Chapter 3 - Environmental Consequences

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented in the chart above.

The cumulative effects discussed in this chapter include an analysis and a concise description of the identifiable present effects of past actions to the extent that they are relevant and useful in analyzing whether the reasonably foreseeable effects of the proposed action and its alternatives may have a continuing, additive and significant relationship to those effects. The cumulative effects of the proposed action and the alternatives in this analysis are primarily based on the aggregate effects of the past, present and reasonably foreseeable future actions. Individual effects of past actions have not been listed or analyzed and are not necessary to describe the cumulative effects of this proposal or alternatives (CEQ Memorandum, Guidance on the Consideration of Past Actions in Cumulative Effects Analysis, June 24, 2005). A listing of all past, present, and reasonably foreseeable future actions known of in the watershed are listed in Appendix B.

Soils

Detrimental Soil Conditions - Significant Issue

Current Conditions - Detrimental Soil Conditions

Soils of the Niner project area are susceptible to compaction and displacement from ground disturbing management activities. Most of the soils have clay and silt textural components. The clay and silt textures retain moisture well when wetted up from fall and winter rains. Summer (July 15th to September 15th) soil moistures are more conducive to minimizing soil compaction from ground-based yarding. The degree of soil compaction is mainly dependent on the amount of soil moisture present and the number of passes a machine makes over a site. Field observations indicate that most of the legacy impacts, both compaction and displacement, come from existing roads of the area and past ground-based logging operations. A majority of the project area has been previously harvested, by either railroad, tractor yarding, or cable yarding systems. Current detrimental soil conditions for the Niner project area (12, 872 acres) are estimated at 3.4 percent for existing roads and 13.2 percent for previously managed harvest units and Huckleberry OHV trail network. Compacted soils affect site productivity, tree growth, water infiltration, soil erosion, and peak flows.

A combination of air photo interpretation (GIS database and plotting capabilities were used to document past detrimental soil conditions) and field transecting was utilized to calculate the percent cumulative detrimental soil conditions for the proposed activity areas (harvest treatment units). The following Table 11 displays the estimation of the current conditions of detrimental soil conditions of proposed treatment units.

Table 11 - Current Detrimental Soil Conditions for Proposed Treatment Units

Proposed Units (Activity Areas)	Past Harvest Detrimental Soil Conditions (%)	1) Existing Roads (%)	2) Current Total Detrimental Soil Conditions (%)	3) Surface Erosion Potential (S E P)
11a	7.0	2.0	9.0	S-M
11b	2.9	0.1	3.0	S-M
11c	1.8	0.1	1.9	S-M
11d	1.8	0.0	1.8	S-M
12	1.4	0.8	2.2	S-M
12a	1.4	0.8	2.2	S-M
13	0.7	0.3	1.0	S-M
13a	0.7	0.3	1.0	S-M
14	0.6	0.2	0.8	M
15	17.3	0.0	17.3	M
15a	17.3	1.2	18.5	M
15c	17.3	0.0	17.3	M
16	13.8	1.5	15.3	M
18	14.1	0.0	14.1	S-M
19	14.1	0.2	14.3	M
29	66.6	0.0	66.6	M
30	28.3	0.0	28.3	M
31	47.2	0.4	47.6	M
32	38.5	0.0	38.5	M
33	41.2	0.4	41.6	M
34	41.9	0.0	41.9	M
35	47.6	0.0	47.6	M
36	29.6	0.8	30.4	M
37	37.8	0.0	37.8	M
38	36.9	0.0	36.9	M
39	39.9	0.0	39.9	M

Proposed Units (Activity Areas)	Past Harvest Detrimental Soil Conditions (%)	1) Existing Roads (%)	2) Current Total Detrimental Soil Conditions (%)	3) Surface Erosion Potential (S E P)
40	25.1	3.1	28.2	M
41	37.9	0.0	37.9	M
120	5.5	0.0	5.5	S
121	9.1	5.8	14.9	S
201	14.9	3.5	18.4	M
202	13.0	6.1	19.1	M
203	16.6	2.9	19.5	M
204	13.8	3.5	17.3	M
205	10.6	6.3	16.9	M
206	16.8	14.1	30.9	M
207	21.6	7.9	29.5	M
208	3.3	4.1	7.4	M
209	9.0	0.0	9.0	M
210	16.5	0.0	16.5	M
211	8.6	0.2	8.8	M
212	12.3	12.4	24.7	M
214	1.3	2.3	3.6	M
215	9.7	4.0	13.7	M
216	7.0	1.2	8.2	M
217	7.6	3.9	11.5	M
218	9.9	10.5	20.4	M
219	6.2	2.6	8.8	M
220	5.0	2.6	7.6	M
221	6.6	0.0	6.6	S
222	11.0	0.1	11.1	M
223	13.0	1.3	14.3	M

Notes:
1) Road calculations are only for those roads adjacent and within the activity area (thinning sale unit).

2) Total % detrimental soil condition.
3) Surface Erosion Potential (SEP): L=Low, M=Moderate, MH=Moderately High, S=Severe. Ratings are expressed for the predominant soil of the harvest unit.

Table 12 presents a summary of proposed treatment units grouped by detrimental soil conditions classes.

Table 12 – Summary of Detrimental Soil Conditions by Classes

Detrimental Soil Condition Classes (%)	0-10	11-15	16-20	20+	Total
Number of Activity Areas (Treatment Units)	18	8	9	4	39
Soil Restoration Activity Areas (Units 29-41)	0	0	0	13	13
Total Treatment Acres	898	349	1832	249	3328
% of Treatment Acres	27	11	55	7	100

The need to rehabilitate compacted soils is based on meeting the Forest Plan S&G (FW-081) for detrimental soils not to exceed 20% of the total acreage of the activity area, including landings and roads. This S&Gs contains the terminology of "should" to identify the type of direction and degree of compliance required (Forest Plan page IV-45). For S&G FW-081 action is required, unless a justifiable reason exists for not taking action. The direction is intended to require a practice unless it entails unacceptable hardship or expenses.

Approximately 62% of the proposed treatment acres are in the detrimental soil condition classes of 16-20 percent and 20+ percent. As a result of the past logging practices and extensive use of ground based yarding on the gentle terrain of the Huckleberry Flats, there remains a network of skid trail that have created strips of compacted soil on which tree growth has been reduced

Compacted soils also reduce soil infiltration rates, and this reduction leads to increases in peak flows within streams draining the affected area. Compaction may increase the rate of surface erosion given that the soil remains exposed and a pathway exists for eroding soil to move across the landscape. Within the project area, there are no identified pathways within the forested areas, whereas there are pathways for transport of soils along roadways to adjacent streams. Field observations during the winter 2005/2006, documented water movement along some road ditch lines which transported minor amounts of sediment into the stream channels. The road and stream crossings are the primary area where soil can be transported to streams. The stream network within the project area generally exhibits high levels of stability, with streambeds and their banks composed of fine material held together by streambank vegetation. Given the low percentage of area with exposed mineral soils, the present current soil conditions are not likely to have measurable adverse affects on aquatic organisms.

For the cumulative effects analysis, the entire area proposed for harvest treatments was the analysis area (i.e., activity area). The existing transportation system both adjacent and within a harvest unit and past harvest system impacts are considered a part of the cumulative detrimental soil condition calculations. For the Niner project treatment area, the past timber management and road conditions makes up approximately 15.4 percent of the project area with detrimental soil conditions.

Direct and Indirect Effects

Effects of Alternative A - Detrimental Soil Conditions

About 1,652 acres of commercial thinning is proposed for ground-based logging systems (on slopes not to exceed 30 percent), 1,233 acres are proposed for skyline cable systems, and 443 acres for helicopter yarding. The ground-based yarding would use existing skid trails and landings, a few new landings, and minimize the creation of new skid trails (only adding minor amounts of detrimental soil conditions). The ground-based yarding systems would likely include a harvester to cut and directionally place the trees (minimal repeated ground trafficking to avoid increases to detrimental soil conditions) and a tractor to yard the trees on designated skid trails to designated landings. Each ground-based yarded unit has varying degrees of addition detrimental soil conditions as based on a proposed harvest plan considering the location of existing skid trails and need for additional skid trails (B. Menke, Logging System Specialist, 2006). Skyline cable yarding is anticipated to be a minor increase in detrimental soil conditions (change of +1.8 percent (Allen, 1997)) and a few new landings distributed about the proposed harvest area. Helicopter yarding is anticipated to be a minor additional impact (change of +1.0 percent) with most of the impact associated with the landings. Fuels treatments would not change the detrimental soil conditions as the methods proposed are not likely to detrimentally compact or displace soils. Grapple slash piling is proposed within 40 feet of all roads and temporary spurs on about 496 acres where there would stay on the road surface to complete the slash piling. Other fuels treatments would include 104 acres of under-burning while soil duff moisture is above 30 percent eliminating the potential for severely burned soil conditions. Yarding tops and branches and machine piling the landings on all the 3328 acres would not add additional amounts to the soil detrimental conditions.

The following table displays each harvest treatment unit (activity area) in Alternative A. Listed in the table is the percent of detrimental soil conditions from past harvest, proposed temporary roads and existing roads (within or adjacent harvest units), the effects of the proposed harvest treatments, effects of the fuels treatments, and total detrimental soil conditions after thinning treatments. The proposed mitigation would be soil tillage or sub-soiling as a means to reduce compaction resulting from the use of mechanized equipment which increases soil bulk density (soil compaction) and to alleviate some past legacy soil compaction from past timber harvest activities. The sub-soiling is planned for new and old landing areas along with some associated primary skid roads adjacent to the landings, temporary roads, and some existing system roads which would be closed and narrowed to a width of 5 feet.

Table 13 - Alternative A: Cumulative Effects of Detrimental Soil Conditions by Treatment Units.

Unit#	Past Harvest (%)	1) Existing Roads & Proposed Temporary. Roads (%)	2) Proposed Timber Harvest with New Landings (%)	3) Proposed Fuels Treatment (%)	4) Total Detrimental Soil Conditions after Harvest (%)	5) Proposed Soil Tillage Mitigation (%)	6) Total Detrimental Soil Conditions after Mitigation (%)
11a	7.0	2.0	1.0	0.0	10.0	0.0	10.0
11b	2.9	0.1	2.5	0.0	6.5	1.5	4.0
11c	1.8	0.1	1.0	0.0	2.9	0.0	2.9
11d	1.8	0.0	1.0	0.0	2.8	0.0	2.8
12	1.4	0.8	1.0	0.0	3.2	0.0	3.2
12a	1.4	0.8	1.0	0.0	3.2	0.0	3.2
13	0.7	0.3	1.0	0.0	2.0	0.0	2.0
13a	0.7	0.3	1.0	0.0	2.0	0.0	2.0
14	0.6	0.2	1.0	0.0	1.8	0.0	1.8
15	17.3	0.8	5.2	0.0	23.3	4.2	19.1
15a	17.3	0.0	6.2	0.0	24.7	4.7	20.0
15c	17.3	0.0	1.0	0.0	18.3	0.0	18.3
16	13.8	2.1	1.8	0.0	17.1	5.2	12.5
18	14.1	1.9	3.7	0.0	19.7	5.4	14.3
19	14.1	0.2	1.8	0.0	16.1	4.0	12.1
120	5.5	0.0	1.0	0.0	6.5	0.0	6.5
121	9.1	5.8	1.0	0.0	15.9	0.0	15.9
201	14.9	3.5	3.3	0.0	21.7	7.7	14.0
202	13.0	6.1	1.1	0.0	20.2	7.0	13.2
203	16.6	2.9	1.8	0.0	21.3	3.8	17.5
204	13.8	3.5	3.3	0.0	20.6	6.7	13.9
205	10.6	6.3	2.8	0.0	19.7	8.6	11.1
206	16.8	14.1	1.8	0.0	32.7	8.6	24.1

Unit#	Past Harvest (%)	1) Existing Roads & Proposed Temporary. Roads (%)	2) Proposed Timber Harvest with New Landings (%)	3) Proposed Fuels Treatment (%)	4) Total Detrimental Soil Conditions after Harvest (%)	5) Proposed Soil Tillage Mitigation (%)	6) Total Detrimental Soil Conditions after Mitigation (%)
207	21.6	7.9	2.3	0.0	31.8	3.7	28.1
208	3.3	6.6	6.6	0.0	19.8	17.6	2.8
209	9.0	0.0	3.6	0.0	12.6	11.6	1.0
210	16.5	0.0	1.0	0.0	17.5	14.2	3.3
211	8.6	1.2	4.2	0.0	14.0	3.0	11.0
212	12.3	12.4	2.7	0.0	27.4	16.8	10.6
214	1.3	4.0	1.4	0.0	6.7	4.8	1.9
215	9.7	4.3	2.2	0.0	16.2	4.8	11.4
216	7.0	1.2	7.9	0.0	16.1	4.6	11.5
217	7.6	3.9	2.5	0.0	13.8	3.8	10.0
218	9.9	10.5	2.7	0.0	23.1	7.6	15.5
219	6.2	2.6	4.3	0.0	13.1	7.2	5.9
220	5.0	2.6	2.3	0.0	9.9	2.6	7.3
221	6.6	0.0	1.0	0.0	6.6	3.5	3.1
222	11.0	0.1	9.0	0.0	20.1	3.1	17.0
223	13.0	1.3	11.1	0.0	25.4	10.6	14.8

Notes:
1) Road calculations are only for those roads adjacent and within the activity area (thinning sale unit).
2) Harvest systems: Skyline=1.8%, helicopter=1%, tractor (using existing skid trails and additional skid trails are calculated for each harvest unit, B. Menke, Logging System Specialist).
3) Fuels treatment: broadcast burning = 0% (low fire intensity broadcast burn (hand fire-line construction is not considered a detrimental soil condition as the width is less than 5 feet) is likely to create little to no detrimental soil conditions (severe burn). It is possible that a small amount of severe burn conditions will occur and are likely to be found where large pieces of downed wood, stumps, or large concentrations of timber harvest slash burn; grapple piling =0% as equipment will not leave existing roads or landings so soil compaction will not be increased beyond existing detrimental soil conditions.
4) Total % detrimental soil condition following completion of thinning harvest before tillage mitigation.
5) Proposed soil mitigation or restoration (soil tillage with winged-tip subsoiler).
6) Total % detrimental soil conditions following mitigation (soil tillage with winged-tip subsoiler).

Table 14 presents a summary of proposed treatment units of Alternative A grouped by detrimental soil conditions classes.

Table 14 – Summary of Alternative A Units by Detrimental Soil Condition Classes

Detrimental Soil Condition Classes (%)	0-10	11-15	16-20	20+	Total
Number of Units (Activity Areas) After the Thinning Harvest	13	5	9	12	39
Acres	474	287	762	1805	3328
% of Acres	**14**	**9**	**23**	**54**	**100**
Number of Units (Activity Areas) After Soil Restoration Mitigation	19	13	5	2	39
Acres	964	2186	104	74	3328
% of Acres	**29**	**66**	**3**	**2**	**100**

In comparison to Alternative C – No Action (see Table 12), Alternative A can be summarized (Table 14) by the greater number of treatment units moving toward the detrimental soil condition classes of 16-20 percent and 20+ percent following the proposed thinning treatments. About 46 percent of the treatment acreage would have less than 20 percent detrimental soil conditions and about 54 percent would have greater than 20 percent. With the mitigating treatments such as soil tillage of landings, temporary roads, and closed roads, there would be a shift of treatment acreage toward the 0-10 percent and 11-15 percent detrimental soil condition classes. About 97 percent of the harvest units acres would be less than 20 percent detrimental soil conditions and about 3 percent would have greater than 20 percent. Two harvest units would remain above the 20 percent threshold (Regional Guideline and Forest Plan Standard and Guideline (FW-081) for detrimental soil conditions, with values of 24.1 percent, and 28.1 percent. Overall, Alternative A reduces the degree of detrimental soil conditions and moves the area toward the desired future conditions of a net improvement of soil quality.

Effects of Alternative B - Detrimental Soil Conditions

About 60 acres of planned commercial thinning is proposed for ground-based logging systems (on slopes not to exceed 30 percent), 2,734 acres are proposed for skyline cable systems (one-end or full log suspension), and 534 acres for helicopter yarding. The ground-based yarding would occur on 13 small patch cuts (about 606 acres) that would undergo restoration of compacted soils by tillage treatment. The ground-based yarding systems would likely include a harvester to cut and directionally place the trees (minimal repeated ground trafficking to avoid increases to detrimental soil conditions) and a tractor to yard the trees on designated skid trails to designated landings. Skyline cable yarding (one-end or full suspension) is anticipated to be a minor increase in detrimental soil conditions (change of +1.8 percent of an activity area (Allen, 1997) and a few new landings (variable percent change by harvest unit) distributed about the proposed harvest treatment area. Helicopter yarding is anticipated to be a minor additional impact (change of +1.0 percent of an activity area) with most of the impact associated with the landings. Fuels treatments would not change the detrimental soil conditions as the methods proposed are not likely to detrimentally compact or displace soils. Grapple slash piling is proposed within 40 feet of all roads and temporary spurs on about 496 acres where there would stay on the road surface to complete the slash piling. Other fuels treatments would include 524 acres of hand piling and burning and about 104 acres of under-burning while soil duff moisture is above 30 percent eliminating the potential for severely burned soil

conditions. Yarding tops and branches and machine piling the landings on all the 3328 acres would not add additional amounts to the soil detrimental conditions.

The following table displays each harvest treatment unit (activity area) in Alternative B. See the descriptions for mitigation measures common to both alternatives (Chapter 2).

Table 15 - Alternative B: Cumulative Effects of Detrimental Soil Conditions by Treatment Units.

