Week 7 Field Trip

- Erosion and Deposition
Stops for Today

• **Typical subdivision**
  – Residential development

• **Hobby farms**
  – Horses or open fields

• **Snoqualmie River Valley**
  – Agricultural use
Urban Growth Boundary

• The 1985 Comprehensive Plan:
  – identifies an "urban growth boundary line." This line limits growth to areas with an existing infrastructure for facilities and services; it protects natural resource lands; it states that rural areas remain largely intact; and it guides cities, service districts and the private sector in working together to manage growth responsibly.

King County: http://www.kingcounty.gov/property/permits/codes/growth/CompPlan/history.aspx
Building on a Slope

• Stop 2
  – Edge of ridge
  – Water flow
  – Soil condition
  – Horses and vegetation
King County Zoning

- Dwelling Units per Acre
• See you right at:
  – 9:30am or 1:30pm in Bloedel 211
• Bring
  – Coat
  – Rite in the Rain notebook
Erosion and Deposition

Redmond Ridge & Snoqualmie Valley
Erosion & Deposition

- Definitions of erosion and deposition
- Examples of erosion and deposition
- Examples in Seattle area
Sustainable Soil Use

Soil Conservation

Safeguarding soil from depletion and/or deterioration
Limitations to sustainable soil use

1. Soil Erosion
2. Salinization
3. Nutrient Removal
4. Urban Encroachment
5. Contamination / Pollution
Erosion & Deposition

the process by which soil (generally O & A horizon or topsoil) and rock are removed from the Earth's surface by natural processes such as wind or water flow, and then transported and deposited in other locations

- Agents
  - water,
  - wind,
  - gravity,
  - ice,
  - humans,
  - etc

Wikipedia photo sources
Erosion

- Types:
  - sheet,
  - rill, &
  - gully
Factors affecting erosion

- **Porosity** of the soil - void spaces for water to collect
- **Induration** of the soil - how hard it is or compaction or bulk density,
- **Density of ground cover** — (Veg and OM) modifies the impact of rain drops
- **Topography**
  - **Slope degree** - how steep are the hills where the soil is
  - **Length of slope** - this causes an increase in momentum of flowing water
- **Velocity of running water** - water's ability to move soil increases rapidly with speed of flow.
- **Degree of saturation** of the soil - the more saturated a soil the more likely soil grains are to move.

*Model with Universal Soil Loss Equation (USLE) or RUSLE*
Raindrop impact loosens soil particles which can then either move downhill, or plug surface soil pores -- encouraging more erosion.
Deposition - can be positive or negative
For water erosion, keep soil infiltration high, control overland flow using vegetation, ditches, contour plowing etc.

Decommissioning and restorating a logging road
Effects of Topography on erosion, deposition and texture

Hill slope position, runoff & erosion

Location, Deposition and Soil Texture

(after Marsh, 1984)

http://www4.uwsp.edu/geo/faculty/ritter/geog101/textbook/soil_systems/soil__development_soil_f orming_factors.html#figure_hillslope_location_deposition
Wetlands in suburban areas
Soils map
Redmond Ridge Development

Alderwood
Seattle (wetlands)
Quadrant Corporation
1427 - 116th Avenue NE
Post Office Box 130
Bellevue, Washington 98009

Attention: John Spangenberg

Gentlemen:

The objectives of the drainage work on parcel 49, as I see them, are as follows:

- Reduce or eliminate large bodies of standing water on site
- Lower the water table in these boggy areas
- Alter the physical characteristics of the wet boggy areas so that nonwetland species of vegetation move into the area
- Retain the existing access into portions of the site

To achieve these objectives I propose the following scope:

- Use a swamp dozer to clear and ditch existing clogged drainage channels and knock out embankments.
- Trap and relocate the beaver population.
- Install culverts in needed locations.

I feel the best way to accomplish this type of non-specific work is to allow CH2M HILL to be your field agent and allow us to hire a contractor on an hourly basis to perform the work. In this way we can direct his operations to achieve the quality of work we all desire. Also, we can end the job at any time without any difficulties from the contractor.
On the accompanying figure you can see where I have proposed the culvert locations and to operate the swamp dozer. The table on the left side indicates the total number of culverts and lineal feet of clearing and ditching in each area. Also, I have circled in red the key culvert locations which I feel must be reinstalled. The areas into which I divided the property are the different drainage basins.

