Soils

APPENDIX M

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Table M-1. Soils Risk Assessment

Watersheds	Erosion	Compaction	Displacement	Totals	Mean	Std. dev	Slope	Avg. of Slope & Mean
Howard Hansen	1	3	3	7	2	1.15	13	7.67
NF Green	3	2	4	9	3	1.00	10	6.50
East Creek	2	1	7	10	3	3.21	7	5.17
Mashel	4	4	8	16	5	2.31	4	4.67
NF Mineral Creek	5	12	1	18	6	5.57	11	8.50
Catt	7	13	2	22	7	5.51	12	9.67
Reese Creek	8	10	5	23	8	2.52	5	6.33
Tiger	9	5	9	23	8	2.31	8	7.83
Mineral Creek	6	11	6	23	8	2.89	9	8.33
Kennedy Creek	10	6	10	26	9	2.31	6	7.33
West Kitsap	11	9	11	31	10	1.15	2	6.17
Great Bend	12	8	12	32	11	2.31	3	6.83
Lynch Cove	13	7	13	33	11	3.46	1	6.00

*Slope seems to have a semi-negative correlation with the other estimations.

Table M-2. Slope Gradient of DNR-Managed Acres

WAU	<30% slope	>30% slope	Total DNR-managed acreage	<30% slope	>30% slope
Catt	31.14%	68.86%	6,893	2,146	4,747
East Creek	55.44%	44.56%	4,052	2,246	1,806
Great Bend	87.39%	12.61%	16,318	14,260	2,058
Howard Hansen	24.11%	75.89%	16,499	3,978	12,521
Kennedy Creek	58.83%	41.17%	9,227	5,428	3,799
Lynch Cove	90.25%	9.75%	11,063	9,984	1,079
Mashel	66.70%	33.30%	15,139	10,097	5,042
Mineral Creek	42.00%	58.00%	4,761	2,000	2,761
NF Green	34.45%	65.55%	6,602	2,275	4,327
NF Mineral Creek	33.39%	66.61%	13,883	4,636	9,247
Reese Creek	62.39%	37.61%	11,971	7,469	4,502
Tiger	50.10%	49.90%	10,092	5,056	5,036
West Kitsap	87.84%	12.16%	7,261	6,378	883
Total			133,761	75,954	57,807
Percent				56.78%	43.22%

Table M-3. Percent of Watershed Harvested

WAU	Total DNR-managed acreage	Percent DNR-managed	Total Harvested Area (Alt A) Decade 1	Percent Watershed Impacted
Catt	6,893	50%	2,247	16%
East Creek	4,052	20%	406	2%
Great Bend	16,318	25%	2,868	4%
Howard Hansen	16,499	35%	1,029	2%
Kennedy Creek	9,227	39%	808	3%
Lynch Cove	11,063	29%	1,646	4%
Mashel	15,139	27%	2,100	4%
Mineral Creek	4,761	22%	491	2%
NF Green	6,602	36%	1,000	5%
NF Mineral Creek	13,883	79%	3,231	18%
Reese Creek	11,971	63%	2,140	11%
Tiger	10,092	25%	1,215	3%
West Kitsap	7,261	20%	531	1%

Table M-4. Harvest Type (Thinning vs. Regeneration Harvest)

		Alternative A		Alternative B		Alternative C	
Watersheds	**Period**	**Thinnings**	**Regeneration Harvests**	**Thinnings**	**Regeneration Harvests**	**Thinnings**	**Regeneration Harvests**
Catt	1	1,798	449	1,037	522	754	457
	2	694	36	519	545	862	478
	3	310	907	409	314	990	97
	4	183	482	252	140	375	368
	5	58	647	67	584	462	1,027
	6	168	267	146	555	51	8
	7	332	150	635	152	156	465
	8	280	889	627	636		621
	9	455	285	285	560		406
	10	480	373	317	382		727
East Ck.	1	378	28	341	28	394	75
	2	83	103	230	161	408	3
	3	34	417	192	380	397	13
	4	353	237	593	128	447	203
	5	171	351	161	19	164	592
	6	217	224	131	351	159	426
	7	120	474	163	103		124
	8	214	258	253	207	29	87
	9	118	214	295	236	3	176
	10	168	222	7	378		339
Great Bend	1	766	2,102	513	2,280	1,964	2,498
	2	385	1,820	327	1,570	1,395	1,354