Unit#	Past Harvest (%)	1) Existing Roads & Proposed Temporary Roads (%)	2) Proposed Timber Harvest with New Landings (%)	3) Proposed Fuels Treatment (%)	4) Total Detrimental Soil Conditions after Harvest (%)	6) Proposed Soil Tillage Mitigation (%)	7) Total Detrimental Soil Conditions after Mitigation (%)
11a	7.0	2.0	1.0	0.0	10.0	0.0	10.0
11b	2.9	0.1	2.5	0.0	6.5	1.5	4.0
11c	1.8	0.1	1.0	0.0	2.9	0.0	2.9
11d	1.8	0.0	1.0	0.0	2.8	0.0	2.8
12	1.4	0.8	1.0	0.0	3.2	0.0	3.2
12a	1.4	0.8	1.0	0.0	3.2	0.0	3.2
13	0.7	0.3	1.0	0.0	2.0	0.0	2.0
13a	0.7	0.3	1.0	0.0	2.0	0.0	2.0
14	0.6	0.2	1.0	0.0	1.8	0.0	1.8
15	17.3	0.8	5.2	0.0	23.3	4.2	19.1
15a	17.3	1.2	6.2	0.0	24.7	4.7	20.0
15c	17.3	0.0	1.0	0.0	18.3	0.0	18.3
16	13.8	2.1	1.8	0.0	17.1	5.2	12.5
18	14.1	1.9	3.7	0.0	19.7	5.4	14.3
19	14.1	0.2	1.8	0.0	16.1	4.0	12.1
29	66.6	0.0	0.0	0.0	66.6	53.3	13.3
30	28.3	0.0	0.0	0.0	28.3	22.6	5.7
31	47.2	0.4	0.0	0.0	47.6	37.8	9.8
32	38.5	0.0	0.0	0.0	38.5	30.8	7.7
33	41.2	0.4	0.0	0.0	41.6	33.0	8.6

Unit#	Past Harvest (%)	1) Existing Roads & Proposed Temporary Roads (%)	2) Proposed Timber Harvest with New Landings (%)	3) Proposed Fuels Treatment (%)	4) Total Detrimental Soil Conditions after Harvest (%)	6) Proposed Soil Tillage Mitigation (%)	7) Total Detrimental Soil Conditions after Mitigation (%)
34	41.9	0.0	0.0	0.0	41.9	33.5	8.4
35	47.6	0.0	0.0	0.0	47.6	38.1	9.5
36	29.6	0.8	0.0	0.0	30.4	23.7	6.7
37	37.8	0.0	0.0	0.0	37.8	30.2	7.6
38	36.9	0.0	0.0	0.0	36.9	29.5	7.4
39	39.9	0.0	0.0	0.0	39.9	31.9	8.0
40	25.1	3.1	0.0	0.0	28.2	20.1	8.1
41	37.9	0.0	0.0	0.0	37.9	30.3	7.6
42	47.8	0.5	0.0	0.0	48.3	38.2	10.1
43	35.0	0.0	1.8	0.0	36.8	28.0	8.8
120	5.5	0.0	1.0	0.0	6.5	0.0	6.5
121	9.1	5.8	1.0	0.0	15.9	0.0	15.9
201	14.9	3.5	1.9	0.0	20.2	3.9	16.3
202	13.0	6.1	1.9	0.0	21.0	3.6	17.4
203	16.6	2.9	1.8	0.0	21.3	2.1	19.2
204	13.8	3.5	3.0	0.0	20.3	5.1	15.2
205	10.6	6.3	2.8	0.0	19.7	5.2	14.2
206	16.8	14.1	1.8	0.0	32.7	8.6	24.1
207	21.6	7.9	2.3	0.0	31.8	3.7	28.1
208	3.3	6.6	8.1	0.0	18.0	16.3	1.7
209	9.0	2.5	1.0	0.0	12.5	2.5	10.0
210	16.5	0.0	1.8	0.0	18.3	7.6	10.7
211	8.6	1.2	1.8	0.0	11.6	3.0	8.6
212	12.3	12.4	2.7	0.0	27.4	8.7	18.7
214	1.3	4.0	1.0	0.0	6.3	0.0	6.3
215	9.7	4.3	2.2	0.0	16.2	4.8	11.4

Unit#	Past Harvest (%)	1) Existing Roads & Proposed Temporary Roads (%)	2) Proposed Timber Harvest with New Landings (%)	3) Proposed Fuels Treatment (%)	4) Total Detrimental Soil Conditions after Harvest (%)	6) Proposed Soil Tillage Mitigation (%)	7) Total Detrimental Soil Conditions after Mitigation (%)
216	7.0	1.2	3.0	0.0	11.2	1.6	9.6
217	7.6	3.9	2.5	0.0	13.8	3.8	10.0
218	9.9	10.5	2.7	0.0	23.1	5.7	17.4
219	6.2	2.6	4.3	0.0	13.1	7.2	5.9
220	5.0	2.6	2.3	0.0	9.9	2.6	7.3
221	6.6	0.0	1.0	0.0	6.6	3.5	3.1
222	11.0	0.1	1.8	0.0	12.9	1.5	11.4
223	13.0	1.3	4.8	0.0	19.1	5.3	13.8

Notes:
1) Road calculations are only for those roads adjacent and within the activity area (thinning sale unit).
2) Harvest systems: Skyline=1.8%, helicopter=1%, tractor (using existing skid trails and additional skid trails are calculated for each harvest unit, B. Menke, Logging System Specialist).
3) Fuels treatment: broadcast burning =0% (low fire intensity broadcast burn (hand fire-line construction is not considered a detrimental soil condition as the width is less than 5 feet) is likely to create little to no detrimental soil conditions (severe burn). It is possible that a small amount of severe burn conditions will occur and are likely to be found where large pieces of downed wood, stumps, or large concentrations of timber harvest slash burn; grapple piling =0% as equipment will not leave existing roads or landings so soil compaction will not be increased beyond existing detrimental soil conditions.
4) Total % detrimental soil condition following completion of thinning harvest before tillage mitigation.
5) Proposed soil mitigation or restoration (soil tillage with winged-tip subsoiler).
6) Total % detrimental soil conditions following mitigation (soil tillage with winged-tip subsoiler).

Table 16 – Summary of Alternative B Units by Detrimental Soil Condition Classes

Detrimental Soil Condition Classes (%)	0-10	11-15	16-20	20+	Total
Number of Units (Activity Areas) After Proposed Thinning Harvest	13	7	9	10	39
Number of Soil Restoration Units (#29-41)				13	135
Acres	408	377	704	1839	3328
% of Acres	**12**	**11**	**22**	**56**	**100**
Number of Units (Activity Areas) After Soil Restoration Mitigation	20	9	8	2	39
Number of Soil Restoration Units (#29-43) Following Treatment	12	1			13
Acres	959	1062	1204	104	3328
% of Acres	**29**	**32**	**36**	**3**	**100**

Alternative B can be summarized (Table 16) by the greater number of harvest treatment units moving toward the detrimental soil condition classes of 16-20 percent and 20+ percent following the proposed thinning treatments. About 45 percent of the treatment acreage would have less than 20 percent detrimental soil conditions and about 56 percent would have greater than 20 percent. With the mitigating treatments of soil tillage of landings, temporary roads, and closed roads, there would be a shift of harvest units toward the 0-10 percent and 11-15 percent, and 16-20 percent detrimental soil condition classes. About 97 percent of the treatment acreage would be less than 20 percent detrimental soil conditions and about 3 percent would have greater than 20 percent. Two harvest units would remain above the 20 percent threshold for detrimental soil conditions, with values of 24.1 percent, and 28.1 percent, which are the same ones as alternative A. Overall, Alternative B reduces the degree of detrimental soil conditions and moves the area toward the desired future conditions of a net improvement of soil quality.

Effects of Alternative C (No Action) - Detrimental Soil Conditions

Within the no action alternative, soils within the project area would have no additional ground-based activities or ground disturbing impacts that would cause a change in the current condition of detrimental soil conditions. Current soil structure would likely continue to recover in the upper most 2-4 inches, while the lower layers of soil would likely remain compacted for many more decades. Soil recovery mechanisms in the Westside Cascades are often slow as there is not a deep freeze thaw cycle but a reliance on vegetation root penetration and mixing by soil biology (both slow processes). Some of the existing compacted soils have remained for up to 50-60 years. Portions of these deeply compacted detrimental soil conditions are likely to persist for the long-term.

Detrimental soil conditions would essentially stay the same as described under the current conditions. Refer to Table 12 for a summary of treatment acreages by the detrimental soil conditions classes that would represent Alternative C.

Under Alternative C (No Action), the existing detrimental soil conditions has about 93 percent of the activity areas in less than 20 percent detrimental soil condition classes. A majority of this area (55 percent) is within the 16-20 percent detrimental soil condition class. The rest of the area has about 7 percent in the class with greater than 20 percent detrimental soil conditions. No soil restoration would occur within the project area to alleviate any compacted soil conditions. The legacy soil compaction would remain as there would be no net improvement in soil quality.

Cumulative Effects - Detrimental Soil Conditions

The analysis of detrimental soil condition cumulative effects considered the total area proposed for treatment in each alternative. The effects of the current project and the effect of past, present, reasonably foreseeable future projects were considered in the analysis and portray the extent and duration of detrimental soil conditions cumulative effects. For past projects, the detrimental soil analysis includes effects from railroad logging, 1955 tractor logging, 1967 and later tractor and cable logging, and current roads and landings within the project activity areas. Present and foreseeable project effects include the OHV trails and proposed new OHV trail construction.

Table 17 - Logging History Summary of Ground Effects – Niner Project Area

Date:	Mid 1930s	1959 to Mid 1960s	Mid 1980s to Mid 1990s (minor areas late 1970s)
Elapsed Time:	70-75 yrs ago	40 yrs ago	15-20 yrs ago
Stand Age: (at treatment)	250-400 years old	30 years old	50-60 years old
Stand Treatment:	Clear-cut with seed trees left.	Seed trees removed. Some clear cut patches.	Thinning at 18 ft. spacing, with 2 trees/acre girdled for wildlife. About five sales.
Yarding Method:	Railroad logged. Donkey engines & ground/high lead cable.	Tractor.	Skyline. "Fall to lead" with tractor designated trails.
Remaining Visible Ground Effects:	Railway grade; cut slopes & fills. Some yarding corridors.	Landings. Skid roads and trails.	Landings. Skyline yarding corridors. Designated tractor trails.
Less-visible Ground Effects:	Railway landings & maintenance areas. Logging landings & sidings.	---	---

For Alternative A, it is estimated that approximately 11.3 percent of the total project treatment area would have detrimental soil conditions from the cumulative effects of management activities.

For Alternative B, it is estimated that approximately 11.5 percent of the total project treatment area would have detrimental soil conditions from the cumulative effects of management activities.

For Alternative C, it is estimated that approximately 15.4 percent of the total project treatment area would have detrimental soil conditions from the cumulative effects of management activities.

Conclusions - Detrimental Soil Conditions

Table 18 - Summary of Detrimental Soil Conditions by Alternatives Following Thinning Harvest and Soil Restoration.

Detrimental Soil Condition Classes	0-10	11-15	16-20	20+	Total
Alternative A (% of acres)	29	66	3	2	100
Alternative B (% of acres)	29	32	37	2	100
Alternative C (No Action) (% of acres)	27	11	55	7	100

Notes:
1. Acreage used is the same activity area for all the alternatives.
2. Action alternatives are based on conditions following thinning harvest and soil restoration.

Both of the proposed action alternatives A and B show a net improvement in soil quality following the proposed thinning and soil restoration mitigation and meet the intent of the Forest Plan FW-081 for detrimental soil conditions. For Alternative A, there is a greater percentage of activity area restored to the 11-15 percent detrimental soil condition class. Restoration in Alternative A would result in a lower overall soil condition class than Alternative B and C. Alternative A would provide for a greater soil productivity improvement and move the area toward the desired future conditions. The same 2 harvest treatment areas in both action Alternatives (A and B) remain greater than 20 percent detrimental soil conditions standard, but are reduced from the current conditions. These current conditions were a result of past activities and not the proposed harvest.

Soil Productivity

Current Conditions – Soil Productivity

An important ingredient in soil productivity, other than minimizing detrimental soil conditions as discussed above, is the presence and retention of coarse woody material (greater than 3” diameter) and the fine organic matter (plant litter, duff, and woody material less than 3” diameter).

Soil organisms and their interactions profoundly affect forest-site productivity through capture and uptake of nutrients, nitrogen fixation, protection against pathogens, maintenance of soil structure, and buffering against moisture stress. To minimize long-term impacts on beneficial soil organisms, forest managers would design a project to: 1) minimize disturbance severity (i.e., intense burns, soil compaction and erosion), 2) emphasize retention of organic matter, and 3) emphasize rapid re-vegetation by indigenous host species and associated beneficial soil organisms (Perry, 1989).

These stands were harvested 60-80 years ago when log utilization standards were less intense than in more recent decades. Coarse woody material is quite variable throughout the project area with extensive concentrations present in some areas and in other areas devoid of large down wood. Field surveys indicate that fine organic matter exists throughout the Niner project area.

Direct and Indirect Effects – Alternatives A, B, and C

Past experience with thinning treatments and the prescribed fuels treatments would retain some portions of the original fine and coarse organic materials. The detrimental soil conditions following harvest by activity area (harvest unit) is a way to evaluate the amount of area remaining with less than the original coarse and fine organic materials (direct and indirect effects). The timber harvesting method will play into the displacement of the coarse and fine organics from the activity area. Fuels treatment and the associated effects will be the measure of the removal of the coarse and fine organic materials. The proposed under burning would result in a low intensity burn and the machine piling and burn would create small areas of high intensity burns under slash piles. It is likely that under the burned slash piles, the deeply burned soil would change to a reddish color and there would be a greater affect on soil physical, biological, and chemical properties (Boyer, 1980). As soil organic matter, humified material, and decaying wood (more downed wood exists now than the previous several centuries when fire was periodically introduced which eliminated or significantly reduced the woody material) are centers of microbial activity which can diminish following an intense fire. It is expected only a minor reduction in soil productivity due to the small amount of reduced above ground organic component. The degree of soil productivity loss is not readily quantifiable but rather as suggested in research (Perry, et al. 1989), forest managers take steps to manage the remaining organic layers and the potential for input from remaining trees and re-growth of vegetation to the site. At varying degrees, all the alternatives manage some degree of organic matter and potential input of organic materials (wood, needles, leaves, decaying grasses, etc.) to maintain soil productivity. For Alternatives A and B, the amount of detrimental soil conditions is an estimate of the area with displaced coarse and fine organic materials. Refer to the soil detrimental discussion for each alternative. In summary, for both Alternatives A and B, two harvest units exceed the 20 % threshold of detrimental soil conditions following soil restoration (pulling coarse wood into restored areas will be part of the proposed soil restoration work) after harvest activities. Alternative C - No Action has a high potential for long term (indirect) input of coarse and fine organic material for site productivity from the mortality of suppressed trees due to overstocking. The soil organics and down wood would not be disturbed by Alternative C and would continue the soil building process. The action Alternatives A and B use a portion of helicopter and cable yarding as a mitigation to minimize the disturbance of surface soils and remaining organic materials, and returns portions of harvested trees to the forest floor (branches and needles). The Forest Plan S&Gs for coarse woody material following timber harvest and fuels treatment would be maintained over the long-term. Long-term site management would manage the coarse and fine organic material (leaves, twigs, needles, etc.) as a future soil productivity reserve as well as the natural creation of snags which would put enough woody material on the ground to meet the Forest Plan S&Gs. The combination of minimizing detrimental soil conditions and retaining coarse woody material, the fine organic materials, and minimizing detrimental soil conditions (less then 20%), soil productivity would be maintained.

Cumulative Effects

The analysis area for cumulative effects to soil productivity is the same area considered in the detrimental soil conditions analysis (entire harvest activity area). The effects of the current project and the effect of past, present, reasonably foreseeable future projects were considered as described in Table 17.

From a coarse woody material standpoint, none of the alternatives would have any cumulative effects. Alternatives A and B will meet and maintain the Forest Plan S&Gs for coarse wood which will maintain soil productivity. Alternative C will have no coarse woody material cumulative effects as it maintains all the existing coarse woody material and has the greatest chance of maintaining a higher level than action alternatives.

Fine organic material will have a short term effect as indicated by the detrimental soil conditions which are translated as the displacement of organic materials. Alternative A and B would have those short term effects over 11.3% and 11.5% of the harvest activity areas. As the canopy cover recovers from the thinning harvest, the fine organics will be replaced on the areas affected by the proposed thinning harvest. Over time with the fine organics being replaced the soil productivity effects will be reduced as well as the cumulative effects on site productivity as the site continues to recover. Alternative C would have any no cumulative effects to soil productivity, as the fine organic material would be maintained.

Wildlife

Deer and Elk (Big Game) Habitat

Current Conditions – Big Game Habitat

The management objectives for deer and elk habitat are applied to specific mapped "Emphasis Areas" within the Forest. The Niner project area encompasses all, or a portion of two Big Game Emphasis Areas (BGEA), named First and Huckleberry. First BGEA is designated as a low level emphasis area, 100 percent of which is located within the southern half of the project area. Huckleberry BGEA is designated as a moderate level emphasis area, and the northern half of the project area includes 75 percent of this BGEA. Forest Plan Standards and Guidelines (S&G) (FW-137) directs the use of a model to evaluate the effects of projects on habitat within BGEAs.

Table 19 displays the current condition baseline (which also represents Alternative C - No Action) resulting from model output (Wisdom et al. 1986) for each affected BGEA. Habitat Effectiveness Indices (HEI) for Huckleberry BGEA indicates that current conditions for forage quality (HEf) and open road density (HEr) are below Forest Plan S&Gs. Current conditions for habitat patch size and spacing (HEs) and cover quality (HEc) are above Forest Plan S&Gs. Because of the low HEf and HEr values the overall HEI value also falls below current S&Gs for a moderate level BGEA. The analysis of the First BGEA indicates current habitat quality for all individual indices, and overall HEI, exceeds S&Gs for a low level BGEA.

The table also displays HEI conditions over the past decade, and reveals the downward trend in forage habitat and subsequent decline in overall big game habitat quality in these areas. This trend has been validated elsewhere in the Middle Fork Ranger District during

other recent project planning, and across the Willamette National Forest. Some District watershed analysis (USDA 1995) and other documents (ODFW 2003, Cook 2002) have included discussion that identified a projected downward trend in local HEI due to the loss of forage habitat as it is converted to cover habitat based on effects from shifts in management practices under the Northwest Forest Plan (USDA, USDI 1994). Values from 1995 are based on model output presented in the North Fork of the Middle Fork Willamette River (NFMFWRW) watershed analysis. Values from 1999 and 2001 are from model output during early stages of project planning in this area. The large

Table 19 - HEI comparison of 10 year change and Alternatives effects on big game habitat in Huckleberry and First BGEAs.

