Southern Willamette Forest Collaborative
Rigdon Collaboration Committee
Tuesday, Feb. 28th, 1:00 – 4:00
Soils, Geography and Plant Associations Workshop

Participants: Alan D, David C, Chandra L, Fergus M, Jean C, Lon O, Jim N, Cindy N, Mike B, Laurie P, Alexis H, Loren H, Tanya H, Audrey S, Molly J, Wendy P
Calling in: James J
Facilitator: Sarah A

Landscape processes

1. **Oregon physiographic provinces** slide 1
2. **Geological Timeline** slide 2
    a. 4 million years ago, during the early volcanic arc, the western cascades formed, which we live in
    b. Coastal activity – High Cascade volcano activity started 3 million years ago until present
        i. The activity may have slowed down but we are still in a volcanic period and can see activity in high cascades
    c. Glacial Deposits – 2 million years ago until to now has been the melting period of glaciers
    d. Unstable Oregon – Today - a lot of landslides occurring
3. **Process of subduction** slide 3
    a. Off shore volcanoes
    b. Moving of plates making uplift of volcanoes
    c. Rifts of plates pulling apart and causing ground to go up and down
    d. A lot of the coast range and the Blue Mts are volcanoes that formed out in ocean and occluded to the landform we have now
4. **Volcanoes** slide 4 – 8
    a. takeaway is there is a lot of explosion and overland lava flows. Lava cools at different rates, meaning it weathers differently.
    b. Ex/ andesite and basalt cools quickly and weathers fast – rich in minerals that plants need and is highly productive.
    c. Ash plumes – layers of thick ash deposits unevenly
    d. Tuff is ash – can be many meters thick and sometimes not permeable to water
    e. Breaks off
    f. Breccia – sedimentary rock that has been under pressure and formed together
    g. Weathers in rinds
    h. Minerals in both can turn different colors (tends to be red here)
    i. When tuff overlays basalt it can weather through the rock and create springs
5. **Glaciers** slide 9
    a. Carving valleys and lakes, dropping rocks. Can see the effects in the Upper Middle Fork

i. Carry boulders and dust that get deposited along the way
ii. Deposit in moraines or paraglacial margin (created by a bunch of glacial outwash)

6. **Landslides** slide 10 - 15
    a. Water infiltrates into soil and gets to a point that the pressure gets so high that it explodes or liquefies the soil.
    b. Important process
        i. Tension cracks
        ii. Scarps – steep slopes such as cliffs
        iii. Depress pile at the bottom
    c. Types of erosion
        i. river carving of valley – water carving deeper valley over time
        ii. waves cutting back cliffs – repeated action
        iii. wind blowing top soil – wind erosion is not usually a factor in Oregon
    d. Landslides happen a lot in this area – a few in Rigdon
        iv. These areas have the highest biodiversity and extremely thick soils
    b. Q When there is an earthquake in an area and liquefaction?
        i. creating a fluid of soil where already loose and heavily eroded
        ii. the soil is not saturated by water but it looks like it
    c. Q about floodplains and alluvial fans – sometimes hard to distinguish?
        i. alluvial are like glacial terrace – alluvial will have gravels and deposits on banks of rivers. Sometimes high up b/c river was once there. Also very productive for vegetation
    d. Q glacial retreat – does it change to alluvial fan basis and how fast? Are there lots of miles of retreat?
        i. In terms of soil development or erosion it depends exposure, steepness.
    e. Q: Are there any hard rock andesite peaks?
        i. Yes, have andesite, erodes quickly
    f. Comment: best examples of glacial valleys are Steens and Walawas.
    g. Q: What kind of rock is the core is Mt. Washington or Theilson, it has not eroded as fast.
        i. Guessing rhyolite, cools faster and the slower rock cools the lighter in color it is. Rhyolite and Diorite tends to be light colored.
        ii. The Sisters and the Mts we can see in the Cascades are new – 400K old and younger – Volcanics that are still happening and not as eroded yet.
        iii. This area is 40M years older and has lots of erosion, glaciers and water eroding things
    h. Q: Patty's valley is a glacial valley – and the river is an alluvial flow, the glacier stopped, melted and create a stream.

