

*From Draft Soil and Water Report for Fishtrap EIS*

**Existing Disturbance Affect on Soil Quality**

To assess current conditions relative to Regional Soil Quality Standards, field investigations were conducted during field seasons of 2002 and 2003. First a soil map of the Project Area displaying the integration of Land Systems Inventory Mapping Units and past harvest activities was produced. The extent, age, and type of past harvest were overlaid with the location of sensitive soils and assessed. Following a hierarchical approach, field surveys initially targeted the most sensitive soil areas and soils with specific harvest system limitations where the most intensive yarding practices were recorded or indicated, if detrimental conditions are encountered, the next lower level of sensitive soil areas with potential impacts were reviewed. The detailed procedure entitled “Procedure for Analyzing the Effects of Previous and Proposed Activities on Soil Resources,” is on file as Document XX.

For soil compaction assessment, soil structure, tree growth, and tree root development were observed for comparison in disturbed and non-disturbed sites for a representative number of units in the targeted soil areas. If compaction was detected, the amount and areal percentages within each unit were quantified and a determination of detrimental conditions calculated. For soil displacement, a representative number of skyline units and ground based harvest skid trails were evaluated for surface soil loss or disruption of mineral soils.

The following table displays the data collected.

**Table 3-S3. Past Harvest on LSI Identified Sensitive Soils**

<b>Soils Assessment</b>			
<b>Assessment Features:</b> Skid trail prevalence; stand type, diversity, age, growth; soil pits; surface disturbance; Root growth.			
<b>LSI Unit*</b>	<b>Location</b>	<b>Harvest Year</b>	<b>Assessment Findings</b>
46OA	West Fork: Section 7	1960	Appears that the unit was harvested from jammer roads – no evidence of tractor skidding. The timber stand was very much intact showing even growth whirs, diversity, and no fanned or stunted root systems on seedlings. Although tree growth in the unit was not impaired, the jammer roads had spotty areas of smaller trees and less tree density than the adjacent stand and therefore have at least partial areas of soil compaction. However, most of the jammer road surfaces observed were occupied by trees of various ages and sizes, and have the same growth trends as trees immediately adjacent to the jammer road. Soil pits in the harvest units did not show indications of compaction. There were no areas of substantial soil displacement.
46OA	West Fork: Section 1	1965	Same assessment results as above.
47OA	West Fork: Section 6	1965	Same assessment results as above.

30BB	Shale Creek: Section 23	1965	Skid trail and jammer road evidence - root analysis, growth assessment, and soil pits showed no compaction evidence. Soil displacement on terrace - impacted area is less than 15% of the former harvest unit. There were no areas of substantial soil displacement in harvest units.
74BA	Radio Creek/ Beartrap Fork: Section 16	1965	Obvious skid trails; however, root analysis showed only 1 of 25 seedlings with fanned root growth; the remainder had a developed tap root and consistent growth whirled with tree growth adjacent to the skid trail. Soil pits showed indiscernible differences in compaction indicators between reference and skidded sites. There were no areas of substantial soil displacement in harvest units.
72BA	Fishtrap Lake Area: Section 3	1965	Rolling hills with little evidence of skid trails, although the area was harvested completely. Identifiable skid trails comprised less than 15% of the area. In one skid trail 2 of 6 trees were had mushroomed or fanned roots. Tree growth was similar throughout the unit showing no stunting. Soil pits did not show compaction indications. There were no areas of substantial soil displacement in harvest units.
74BA	Upper Mantrap: Section 21	1965	Soils exhibit high rock content. This area was cable harvested. Assessment of tree growth and composition indicated no differences between trees in or outside of cable corridors. No evidence of soil displacement. Ten to fifteen tree roots were examined with 5-7 showing a turned root, which was attributed to the high rock content of the soils.

Soil Productivity - Reduced productivity from timber harvest occurs when jammer roads, skid trails and landings are compacted and might be rutted or puddled. Soil occupied by roads and trails have a reduced level of productivity compared to undisturbed soils. System roads though are a dedicated land use allocation and do not enter into calculations of detrimental soil condition.

Soil Erosion - Soil erosion in the project area is concentrated on roads. Road erosion has direct effects on water quality, but because it is not a component of soil quality assessment it is evaluated in the hydrology section. The most recent ground based harvesting was completed in the mid-1990's. Surface vegetation has returned to disturbed sites either through seeding or natural recovery and skid trails and landings in the project area have all had erosion control features completed, which reduce or eliminate soil erosion.