HEI Modeling Output	Huckleberry: Moderate Emphasis Level BGEA				
	Individual Habitat Effectiveness Values				Overall Index
	HEs	HEr	HEc	HEf	HEI
NFMFWR WA 1995	0.67	0.36	0.44	0.49	0.47
2001	0.74	0.12	0.61	0.16	0.31
Current (2006) (Alternative C - No Action)	0.76	0.15	0.53	0.18	0.32
Alternative A & B	0.80	0.23	0.54	0.25	0.39
HEI Modeling Output	**First: Low Emphasis Level BGEA**				
	Individual Habitat Effectiveness Values				**Overall Index**
	HEs	**HEr**	**HEc**	**HEf**	**HEI**
NFMFWR WA 1995	0.64	0.51	0.52	0.54	0.55
1999	0.86	0.38	0.53	0.38	0.51
Current (2006) (Alternative C – No Action)	0.76	0.31	0.58	0.29	0.44
Alternative A & B	0.77	0.32	0.59	0.28	0.45

Willamette NF Land Management Plan S&G Target Level:
Moderate Level BGEA Individual Index: >0.4 Overall Index: >0.5
Low Level BGEA Individual Index: >0.2 Overall Index: increase if any variable < 0.2
Index Definitions: HEs = size and spacing, HEr = open road density, HEc = cover quality, HEf = forage quality, HEI = overall habitat quality

decrease in HEr between 1995 and 1999/2001 is a result of two factors. First, HEr values from 1995 watershed analysis were found to be overrepresented based on a modeling error. Second, the Huckleberry OHV trail system has been developed in the area. OHV activity has the potential to substantially affect elk behavior (Wisdom et al. 2005), and trail mileage is therefore incorporated into calculating open road density to generate HEr values.

Current ODFW biological data are not sufficient to provide an accurate estimate of the black-tailed deer population in western Oregon (ODFW 2002). Despite a perceived decline, ODFW has identified areas such as those in the vicinity of the project area as being more productive and achieving higher population densities than elsewhere in northwestern Oregon.

Because of a declining forage base, ODFW (2005) has proposed a 4 percent reduction in the target population management objective for elk in the McKenzie Wildlife Management Unit (WMU) surrounding the Niner Project area. Nevertheless, recent ODFW population estimates indicate elk are at 96 percent of their current management objectives for the McKenzie WMU (Bill Castillo pers com; ODFW 2003; ODFW 2005).

No specific data are available for the local deer/elk population within Huckleberry or First BGEAs. Sightings of individuals, and particularly their sign, are common throughout the area.

The Forest Plan includes deer and elk as Management Indicator Species (MIS) because of their economic and aesthetic value to local communities, hunters, and recreationists.

Direct and Indirect Effects

Effects of Alternatives A, B and C - Big Game Habitat

The commercial thinning and associated activity proposed in both Alternative A and B would affect approximately 29 percent of Huckleberry BGEA and 12 percent of First BGEA and would results in changes to individual habitat effectiveness values and overall index (Table 19).

Model output is insensitive to small differences between alternatives in how they affect the overall amount of forage habitat in the BGEAs. The model is also considered insensitive to the potential quantity and quality of native forage habitat restored under either Alternative A or B relative to the proposed commercial thinning. HEI modeling input for forage values in thinned stands were adjusted to reflect a more accurate post-treatment condition of forage quantity and quality (see Wildlife Report in Analysis File). The data reveal a 39 percent increase in HEf and a 53 percent increase in HEr compared to current values for Huckleberry BGEA. This result influences a 22 percent improvement in HEI for Huckleberry BGEA. Despite an attempted correction, Model output still underrates the effect of thinning as evidenced by the suggested decline in HEf for First BGEA and therefore results in little to no effect on modeling overall index for habitat effectiveness. Table 20 displays another way to consider the overall effect to forage habitat from proposed activities.

In similar habitat, thinning has been shown to immediately stimulate the development of understory vegetation – much of which is recognized for its contribution to foraging habitat for deer and elk (Hagar et al. 2004, Suzuki and Hayes 2003). Understory

vegetation data associated with a study of thinning effects on habitat similar to Niner Project showed an average 467 percent increase in grass, forbs, and shrubs coverage between thinned and unthinned stands (Artman 2003). Similar increases in understory vegetation can be expected to occur within thinned stands throughout much of the project area.

The forage habitat under both Alternative A and B would further be enhanced by implementing proposed road closures. Open road density would be reduced under both action alternatives. Approximately 19.5 miles of road closure is proposed under either alternative. However some of this road mileage may still be subject to motorized use as OHV trail, resulting in a net closure of approximately 9 miles. All or portions of roads scheduled for closure would be treated for soil compaction, seeded, and fertilized.

Table 20 - Comparison of Alternatives and effects on big game forage habitat.

BGEA Name	Alternatives	Change in BGEA Forage Habitat		
		Cover Converted to Forage	% Increase in BGEA Forage Acres	Quality Forage Created/Enhanced
Huckleberry	A	2613 ac.	21%	163 ac
	B	2613 ac.	21%	233 ac.
	C	0	0	0
First	A	715 ac.	10%	60 ac.
	B	715 ac.	10%	60 ac.
	C	0	0	0
Totals	A	3328	31	223
	B	3328	31	283
	C	0	0	0

Any increase in the amount and extent of forage habitat would benefit deer and elk within either BGEA. The potential to increase forage habitat is considered slightly higher under Alternative B than Alternative A. The additional benefits associated with Alternative B are a result of the small restoration units (2-6 acres) proposed for approximately 60 acres where excessive soil compaction has been identified within Huckleberry BGEA. After treatment these area would be seeded with an approved forage mix and restocked with trees. High quality forage habitat would exist in these areas until conifer seedlings out compete other forage vegetation.

Acres commercially thinned are considered converted from cover to forage habitat for this analysis. Quality forage habitats created/enhanced are acres treated with soil tillage, seeding, and fertilizing.

Because the treatment acres are same for both Alternative A and B, the overall effect is essentially the same under the two action alternatives, except as indicated under “quality”

forage created/enhanced. Alternative A creates 223 acres of quality forage and Alternative B would create 283 acres of quality forage habitat. Alternative C would not create any new forage habitat.

The direct and indirect effects from proposed activities are considered in the context of disturbance and habitat modification. Individuals that are within close proximity to proposed activities are likely to leave the area while the disturbance is underway. Disturbance may include falling, yarding, hauling, fuels treatment, and other prescribed activities. However those activities are expected to occur at a spatial and temporal extent such that they should not result in negative direct or indirect effects to individual deer or elk or the local population.

Cumulative Effects - Big Game Habitat

The cumulative effect analysis area is also defined by the big game emphasis areas. Past, present, and foreseeable actions were considered in the analysis and model during the mapping of habitat conditions. In a general context, cumulative effects of the Niner Project on deer/elk would be positive in the short-term (<10 years) yet inconsequential in the long-term and relative to cumulative effects from past actions that have created the current habitat condition throughout Huckleberry and First BGEAs. There are no foreseeable actions that would modify habitat in these BGEAs – with one exception. The Huckleberry OHV Trail Expansion Project is proposing to approximately double the miles of existing OHV trails within the Huckleberry BGEA portion of the Niner project area. The cumulative effect of the proposed trail expansion would negate the influence Niner Project would have on the upward trend in HEr and overall HEI for this BGEA. The Huckleberry OHV Trail Expansion Project is also proposing non-significant Forest Plan amendment that would change the Huckleberry BGEA for moderate to low emphasis level.

Conclusion - Big Game Habitat

Proposed activities would elevate all aspects of habitat quality for deer and elk in both Huckleberry and First BGEAs. The overall index (HEI), forage quality (HEf) and open road density (HEr) for the Huckleberry BGEA would remain below S&Gs for a moderate level BGEA. The overall index and all habitat values for the First BGEA would exceed S&Gs for a low level BGEA.

Alternative B has a slight qualitative advantage over Alternative A by enhancing an additional 60 acres of forage habitat associated with soil restoration areas. Otherwise overall effects are considered similar between either action alternatives.

Given what is currently known about local deer and elk populations, the future viability of these species in this area should be assured as long as habitat management opportunities continue to be implemented, and adequate protection measures such as S&Gs governing activities proposed by the Niner Project continue to be implemented.

Coarse Woody Debris

Current Conditions – Coarse Woody Debris

The significance of the ecological role of snags and down wood in influencing ecosystem diversity and productivity is addressed in the Forest Plan and elsewhere (Brown et al. 2003). The significance of this relationship in coniferous forests of the Pacific Northwest is further emphasized by management S&Gs under the Northwest Forest Plan and elsewhere throughout published literature (Hagar et al. 1996, Hallett et al. 2001, Laudenslayer et al. 2002, Lewis 1998, Muir et al. 2002, Rose et al. 2001).

Under the Forest Plan as amended, snag habitat shall be managed at levels capable of providing for at least 40 percent or greater potential populations of cavity-nesting species. Current science has tested the validity of the potential population approach to species management, yet it remains the basis for S&Gs involving snag management. Strong support for identifying more appropriate amounts of snag and down wood habitat is being given to new approaches in addressing these habitat components. One such approach devoted to identifying appropriate levels of snag and down wood in selected habitat types is "DecAID - The decayed wood advisor for managing snags, partially dead trees, and down wood for biodiversity in forests of Washington and Oregon" (Mellen et al. 2006). DecAID has been created to help managers decide how much dead wood to provide for this part of a species habitat needs, and is designed to apply to salvage as well as green tree projects. The benefit of DecAID applied to projects involving removal (harvest) of green trees is in evaluating affected habitat types during the planning process to determine if current dead wood levels are consistent with reference conditions, and to aid in identifying dead wood management goals for projects that affect dead wood habitat throughout dominant habitat types. Snag and down wood levels were compared to DecAID recommendations as well as Forest Plan S&Gs based on population potential.

Interpretation and/or application of advice obtained from DecAID pertaining to how the Niner Project may affect dead wood habitat is based on referencing information available in DecAID for the Westside Lowland Conifer-Hardwood habitat type, in the Western Oregon Cascades, with a Small/Medium Tree Vegetation Condition (WLCH_OCA_S). The WLCH habitat type represents approximately 60 percent of the NFMFWR fifth field watershed. The Niner Project is predominantly within this habitat type, and represents approximately 14 percent of WLCH habitat within the watershed. All stands proposed for commercial thinning harvest are within this habitat type, and the Niner project area (12,872 acres) is considered an appropriate minimum sized area of similar habitat to consider when evaluating current and future levels of dead wood (Mellen et al. 2006).

Snags

Estimates for current snag size and distribution are displayed below, and were made based on estimates from a combination of stand exam data, knowledge of previous snag creation activity, and extensive field reconnaissance.

Table 21 – Current Conditions (Alternative C – No Action) and Estimated Levels of Snag Habitat for Alternative A and B and in Comparison with DecAID

Snag Size	Current Snag/Acre	DecAID - WLCH_OCA_S	
		Un-harvested inventory plots (unthinned managed stands)	All inventory plots (previously thinned and unthinned managed stands
≥ 10" dbh	≈ 15 snags/ac.	66th percentile	85th percentile
≥ 20" dbh	≈ 5 snags/ac.	67th percentile	83rd percentile

The majority of large standing snags are Douglas-fir. The smaller snags throughout the area are also Douglas-fir, and are a result of competition driven mortality. Snag distribution across the project area can be considered patchy and variable.

Snag levels for this project were compared against those listed in DecAID for Westside Lowland Conifer-Hardwood habitat type, in the Western Oregon Cascades, with a Small/Medium Tree Vegetation Condition (WLCH_OCA_S). Current snag levels throughout the project area are above average values (within the upper end of the 50 percent tolerance range) for snags in un-harvested areas in this habitat type and condition. Snag levels are also well above average values (within the 80 percent tolerance range) for snags where harvested areas are included. Table 21 compares snag levels in the Niner project area to DecAID.

Down wood

Down wood estimates for current size and distribution were made based data obtained from 84 fixed area plots that sampled both unthinned and previously thinned managed stands throughout the project area. Tree mortality largely associated with self-thinning competition, cull logs from previous harvest activity, localized breakout from snow loading, and in one area, wildfire resulted in down wood levels as displayed in the table on the next page.

Smaller logs are generally in decay class I and II, while larger logs are in decay class II and III. Many of the largest pieces of down wood (cull logs from initial harvest activity) exist in decay class III. Plot data and extensive field reconnaissance indicate existing down wood occurs in a patchy rather than even distribution across the project area.

Table 22 – Current Conditions (Alternative C – No Action) and Estimated Levels of Down Wood for Alternative A and B and in Comparison with DecAID

Down wood Size	Stand Types	Tons/Acre
≥ 6" diameter	previously thinned managed stands	26.1 tons/acre
≥ 20" diameter	previously thinned managed stands	17.2 tons/acre
≥ 6" diameter	unthinned managed stands	44.2 tons/acre
≥ 20" diameter	unthinned managed stands	28.6 tons/acre

In addition to dead wood levels associated with down logs, it is estimated that decaying wood habitat associated with stumps would cover 0.3 percent of areas treated under either Action Alternative. The amount is considered to be equal under either of these alternatives. Use of stumps throughout a range of decay classes has been documented for a wide variety of organisms (O'Neil et al. 2001, NatureServe 2006, Rose et al. 2001, Zabel and Anthony 2003). This type of dead wood provides a valuable, long-lasting habitat component that supplements the potential to maintain native biodiversity throughout the project area.

Down wood levels for this project again were compared against those listed in DecAID. A review of DecAID data discloses current down wood levels throughout the project area are well above average values (within or exceeding the upper end of the 50 percent tolerance range) representative for dead wood in both harvested and un-harvested areas within this habitat type and condition.

Table 23 – Current Conditions (Alternative C – No Action) and Estimated Levels of Down Wood for Alternative A and B and in Comparison with DecAID

Down wood Size	DecAID - WLCH_OCA_S	
	Un-harvested inventory plots (unthinned managed stands)	all inventory plots (previously thinned and unthinned managed stands)
≥ 5" diameter	71st percentile	67th percentile
≥ 20" diameter	82nd percentile	78th percentile

Normal processes that influence changes in coarse wood levels are highly variable in their ability to affect change (Rose et al. 2001). Natural fire interval for this area has been estimated at 400 years (USDA 1995), which places it among the highest for landscapes with habitat similar to the Niner project area (Chappell et al. 2001). District fire records reveal that from 1943 to 2006, 214 small wildfires averaging 0.6 acre (range .01 - 20 acres) each contributed to additional levels of dead wood in a patchy distribution throughout much of the WLCH habitat in four townships in the watershed immediately surrounding the project area. In 1998 the Gorge Fire occurred within the Niner project area and created variable levels of snags and down wood across approximately 260 acres

where fire intensity ranged from mild underburning to ±10 acre patches of 100 percent mortality. Little or no salvage has occurred associated with any of these events.

Insects and pathogens continually contribute to successional development, however traditionally this occurs at a small scale in this area relative to the overall landscape. The area is not prone to flooding or landslides which may also affect changes on a small scale. Windthrow is yet another normal process that has occurred, and would continue to occur unpredictably, to influence stand dynamics in this area on a small scale. The overall condition of the project is largely influenced by previous management activities that have simplified stand and landscape structure and diversity. Additional stand management would assist in restoring some landscape conditions such as stand dynamics that contribute levels of snags and down wood associated with natural events. Snag creation projects in the early to mid 1990s have created an average of two snags per acre across approximately 7 percent of the project area. These snags occur throughout areas commercially thinned between the late 1980s and early 1990s, and are now providing valuable Stage 3-4 snag habitat (Bartels et al. 1985).

Reference information extrapolated from DecAID suggests current size, abundance, and distribution of snags and down wood exceeds average historic levels (50 percent tolerance) across the project area considering habitat type and vegetation condition. For snags or down wood, the objective of the Niner Project is more directed at managing for an average historic dead wood habitat condition rather than focusing on specific dead wood requirements for individual wildlife species.

Direct and Indirect Effects

Effects of Alternative A B, and C – Coarse Woody Debris

Some loss of existing snag habitat would occur under each action Alternative A or B, to address to safety issues. Some existing snags in proximity to harvest activities would present a serious safety risk to workers involved with implementing the timber sale. Snag loss would be greatest among sizes <10” dbh, intermediate for snags ≥10” - <20” dbh, and lowest among snags ≥20” dbh. All felled snags would be left as down wood. Depending on decay class and burning conditions, some felled snags may be fully or partially consumed during subsequent fuels reduction and prescribed underburning in selected areas.

Under the silvicultural prescription, excess trees would be harvested from specified areas using various elements of variable density thinning. Following the prescription would result in a range of 56-76 trees per acre being retained, some of which have defects that would provide a dead wood habitat component distributed throughout the project area. The silviculture prescription for the Riparian Reserves calls for protection and retention of habitat features such as hardwoods and the largest conifers - some of which possess decadent features providing an arboreal dead wood habitat component. The silvicultural prescription also includes provisions for replacement of large snags at levels exceeding the anticipated average loss throughout the project area under either action Alternative. The prescription would create 2 snags per acre (≥20” dbh) to mitigate any snag loss. This would result in a stable or slightly increasing large snag density. Smaller snag values would likely decrease and stabilize around the 50 percent tolerance level when averaged

throughout the project area. Future replacement snags would not be created from any remnant overstory old-growth trees.

The silvicultural prescription also includes measures to protect existing snags and down wood to the greatest extent feasible during thinning activities.

Implementing the fuels treatment prescription under either Alternative A or B would only affect current snag levels where underburning is planned. Underburning is prescribed for approximately 104 acres (Units 120, 121, 220). The mortality estimated from underburning would create approximately 6-7 snags per acre on approximately 3 percent of all acres thinned, and 0.8 percent of the project area. Some level of partial or full mortality associated with trees immediately adjacent to pile burning activity is also likely. Any such mortality would add to an existing patchy distribution of snag habitat throughout the project area.

