

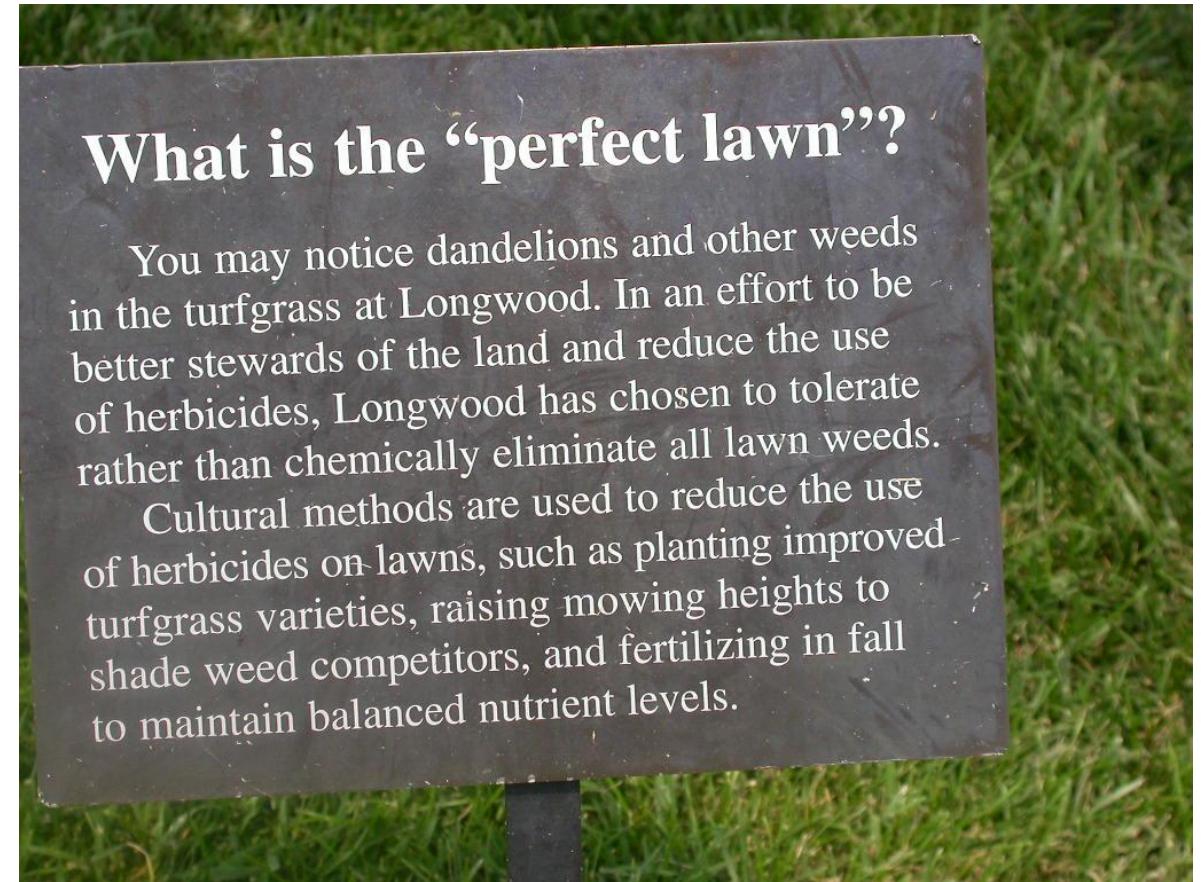
GREEN GRASS, CLEAR WATER for Professional Landscapers

Landscaping for Water Quality
March 2023 - Swanzey, NH

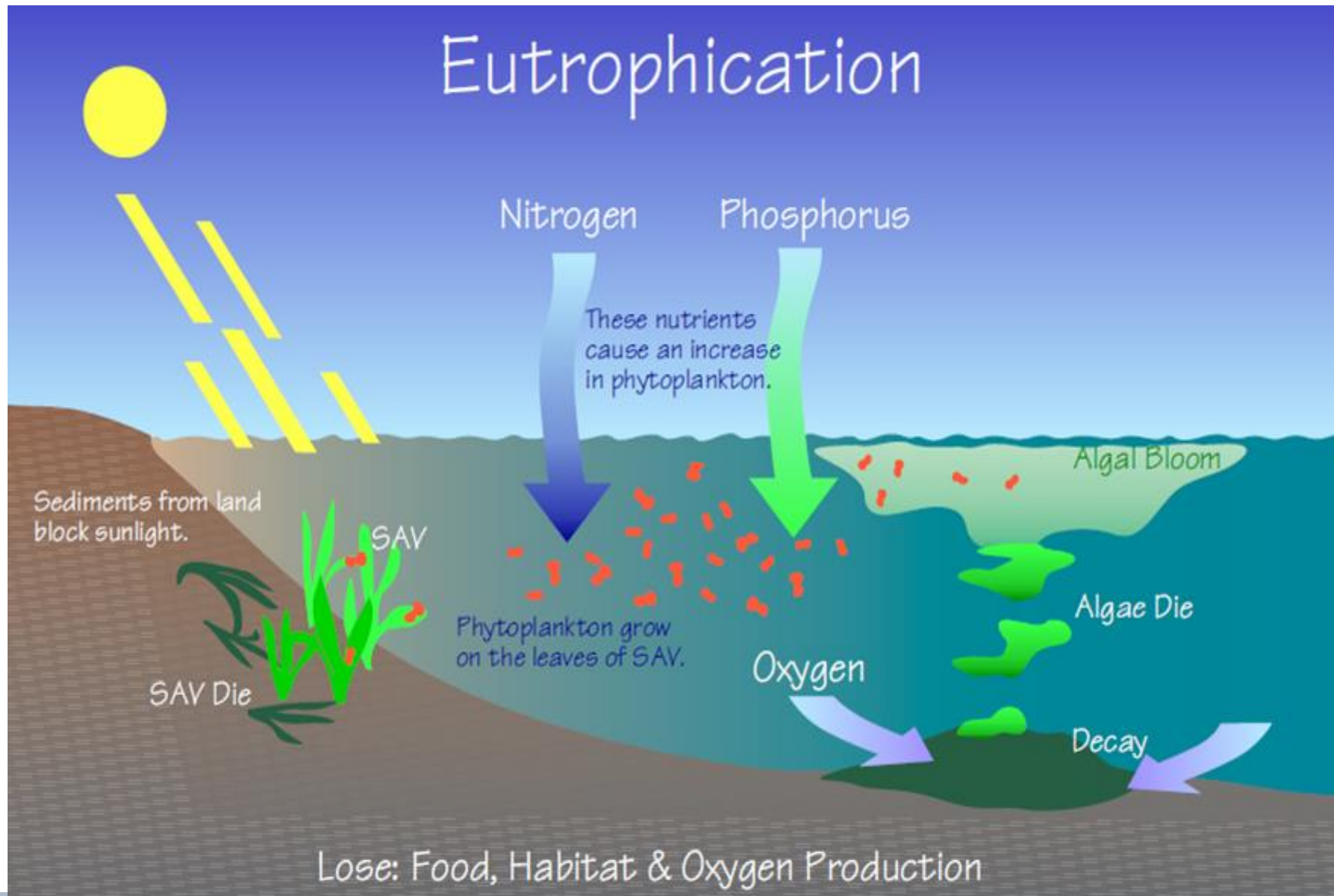
Julia Peterson (N.H. Sea Grant Extension)
Amy Papineau (UNH Cooperative Extension)

Our goals today:

1. Recognize the **connection** between lawn care and clean water
2. Learn **cultural practices** that encourage healthy turf and reduce pollution from lawns.
3. **Promote or adopt** at least one new or improved practice for clients.



Eutrophication



Nutrients

- Both Phosphorus (P) and Nitrogen (N) need to be managed carefully!
 - Nitrogen enhances eutrophication caused by excess Phosphorus in freshwater lakes and ponds
 - Phosphorus enhances eutrophication caused by excess Nitrogen in estuaries and coastal salt-waters

Conley et al., 2009. Controlling eutrophication: Nitrogen and phosphorus. *Wetlands* 29:1014-1015; vol. 324:721-725



Changing Homeowner's Lawn Care Behavior to Reduce Nutrient Losses

USDA/NIFA 2006-51130-03656



Applying knowledge to improve water quality

**National
Water Program**

*A Partnership of USDA, NIFA
& Land Grant Colleges and Universities*



Applying knowledge to improve water quality

**Northeast States &
Caribbean Islands
Regional Water Center**

*A Partnership of USDA, NIFA
& Land Grant Colleges and Universities*

Turfgrass Nutrient Management Bulletin B-0100

New England Regional Nitrogen
and Phosphorus Fertilizer and
Associated Management Practice
Recommendations
For Lawns Based on Water
Quality Considerations

 University of
Connecticut
College of Agriculture
and Natural Resources
*Department of Plant Science
and Landscape Architecture*