Mass Failure – Between 1990 and 1995, periods of heavy rain resulted in multiple slumps along Road 7569 (known as the Radio Creek Road). During the investigation of the slumps, the Forest Soil Scientist described the soils as “Woolsey Shales” (LSI map unit 30BB). These soils are interpreted as having a moderate geologic hazard. After numerous reconstruction and stabilization options were considered, the road was decommissioned and fully re-contoured in 1997.

In summarizing Table 3-S3, sensitive soil areas did not exhibit detrimental soil compaction nor displacement problems in previously harvested units. These harvest units were between 35 and 45 years old and the high annual precipitation of the area combined with active frost heave has likely dissipated any compacted soils and, observations revealed that many of the areas where tractor harvest was suspected to have occurred had

extensive jammer road systems. The jammer systems afforded cable operations through the units, and therefore, soil displacement and compaction were limited in the units themselves. Previously harvested units in the targeted soil areas did not exceed soil quality standards in terms of compaction nor displacement and soil productivity is being maintained. Because the targeted areas represented the combination of soils most susceptible to impact with the most intensive harvest system, less intensively harvested on less susceptible areas are, by extension, also expected to meet soil quality standards.

Many jammer roads in the project area have been observed and evaluated. Between 20 and 25 percent of these roads have substantially recovered to the point where they exhibit tree growth, composition and vigor similar to trees in stands immediately adjacent to the road. The remainder of the roads exhibit ample vegetation in the form of grass, forbs, shrubs, and trees. However, although no areas were devoid of vegetation, compaction is generally present and is indicated by an obvious hardened surfaces, lack of tree or shrub growth, smaller trees and a higher frequency of fanned root systems on seedlings (although most have normal tap root growth). The affect of jammer roads soil and vegetation properties appeared to be independent of whether the soil was “sensitive” or not. While system roads are not included within the calculations for soil quality, jammer roads are within activity areas and do enter the calculations. Table 3-S1 displays the area of jammer roads existing within the Fishtrap project area as 349 acres. If 75 to 80 percent of this area fails to meet soil quality standards that would be 260 to 280 acres, or less than 1 percent of the project area.

### **Past Management in Proposed Activity Areas**

This section describes the existing condition of the proposed units (activity areas) within the Fishtrap project area. The roads and timber stand database was used in conjunction with aerial photographs and field investigations to determine which proposed units had past management activities that may have residual detrimental soil conditions.

There are 11 proposed units that have no previous harvest nor other management. These units are listed with their corresponding LSI map units in table 3-S4 below. While, based on LSI interpretation, some of these units may have sensitivities or limitations, they have no existing detrimental soil conditions.

**Table 3-S4. Proposed Harvest Units with No Previous Harvest Activity**

<b>Proposed Harvest Units in Areas not Previously Harvested</b>	
<b>Unit No.</b>	<b>LSI Map Unit</b>
166	43QA, 64QE
48	32QA, 30QE
44	32QA, 30QD
57	30QD
54	74UA
28	74BA
18	13UB

12	74BA
85	74BA
4	30MB
91	74BA
92	74BA
93	74BA

There are another 19 proposed treatment units that have previous harvest and because of internal or adjacent jammer roads have a range of residual detrimental conditions. The treatments proposed for these units would not involve any form of ground based skidding. In fact most of these units do not involve harvesting at all. Several units are proposed for pre-commercial thinning (PCT) and (RW) or under-burning (UB). Unit 234, the only unit identified as residual detrimental conditions exceeding the regional standard of 15 percent, is scheduled for “grapple piling” (a slash treatment) followed by planting. This unit is 2 acres in size. Unit 314 is the only unit in Table 3-S5 to have a harvest prescription. The information for these units is presented in Table 3-S5.

