

(This is only an example of a final laboratory report for the length and content, and does not have to be used as a template i.e., you can use your own ideas to make an unique report – in fact, this is encouraged)

FINAL LABORATORY REPORT – ALTAMONT SOIL

Introduction

The laboratory for Soils and Landscapes in Our Environment provides a chance for students to gain hands on experience classifying soils and finding chemical and physical soil properties through simple experimentation. By recognizing the properties of a soil, we can use it appropriately in the agricultural industry. Our soil series was Altamont, which is a Luvisolic soil from grassland that has been invaded by forest. The soil is found in the dark subgroup, the dark gray Luvisol great group, and the Luvisolic order. The parent material consists of heavy textured lacustrine deposits interspersed with modified and mixed glacial till.

Methods and Materials

For complete materials and methods for any of the experiments performed, please refer to the Laboratory Manual for the course 40.360, for the school year 2017. There were no changes to any of the procedures.

Results

The following is the profile description of our soil:

Table 1.a. Profile description of Altamont Soil

<u>Depth</u>	<u>Horizon</u>	<u>Description</u>
0-14 cm	Ap	dark gray to black; loam; granular; disturbed by agricultural activities due to good to excellent fertility
14-34 cm	Ae	light gray; clay loam; platy; friable when dry; eluviate horizon due to downward movement of clay; slightly calcareous
34-104 cm	Bt	dark gray; clay loam; blocky, hard; illuviated horizon due to addition of clay; clay skins are present; slightly calcareous
104 + cm	Ck	light gray; sandy loam; massive blocky, extremely hard; relatively unmodified; carbonates present

Table 1.b: Particle Size Analysis for the Altamont Soil Horizons

Horizon	%Sand	%Silt	%Clay
Ap	35	40	25
Ae	36	35	29
Bt	29	39	32
Ck	65	19	16

Table 2: Soil Texture, % Porosity, and Bulk and Particle Densities for the Altamont Soil Horizons

Horizon	Texture	% Porosity	Bulk Density (Mg/m3)	Particle Density (Mg/m3)
Ap	loam	46.19	1J20	2.23
Ae	clay loam	47.70	1.25	2.39
Bt	clay loam	43.81	1.27	2.26
Ck	sandy loam	32.86	1.41	2.10

Table 3: pH, Electrical Conductivity, Organic Matter, and %CaCO₃ for Altamont Soil Horizons

Horizon	pH	Electrical Conductivity (dS/m)	% Organic Matter	%CaCO ₃
Ap	7.64	2.64	4.65	0.8625
Ae	7.55	2.05	4.29	1.06
Bt	7.1	0.35	2.94	0.75
Ck	8.1	2.27	1.65	1.88

Note: Electrical Conductivity is measured in dS/m for all horizons except for Bt, which is measured in mS/m.

Table 4: Soil Moisture Contents for Altamont Soil Horizons

Horizon	Air Dry Basis (%)	Field Capacity (cm/m)
Ap	2.15	47.70
Ae	2.42	40.04
Bt	3.0%	33.60
Ck	13.25	3220

Note: The Ck horizon was oven dried

Discussion

The Ap horizon is used for agricultural production and is tilled. Its loam texture makes it the best type of soil for agricultural production, due to ease of root penetration, water-holding capacity, aeration, and ease of water infiltration. The bulk density, particle density, and porosity of our soil also contribute to these important characteristics. The soil's neutral pH indicates the presence of Ca^{2+} and a high cation exchange capacity. The concentration of salts in the soil is determined by the electrical conductivity of the soil. The Ap horizon of Altamont is moderately saline.

Eluviation has occurred in the Ae horizon. This means that there is a loss of clay as well as organic matter. This soil is characterized by a light color and platy structure. This layer has the highest porosity when compared to the other horizons. Normally that would increase aeration and help root penetration, but due to the horizon's platy structure, aeration is decreased and roots have a hard time growing through the soil. There is also a decrease in infiltration and water movement; water tends to puddle. This horizon's slightly higher pH means the soil is more basic, resulting in a higher cation exchange.

The presence of Bt indicates a layer created by the illuviation of clay. It is a darker layer than the Ae, because of the enrichment of soil material. It also has a blocky structure. The presence of clay increases the water holding capacity and the blocky structure and high porosity (47.5 %) allow for good water infiltration. Its bulk density reflects good porosity, but the soil is still not dense and compacted by farming. The pH also indicates the soil is slightly alkaline, has a higher organic matter and moderate cation exchange capacity. Due to the clay fraction in the Ae layer being more than 15% and less than 40%, the Bt layer should have a clay ratio with Ae of 1.2:1. Since the Ae has 29% clay content, the Bt should have 34%, but ours actually only had 32%.

The parent material for the Altamont profile is Ck. It is a light-gray, sandy loam textured soil with a hard, massive structure. This horizon is characterized by the presence of carbonates. This was demonstrated when dilute HCl acid reacted with the soil and caused moderate effervescence indicating the presence of lime. The percent of calcium carbonate (CaCO_3) in the soil was calculated to be 1.88%, a higher value in comparison to the other three horizons. The increased presence of carbonates causes

the soil to be either neutral or alkaline which was confirmed when the pH was measured to be 8.1. The defining trait of the Ck horizon is its moderate calcareous nature.

Some of the soil property values that we obtained differed from the class average values. The main reason for this is human error. Simple mistakes such as unclean equipment, improperly rounded numbers, and approximation when measuring account for these deviations.

Conclusion

Generally, Altamont is a good agricultural soil. Overall it has a fairly neutral pH, good porosity and clay loam clay texture. Roots easily penetrate the topmost layer and water is held in the second layer. There is sufficient soil organic matter content to support crop growth and its electrical conductivity indicates a supply of cations. This soil is suited to crop growth and agricultural production. The soil capability classification indicates a medium to severe limitations that restrict the choice of crops with some areas only being able to produce perennial forage.

References

1. Laboratory Manual for Soils and Landscapes in Our Environment 2017.
2. Class notes for the school year.