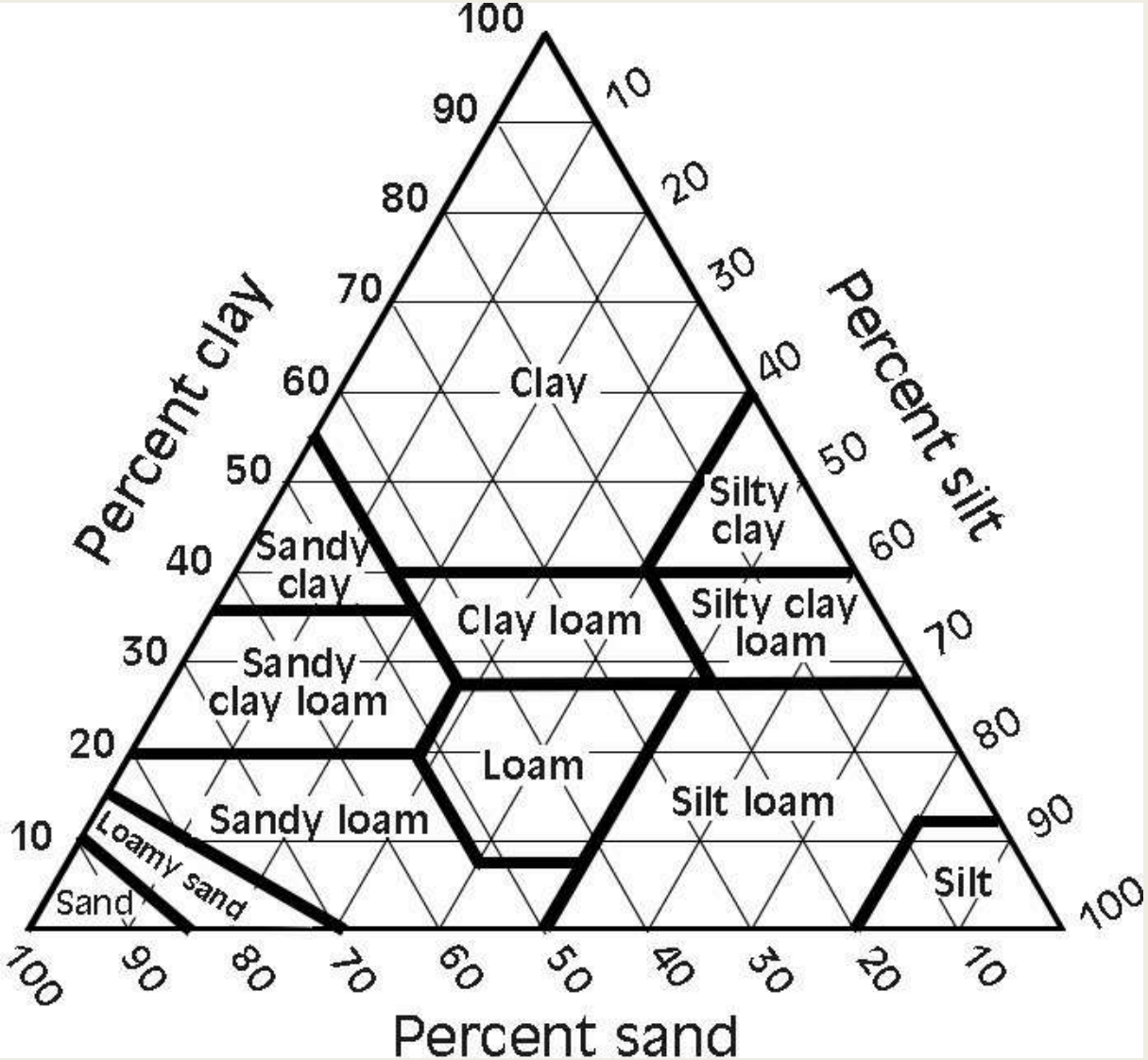
BIOLOGICAL COMPLEXITY IN THE DUMBARTON OAKS GARDENS

