Hydrology and Forest Roads

Curt Veldhuisen

Skagit River System Cooperative Sauk-Suiattle and Swinomish Tribes



It rains – so what?

- Roads built from soil and rock
- Performance based on how they handle water



Also....

- Water drives environmental impacts
- Forest Practice Rules focus on impacts to streams
 - Clean Water,
 - ESA fish,
 - Stewardship



- Hydrology Concepts:
 Water Cycle
 Water Pathways
 Weather Climate
 Soil Profiles
- Road Drainage



Precipitation

- Forms:
 - Rain
 - Snow
 - Hail, Fog drip...
- Amount "Area-inches"





Vegetation Pathways

- ET
- or Evapo-Transpiration
- Evaporation passive
- Transpiration active
- ET is combined amount



Soil Pathways

- Infiltration
- Overland flow
- Sub-surface flow & Piping
- Exfiltration



Soil Profiles

- Surface organic layer critical to infiltration
- **Sub-surface flow** drives lateral movement
- Soil **depth** affects road hydrology



C. Gravel terrace



Weather & Climate

- Weather = Short term conditions
- Climate = Long-term average
- "On cable TV they have a weather channel. We had something like that where I grew up. We called it a window"



Northwest Washington

- Climate wet
- Rainfall intensity low
- Dry(er) summers







Precip. in NW Washington

- Olympics rainshadow
- Cascade effects orographic
 - Cultus Mtn. ~140"!
- Convergence Zone
 - Verlot 146"!

Long-term low elevation stations



Operating Seasons

- Q: What do you call a day of rain after five dry days?
- Soil conditions depend on short & long term precip.
 - Fall precip M, storage L-H
 - Winter precip H (occasional dry periods), storage H
 - Spring precip M, storage H-M
 - Summer precip L, storage L
- Profile? precip, trans, moisture storage

Logging effects – soil

- Disturbance of surface layer
- Soil compaction (mainly fine soils)
- Change in surface topography



- Controllable by Best Management Practices ("BMP"s)
 Logging method, care, soil moisture
- Clearcut = "Parking lot"?

Logging effects – canopy removal

- Clearcut reduces ET for 10-20 years
- Percent of annual input
- Low flows increase
- Flood effects minimal
- Trees: "*Nature's umbrella*"?



Road effects

- Canopy removal plus:
- Surface runoff
- Interception of shallow subsurface flow
- Road networks can accumulate to affect stream flow





Road Ideal: "Hydrologic transparency"

- Road allows unrestrained movement of streams, seeps and surface water.
- Also other watershed materials (sediment, wood, fish and animals)
- "A rainy day is the perfect time for a walk in the woods..." Rachel Carson
- ...or to drive your logging road!
- Add photo?

Tribal 'TFW' Programs

- Technical assistance
- Support forests over development
- Salmon streams lined by small ownerships
- Tribes involved in FPA process
- Cooperate to improve forests and fish habitat
- SRSC works in Skagit and Samish
- Other tribes and groups

