

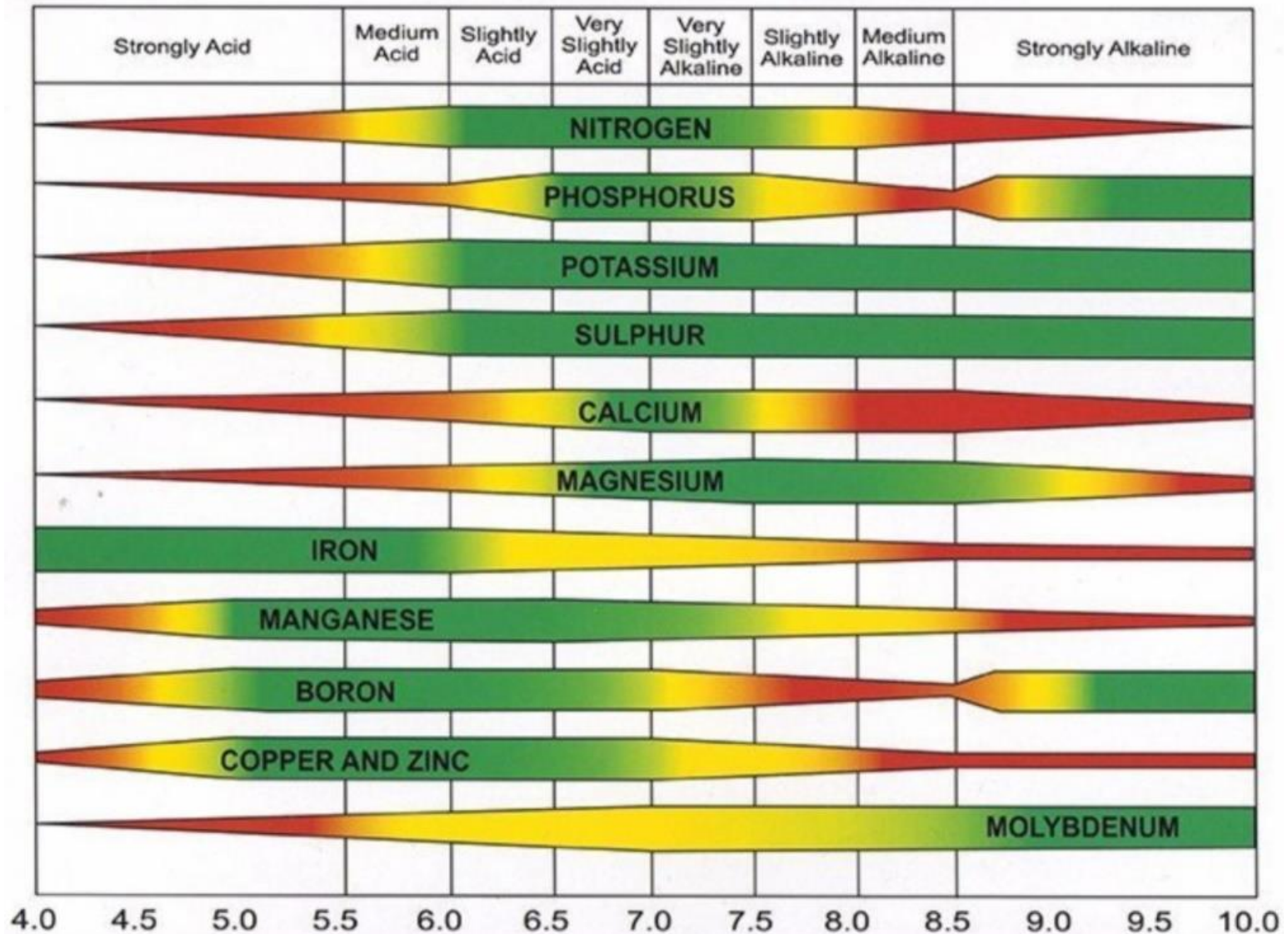
Soil Testing (Garden Math)

Get a soil test!



- Same:
 - Variety
 - Seed pack
 - Planting day
 - Planting person
 - Planting Depth
- Different: pH
 - Green plant: 6.1
 - Yellow plant: 5.3

Nutrient Availability



Macro Nutrients

- Nitrogen
 - Adequate nitrogen gives plants vigorous growth, green color, general health
 - Excessive nitrogen increases disease problems, reduces general vigor, reduces root zone and can burn plants
 - Excessive nitrogen leaches out of the soil into waterways causing algae bloom and fish die-off
- Phosphorus
 - Adequate phosphorus promotes good root growth, flowering, and winter hardiness
 - Excessive phosphorus can hinder the plants' ability to absorb nutrients by inhibiting mycorrhizal growth and competing for the plant's uptake of other nutrients
 - Excessive phosphorus can leach out of the soil into waterways causing algae bloom and fish die-off
- Potassium
 - Adequate potassium improves wear tolerance, heat and cold tolerance, stolon and rhizome growth and rooting
 - Excessive potassium may interfere with the plants' ability to absorb nitrogen and some micronutrients
 - Excessive potassium is not an environmental hazard

Micro Nutrients

- Secondary nutrients

- Calcium – soil gets this when you add calcitic lime
- Magnesium – soil gets this when you add dolomitic lime
- Sulphur – not generally a problem in the northeast

- Other micronutrients

- Iron
- Manganese
- Boron
- Copper
- Zinc
- Chlorine
- Molybdenum
- Nickel



Compost is a great source for all of these!

Visited Fwd: hours at festival ...