Emma van der Heide

Soil Science

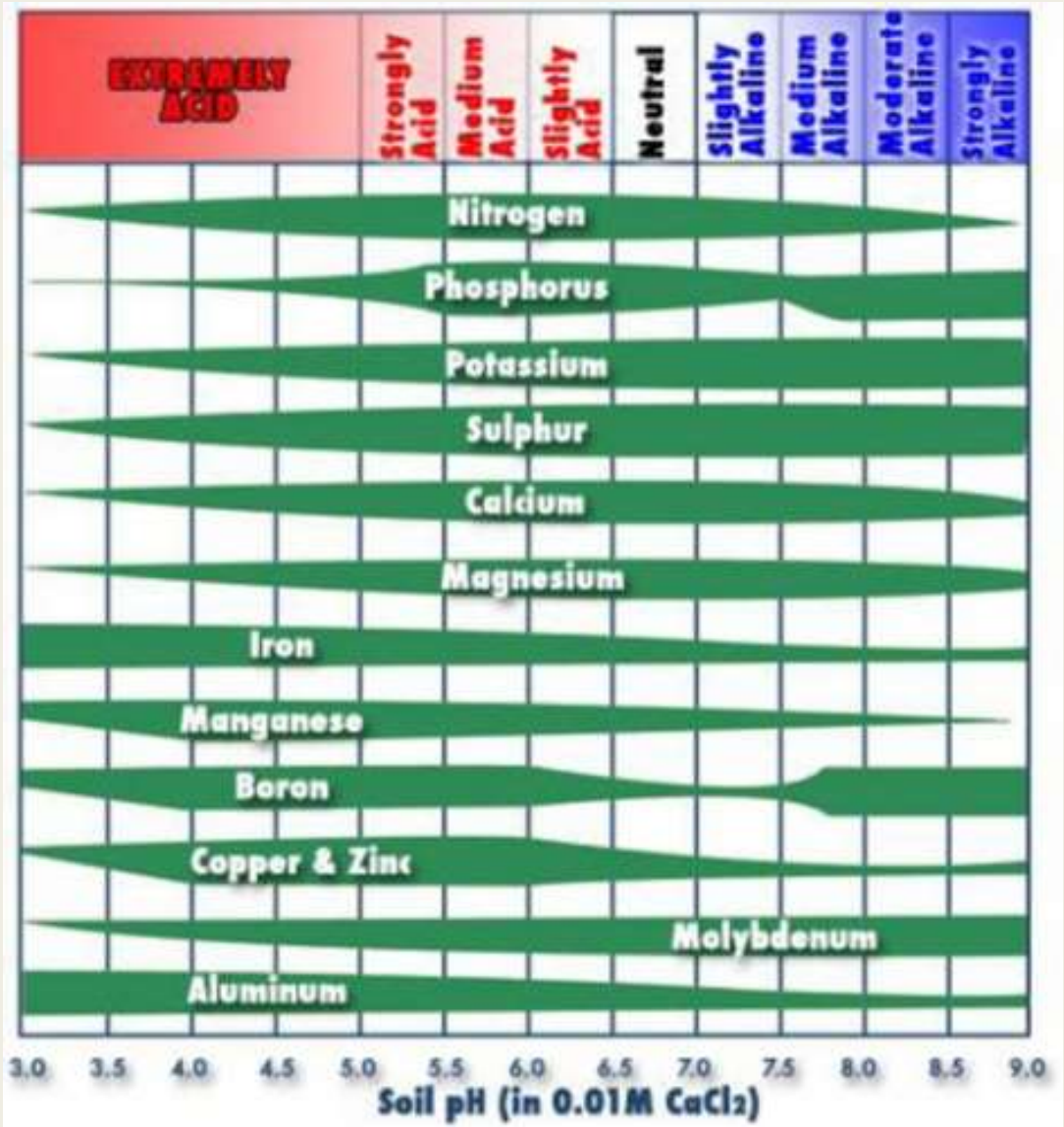
- Soil Formation: weathering of rock over long periods of time
  - *Type of rock influences type of soil*
- Ecology
  - *Healthy soil feeds a healthy ecosystem*
- Texture
- Nutrient Content

Textural Analysis



This textural triangle allows me to categorize soil based on the relative amounts of sand (the largest particle), silt, and clay (the smallest particle) that the soil contains.

