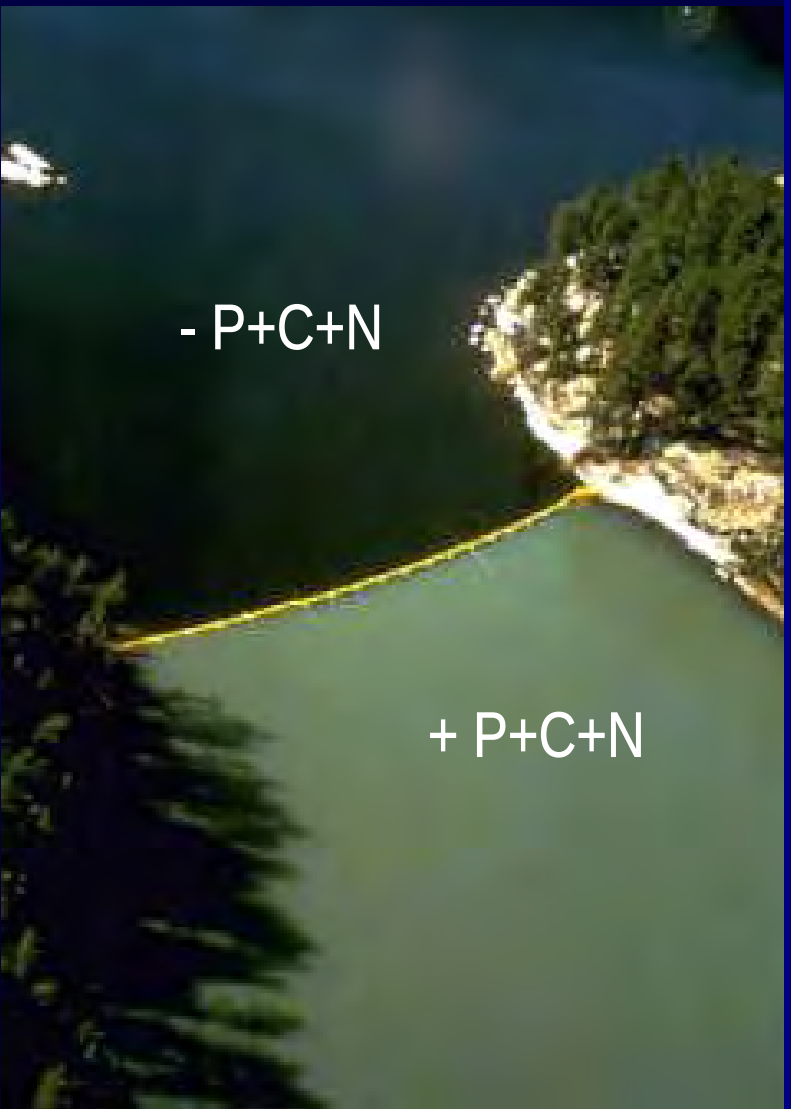
- Inorganic P fairly insoluble
- Adsorbed Inorganic
- Precipitates



