

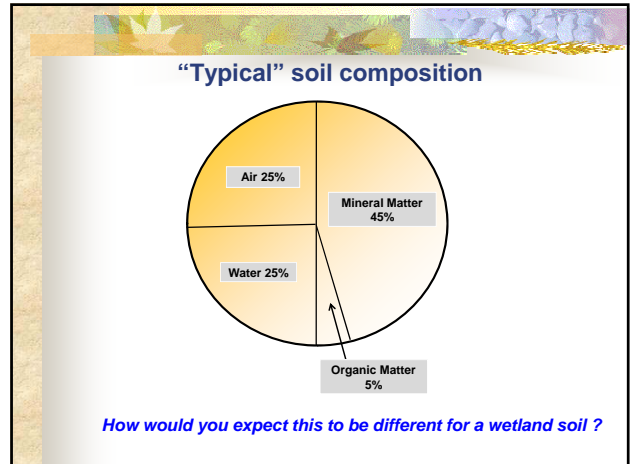
Definitions of SOIL

Geologic definition:
Loose surface of the earth as distinguished from solid bedrock (support of plant life not required).

Traditional definition:
Material which nourishes and supports growing plants (includes rocks, water, snow, air).

Component definition:
Mixture of mineral matter, organic matter, water, and air.

Combined definition:
Loose material on the Earth's surface supporting plant life that is composed of a mixture of mineral and organic matter, water, and air.



Typical soil horizons: a result of soil development

Soil development results from an interaction of:

- Weathering of parent material (climate, type of parent material, vegetation)
- Input of transported material and/or loss of on-site material
- Organic matter input (vegetation)
- Soil biota actions

Parent material

Biota

➔

Soil development

A SOIL PEDON

Horizons

O 0' 2"

A 2' 10"

B 10' 30"

C 30' 48"

Parent material

Typical soil horizons: a result of soil development

O Horizon:
Organic matter: litter & humus

Litter

Humus

A SOIL PEDON

Horizons

O 0' 2"

A 2' 10"

B 10' 30"

C 30' 48"

Parent material

Typical soil horizons:
a result of soil development

A Horizon:
Nutrient-rich soil layer

Thin A horizon in forest soil

Thicker A horizon in grassland soil

A SOIL PEDON

Horizons 0' 2' 10' 30' 48'

Parent material

Typical soil horizons:
a result of soil development

E Horizon:
A leached layer sometimes present below the A horizon (Fe, Al removed)

A horizon

E horizon

B horizon

O horizon surface litter

A horizon topsoil

E horizon zone of leaching

B horizon subsoil

C horizon parent material

bedrock

Typical soil horizons:
a result of soil development

B Horizon:
Nutrient-poor soil layer

B horizon in forest soil

B horizon in arid zone soil

A SOIL PEDON

Horizons 0' 2' 10' 30' 48'

Parent material

Typical soil horizons:
a result of soil development

C Horizon:
Soil layer dominated by parent material

C horizon in forest soil

A SOIL PEDON

Horizons 0' 2' 10' 30' 48'

Parent material

Selected Soil Edaphic Factors

- Texture
- Structure
- Organic Matter
- Moisture content & availability
- pH
- Aeration
- Nutrients
 - ✓ "available"
 - ✓ nutrient holding capacity (CEC)

Physical or chemical attribute of soil that impacts plant function

Selected Soil Edaphic Factors

Soil Texture

Particle size attributes

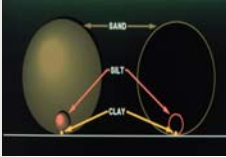
Texture category	Particle size range (mm diameter)
Clay	< .002
Silt	.002 - .05
Sand	.05 - 2.0
Gravel	> 2.0

Selected Soil Edaphic Factors

Soil Texture

Particle size composition

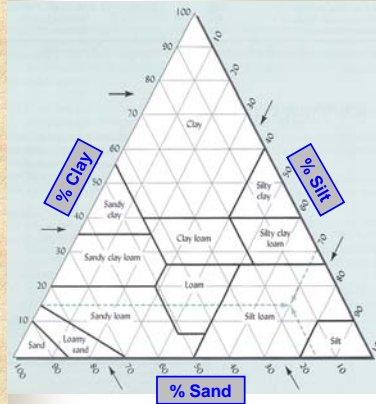
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Soils have varying proportions of these particles

The relative proportions of different sized particles place a soil into a certain **SOIL TEXTURE CLASS**

SOIL TEXTURE CLASSES



Clay soils:

Fine textured

Silty soils:

Intermediate textured

Sandy soils:

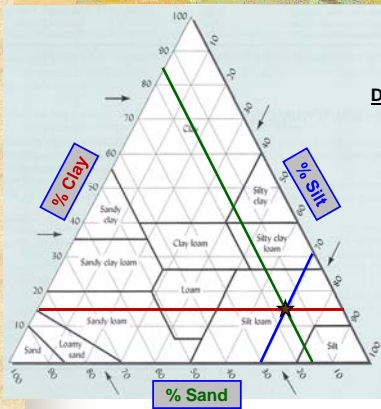
Coarse textured

Loam soils:

Balanced texture

USDA Soil Texture Triangle

SOIL TEXTURE CLASSES



Determining a texture class:

70% silt

15% clay

15% sand

The intersection is the texture class:

Silt loam

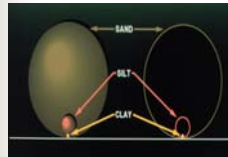
USDA Soil Texture Triangle

Selected Soil Edaphic Factors

Soil Texture

Particle size composition

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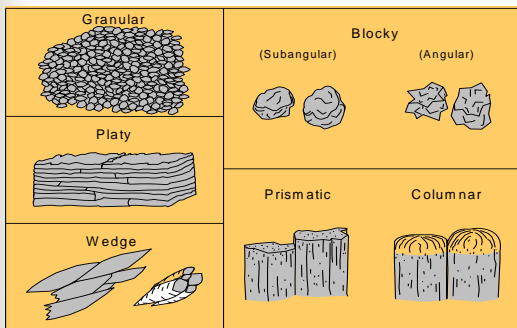


Effects of soil texture

- Water holding capacity
- Aeration
- Temperature
- Nutrients
- Erosion

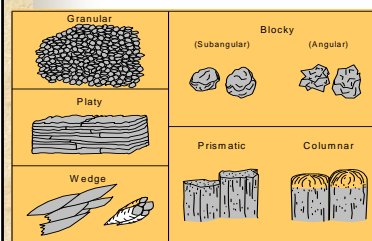
Selected Soil Edaphic Factors

Soil Structure



Selected Soil Edaphic Factors

Soil Structure



Effects of soil structure

- Water movement
- Root growth
- Erosion / slope stability

Selected Soil Edaphic Factors

Soil organic matter

Effects of soil OM

- Nutrient input
- Moisture retention

Soil pH

Effects of soil pH

- Soil organism / plant function
- Nutrient cycling & retention

Soil moisture

Effects of soil H₂O

- Organism function
- Aeration
- Nutrient cycling

Soil aeration

Effects of soil aeration

- Soil organism / plant function
- Nutrient cycling & retention

Selected Soil Edaphic Factors

Soil bulk density

Effects of soil bulk density

- aeration
- Water retention and flow

Soil surface hardness

Effects of surface hardness

- Water infiltration
- Seed incorporation / germination

Soil water infiltration

Effects of soil H₂O infiltration

- Moisture input to soil
- Water availability to organisms

Other Soil Properties Often Assessed

- Color
- Horizon development / descriptions
- Soil macrofauna
- Soil microorganisms

Regional Soils

Tremendous Soil Variation across WA

- Variation in parent material
- Variation in climate
- Variation in plant communities

Greatest variation on east slope of Cascades & Olympics

Regional Soils

Puget Sound Area

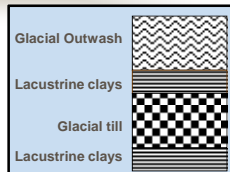
- Glacial deposits
 - ✓ Glacial till (e.g., "Alderwood" series)
 - ✓ Glacial outwash (e.g., "Everett" series)

Development under coniferous forests

➢ Acidic conditions, low temperatures = slow development

Springs & slides

➢ Interbedding of (1) clay and (2) sand layers with glacial till can lead to (1) springs and (2) slope instability



Regional Soils

Puget Sound Area

- Glacial deposits
 - ✓ Glacial till (e.g., "Alderwood" series)
 - ✓ Glacial outwash (e.g., "Everett" series)
- Old sedimentary deposits
- Wetland mucks
- Alluvial soils

Soil Measurements Today

For each group:

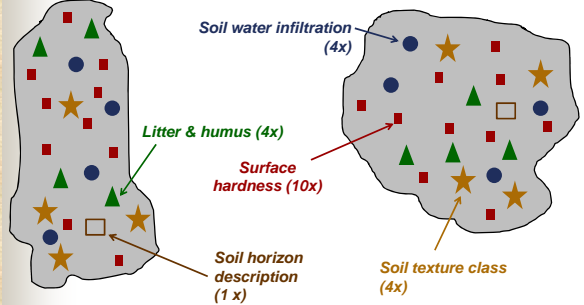
Field measurements today	Later lab analyses on collected soil
Soil horizon descriptions (1 / site)	pH
Litter type and depth, humus depth (4 / site)	Organic matter content
Soil texture class (4 / site)	Moisture
Surface hardness (4 / site)	Texture
Soil infiltration rate (4 / site)	Bulk density

Soil Measurements Thursday

Measurements by EACH group
Use same vegetation stands as we used for the forest vegetation lab

Red alder – sword fern

W. hemlock – sword fern



Soil Collection Thursday

- Six soil tins from each site – collected by bulk density corer

✓ 5 – 15 cm deep (A horizon)

- Four 1-liter bulk samples in paper bags (labeled)

✓ 5 – 15 cm deep

These samples will be used next week to assess

- Soil moisture
- Soil pH
- Soil bulk density
- Soil texture
- Soil OM