Soil

1. **Soil** – slide 19
    a. Healthy soil generally considered 40% mineral matter (decomposed rock), 25% water and 25% air, 5% organic matter usually in surface
    b. air and water exchange depending on season
    c. Q: how variable is the organic matter?
        i. It is highly variable, it will be higher here where there is a large influx of organic matter. Should be lower in Rigdon area mixed conifer stands or Oak savannahs where it might be a rock field, S facing slope. If refer to it be historically lower – means the area historically was accustomed to less biomass inputs
2. **Process approach to making soil** – slide 20
    a. parent material - rock
    b. climate – how much water help to decompose rock and organic matter. In a temperate forest it can happen very quickly and in tundra it can happen slowly.
        i. depend on aspect, steepness, and processes of gravity
        ii. topography – has to do with solar radiation in terms of aspect, elevation, depend on aspect, steepness, and processes of gravity
    c. organisms
        i. conifer trees good at decomposing soil, and contributions of organic matter
        ii. earthworms change forest floor
        iii. mycorrhiza and nitrifiers contribute to development to soil
    d. time
    e. all the processes happen over time and contribute to making soil properties
3. **Timeline of how soil develops** – slide 21
    a. Organic matter – from disintegrating rock
    b. carbon - creates carbonic acid that also decompose the rock and darkens the soil
    c. development of the soil horizons – the top is younger and bottom older as deeper horizons develop the soil profile gets more complex – and can be a host to vegetation and deeper roots
4. **Soil layers** – slide 22
    a. roots can access all layers
5. **Soil development with Stages of forest succession** – slide 23
    a. where there are smaller plants, little roots, thin soil as soil develops more over time it can support forest succession to bigger plants
6. **Difference between grasslands and forest soils** – slide 24
    a. deciduous soil – ABC horizons, maybe a little bit of clay, and a thick A horizon with a lot of carbon,
    b. deciduous forest soil
        i. A – leeched
        ii. B – minerals and clay which is very developed and deep
    c. Q: Which has more carbon?

        i. Depending on how long its been there, if have a forest that is really developed but if it is cut or dies in fire the carbon will exhale – depends on soil how much carbon is lost. If plant w/ grass it will go back up until it's the same amount of carbon.
    d. Q: Time and soil forming factors?
        i. Paleo soil - really developed soil - 40K years in coast range – lots of rain and developing quickly.
        ii. developed soil here in this area are 4 million years old – that is how long ago volcanoes were here and the soils have been developing for a long time
    e. Q how come our soils are deeper than tropical soils?
        i. because of process of rapid decomposition top soil doesn't form in tropics – the decomposing happens quickly. In the tropics if something dies it decomposes in a week. Here it can take a long time, even hundreds of years if a big stump.
7. **Soil size** – slide 25
    a. Clay - people think red soil but clay is a technical term for a microscopic particle size that has totally disintegrated into water and then reformed with different minerals – clay not good to hold water –
    b. silt – a little bigger – most erosive soil texture
    c. sand – created whenever rock gets weathered to that size
    d. gravel - can be lots of sizes
        i. Water infiltrates differently into soil depending on texture
        ii. silt - slowly and lots of runoff
        iii. Clay – wont absorb and lots of runoff – water flows by capillary forces and
            1. Ponderosa Pines don't like clay soil – only do here because of the rain
8. **Water infiltration over time** – slide 26
    a. water doesn't get far into ground if clay
9. **Compacted and non-compacted soil** – slide 27
    a. basically all the soil particles have been squished and air and water can't get into the soil very well.
10. **Normal and compacted soil** – slide 28, 29
    a. The ideal soil is then compacted to 45% mineral content, 25% air, 25% water depending on the season, 5% organic matter
    b. compacted soil has 69% mineral particles – implications is plants can't grow there. If the soil compacted the roots have a harder time getting the air and water they need
        i. for trees it makes it hard for them to grow tall in early years.
        ii. Overcome at 7 years and can grow tall but then they don't grow wide in girth
    c. Q: technical way to measure compaction?
        i. Yes, surface might look fine but 18 cm below compacted. How recognize? Probe that measures psi – 500psi plants have problems and at 2500 psi plants can't grow

11. **Slope instability** – slide 30
    a. rock fall, slumping – when assessing health and mitigation needs the soil scientist will look at compaction, vegetation to measure health of the forest and mitigations that can happen for management
12. **Vegetation holds soil in place** – slide 31
    a. amount of sheer strength that is given to soil by roots.
    b. Unless old and heavy and very wet can cause slide
13. **Decomposing leaf litter and woody debris** – slide 32
    a. get a lot less run off and more infiltration if multiple pathways for water to seep into soil
    b. after fire soil exposed, raindrops hit ground, get sedimentation and erosion

