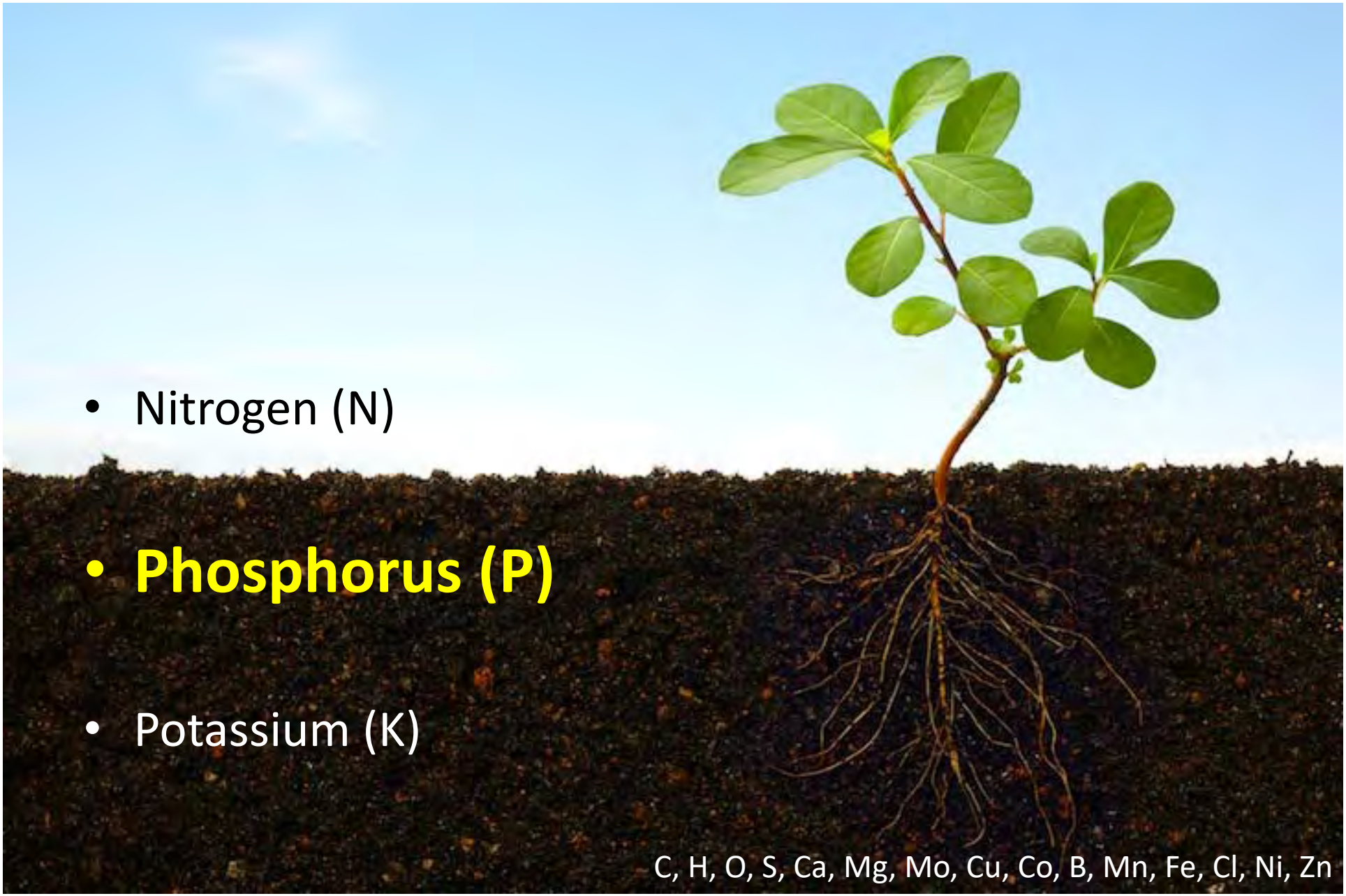
Lawn and Gardening our Way to Hell in a Vegetable Basket

Brad D. Lee, PhD, CPSS
Associate Professor and Extension Specialist
Department of Plant and Soil Sciences, University of Kentucky

Plant requirements



Farm Nutrient Supplements

Home and Garden Nutrient Supplements

Urban

Agriculture

Aesthetics

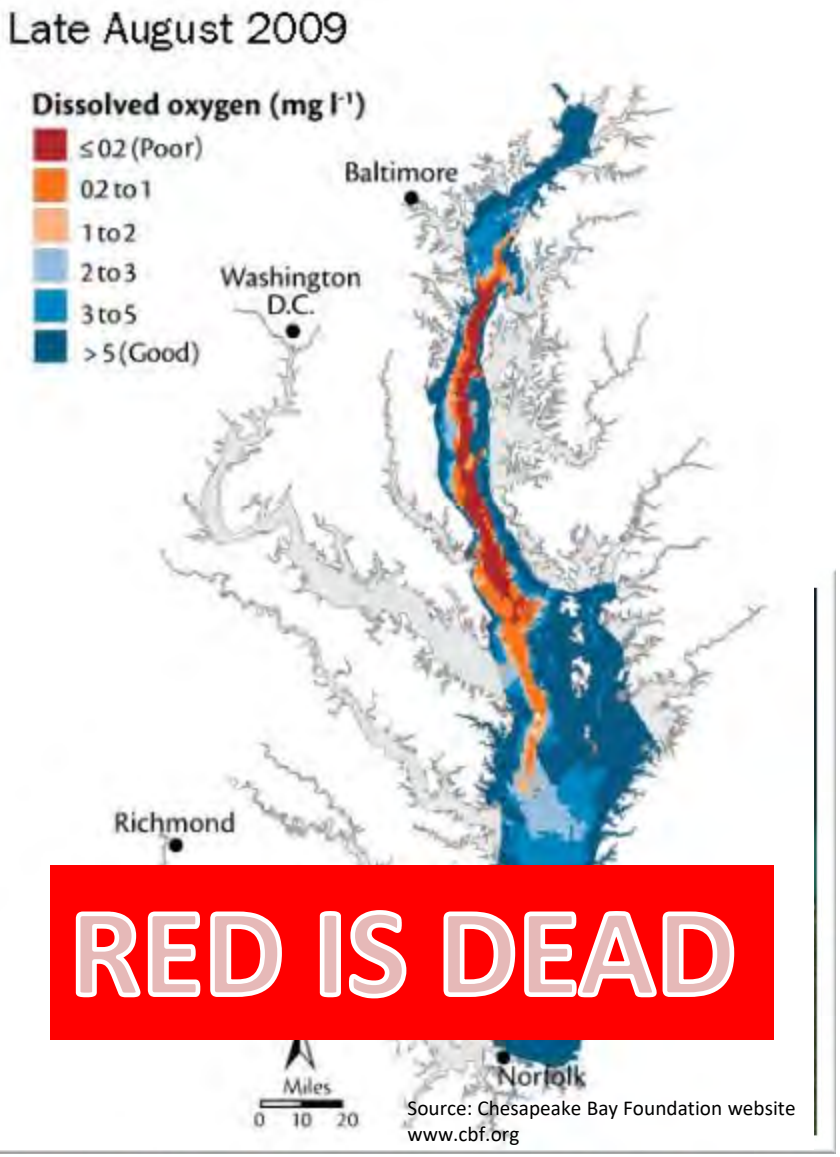
Economics

ALGAL

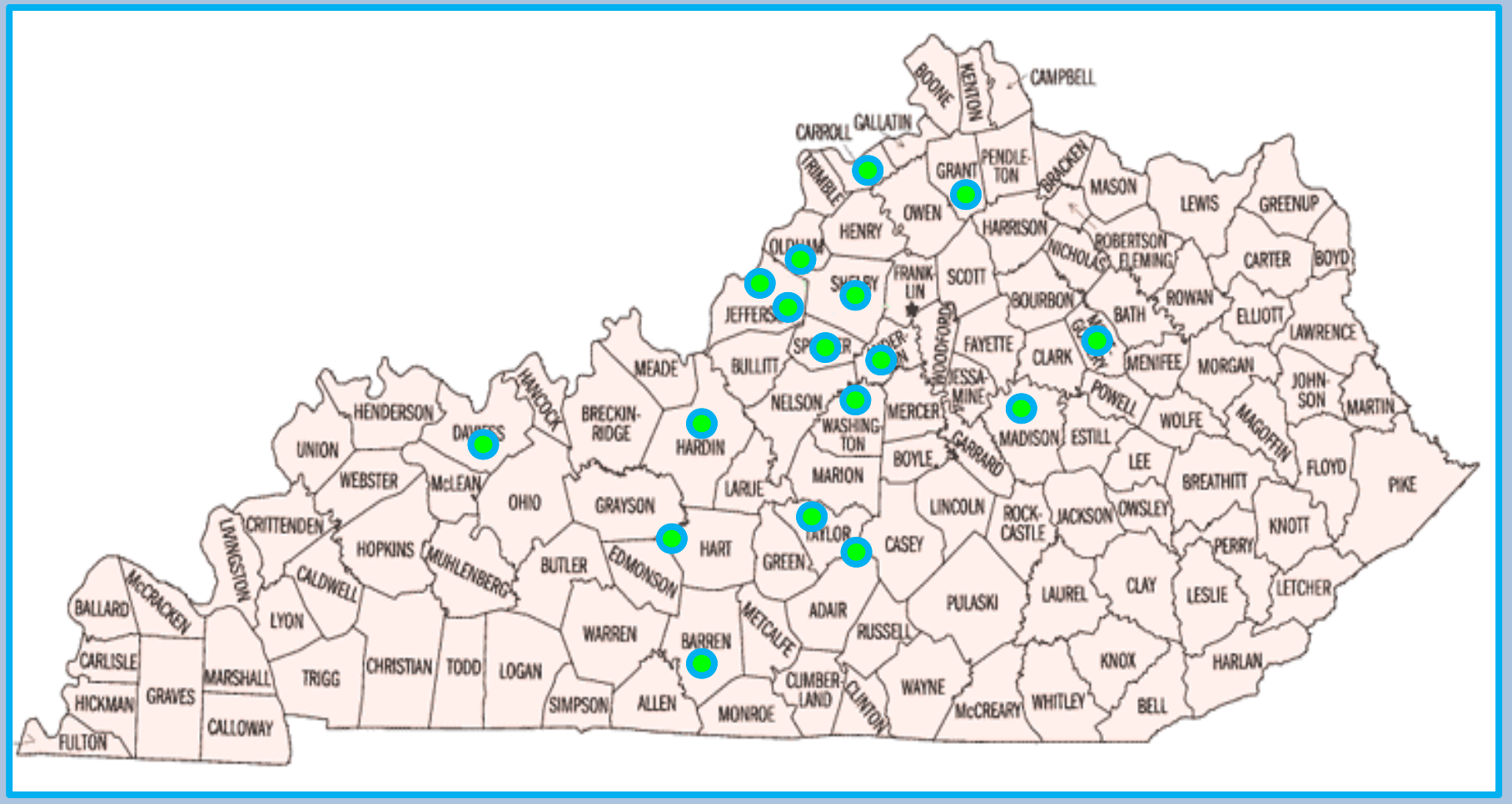
Block Sunlight

Produce Toxins

Decrease Oxygen



Source: Chesapeake Bay Foundation website www.cbf.org



Hazardous Algal Blooms (HABs) Lake Recreational Advisories,
Kentucky Division of Water 2014 - 2016