Water Quality Friendly Lawn Care Recommendations

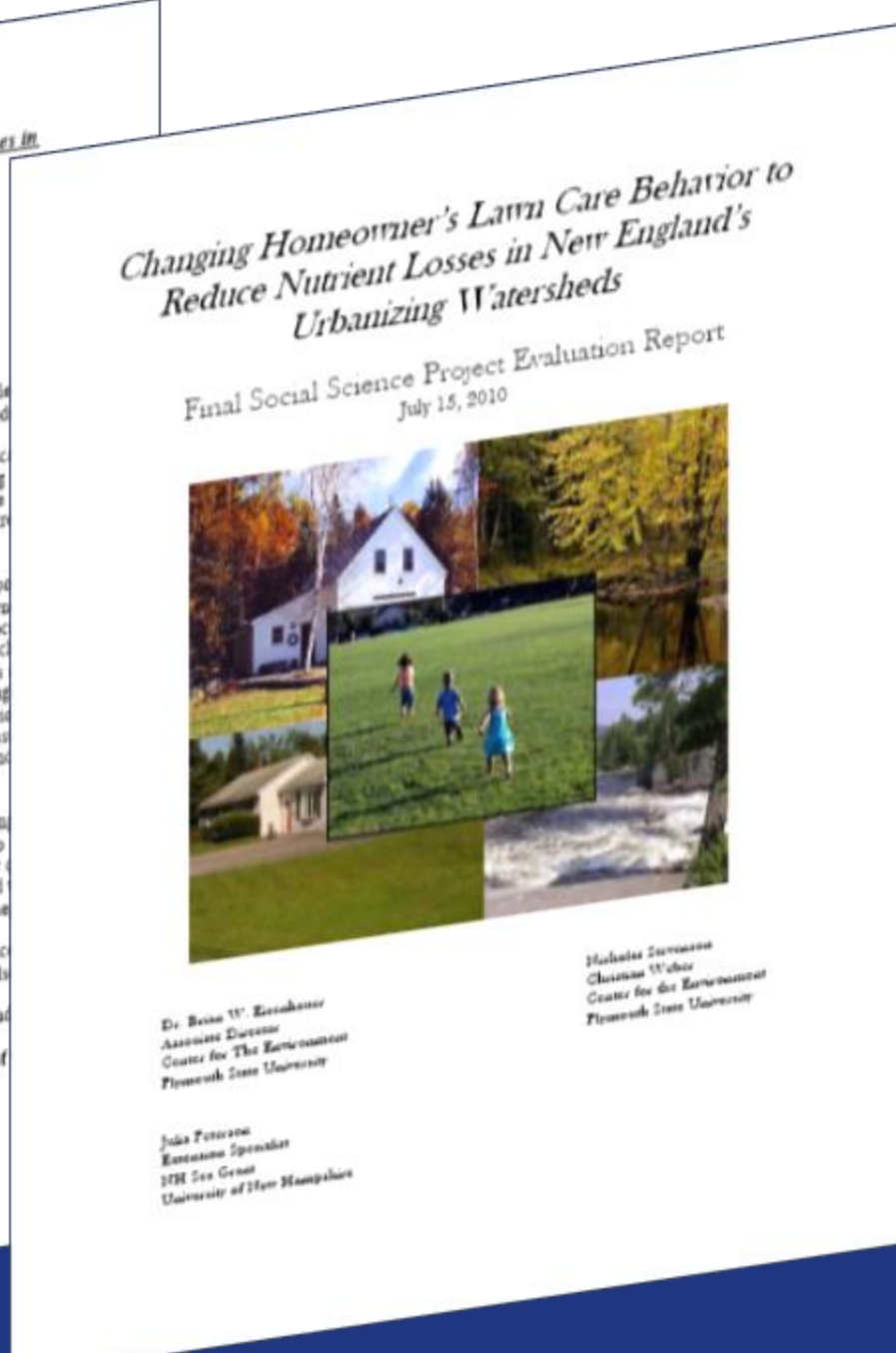
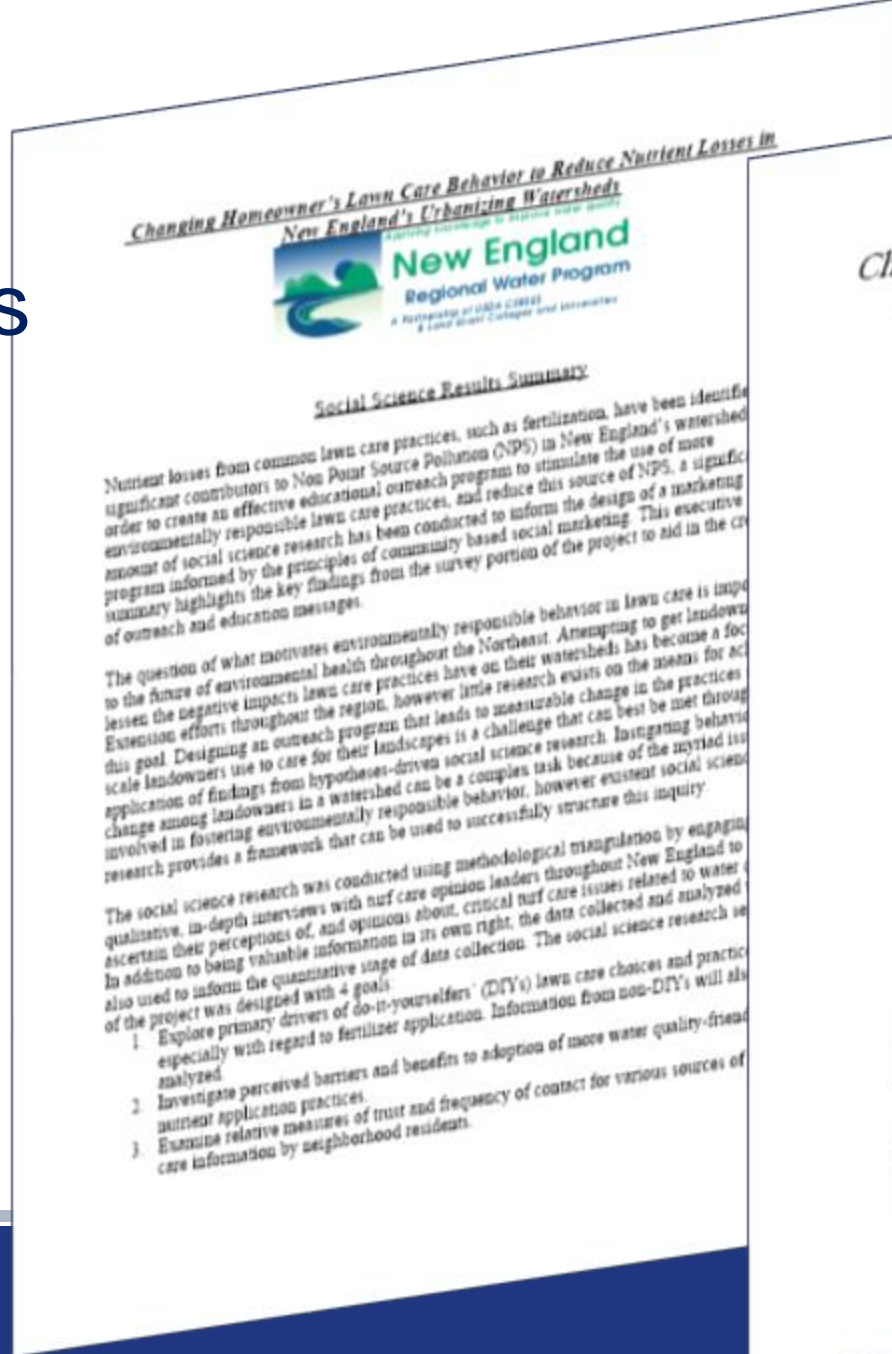


Social Science Results and Recommendations for Outreach

Brian Eisenhauer, PhD
Plymouth State University

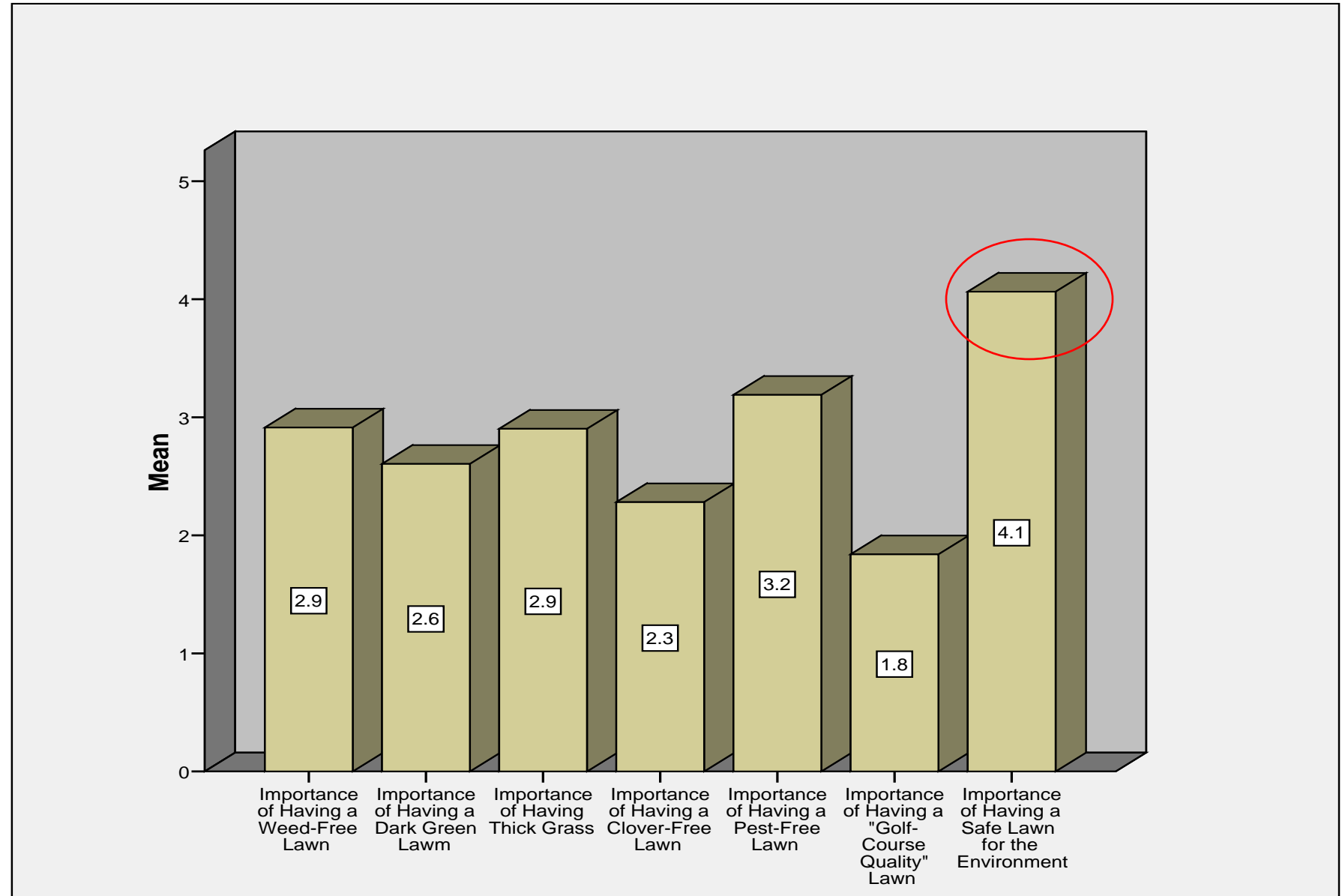
From Report of Social Science findings from Changing Homeowner's Lawn Care Behavior to Reduce Nutrient Losses in New England's Urbanizing Watersheds

USDA CSREES (now NIFA) project
2006-51130-03565



What Matters to People in New England Regarding Lawns?

Respondents Mean Rating of the Importance of Each Lawn Issue



Recommendations, part 1

Without fertilizer

Simple Recommendations for Every Lawn

1. Right place, right plants
2. Choose the right grass seed varieties
3. Mow smart
4. Don't overwater
5. Test your soil
6. Dispose of yard waste properly

1. Limit lawn areas to play and picnic places



Expectations: turf seasonal cycle

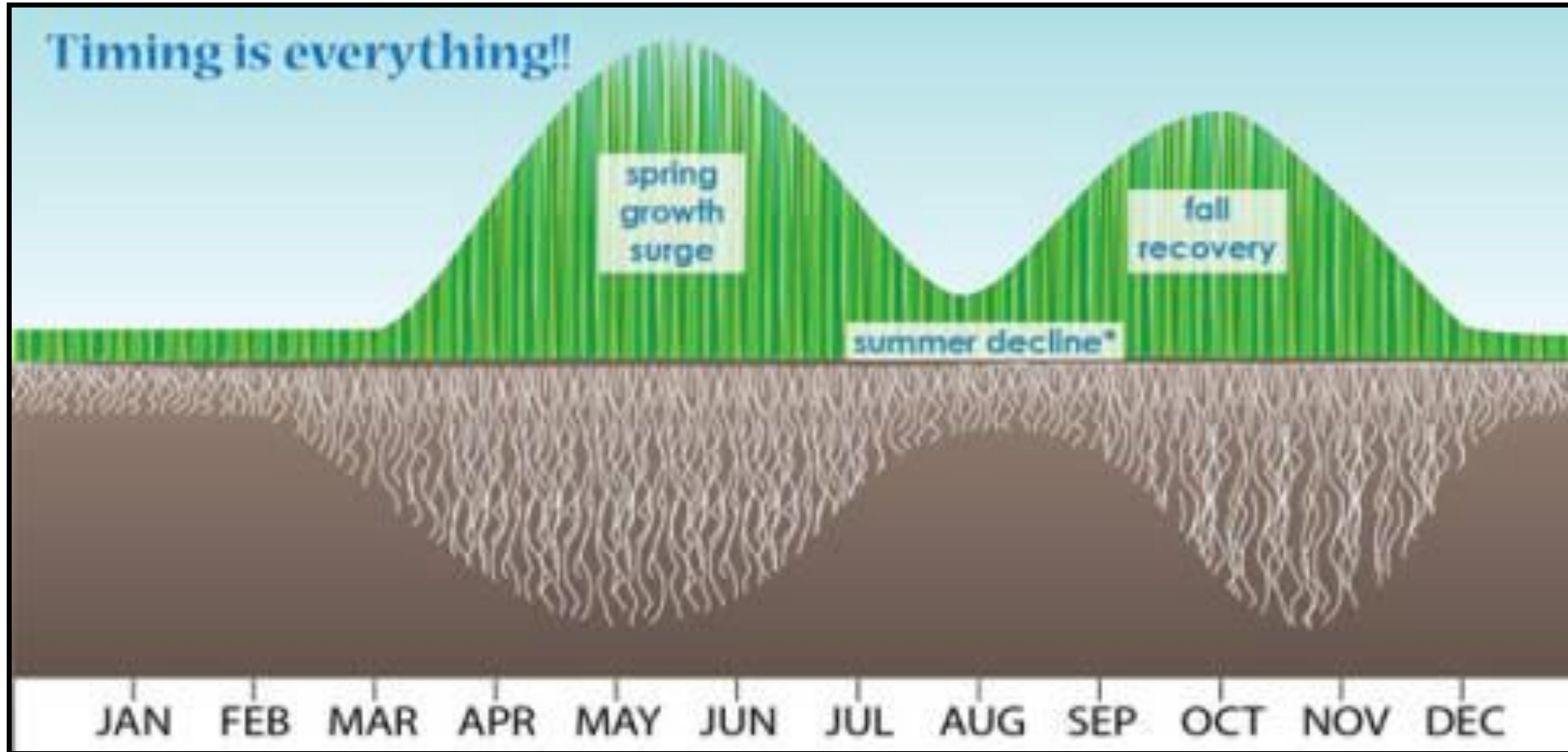
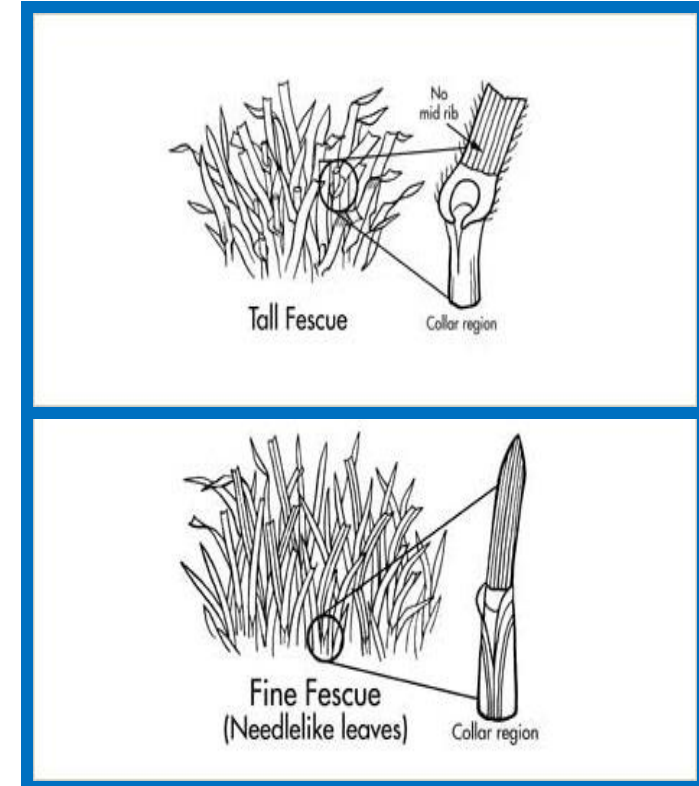