Nutrient Analysis



Nutrient availability is influenced by pH. For example, we can see here that a given amount of Phosphorus in the soil is less available to plants at a pH of 4 than at a pH of 5.5.

Soil Sampling

- Plan
  - *Each dot represents a sample*
- Procedure
  - *Sampling Equipment*
  - *Soil probe*
  - *Composite Sampling*

    - Several subsamples from the area of concern are combined to make a composite sample. This dilutes the effect of any anomalous deposits.

This soil auger can be used to take soil cores, in which we can see the soil profile.

Soil Sampling

- Procedure
  - *Sampling Equipment*
  - *Composite Sample*
- Analysis
  - *Textural: to Waypoint Analytical*
  - *Nutrient: to Virginia Tech Soil Testing Lab*


FILL TO HERE!
WITH LOOSE AIR-DRIED SOIL
Gail Griffin
N
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SOIL SAMPLE BAG
INSTRUCTIONS
A&L

Waypoint ANALYTICAL
7621 Whitepine Road, Richmond, VA 23237
Main 804-743-9401 ° Fax 804-271-6446
www.waypointanalytical.com

TEXTURE ANALYSIS

Client :
DUMBARTON OAKS
1703 32ND ST NW
WASHINGTON , DC 20007

Grower :
Dumbarton Oaks

Farm:

Report No : 17-184-0581
Cust No : 13202
Date Printed : 07/06/2017
Page : 1 of 1

Date Received : 07/03/2017

Lab No	Field ID	Sample Identification	Percent Sand	Percent Silt	Percent Clay	Textural Classification
08061		EL1	65.2	22.4	12.4	Sandy Loam
08062		NV1	45.2	44.4	10.4	Loam
08063		LD1	57.2	22.4	20.4	Sandy Clay Loam
08064		UD1	47.2	34.4	18.4	Loam
08065		PC1	47.2	48.4	4.4	Sandy Loam
08066		RB1	43.2	50.4	6.4	Silt Loam
08067		FD1	57.2	34.4	8.4	Sandy Loam
08069		SL1	59.2	38.4	2.4	Sandy Loam

Virginia Cooperative Extension
Soil Test Report

Questions? Contact:
Arlington County Office
3308 South Stafford St
Arlington, VA 22206
703-228-6400

Virginia Tech Soil Testing Laboratory
145 Smyth Hall (0465)
185 Ag Quad Ln
Blacksburg, VA 24061
www.soiltest.vt.edu

SEE NOTES:
1 20
at www.soiltest.vt.edu under Report Notes

OWNER
GRIFFIN GAIL
1703 32ND ST NW
WASHINGTON, DC 20007

COPY FOR
EMMA VAN DER HERDE

SAMPLE HISTORY

Sample ID	Field ID	LAST CROP		LAST LIME APPLICATION		SOIL INFORMATION				
		Name	Yield	Months Prev.	Tons/Acre	SMU-1 %	SMU-2 %	SMU-3 %	Yield Estimate	Productivity Group
BEECH										

LAB TEST RESULTS (see Note 1)

Analysis	P (lb/A)	K (lb/A)	Ca (lb/A)	Mg (lb/A)	Zn (ppm)	Mn (ppm)	Cu (ppm)	Fe (ppm)	B (ppm)	S.Salts (ppm)
Result	360	228	4517	328	9.5	24.3	1.5	22.5	0.7	
Rating	VH	H	VH	VH	SUFF	SUFF	SUFF	SUFF	SUFF	

Analysis	Soil pH	Buffer Index	Est.-CEC (meq/100g)	Acidity (%)	Base Sat. (%)	Ca Sat. (%)	Mg Sat. (%)	K Sat. (%)	Organic Matter (%)
Result	6.8	6.27	13.7	5.6	94.4	82.4	9.9	2.1	

FERTILIZER AND LIMESTONE RECOMMENDATIONS

Crop: TREES. (246)