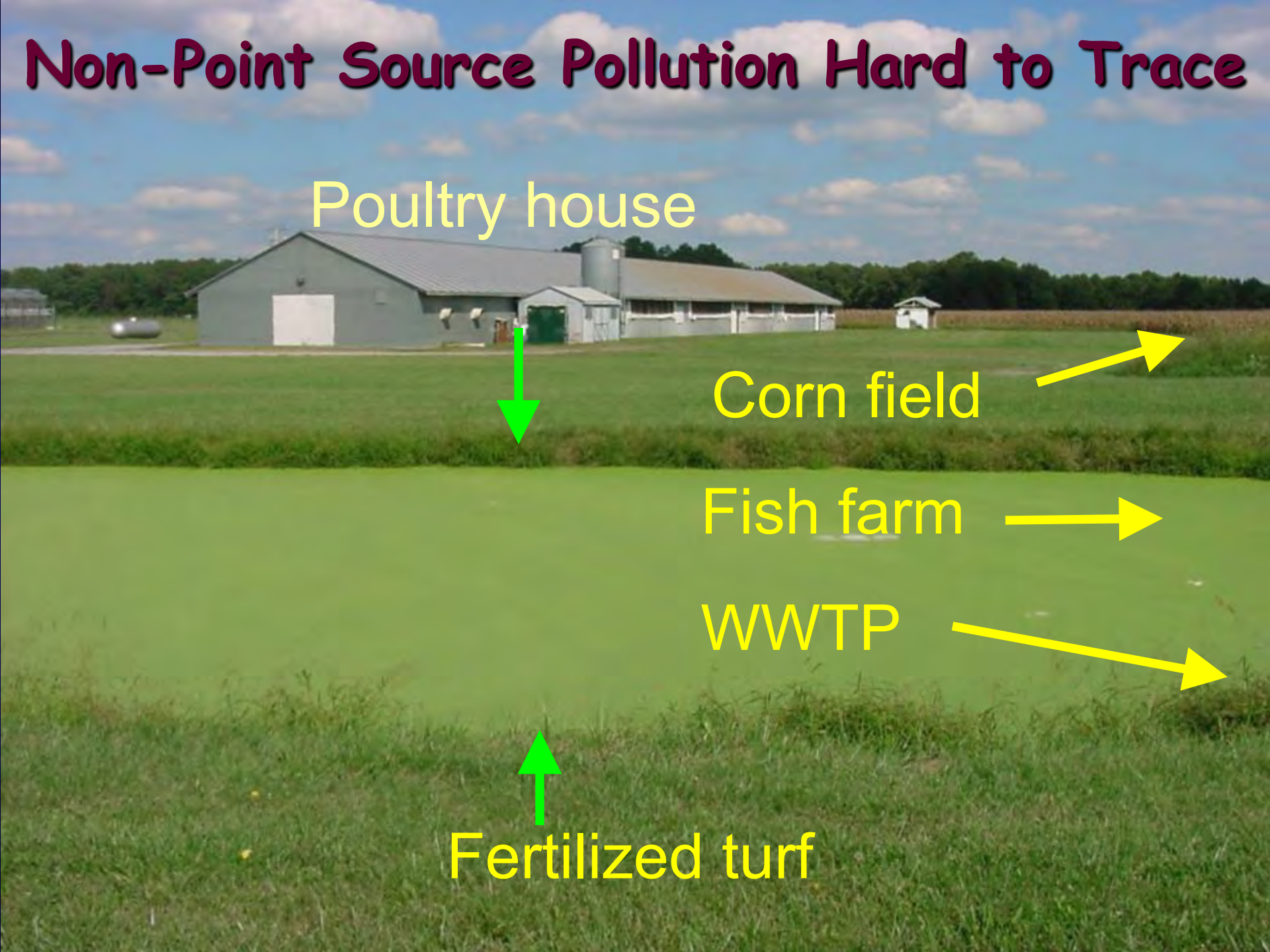


Phosphorus Generally Limiting in Freshwater Systems

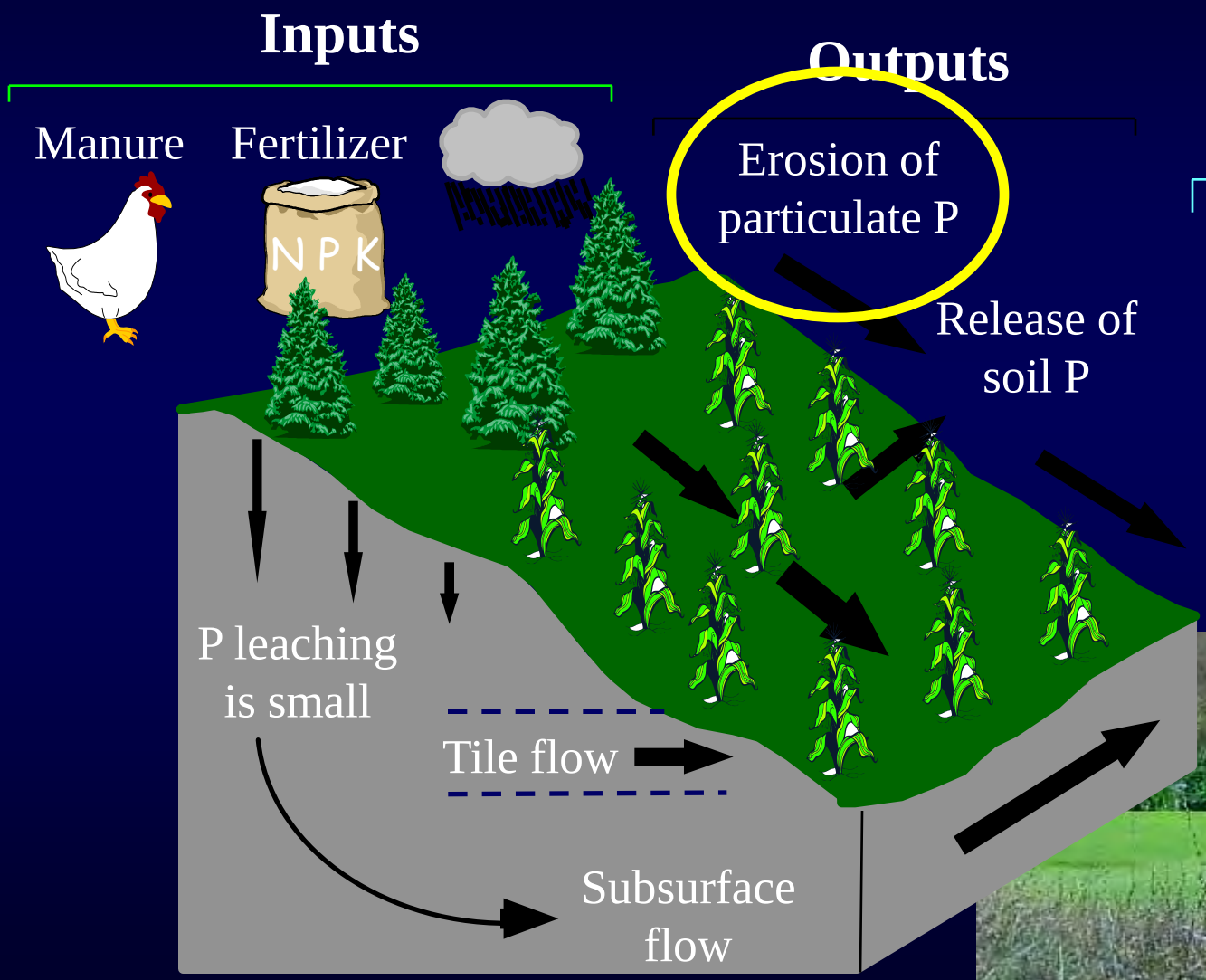
University of Manitoba Experimental Lakes Area Research Project