Questions & Answers

1. Q: number of landslides – has it increased? Yes and no. Maybe not increased, just redistributed differently related to human activities – such as building on unstable landforms
2. Q: Do you have data on impacts on myccorhiza and fungal networks from disturbance?
    a. Trees have mycorrhiza and fungal associations that are species specific. The tree feeds them carbohydrates and they grow and access pockets of water that trees roots are too big to access. This massively increases the surface area of where tree can get water.
    b. There is lots of research being done – trees share nutrients and communication through mycorrhiza. Mycorrhiza can be sensitive to climate and other management activities. Can persist w/ out trees for a while but there is a tipping point.
3. Q: Relationship b/t the soil, plants and transfer of water?
    a. Yes. There are different processes through which water moves. One is that it sticks to the surface of the soil particles or the other is between soil particles.
    b. The less water there is in the soil the more likely it is to cover each soil particle. There is always a layer of water over a soil particle. The closer water is to the soil the more tension there is to relive it. That is why at a certain point the tension is so high plants can't access the water.
    c. Air evaporative demand is pulling the water through soil and can only exert a certain amount of pressure. As it does it adheres more to soil particles. When it does, it causes the plant to die and it is called the wilting point.
        i. Water passes more quickly through wet soil and dry soil
4. Q: How does all this information typically inform management decisions, and how would it ideally?
    a. Try to come at soil management through perspectives of healthy forests, landscapes, and soils. Essentially goals of best management practices BMPS but confined by laws and guidelines
    b. Soil scientists visually inspect and record instability, compaction, potential for nutrient loss, and displacement (erosion movement by machines). All effect forest and soil health. Usually combinations of all processes together that are making the system healthy.

        i. In a stand or unit there can't be more than 20% of area compacted detrimentally. Ex/ 10% from previous and can't do more.
        ii. If there are a lot of rock outcrops, steep slopes, revegetated landslides that will move again request buffers, dropped from unit, ect. Don't want to activate old slides
        iii. Will pay attention to roads and road cuts and if they are sluffing or eroding. If close to flowing water have to make sure not contributing sedimentation to water.
    c. A lot of what they do is make sure dirt doesn't get in streams and damage fish habitat
        i. However there are huge implications for forest health, fire, disease related to soil, competition of vegetation that isn't incorporated in current guidelines
    d. look at nutrient loss and prescribed fire
        i. how much we can underburn to support nutrient cycling
        ii. some situations where there should not be underburning – shallow soil, had fire before, usually for soil stability – so if burned soil would start moving
        iii. most situations want even distribution of types of sizes
        iv. amount of litter that needs to stay in unit
5. Q: about cutting trees and how much can be taken? Will Clear cut kill soil?
    a. Gerally yes, but in some situations it won't such as on the coast range that forms rich soils with aggregates that form in clumps on roots. They are additional benefit to fine and rich textured soil. If you go to a clear cut there may be dark soils but likely light colored because top soil is eroded.
    b. When replanted trees won't do as well but it will help regenerate the soil.
6. Q about mycorrhiza – how long it will last after a clear cut? how soils behave will be different depending on trees. . . combo of benefits of fine and coarse texture soil.
    a. Degradation of soil - or quality of soil in old forest extremely high. Degraded really fast if remove vegetation. If replant it will restore it but not to level it was before clear cut.
    b. There are healthy clearcuts – in certain situations when right mitigations are put in place
7. Q: Fire severity - do we have enough information on fire soil and soil PH in Rigdon area?
    a. many situations where no underburning is needed
    b. usually for soil stability that would not want to underburn
    c. most situations would want an even distribution of all class sizes of material, and want to maintain
    d. usually when underburn the smaller material burns and large material stays, important to retain a portion of the small litter materials also.
8. Q: 1) Fire severity – do we have good enough info about fire severity in our restoration discussions, and 2) soil PH – do we have enough info about soil PH
    a. We don't have much info on soil PH – Northern Rockies Research Station (NRCS) has been doing mapping across the forest and we will continue in the

Rigdon area. District will be taking the measurements that the NRCS usually takes – soil pts, measurements and making map. Can guess from kinds of rocks but don't have data

9. Q: When you do management when creating early seral habitat in forested area? What do you do to keep soils healthy?
    a. Yes, have revegetation plans, actions immediately after disturbance
    b. There are very small amounts of bare soil that are allowed to happen. All actions have to have revegetation plan – i.e. planting native grasses and slash distributed over top
        i. provides shelter for grass seeds
        ii. wildlife also makes revegetation plans – shrubs and plants desirable to wildlife
10. Q: Are getting away from slash burning? We definitely do slash burning as needed. They really can't burn slash that is big. Might make piles, also called wildlife piles. If piles are on a landing can use them to rehabilitate soil.
    a. standards and guidelines that require slash to be burned so extra fuel doesn't create a fire hazard.
        i. In some situation this is good to decrease competition and allow other biodiversity.
    b. There hasn't been clear cutting and broadcast burning in this area for a long time. Not a current management action.
    c. If there is a lot of meadow burning will look for erosion, vegetation reestablishment, or lack thereof, buffers, and when to burn.