	3	19	1,562	146	1,423	788	918
	4	684	1,054	126	830	1,319	872
	5	346	1,201	399	1,382	125	1,599
	6	170	1,855	287	1,345	404	1,951
	7	319	869	22	1,907	525	1,540
	8	181	1,753	14	1,304	195	1,586
	9		1,705	309	1,470	407	1,359
	10		1,408	33	1,339		2,032
Howard Hansen	1	992	38	605	452	739	158
	2	429	139	822	376	1,036	140
	3	622	1,756	616	533	950	1,005
	4	328	1,058	509	625	654	4
	5	366	1,423	272	194	655	1,742
	6	268	689	788	588	427	576
	7	972	846	1,219	533	488	448
	8	348	1,006	79	744	218	734
	9	1,717	403	719	981	158	852
	10	1,409	2,288	690	512	334	1,438
Kennedy Ck.	1	224	584	191	837	2,072	1,307
	2	74	2,116	39	1,985	305	477
	3	29	1,200		206	227	349
	4	191	355	109	1,406	250	2,285
	5	456	732	194	1,469	46	1,134
	6	111	1,448	61	1,237	77	1,473
	7	16	1,754		1,264	74	1,060
	8		1,724		955	242	597
	9		673	150	443	84	2,365
	10		1,082		2,365	407	821
Lynch Cove	1	189	1,457	79	1,586	574	1,424
	2	68	1,422	11	1,253	736	1,292
	3	0	1,204	201	939	1,030	885
	4	270	1,178	100	1,070	579	970
	5	75	1,124	105	614	24	1,357
	6	46	405	103	1,299	128	973
	7	144	847	15	1,455	392	935
	8	482	1,235	18	1,053	135	1,556
	9		1,820	261	955	223	1,565
	10		1,297		1,467		1,375
Mashel	1	1,579	521	1,144	558	1,483	345
	2	288	259	481	186	2,145	85
	3	730	949	1,276	1,785	1,274	36
	4	1,345	1,202	685	880	1,483	697
	5	322	1,886	606	441	697	2,629
	6	1,278	1,752	1,192	717	348	1,343
	7	893	328	380	1,364	21	1,049

	8	653	1,241	1,790	547	48	96
	9	727	1,209	1,002	1,077	126	660
	10	1,066	1,444	409	1,255	492	2,540
Mineral Ck.	1	483	8	236	203	601	52
	2	142	3	228	130	859	73
	3	1,583	206	1,181	41	1,411	92
	4	80	822	855	197	222	119
	5	521	757	147	45	78	935
	6	232	318	237	505	18	452
	7	73	146	245	277	3	54
	8	118	113	68	296		89
	9	401	315	236	138		200
	10	289	808	45	273		812
NF Green	1	858	141	664	267	661	126
	2	63	7	117	170	405	149
	3	495	353	466	185	706	129
	4	208	671	698	15	961	
	5	815	707	478	422	131	461
	6	102	941	46	157	6	217
	7	136	225	337	442	28	455
	8	155	155	57	828	126	814
	9	254	511	134	304	80	122
	10	321	687	525	157	33	489
NF Mineral Ck.	1	2,014	1,217	874	998	1,795	760
	2	472	221	731	1,078	1,314	735
	3	715	1,313	370	650	1,540	836
	4	503	1,286	631	83	621	1,449
	5	88	1,140	79	909	735	905
	6	393	621	527	943	309	290
	7	415	248	1,267	639	92	769
	8	1,274	1,616	944	1,357	32	935
	9	953	1,345	595	1,125		2,178
	10	502	1,656	317	708		796
Reese Ck.	1	1,759	381	1,069	702	1,684	269
	2	243	115	287	242	965	79
	3	720	199	1,046	875	1,436	75
	4	823	2,002	1,094	703	1,447	640
	5	573	1,458	702	721	313	2,273
	6	1,229	785	968	722	245	1,122
	7	562	1,316	638	1,326	21	598
	8	442	652	969	555	10	65
	9	55	890	743	799	15	507
	10	484	1,164	610	979	30	1,935
Tiger	1	664	551	523	552	1,282	198
	2	252	343	257	310	1,050	242

	3	75	426	98	442	509	289
	4	58	80	76	219	42	338
	5	91	139	78	83	74	210
	6	78	142	63	75	360	74
	7	36	224	36	224	45	194
	8	45	343	45	311	261	249
	9	23	426	23	428	266	353
	10		95	29	204	116	274
West Kitsap	1	106	425	40	410	292	390
	2	8	497	6	349	466	476
	3	27	774	38	627	289	353
	4	243	117	71	411	78	215
	5	123	169	145	298	23	576
	6	2	599	4	467	58	573
	7	77	406	45	375	19	390
	8	5	543	11	325	93	504
	9		742	92	466	35	515
	10	1	186	145	546		278

Table M-5. DNR-Managed Acreage and Percent of Total DNR-Manage Acreage Thinned for 10 Decades (2007- 2107)

Watersheds	Total DNR-managed acreage	Thinning- acre			Thinning-percent		
		A	B	C	A	B	C
Howard Hansen	16,499	7,451	6,318	5,657	45%	38%	34%
Great Bend	16,318	2,870	2,176	7,123	18%	13%	44%
Mashel	15,139	8,881	8,964	8,117	59%	59%	54%
NF Mineral Ck.	13,883	7,329	6,333	6,436	53%	46%	46%
Reese Ck.	11,971	6,890	8,127	6,164	58%	68%	51%
Lynch Cove	11,063	1,275	894	3,821	12%	8%	35%
Tiger	10,092	1,323	1,227	4,005	13%	12%	40%
Kennedy Ck.	9,227	1,101	744	3,785	12%	8%	41%
W. Kitsap	7,261	591	596	1,354	8%	8%	19%
Catt	6,893	4,758	4,295	3,650	69%	62%	53%
NF Green	6,602	3,408	3,522	3,137	52%	53%	48%
Mineral Ck.	4,761	3,922	3,477	3,191	82%	73%	67%
East Ck.	4,052	1,856	2,366	2,002	46%	58%	49%
Total		**51,655**	**49,039**	**58,442**			