Within stand variability throughout the project area influences current snag distribution. This variability would also influence the location of replacement snags, which would be provided for in a patchy rather than even distribution across the area. The coarse wood prescription is common to both Alternative A and B and would assure compliance with Northwest Forest Plan guidance to maintain 40 percent of potential populations of cavity nesting species (USDA, USDI 1994 page C-42).

Implementing the fuels treatment prescription under either Action Alternative should not affect current levels of down wood with one exception. Underburning is prescribed for approximately 104 acres (Units 120, 121, 220) because of excessive fuel loading in the area relative to Forest standards. Reduction of current smaller class down wood is expected from underburning that involves approximately 3 percent of all acres thinned, and 0.8 percent of the project area.

Some loss or disturbance of existing down wood associated with proposed commercial thinning is inevitable. However, replacement from loss of some existing snags, recruitment from retained trees, and the contribution of stumps from harvested trees would result in a stable or slightly elevated level of down wood in areas treated.

Based on current stand structure, composition, and habitat type there is sufficient site-specific potential to support application of the Northwest Forest Plan Standard and Guideline (ROD page C-40) to leave an average of 240 linear feet of logs per acre greater than or equal to 20 inches in diameter across areas treated by the Niner Project under either Action Alternative. Down wood levels would be monitored after harvest activities and if the standards are not met, down wood would be created to mitigate the shortage.

Cumulative Effects – Coarse Woody Debris

The cumulative effects analysis area was the Niner project area. As mentioned above the project area (12,872 acres) is considered an appropriate minimum sized area of similar habitat to consider when evaluating current and future levels of dead wood (Mellen et al. 2006).

Past management actions related to timber harvest activity has affected the overall amount and distribution of dead wood habitat by reducing the amount of old-growth habitat and increasing the amount of mid-late seral habitat. There are no foreseeable actions that would affect dead wood habitat in this area. Current science and the

changing trend in timber management that has occurred within the past decade, and projected for the future, should positively influence management of decaying wood as previously harvested stands develop, and more emphasis is placed on retention of key structural components in un-harvested stands.

Data analysis reveals the amount and distribution of snag and down wood habitat would essentially remain unchanged or experience a slight increase under either Alternative A or B. Commercial thinning under either Alternative A or B is likely to have little or no cumulative effect on dead wood habitat throughout the project area

Dead wood habitat should exist in a sufficient amount and distribution to support the local wildlife community, including Management Indicator Species (MIS) such as pileated woodpecker, marten, and cavity nesters such that their ability to persist or become established would not be limited by this habitat component important to most members of the wildlife community in this area.

Conclusions – Coarse Woody Debris

Under either Alternative A or B, the Niner Project proposes commercial thinning in approximately 44 percent of mid-seral (stem exclusion) habitat throughout the project area. This relates to approximately 25 percent of the entire project area. Proposed openings associated with compaction areas under Alternative B are generally lacking in snags and down wood. There is essentially no difference between Alternative A and B and their effect on dead wood.

The silvicultural prescription calls for protection of existing snags and down logs. However some amount of loss or disturbance of snags and down wood is inevitable as a result of safety and logging feasibility issues. Mitigation measures are identified to address this loss or disturbance. Effects analysis reveals that proposed activities in conjunction with mitigation measures would result in a stable or slight increase in dead wood levels associated with areas treated. Direct and indirect effects would be limited to an undeterminable number of snags and logs that may be unavoidably affected or created within harvest units.

DecAID relies on data from un-harvested plots to assist managers in setting objectives aimed at mimicking natural conditions. Considering the current condition of snag and down wood habitat along with the information presented above, it is expected that dead wood levels throughout the project area should remain above average in the natural range considered for similar habitat following thinning, prescribed fuels reduction, and underburning.

Niner Project would result in maintenance and promotion of dead wood habitat throughout a managed forest that typifies the project area at levels that would ensure its ongoing central role in the ecological processes affecting this type of forested habitat (Rose et al. 2001).

The project would comply with S&Gs pertaining to snag and down wood management on matrix land.

Threatened, Endangered, and Sensitive Species

Current Conditions – Threatened, Endangered, and Sensitive Species

A Biological Evaluation (Davis, 2006) was conducted for all terrestrial threatened, endangered, and sensitive (TE&S) animal species within the project area. For complete discussion of these species, refer to the BE located in Analysis File. The BE provides documentation of pre-field reviews, field reconnaissance surveys, and complete list of TE&S species reviewed including those species determined not to have habitat within the project area.

For the discussion of botanical TE&S species, refer the Vegetation section and the for TE&S fish species, refer to the Fisheries section.

The following table lists the terrestrial TE&S species which have habitat present within the project area, known occurrences, displays the outcome of the risk assessment, and the effects determination for the two action alternative A and B, and consultation status.

Table 24 - Biological Evaluation process for Willamette TES (or Proposed) fauna associated with potential effects from action Alternatives A and B.

	STEP 1	STEP 2	STEP 3	STEP 4	STEP 6
	Prefield Review	***Field Reconn.***	***Risk Assessment***	***Analysis of Significance***	***USFWS Review***
SPECIES	**Habitat Present (B,R,F,D)***	**Occupancy Status**	**Conflicts? Alt's A & B**	**Effects / Impacts Alt's A & B**	**Consul-tation? BA[1]/BO[2]**
Northern Spotted Owl ***Strix occidentalis caurina***	B,R,F,D	Occupied	Potential Conflict	MA, LAA	July 2006 / Pending
Northern Bald Eagle ***Haliaeetus leucocephalus***	B,R,F,D	Unoccupied	No Conflict	NE	NA
Harlequin Duck ***Histrionicus histrionicus***	B,R,F,D	Unknown	No Conflict	NI	NA
American Peregrine Falcon ***Falcon peregrinus anatum***	F,D	Unoccupied	No Conflict	NI	NA
Baird's Shrew ***Sorex bairdii permiliensis***	B,R,F,D	Unknown	Potential Conflict	MIIH, NLCT	NA
Pacific Shrew ***Sorex pacificus cascadensis***	B,R,F,D	Unknown	Potential Conflict	MIIH, NLCT	NA
Fisher ***Martes pennanti***	B,R,F,D	Unknown	No Conflict	NI	NA

	STEP 1	STEP 2	STEP 3	STEP 4	STEP 6
	Prefield Review	***Field Reconn.***	***Risk Assessment***	***Analysis of Significance***	***USFWS Review***
SPECIES	**Habitat Present (B,R,F,D)***	**Occupancy Status**	**Conflicts? Alt's A & B**	**Effects / Impacts Alt's A & B**	**Consul-tation? BA[1]/BO[2]**
Pacific Fringe-tailed Bat *M. thysanodes vespertinus*	R,F	Unknown	Potential Conflict	MIIH, NLCT	NA
OR Slender Salamander *Batrachoseps wrighti*	B,R,F,D	Unknown	Potential Conflict	MIIH, NLCT	NA
Cascade Torrent Salamander *Rhyacotriton cascadae*	B,R,F,D	Unknown	No Conflict	NI	NA
Crater Lake Tightcoil *Pristiloma arcticum crateris*	B,R,F,D	Occupied	No Conflict	NI	NA

* B = breeding (nesting/denning) habitat
R = roosting/cover habitat
F = foraging habitat
D = dispersal habitat
[1] Date of Biological Assessment (BA) Consultation initiated with USFWS
[2] Date Biological Opinion (BO) or Concurrence issued from USFWS
NA = not applicable
NE = No Effect
NI = No Impact.
MA, NLAA = May Affect, Not Likely to Adversely Affect
MA, LAA = May Affect, Likely to Adversely Affect
MIIH, NLCT = May Impact Individuals or their Habitat, but the action will Not Likely Contribute to a Trend towards Federal Listing or loss of viability to the population or species.

The S&G (FW-156 and FW 157) of the Forest Plan as amended reiterates the legal requirements for the completion of Biological Evaluations to determine the possible effects of the proposed activities would have on threatened, endangered, or sensitive species and the consultation requirements of the Endangered Species Act (ESA) (Public Law 93-205) if any of the species are found in the project area.

Northern Spotted Owl (Strix occidentalis caurina)

Current Conditions – Northern Spotted Owl

This project is consistent with current standards established for projects that would specifically affect the northern spotted owl and its habitat. The standards were established for the Willamette Province by the Level 1 Consultation Team and are listed in the Batched Biological Assessment (BA) (USDA et al. 2006) that addresses spotted

owl habitat modification projects proposed for implementation during FY/CY 2007 and 2008. The Niner Project is among the projects identified in the BA, which also considered new information from the 5-year species status review and other recent documents (USDI 2004, Anthony et al. 2004, Courtney et al. 2004). The literature updates our knowledge related to northern spotted owl biology, ecology, and connected issues such as climate change on regional vegetation patterns, sudden oak death syndrome, West Nile virus, wildfire, barred owls, timber harvest, and range wide population decline as presenting individual and cumulative threats to the species.

Effects not specifically discussed in this document pertain to issues that cannot be addressed at the project scale, but are further discussed and analyzed in the 2007 – 2008 Habitat Modification BA and BO which provide a thorough analysis of new information pertaining to potential threats to this species in the Willamette Province (USDA et al. 2006, USDI 2006).

Within the 12,872 acre Niner project area, approximately 3,328 acres are proposed for commercial thinning in stands consisting of upland (82 percent) and riparian reserve (18 percent) habitat. About 90 percent of these stands are under matrix land designation. The project does not occur within the LSR network designated by the Northwest Forest Plan. However, less than 1 percent (25 acres) of the area falls within designated northern spotted owl Critical Habitat Unit (CHU) (OR-18). Also, about 9 percent (291 acres) of the area proposed for thinning is under a Congressionally Withdrawn Allocation (CWA) applying to the NFMFWR Wild and Scenic River corridor.

CHU OR-18 is northwest and adjacent to the project area, CHUs OR-19 and OR-20 are located about 5 miles east and 10 miles southwest respectively. The Willamette LSR Assessment (USDA et al. 1998) and NFMFWR Watershed Analysis (USDA 1995) has identified areas on the landscape that may function as connectivity/dispersal corridors between large blocks of late-successional habitat. Habitat throughout most of the Niner project area currently provides such dispersal opportunity between the surrounding land allocations and CHUs.

Based on feedback from a Willamette Province Level One Team member (Wahl pers. com.), a decision was made to evaluate effects of commercial thinning activities on spotted owls and their habitat by focusing on the condition of riparian reserve and upland habitat within an area where a portion of a 1.2 mile home range radius from known spotted owl activity centers overlapped the Niner project area boundary. Results from previous survey history for this area indicated 17 historic and occupied spotted owl activity centers meet this criterion. Collectively, the Niner project area plus the surrounding area associated with these home ranges defines the Niner Project spotted owl habitat analysis area which encompasses about 32,250 acres. This area is recognized for its current or potential ability to provide late-successional habitat connectivity between LSRs RO219, RO220, and RO222 along pathways that could include the Niner project area.

The effects to spotted owls have been reviewed by focusing on habitat conditions at two scales. A landscape level analysis was conducted to assess habitat suitability and connectivity between LSR/CHU allocations along pathways that include the Niner project area. Analysis considered current and capable habitat conditions across the area

in two contexts: 1) the condition of habitat in upland versus riparian reserve settings, and 2) the condition of habitat based on land management allocations designated as either "protected" or "unprotected" (see footnote in Table 25 for definition of these allocations).

Within the landscape level analysis area, habitat suitability in the home ranges for known owl pairs is also evaluated. This area includes a 1.2 mile radius traditional home range around spotted owl activity centers, and identified which activity centers could be affected by proposed restoration activities. The home range analysis provides data to compare the condition of occupied habitat surrounding the Niner project area against the condition of occupied habitat within the Willamette Province.

The second scale of analysis was defined as the area within the project area boundary plus an area within 0.5 mile on either side of Road 1912 leading to a proposed helicopter landing [T20S R3E Section 27 ne1/4] located about 0.5 mile off the project area boundary.

Table 25 lists northern spotted owl habitat and owl activity center conditions within the Niner Project spotted owl analysis area. Spotted owl home ranges in the Willamette Province have typically been considered to incorporate a 1.2 mile radius around an owl activity center, and that at least 40 percent of the area within that home range should provide suitable habitat in order to support successful nesting. The 40 percent suitable owl habitat within 1.2 miles of an activity center was once considered a viability threshold. But along with suitable capability and protection status it is now recognized as a measure of fitness for owls (Courtney et al. 2004).

Table 25 - Status of the northern spotted owl and its habitat within the Niner Project spotted owl analysis area.

	Total		Protected[1]		Unprotected[2]	
	Acres	% of Total	Total Acres	% of Total	Total Acres	% of Total
Acres within Boundary[3]	32,258	100	13,208	41	19,049	59
Acres of Ownership[4]	31,284	97	13,208	42	18,075	58
Suitable Habitat - Capable Acres[5]	30,905	96	13,108	42	17,798	58
Suitable Habitat - Current Acres	15,495	48	7,977	51	7,518	49
	Number of Activity Centers[9]				**Number of Activity Centers**	
Spotted owl Activity Centers	17	100	12	71	5	29
Spotted owl Activity Centers >40%[6]	13	76	11	85	2	15
Spotted owl Activity Centers 30-40%[7]	4	24	1	25	3	75
Spotted owl Activity Centers <30%[8]	0	0	0	0	0	0

[1] Acres in these columns are comprised of: Late Successional Reserves (LSR), 100-acre LSRs, Congressionally Withdrawn Areas, Riparian Reserves, District Designated Reserves, and Scenic Area Open Spaces. Spotted owl data are composed of LSR or designated wilderness areas only. These figures include those owl activity centers whose centers fall within the LSR or wilderness. The 1.2 mile radius surrounding the activity center may actually extend into unprotected areas.
[2] Acres in these columns are comprised of: Matrix, Adaptive Management Areas, and Administratively Withdrawn Areas. Administratively Withdrawn Areas are included in the unprotected column because technically these areas are not designed to provide spotted owl habitat but rather to serve some other function such as "recreation and visual areas, back country, and other areas where management emphasis precludes scheduled timber harvest" (Record of Decision A-4). The respective administrative land and resource management plans may protect and/or reduce the likelihood that spotted owl habitat located within Administratively Withdrawn Areas would be modified. Spotted owl data are composed of everything but LSR and designated wilderness data.
[3] Acres include both private and federal lands.
[4] Federal land only.
[5] Acres that are either currently suitable spotted owl habitat or have the potential to become suitable in the future. Suitable habitat is defined as nesting, roosting, and foraging habitat.
[6] Spotted owl activity centers with greater than or equal to 1182 acres of suitable habitat within a 1.2 mile radius.
[7] Spotted owl activity centers that have between 886 and 1182 acres of suitable habitat within a 1.2 mile radius.
[8] Spotted owl activity centers with less than 886 acres of suitable habitat within a 1.2 mile radius.
[9] Spotted owl activity center data based on current GIS coverage and prior (<2003) protocol survey results.

Refer to the BE for a comparison of the data between the Niner Project spotted owl analysis area and the Willamette Province. Relative to the Forest and the Willamette Province, these data indicate the Niner Project spotted owl analysis area contains an above average number of activity centers in habitat above average in a number of fitness indicators such as current suitability, capable suitability, and protection status.

Knowledge of spotted owl activity center locations within the Niner Project owl analysis area is a result of past survey efforts associated with Regional population monitoring and District timber sale planning. Table 25 shows that 17 activity centers are known to exist within the overall analysis area. Based on activity center locations relative to locations of proposed harvest units within the project area, commercial thinning activity would occur within a 1.2 mile home range radius for 12 of the 17 activity centers. Thinning within 1.2 miles of activity centers represents about 78 percent of all thinning proposed under either action Alternative A or B. About 20 percent of the proposed thinning occurring within a 1.2 mile radius would also occur within a 0.7 mile radius for 6 of the 17 historic activity centers. A 0.7 mile radius is considered to be the core home range for spotted owls in this portion of their range, and an area where the amount and quality of suitable habitat is particularly important for supporting resident owls.

The habitat currently considered suitable for spotted owls and proposed for thinning is located in stands associated with previous harvest activity. The quality of suitable habitat in these areas is not comparable to nesting, roosting, and foraging habitat more typical of suitable habitat associated with natural late-successional or old-growth stands. Smaller snags and down logs resulting from understory competition mortality, larger cull logs from initial harvest, and some remnant overstory left as seed trees contribute to what is otherwise considered simplified habitat in these managed stands. However, this contribution results in providing nesting, roosting, and foraging opportunities for spotted owls – albeit in limited amount.

For the purpose of this review it is recognized that suitable habitat throughout the analysis area is not considered currently surveyed under a valid protocol timeframe. According to standards and definitions listed in the Willamette Province Habitat Modification BA for FY2007-2008 (USDA et al. 2006), un-surveyed suitable habitat is considered as occupied by individual owls or breeding pairs. Activities associated with either action Alternative A or B fall within the disturbance distance defined in the BA when considering effects to spotted owls during the breeding season (March 1 – September 30). This distance is recognized as 0.25 mile, except for disturbance associated with Type I helicopters (0.5 mile). About 56 percent of the acres in proposed thinning units fall within the 0.25 mile disturbance distance.

Direct and Indirect Effects – Northern Spotted Owl

Direct effects are considered short-term (< 10 years) in this context and are generally considered to range from adverse to none as described below applied to habitat modification, disturbance, and Critical Habitat. Indirect effects are considered long-term (generally > 10 years) in this context and are considered to range from none to beneficial for this proposed project.

Habitat Modification

Direct effects associated with habitat modification activities to suitable habitat for both Alternative A and B are considered as short-term, and are summarized as follows:

- Suitable owl habitat proposed for heavy thinning amounts to 488 acres downgraded, and consists of 356 acres upland (73 percent) and 132 acres riparian reserve (27 percent) habitat.
- Suitable owl habitat in Matrix: 211 acres downgraded (43 percent of suitable downgraded) consisting of 174 acres upland (82 percent) and 37 acres riparian reserve (18 percent) habitat.
- Suitable owl habitat in Wild and Scenic River: 277 acres downgraded (57 percent of suitable downgraded) consisting of 182 acres upland (66 percent) and 95 acres riparian reserve (33 percent) habitat.
- Suitable owl habitat in Wild and Scenic River and Critical Habitat Unit: 25 acres downgraded (5 percent of suitable downgraded) consisting of 9 acres upland (36 percent) and 14 acres riparian reserve (64 percent) habitat.
- In addition, during road maintenance along haul route about 20 hazard trees in Matrix-riparian reserve may be removed.