By working through the numbers I have presented above, the total price for the swamp dozer operator and laborer comes to $28,400. The price to install the six key culverts is $5,600. C.H.I.M. N.I.L.'s inspection and office services would be approximately $7,000. The total estimated fee would be $41,000.

The drainage work can be phased, but the result is that only a portion of the site is reclaimed. My thoughts about phasing are what does it gain you. If development begins on the eastern portion, then even more citizens are going to object to doing any work in the central portion of the site. Also, if we wish to change the vegetation characteristics of several of these swampy areas, then we must give sufficient lead time (growing seasons) for this process to occur. In summary, I would recommend that we perform nearly the entire drainage work at once so that this winter we can evaluate what we have achieved. This allows us to plan for more work or finalize the physical features of the master plan. Besides, one bulldozer and a two-man crew do not stick out on 1,500 acres of property, especially if we hide the dozer in the woods at night and on weekends.
Wetlands in suburban areas
Wetlands in suburban areas
ALDERWOOD SERIES

The Alderwood series consists of moderately deep, moderately well drained soils formed in glacial till. Alderwood soils are on glacially modified foothills and valleys and have slopes of 0 to 65 percent. The average annual precipitation is about 40 inches, and the mean annual temperature is about 50 degrees F.

TAXONOMIC CLASS: Loamy-skeletal, isotic, mesic Vitrandic Dystroxerepts

TYPICAL PEDON: Alderwood gravelly loam - forested. (Colors are for moist soil unless otherwise noted.)

Ap--0 to 7 inches; very dark grayish brown (10YR 3/2) gravelly sandy loam, brown (10YR 5/3) dry; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; few fine interstitial pores; slightly acid (pH 6.2); abrupt smooth boundary. (3 to 7 inches thick)

Bs1--7 to 21 inches; dark yellowish brown (10YR 4/4) very gravelly sandy loam, yellowish brown (10YR 5/4) dry; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many fine roots; many fine tubular and interstitial pores; 35 percent pebbles; diffuse smooth boundary; slightly acid (pH 6.2).

Bs2--21 to 30 inches; dark brown (10YR 4/3) very gravelly sandy loam, pale brown (10YR 6/3); dry; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common fine roots; few very fine tubular pores; 40 percent pebbles; slightly acid (pH 6.2); clear wavy boundary. (Bs horizon 15 to 30 inches thick)

Bs3--30 to 35 inches; 50 percent olive brown (2.5Y 4/4) very gravelly sandy loam, light yellowish brown (2.5Y 6/4) dry and 50 percent dark grayish brown (2.5Y 4/2) cemented fragments with strong brown (7.5YR 5/6) coatings on fragments, light brownish gray (2.5Y 6/2) and reddish yellow (7.5YR 6/6) dry; massive; slightly hard, very friable, nonsticky and nonplastic; few fine roots; common fine tubular and interstitial pores; 45 percent pebbles; moderately acid (pH 6.0); abrupt wavy boundary. (0 to 15 inches thick)

Bsm--35 to 43 inches; dark grayish brown (2.5Y 4/2) cemented layer that crushes to very gravelly sandy loam, light brownish gray (2.5Y 6/2) dry; dark yellowish brown (10YR 4/4), reddish brown (5Y 4/4), yellowish red (5YR 4/8) and strong brown (7.5YR 5/6) in cracks; massive; extremely hard; extremely firm, nonsticky and nonplastic; few fine roots; few fine tubular pores; 40 percent pebbles; moderately acid (pH 6.0); abrupt irregular boundary. (5 to 20 inches thick)

Cd--43 to 60 inches; grayish brown (2.5Y 5/2) compact glacial till that breaks to very gravelly sandy loam, light gray (2.5Y 7/2) dry; massive; extremely hard, extremely firm, nonsticky and nonplastic; 40 percent pebbles; moderately acid (pH 6.0).
The Briscot series consists of deep, poorly drained soils formed in recent alluvium on floodplains. Slopes are 0 to 2 percent. Average annual precipitation is about 40 inches. Mean annual temperature is about 50 degrees F.