Image: University of Minnesota, Cornell University

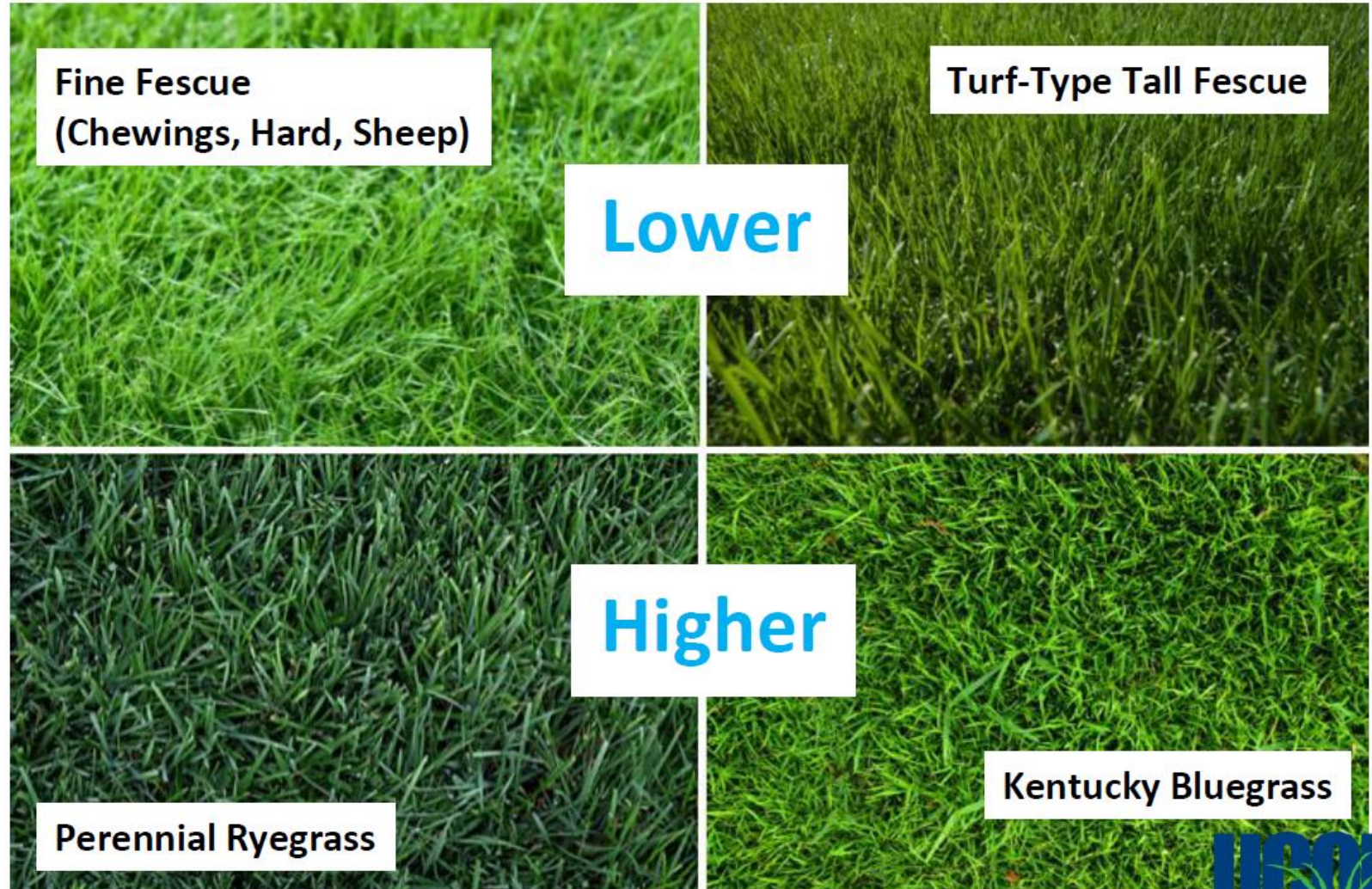
2. Plant low maintenance grass varieties.

- Use recommended grass mixes
- Overseed when needed
- Plant new lawn in the early fall for best results (less weeds)



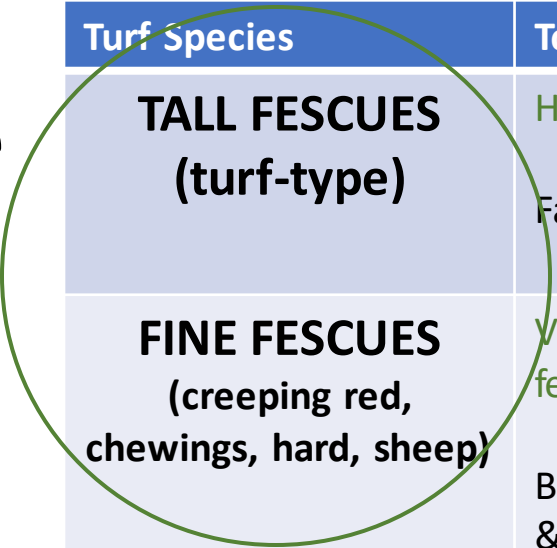
Selection of Species – Higher vs. Lower Maintenance Requirements

<https://ntep.org/>



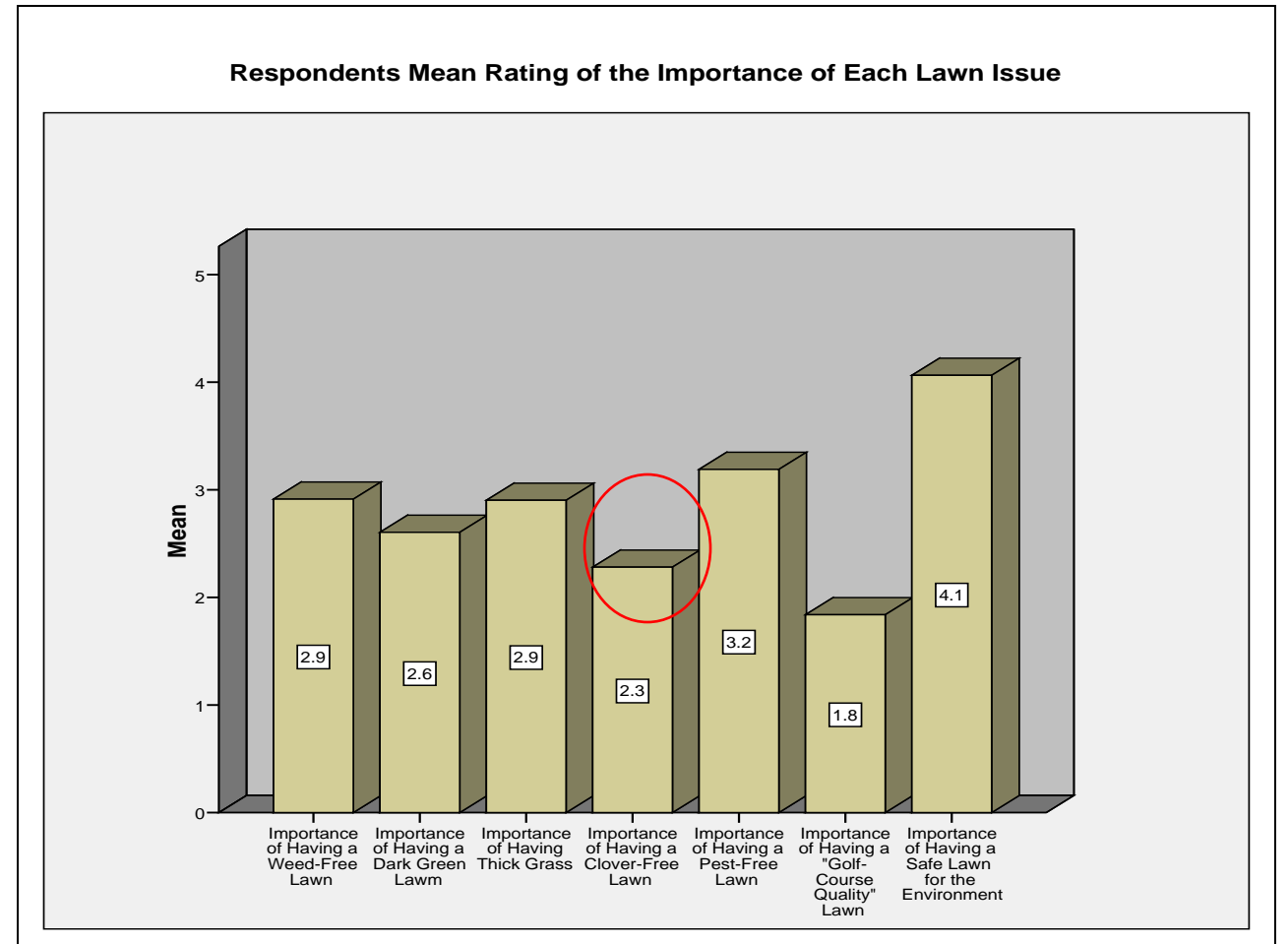
Choose the Right Seed Mixes

Turf Species	Tolerances	Limitations	Color and Best Conditions
TALL FESCUES (turf-type)	Heat and drought tolerant Fairly shade tolerant	Slow to establish Fair recovery potential	“New” ones are finer textured and darker green. Best in well drained soils & sun
FINE FESCUES (creeping red, chewings, hard, sheep)	Very tolerant of low pH and low fertility, drought and shade Become semi-dormant in heat & drought but recover quickly	Don't perform well under hot, humid conditions with high fertility	Narrow-leaf, medium to dark green Ideal for low maintenance
PERENNIAL RYEGRASS	Germinates rapidly and is quick to establish – good for overseeding Tolerant of wear and heat	Can be competitive Not tolerant of shade and drought Susceptible to ice cover injury	Fine to medium leaf texture and dark green color Best on well drained soils with moderate fertility
KENTUCKY BLUE GRASS	High tolerance for cold and wear Moderate tolerance for heat and drought Becomes semi-dormant in heat and drought; can recover	Requires higher amounts of N fertilizer May produce thatch	Fine to medium leaf texture and dark green color Best in well drained, sunny areas