619. Lime recommendations: NONE NEEDED.

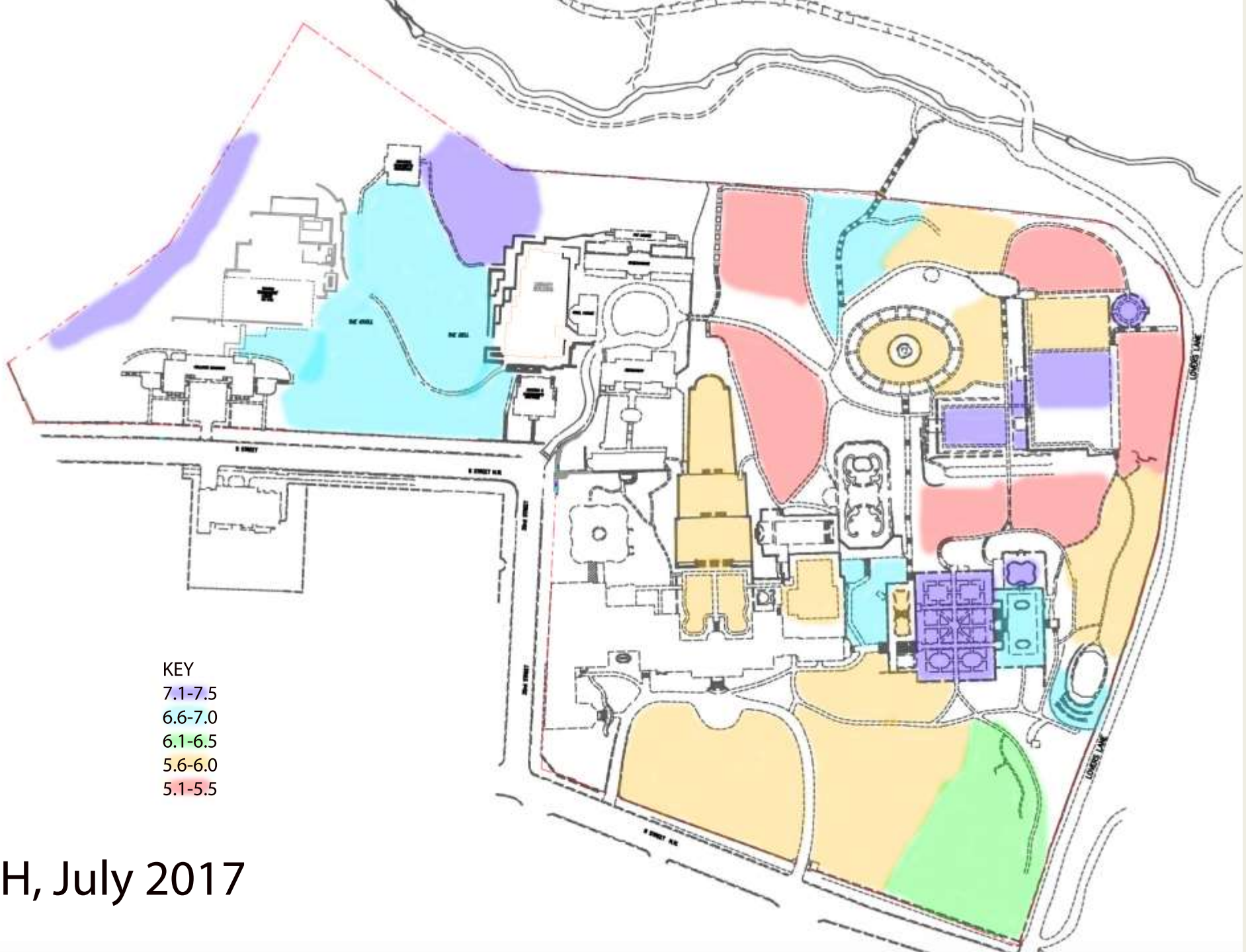
261. FERTILIZER RECOMMENDATIONS: See Note 20.

991. "Explanation of Soil Tests, Note 1" and other referenced notes are viewable at www.soiltest.vt.edu under Report Notes.