Urban

Agriculture

Global Developer

Corn Belt Senator

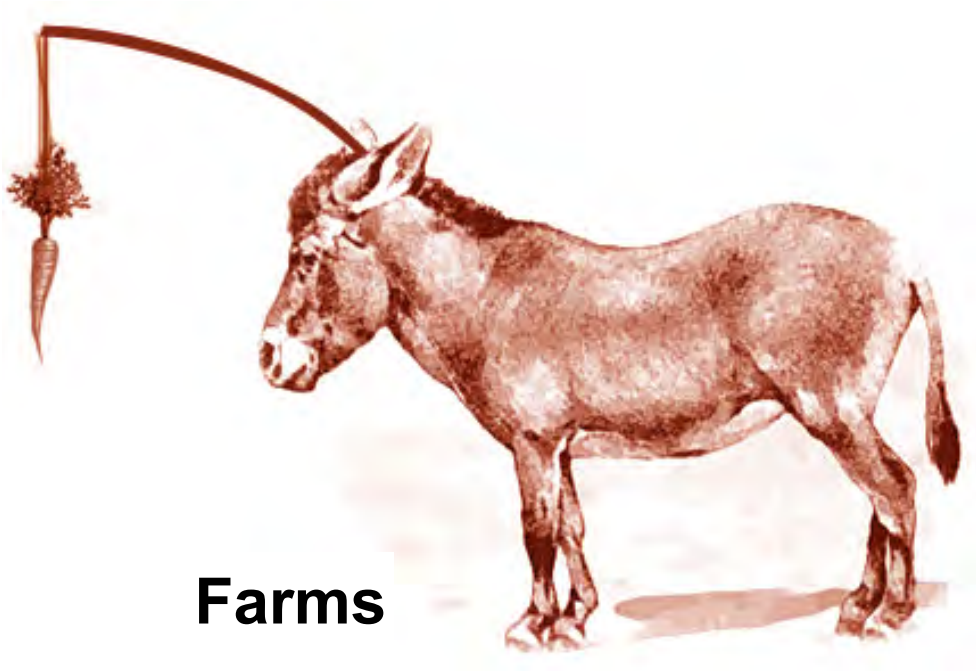
There is a lot of finger pointing regarding which land use is responsible for water quality impairments.

Water Quality Impairments

- In agricultural environments → agricultural runoff
  - Concerns about natural resource loss, nutrient loss and agricultural productivity loss (erosion) (*$$$$$)*
  - Concerns about impairment of nearby streams

- In urban environments → stormwater
  - Increases with abundance of impervious surfaces and population density (*$$$$$)*
  - *Concerns about impairment of nearby streams*