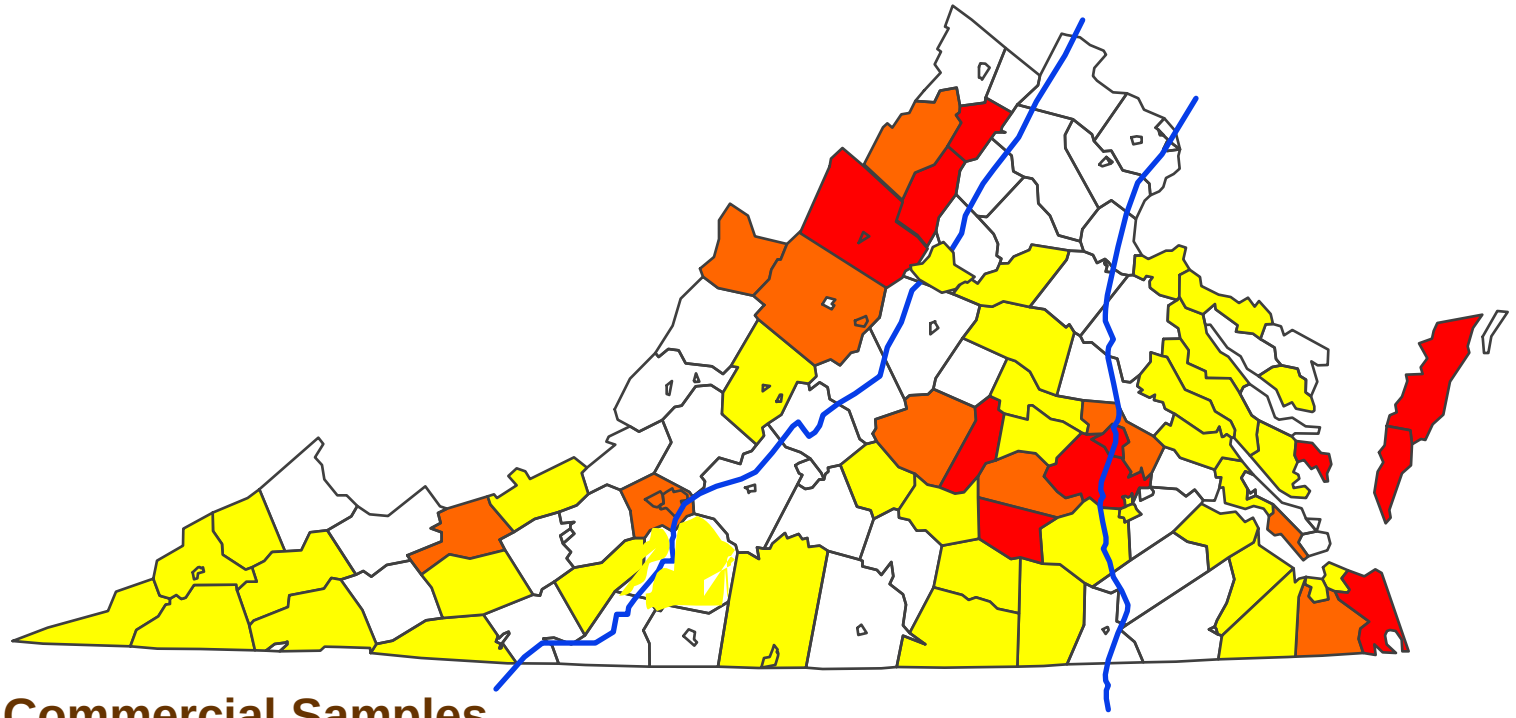
Non-Point Source Pollution Hard to Trace



Pathways of Transport



Agronomic Soil Test P in Virginia for years 2004-2006. (% soils rated "Very High")