Services

- Pesticide Education
- Plant Diagnostics Laboratory
- Soil and Plant Nutrient Testing Laboratory
 - Lab Services
 - Contact and Lab Hours
 - Ordering Information & Forms**
 - Overview and Order Forms
 - Turnaround Time for Routine Soil Analysis
 - Payment Policy
 - Recharge Order Forms
 - Fact Sheets
 - Sampling Instructions for Routine Soil Analysis
 - Master Crop Code List for Routine Soil Testing
 - Lab Proficiency
 - Recommended Soil Testing Procedures
 - Frequently Asked Questions
 - Directions and Parking
 - Make a Gift to the UMass Soil Testing Lab
- Hot Water Seed Treatment
- Tick-Borne Disease Diagnostics
- Environmental Analysis Laboratory

Ordering Information & Forms

To submit a sample to the lab, download the appropriate form and follow the sample collection guidelines provided. Complete the submission form and either mail or hand deliver to the lab.

The fees on all order forms are **per sample**. Payment must accompany sample(s) submitted with checks or money order made payable to University of Massachusetts.

One cup of dry soil per sample is needed for Routine Soil Analysis. See [Sampling Instructions for Routine Soil Analysis](#) for detailed instructions on collecting a soil sample.

Note: When submission forms are opened with Adobe Reader or Acrobat, information may be typed in on the screen, then printed and sent to the lab.

The UMass Soil and Plant Nutrient Testing Lab does not test for herbicides, pesticides, or contaminants other than the heavy metals listed on our [Services](#) page.

Attention UMass personnel: Recharge order forms that use a speedtype for electronic payment may be found [here](#).

Soil Forms:

The Routine Soil Analysis is not intended for greenhouse planting mixes or organic soils containing more than 20% organic matter. The Modified Morgan extraction method and recommendations were developed for New England soils and climate.

- [Routine Soil Analysis - Order Form for Home Grounds and Gardening](#) ←
- [Routine Soil Analysis - Order Form for Turf, Ornamentals, and Landscaping](#)
- [Routine Soil Analysis - Order Form for Commercial Vegetables and Fruits](#)
- [Routine Soil Analysis - Order Form for Forage and Grain Crops](#)
- [Routine Soil Analysis - Use this form when submitting more than six samples and attach to appropriate order form.](#)

https://ag.umass.edu/services/soil-plant-nutrient-testing-laboratory/ordering-information-forms



UMass Soil & Plant Nutrient Testing Laboratory

Paige Laboratory, Room 203

161 Holdsworth Way

Amherst, MA 01003

(413) 545-2311

soiltest@umass.edu

<http://soiltest.umass.edu>

USE THIS FORM FOR ROUTINE SOIL ANALYSIS – HOME GROUNDS AND GARDENS

Visit our website to download a copy of [Sampling Instructions for Routine Soil Analysis](#), which includes a description of routine and optional soil tests offered. Send your sample(s), completed submission form and payment to the address listed above. Enclose check payable to UMass for \$20 for each sample plus additional fees for optional tests requested below.

Main Contact		Send Copy to		Method of Receiving Results	
Name:		Name:		<input type="checkbox"/> US Mail (Please include \$2 per order for postage & handling) <input type="checkbox"/> Email	
Business Name:		Business Name:			
Street Address:		Street Address:			
City, State, Zip		City, State, Zip:			
Phone:		Phone:			
Email Address:		Email Address:			

LAB # (Leave blank)	Sample ID (You create this)	Approx. area Represented by Sample (Sq. ft. or Acres)	Crop Code, limit of 3 (See reverse side of this form)	Routine Analysis (\$20.00)	Organic Matter (\$6.00)	Soluble Salts (\$6.00)	Nitrate (\$8.00)
				<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Order Total \$ _____.

Office Use Only	
Received	Due
Check#	PO#
Cash	Date

“Routine Soil Analysis - Order form for Home Grounds and Gardening”

Crop Codes for Home Grounds and Gardens

To receive lime and nutrient recommendations on your test report, you must specify the appropriate Crop Code(s) on your soil sample submission form. These recommendations are based on analytical results for your sample. Please select up to three Crop Codes that best describes your management objectives from the list below.

Home Lawns – Recommendations given per 1,000 sq. ft.

Description	Crop Code
Lawn-New Establishment.....	HA1
Lawn-Maintenance.....	HA2

Home Gardens, Trees and Shrubs – Recommendations given per 100 sq. ft.

Description	Crop Code
Home Vegetable Garden.....	HB1
Home Vegetable Garden, Asparagus only.....	HB1A
Flowers, Roses, & Herbs.....	HB3E
Deciduous Trees, Shrubs & Vines-New Establishment.....	HC1E
Deciduous Trees, Shrubs & Vines-Maintenance.....	HC1M
Needle Leaf Trees & Shrubs-New Establishment.....	HC2E
Needle Leaf Trees & Shrubs-Maintenance.....	HC2M
Acid-loving Trees, Shrubs, & Groundcover-New Establishment.....	HC3E
Acid-loving Trees, Shrubs, & Groundcover-Maintenance.....	HC3M
Home Blueberries-New Establishment.....	HD1E
Home Blueberries-Maintenance.....	HD1M
Home Brambles-New Establishment.....	HD2E
Home Brambles-Maintenance.....	HD2M
Home Strawberries-New Establishment.....	HD3E
Home Strawberries-Maintenance.....	HD3M
Home Grapes, American Varieties-New Establishment.....	HD4E
Home Grapes, American Varieties-Maintenance.....	HD4M
Home Grapes, European Varieties-New Establishment.....	HD5E
Home Grapes, European Varieties-Maintenance.....	HD5M

You can use up to 3 of these crop codes for each soil test sample.