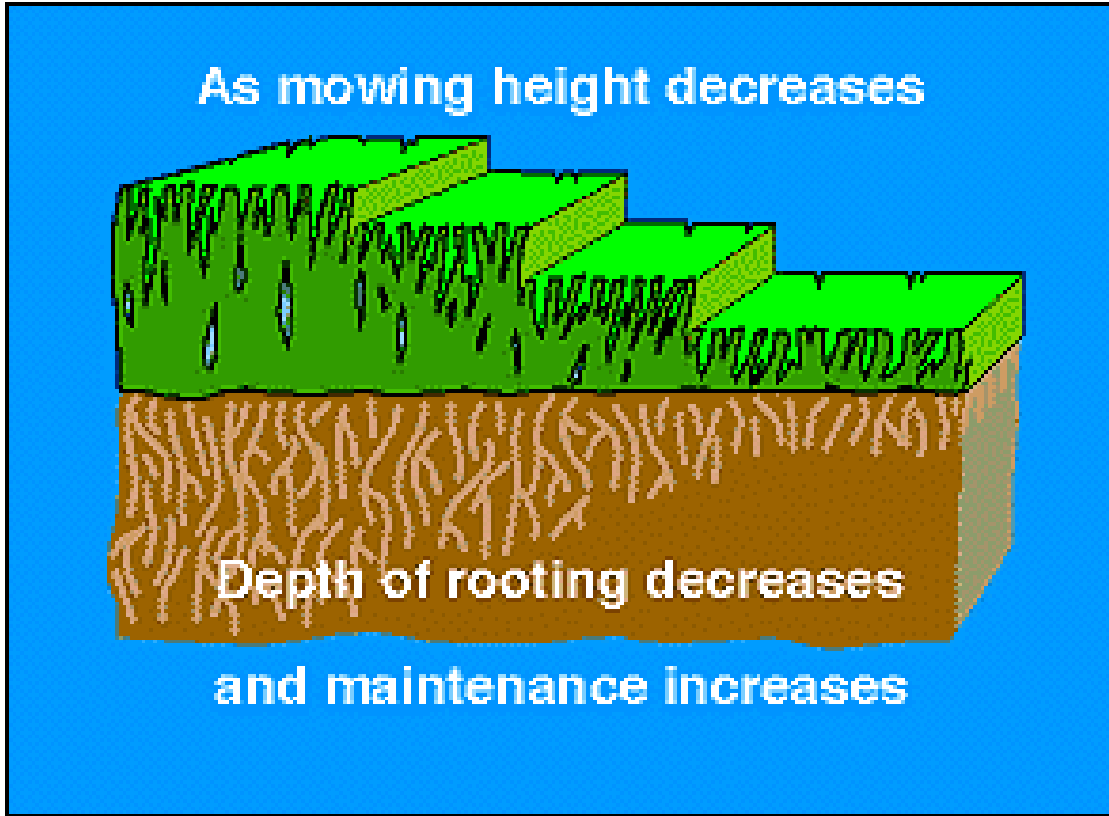
Source:
<http://extension.umass.edu/turf/fact-sheets/selection-grasses>

Incorporate clover.

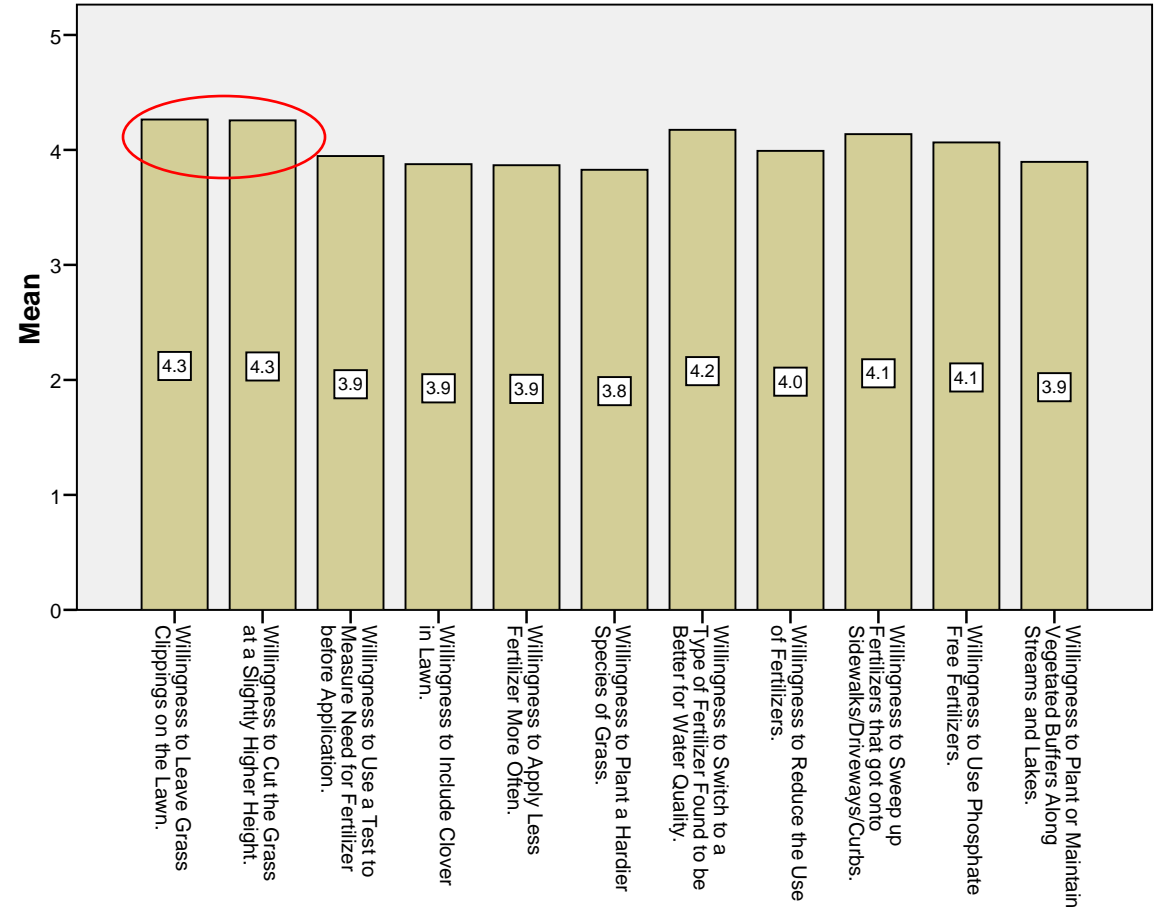


Clover fixes nitrogen naturally in the soil. **Keep clover <10% of seed mix.**
Disregard if there are allergies to bee stings in the household.

3. Mow Smart



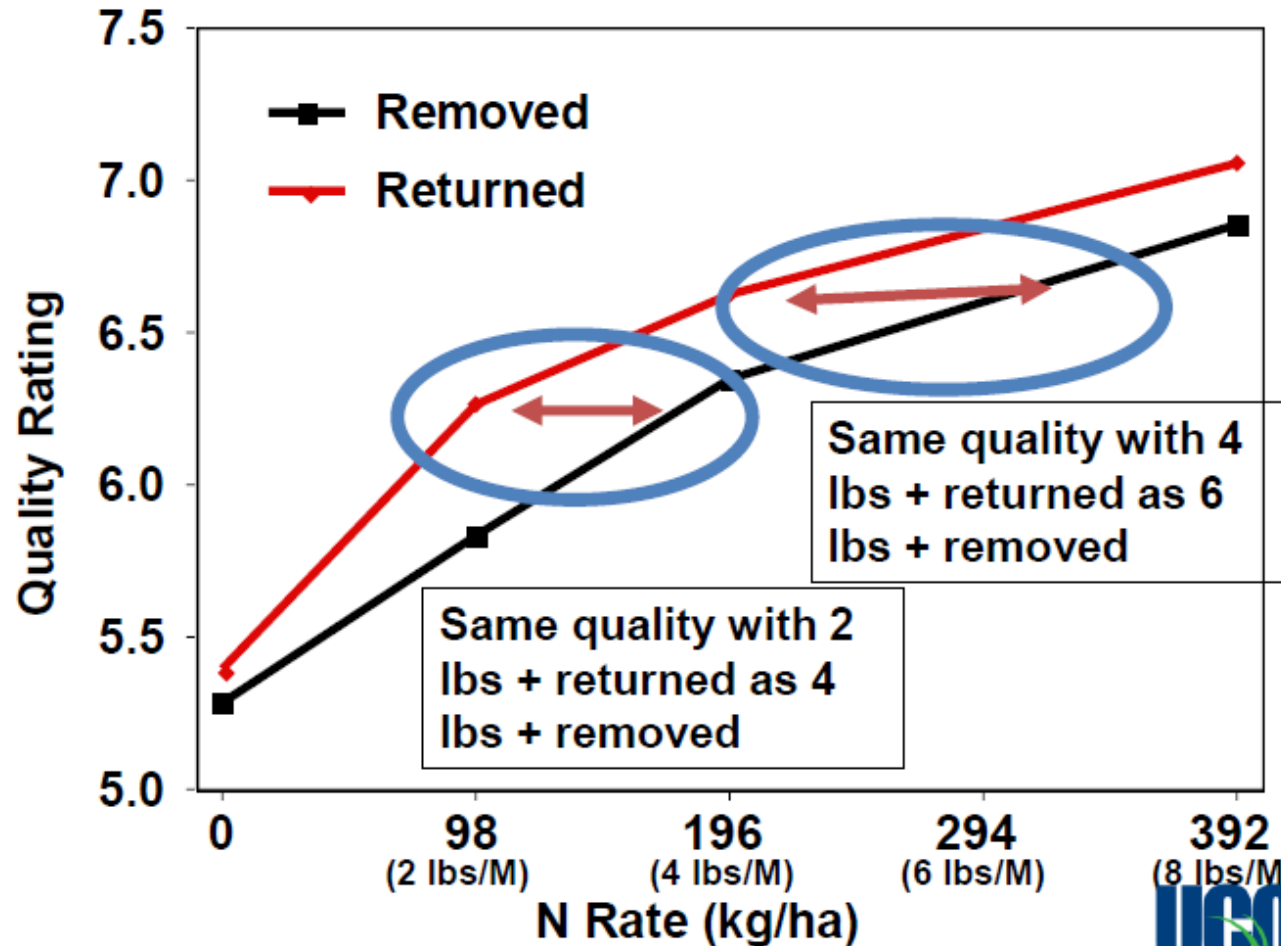
Respondents' Mean Levels of Willingness to Engage in Practices to Reduce Nutrient Leaching and Runoff from Their Lawn (1=Not willing; 5=Very Willing)



Mow high 3" and leave clippings on the lawn.