92,303 Commercial Samples

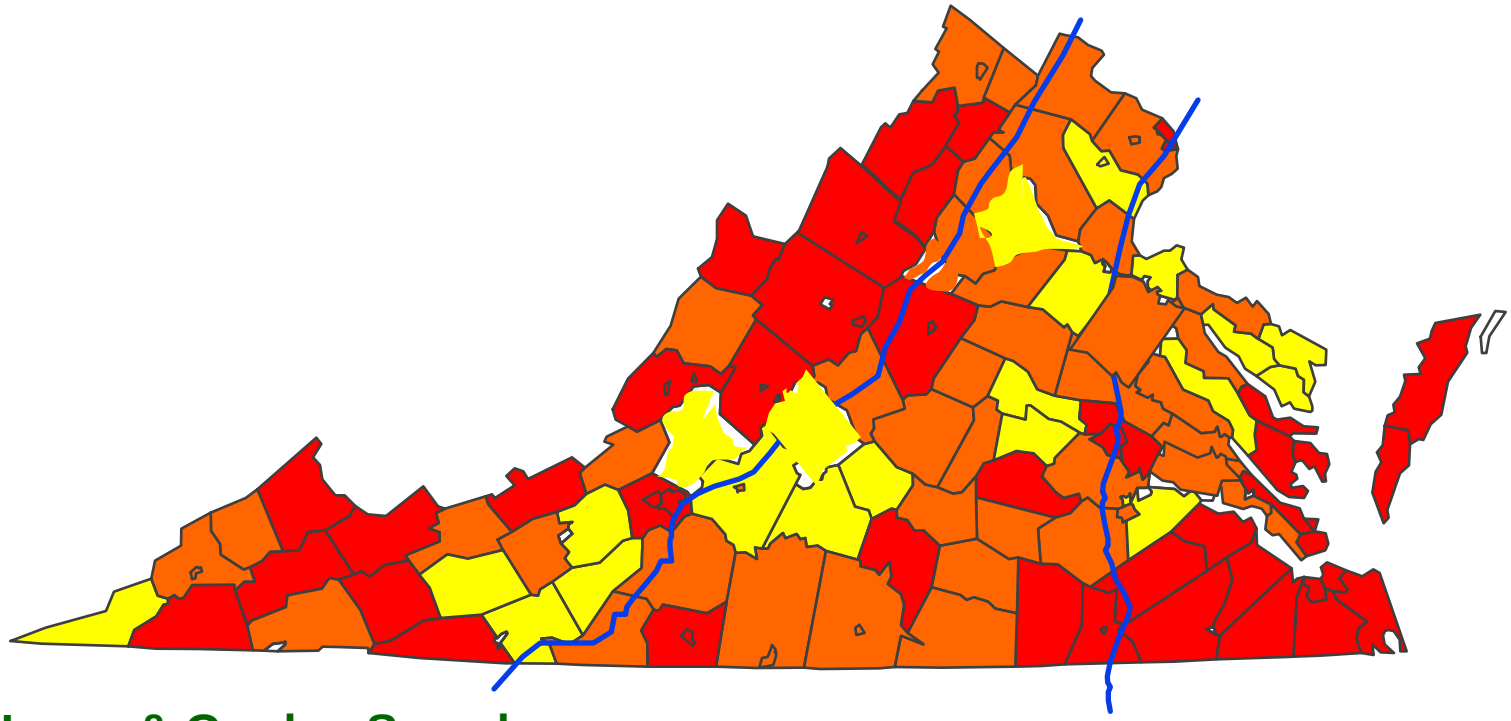
≥10%-Yellow

≥20%-Orange

≥33%-Red

Heckendorn and Maguire, 2007

Agronomic Soil Test P Data Base in Virginia for years 2004-2006. (% soils rated "Very High")