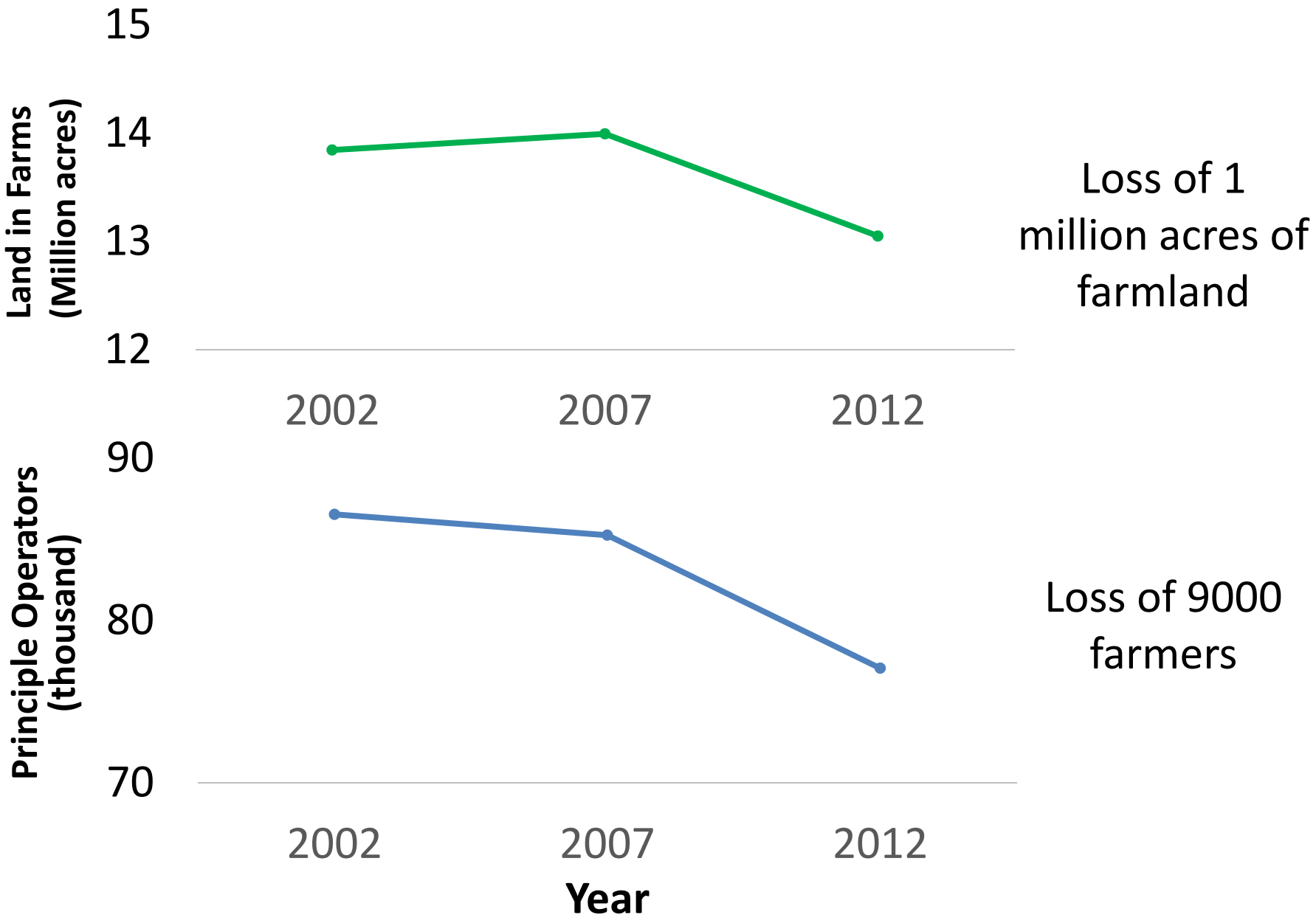
Management of Water Quality Impairments



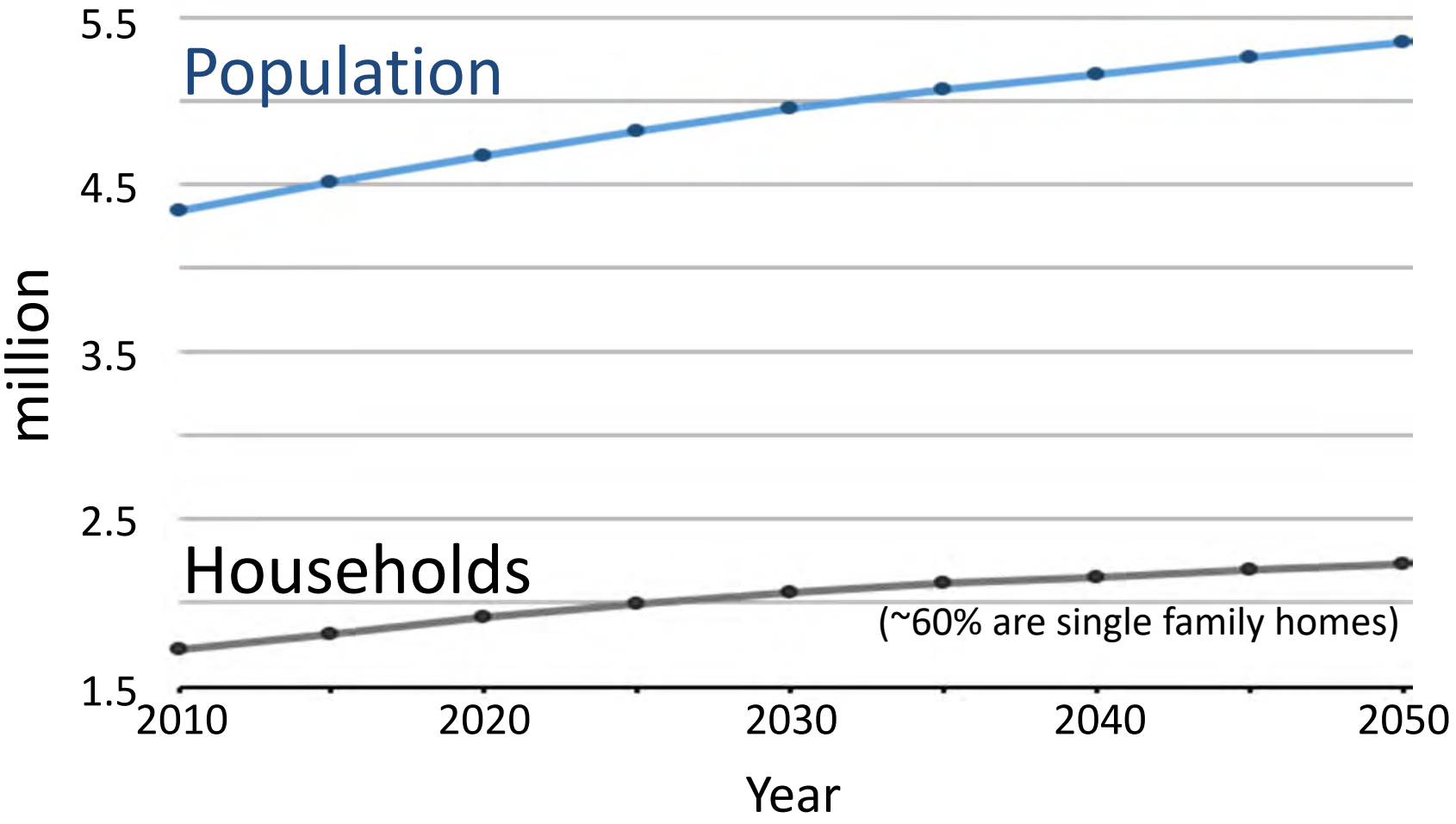
URBAN
Regulations
EPA

AGRICULTURE
Incentives ($)
USDA NRCS

Fewer Acres Farmed by Fewer Farmers



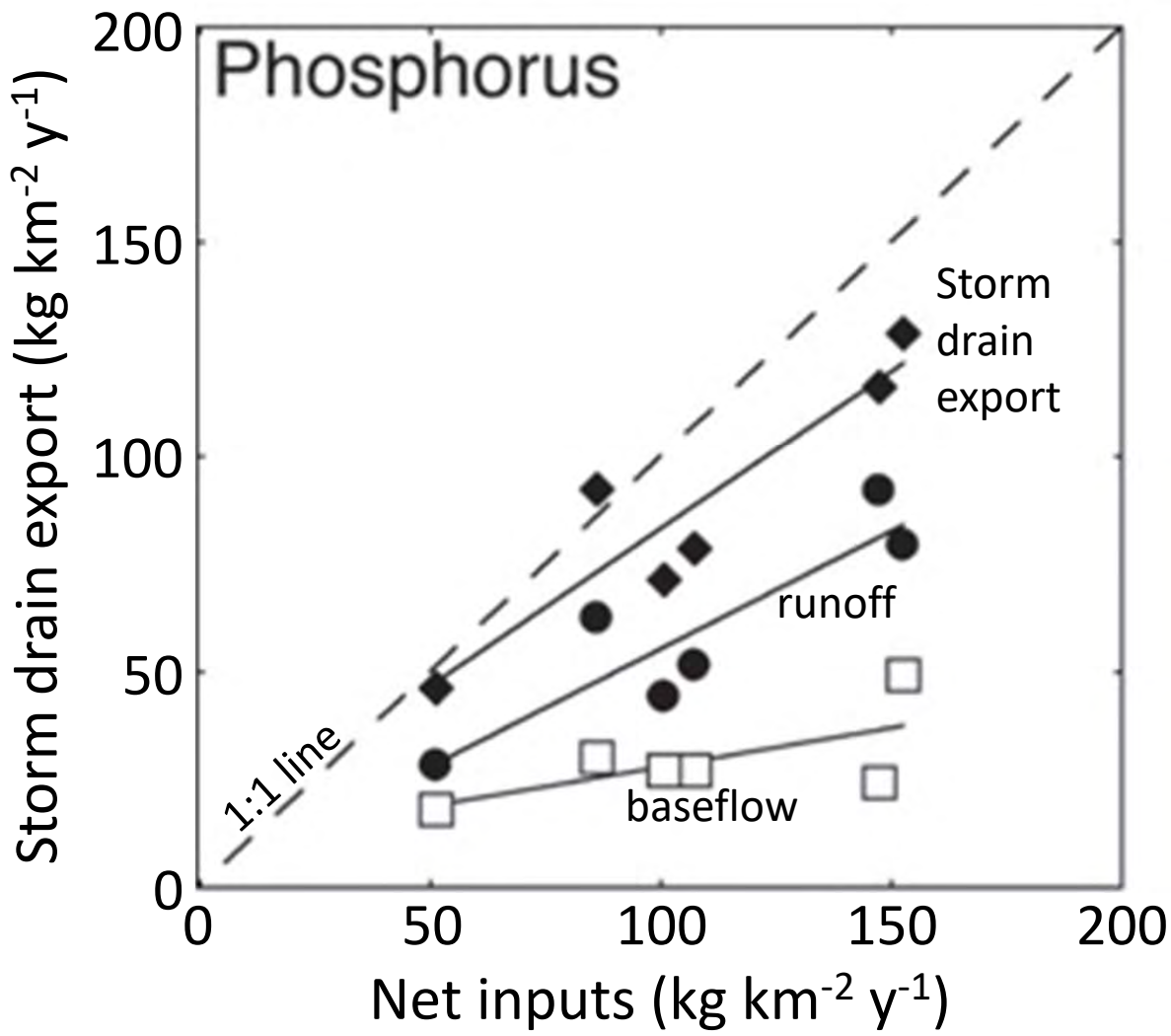
Kentucky Population & Household Growth Projections



National Trend

- Urban centers are growing in population and land area
- Rural populations are shrinking and the number of farms are shrinking
- ***With development we have more impervious surfaces***

Direct relationship between phosphorus (P) inputs and storm drain exports



Hobbie et al., 2017

Urban Kentucky P inputs and outputs

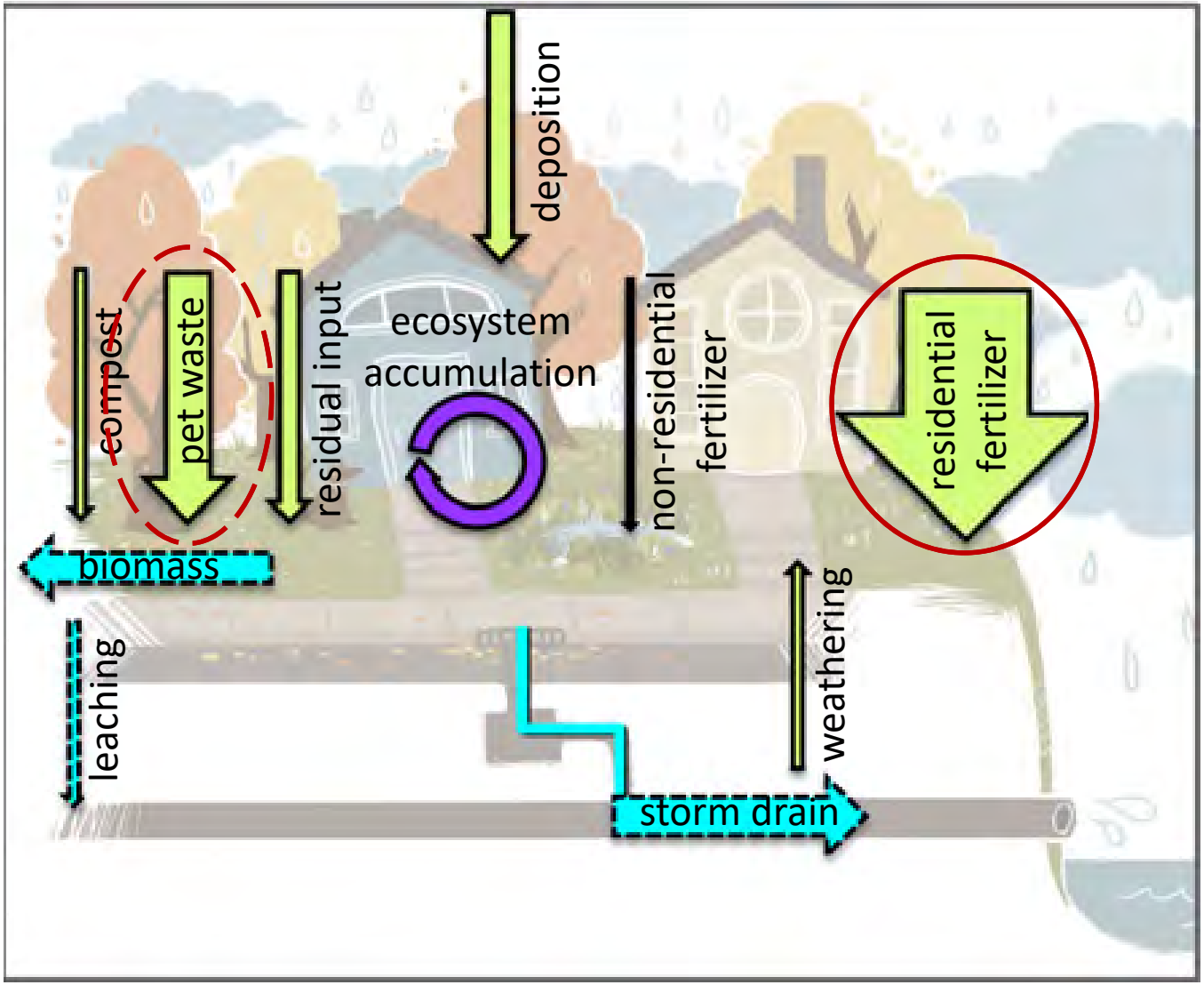
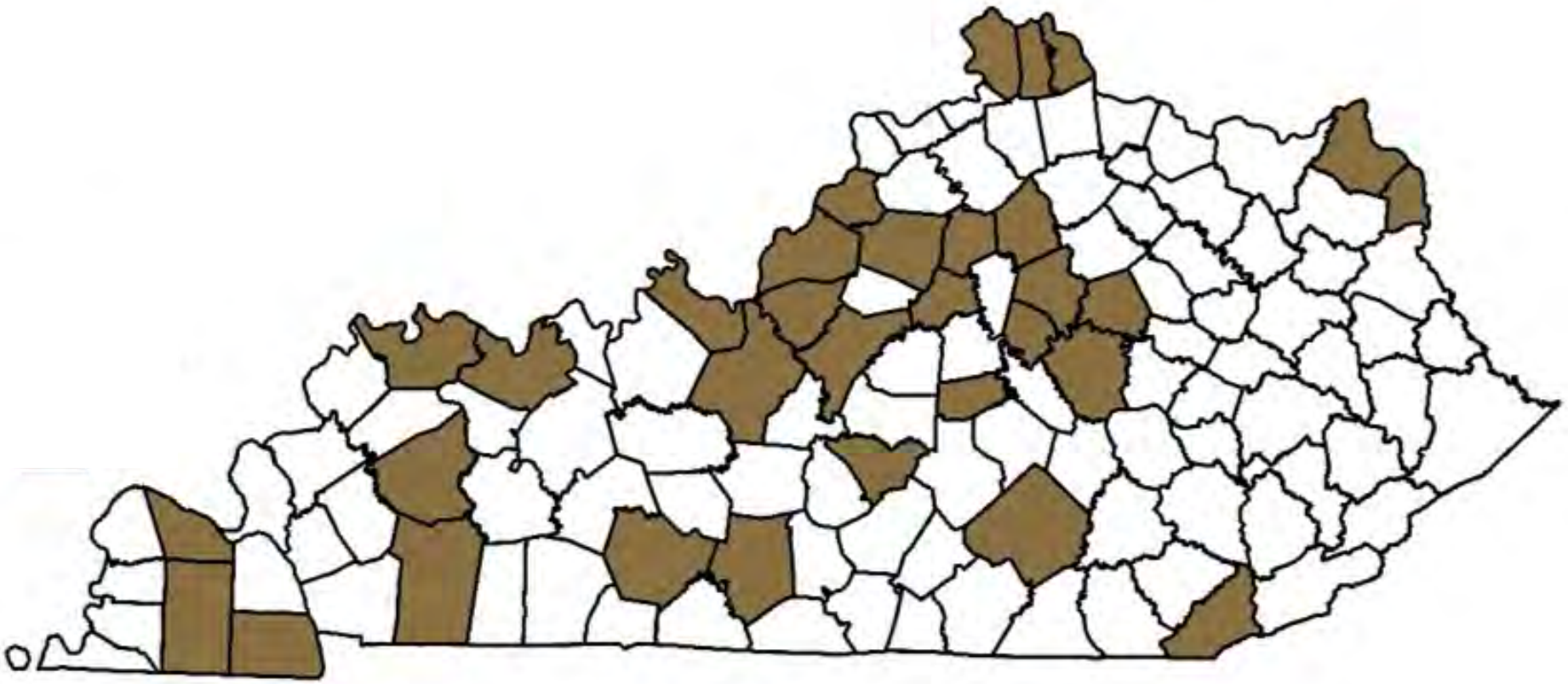