The effects determination for modification of suitable habitat is a may affect, and is likely to adversely affect spotted owls. Individual tree removal is not likely to adversely affect owls.

- Dispersal habitat proposed for either light/moderate or heavy thinning amounts to 2,822 acres, and consists of 2,382 acres upland (84 percent) and 440 acres riparian reserve (16 percent) habitat all in Matrix allocation.
- Dispersal Habitat Removed (Heavy Thin): 2,252 acres downgraded (80 percent of dispersal thinned) consisting of 1,870 acres upland (83 percent) and 382 acres riparian reserve (17 percent) habitat.

- Dispersal Habitat Degraded (Lt/Mod Thin): 570 acres degraded (20 percent of dispersal thinned) consisting of 512 acres upland (90 percent) and 58 acres riparian reserve (10 percent) habitat.

The effects determination for modification of dispersal habitat is a may affect, but is not likely to adversely affect spotted owls.

Indirect effects associated with habitat modification activities are considered beneficial for spotted owls for the following reasons. Estimates of down wood size and distribution for the project area when compared to DecAid data (Mellen et al. 2006) reveal conditions approaching the 50 percent tolerance level exist throughout the area. Data are limited but suggest that dispersal habitat throughout the project area is approaching suitability as foraging habitat. Implementing the silvicultural prescription as proposed would result in accelerating the transition from dispersal to foraging habitat as released trees respond by increasing size and structural diversity, and as additional levels of larger down wood continue to accumulate. Current suitable habitat would respond favorably to propose thinning as structural diversity increases among younger live trees in stands where existing components such as large down wood, snags, and remnant overstory trees are protected.

Based on the silvicultural prescription and growth response projections, dispersal or suitable capability in thinned stands across the project area should recover within approximately 10 years.

Disturbance

Direct effects associated with project activities that may result in disturbance to spotted owls are considered as short-term, and summarized as follows.

- Any activity proposed in the Niner Project resulting in disturbance between September 30 and March 1, or conducted beyond disturbance distances described in the Provincial BA (USDA et al. 2006), would have no effect on spotted owls.
- Disturbance activities such as use of chainsaws, heavy equipment, and hauling associated with proposed thinning activities are considered to may affect, but are not likely to adversely affect (MA-NLAA) spotted owls if conducted from July 15 – September 30 within the disturbance distances described in the Provincial BA (USDA et al. 2006). Helicopter yarding proposed under either Alternative A or B would also result in a MA-NLAA situation during this timeframe as long as the activity involved a Type I KMAX or any Type II-IV helicopter.
- With one exception, disturbance activities conducted between March 1 and July 15 within the distances described in the Provincial BA (USDA et al. 2006) are not proposed by the Niner Project. Prescribed underburning is proposed in 93 acres of suitable and 11 acres of adjacent dispersal habitat in three thinning units during this timeframe. Burning within and adjacent to suitable habitat during this time may affect, and is likely to adversely affect spotted owls.

Indirect effects to spotted owls from disturbance associated with this thinning project may occur as a result of some related activities. Activities are associated with some mitigating measures and resource opportunity projects. Mitigating measures such as soil tillage and snag creation, and other projects such as firewood cutting and stream

enhancement, could result in disturbance if conducted within the defined disturbance distance during the spotted owl breeding season (USDA et al. 2006). Related activities would not be conducted within the defined disruption distance during the breeding season.

Critical Habitat

Critical Habitat is designated to provide for the conservation and eventual recovery of the species. The primary constituent elements of spotted owl Critical Habitat are those physical and biological habitat features which support nesting, roosting, foraging, and dispersal. The Niner Project proposes 25 acres of heavy thinning in Critical Habitat consisting of 9 acres upland and 14 acres riparian reserve habitat in the extreme southeast corner of CHU OR-18. The affected acres are currently considered suitable spotted owl habitat based on stand age and structural characteristics, but are considered to be marginally functional as suitable. Thinning would result in a short-term downgrade of this suitable habitat to dispersal habitat due the reduction in canopy closure from approximately 60-70 percent to 35 to 40 percent.

The silvicultural prescription for thinning this area involves a variable density thinning component along with measures to protect existing snags, down wood, and any remnant overstory trees. This prescription would speed the attainment of late-successional characteristics and the desired future condition for this area. Thinning 25 acres of Critical Habitat as proposed represents 0.04 percent of the suitable habitat in OR-18, and less than 1 percent of the surrounding stand of suitable habitat. Thinning these acres as proposed may affect, but is not likely to adversely affect Critical Habitat because the effects are considered discountable and entirely beneficial when evaluated at the stand scale.

Indirect effects associated with habitat modification activities in Critical Habitat are considered beneficial for spotted owls for reasons previously identified in the habitat modification section. Thinning increases the overall stand structure diversity.

Cumulative Effects – Northern Spotted Owl

Past timber harvest has occurred on approximately 9,200 acres within the Niner project area. This represents 72 percent of the project area, and includes harvest activity dating back to the 1910's. Harvest activity between the 1910's and 1930 accounts for 12 percent of total acres harvested. The rate increased greatly during the railroad logging era of the 1930's and 1940's when 70 percent of the harvest activity occurred across 50 percent of the project area. Harvest activity since 1950 accounts for the remaining 18 percent of the harvest total.

Private land accounts for approximately 5 percent of the project area, and has generally been cleared of forested vegetation. Private land currently provides non-forested habitat in rural residential and agricultural settings in a small portion of the project area.

As a result of the timing and extent of previous harvest history, the project area currently consists of an uncharacteristically high percentage of mid and late seal habitat (about 71 percent) and low percentage of old-growth habitat (about 15 percent) compared to reference conditions (30-40 percent and 45-60 percent respectively)(USDA, 1995). This consequence has had a mixed effect on terrestrial wildlife species. Generally speaking

the maintenance and development of habitat associated with old-growth characteristics on approximately one third of the area has favored some species such as the spotted owl, while the conversion of approximately two thirds of the area to mid-seral closed canopy habitat set in a mosaic across the landscape has favored another group of species.

Habitat Modification and Critical Habitat

Other than the effects of the proposed action Alternative A and B, there are no future Federal, State or private activities that are reasonably certain to occur within the action area that would result in cumulative effects to spotted owl habitat – including Critical Habitat.

Forest Plan S&Gs governing management of this and surrounding areas provide direction that should provide for the long term maintenance of amount and distribution of potentially suitable habitat for the spotted owl. The changing trend in forest management that has occurred within the past decade, and projected for the future, should positively influence occupancy of suitable habitat for the spotted owl as previously harvested stands redevelop and more emphasis is placed on recruitment of key structural components missing from harvested stands, retention of key structural components present in unharvested stands, and restoration/maintenance of special habitats as key components of biodiversity at a landscape level. The cumulative effect of the Niner Project to habitat throughout the analysis area covering both the action area and project area is considered positive in this regard.

Because of the present condition and location of current harvest and non-harvest allocations, cumulative effects of past or present actions such as the Niner Project should not influence the ability of local populations to persist, or become established, by eliminating demographic linkages beyond the species dispersal capabilities.

Disturbance

One reasonably foreseeable interdependent action that applies to the Niner project area is the Huckleberry OHV Trail Expansion Project. Although no aspects of the Niner Project are considered would result in an indirect or cumulative effect to spotted owls from disturbance, the Huckleberry OHV Trail Expansion Project does have the potential to result in long-term disturbance to spotted owls that may occur in suitable habitat within the disturbance distance (USDA et al. 2006) from OHV activity. The current 99dB limit imposed under State OHV licensing requirements exceeds the 92dB disruption threshold for noise considered by the USFWS in current BOs.

The contribution of OHV activity to cumulative effects from disturbance applies to disturbance of spotted owls from OHV activity during the March 1 – September 30 breeding season. The potential cumulative effect associated with future disturbance to spotted owls in the project area portion of this project's owl analysis area is considered un-quantifiable and un-estimable based on the spatial and temporal variability associated with future OHV use in the area.

Conclusions – Northern Spotted Owl

The analysis indicates the amount of current suitable spotted owl habitat, as a percent of the Niner Project owl analysis area, is consistent with similar range-wide estimates. The analysis found the capability of Federal land to provide suitable habitat within the Niner

Project owl analysis area is considerably greater than elsewhere throughout Willamette Province or the NWFP range of the spotted owl. Current conditions in the owl habitat analysis area are sufficient to support occupancy and dispersal of owls across the landscape, and should increase as capable habitat develops. The overall long term effect of this project on spotted owl habitat within the analysis area under either of the action Alternative A or B is considered to be beneficial.

The Niner Project proposal does involve short-term degrading, downgrading, or removal of dispersal and suitable habitat in General Forest, Wild and Scenic River corridor, and Critical Habitat for the northern spotted owl. This habitat modification would also affect suitable and dispersal habitat within one or more spotted owl home ranges, and result in potential disturbance from associated activities.

The following parameters were used in assessing the impacts of proposed activities of the two action Alternatives on spotted owls and their habitat, or on spotted owl Critical Habitat:

For Habitat Modification

- Heavy thinning that downgrades suitable habitat may affect, and is likely to adversely affect northern spotted owls.
- Light/moderate or heavy thinning that degrades or removes dispersal habitat may affect, but is not likely to adversely affect northern spotted owls.
- Individual hazard tree removal in suitable habitat along haul routes may affect, but is not likely to adversely affect northern spotted owls.
- Thinning that downgrades suitable Critical Habitat as proposed may affect, but is not likely to adversely affect Critical Habitat because the direct effects to overall stand structure are considered discountable and entirely beneficial.

For Disturbance

- Underburning between March 1 – July 15 in and adjacent to suitable habitat may affect, and is likely to adversely affect northern spotted owls.
- Thinning and post –harvest activities generating above ambient noise and conducted within the defined disturbance distance (USDA et al, 2006) between July 15 and September 30 may affect, but is not likely to adversely affect northern spotted owls.

Consultation with U.S. Fish and Wildlife Service:

Consultation with USFWS was required based on analysis of proposed actions. The effects from proposed activities have been incorporated into the Willamette Province FY 2007-2008 Batched BA for Habitat Modification Projects dated July 2006.

The BO from the USFWS is currently pending for calendar years 2007-2008 habitat modification activities within the Willamette Province (FWS Reference Number pending). The Niner Project would be listed in the BO and would comply with the reasonable and prudent measures, and terms and conditions pertaining to project activities described therein.

Compliance with stated conditions ensures consultation requirements under the ESA have therefore been met regardless of which action Alternative may be selected for implementation.

Northern Bald Eagle (Haliaeetus leucocephalus)

Current Conditions – Northern Bald Eagle

Although the NFMFW River corridor offers potential food sources such as fish and waterfowl, concentrated northern bald eagle activity during the nesting season has not been observed within the area. Occasional sightings of one or two bald eagles roosting or foraging within this corridor have been reported by District employees and the general public. Most observations are associated with areas along the river downstream from the action area. The nearest known bald eagle nest site is located approximately 6 miles southwest of the project area. No nesting activity at this site has been documented during the past two breeding seasons.

Single individuals or small concentrations of wintering bald eagles have been observed near the mouths of Salmon and Salt Creeks, near the old millponds, and along the Middle Fork Willamette River to the mouth of the NFMFW River. Both areas are located approximately 4 – 6 miles south to southwest of the Niner planning area

Direct, Indirect and Cumulative Effects – Northern Bald Eagle

The analysis area for bald eagles is defined as the area within the planning area boundary plus an area within 0.5 mile on either side of Forest Service road 1912 leading to a proposed helicopter landing [T20S R3E Section 27 ne1/4] located about 0.5 mile off the planning area boundary.

No management activities are proposed that would affect nesting, roosting, or perch habitat in the project area. No direct effects to bald eagles are anticipated as a result of activities proposed under either action Alternative A or B. Nesting, roosting, or perch habitat would likely improve as a result of this project's activities as maturing second growth stands respond to commercial thinning and silvicultural objectives such as increasing growth, vigor, and structural diversity are realized. The effects determination is a “no effect” to bald eagles or their habitat.

Other than the effects of the proposed action alternatives, there are no future federal, state or private activities that are reasonably certain to occur within the action area that would result in cumulative effects to bald eagle habitat.

The management of this area under the Forest Plan as amended, and the North Fork of the Middle Fork of the Willamette Wild and Scenic River Management Plan should provide a long-term increasing trend in amount and distribution of potentially suitable nesting, roosting, and foraging habitat for bald eagles.

Harlequin Duck (Histrionicus histrionicus)

Current Conditions – Harlequin Duck

Suitable breeding habitat for harlequin ducks exists within riparian reserve habitat along portions of the NFMFW River in this area. Along with aquatic habitat, this area provides nesting, loafing, foraging, and dispersal opportunities for harlequins.

Harlequin duck sightings have been reported during the breeding season on all the Districts of the Willamette National Forest, including a single report from the early 1990’s of a female with young in the lower portion of the NFMFW downstream from the

project area boundary. Other records of sightings include pairs, singles, and females with young in adjacent or nearby watersheds such as Salmon Creek, Salt Creek, Hills Creek, Lower Middle Fork, Winberry Creek, and Fall Creek on the Middle Fork District. Reported observations are lacking in this project area since about 2000.

Direct, Indirect and Cumulative Effects – Harlequin Duck

The analysis area for harlequin ducks is defined by the portion of the planning area which is in the Wild & Scenic River allocation within the NFMFW riparian reserve.

No management activities are proposed that would modify or otherwise disturb breeding, loafing, foraging, or dispersal, habitat located in a limited portion of the project area for harlequin ducks. No direct effects to this species are anticipated as a result of activities proposed under either action Alternative A or B. The quality of suitable foraging habitat in the NFMFWR for harlequin ducks may improve as a result of this project's influence on upslope riparian habitat responding to silvicultural objectives such as increasing growth, structure, and overall diversity. The effects determination is “no impact” to harlequin ducks.

The Niner Project may generate sale area improvement funds to support in stream placement of large woody debris in the NFMFW River channel to improve fish habitat. This activity would occur in or near suitable harlequin duck nesting habitat where it has the potential to disturb the species if conducted during the breeding season. Any effect associated with disturbance could be avoided if all such activity funded by this project was restricted from March 15 through July 15 during the critical portion of the breeding season.

Other than the effects of the proposed action alternatives, there are no activities that are reasonably certain to occur within the project area that would result in cumulative effects to habitat for harlequin ducks.

Cumulative effects from the Niner Project should be positive on the limited amount of habitat in the project area as overall biodiversity increases in and near areas responding to the silvicultural treatments proposed. These treatments should encourage a long-term increasing trend in the quality of riparian and/or aquatic habitat that may support harlequin ducks along the NFMFWR.

American Peregrine Falcon (*Falco peregrinus anatum*)

Current Conditions – American Peregrine Falcon

There is no suitable peregrine nesting habitat in the project area. The southwest corner of the project area is adjacent to the outer edge of tertiary management zone for one known nearby peregrine nest site (OE-97). Although the Niner Project project area is not within the management area considered for OE-97, peregrines regularly forage beyond three miles from a nest site, so it is likely that the project area is used as foraging habitat by this species. Young dispersing from the nearby nest site may utilize habitat within the project area

Direct, Indirect and Cumulative Effects – American Peregrine Falcon

The analysis area for peregrine falcons is defined by the management area delineated around each nest sites. Effects from the Niner Project proposal are considered relative to

the nearby nest site, but address how habitat within the planning area may be used by peregrines.

No suitable peregrine nesting habitat would be modified by this project. Following guidelines recognized by the Forest, disturbance to peregrines from management activity in tertiary zones can be avoided during implementation of thinning activities under either action Alternative A or B by ensuring that helicopter activity is spatially restricted within a designated flight path. No management activities are proposed that would affect nesting habitat, nor influence foraging success or dispersal behavior in the project area. No direct effects to peregrine falcons are anticipated as a result of activities proposed under either action Alternative A or B. The effects determination is "no impact" to peregrines

Foraging habitat for peregrines would likely improve as a result of this project's influence on habitat responding to silvicultural objectives such as increasing growth, structure, and overall diversity to the benefit of a variety of birds known to be preyed upon by peregrines.

Other than the effects of the proposed action alternatives, there are no activities that are reasonably certain to occur within the project area that would result in cumulative effects to peregrine habitat.

The changing trend in timber and habitat management that has occurred within the past decade, and projected for the future, should positively influence successful utilization of foraging habitat for peregrines as more emphasis is placed on recruitment of key structural components missing from previously harvested stands, retention of key structural components present in unharvested stands, treatments in Riparian Reserves to promote the development of stand structure, and restoration and maintenance of special habitats as key components of biodiversity at a landscape level.

Cumulative effects from the Niner Project should be positive as overall biodiversity increases in response to the silvicultural treatments proposed within the project area. These treatments should encourage a long-term increasing trend in the quality of foraging and dispersal habitat for peregrine falcons that may utilize this area in association with a nearby nest site.

Fisher (Martes pennanti)

Current Conditions – Fisher

Habitat conditions in this area during the reference era favored the likelihood of occupancy by fisher, as it is located well within the historic range for this species and would have been relatively free from human disturbance – especially during the breeding season. Then, as now, population densities would be expected to have been low given our current understanding of fisher ecology.

The USDA Forest Service Fiscal Year 1958 Annual Wildlife Statistical Report for the Willamette National Forest lists the fisher as having occasional abundance and a stationary population trend. Suitable habitat existed throughout the NFMFW Watershed, and if fisher were indeed present during that time the species would likely have occupied habitat in or near the planning area. Maj and Garton (1994) mapped observation records for fisher from 1961 through 1982, which show a cluster of sighting locations in

Willamette River watersheds. They also mapped records from 1983 through 1993, which show a sharp decline for sightings in the same location. Occurrence and breeding status data presented by O'Neil et al. (2001) show that fisher both occurs and breeds in Oregon. A review of local records for sightings reported between 1979 and 1999 revealed 9 reports of fisher sightings in the Middle Fork Ranger District. There is no current confirmation that this species occupies habitat in the vicinity of the Niner Project, however there is confirmation of fisher presence within the past decade at a location approximately 35 air miles southeast of the planning area on the Umpqua National Forest. Presence was confirmed based on photographic evidence obtained at a remote camera station during a survey conducted by the Oregon Department of Fish and Wildlife.