32,172 Lawn & Garden Samples

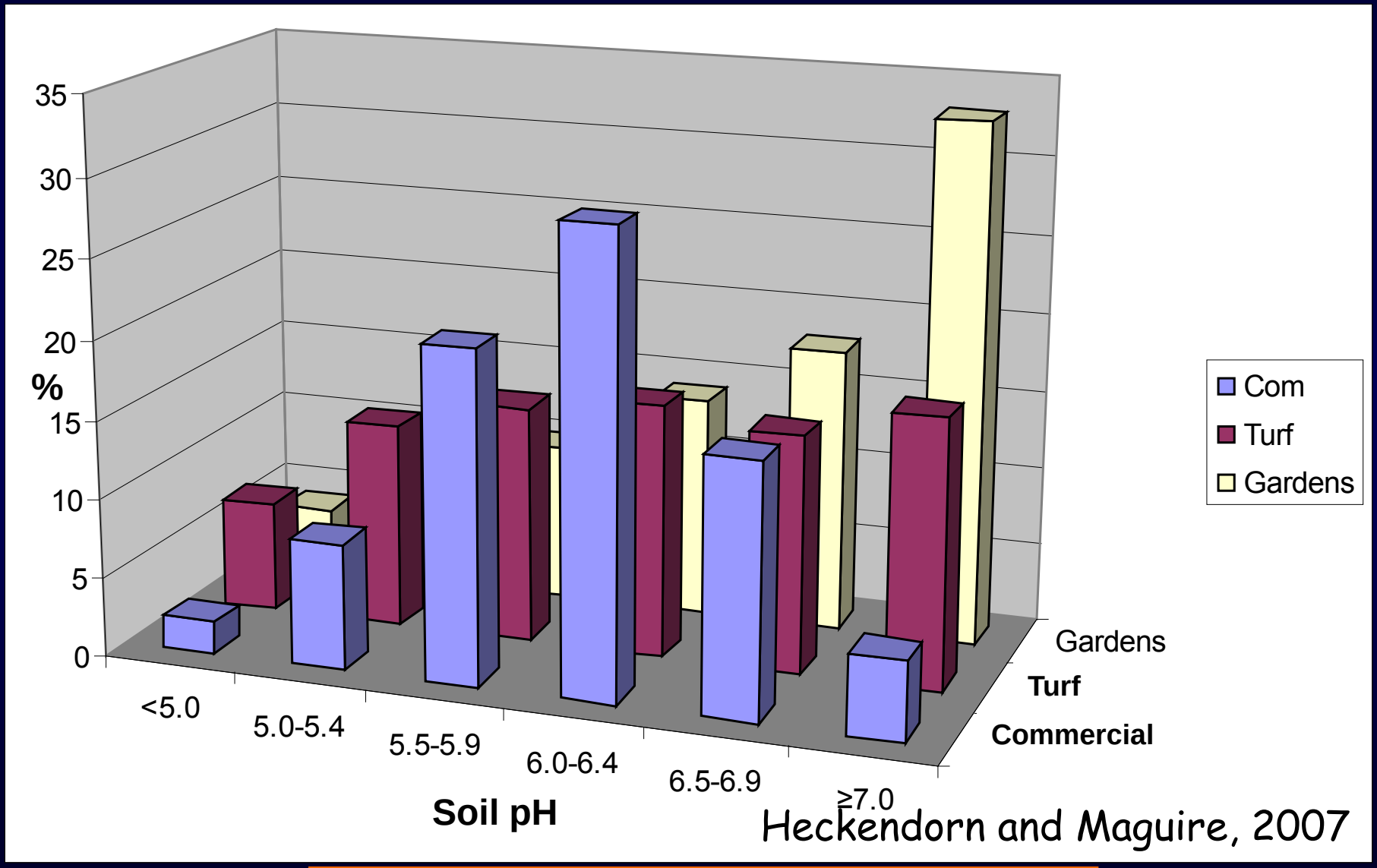
≥10%-Yellow

≥20%-Orange

≥33%-Red

Heckendorn and Maguire, 2007

Soil pH Data in Virginia for years 2004-2006



Heckendorn and Maguire, 2007

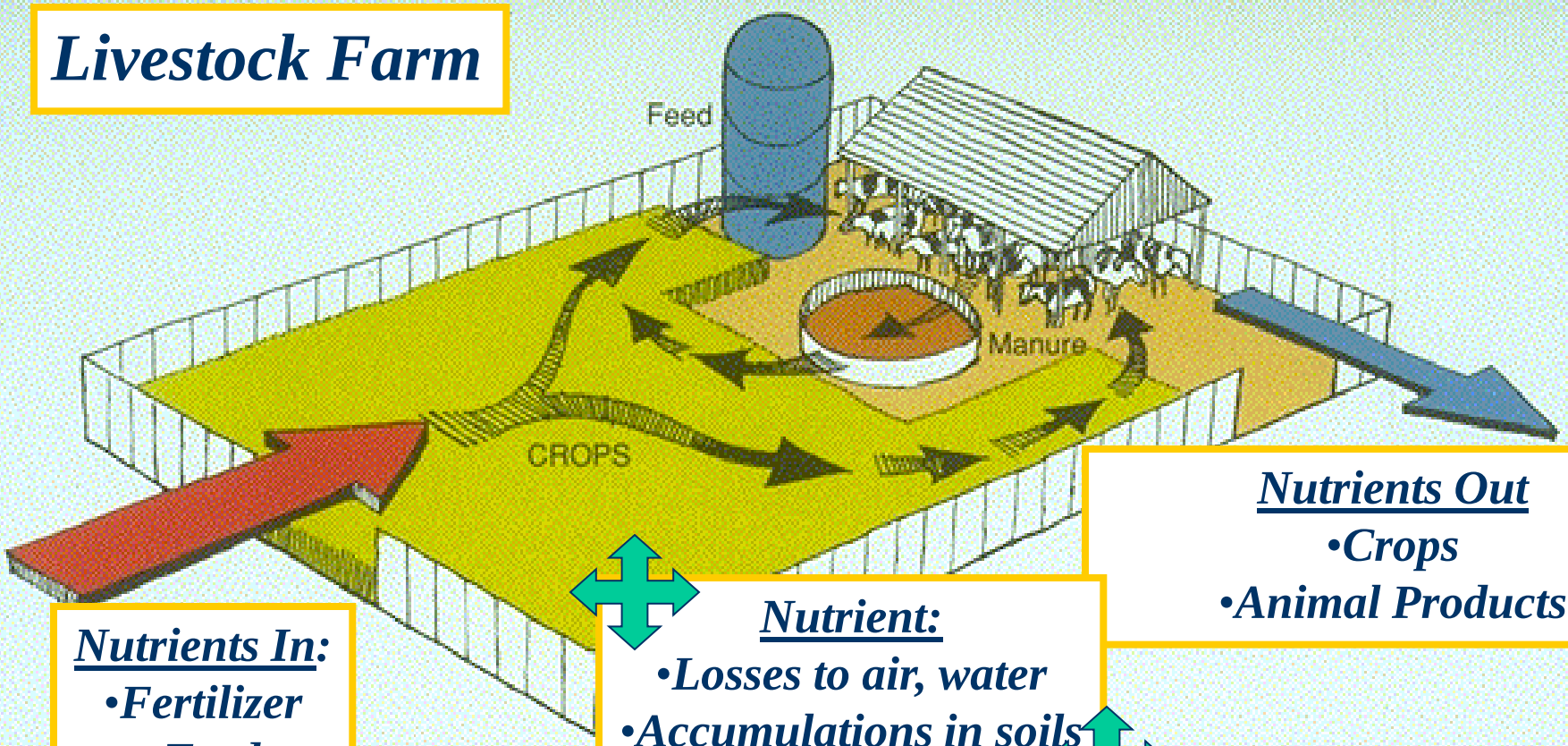
Is turf environmentally good or bad?

How Important is Soil Erosion?


How important is soil erosion?
How important is soil test P?

Should we fertilize?

Livestock Farm

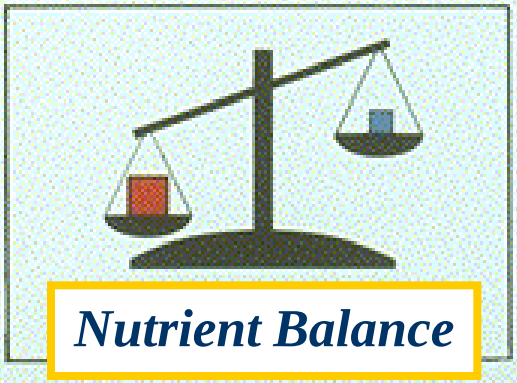


Nutrients In:
- Fertilizer
- Feed

Nutrient:
- Losses to air, water
- Accumulations in soils

Nutrients Out
- Crops
- Animal Products

" A livestock farm is much more complex. We often cannot balance inputs of feed and fertilizers with outputs. This results in excess nutrients that can be lost to air or water or build up in soils.



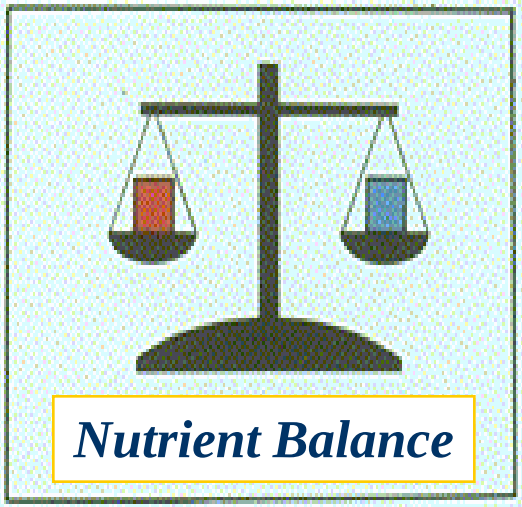
Nutrient Balance

Urban landscape is easy to manage if you follow soil test

Nutrients Out:

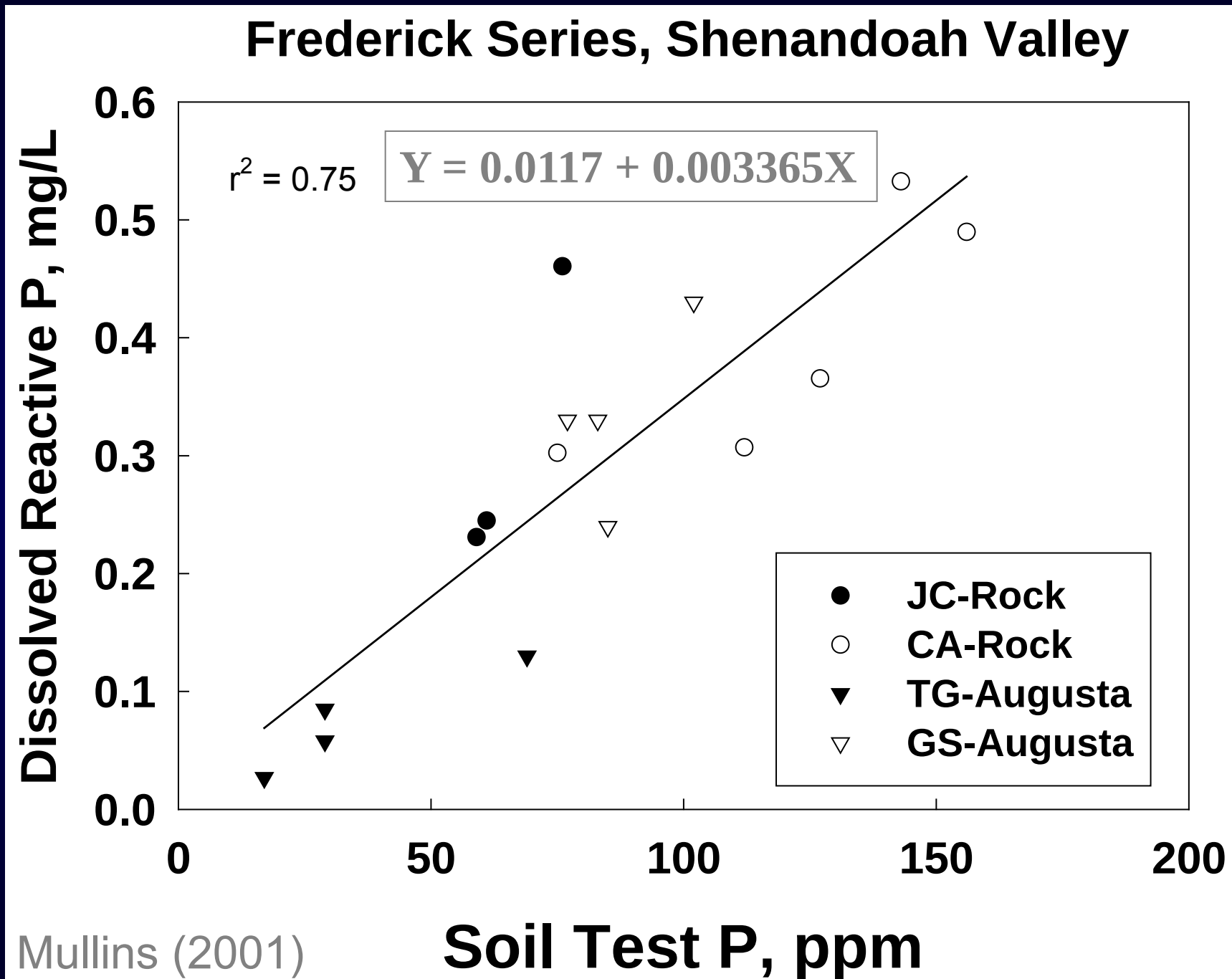
Turf or other

Nutrients In:
Fertilizer

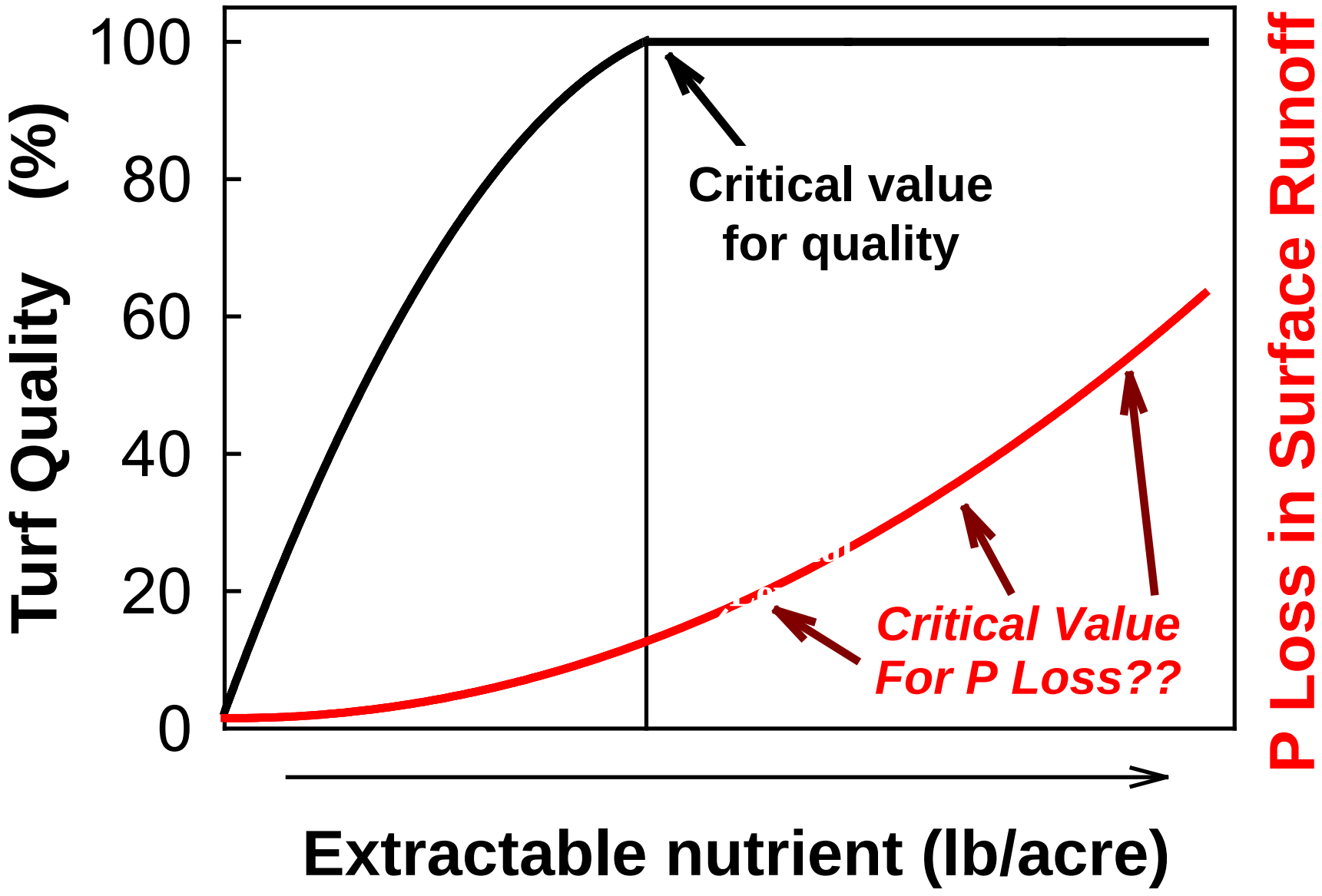


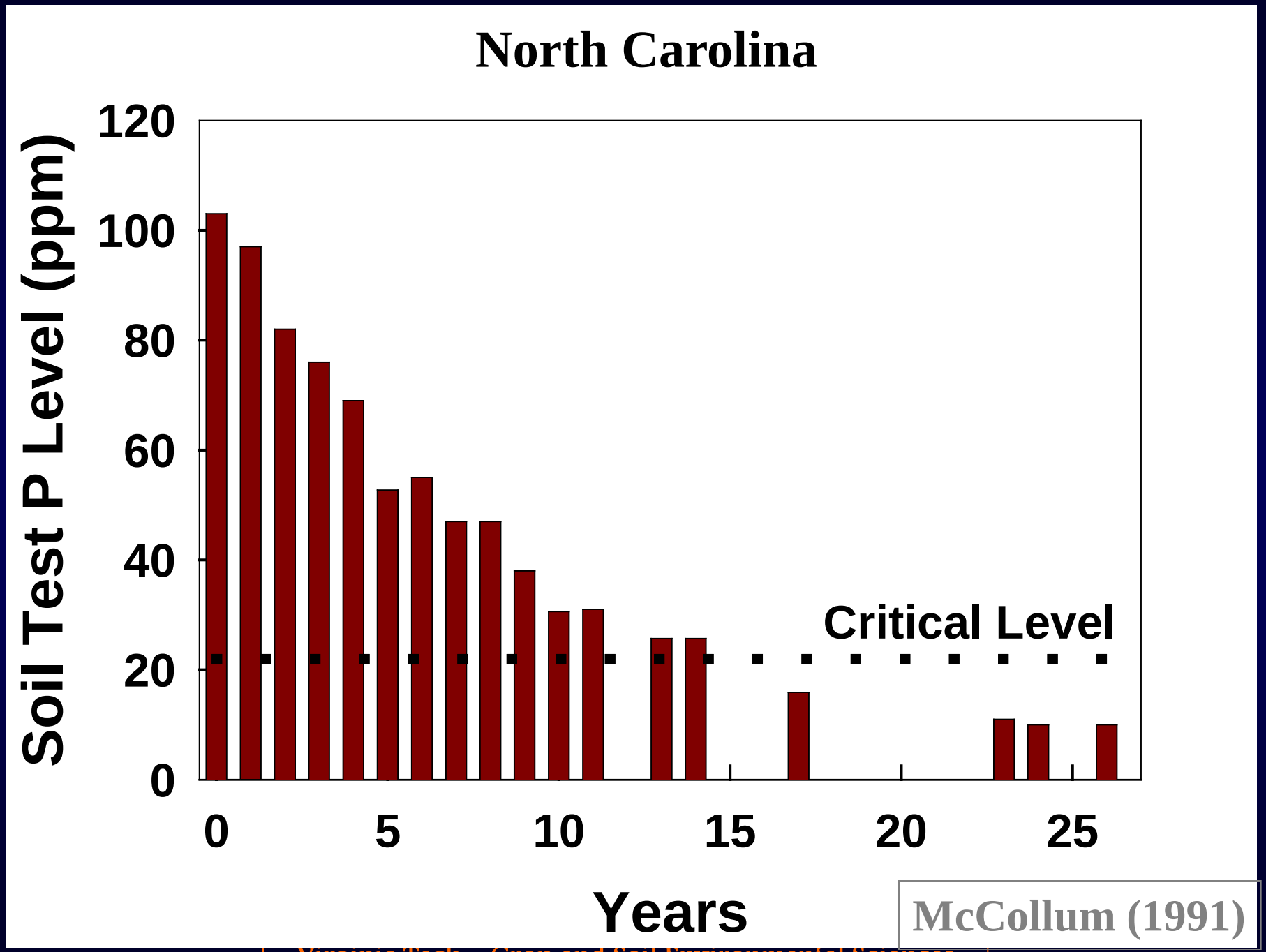
Nutrient Balance

…and follow nutrient recommendations



Mullins (2001)


Turf Quality (%)
100
80
60
40
20
0
Critical value
for quality
Critical Value
For P Loss??
P Loss in Surface Runoff
Extractable nutrient (lb/acre)


North Carolina
Soil Test P Level (ppm)
120
100
80
60
40
20
0
Critical Level
0
5
10
15
20
25
Years
McCollum (1991)

So how do we manage high phosphorus soils?