Top of 1st page of report



Soil and Plant Tissue Testing Laboratory
203 Paige Laboratory
161 Holdsworth Way
University of Massachusetts
Amherst, MA 01003
Phone: (413) 545-2311
e-mail: soiltest@umass.edu
website: soiltest.umass.edu



Soil Test Report

Prepared For:
Gretel Anspach

gretel@alum.mit.edu

Sample Information:

Sample ID: Tre
Order Number: 14725
Lab Number: S150515-907
Area Sampled: 2000 sq ft
Received: 5/15/2015
Reported: 6/5/2015

This is the code you used to identify your soil test when you sent it in. Make sure you write down what part of your property it refers to!

Middle of 1st page – what's in your soil

Results

<i>Analysis</i>	<i>Value Found</i>	<i>Optimum Range</i>
Soil pH (1:1, H ₂ O)	5.5	
Modified Morgan extractable, ppm		
<i>Macronutrients</i>		
Phosphorus (P)	3.1	4-14
Potassium (K)	31	100-160
Calcium (Ca)	315	1000-1500
Magnesium (Mg)	41	50-120
Sulfur (S)	3.8	>10
<i>Micronutrients *</i>		
Boron (B)	0.1	0.1-0.5
Manganese (Mn)	1.5	1.1-6.3
Zinc (Zn)	0.7	1.0-7.6
Copper (Cu)	0.2	0.3-0.6
Iron (Fe)	7.8	2.7-9.4
Aluminum (Al)	74	<75
Lead (Pb)	0.7	<22





* Micronutrient deficiencies rarely occur in New England soils; therefore, an Optimum range found in soils and are for reference only.

- Lead (Pb)
- < 100 ppm (parts per million)
 - No action required
- 100 ppm – 300 ppm
 - Avoid bare soil if there are children around who may eat soil
 - Wash or peel any edibles grown in the soil
 - Grow for fruit rather than roots or leaves
- > 300 ppm
 - Cover (e.g. lawn, mulch), and/or
 - Remediate (pH > 6.5, add compost), or
 - Remove

Check lead level, ignore the rest

Bottom of 1st page – how it compares

Soil Test Interpretation

Nutrient	Very Low	Low	Optimum	Above Optimum
Phosphorus (P):				
Potassium (K):				
Calcium (Ca):				
Magnesium (Mg):				

1 of 2

Sample ID: Tre

Lab Number S150515-907

You can ignore this part too

2nd page – what to do!

Recommendations for Deciduous Trees, Shrubs & Vines-Maintenance

Limestone (Target pH of 6.0)	Nitrogen, N	Phosphorus, P ₂ O ₅	Potassium, K ₂ O
5	.1 - .2	0.25	0.25

Comments:

- For instructions on converting nutrient recommendations to fertilizer applications in home gardens, lawns and landscapes, see Reference "Step-by-Step Fertilizer Guide for Home Grounds and Gardening" (listed below).
- Maintaining a 2 to 4 inch organic mulch will help conserve moisture and improve soil conditions.

References:

Home Lawn and Garden Information

<http://ag.umass.edu/interest-areas/home-lawn-garden>

Step-by-Step Fertilizer Guide for Home Grounds and Gardening

<https://soiltest.umass.edu/fact-sheets/step-step-fertilizer-guide-home-grounds-and-gardening>

General References:

Interpreting Your Soil Test Results

<http://soiltest.umass.edu/fact-sheets/interpreting-your-soil-test-results>

For current information and order forms, please visit

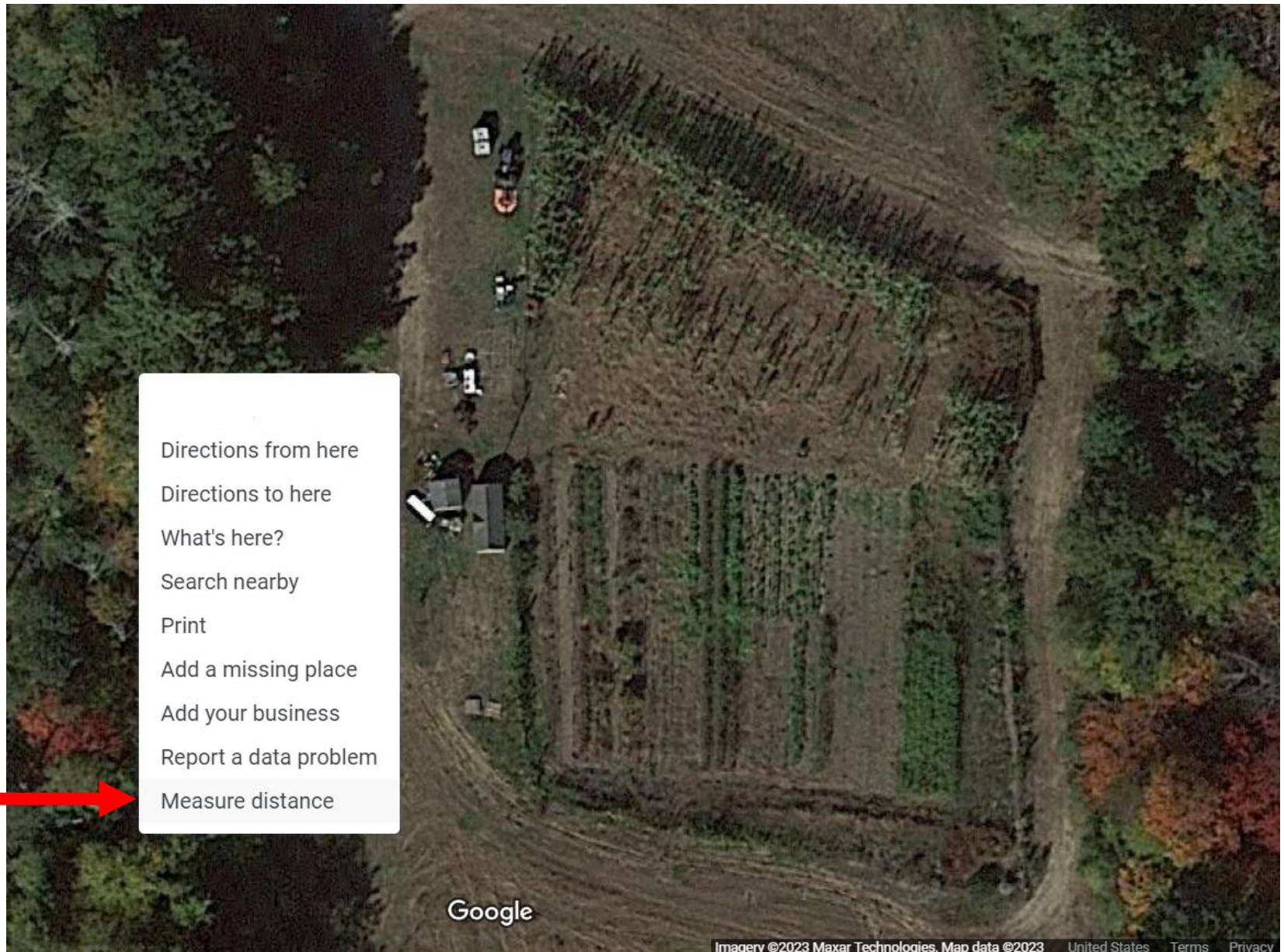
<http://soiltest.umass.edu/>

Recommendation: Add 5 # lime
.1-.2 # nitrogen
.25 # phosphorus
.25 # potassium per 100 square feet

Either – Google your address



Right click and select “Measure distance”



- Directions from here
- Directions to here
- What's here?
- Search nearby
- Print
- Add a missing place
- Add your business
- Report a data problem
- Measure distance

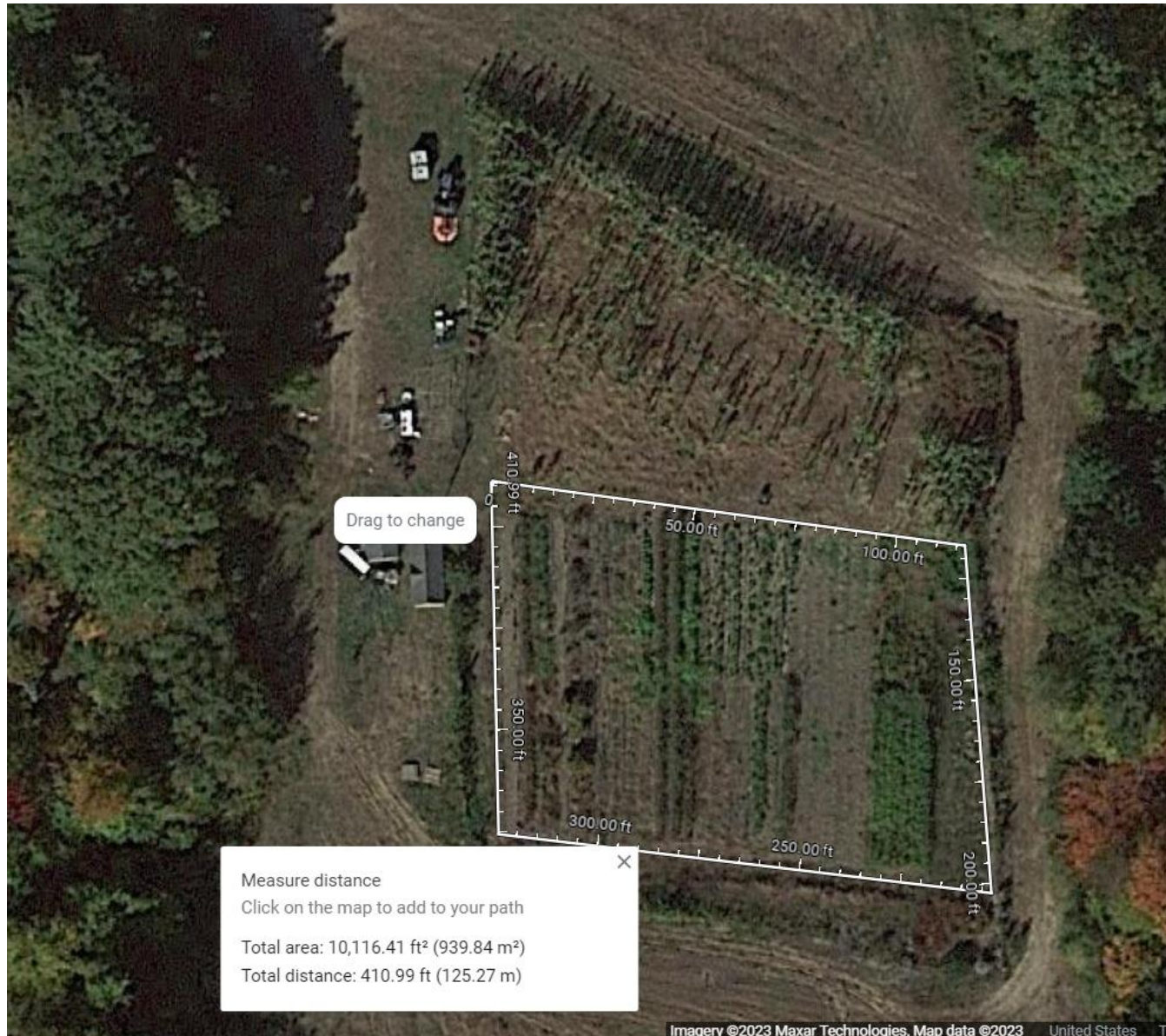
Notice pop-up. Getting the first point right can be fiddly