**Table 3-S5. Residual Detrimental Soil Conditions in Proposed Treatment Units.**

<b>Proposed Treatment Units (non-tractor harvest) with Existing Detrimental Soil Conditions</b>					
	<b>Unit No.</b>	<b>Area (acres)</b>	<b>Proposed Treatment</b>	<b>Potential Detrimental Conditions (Residual Jammer Road Effect)</b>	<b>Potential Range of Acres Effected</b>
	6	37	SEL	6-10%	2-4
	204	55	PCT	6-10%	3-6
	205	24	PCT	6-10%	1-2
	210	11	RW	6-10%	About 1
	218	103	PCT	6-10%	6-10
	224	33	RW	11-15%	4-5
	225	30	RW	6-10%	2-3
	226	27	RW	6-10%	2-3
	227	44	RW	6-10%	3-4
	229	26	RW	6-10%	2-3
	234	2	GS/P	>15%	<1
	308	90	UB	6-10%	5-9
	310	41	UB	6-10%	2-4
	313	43	UB	6-10%	3-4
	314	45	SS/MLB/P	6-10%	3-4
	315	33	UB	6-10%	2-3
	316	55	UB	6-10%	3-6
	317	43	UB	6-10%	3-4
	318	37	UB	6-10%	2-4
<b>Total:</b>	19 units	779	-	-	50-80

	17 units 6-10		1 unit 11-15	1 unit >15%	
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There are 41 proposed harvest units where tractor skidding is the planned yarding system. Tractor harvesting has a higher potential for creating surface disturbance than other systems or non-harvest treatments. Table 3-S6 displays the proposed tractor units, their size, whether they have had previous harvest, whether the LSI identifies any limitations and whether there are any residual detrimental soil conditions.

**Table 3-S6. Existing Condition of Proposed Tractor Units.**

<b>Fishtrap Proposed Tractor Units</b>					
	<b>Proposed Unit No.</b>	<b>Treated Acres</b>	<b>Identified Limits? (if so, acres)</b>	<b>Previous Harvest (?)</b>	<b>Existing Percent Detrimental Conditions (acres effected)</b>
	1	15	Y (9)	Y	1-5 (<0.5)
	4	17	N	N	none
	5	17	N	Y	none
	7	27	Y (22)	Y	6-10 (<2)
	8	5	Y (4)	Y	none
	9	35	Y (10)	Y	none
	11	9	Y (1)	Y	none
	12a	20	Y (2)	Y	none
	12b	23	Y (18)	N	none
	12c	115	Y (115)	Y	1-5 (<6)
	12d	24	Y (22)	Y	none
	12e	142	Y (135)	Y	none
	12f	19	Y (19)	Y	1-5 (<1)
	13	28	Y (4)	Y	6-10 (<0.5)
	14	32	N	Y	1-5 & 6-10 (<1)
	15	21	Y (21)	Y	none
	18	6	Y (6)	N	none
	23	9	Y (9)	Y	1-5 (<0.5)
	24	13	Y (13)	Y	none
	25	26	Y (26)	Y	none
	28	39	Y (39)	N	none
	44	8	N	N	none
	48	8	N	N	none
	49	23	N	Y	none

	52	42	N	Y	none
	53	39	N	Y	none
	54	16	Y (5)	N	none
	57	11	N	N	none
	61	28	Y (8)	Y	none
	62	11	Y (11)	Y	1-5 (<0.5)
	85	39	Y (39)	N	none
	86	4	N	Y	none
	87	7	N	Y	none
	90	31	Y (31)	Y	none
	91	13	Y (13)	N	1-5 (<1)
	92	31	Y (31)	N	1-5 (<2)
	93	14	Y (14)	N	1-5 (<1)
	94	15	Y (15)	Y	6-10 (<2)
	95	11	Y (1)	Y	none
	100	30	Y (30)	Y	none
	166	15	N	N	none
<b>Total:</b>	41 units	1,038 ac	29 units (687 ac)	28 units (884ac)	(<18)

Table 3-S7, below provides further interpretation of the units displayed in Table 3-S6 above. Table 3-S7 provides the LSI classification that carries the sensitivity and the proportion of the unit that is so affected.

### **Cumulative Effects of Existing Soil Conditions**

Consolidating information displayed in Tables 3-S5 and 3-S6 indicates that at the outside the potential range of previously harvested areas with existing detrimental soil conditions proposed for some form of treatment in the Fishtap Project is about 70 to 100 acres. No more than 18 of those acres are proposed for tractor yarding. In addition, analysis of information in the timber stand and roads databases suggests that an additional 100 acres in the project area not proposed for treatment exceed the 15 percent standard for detrimental conditions. Thus, if the upper range of potential detrimental soil condition is considered, less than 1 percent of the project area would be effected.