

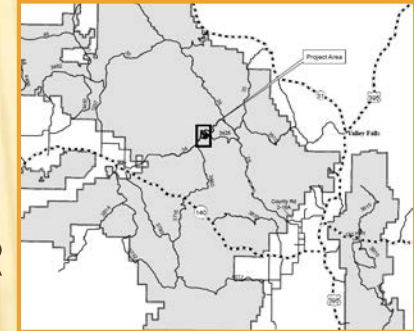
A photograph of a steep forest slope. In the foreground, a yellow logging skidder is positioned on a dirt path, surrounded by large logs and branches. The background is filled with tall, green coniferous trees under a clear blue sky. The text 'SOIL RESOURCE MANAGEMENT FOR GROUND-BASED LOGGING ON STEEP SLOPES...' is overlaid in large, bold, yellow letters with a black outline.

SOIL RESOURCE MANAGEMENT FOR GROUND-BASED LOGGING ON STEEP SLOPES...

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✘ Pilot Timber Sale

- + Fremont-Winema NF, Bly RD
- + Purchased by Collins Pine, Lakeview, OR
- + Logged by Miller Timber Services, Philomath, OR
- + OSU Research Unit - John Sessions
- + Unit 10: 54 acres



PILOT TIMBER SALE

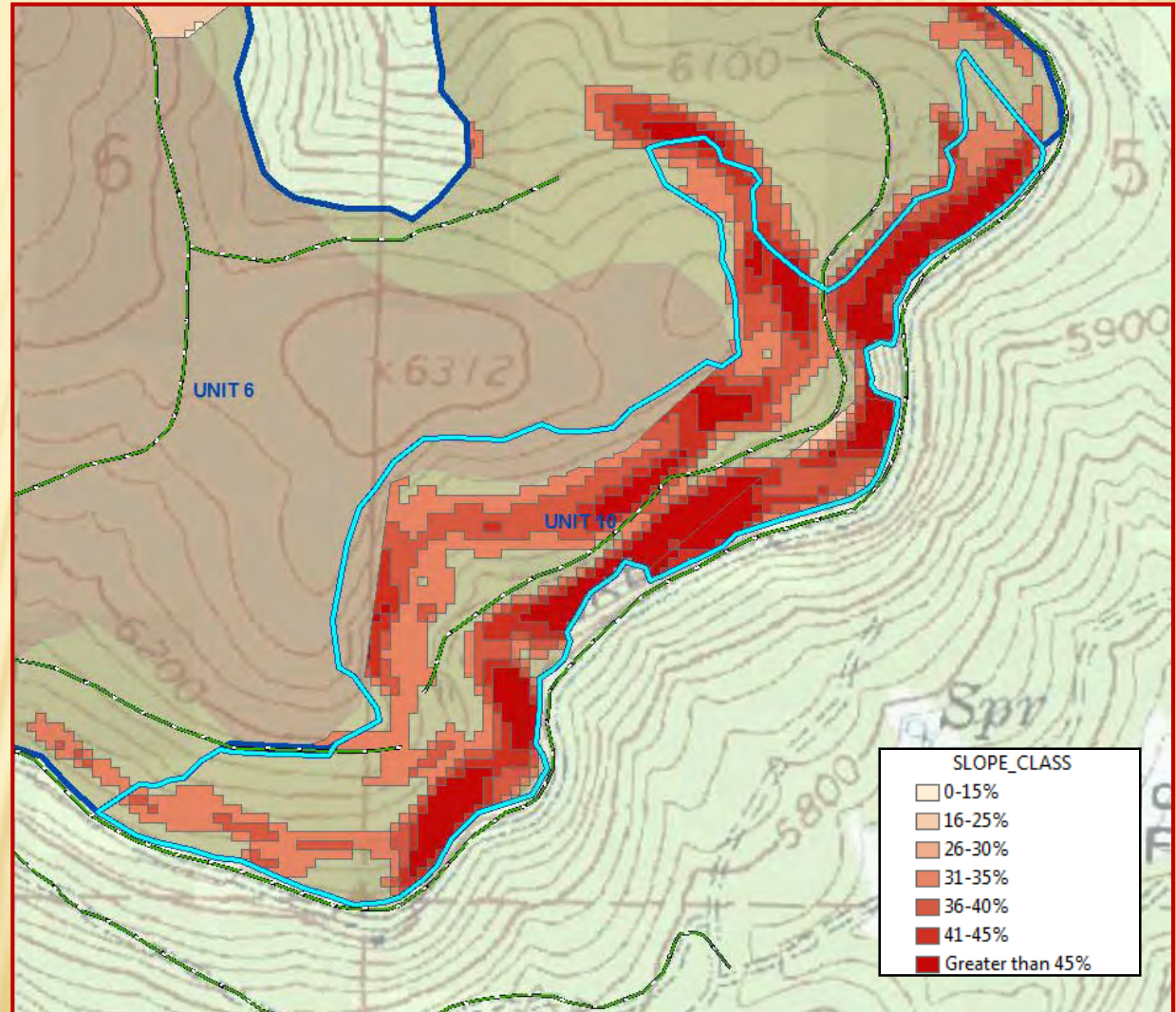


- + Logged: July – August 2016
- + Tethered Ponsse Harvester & Forwarder on wheel tracks
- + Mixed conifer stand at ~6,100 ft. elevation



FIELD CONDITIONS

- + Average slope ~20% to 60%
- + Usual slope limits for ground-base equipment: 35%



✘ Monitoring Results

Table 1: Monitoring results for soil disturbance (Page-Dumroese et al., 2009)

	Disturbance Class				Coarse Woody Debris
	0	1	2	3	~34 tons/ac
# of Points	101	27	13	9	
% Disturbance	67	18	9	6	

✘ ...have to be taken with a grain of salt

- + Monitoring occurred shortly after harvest completion – results don't tell the whole story yet
- + Proposed treatments not completed yet – Rx fire
- + Mother Nature remains at the table – weather, weeds, resiliency etc.

OBSERVATIONS – GROUND-BASE LOGGING ON STEEP SLOPES

Displacement



Compaction



- ✘ In pumice soil, displacement accounts for most of the disturbance
 - ✘ Compaction in pumice is limited but still present
- ✘ Expect compaction to be higher in finer textured soils compared to coarser

OBSERVATIONS CONT.