Direct, Indirect and Cumulative Effects – Fisher

Effects to fisher from activities proposed under either action Alternative A or B are considered at the scale of the project area, and are considered for the potential to modify habitat or otherwise disturb individuals that may occur in the area. There is no recognized difference between Alternative A or B with respect to any potential to affect this species.

Fisher are more likely to associate denning or resting activity in late successional or old-growth habitat found throughout about 28 percent of the project area than in previously harvested stands proposed for thinning activities. The silvicultural prescription provides measures for protecting key features of potential denning or resting habitat such as existing snags and large down logs. The thinning treatments proposed in the Niner Project, which represent about 25 percent of the project area, would not directly affect the ability of fisher to utilize habitat throughout the project area for denning , resting, foraging, or dispersal.

Noise generating activities are considered to have some potential for disturbance to this species should it occur in close enough proximity. However because of the wide-ranging daily movements of fisher, the low density of any potential population, plus the spatially and temporally dispersed aspect associated with activities across the project area, disturbance potential is considered low. Any direct effects in this regard should not compromise the suitability of overall habitat throughout the project area for use by fisher to any estimable extent. There are no recognized indirect effects to fisher related to disturbance associated with this thinning project as currently proposed.

Indirect effects associated with habitat modification activities are considered beneficial to fisher for the following reasons. Implementing the silvicultural prescription as proposed should result in accelerating the transition from managed stands in a structurally simplified mid-seral condition, to habitat having late-successional characteristics as released trees respond by increasing size and structural diversity, and as additional levels of larger down wood continue to accumulate. The developmental effects in riparian habitat should be particularly beneficial to fisher. The effect determination is "no impact" on fishers.

Other than the effects of the proposed action alternatives, there are no activities that are reasonably certain to occur within the project area that would result in cumulative effects to fisher from modification of habitat.

The management of the area under the Forest Plan as amended, and the North Fork of the Middle Fork of the Willamette Wild and Scenic River Management Plan should provide a long-term increasing trend in amount and distribution of habitat capable of providing for the ecological requirements of fisher. Cumulative effects from the Niner Project in conjunction with past actions should be positive as overall biodiversity increases in response to the silvicultural treatments proposed within the project area.

Fishers have a well documented sensitivity to disturbance connected with human activity. Effects of past, present, and expected human use and management activities combine to influence the potential for fishers to occupy habitat in or near the project area. Recreational activities associated with roads, trails, and campsites; along with habitat management associated with extensive timber harvest activity can be considered to have contributed to the potential extirpation of fishers from this area or to be compromising the ability of this species to thrive in formerly occupied habitat. The increasing trend in recreational use throughout this area may negatively influence occupancy of otherwise suitable habitat for the fisher.

Although there are no recognized cumulative effects to fisher associated with disturbance from Niner Project activities, there is one reasonably foreseeable interdependent action that applies to long-term disturbance of habitat throughout a large portion of the project area. The Huckleberry OHV Trail Expansion Project is currently planning a proposal that would approximately double the mileage of current OHV trails throughout the area. The spatial and temporal variability associated with current and future OHV use in this area does not support a quantifiable estimate of the potential cumulative effect of this activity on the likelihood of otherwise suitable habitat in the project area to be utilized by fisher.

Cascade Torrent Salamander (*Rhyacotriton cascadae*)

Current Conditions – Cascade Torrent Salamander

R. cascadae can reach high densities in appropriate habitat (Leonard et al. 1993) which may help to explain why a surprising number of individuals were documented at sites during habitat surveys conducted between August 1995 and August 1997 on the Middle Fork Ranger District. During that timeframe at least 66 individuals were documented at 13 locations. Two of these locations were within the NFMFW watershed, and one site is just across the NFMFW River adjacent to the planning area boundary.

Suitable habitat for this species exists within limited stretches of aquatic and immediately adjacent moist forested habitat within riparian reserves throughout this area. These limited areas are expected to provide nesting, cover, foraging, and possibly very limited dispersal opportunities for these aquatic salamanders.

Direct, Indirect and Cumulative Effects – Cascade Torrent Salamander

Potential effects to habitat for *R. cascadae* from activities proposed under either Action Alternative are considered limited to habitat within the planning area boundary. The Niner Project as proposed would not modify or otherwise disturb suitable habitat, or cause any level of negative effects that would influence the potential for persistence of the Cascade torrent salamander in the limited amount of suitable habitat occurring in portions of the project area.

Due to protection measures listed in the silvicultural prescription that apply to riparian habitat associated with any thinning activity, no management activities are proposed that would affect suitable habitat allied with some sections of streams in the project area. No direct effects to Cascade torrent salamander are anticipated as a result of activities proposed under either action Alternative A or B.

Suitable habitat for Cascade torrent salamander may likely improve as a result of this project's influence on riparian habitat responding to silvicultural objectives such as increasing growth, structure, and overall diversity. The effects determination is "no impact" on Cascade Torrent Salamander.

Other than the effects of the proposed action alternatives, there are no reasonably foreseeable activities that would result in contributing to cumulative effects to habitat for Cascade torrent salamander within the Niner Project area.

Crater Lake Tightcoil (Pristiloma arcticum crateris)

For the discussion of the current conditions and effects, refer to the section on the Crater Lake Tightcoils under the Survey and Manage Species below.

Baird's Shrew (Sorex bairdii permiliensis), Pacific Shrew (Sorex pacificus cascadensis), Pacific Fringe-tailed Bat (Myotis thysanodes vespertinus), Oregon Slender Salamander (Batrachoseps wrighti aka Batrachoseps wrightorum)

The discussions of these species have been grouped together due to the similar nature of the effects.

Current Conditions - Baird's Shrew and Pacific Shrew

Both these Sorex species have documented occurrences on the **For**est in habitat similar to that associated with natural and older managed stands found throughout the Niner Project planning area. At least 38 specimens of S. bairdi are known to have been collected from sites in Lane County, most from locations on or near the Forest (Verts and Carraway 1998). At least 65 specimens of S. pacificus are known to have been collected from sites in Lane County, most from locations on or near the Forest including one location on the Middle Fork Ranger District (Verts and Carraway 1998).

Studies have shown that leaving even small no-harvest streamside buffers (9-67m) is beneficial in maintaining riparian communities of small mammals at levels comparable to nearby undisturbed areas (Cross 1985, Anthony et al. 2003). The variable density thinning prescription proposed under either Niner Action Alternative includes a no-harvest buffer in riparian habitat averaging 15m on either side of all streams, seeps, and springs. In addition, the prescription incorporates a strategy designed to promote down wood plus herbaceous and shrub cover, as well as provide patches of closed-canopy conditions. Such a prescription positively addresses finer-scale habitat features important to these shrew species, and has been considered to have the highest probability of maintaining the diversity of indigenous ground-dwelling vertebrates within a stand (Garman 2000).

Current Conditions - Pacific Fringe-tailed Bat

Despite an overall lack of survey data and poorly documented habitat requirements and life-history accounts for this species, its presence has been documented on the Middle Fork Ranger District (Ormsbee pers com., Verts and Carraway 1998). A review of recent documented location data for this species includes a record from a location in the NFMFW watershed within five miles of the Niner Project planning area. The potential exists that at least single individuals may utilize available forage and roost habitat throughout the summer and early fall in or adjacent to areas where activities associated with proposed thinning would occur.

Current Conditions - Oregon Slender Salamander

Oregon slender salamanders have been documented at sites across the Willamette National Forest including the Middle Fork Ranger District, but no documented occurrences are within the Niner Project planning area. O'Neil et al. (2001) consider a general association between Oregon slender salamander and the WLCH habitat type descriptive of the Niner Project area suggesting their occurrence in the area may be likely.

Suitable habitat for this species occurs throughout portions of the planning area, including areas proposed for thinning activities under either Action Alternative. Large down logs in a variety of decay classes are a sporadically abundant habitat feature in both natural stands and portions of previously harvested stands. The presence of smaller woody debris and especially decaying stumps considered highly suitable for use by Oregon slender salamanders also provide patchy habitat for this species throughout areas proposed for thinning.

Direct, Indirect and Cumulative Effects – Baird's Shrew and Pacific Shrew, Pacific Fringe-tailed Bat, Oregon Slender Salamander

For this evaluation, effects to these species from proposed activities are considered limited within the project planning area. The direct effects to Baird's Shrew and Pacific Shrew, Pacific Fringe-tailed Bat, and Oregon slender salamanders from implementing the silvicultural prescription under either action Alternative A or B is related to potential habitat disturbance associated with activities such as falling and yarding – particularly when it occurs adjacent to or within portions of riparian reserves, and the prescribed underburning. The potential disturbance could result in loss or displacement of individuals that may be occupying affected habitat during these activities.

Direct effects to these species are judged by the amount of habitat modified or disturbed against that which is available throughout the whole project area. All natural stands, 75 percent of the project area, and 64 percent of previously managed stands within the project area would be unaffected by proposed thinning. Thinning activities are proposed in about 36 percent of the previously harvested stands and would affect about 25 percent of the project area. Prescribed underburning would occur in three of 39 harvest units and affect about 3 percent of all acres thinned. A variable density component to the silvicultural prescription, along with a riparian no-harvest buffer and a variety of seasonal restrictions would apply to either action Alternative A and B. The anticipated scheduling

of harvest activities over a period of about 2-8 years would further stagger modification or disturbance of habitat spatially and temporally across the project area.

These measures would provide a level of spatial and seasonal refugia for individuals that may be exposed to direct effects from proposed activities. Nevertheless, this project would result in disturbance or modification of some habitat features known to be associated with use by Baird's Shrew and Pacific Shrew, Pacific Fringe-tailed Bat, and Oregon slender salamanders. Direct effects associated with thinning activities may therefore result in a short-term adverse effect to an undeterminable number of individuals. However current science also suggests that thinning activity as proposed may also result in short-term beneficial effects to bats (including Pacific Fringed-tailed bats) by attracting bats to areas of improved foraging habitat.

Indirect effects associated with habitat modification activities are considered beneficial to Baird's Shrew and Pacific Shrew, Pacific Fringe-tailed Bat, and Oregon slender salamanders for the following reasons. Implementing the silvicultural prescription as proposed should result in accelerating the transition from managed stands in a structurally simplified mid-seral condition, to habitat having late-successional characteristics as released trees respond by increasing size and structural diversity, understory vegetation growth is stimulated, and as additional levels of larger down wood continue to accumulate. The developmental effects in riparian/upland ecotone habitat should be particularly beneficial to Baird's Shrew and Pacific Shrew.

One anticipated long-term result of the Niner Project under either action Alternative A or B would be that post thinning habitat would offer a greater amount of edge habitat, an overall greater complexity in open habitat, and with abundant roost sites in both living and dead trees that would be expected to provide better overall foraging opportunities for most bat species including Pacific Fringe-tailed Bat.

There are no recognized indirect effects to the Baird's Shrew and Pacific Shrew, Pacific Fringe-tailed Bat, and Oregon slender salamanders related to disturbance associated with this thinning project as currently proposed.

The effects determination is "may impact individuals or habitat" for Baird's and Pacific shrews, Pacific Fringe-tailed bats, and Oregon slender salamanders.

Other than the effects of the proposed action alternative, there are no activities that are reasonably certain to occur within the project area that would result in cumulative effects to Baird's Shrew and Pacific Shrew, Pacific Fringe-tailed Bat, or Oregon Slender Salamander from modification or consequential disturbance of habitat.

The management of the area under the Forest Plan as amended, and the North Fork of the Middle Fork of the Willamette Wild and Scenic River Management Plan should provide a long-term increasing trend in amount and distribution of habitat capable of providing for the ecological requirements of the Baird's Shrew and Pacific Shrew, Pacific Fringe-tailed Bat, and Oregon Slender Salamander. Cumulative effects from the Niner Project in conjunction with past actions should be positive as overall biodiversity increases in response to the silvicultural treatments proposed within the project area.

Effects of Alternative C – No Action – Threatened, Endangered, and Sensitive Species

Alternative C (No Action) proposal would have no effect on federally listed threatened, endangered, or proposed species, and would also have no impact on sensitive species identified by the Regional Forester.

The No Action proposal would have no effect or impact on TES terrestrial wildlife species based on the following assumption – that habitat within and adjacent to the project area would continue to provide existing habitat for wildlife species that may be present as it evolves without human management. The evolution of habitat and associated dynamic nature of habitat suitability that may be subject to an unknown frequency and variety of stochastic events is considered beyond the scope of this evaluation.

Survey and Manage (S&M) and Other 2001 Record of Decision (ROD) Species

The following species listed below in Table 26 were compiled from the 2003 Annual Species Review (IM-OR-2004-034) and incorporates those vertebrate and invertebrate species whose known or suspected range includes the Willamette National Forest. Pre-disturbance surveys and management of known sites required by protocol standards that comply with the 2001 Record of Decision and Standard and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure S&Gs (USDA, USDI, 2001) were either completed or not required for the Niner Project. The following list includes two category A and one C species. There are no known category B, D, E, or F species to consider in this area.

Great Grey Owl (*Strix nebulosa*)

Current Conditions - Great gray owl

Under the 2001 amendment to the Northwest Forest Plan, the status of the great gray owl changed from a protection buffer species to a Category C Survey and Manage species (USDA, USDI 2001). The species was changed to a Category A species following the 2002 Annual Species Review where it remains considered rare, and for which pre-disturbance surveys are practical if habitat is present.

Although some great gray owl sightings have been reported on private land associated with cleared pasture land in the southwest corner of the project area, habitat in the area is not considered suitable as defined in the current great gray owl survey protocol (Version 3.0 January 2004).

Direct and Indirect Effects – Great gray owl

Proposed thinning activities would not modify or disturb any habitat associated with sighting locations on adjacent private land. Suitable habitat does not exist elsewhere within the project area, therefore Alternative A, B, or C would have no affect on great gray owls.

Table 26 - Survey & Manage Wildlife Species Known or Suspected on the Willamette National Forest.

Species	S&M Category	Survey Triggers			Survey Results			Site Mgtmt.
		Within Range of the Species?	Project Contains Suitable habitat?	Project may negatively affect species/habitat?	Surveys Required ?	Survey Date (month/year)	Sites Known or Found?	
Vertebrates								
Great Gray Owl (Strix nebulosa)	A	Yes	No	No	No	NA[1]	NA	NA
Red Tree Vole (Arborimus longicaudus)	C	Yes	Yes	Yes	No[2]	NA	NA	NA
Mollusks								
Crater Lake Tightcoil (Pristiloma arcticum crateris)	A	Yes	Yes	Yes	Yes	05/2006	No	NA

[1] N/A = Not Applicable
[2] Species removed from Survey and Manage list within Mesic Zone portion of its range under 2003 Annual Species Review. This project is located within the Mesic Zone, therefore surveys not required.

Red Tree Vole (Arborimus longicaudus)

Current Conditions - Red tree vole

The red tree vole was initially listed as a Survey and Manage species in the 1994 Northwest Forest Plan ROD. In the 2001 ROD the red tree vole was classified as a Category C species. Under that classification it was considered uncommon, where pre-disturbance surveys were considered practical, and where survey requirements applied across the known or suspected range of the species. Based on survey results that revised the understanding of occurrence, distribution, and habitat use, the 2003 Survey and Manage Annual Species Review removed the red tree vole from the Survey and Manage list within the Mesic Zone portion of its range. The Niner Project is within the Mesic Zone, therefore Survey and Manage requirements for this species do not apply to this project.

Direct and Indirect Effects - Red tree vole

Suitable habitat for this species would be exposed to disturbance associated with proposed thinning activities at various locations within units throughout the project area under either Alternative A or B. Negative effects to this species or its habitat from proposed activities should have little impact on the local population in this area where the persistence of red tree voles is shown to be of no concern based on Northwest Forest Plan land allocations and S&Gs. Alternative C would have no affect to red tree voles.

Crater Lake Tightcoil (Pristiloma arcticum crateris)

Current Conditions - Crater Lake tightcoil

The Crater Lake tightcoil has been listed as a Survey and Manage species since the 1994 Northwest Forest Plan. Under the 2001 ROD, it was classified as a Category B species. The species was changed to a Category A species following the 2002 Annual Species Review where it remains considered rare, and for which pre-disturbance surveys are practical if habitat is present. This species is also included on the Regional Forester's Sensitive Species List, and a more thorough discussion of how proposed activities may impact this species is conducted in the biological evaluation for this project.

Suitable habitat for this species exists in numerous locations throughout the project area and is associated with perennially wet areas within riparian reserves. The no cut buffers portion of the riparian reserves provide the mitigation measures to protects this habitat by avoiding disturbance and maintaining microclimate conditions. Several locations have been identified where culvert replacement would take place in perennial and intermittent streams with well-defined channel. Because these stream locations are in well-defined channels they are not considered suitable habitat. The three criteria established in the survey protocol to determine the need for surveys were not met; therefore surveys for Crater Lake tightcoil are not required in the proposed treatment areas– with one exception.

A temporary bridge site to access one harvest unit (Unit 209) is proposed under Alternative A. Installation of the temporary bridge would disturb suitable habitat for this species at bridge crossing location. A two visit survey for Crater Lake tightcoil of suitable habitat associated with the bridge site location was conducted to current protocol (Version 3.0 2003) in May 2006. Voucher specimens were collected during each visit and submitted for identification. No Crater Lake tightcoil individuals were identified among the specimens collected.

Therefore, survey protocol requirements for this species have been met, and no occupied sites were found, or are known to exist within habitat at the bridge location that would be subject to disturbance under Alternative A. Under Alternative B, Unit 209 would be helicopter yarded and would not require a temporary bridge, therefore avoiding disturbance of this location.

Direct and Indirect Effects - Crater Lake tightcoil

The effects to this specie are considered limited to habitat disturbed at one location under Alternative A. The pre-disturbance surveys were completed and results were negative for Crater Lake tightcoils. Therefore, Alternative A would have no effect to Crater Lake tightcoils. Alternative B or C would not disturb this location and would have no effect to Crater Lake tightcoils.