• Return the Clippings to the Turf

Turfgrass Quality and Clipping Management



Kopp and Guillard (*Crop Sci.* 42:1225-1231, 2002)




4. Water wisely

1 inch of water per week



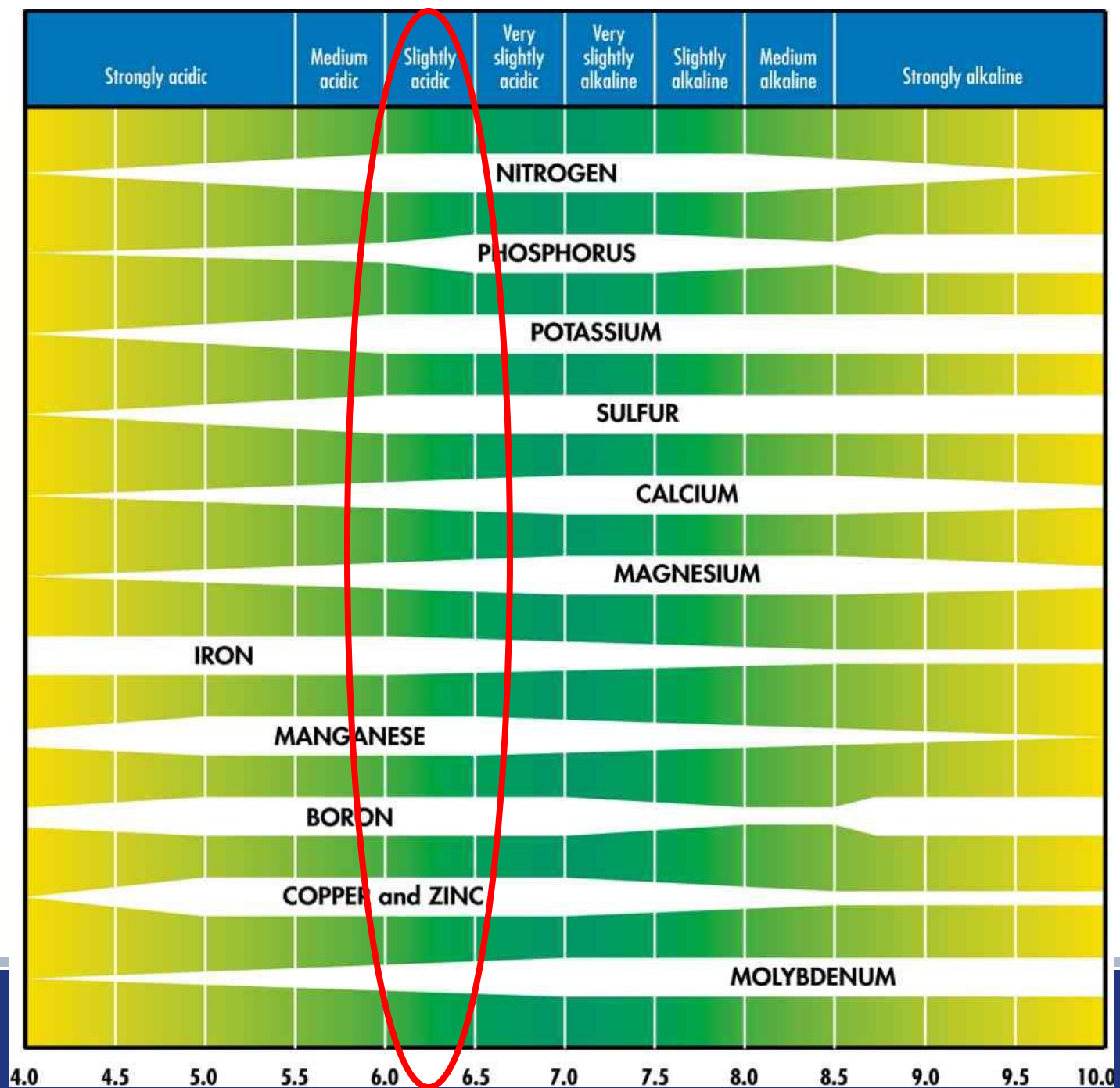
5. Test Soil

Note pH
and Organic
Matter

		Home Grounds and Gardens		
		Soil Report		
		Lawn		
Lab ID: 41646		Lab Run Date: 08/07/19		
Test Data				
pH - Soil	6.20			Optimum Range
Calcium, Mehlich 3 (Ca)	530.80 (ppm)	L		800 - 1200
Magnesium, Mehlich 3 (Mg)	80.00 (ppm)	O		60 - 120
Potassium, Mehlich 3 (K)	62.00 (ppm)	L		170 - 280
Phosphorus, Mehlich 3 (P)	40.00 (ppm)	O		30 - 50
Lead, Mehlich 3 (Pb)	3.79 (ppm)	VL		
Org. Matter, LOI-360 (OM)	5.69 (%)			
<u>Optimum Range Key</u>				
VL - Very Low	L - Low	O - Optimal	H - High	VH - Very High

Soil pH

Ideal = 6.0-6.5



Soil Organic Matter: For NEW turf

Incorporate compost or another organic matter source to raise the organic matter content to at least 3%-5%.*

(NOTE: compost can have high phosphorus levels.)



Soil Organic Matter: For EXISTING lawn

Build up soil organic matter by **top dressing** with compost.

$\frac{1}{4}$ inch layer, gently raked in

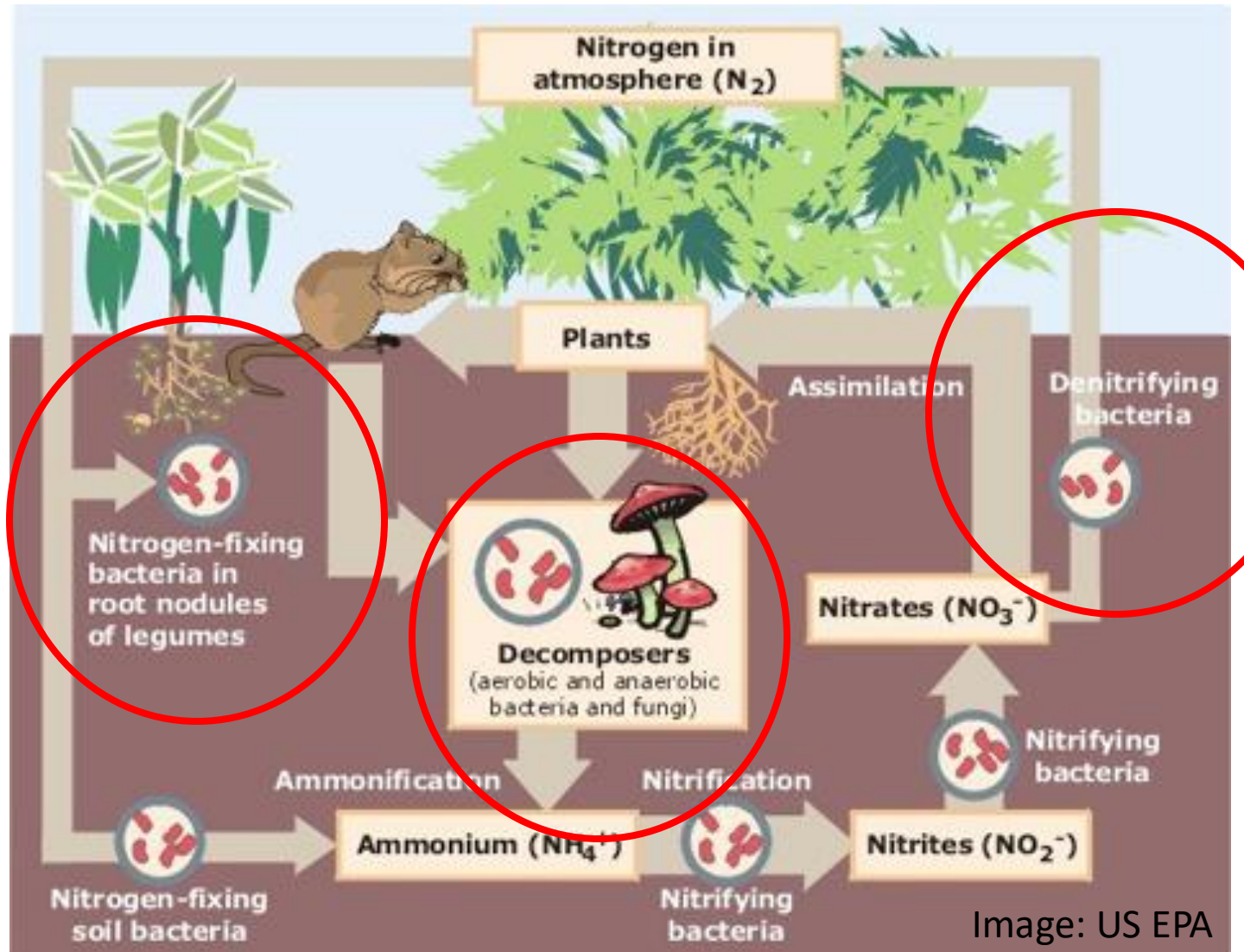


6. Manage yard waste properly

- LEAVE clippings on the lawn *OR* COMPOST them if very heavy
- COMPOST leaves *OR* SHRED for mulch
- NEVER rake grass clippings, leaves, or plant material into a waterbody, drainage area or stormdrain catch basin



Nitrogen Cycle



Recommendations, part 2

With fertilizer use

Recommendations for Lawns That Need Fertilizer

1. Know which nutrients are needed *and which are not*
2. Determine how much to apply
3. Know when and where to apply
4. Choose the right fertilizer for the situation

1. Know the soil nutrients



N = nitrogen for growth and greening

P = phosphorus for new roots and shoots

K = potassium for stress resistance

Goal is to have enough nutrients for healthy growth, but NONE in excess.

Soil Testing Services <http://extension.UNH.edu>



Trusted Analytics & Recommendations to Help You Grow

▶ Videos :



How to Take a Soil Sample for Soil Testing

YouTube · UNH Extension
Sep 13, 2019

I had my soil tested...but what do the results mean?

TUESDAY, SEPTEMBER 12, 2017

SHARE @ f t v p



Given the way this winter has gone so far, it's possible the ground will thaw soon if it hasn't already. That gives gardeners a prime opportunity to take their spring soil samples earlier than normal. But, sending in the sample is only the first step, next you will need to make sense of the results that come back.

Soil Testing Form – Commercial Landscape & Grounds Maintenance – Page 2

Sampling instructions

The soil sample should be representative of the area for which you want recommendations. Avoid areas that have an obvious difference in soil type, drainage, or plant growth. Take samples from at least 6-8 spots in each planting bed or lawn area you want tested and combine in a bucket.

Take samples to a depth of 6"- 8" for trees and shrubs and 3 - 4" for lawns. If sampling for established trees, take samples from several spots within and just beyond the dripline. The sample can be taken with a spade, shovel, trowel, soil probe or auger.

Mix well, air dry, and remove stones and other debris. Submit **ONLY 1 cup of dry soil** in a clean zip-lock bag for testing. Name each sample and label each bag clearly (e.g. "front lawn", "oak tree", etc.). If requesting **texture class**, send **2 cups of soil**.

Test descriptions

Standard Test includes conventional fertilizer and lime recommendations, based on pH, calcium, magnesium, potassium, and phosphorus levels.

Organic Test includes organic fertilizer and lime recommendations, based on pH, calcium, magnesium, potassium, phosphorus levels and organic matter.

Organic Matter includes the % organic matter content.

Texture Class includes % sand, silt & clay particles. **Send 2 cups of soil for this test.**

Micronutrients includes extractable copper, iron, manganese and zinc.