Figure liberally modified (**in red**) from Hobbie et al., 2017
(MN does not allow P fertilizer)

104 MS4 Permits in 32 Counties

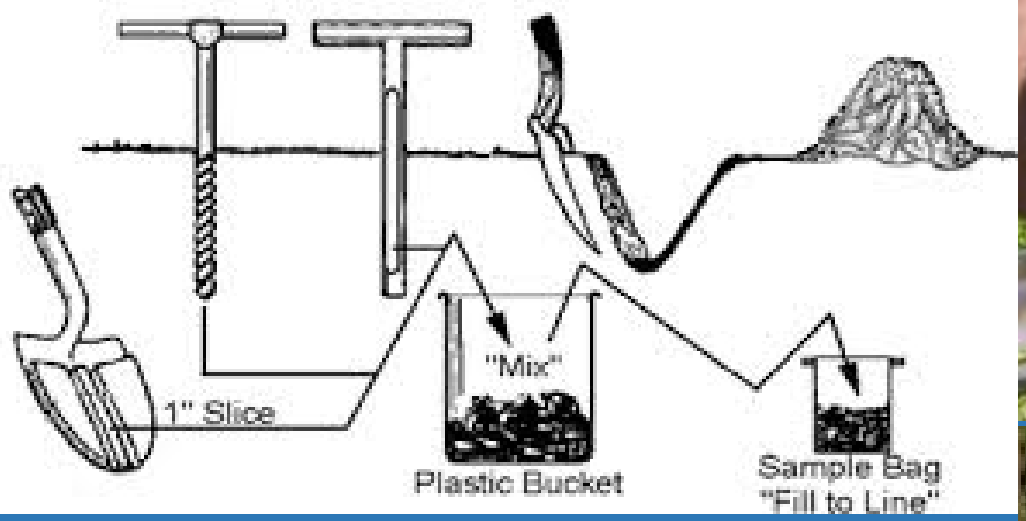


Minimum **C**ontrol **M**easures

1. **Public Education & Outreach**
   - **Number of soil tests**
2. Public Participation/Involvement
3. Illicit Discharge Detection & Elimination
4. Construction Site Runoff Control
5. Post-Construction Runoff Control
6. Pollution Prevention/Good Housekeeping

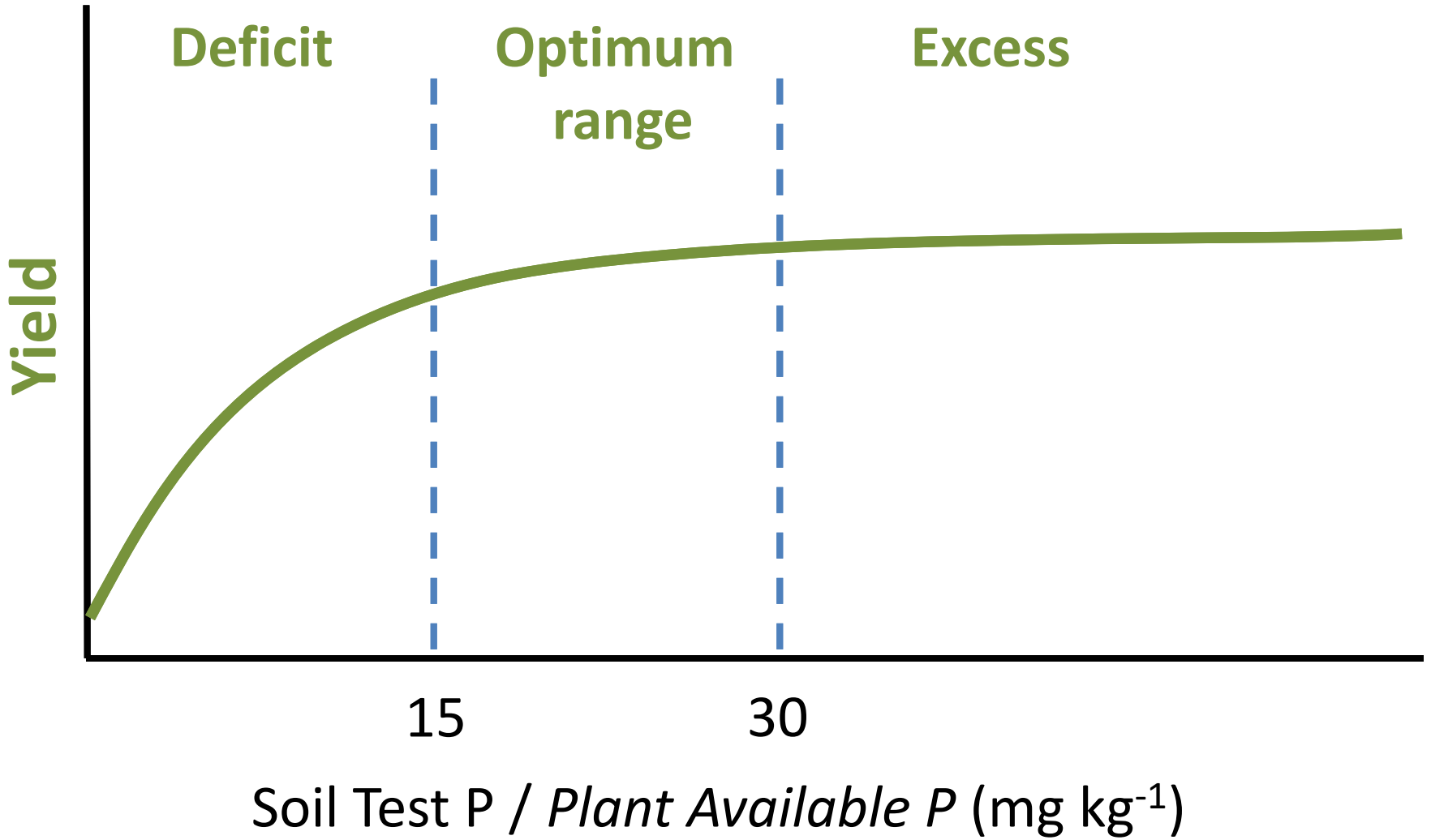
UK Extension Conducts Soil Tests

Fertilizer recommendation is made based on test results by UK for the desired crop