Suitable habitat for Crater Lake tightcoil would improve as a result of this project's influence on riparian habitat responding to silvicultural objectives such as increasing growth, structure, and overall diversity. The BE effects determination is "no impact" on Crater Lake Tightcoil.

Other than the proposed action alternatives, there are no reasonably foreseeable activities (such as Huckleberry OHV Trail Expansion Project) that have not addressed habitat

protection for this species or would result in cumulative effects to habitat for Crater Lake tightcoil within the project area.

Other ROD Species/Habitat:

Cavity-nesting birds - White-headed woodpecker, black-backed woodpecker, pygmy nuthatch, and flammulated owl:

These four species occur on the periphery of the range of the northern spotted owl on the east slope of the Cascade Range in Washington and Oregon. Additionally, the white-headed woodpecker and flammulated owl occur in the Klamath Provinces in northwestern California and southwestern Oregon. These species are generally not associated with Westside Oregon Cascades habitat (Marshall et al. 2003, O'Neil et al. 2001, NatureServe 2006), are not considered to have potential to occur within the project area.

Bat Roosts

Current Conditions - Bat roosts – caves, mines, and abandoned wooden bridges and buildings:

There are no caves, mines, or buildings within the project area that would need to be protected from activities associated with this project. There are however rapidly deteriorating remnants of a few abandoned wooden trestle bridges used during the railroad logging era that would receive full protection from disturbance under either Action Alternative.

Direct and Indirect Effects - Bat roosts – caves, mines, and abandoned wooden bridges and buildings:

Because they would be buffered from any disturbance, there would be no direct or indirect effect to potential bat roosts in the abandoned wooden bridges in Alternatives A or B. Alternative C would have no affect to potential bat roosts.

Cumulative Effects – Survey and Manage Species

Past management actions related to timber harvest activity are generally responsible for the current condition of habitat throughout the project area. See Appendix B for listing of past, present and foreseeable future activities for the NFMFWR watershed. These actions have affected the overall amount and seral stage distribution of forested habitat largely by reducing the amount of old-growth habitat and increasing the amount of early to mid seral habitat. There are no foreseeable actions that would affect seral stage habitat in this area. The only foreseeable action within the project area that may affect a survey and manage species listed above is the Huckleberry OHV Trail Expansion Project. The trail system may cross riparian habitat that may be suitable for Crater Lake tightcoil. Any potential effects from the Huckleberry OHV Trail Expansion Project to the Crater Lake tightcoil would be mitigated by conducting surveys, protecting sites, and avoiding suitable habitat altogether.

The effects from this project on seral stage habitat that influences suitability for Survey and Manage species such as Crater Lake tightcoil and red tree vole would be inconsequential relative to cumulative effects from past actions. Current science and the changing trend in timber management that has occurred within the past decade, and

projected for the future, should positively influence management of habitat for Crater Lake tightcoil and red tree voles towards a historic condition as previously harvested stands and riparian reserves redevelop, and more emphasis is placed on retention of key structural components in un-harvested stands.

Management Indicator Species

The Forest Plan has identified a number of terrestrial wildlife species with habitat needs that are representative of other wildlife species with similar habitat requirements for survival and reproduction. These management indicator species (MIS) include spotted owl, bald eagle, peregrine falcon, cavity excavators, pileated woodpecker, deer, elk, and marten. These species have potential to occur in or near the project area. Spotted owls, bald eagles, and peregrine falcons are addressed in the Threatened and Sensitive Species section and deer and elk in the Big Game section.

Pileated Wood pecker

As described earlier in the wildlife section, snag and down wood habitat throughout the project area are considered abundant relative to natural conditions for the habitat type and structural condition. These habitat components are important in influencing the presence of this MIS in the project area. Current, as well as historic, composition and structure associated with the habitat type and plant associations for this area favor nesting and foraging use by pileated woodpeckers (Csuti et al. 1997, Marshall et al. 2003, NatureServe 2006, O'Neil et al. 2001). Approximately 350 acres of remnant forest somewhat centered within the project area has been designated as a pileated woodpecker habitat area (Management Area 9B) under the Forest Plan. This species has been detected on numerous occasions during field visits throughout the planning process. Typical foraging sign can be commonly found on trees and logs throughout the project area. Favored tree species appear to be western redcedar, Douglas-fir, and grand fir. There are no known nest trees within any proposed harvest unit or elsewhere throughout the project area.

The Niner Project proposes commercial thinning more in the context of promoting general diversity rather than focusing on the habitat requirements of any specific individual or group of species. Nevertheless a comparison of current dead wood habitat within the project area against data from DecAID (Mellen et al. 2006) pertaining to pileated woodpecker habitat use reveals the following relative to size and distribution for both snags and down wood:

- Abundant foraging habitat within the 50 percent tolerance interval exists throughout the project area, and would remain after thinning,
- Nesting and roosting habitat currently falls within the 30 percent tolerance interval throughout the project area, and should experience an accelerated gradual increase after thinning.

Direct and Indirect Effects

Effects of Alternative A and B - Management Indicator Species

Management activities proposed under Alternative A and B would involve modification or disturbance of suitable habitat for these species. Commercial thinning would occur within stands that are well distributed across the project area (approximately 20 sq mi in size). Removal of standing green trees, loss of snags that pose a risk to worker safety, and disturbance of some large down wood from effects of harvest activities would occur in these stands. The coarse woody debris section provides a through discussion of how dead wood habitat important to these species may be affected by proposed commercial thinning.

Direct and Indirect Effects - Pileated woodpecker:

Project effects (direct and indirect) to this species are considered relative to the large home range size (>1000 ac) and the amount of habitat modified or disturbed against the amount available throughout the area. Any negative effects associated with activities are considered short term, and suitable foraging and nesting habitat would continue to be provided throughout the project area both during and after commercial thinning is completed. Approximately 75 percent of the project area would not be affected by proposed activities. Any modification or disturbance of habitat for this species would be limited to approximately 25 percent of the project area under either Action Alternative, and would largely be limited to disturbance of foraging habitat. Commercial thinning as proposed by this project should have little to no effect on this species or its ability to persist within the project area.

The pileated woodpecker was formerly listed by the Oregon Natural Heritage Information Center (ORNHIC) among rare, threatened, and endangered species of Oregon. The species was dropped from the list in 2004 because it was found to be too common (ORNHIC 2004). Currently NatureServe and the Oregon Department of Fish and Wildlife (ODFW) show the status of the pileated woodpecker to be secure, which suggests the changing trend in timber management that has occurred within the past decade, and projected for the future, may positively influence occupancy of suitable habitat by this species as previously harvested stands redevelop, and more emphasis is placed on retention of key structural components in unharvested stands. Effects of the Niner Project should be positive on pileated woodpeckers as habitat throughout the project area develops into condition favoring the welfare of this species along with a diverse assemblage of others.

Cumulative Effects - Pileated woodpecker

Project effects would result in a negligible contribution to cumulative effects that have already occurred from past management actions within the project area, or to foreseeable actions such as the Huckleberry OHV Trail Expansion Project.

Cavity Excavators

The significance of snags as one component characterizing both old-growth and younger timber stands, and the dependence of primary cavity excavators on this component as MIS that provide nesting and denning habitat for numerous additional species of birds and mammals (secondary cavity nesters) is thoroughly addressed in the Forest Plan

(USDA, 1990). A complete list and discussion of these species can be found on page 74 in Chapter III of the Forest Plan FEIS. The significance of this relationship is further emphasized by management S&Gs under the Northwest Forest Plan and elsewhere throughout published literature (Hagar et al. 1996, Hallett et al. 2001, Lewis 1998, Muir et al. 2002, Olson et al. 2001, Rose et al. 2001). Five out of eight species of primary cavity excavators used as ecological indicators in the Forest Plan are known to occur within the Niner project area. The remaining three species (Lewis woodpecker, black-backed woodpecker, and three-toed woodpecker) are generally not associated with Westside lowlands conifer-hardwood forest habitat that defines stands throughout the project area (Marshall et al. 2003, O'Neil et al. 2001, NatureServe 2006).

Visual or audible detection plus visual indicators of presence (use sign) have confirmed the presence of the following five primary cavity excavators MIS: red-breasted nuthatch (RBNU), northern flicker (NOFL), hairy woodpecker (HAWO), downy woodpecker (DOWO), red-breasted sapsucker (RBSA). DOWO have been detected during field trips throughout the project area, but locations are largely associated with more open habitat having a hardwood component such as in the southwest portion of the project area in the vicinity of High Prairie. RBNU, NOFL, HAWO, and RBSA are known to occur elsewhere, and are among species documented during an intensive young stand study (YSS) that included conifer dominated managed stands adjacent to the northern portion of the Niner project area

The YSS grouped cavity-nesters that included these species when considering post treatment effects of commercial thinning on this group of birds (Hagar et al. 2004). Data analysis (YSS) revealed the following for cavity nesters:

- Bird species richness (number of species/stand) was positively affected by thinning, and increased to the greatest extent in stands that were heavily thinned.
- No species regularly detected prior to thinning were absent during post-treatment surveys regardless of thinning intensity.
- Thinning prescription had no influence on bird density (number of individuals/acre) for this group.

Another study investigating wildlife response to effects of thinning in similar habitat has shown that RBNU and HAWO populations increased after thinning despite overall lower snag densities (Hayes et al. 1997).

Implementing the silvicultural prescription associated with either Alternatives A or B would result in maintaining a no-harvest buffer adjacent to streams in all riparian reserves, plus protection and retention of habitat features such as snags, hardwoods and any remnant conifers (many of which possess decadent features making them suitable for use by cavity excavators). One anticipated result of this project would be a post-treatment habitat offering greater amount of edge habitat, with greater complexity in more open habitat, and with abundant forage and nesting opportunities in both living defective and dead trees that can be considered to provide better overall habitat for a greater diversity of cavity excavator species (Hagar et al. 2004, O'Neil et al. 2001, Marshall et al. 2003, NatureServe 2006).

Direct and Indirect Effects - Cavity Excavators

Project effects (direct and indirect) to this group of species are considered relative to the amount of habitat modified or disturbed against the amount available throughout the Niner project area. Any negative effects associated with activities are considered short term, and suitable foraging and nesting habitat would continue to be provided throughout the project area both during and after commercial thinning is completed. Because of a variety of spatial and temporal operating restrictions that would apply to harvest activities, disturbance to individuals that may be in close proximity to activities would generally be limited to outside the breeding season (Marshall et al. 2003). Research results suggest commercial thinning should have a positive indirect effect on this group of MIS, and little to no negative direct effect on these species or their ability to persist within the project area.

Cumulative Effects - Cavity Excavators

Past management actions related to timber harvest activity are generally responsible for the defining the current condition of habitat throughout the project area relative to suitability for primary cavity excavators. These actions have affected the overall amount and seral stage distribution of forested habitat largely by reducing the amount of old-growth habitat and increasing the amount of mid-late seral habitat. There are no foreseeable actions that would affect seral stage habitat in this area and influence future suitability for primary cavity excavators.

The contribution of effects from this project on seral stage habitat that influences suitability for primary cavity excavators MIS would be inconsequential relative to cumulative effects from past actions. Current science and the changing trend in timber management that has occurred within the past decade, and projected for the future, should positively influence management of habitat for this group of species towards a historic condition as previously harvested stands and riparian reserves redevelop, and more emphasis is placed on retention of key structural components in un-harvested stands.

Marten

Marten occupy a narrow range of habitat types found in or near coniferous forests. More specifically, they associate closely with late-successional stands of mesic conifers – especially those with complex physical structures near the ground such as large low snags and down wood (Chapin et al. 1997, NatureServe 2006, Ruggiero et al. 1994, Verts and Carraway 1998, Zielinski et al. 2001). Current habitat in portions of the project area can be described as having such characteristics, and may support use by this species. Prior to initial harvest activity, habitat throughout most of the project area would have provided the canopy cover and ground level structural complexity favored by this species for selection as optimum breeding/denning habitat. Despite lack of documented presence in the immediate vicinity, it is assumed that marten are likely a member of the local faunal community.

As described earlier in this report, snag and down wood habitat throughout the project area are considered abundant relative to natural conditions for the habitat type and structural condition. These habitat components are important in influencing the presence of this MIS in the project area. Approximately 250 acres of remnant forest in the middle

of the project area has been designated as a marten habitat area (Management Area 9C) under the Forest Plan.

Direct and Indirect Effects - Marten

Because the home range size (average ±6 sq mi) for marten is quite variable and 3-4 times larger than predicted for a similar size terrestrial carnivore (Buskirk and Ruggiero 1994, NatureServe 2006), the effects from proposed activities on this wide-ranging species are considered in relation to the Niner project area.

Project effects (direct and indirect) to this species are considered relative to the large home range size and the amount of habitat modified or disturbed against the amount available throughout the area. Any negative effects associated with activities are considered short term, and suitable foraging along with some denning habitat would continue to be provided throughout the project area both during and after commercial thinning is completed. Approximately 75 percent of the project area would not be affected by proposed activities. Any modification or disturbance of habitat for this species would be limited to approximately 25 percent of the project area under Alternative A and B and would largely be limited to disturbance of foraging habitat. Commercial thinning as proposed by this project should have little to no effect on this species or its ability to persist within the project area. Alternative C would not disturb forage habitat.

The habitat associated with proposed harvest units is recovering from seral simplification as a result of previous intensive timber management regimes. The commercial thinning proposed in these stands in either Alternative A or B would encourage development of structural diversity throughout, and adjacent to areas treated. The variable density thinning proposed by this project is believed to influence accelerated development of many aspects of biodiversity were it is lacking as a result of previous management (Franklin et al. 1997, DeBell et al. 1997). Alternative C would progress through seral development stages at a slower rate of succession.

Cumulative Effects - Marten

Project effects would result in a negligible positive contribution to cumulative effects that have already occurred from past management actions throughout the project area. There are no foreseeable actions that should affect habitat for this species in the project area.

NatureServe lists the status of marten as secure, while ODFW lists them as sensitive and vulnerable, which places the species on the ORNHIC watch list as a species of conservation concern. However the status of this species should be secure in this area considering the changing trend in timber management that has occurred within the past decade, and projected for the future. Supported by current science, this trend should positively influence occupancy of suitable habitat by this species as previously harvested stands redevelop, and more emphasis is placed on retention of key structural components in un-harvested stands. Long-term (>10 years) effects of the Niner Project would be positive on marten as habitat throughout the project area develops into condition favoring the welfare of this species along with a diverse assemblage of others.

Conclusions - Management Indicator Species

Activity associated with the proposed action is consistent with, or exceeds Willamette Forest Plan S&Gs as they pertain to MIS management (FW-121, 122, 124-133, 136-153, 162-173; MA-9b-08 through 18, MA-9c-08 through 19).

Some suitable habitat for terrestrial MIS would be modified by proposed activities associated with the Niner Project. Activities could result in disturbance to MIS that may be present in or adjacent to work areas. However, any modification or disturbance that may occur associated with this project is not of a scale that would threaten the viability of any MIS to persist within the project area or within any local population.

Land Birds / Neo-tropical Migrants

Current Conditions - Land Birds/Neo-tropical Migrants

Land bird species exhibit a dramatic response to the height, seral stage, canopy structure, and spatial distribution associated with forest habitat where greater numbers of birds are associated with more complex heterogeneous forested landscapes (Altman 1999). The current amount of forested and open ecotone habitat throughout the project area should be attractive for use by a variety of avian species (Gilbert and Allwine 1991). However effects of past management practices (extensive timber harvest) have resulted in a general simplification of habitat throughout much of this area as a uniform canopy dominated by Douglas-fir closes in. In the small portion of the project area where they still exist in previously harvested stands, many remnant overstory trees dominated by Douglas-fir are experiencing mortality associated with competition from the developing understory.

The importance of habitat associated with hardwood trees and shrubs has been widely documented in published literature as one of the leading factors influencing bird community composition in conifer-dominated landscapes that typify the Niner project area (Csuti et al. 1997, O'Neil et al. 2001, Marshall et al. 2003). Such habitat in this project area is generally located in riparian reserves, but is scattered across upland settings also. A direct positive correlation has been shown to exist between abundance and distribution of hardwoods, and abundance and diversity of birds.

Management actions such as those proposed under either of action Alternatives are recognized as a key component of a conservation strategy for land birds in coniferous forests of western Oregon (Altman 1999) that have been described by Rich et al. (2004) as the flagship habitat of the Pacific Biome. These actions can be considered particularly important when they involve restoration of diversity in habitat such as that associated with the Niner project area. Heavier thinning such as proposed under either Alternative A or B favors greater establishment and growth of hardwoods, shrubs, and conifer seedlings (Hayes et al. 1997). Proposed thinning also involves a variable density component to the silvicultural prescription that can be expected to further enable structural enrichment in treated stands while providing small-scale refugia for all elements of biodiversity (Franklin et al. 1997) including land birds/neo-tropical migrants.

Species such as band-tailed pigeon, olive-sided flycatcher, and hermit warbler are considered focal in the effort to maintain functional ecosystems that support a diverse assemblage of land birds throughout this area (Rich et al. 2004). Visual or audible detections confirm or suggest the presence of most bird species listed in Westside

Lowlands Conifer-Hardwood (WLCH) forest habitat type in the appropriate habitats throughout the project area. Hagar et al. (2004) analyzed survey data that documented the presence of half these closely associated species during an intensive young stand study (YSS) that included conifer dominated managed stands adjacent to the northern portion of the Niner project area.

The YSS grouped neo-tropical migrants that included 15 species from the local community when considering post treatment effects of commercial thinning on this group of birds (Hagar et al. 2004). Data analysis (YSS) revealed the following for neotropical migrants:

- Bird species richness (number of species/stand) was positively affected by thinning, and increased to the greatest extent in stands that were heavily thinned.
- No species regularly detected prior to thinning were absent during post-treatment surveys regardless of thinning intensity.
- A heavy thinning prescription had a positive influence on bird density (number of individuals/acre) for the neo-tropical migrant group.