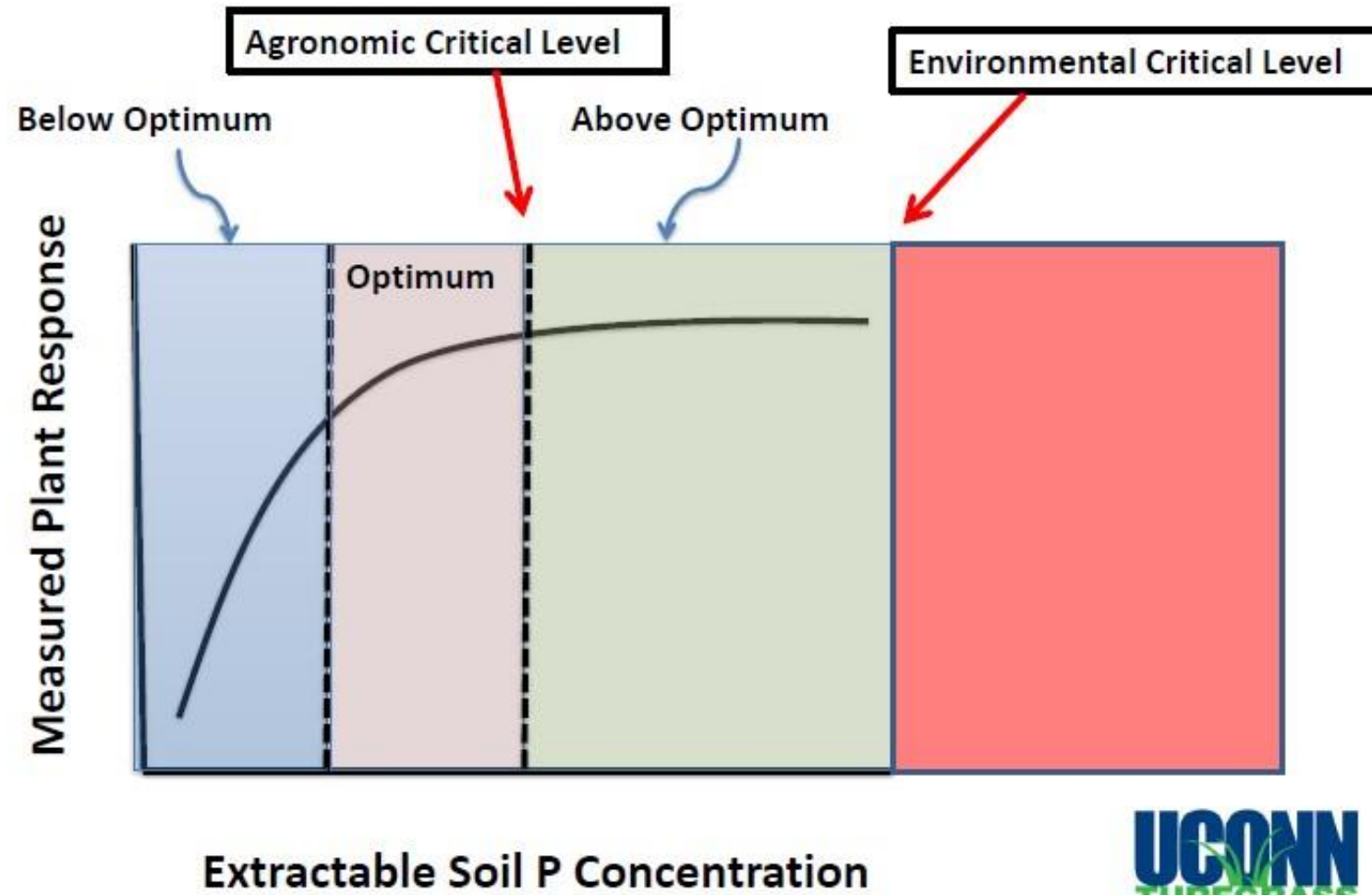
Crop Codes

- 1 – Annual flower beds
- 2 – Perennial gardens
- 3 - Azaleas & Rhododendrons, broadleaf evergreens
- 4 - Deciduous trees & shrubs
- 5 - Narrowleaf evergreens (pine, spruce, fir, juniper, etc.)
- 6 - Lawn/turf area
- 7 – Other:

Soil Testing for New Hampshire

Since the early 1900s, UNH and UNH Cooperative Extension have been providing soil analysis and nutrient recommendations to researchers, farmers and homeowners. Our soil testing procedures are best suited to typical New England soil types and may not be appropriate for samples submitted from other regions of the United States. The recommendations that you will receive are based on the latest research conducted in New Hampshire and the northeastern states. We do accept samples from neighboring states.

Turfgrass Response to Soil Test Phosphorus



Soil Test Results - pH

Test Data

pH - Soil	6.20			Optimum Range
Calcium, Mehlich 3 (Ca)	530.80 (ppm)	L		800 - 1200
Magnesium, Mehlich 3 (Mg)	80.00 (ppm)	O		60 - 120
Potassium, Mehlich 3 (K)	62.00 (ppm)	L		170 - 280
Phosphorus, Mehlich 3 (P)	40.00 (ppm)	O		30 - 50
Lead, Mehlich 3 (Pb)	3.79 (ppm)	VL		
Org. Matter, LOI-360 (OM)	5.69 (%)			
<u>Optimum Range Key</u>				
	VL - Very Low	L - Low	O - Optimal	H - High
				VH - Very High

Recommendations

Home Lawn (Target pH Range: 6.0 - 6.5)

Lawn Seeding

Lime: No Lime or Sulfur required at this time.

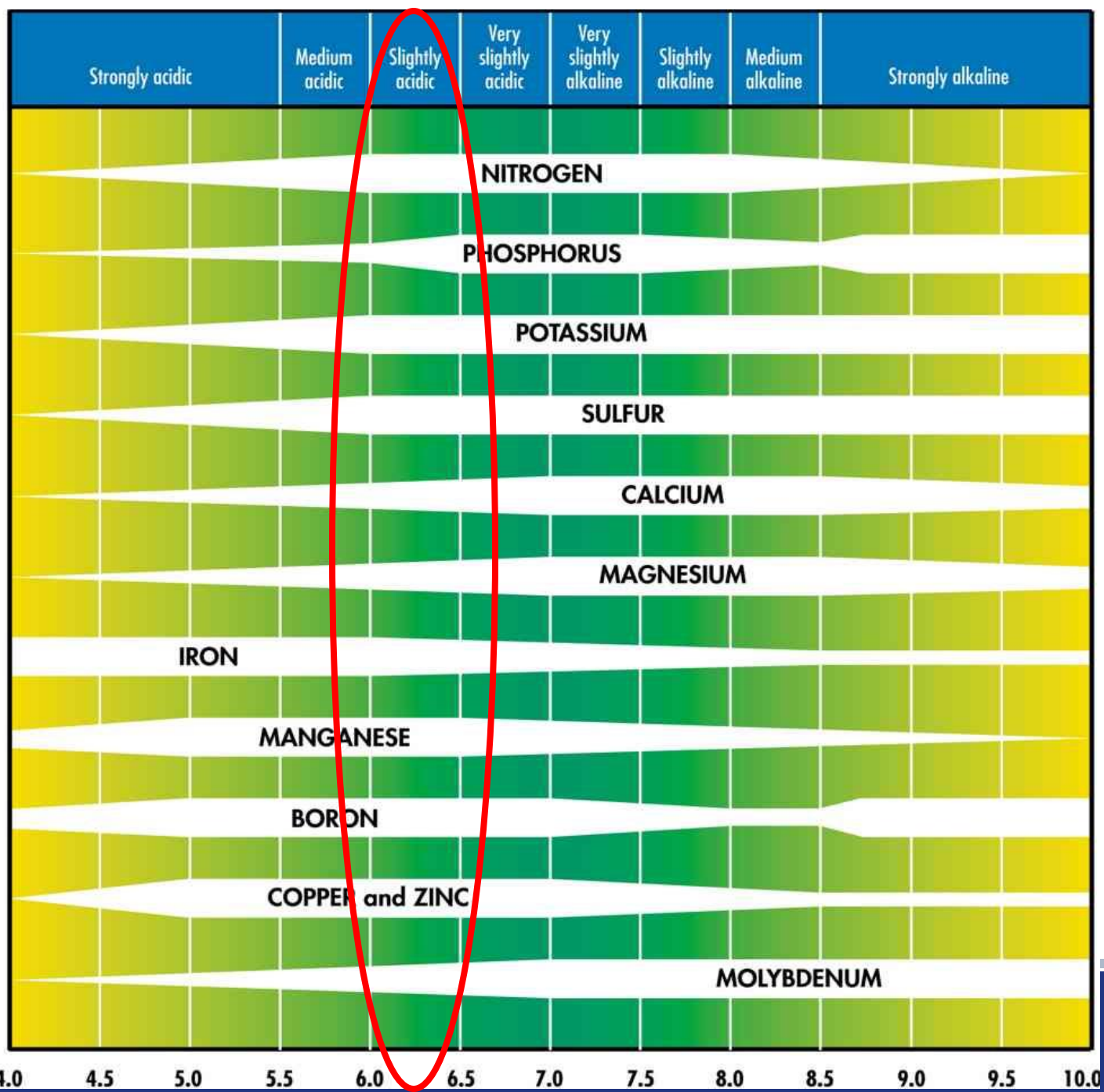
Fertilizer: For any single application, apply up to 0.9 lbs of total nitrogen per 1,000 sq. ft. of lawn using a fertilizer ratio of 1:1:1 or equivalent. Refer to the maintenance schedule below to determine how many applications you should make in 1 year. Do not apply more than 3.25 lbs of total nitrogen per 1,000 sq. ft. per year.

Lawn Maintenance

Lime: No Lime or Sulfur required at this time.

Fertilizer: For any single application, apply up to 0.9 lbs of total nitrogen per 1,000 sq. ft. using a fertilizer ratio of 3:0:3 or equivalent. Refer to the maintenance schedule below to determine how many applications to make in one year.

For spring and fall applications at least 25% of the total nitrogen in the fertilizer should be derived from slow release nitrogen. For a mid-summer fertilizer application at least 50% of the total nitrogen in the fertilizer should be derived from slow release nitrogen sources. Read the label on the back of the bag to see how much of the total nitrogen is in slow release form (which may be called water insoluble nitrogen on the label).



Soil Test Results - Nutrients

Where's the Nitrogen result?

Test Data

pH - Soil	6.20		Optimum Range	
Calcium, Mehlich 3 (Ca)	530.80 (ppm)	L	800 - 1200	
Magnesium, Mehlich 3 (Mg)	80.00 (ppm)	O	60 - 120	
Potassium, Mehlich 3 (K)	62.00 (ppm)	L	170 - 280	
Phosphorus, Mehlich 3 (P)	40.00 (ppm)	O	30 - 50	
Lead, Mehlich 3 (Pb)	3.79 (ppm)	VL		
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Recommendations

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Water Quality Friendly Recommendation:

Apply NO MORE than 0.9 pounds N per application

*Apply NO MORE than 2 pounds N per year**

* For lawns greater than 10 years old where clippings are left.

$0.9 + 0.9 + 0.9 + 0.9 = 3.6\text{lbs N} / 1000\text{ft}^2$ annually. $> 2\text{lbs N}$ per year

Apply **one-half to one-third** of amount recommended on fertilizer bag.

$0.45 + 0.45 + 0.45 + 0.45 = 1.8\text{lbs N} / 1000\text{ft}^2$ annually. $\leq 2\text{lbs N}$ per year

$0.3 + 0.3 + 0.3 + 0.3 = 1.2\text{ lbs N} / 1000\text{ft}^2$ annually. $\leq 2\text{lbs N}$ per year

$0.9 + 0.9 = 1.8\text{lbs N} / 1000\text{ft}^2$ annually. $\leq 2\text{lbs N}$ per year

NH Turf Fertilizer Law: RSA 431

When applied according to the label, NO turf fertilizer sold at retail shall:

- exceed 0.7lb/1,000ft² of *soluble* nitrogen per application
- **exceed 0.9lb/1,000ft² of *total* nitrogen per application**
- exceed an annual application of 3.25lb/1,000ft² of total nitrogen
- exceed a content level of 0.67% available phosphate
 - unless specifically labeled for establishing new lawns, for repairing a lawn, for seeding, or for use when a soil test indicates a phosphorus deficiency.
- exceed an application rate of 1lb/1,000ft² annually of available phosphate

The screenshot shows a webpage from the University of New Hampshire Extension. The header includes the UNH logo and the text 'Extension' and 'Bringing information and education into the communities of the Granite State'. The main title is 'New Hampshire's Turf Fertilizer Law - What You Should Know'. There is a sidebar with 'UNH Cooperative Extension Programs' including Community and Economic Development, Food and Agriculture (checked), Natural Resources, and Youth and Family. The main content has an 'Introduction' section discussing nitrogen and phosphorus in lawns and waterways. A photo shows a green fertilizer spreader. A 'Nitrogen Summary' box lists the limits: 0.7 lb/1,000 sq ft soluble nitrogen, 0.9 lb/1,000 sq ft total nitrogen, and 3.25 lb/1,000 sq ft annual total nitrogen.

Water Quality Friendly Recommendation:

Apply NO MORE than 0.9 pounds N per application

*Apply NO MORE than 2 pounds N per year**

* For lawns greater than 10 years old where clippings are left.