Plant Associations

- Plant associations guide: can get online version – will be on website
- Presentation starting on Plant Association powerpoint slide 19

1. Overstory indicators – slide 19
    a. One of the local main overstory indicators is the western hemlock – slide 21
        i. in the Outlook area there is a lot of western hemlock
        ii. A lot of lower elevations on the District is the western hemlock plant association (PA)- when we know we are in that PA we will look in the book for the series
    b. In the higher elevations, it is pacific silver fir PA – slide 22
        i. such as higher tumblebug area
    c. Upper elevation overstory indicator – slide 23
        i. The "almost" alpine zone is Mountain hemlock PA – Waldo area
2. Steps you take in the field to decide what the plant association is – slide 25
    a. select right size area that is all in same similar unit
        i. can help to do one in undisturbed area and disturbed adjacent
        ii. make list of species and look for indicator species
    b. estimate cover of the species
        i. easy to overestimate the cover
    c. work through keys to see where you are
        i. temp gradient – if very close then ok but if different then need to

determine b/c can have different management implications
        ii. sometimes close to 2 PA's – if they are similar its ok, but if they aren't then need to spend more time
    d. Record the stand that fits
3. Helpful for future planning and winter work to have the guide to refer to – slide 26-27
    a. Use PA to determine what and how to manage – an idea of how soils are, the types of vegetation grow well
    b. There is also an associated wildlife guide that ID how wildlife respond
    c. Use the landform and soil as basis, and then PA is the next step to understand how to manage an area
4. Applications for the PAG – slide 30
    a. Has been used far larger modeling efforts – huckleberry restoration, wildlife habitat – lynx, elk forage, different types of lichen species, can
    b. Fire regime condition class mapping – can use the PAG to identify diff temperature, tree species
    c. field trips – how will thinning effect wildlife, fuels, and environment factors
    d. Provides a common language

Question & Answer

1. Q's: Is there an incense cedar PA? subclass of doug fir?
    a. Indicator species but not a major species for Doug fir PA.
2. Q: Has PAG been updated? Once or twice
3. Q: How often are people surprised by prediction made by PAG? Haven't seen
    a. Tends to be that most surveys were done when there was lots of management but where it might be different is where large fires
    b. Some PA's had a lot more research plots
4. Q: Is this PAG for forested areas?
    a. Yes, there is also a special habitat guide for non-forested areas: meadows, rock outcrops, wet areas
    b. Willamette is unique to have special habitat management areas within the forest plan
        i. directives on what can do or cant do as a management action
    c. Similar to the PAG, look to see what species are present and categorize based on special habitats.
    d. Mostly done on northern part of forest so there is more info to add for the southern area
        i. Includes a list of indicator species, wildlife use, rock gardens, development, average widths & buffers, etc.
    e. There is also a riparian plant associations guide
5. Q: Is there active restoration going on with the plant communities? What is the process?
    a. Yes, quite a bit. There are a lot of different projects, meadow restoration, stream channel restoration, thinning so forests can grow bigger, restore wet areas that were disconnected or damaged in the past.
    b. There is some species specific restoration: a plant called physaria ?? near Elk

Camp shelter with long term monitoring plots that showed it was fanning out. removed small trees and shrubs that were crowding it out and now its coming back. Very small scale.

c. knob cone pine
d. On larger scale, its hard to address issues such as long term drought or climate change. We don't have a good solution to large scale die offs.
    i. One example is the ponderosa pine in the Rigdon mixed conifer areas
    ii. They are dying off rather quickly because there are more doug fir there than there was historically.
    iii. Part of the idea of Rigdon is similar to the Pine-Grass project to help this species persist and not die off
    iv. Knob cone pine - they need fire – so we need to cut some of the crowding trees and reintroduce fire
    v. The question is what can we do? We can't make it rain more but we can reduce the competition that some of these species have and reintroduce fire so they will persist