Table M-6. DNR-Managed Acreage and Percent of Total DNR-Manage Acreage with Variable Retention Harvests (VRH) for 10 Decades (2007- 2107)

Watersheds	Total DNR-managed acreage	Variable Retention -Acres			Variable Retention -Percent		
		A	B	C	A	B	C
Howard Hansen	16,499	9,646	5,538	7,097	58%	34%	43%
Great Bend	16,318	15,329	14,892	15,709	94%	91%	96%
Mashel	15,139	10,791	8,810	9,480	71%	58%	63%
NF Mineral Ck.	13,883	10,664	8,491	9,653	77%	61%	70%
Reese Ck.	11,971	8,962	7,624	7,563	75%	64%	63%
Lynch Cove	11,063	11,989	11,689	12,332	108%	106%	111%
Tiger	10,092	2,767	2,848	2,421	27%	28%	24%
Kennedy Ck.	9,227	11,669	12,168	11,867	126%	132%	129%
W Kitsap	7,261	4,458	4,274	4,270	61%	59%	59%
Catt	6,893	4,485	4,390	4,654	65%	64%	68%
NF Green	6,602	4,397	2,946	2,961	67%	45%	45%
Mineral Ck.	4,761	3,496	2,104	2,878	73%	44%	60%
East Ck.	4,052	2,528	1,993	2,037	62%	49%	50%
Total		**101,181**	**87,767**	**92,922**			

Definitions for Soil Management Interpretations

Compaction Potential

Compaction is the compression of soil particles closer together, reducing the amount of pore spaces of the soil. The process of compaction increases soil density. Compaction occurs as a result of the movement of wheeled and tracked equipment and of other logging practices (e.g. yarding logs) on the soil surface.

Compaction can reduce the growth rate of trees by:

1. Reducing the size or extent of root systems and the number of fine roots by increasing soil density. The moisture stress and nutrient stress potentials are greater as a result.
2. Reducing the oxygen uptake of roots, thereby decreasing absorption of water and nutrients.
3. Impeding water movement through soils.

The Compaction Potential Rating refers to the susceptibility of a soil to compact. The ratings are based on moist surface soil behavior.

Definitions of the ratings:

Low: The potential for compaction is insignificant. This soil is able to support standard equipment with minimal compaction. The soil is moisture insensitive, exhibiting only small changes in density with changing moisture content.

Medium: The potential for compaction is significant. The growth rate of seedlings may be reduced. After the initial compaction (i.e. the fist equipment pass), this soil is able to support standard equipment with only minimal increases in soil density. The soil is an intermediate between moisture insensitive and moisture sensitive (see below) soils.

High: The potential for compaction is significant. The growth rate of seedlings will be reduced following compaction. After initial compaction, this soil is still able to support standard equipment, but will continue to compact with each subsequent pass. The soil is moisture sensitive, exhibiting large changes in density with changing moisture content.

Displacement Potential

Displacement is the movement of the soil caused by scraping or gouging during equipment operation and yarding. This movement is not downward (as in compaction) but sideward or horizontal, resulting in the formation of ridges and furrows of soil. Displacement is most pronounced on sites that are tractor logged, or that are cable yarded without adequate suspension. Further displacement may occur during site preparation.

Displacement results in loss of productivity by:

1. Disturbing or removing the duff, which protects the soil and provides nutrients for seedling growth.
2. Removing the surface layer from some areas.
3. Increasing the potential for erosion.

The Displacement Potential rating refers to the susceptibility of a soil to displace. The ratings are based on dry and moist soil behavior.

Definitions of the ratings:
Low: The potential for displacement is insignificant under standard operations.

Medium: The potential for displacement is significant, but the damage that may occur can be limited or minimized by careful equipment selection and operation.

High: The potential for displacement is significant, and the damage that may occur <u>cannot</u> be effectively reduced by careful equipment selection and operation.

Erosion Potential

The Erosion Potential Rating refers to the susceptibility of a soil surface to erode from bare slopes as a result of water action. Bare soil areas include skid trails and yarding paths. The types of water erosion that occur are sheet, rill, and gully erosion.

The Erosion Potential Ratings are based on the interaction of:

1. Certain soil properties, including texture, structure, and porosity.
2. Rainfall and storm intensity.
3. Slope

Definitions of the ratings:
Low: The potential for surface erosion is insignificant. Erosion will be minimal.

Medium: The potential for surface erosion is significant. Extensive erosion can occasionally occur on skid trails and yarding paths, but it can be reduced or limited by careful logging and by avoiding unnecessary surface disturbance.

High: The potential for surface erosion is significant. Extensive erosion can frequently be expected to occur on all bare surfaces. Widespread erosion cannot be avoided unless logging practices that minimize surface disturbance are applied.