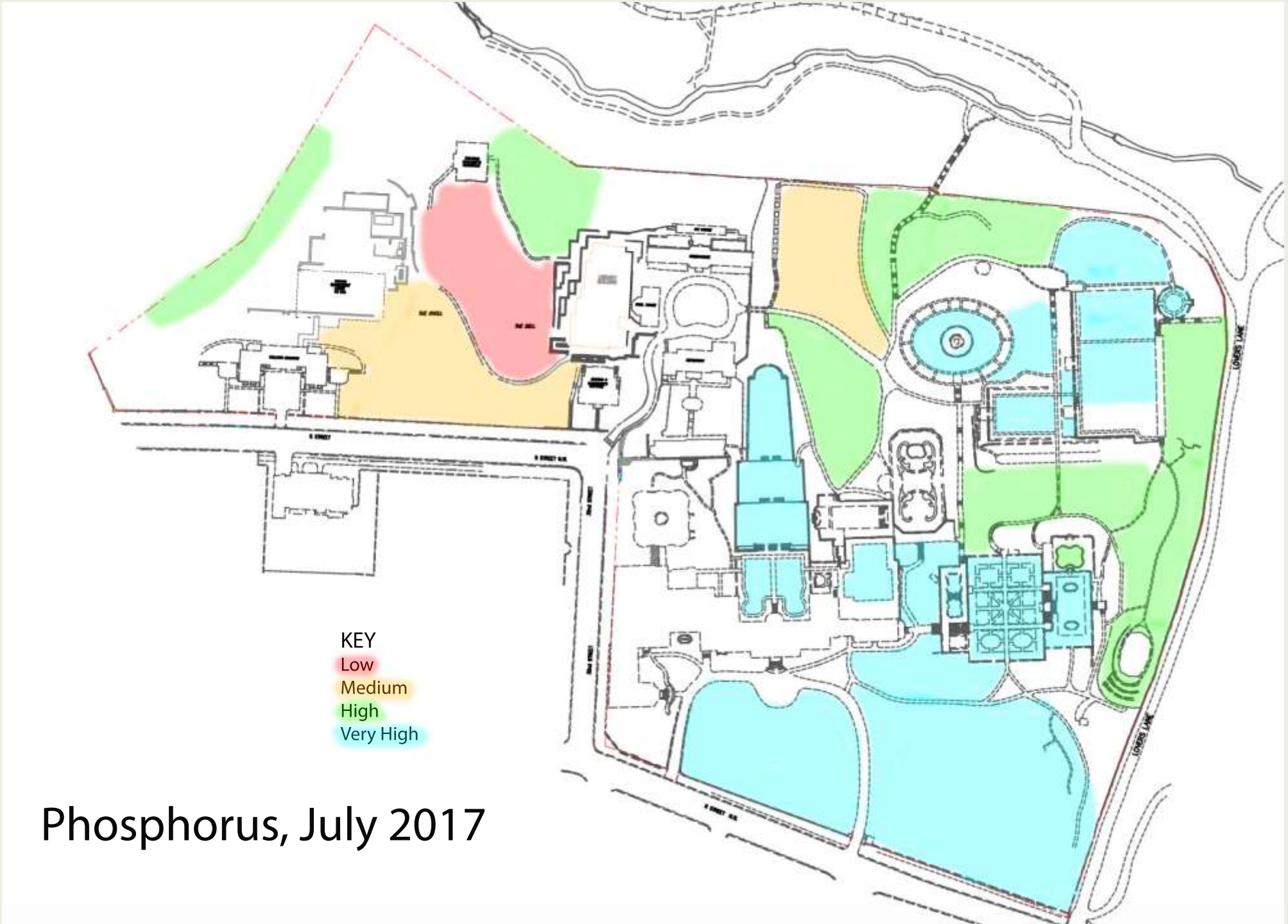
Nutrient Analysis

- Micro- vs. Macronutrients
  - *Macronutrients: extremely important for plant growth, noticeable effect if lacking*
  - *Micronutrients: less important for plant growth, smaller effect on productivity if lacking*
- Leaching: dissolved nutrients move with percolating water through the soil profile and away from plant roots
- pH: tends toward acidic in DC area
  - *Optimal: 5.8-6.8*