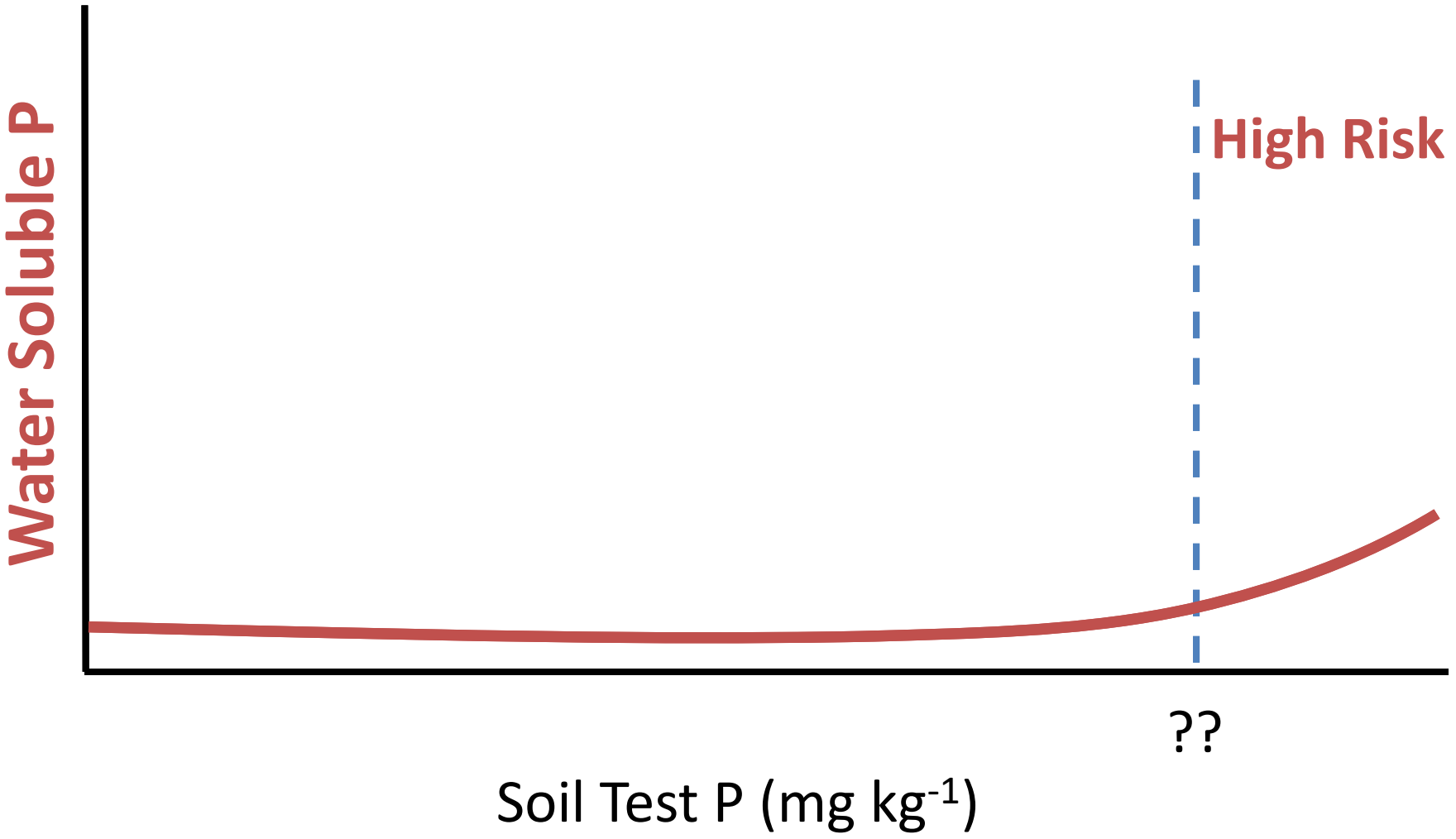


UKAg EXTENSION

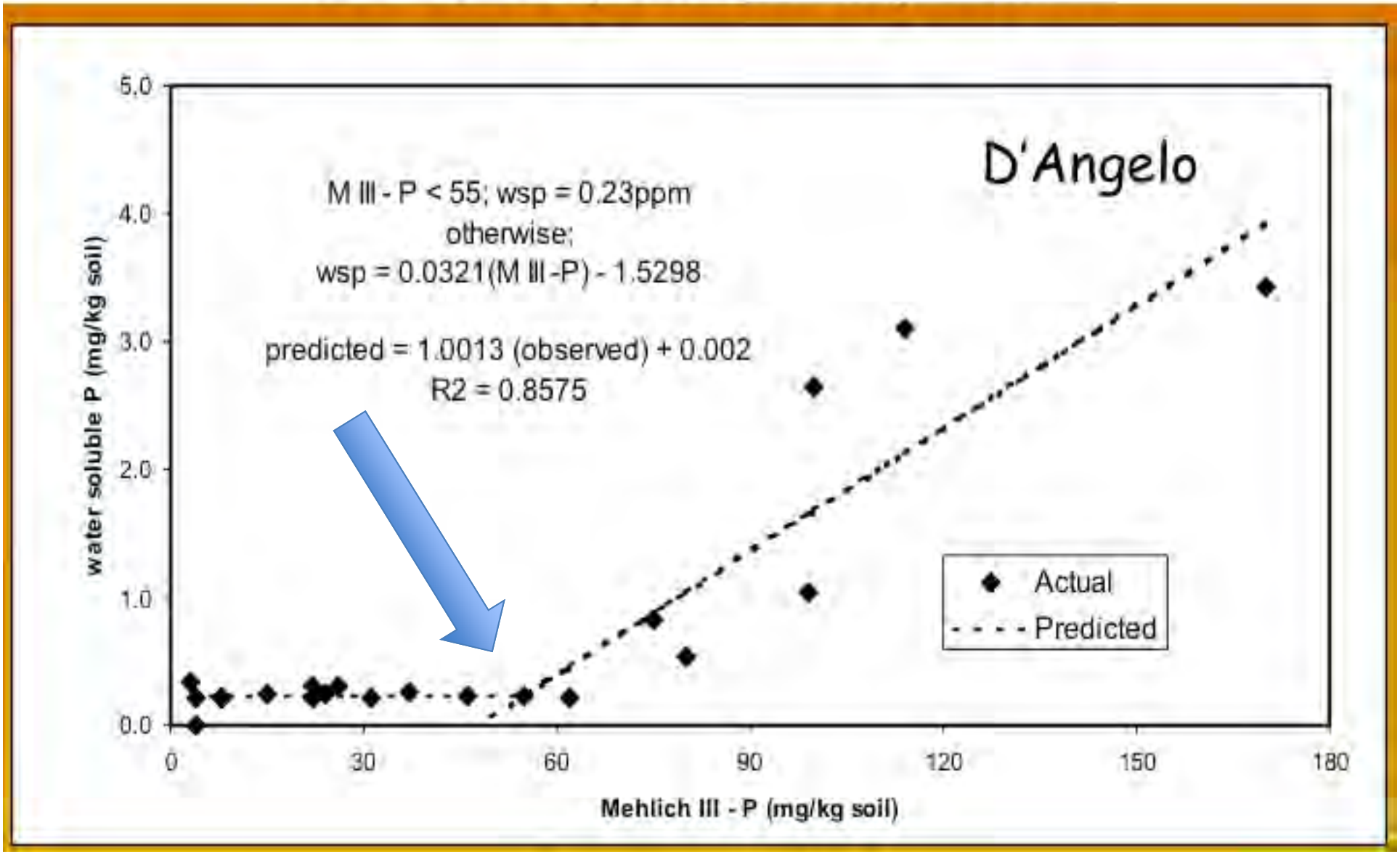
Soil Test P


Deficit
Optimum range
Excess
Yield
15
30
Soil Test P / *Plant Available P* (mg kg^{-1})

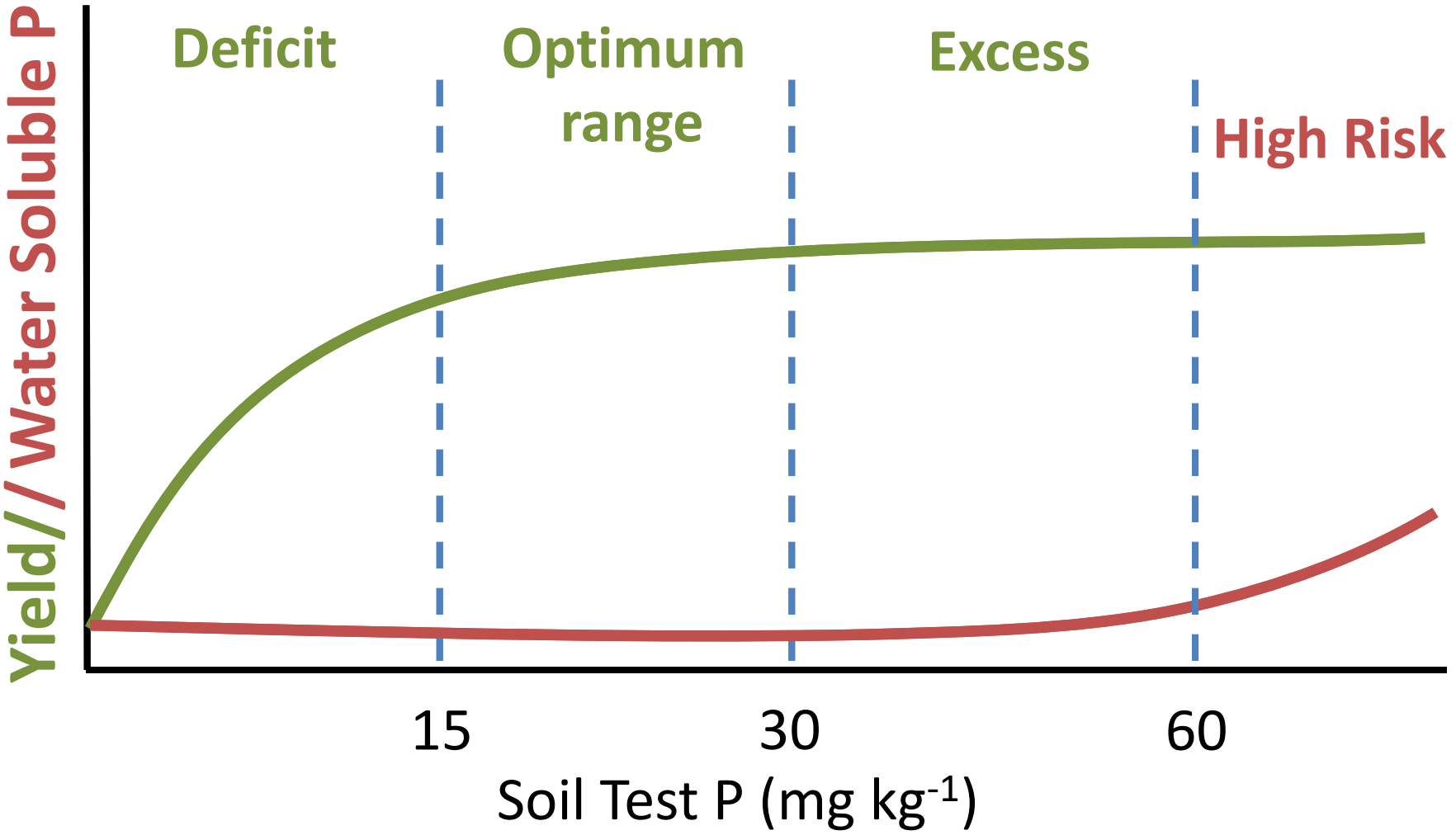
Soil Test P



Predicting Water Soluble P from Soil Test P on Twenty Kentucky Soils



Soil Test P


Deficit
Optimum range
Excess
High Risk
Yield// Water Soluble P
15
30
60
Soil Test P (mg kg-1)