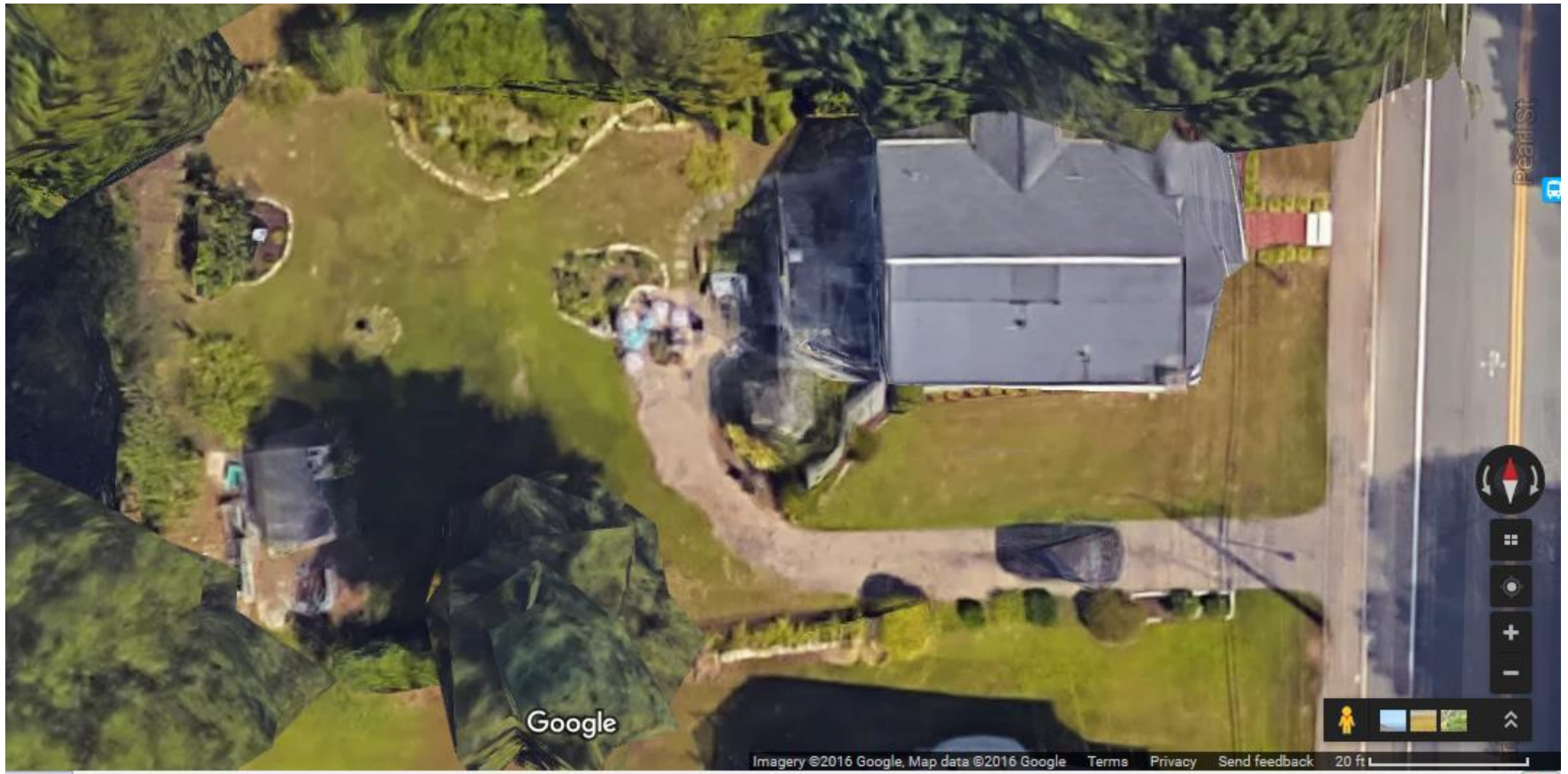
Then it gets easier



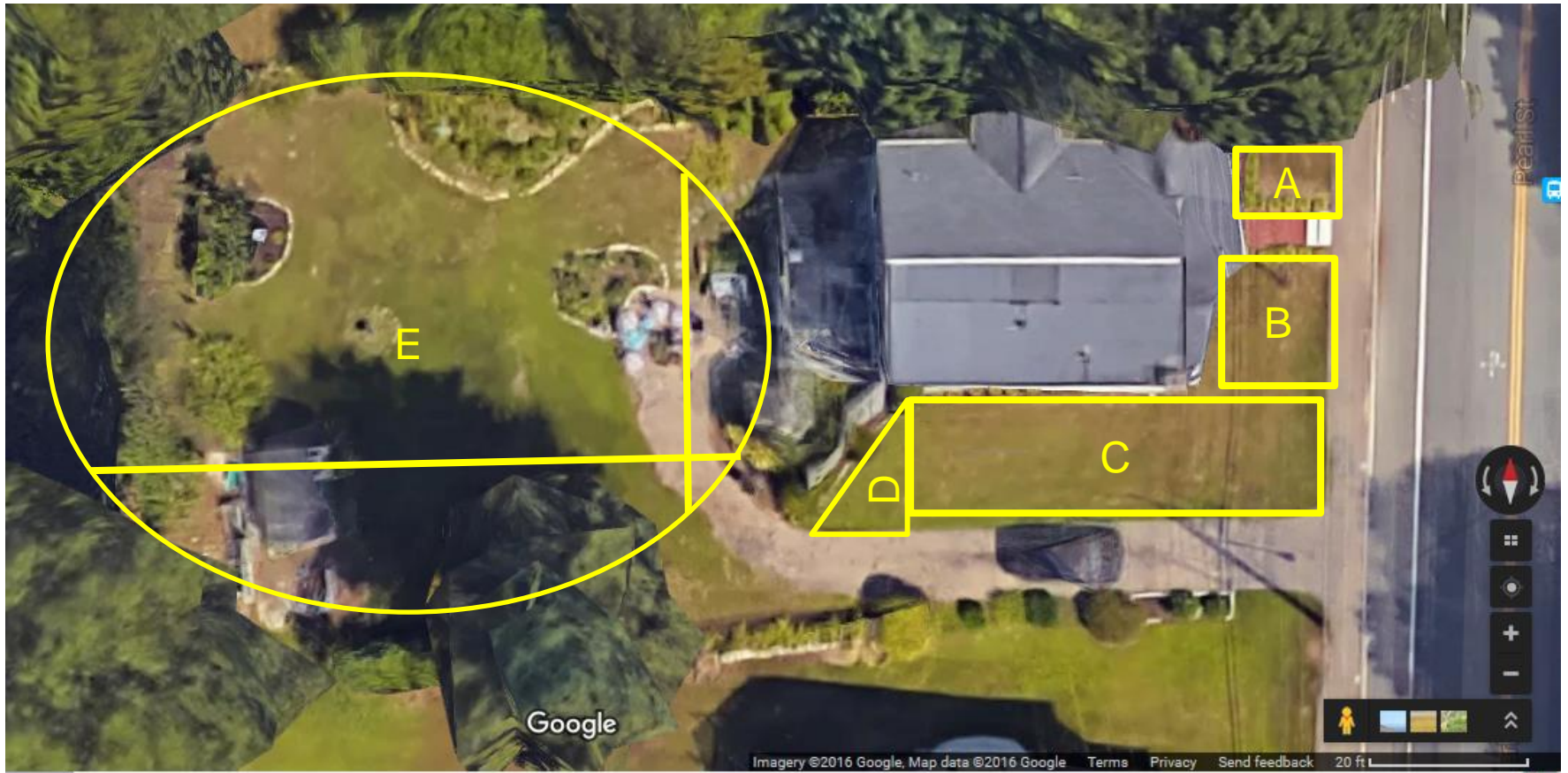
Close the path to get the area



Or – Google your address



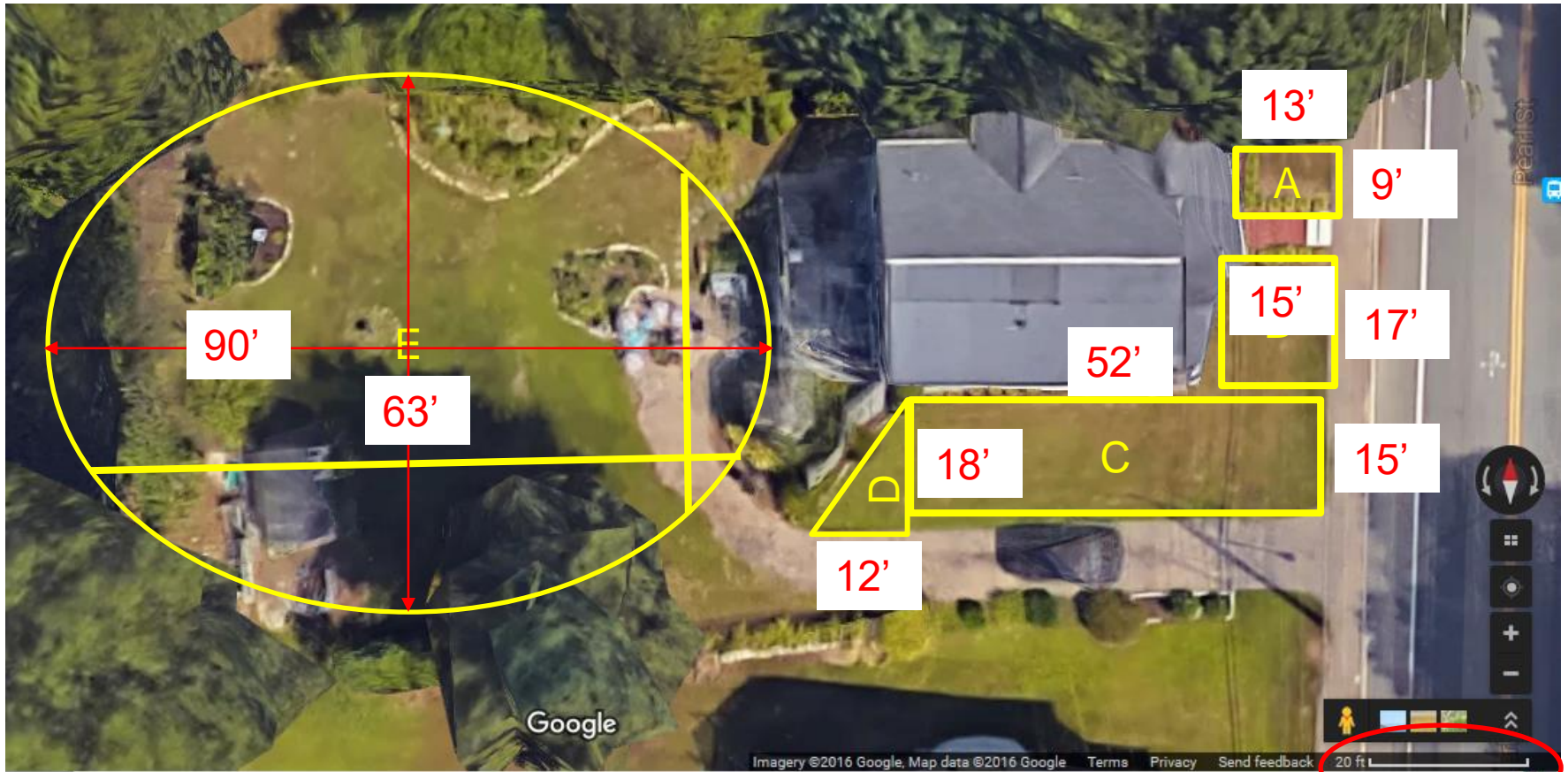
Draw shapes



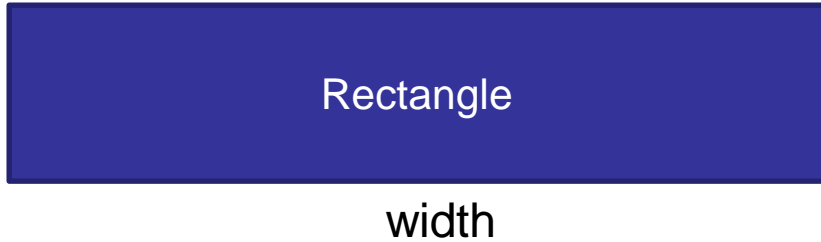
Doesn't have to be a perfect fit

Can eyeball “cut-outs” – e.g. probably half of the circle is lawn

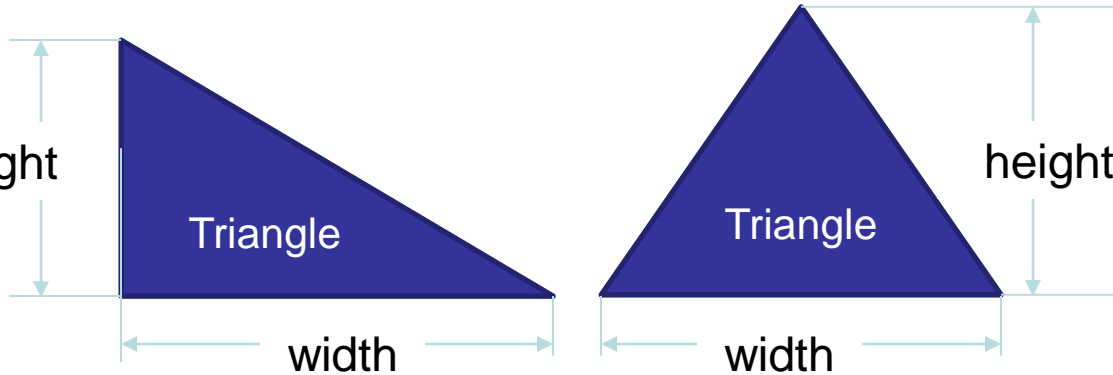
Measure key dimensions



Standard math formulae