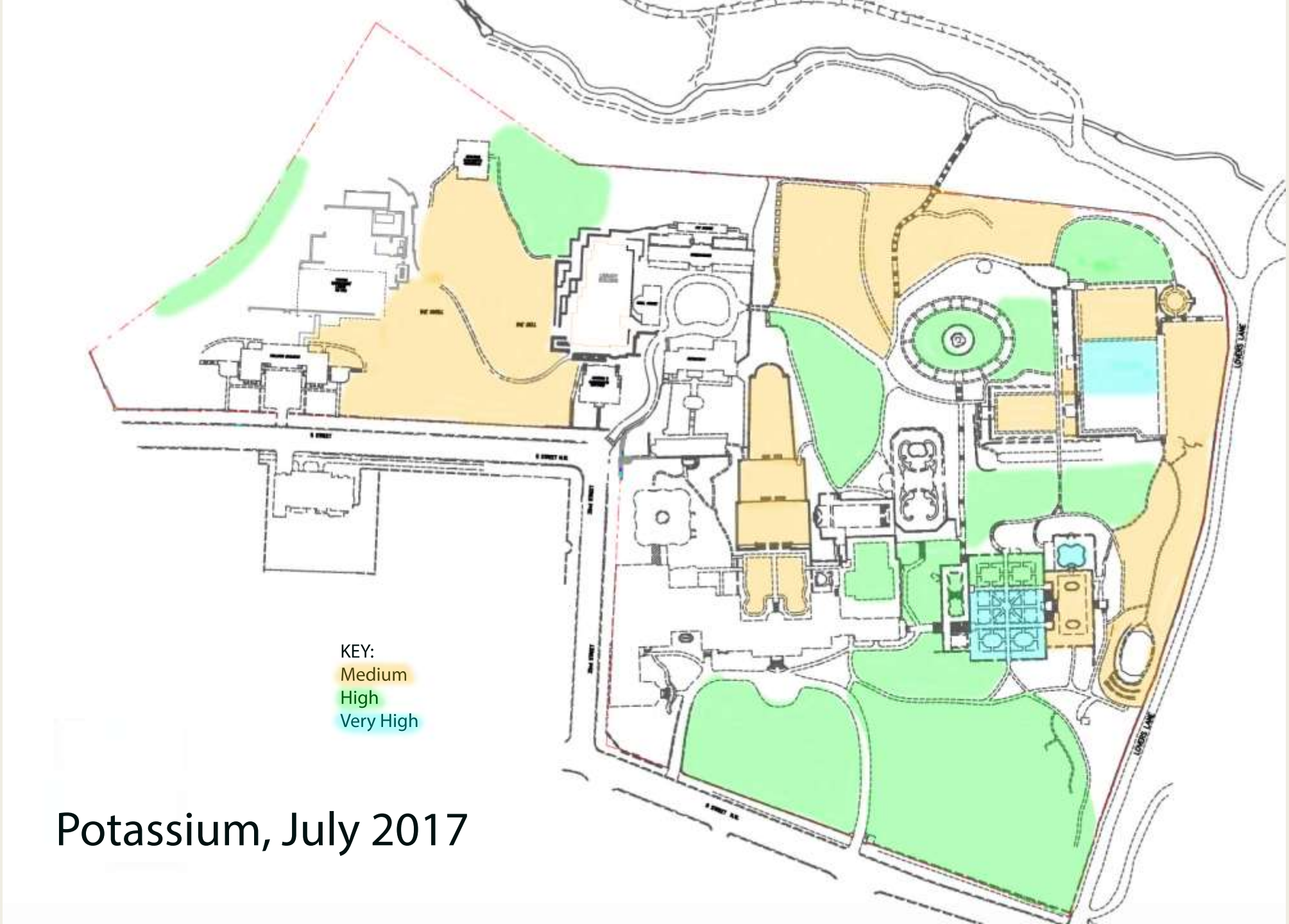
- Following slides: pH, Phosphorous and Potassium concentrations at Dumbarton Oaks



pH, July 2017



Phosphorus, July 2017



Potassium, July 2017

Geology

- Geologic Province: geologically distinct from other areas, different ages/processes of formation
  - *Piedmont*
  - *Atlantic Coastal Plain*