- Apply zero P fertilizers
  - No organic fertilizers such as compost
- Control erosion – "critical source areas"
- Remove clippings
- Soil test every 3-5 years

We know how nutrients move: Runoff versus Leaching

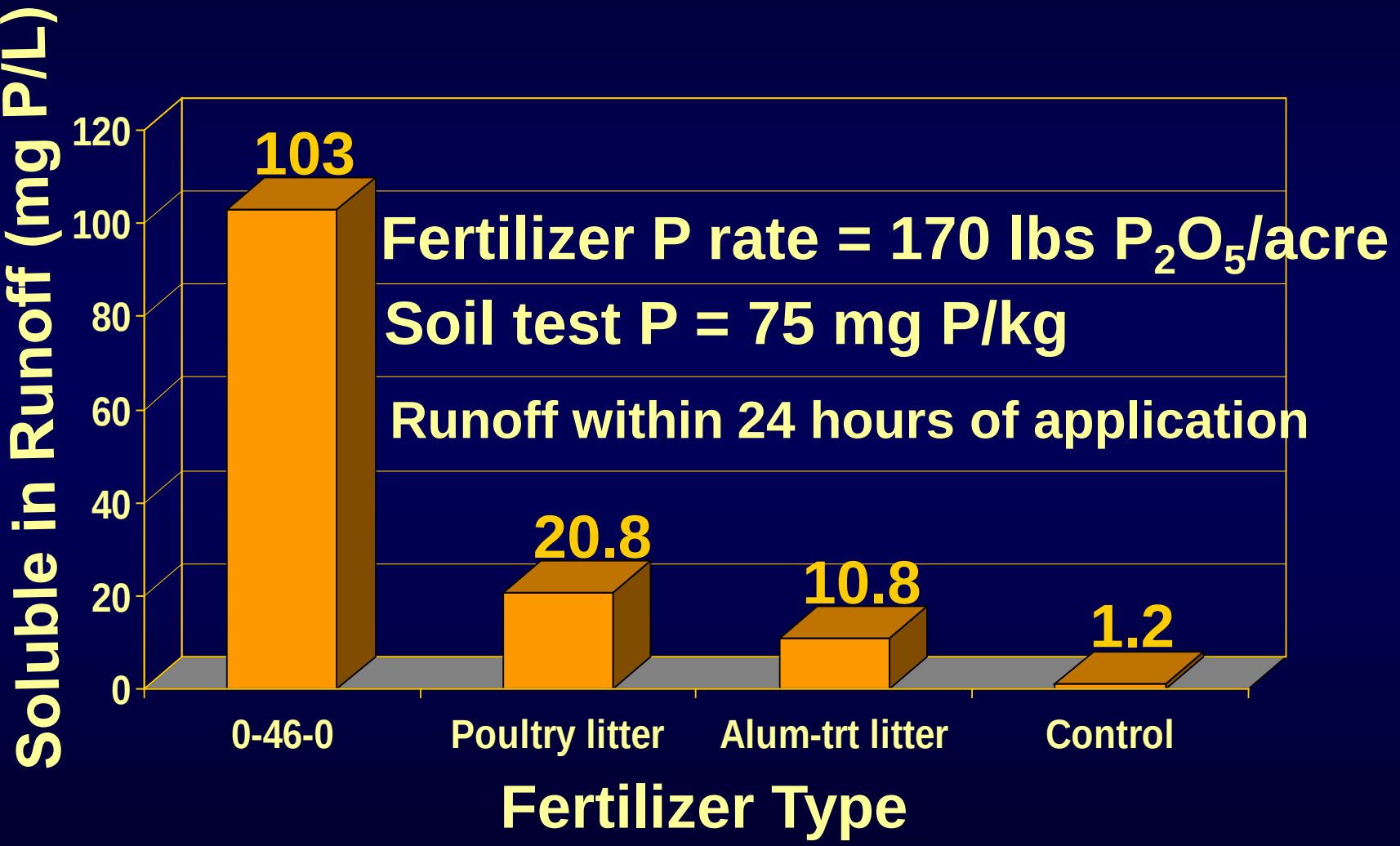
N Movement

Nitrate Leaches!!

P Movement

P Leaches Slowly

We know the importance of soil test P versus fertilizer



General Recommendations

1. Apply soluble fertilizer at no more than 0.5 lb N/1000 ft^2 at one time
2. Do not apply fertilizer when heavy rains are imminent
3. Fertilization may NOT be required:
   1. If homeowners or clients are pleased with the appearance of their landscape plants;
   2. If plants are established;
   3. If plants are flowering or fruiting, since exposure to high nitrogen at this stage may impede development;
   4. For trees, unless nutrient deficiencies exist.

General Recommendations

1. Fertilizer applied should be the minimal amount to achieve a defined objective
2. Slow-release fertilizer may be an advantage when nutrients cannot be applied as frequently
3. Maintain turfgrass, as low-quality turfgrass areas are more likely to produce runoff and off-site contamination than healthy, well-maintained turfgrass areas
4. 3' "Ring of responsibility" around water courses

Good or bad lawn?

High or low input?

Good or bad lawn?

High or low input?

Low input lawn up close


Fertilizing Around Water
"Ring of Responsibility"

How To Properly Apply Fertilizer

- Use a deflector shield when fertilizing near water bodies or impervious surfaces.


LET ONLY RAIN
DOWN
THE STORM DRAIN

Some of my Recommendations

1. Stabilize disturbed soils ASAP
2. Define objective
3. Apply small amounts of nitrogen at a time or use slow release N
4. Soil test and follow recommendations
5. Soil test and follow recommendations
6. Ring of responsibility
7. Easier to reach large acreage through lawn service providers than individuals
8. We know what to do, implementation the main issue

QUESTIONS?

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