6. Q: What can you tell us about the species of concern and actual types of soils that are present?
    a. The Doug fir grow almost everywhere, ponderosa pine
    b. trees can be limited by their root systems and different aspects of the soil
    c. quite often trees are limited by the PH of the soil – trees like a balance of about 7. Some trees might be able to handle a PH 8
    d. In the Willamette Valley the soil tends to be a PH of 5. This is great for growing grass or vegetables, but not so much for trees. However trees tend to acidify the soil by their litter and amount of rain that happens where trees grow and interaction with the rocks and soils.
    e. Ponderosa pine tends to like a fairly deep soil – it has a tap root
        i. Have found that areas like Jims Creek where there isn't deep soil they will spread out
    f. The ponderosa pine – surprised to see these East side ponderosa pines growing here
        i. There is a Willamette valley ponderosa pine but it is a totally different creature and it grows in wet places or high elevation were you expect to see Oaks
    g. White oaks will grow where soil is deep and wet, like where there are seeps and bottoms of landslides
    h. Ponderosa pines are not as effected by the depth of the soil as they are by the texture of the soil. They have pretty course roots and if there is enough rain they can grow on fine textured soil or siltier to clay soil if there is a lot of rain. But once rain levels go down that tree will die off. The pores of the roots suck water out of the soil quickly. Needs course grain gravity flow. If there is clay soil that holds water tightly it can't create enough tension
        i. If there is an increase in the solar radiation or pressure deficit and increase in temperature that changes the moisture in the soil they can die quickly
            1. If there is deep enough soil, course enough grain, that holds

enough water then they will do well
2. Important consideration for ponderosa pine and climate change

ii. In a situation where there are other trees outcompeting Ponderosa Pines - They don't compete well. If other tree is closer, better at accessing water and has an advantage, such as more myccorhiza then that other tree will win.

iii. Rigdon soil type – coarse grained and not very deep

7. Q: Thought oaks like S facing slopes? Yes, they are very adaptive species to a lot of different species and different variation of oaks respond differently.
   a. Will see on dry shallow soils in lower elevations because the soil is actually very thick and deep. They will have a clay like soil that is very rich for plants. A drier site in the valley could still be wetter than a fairly rocky site at a higher elevation.
8. Q: When it comes to the Ponderosa Pine what is PA or the plants that help support it and help it thrive?
   a. There isn't a specific plant species that helps it.
   b. PPines have myccorhiza systems and also depend on their fine root systems. PPine systems have deeper tap root and also fine, fine roots that spread out. Their own needle and duff layer becomes really thick with its own myccorhiza that help it get more moisture.
   c. This is also part of why they don't burn
   d. Poison oak shows up in PPine forests but doesn't help it
9. Q: Staley Creek floodplain restoration project – how to protect the soils?
   a. The soil doesn't get compacted until about 5 passes
   b. Type ad size of tires are important. There is low impact heavy equipment
   c. Have direction for certain types of machines and how many passes they make
   d. Can also have them decompact the soil afterwards
10. Q: Hydrophobic soils that shed water, what causes this? It's a condition caused by fire – it can either be chemical or physical.
   a. Chemical hydrophobia is a condition that causes the soil to turn bright red or orange because it melts the polysaccharides in the soil and makes them turn into a wax. Its not very deep, but there is a crust where all the soils are coated with the wax.
   b. Can mix up the soil, scrape it away from a plant you want to plant
   c. Forests that are dealing with many, many acres is another issue
   d. There is a maximum amount of surface area that can be impacted this way by prescribed fire
11. Q: Sugar pines – there are a lot on the District. Is this something we are losing or managing for?
   a. Yes, we think about all the 5 needle pines and the damage from white pine blister rust.
   b. They grow in different areas than the Ponderosa but definitely loosing all of the 5 needle pines. There are a lot of big ones but not many young ones. Have collected cones to grow them out.
   c. The blister rust has been around for a while, but as trees get more stressed they are more susceptible
      i. Would getting rid of doug firs that are competing help them? Yes, have

done some cutting a doughnut around these trees.

12. Q: Pine grass plantation projects – Is there any problematic larger sites that need treatment?
    a. Yes, when the Pine-grass work started there were stands that were too big to thin by hand. They have grown too tall. If we thinned them now, there would be larger 30 year old trees on the ground. No one wants to buy these young pine so there isn't a market to get them out of the woods.
        i. Can burn as piles but it's a lot of work and very expensive
        ii. Would be better to find a way to harvest as a project
13. Q: Has anyone looked at the differences in myccorhiza plant associations?
    a. It tends to happen by tree species. PPine and Doug fir have different myccorhiza that can compete against each other as well. They can become acidic to each other and toxic to the other species.
    b. There is a OSU study that is looking at myccorhiza survival in different sites and climate change.

Q: Does lodgepole pine grow here? Not in general, there will be some spots where you will see a single tree, such as bogs, like near Timpanogas. Not commonly. Lodgepoles tend to grow where other trees don't want to.