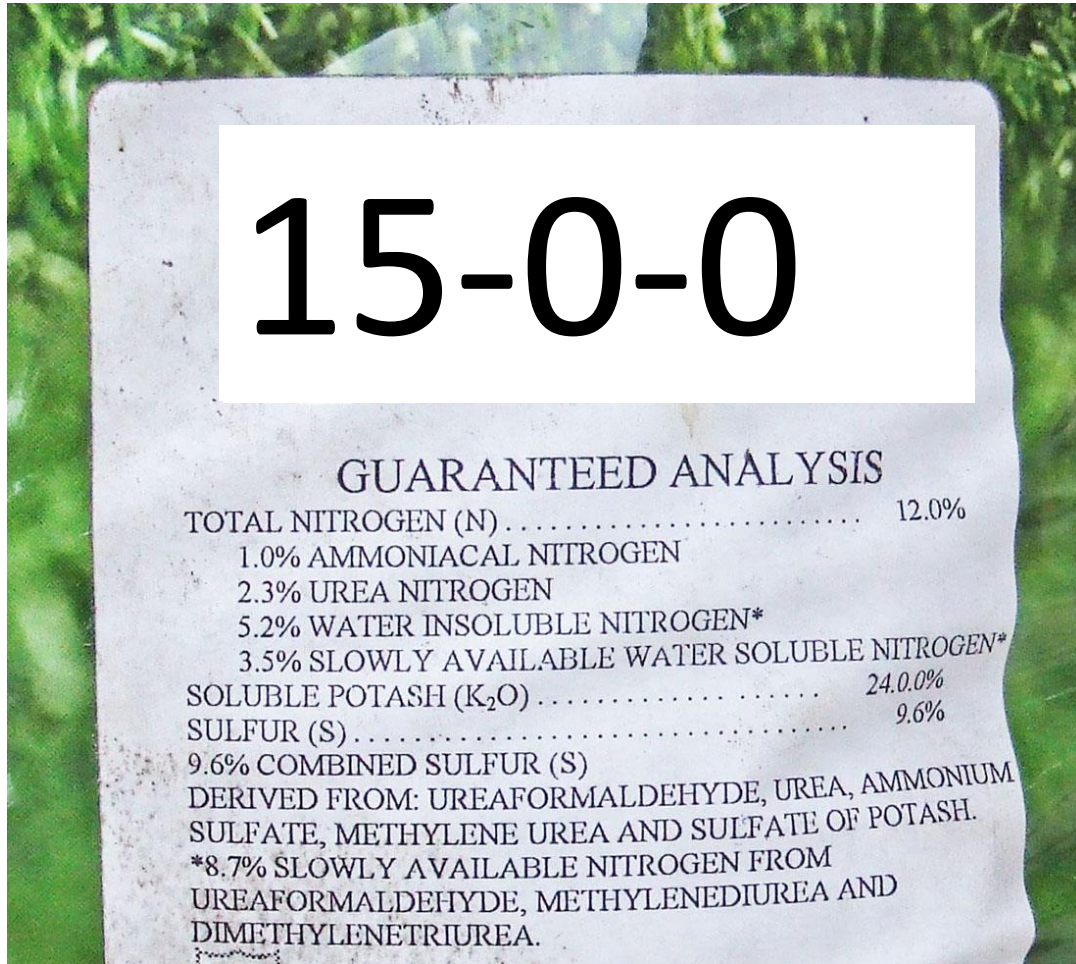
Look for results...

- quick release - within a couple weeks
- slow release - over many weeks

Reapply at reduced rate only if lawn response is unacceptable.

Reading a Fertilizer Label:

N-P-K



When would this product be appropriate?

How Much to Apply?



- A. Measure the dimensions to calculate AREA in square feet.
- B. Read label.
 - It states **how many pounds of product** to put down for each 1000ft² of lawn.
 - It **assumes a rate of .9 pounds of N per application** (in NH).
- C. Anticipate how many times you will apply this year (1-4).

Do people know the square footage of their lawns?

Does Respondent Know the Square Footage of their Lawn?

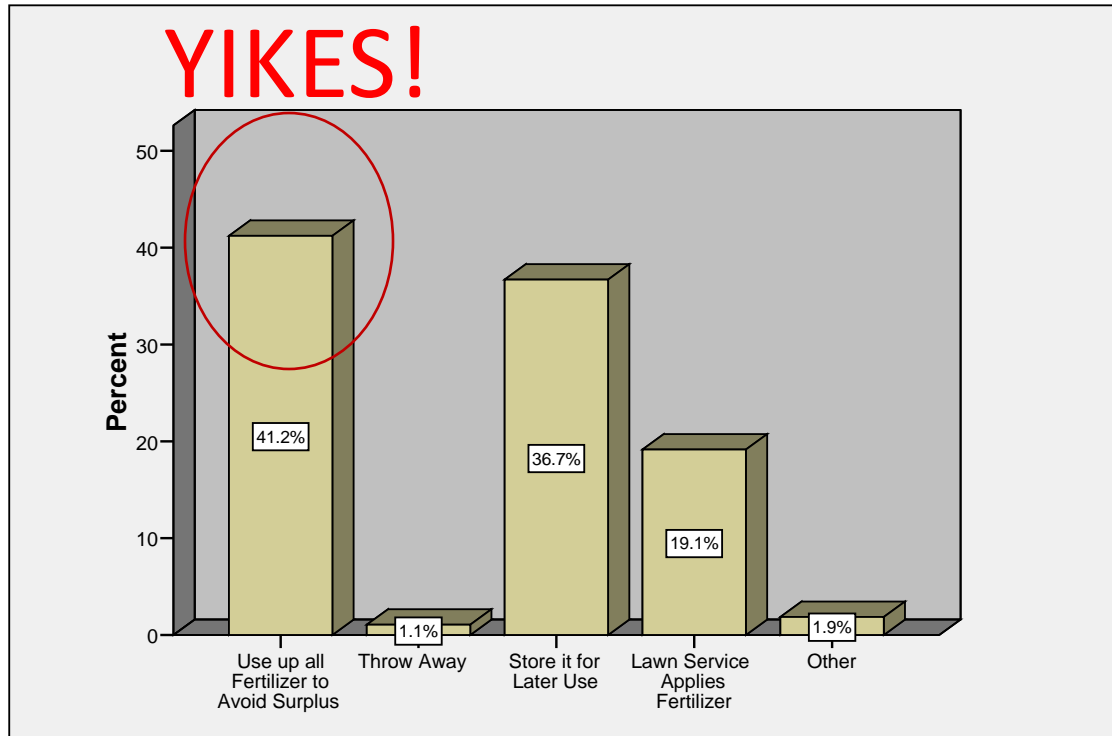
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	399	52.9	55.4	55.4
	Yes	321	42.6	44.6	100.0
	Total	720	95.5	100.0	
Missing	Not Applicable	8	1.1		
	Missing	26	3.4		
	Total	34	4.5		
Total		754	100.0		

Poll: If you apply fertilizer, what do you do with leftover fertilizer?

- Use up all fertilizer to avoid surplus
- Throw it away
- Store it for later use
- A lawn service applies my fertilizer
- Other

Use Only What You Need - Store or Give Away Extra

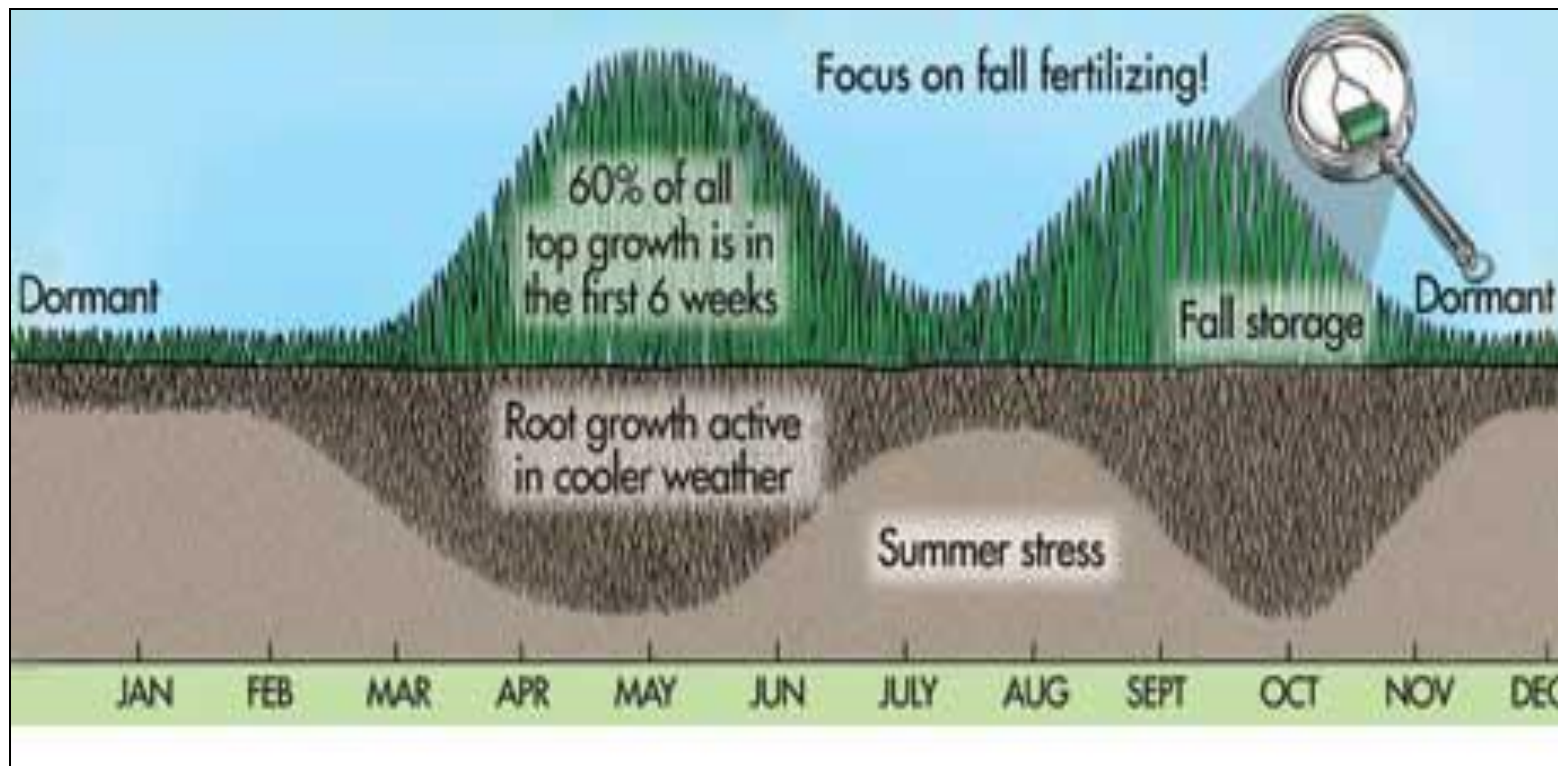
What Does Respondent do with Left-Over Fertilizer?