Kentucky County Soil Tests
1990 – 2014
(n = 990,162)

Home and Garden (H code)

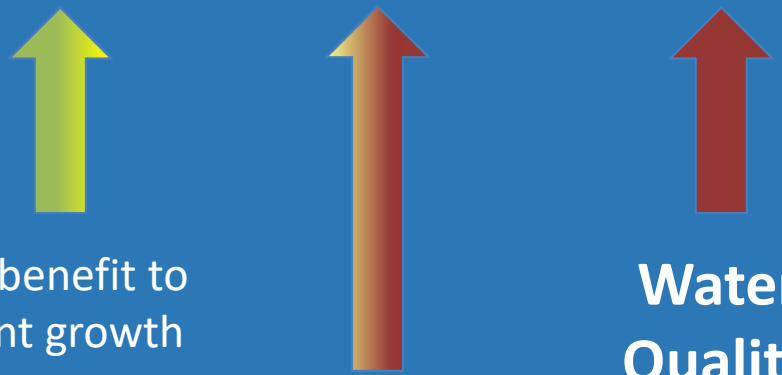
- Total = 179,184
- Max = 17,691
- Min = 52
- Mean = 1493
- Median = 747

Agriculture (A code)

- Total = 810,978
- Max = 52,245
- Min = 116
- Mean = 6758
- Median = 4886

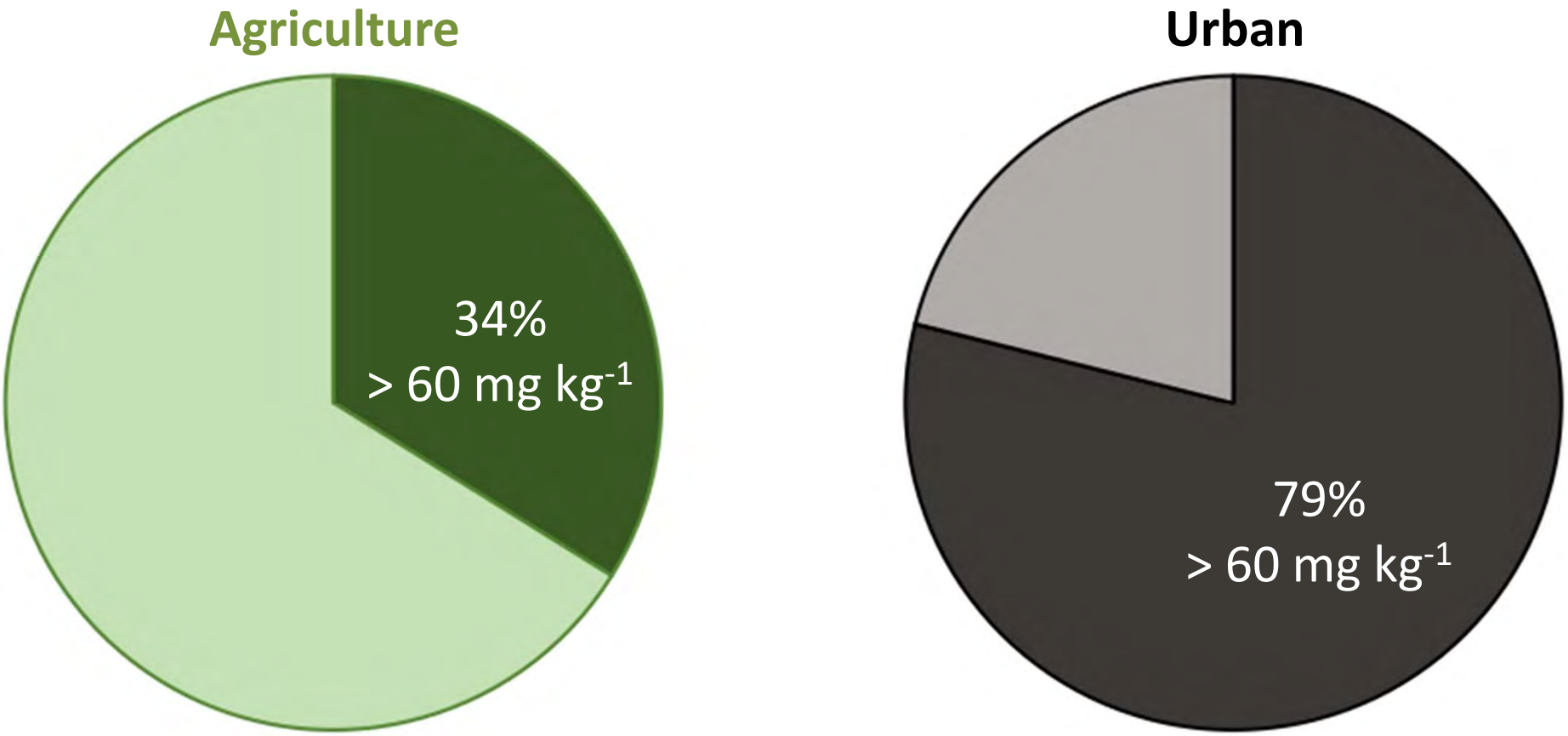
25 year soil test summary for Boone County.

1990-2014	Samples (n)	Low (%) <15 mg/kg	Med (%) 15-30 mg/kg	High (%) 30-60 mg/kg	Very High > >60 mg/kg
Agriculture	9188	15	25	**28**	**32**
Lawn and Garden	6933	7	14	**26**	**53**



UKAg EXTENSION

Water Quality Risk
Soil Test P levels

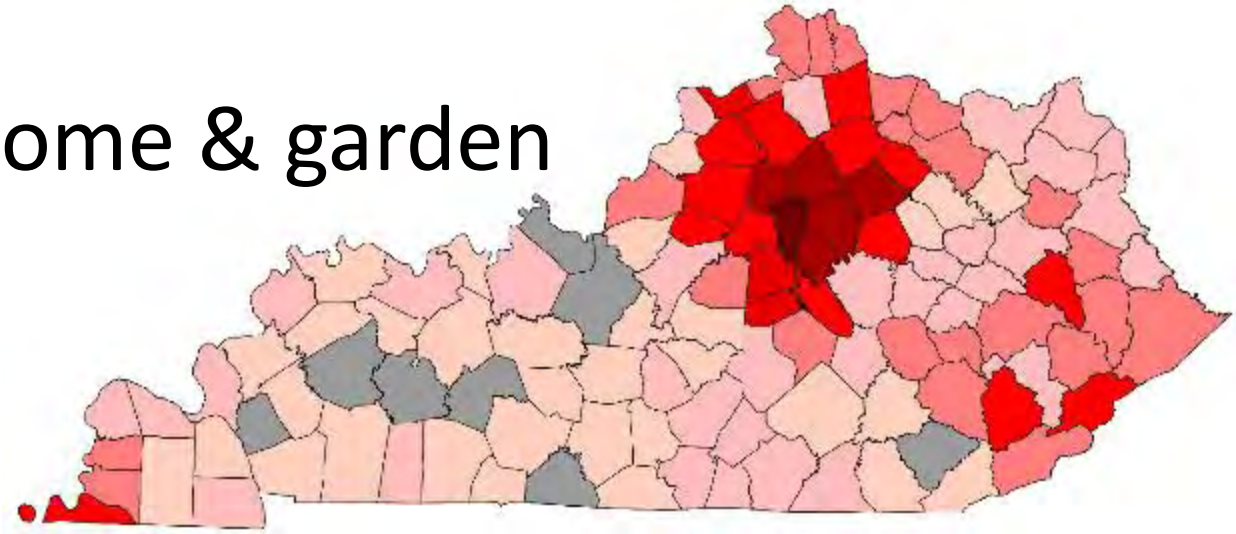


1990 – 2014 Soil Test Phosphorus Levels > 60 mg kg^{-1}

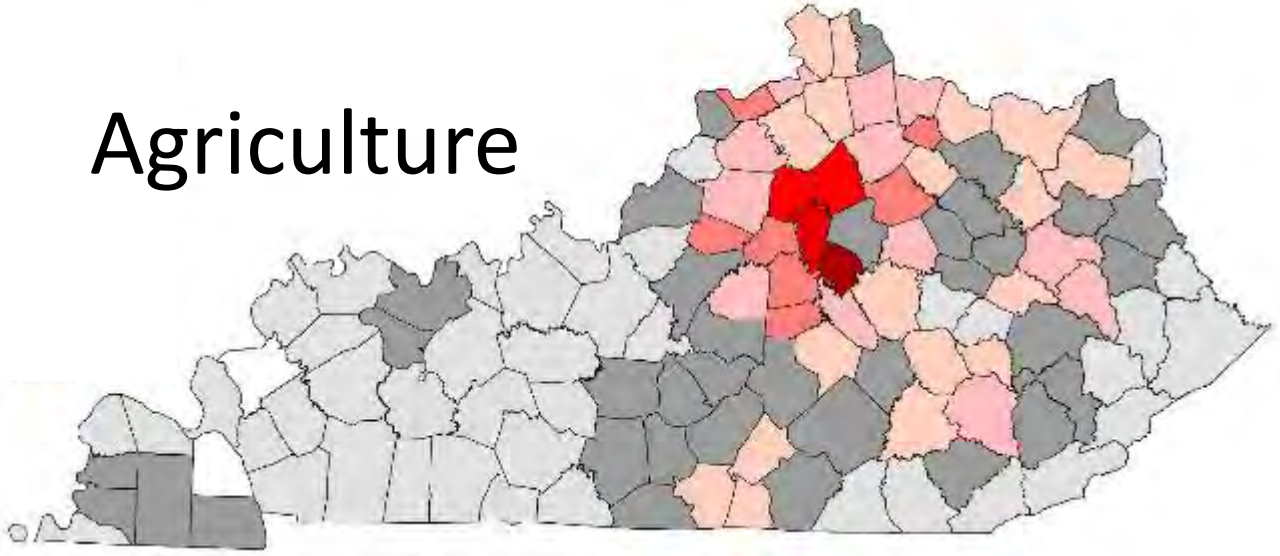
% Soil Tests with
High Risk P Levels

- 0 - 10
- 10.1 - 20
- 20.1 - 30
- 30.1 - 40
- 40.1 - 50
- 50.1 - 60
- 60.1 - 70
- 70.1 - 80
- 80.1 - 90
- 90.1 - 100