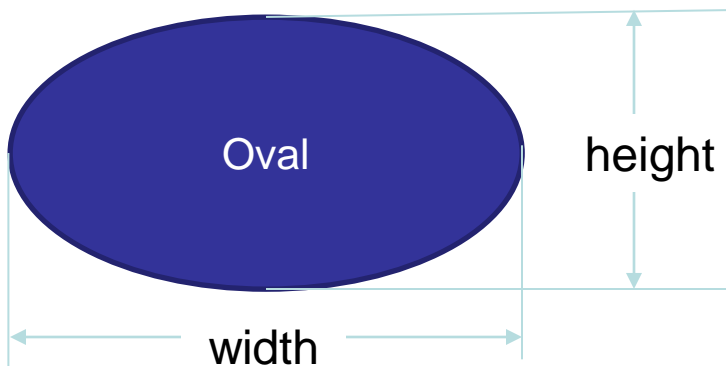


$$\text{Area} = \text{height} \times \text{width}$$



$$\text{Area} = \frac{1}{2} \times \text{height} \times \text{width}$$

(a triangle is half a rectangle)



$$\text{Area} = 3.14 \times \frac{1}{4} \times \text{height} \times \text{width}$$

Compute areas of shapes

- Front lawn:
 - Rectangle A: $13' \times 9' = 117'$
 - Rectangle B: $15' \times 17' = 255'$
 - Rectangle C: $52' \times 18' = 936'$
 - Triangle D: $\frac{1}{2} \times 12' \times 18' = 108'$
 - Total Front Lawn Area: 1416 (call it 1400')
- Back lawn:
 - Oval E: $3.14 \times \frac{1}{4} \times 63' \times 90' = 4451'$
 - Back lawn is probably half that circle = 2225'
 - 2200 is probably close enough

Lime

- Recommendation: 5# lime/100 square feet
- Front lawn: 1400 square feet -> 70# of lime
 - $(5 * 1400 / 100)$
- Back lawn: 2200 square feet -> 110# of lime
 - $(5 * 2200 / 100 = 110)$