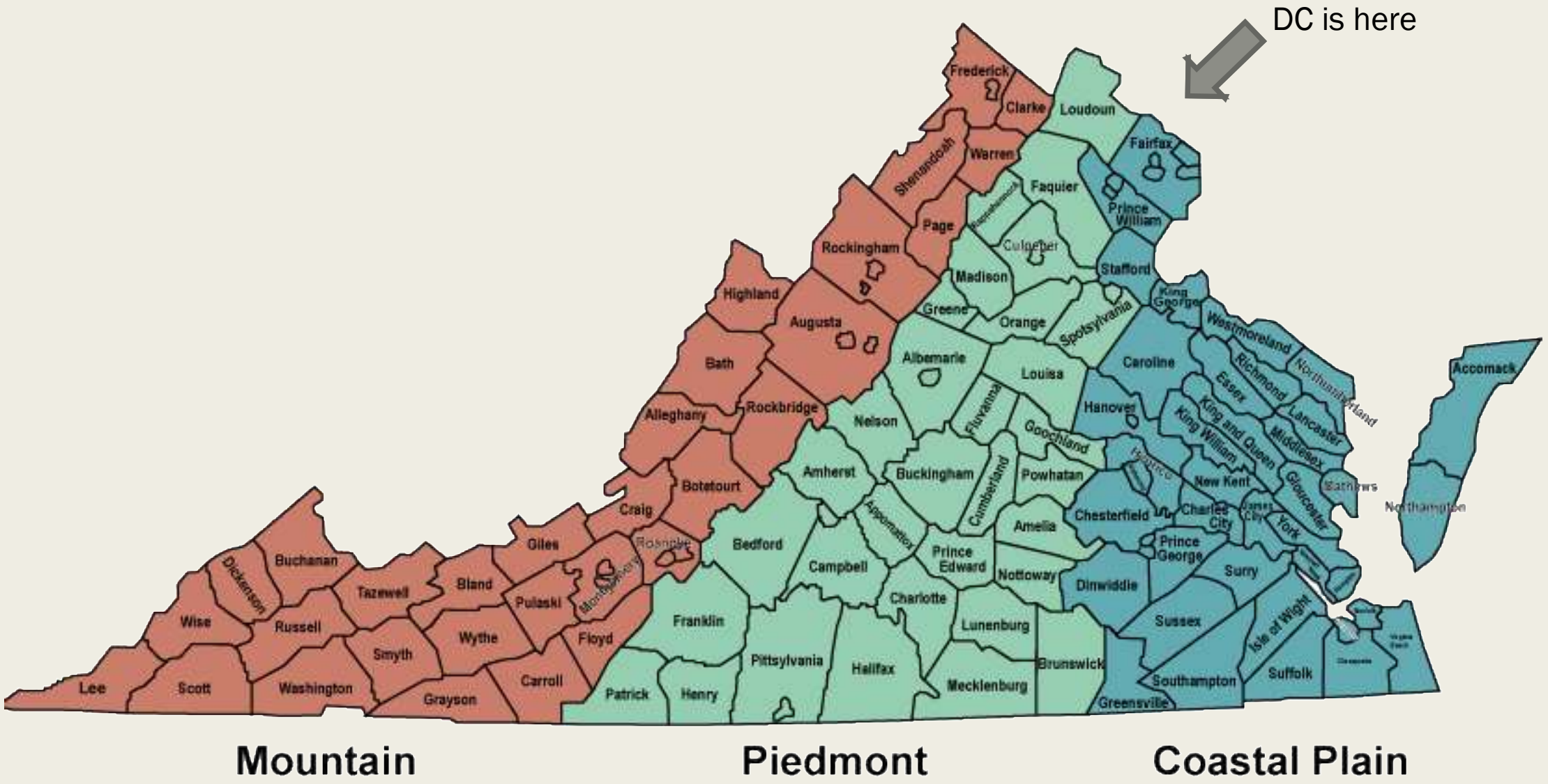


Image from: http://www.virginiaplaces.org/regions/12piedmont.html

Geology

- Geologic Province
  - *Piedmont*
  - *Atlantic Coastal Plain*
- Fall Line: marks the meeting of the Piedmont and Coastal Plain provinces
  - *So named for waterfalls/rapids that occur in streams and rivers that flow from the Piedmont to the Coastal Plain. These water features occur because the sedimentary Coastal Plain rock is eroded faster than the hard rock of the Piedmont.*