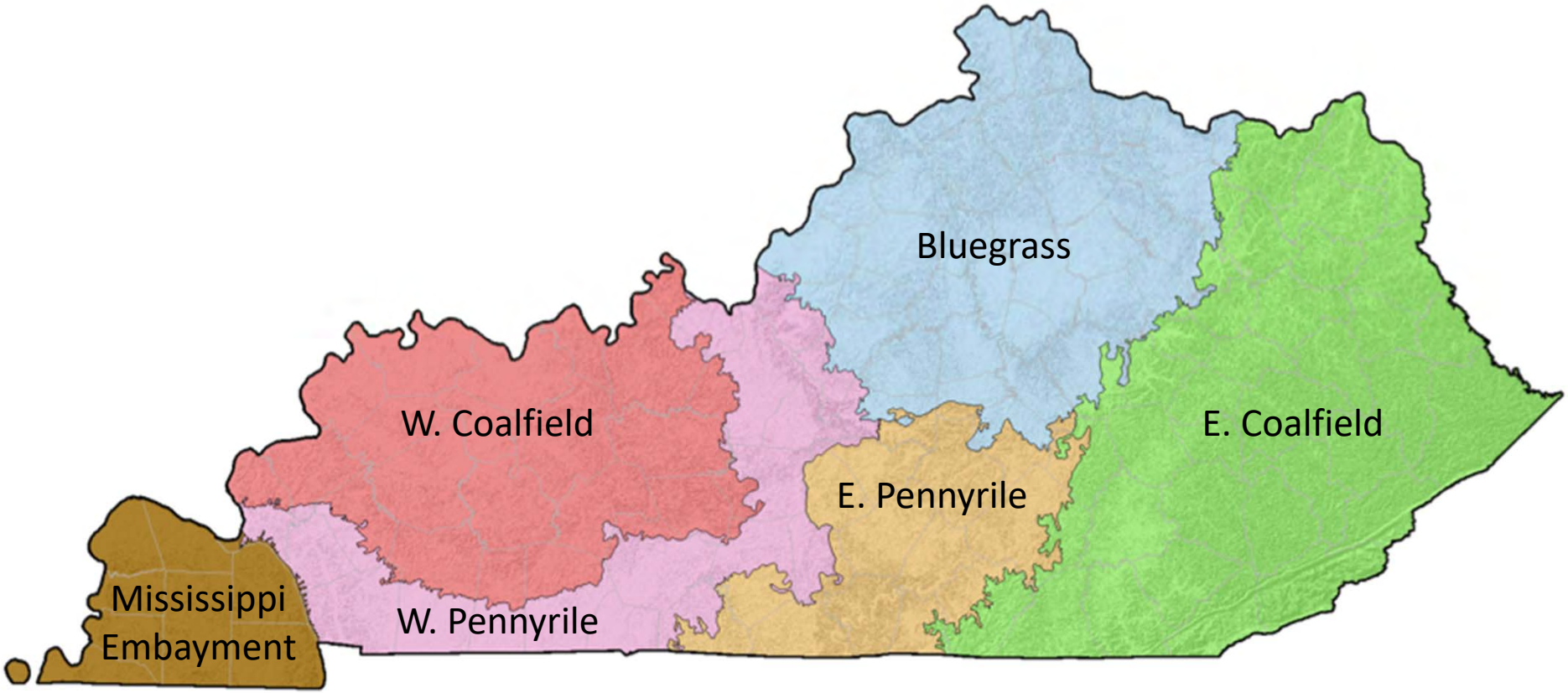
Home & garden



Agriculture

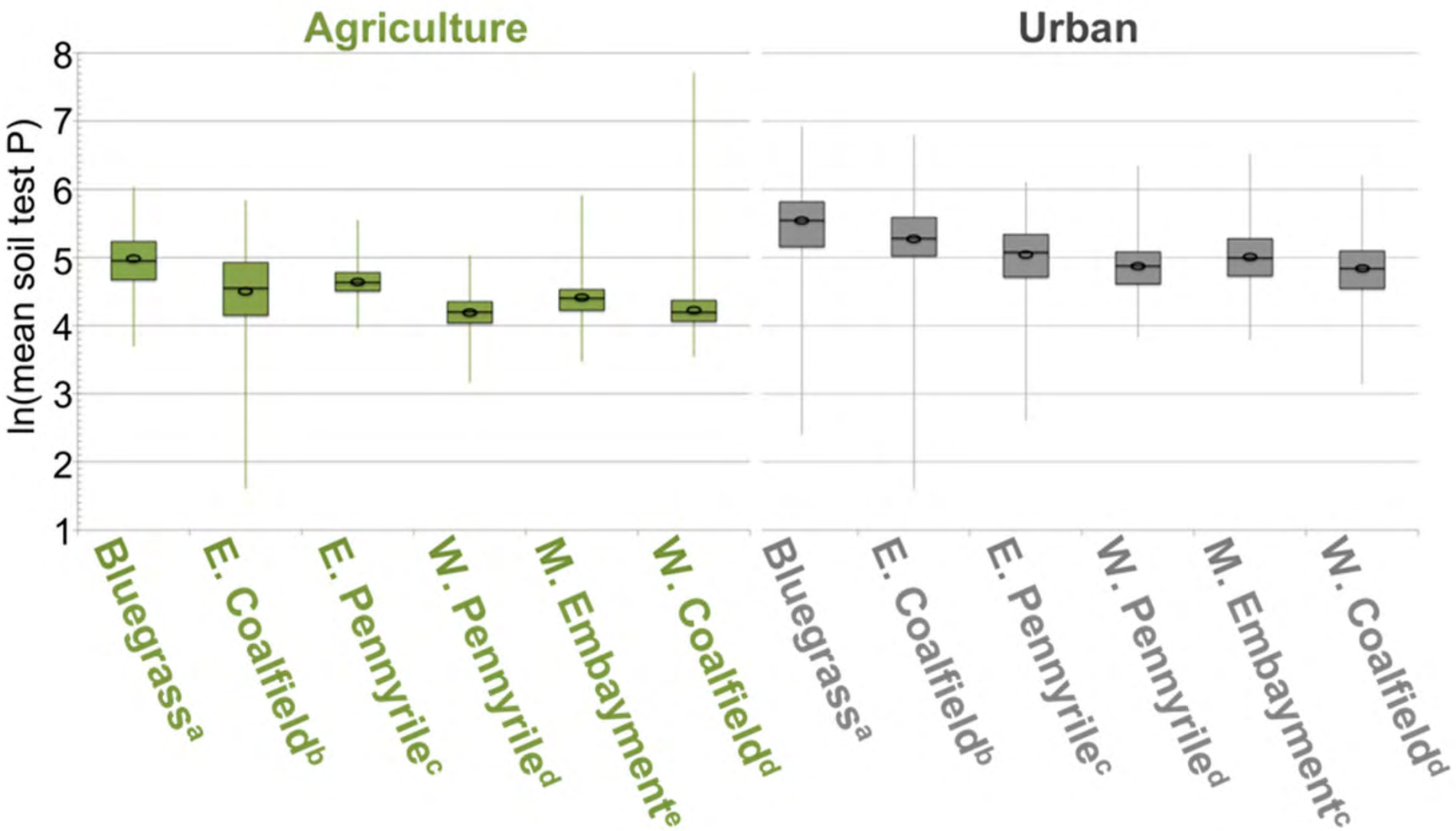


Physiographic / Soil Regions of Kentucky

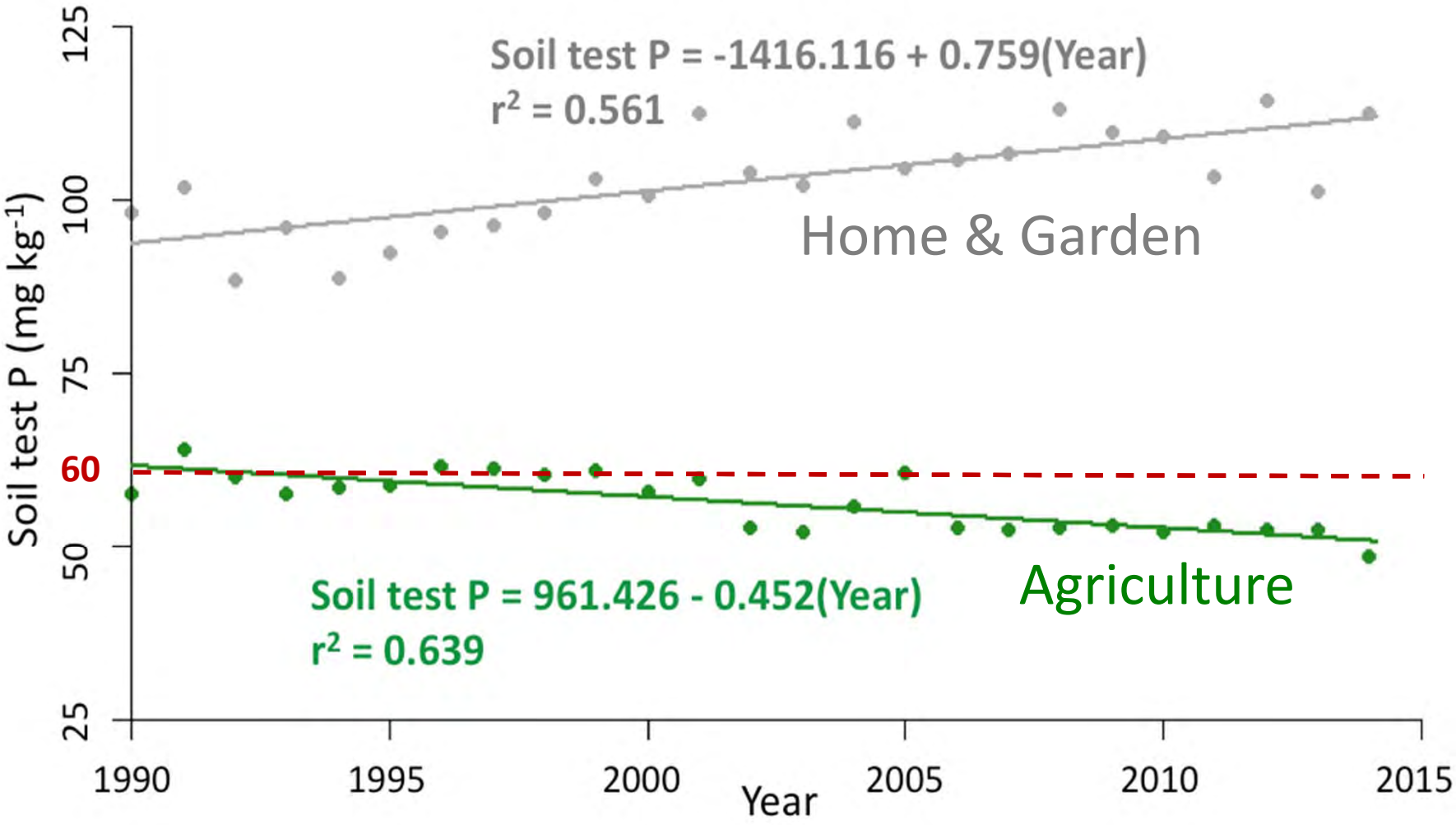


KY USDA NRCS

Regional Distribution of Soil Test P Levels



Kentucky Soil Test: Phosphorus over 25 years



How representative are KY results for the urban home and garden soil test P levels?

Annual soil tests by county

(soil tests / single family homes in county[1])*100

- Max = 1.42%
- Min = 0.16%
- Mean = 0.45%
- Median = 0.38%

We need more soil tests

[1]2010 Census

Why are Home Lawn and Garden P Levels so High?

- 1/3 of homeowners do not apply fertilizer

- A few households contribute disproportionately to total nutrient load in runoff

Minnesota – Hobbie et al., 2017
North Carolina – Osmond and Hardy, 2004
Maryland – Law et al., 2004

Homeowner Habits

- Homeowners decisions are related to their attitudes, norms, and values

- Widespread idea that fertilizing will result in a healthier and greener lawns

(Nelson et al., 2008; Cheng et al., 2008)

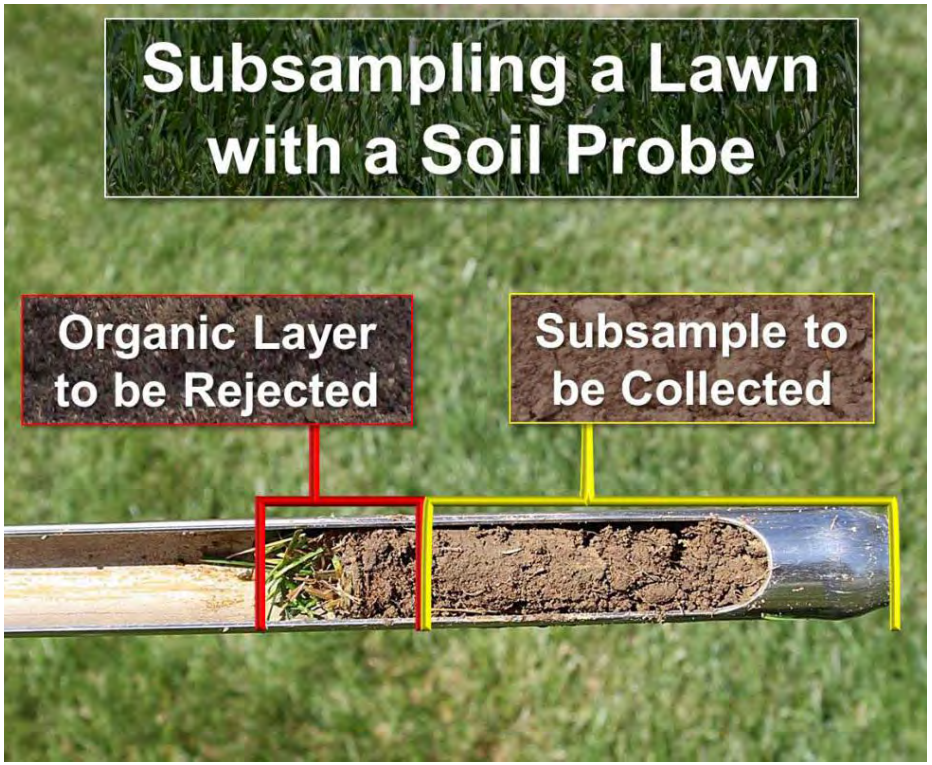
Fertilizer Marketing:

Soil Test at Jefferson County CES Office

A routine or basic soil test measures pH and the need for P and K for $7

However…