Fertilizer

- 3 numbers on each bag
 - N-P-K
 - Nitrogen – Phosphorus – Potassium (always in that order)
- Numbers are the percent of that element in the fertilizer by weight
 - 50 pound bag of 14-14-14
 - 14% nitrogen – 7# nitrogen
 - 14% phosphorus – 7# phosphorus
 - 14% potassium – 7# potassium
 - 30 pound bag of 12-32-06
 - 12% nitrogen – 3.6# nitrogen
 - 32% phosphorus – 9.6# phosphorus
 - 6% potassium – 1.8# potassium



Fertilizer

	Nitrogen	Phosphorus	Potassium
Recommendation	.1-.2#/100 sq. ft.	.25#/100 sq. ft.	.25#/100 sq/ft
Front Yard (1400 sq. ft.)	1.4-2.8# total	3.5# total	3.5# total
Back Yard (2200 sq. ft.)	2.2-4.4# total	5.5# total	5.5# total

- Can add 3 elements separately
- Easier to add balanced fertilizer

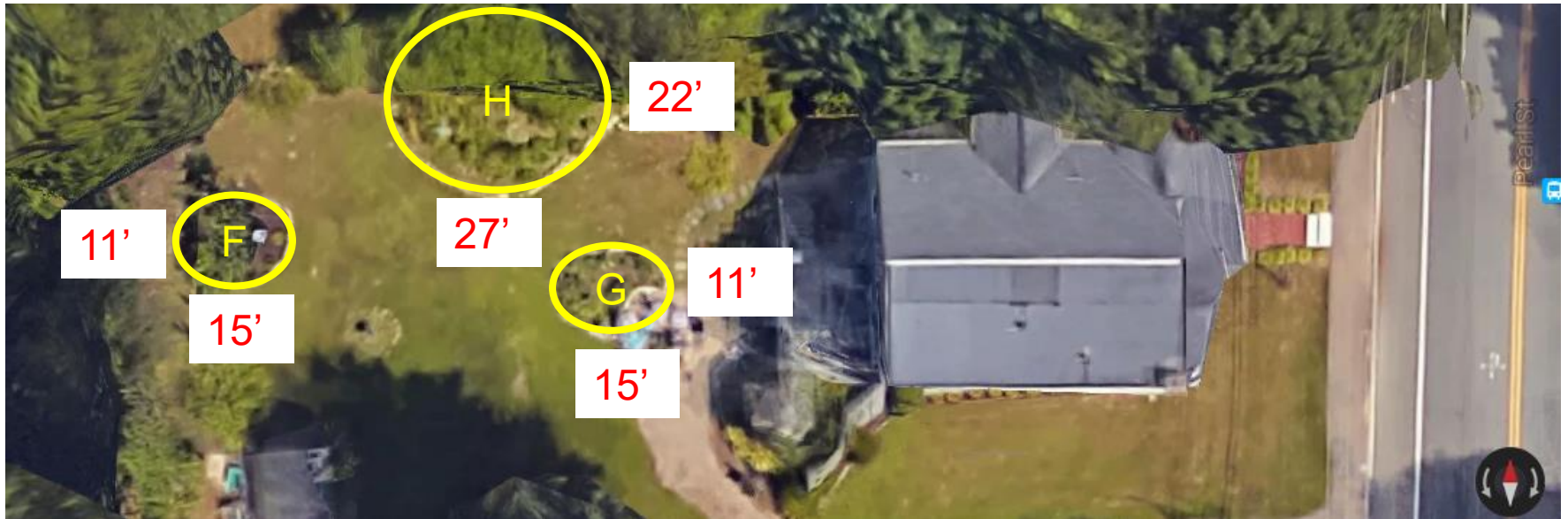
Product	Weight / Cost	Front Bags	Front NPK	Back Bags	Back NPK	Total Weight	Total Cost
10-10-10 (synthetic)	40# for \$28.99	.75 bags	3-3-3	1.25 bags	5-5-5	80#	\$57.98
3-4-4 (organic)	27# for \$22.97	3.5 bags	2.8-3.8-3.8	5.5 bags	4.5-5.9-5.9	243#	\$206.73
1-1-1 (steer manure)	25# for \$5.97	12 bags	3-3-3	20 bags	5-5-5	800#	\$191.04

Organic versus Synthetic Fertilizer

- Synthetic Fertilizers
 - Generally only N-P-K
 - Generally fast release, high dose – easy to overdose the plant and the land
- Organic Fertilizers
 - Generally N-P-K plus others
 - Generally medium release, low dose – harder to overdose (but not impossible)
- Soil Amendments (e.g. manure)
 - N-P-K generally not known
 - Broad range of nutrients available in some
 - Generally slow release, low dose – require micro-organisms to break down (temperature dependent)

Experiments show using exclusively synthetic fertilizers is worse for soil than including soil amendments – silent on the subject of organic fertilizers.

Mulch



- Oval F: $3.14 \times \frac{1}{4} \times 11' \times 15' = 130$ sq ft
- Oval G: $3.14 \times \frac{1}{4} \times 11' \times 15' = 130$ sq ft
- Half of Oval H: $\frac{1}{2} \times 3.14 \times \frac{1}{4} \times 22' \times 27' = 233$ sq ft
- Total bed area: 493 sq ft (500 sq ft)

Mulch math

- How much mulch do you need to cover 500 square feet 2" deep?
- Volume needed (cubic feet)
 - Area x depth
 - 500 square feet x 2 inches (but can't multiply inches by feet)
 - 1 foot = 12", so 2" = $2/12$ of a foot ($1/6$)
 - 500 square feet x $1/6$ foot = 83 cubic feet
- Volume needed (cubic yards)
 - 1 cubic yard = 27 cubic feet ($3' \times 3' \times 3'$)
 - 83 cubic feet = $83/27$ cubic yards = 3 cubic yards

Questions?