Hydrophobicity test – no difference between disturbed and undisturbed this fall



- ✘ Pumice soils were pulverized and churned under dry conditions
 - ✘ Sliding of equipment

OBSERVATIONS CONT.



✘ Side tracking & turning

OBSERVATIONS CONT.



× Converging & side-by-side skids

OBSERVATIONS CONT.



- × Evolution of a skid trail
- × Slash mat deterioration

OBSERVATIONS CONT.



Upper slopes rockier, shallow soils, opening, less material

Slope location, terrain, and aspect dictate slash amounts



More slash at lower end of skid trails and on concave east-facing terrain

OBSERVATIONS CONT.



- ✘ Slash cover varied along trails; required 18 in. thickness inconsistent

OBSERVATIONS CONT.



- ✘ Continuous traffic along rocky knoll removed soils and left cobbles and gravel

OBSERVATIONS CONT.



- ✘ No waterbars installed



OBSERVATIONS CONT.



- ✘ Leave trees are shedding needle cast to provide cover on bare soils

SUMMARY & CONCLUSIONS

- + Know your soils
- + Match logging system and equipment to terrain
- + Avoid side tracking along hills and turning, keep skid trails straight
- + Eliminate unnecessary side-by-side skids, utilize existing infrastructure and trails
- + Incorporate adequate trail spacing
- + Shut down activities when conditions deteriorate and/or plan for the right season
 - × logging when soils are too wet (fine-textured soils) or too dry (coarse textured soils)
- + Factor in variable slash availability due to terrain and habitat type
- + Ensure sufficient slash placement, maintain existing integrity of duff and organic matter
 - × Consider slash placement direction (perpendicular to tracks)
- + Account for additional disturbance from post-harvest slash treatment and fire
- + Apply above principles during all stages of site treatment - include good operators and practitioners at all stages