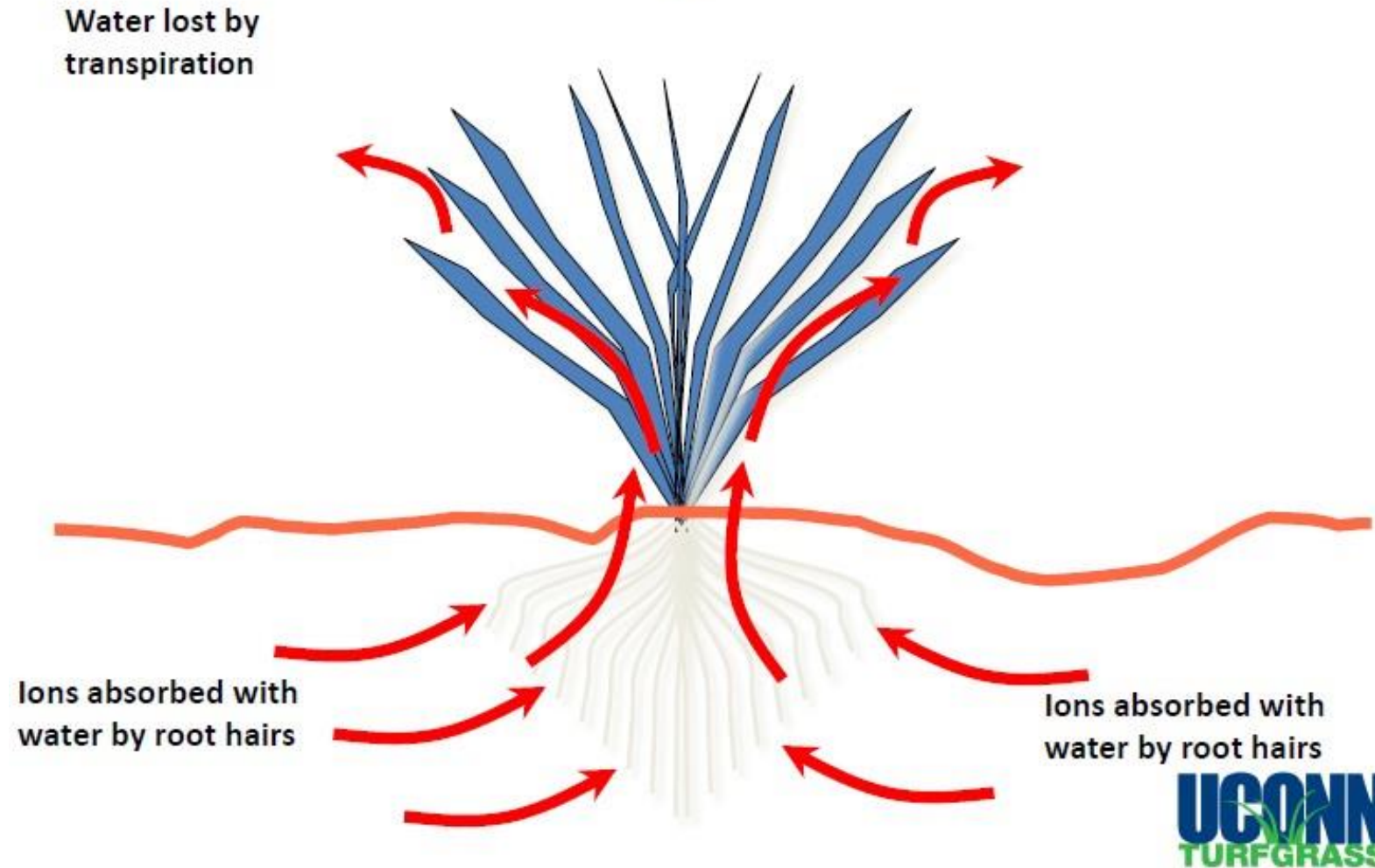
3. Know When to Apply

If needed, fertilize after spring green-up and no later than mid September.

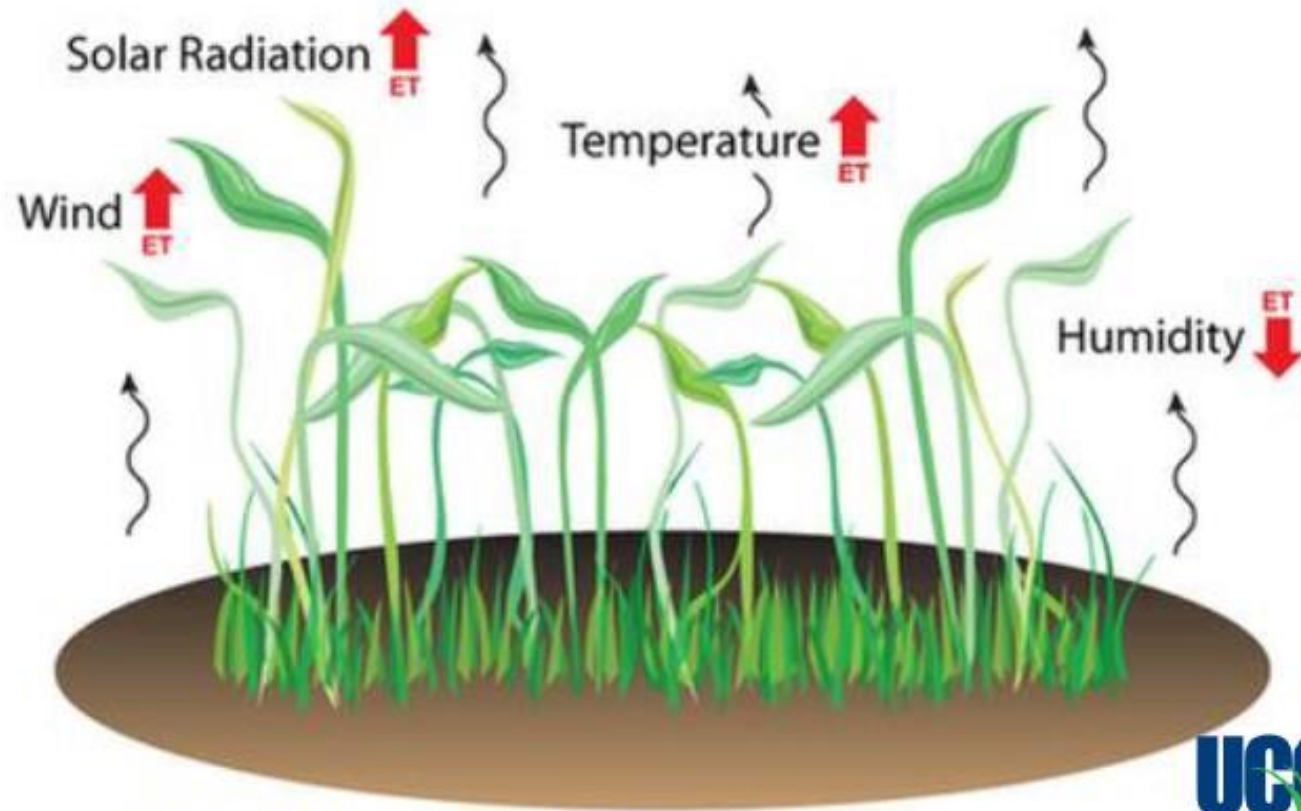
Avoid fertilizing in the mid-summer.



Mechanism of Nitrogen Uptake Related to Transpiration and Mass Flow



What is Likelihood of Sufficiently High Transpiration Rates in Late Fall to Drive Uptake of Large Volume of Soil Water?



<https://www.campbellsci.com/blog/evapotranspiration-101>

UConn
TURFGRASS

4. Choosing fertilizer

- **SLOW RELEASE** – is generally preferable for water quality considerations.
 - look for > 50% water insoluble nitrogen (win).
 - nutrient releases based on temperature, moisture levels or microbial activity depending on type.
 - comes in synthetic and organic forms.
- **NORMAL RELEASE SYNTHETIC** - may be preferable under very specific conditions
 - + Temperature is getting too low for slow release and supplement is needed
 - + Need to push growth quickly to prevent erosion
 - + Is typically less expensive
 - Is more prone to salt burn
 - Is more susceptible to leaching

- **ORGANIC – is a slow release option**

- +non-petroleum based, is from natural sources in a plant or animal-based carrier
- +good source of micronutrients
- +feeds microbes
- +adds organic matter
- may lead to over-applying P in order to get adequate levels of N for turf

AVOID – combination products (often herbicide and fertilizer, aka weed and feed) unless you are certain it's needed.

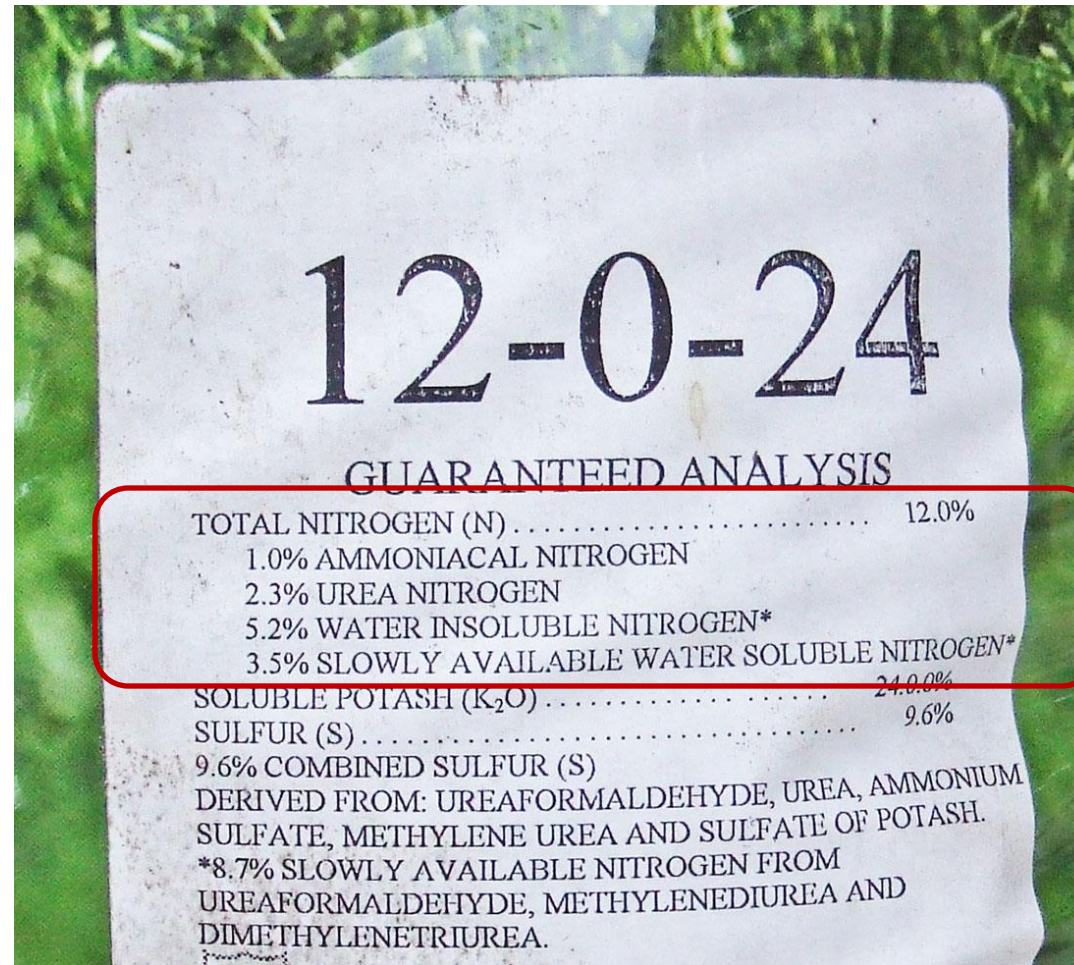
Just Because Fertilizer is Organic Doesn't Mean No Threat to Water Quality

- Once nutrients mineralized to ionic forms, they can runoff or leach
- Doesn't matter if original source synthetic or organic
- Excess is Excess



Reading a Fertilizer Label – % slow release / WIN

Look for products with 50% Slow Release / Water Insoluble Nitrogen



What is this soil test result telling you about P and K?

Test Data				
pH - Soil	6.40			Optimum Range
Calcium, Mehlich 3 (Ca)	695.70 (ppm)	L		800 - 1200
Magnesium, Mehlich 3 (Mg)	63.00 (ppm)	O		60 - 120
Potassium, Mehlich 3 (K)	72.00 (ppm)	L		170 - 280
Phosphorus, Mehlich 3 (P)	97.00 (ppm)	H		30 - 50
Lead, Mehlich 3 (Pb)	3.72 (ppm)	VL		
Org. Matter, LOI-360 (OM)	1.78 (%)			
<u>Optimum Range Key</u>				
VL - Very Low	L - Low	O - Optimal	H - High	VH - Very High

Fertilizer: For any single application, apply up to 0.9 lbs of total nitrogen per 1,000 sq. ft. using a fertilizer ratio of 1:0:1 (or 4:0:3) or equivalent. Refer to the maintenance schedule below to determine how many applications to make in one year.

Choose the best fertilizer based on soil test results (P and K) AND water quality goals (hint: >50% WIN)

Test Data				
pH - Soil	6.40			Optimum Range
Calcium, Mehlich 3 (Ca)	695.70 (ppm)	L		800 - 1200
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Potassium, Mehlich 3 (K)

72.00 (ppm)

L

Phosphorus, Mehlich 3 (P)

97.00 (ppm)

H

18-24-12

9.4% Ammoniacal Nitrogen

8.6% Urea Nitrogen

6-3-0

4.75% Water Insoluble Nitrogen

1.25% Water Soluble Nitrogen

8-0-5

0.1% Ammoniacal Nitrogen

1.2% Other Water Soluble Nitrogen

6.7% Water Insoluble Nitrogen

24-0-11

13.2% Urea Nitrogen

10.8% Slow Release Urea Nitrogen

Additional Information:

- <https://extension.unh.edu/tags/landscaping-water-quality> - includes video clips, manuals, fact sheets
- <https://extension.unh.edu/> - search by any lawn or gardening topic
 - Videos, blogs, fact sheets, manual, etc.

Thank you!