The Jefferson County Soil & Water Conservation District will provide two soil tests to each homeowner for FREE!!!



Front lawn composite (4” deep)
Back lawn composite (4” deep)
Garden composite (6 – 10” deep)

Total = $21
BUT NOW ONLY $7

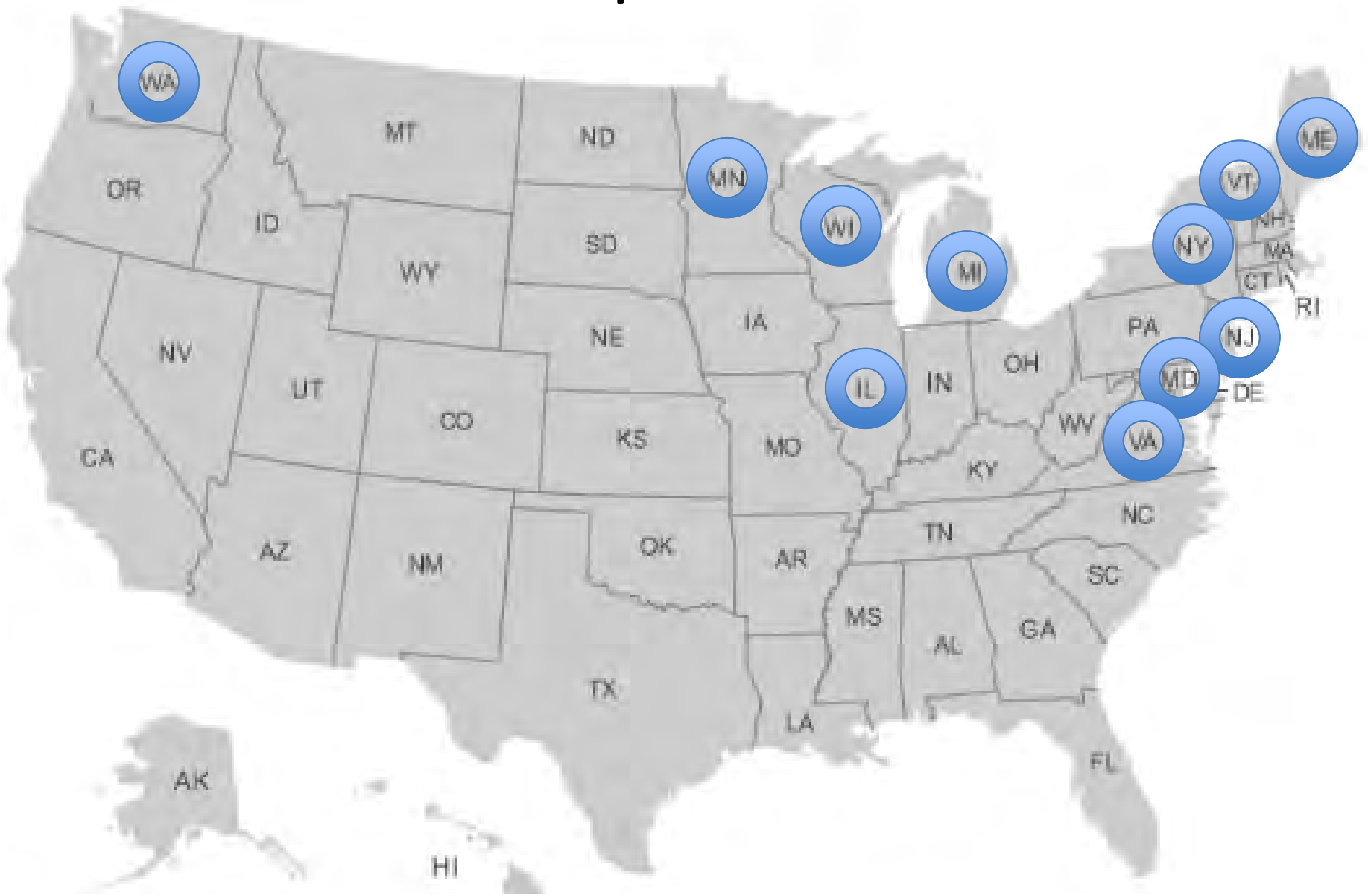
Some states passed laws for lawn maintenance

Nitrogen (N)

Phosphorus (P)

Potassium (K)

States that Require Soil Test Prior to Sale of Phosphorus Fertilizer



Is P – free fertilizer available?

Scotts drops phosphorus from lawn fertilizer

Marysville company acts to reduce risk of runoff feeding toxic-algae blooms in lakes; competitors likely to follow its lead

Columbus Dispatch - May 10, 2013

Nutrient Management in KY

- Managed landscapes need N
- Most KY lawns will **not** require additional P or K
- Green lawns possible with less fertilizer if clippings are left on site (Guillard and Kopp, 2004; Heckman et al, 2000)

Photo: grasshopperlawns.com

1 ton grass clippings has
15# N, 2# P, 10# K

4 – 1 – 3

Thelawninstitute.org

Assistance to MS4s

- Home owner program
  - ***"No P on my Lawn!"***

- Lawn care professional program
  - ***"Green Certification for Lawn & Landscape Professionals"***


Questions?
Brad Lee, PhD CPSS
Associate Professor & Extension Specialist
Plant and Soil Sciences Department
University of Kentucky
Brad.lee@uky.edu