TAXONOMIC CLASS: Coarse-loamy, mixed, nonacid, mesic Aeric Fluvaquents

TYPICAL PEDON: Briscot silt loam-cultivated (Colors are for moist soil unless otherwise noted)

Ap--0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; slightly hard, friable, sticky, plastic; many roots; few fine tubular pores; neutral (pH 6.8); abrupt smooth boundary. (8 to 10 inches thick)

Cg1--9 to 17 inches; grayish brown (2.5Y 5/2) silt loam, light brownish gray (2.5Y 6/2) dry; many large prominent dark brown (7.5YR 4/4 and 3/4) mottles, brownish yellow (10YR 6/6) dry; weak very coarse prismatic structure; slightly hard, friable, sticky, plastic; common roots; many fine tubular pores; neutral (pH 6.6); abrupt wavy boundary. (7 to 9 inches thick)

Cg2--17 to 44 inches; grayish brown (2.5Y 5/2) finely stratified silt loam, fine sand, and fine sandy loam, light brownish gray (2.5Y 6/2) dry; many large prominent dark brown (7.5YR 4/4) mottles, yellowish brown (10YR 5/6) and light yellowish brown (10YR 6/4) dry; massive; slightly hard, very friable, slightly sticky, nonplastic; few roots; many fine tubular pores; neutral (pH 6.8); diffuse smooth boundary. (25 to 28 inches thick)

Cg3--44 to 60 inches; dark gray (5Y 4/1) finely stratified silt loam, fine sand and fine sandy loam, grayish brown (2.5Y 5/2) dry; many large prominent dark brown (7.5YR 4/4) and dark red (2.5R 3/6) mottles, brown (7.5YR 5/4) and yellowish brown (10R 5/6) dry; massive; very friable, slightly sticky, nonplastic; few roots; common fine tubular and many very fine interstitial pores; neutral (pH 6.8).

TYPE LOCATION: King County, Washington, 1,000 feet north and 1,410 feet east of southwest corner sec. 25, T. 22N., R. 4 E.

RANGE IN CHARACTERISTICS: The mean annual soil temperature at a depth of 20 inches ranges from 48 degrees to 54 degrees F. The 10- to 40-inch section contains 5 to 15 percent clay, and 0 to 2 percent coarse fragments. These soils are usually moist, and contain irregular distribution of organic matter with depth. It is slightly acid or neutral throughout.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 or 4 moist, 5 through 7 dry, and chroma of 2 or 3 moist and dry. It has weak or moderate granular or blocky structure.

The Cg horizon has hue of 2.5Y or 5Y, and value of 4 through 7 moist and dry, and chroma of 1 or 2 moist and dry. Mottles have hue of 2.5YR through 2.5Y, value of 3 through 5 moist, 4 or 5 dry, and chroma of 4 through 6 moist and dry.

More than 40 percent of the soil between a depth of 10 and 30 inches has a hue of 2.5Y, a value moist of 5 or less, and chroma of 2. This horizon is stratified with layers of silt loam, fine sand, sand, and fine sandy loam. It has weak very coarse prismatic structure or is massive.

COMPETING SERIES: These are the Holton and Rippowan series. Holton and Rippowan soils have more than 26 degrees F difference between mean winter and mean summer soil temperature. In addition, Rippowan soils have less than 8 percent clay in the particle-size control section.

GEOGRAPHIC SETTING: These soils are on floodplains in river valleys at elevations of 20 to 250 feet. The soils formed in recent alluvium. Briscot soils occur in a humid climate with an average January temperature of 38 degrees F.; average July temperature is 64 degrees F.; and mean annual temperature is 50 degrees F. The frost-free season is 160 to 210 days. The average annual precipitation ranges from 30 to 55 inches, most of which falls as rain during the winter months. Each of the summer months generally has at least 1 inch of rainfall. Snow is infrequent.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Oridia, Puget, Puyallup, Renton, Skagit, and Woodinville soils. Oridia soils are coarse silty. Puget, Skagit and Woodinville soils have more than 18 percent clay in the particle-size control section. Puyallup and Renton soils are coarse-loamy over sandy or sandy-skeletal.

DRAINAGE AND PERMEABILITY: Poorly drained; very slow runoff; moderate permeability. These soils are subject to occasional, brief flooding from November through April. An apparent water table is at 0 to 1 foot from November through April unless drained.

USE AND VEGETATION: Most soils are drained and used for cropland. Row crops and seeded grass pasture are common crops. Native vegetation was western redcedar, western hemlock, red alder, and Douglas fir with an understory of western swordfern, salal, vine maple, western bracken, and Pacific crabapple.