Exposure of the Fall Line in DC, near the National Zoo. On the left, you can see the solid Piedmont rock. On the right, you can see the gravelly, easily-eroded Coastal Plain rock.

The Fall Line

- Cuts through NW third of DC

The Fall Line

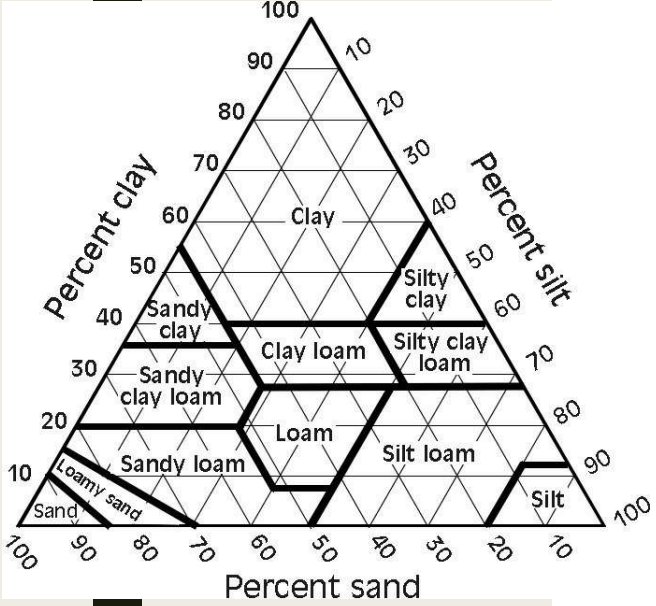
“Lovers Lane” begins at the southwest end of the Massachusetts Avenue Bridge. This historic roadway … marks the vertical contact of the Atlantic Coastal Plain terrace gravels with the metamorphic Piedmont bedrock.

-From “Rock Creek Park Geologic Resources Inventory Report” produced in 2009 by the National Park Service

Lover’s Lane also runs along the East side of the Dumbarton Oaks property. We appear to be located on or very near the Fall Line.

Soil Sampling

- Can we find evidence of the Fall Line in Dumbarton Oaks soils?
- Expectation: Soil becomes less sandy and more clayey moving from East to West
- Surface Sampling yields the following map



There is no clear trend in soil texture. This is not surprising given the amount of soil that has been moved in the past to create the beautifully landscaped terraces of Dumbarton Oaks.

KEY:
Sandy Loam
Sandy Clay Loam
Loam
Silt Loam

Soil Texture

Boschke, 1861

In fact, so much of the original topography has been changed that these two streams, present in 1861, have since been filled and/or buried in culverts as a result of construction and landscaping.

Soil Sampling

- Expectation: Soil becomes less sandy and more clayey moving East to West (from Coastal Plain to Piedmont derived soils)
- Surface Sampling: not useful
- Core Sampling: deeper soil is less likely to have been disturbed in the past

Kitchen Garden

Forsythia Dell

Garden Gate

Here, we actually see the opposite of what we expected. The Kitchen Garden, in the east of the property, has the most clayey soils, while the Garden Gate, in the west, has the sandiest. This may be due to our proximity to the fall line; we may not see sharp distinctions because of mixing between Coastal Plain and Piedmont derived soils as the soil in this area was formed.

Challenges

- Textural Analysis: self-sampled vs. lab tested
  - *I wanted to self-sample for soil texture at a fine scale, but I only produce the same results as the lab about 50% of the time.*
- Fall Line: lack of data
  - *Specific information about the location of the Fall Line in DC is difficult to find.*