Implementing the silvicultural prescription associated with either action Alternatives would result in maintaining a partial no-harvest buffer in all riparian reserves, plus protection and retention of habitat features such as snags, hardwoods and any remnant conifers. One anticipated result of this project would be a post-treatment habitat offering greater amount of edge habitat, with greater complexity in more open habitat, and with abundant forage and nesting opportunities in both living and dead trees that can be considered to provide better overall habitat for a greater diversity of bird species (Hagar et al. 2004, O'Neil et al. 2001, Marshall et al. 2003, NatureServe 2006).

All bird species listed under WLCH forest habitat type with the exception of blue and ruffed grouse are listed among species protected by the Migratory Bird Treaty Act (MTBA). Habitat associated with approximately 75 percent of the project area would not be subject to modification or disturbance from proposed thinning activities. Activities associated with approximately 56 percent of the acreage proposed for thinning would be subject to a variety of seasonal restrictions extending from March through mid-July. Restricting activities during this timeframe would avoid disturbance to the native bird community throughout most or all of the nesting season for these species (Marshall et al. 2003, NatureServe 2006). The remaining 44 percent of areas where thinning activities are proposed represents about 11 percent of the project area. Activities in this small portion of the project area would be subject to a shorter seasonal restriction (March through mid-June) that could result in disturbance to habitat during the latter portion of the breeding season for some species. Disturbance in these areas, however, would be spatially distributed across the project area, and temporally distributed throughout multiple breeding seasons further reducing the likelihood of disturbance to individuals.

Direct and Indirect Effects of Alternative A and B - Land Birds/Neo-tropical Migrants

The effects to this group of species from proposed activities are considered limited to within the project area. Consideration of project effects (direct and indirect) to native bird species from proposed activities is directed to the potential for habitat modification and disturbance to occur associated with thinning units, and how thinning may affect habitat use.

Loss or displacement of individuals that could be unknowingly occupying habitat during implementation of proposed activities in Alternative A and B such as falling, yarding, and prescribed burning could occur. The number of individuals and/or species potentially affected by proposed activities is unknown and considered unquantifiable without reliable survey data. The spatial and temporal extent of proposed activities that could result in disturbance to nesting birds in a small portion of the project area should mitigate the overall potential for disturbance and provide protection for nesting birds as intended under MTBA (Green pers com. 2006). Based on management proposed under either Action Alternative, risk to individuals that may be present and directly affected by project activities is considered equal for either Action Alternative.

Short and long-term suitability of habitat in and near proposed treatment areas should improve for the majority of bird species that are likely to forage and nest in this area – albeit on a small scale compared to the surrounding landscape. Current science suggests these indirect effects are generally considered neutral or beneficial for all affected species, and are equal under either action Alternative.

Direct and Indirect Effects of Alternative C (No Action) - Land Birds/Neo-tropical Migrants:

Alternative C would have no effect on land birds or neo-tropical migrants because it does not propose any activities that would change habitat conditions.

Cumulative Effects – Land Bird /Neo-tropical Migrants:

Past management actions related to timber harvest activity are generally responsible for the current conditions of habitat throughout the project area relative to suitability for land birds/neo-tropical migrants. These actions have affected the overall amount and seral stage distribution of forested habitat largely by reducing the amount of old-growth habitat and increasing the amount of mid-late seral habitat. There are no foreseeable actions that would affect seral stage habitat in this area and influence future suitability for this group of species.

Implementing current science recommendations and application of Forest Plan S&Gs would ensure the long-term maintenance of amount and distribution of suitable habitat for native resident and migratory land bird species. Due to the location of treated and untreated areas within the project area, cumulative effects from this proposed thinning project under either action Alternative would result in a positive yet minor contribution to overall effects from past actions.

Fire and Fuels

Fire History

Fire records from 1943-2005 indicate that approximately 54 wildfires were reported and suppressed within or immediately adjacent to the 12,872 acre project area boundary. Four of these fires grew beyond one-tenth of an acre. The 1967 Dead Mountain Fire burned 2,047 acres near the southeast boundary of the project area. The 1998 Gorge Fire burned 258 acres along the western boundary of the project area; two other fires during the 1970s burned 1.5 and 5 acres, respectively, near what is now the eastern boundary of the Niner project area. All other fire starts during the modern fire suppression era (1943-present) were contained to one-tenth of an acre in size or less. In summary, the Niner project area has typically experienced slightly less than one fire per year since 1943, and only two fires grew beyond 5 acres during that era (Sources: Willamette NF fire records and GIS).

Fire Regime

The Integrated Natural Fuels Management Strategy (INFMS) (USDA, USDI, 1999) designated lands within the Niner project area as fire regimes 3B, 3C and 5A. Fire regime 3B is a mixed-severity regime with a fire return interval of 50-100 years; approximately 40 percent of the Niner Project Area may be categorized by this regime. Fire regime 3C is a mixed-severity regime with a fire return interval of 100-200 years, and this regime is found in approximately 55 percent of the project area. Fire regime 5A is a high-severity regime with a fire return interval of 200-400 years. Approximately 5 percent of the project area may be categorized as fire regime 5A. On the Forest, this fire regime occurs mostly in higher elevation forests.

Fire regime designations are simply a method to estimate how often we would expect to see natural fire on the landscape in the absence of human intervention. For example, in a landscape categorized as fire regime 3B, we would expect to see a mixed-severity fire at least once every 50-100 years. In fire regime 3C, we would expect to see at least one fire every 100-200 years.

In the era of modern fire suppression, we would continue to see natural fire starts according to the same natural regime schedules. What is different now is that the vast majority of fires are suppressed before they can spread, consume fuels and thin out overgrown stands. When a fire is immediately suppressed, a fire return interval is essentially skipped, causing forest fuel conditions to worsen gradually over time (Sources: FRCC Guidebook, INFMS and field obs.).

Condition Class

Condition class is a classification of the amount of departure from the natural fire regime. Departure from a natural fire regime results in changes to one or more of the following ecological components: vegetation characteristics, fuel composition, fire frequency, fire severity, burn pattern, and other associated disturbances, including plant/tree mortality from insects or disease.

Field observations obtained through fuels inventories made it possible to assign condition classes to stands within the Niner Project Area. The approximate breakdown is as follows: Approximately 81 percent of the planned harvest acres are categorized as

condition class 1; about 19 percent of proposed harvest acres are represented by condition class 2. Condition class 1 is within the range of natural/historical variability of vegetation characteristics, fuel composition, fire frequency, fire severity, and associated disturbances. Condition Class 2 is a moderate departure from the natural fire regime. Tables 28 and 29 contain estimates for fuel loading and condition class according to planned harvest units (Sources: INFMS and field obs.).

Fuel Models

Three major Fire Behavior Prediction System fuel models are represented within the Niner project area. Field observations have indicated that approximately 50 percent of the project area can be described as fuel model 8. This fuel model is characterized by closed conifer stands where fires spread primarily through litter and light fuels on the forest floor. Approximately 35 percent of the project area can be described as fuel model 5. This fuel model is characterized by conifer stands where the primary carrier of fire is understory brush. Fires in this fuel model may generate high intensities and fast rates of spread under the right conditions. Crown-fires may develop but are not as common as in fuel model 10. Approximately 15 percent of the project area can be described as fuel model 10. This fuel model is characterized by closed conifer stands with a significant component of dead and down fuels. Fires in this fuel type spread primarily through dead/down fuels on the forest floor and generally burn with greater intensity than fires in fuel model 8. Fires in this fuel model have a higher probability of developing into crown fires, which may lead to large fires with significant mortality when hot, dry and windy conditions persist.

As has already been noted, field observations have indicated that 85 percent of the project area is best represented by fuel model 8 and/or 5. The remaining 15 percent of the project area may be classified as fuel model 10. While field observations are most accurate method of determining fuel models, GIS fuels mapping done for the Forest can also help illustrate how fuels exist in a mosaic across a landscape. The following map (Figure 5) displays fuel model information based on landscape scale interpretation of stand and vegetation information.

Because landscape fuels mapping is done at a coarse scale, it is not as accurate as observations in the field. However, the map below does give an indication of how fuel models exist in a mosaic in the Niner Project Area (Fuel modeling sources: GTR-INT-122, Willamette NF GIS and field obs.).

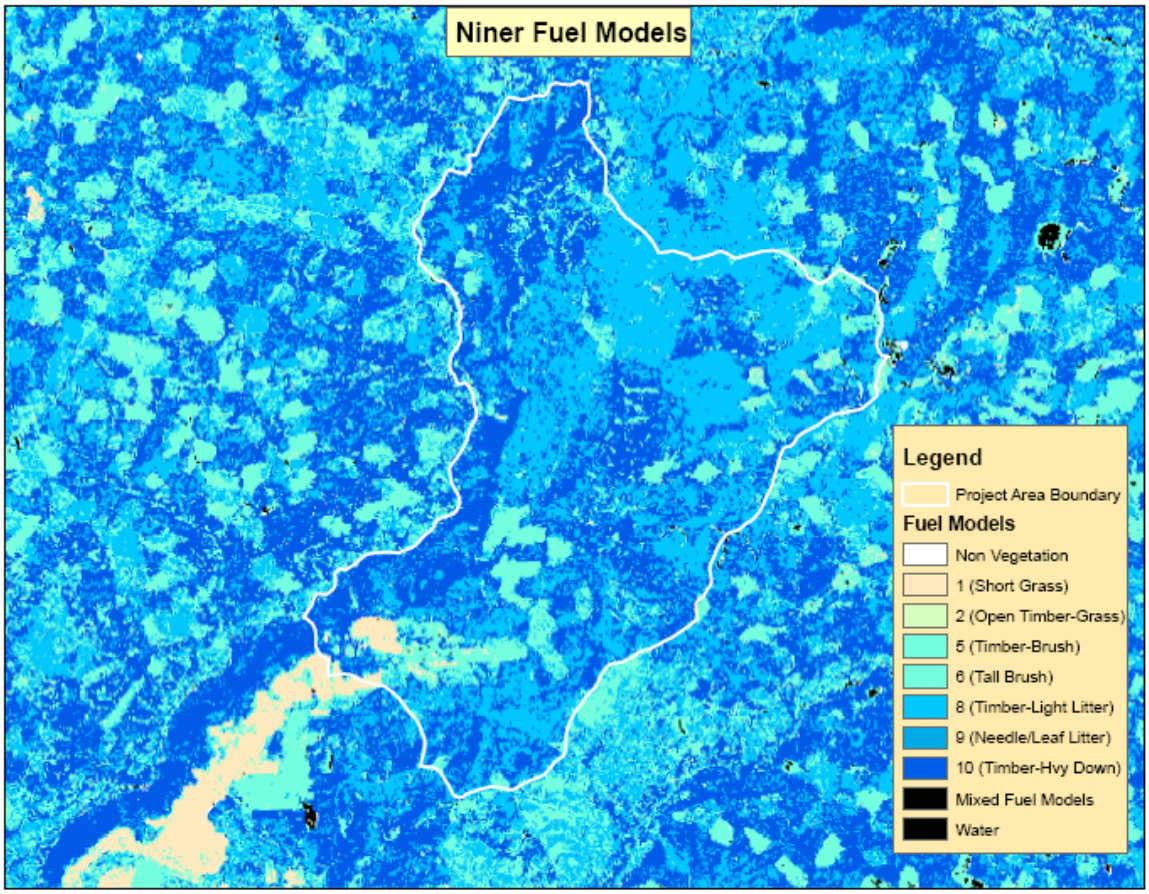

Figure 5 – Map of the Fuel Models in the Project Area

Current Conditions – Fuel Loadings

Fixed area plots were established throughout the project area to determine existing surface and crown fuel loads. Table 27 represents existing surface fuel loads in the project area.

Table 27 - Existing Surface Fuel Loading Estimates+ of Treatment Units

Unit Number	0-3" Fuel Load (tons/acre)*	>3" Fuel Load (tons/acre)	Total Fuel Load (tons/acre)
2,18,19	5-7	40-50	45-57
11-14	3-4	20-25	23-29
15,16	2-4	32-42	34-46
120,121	8-10	85-95	93-105
201-207, 210-213, 215-218, 222	3-4	21-31	24-36
208,209,214,219,220,221	10-13	30-40	40-53

Source: Field Surveys
+Estimates were obtained from planar intercept transects, fixed area plots and ocular estimates. In some cases, surface fuel loads from surveyed stands have been used to model nearby stands with similar characteristics.
*For the purpose of the Niner analysis, 0-3" fuels may also be referred to as fine fuels and >3" fuels may be referred to as coarse woody fuels.

It is well documented that coarse woody fuels have little influence on the spread and intensity of initiating surface fires (Brown et al, 4). Fine fuels are required for fires to spread and gain the intensity needed to ignite heavier fuels. Harvest activities primarily generate fine fuels and create relatively small amounts of coarse woody fuels. In addition, treating coarse fuels on the landscape without treating fine fuels is not feasible. For all of these reasons, coarse woody fuels will not be considered further in this analysis. Coarse woody requirements for wildlife will be addressed in the wildlife section.

Direct and Indirect Effects

Effects Common to Both Alternatives A and B – Fuel Loading

The proposed commercial thinning in the Niner project area would open the stands, creating a forest canopy less susceptible to sustaining a crown fire. Ladder fuels would be reduced as harvest operations remove the vertical fuel continuity. Because heavily thinned stands would have fewer residual trees and more crown spacing, these stands would be less susceptible to crown fires than moderately thinned stands. The proposed treatments for both alternatives includes yarding trees with tops and limbs attached, roadside grapple piling cleanup, pile burning, and under-burning on select units.

The amount of harvest-related slash remaining in a unit depends primarily on the pre-existing surface fuel load and the number of trees to be harvested. In the Niner project area, stands that have been previously thinned would require harvest of fewer trees than stands that have never been thinned (assuming similar thinning prescriptions). As a consequence, harvest generated slash would generally be heavier in previously un-thinned units. In addition, previously un-thinned stands in the project area generally have heavier pre-existing surface fuel loadings. This is true because there are more crowns to shed needles/twigs/branches, and because the un-thinned stands tend to have more dead and dying trees.

Effects of Alternative A – Fuel Loading

Under Alternative A, whole tree yarding would occur on all acres, and roadside grapple piling cleanup would be done on all affected permanent and temporary roads. The additional treatment of prescribed under-burning would occur on 104 acres. As a result of these treatments, residual fuel loadings in approximately 84 percent of the project area would be within forest S&Gs for 0-3" fuels. Fuel loadings on approximately 16 percent of the project area would be above forest S&Gs for several years.

Increased surface fuel loads affect fire behavior by temporarily increasing fire intensity and rate of spread. The increase in fuel loading is temporary because moderate to heavy precipitation in the western Cascade Mountains accelerates the decomposition processes, especially for fine fuels. As a result, fire danger in an untreated stand would be highest 1-5 years after thinning and would decrease significantly thereafter. Studies done by Fahnestock and Dieterich have shown that Douglas-fir slash decomposes to

approximately 79 percent of its original volume after 5 years (Fahnestock 7). Field observations on the Willamette National Forest have indicated that Douglas-fir and Western hemlock slash decomposes to approximately 50 percent of its original volume after 10 years; observations have found that less than 10 percent of residual slash remains after 20 years. This indicates that all harvest units in the Niner Project Area would be within Willamette National Forest S&Gs for 0-3" fuels after 10 years. Because fire spread is primarily driven by 0-3" fuels, S&Gs for 0-3" fuels are used to determine when slash loadings are above acceptable levels.

The following table displays the recommended fuels treatment by unit, predicted post treatment slash loading and percentage of project area occupied by the different fuel loadings:

Table 28 - Alternative A - Fuel Treatment Information+

Unit Number	Recommended Fuels Treatment	Post Treatment 0-3" Fuel Loading (tons)*	Approx. Percentage of Project Area	Current/Post Treatment Condition Class Estimate	Approx. Priority Acres Treated++
2,18,19	YTL/PB/RGPB	17.6, 14.7	4.2%	2/2**	14
11-14	YTL/PB/RGPB	10.0, 8.3	8.2%	1/1	388
15,16	YTL/PB/RGPB	10.3, 8.5	3.4%	1/1	118
120,121,220	YTL/PB/UB	3.0	3.2%	2/1	104
201-207, 210-213, 216-218	YTL/PB/RGPB	9.9, 8.2	64.1%	1/1	209
208,209	YTL/PB/RGPB	17.9, 14.9	6.6%	2/2**	22
214,219,221	YTL/PB/RGPB	18.7, 16.9	4.1%	2/2**	11
215	YTL/PB/RGPB	7.7,6.7	5.2%	1/1	17
222	YTL/PB/RGPB	12.9, 10.5	1.0%	2/2**	3
TOTAL	N/A	N/A	100%	N/A	886

YTL= yarding tops/limbs, PB= pile burning of yarded material
RGPB= roadside grapple pile/burn, UB= underburn
*All numbers are estimates only; second number represents estimated fuel loading after needles have dropped. Predictions are based on a heavy thinning prescription (28'X28' spacing).
**Will become Condition Class I after fine fuels decompose to normal background levels (7-11 tons/acre), or about 10 years.
+Forest S&Gs for 0-3" fuels are 7-11 tons/acre.
++Priority acres treated are defined as acres in Condition Class 2 or 3, road corridors, and/or acres in the Wildland Urban Interface (WUI) which receive treatments sufficient to lower fine fuel loads to levels recommended by the Forest Plan (7-11 tons/acre). Road corridor acres were estimated as 10 percent of total harvest area acres.

As illustrated by Table 28, the fuels treatment for most units under Alternative A is yarding tops/limbs, piling/burning material at roads/landings, followed by excavator (grapple) cleanup of residual debris along all roads and temporary spurs. This treatment is a cost- effective approach to fuels cleanup that also creates fire breaks along project area roads. The amount of slash yarded to roads and landing areas through yarding tops/limbs would be 2-3 tons per acre, depending on the unit being harvested (Ashcraft, Predict Spreadsheet). The primary disadvantage to this type of treatment is that tops/limbs that break off during yarding and that are not within 30 feet of roads/spurs would not be treated. As a consequence, the Responsible Official would accept a small measure of risk until residual slash has decayed to levels within S&Gs, or up to 10 years, as noted previously. In addition, temporary spur roads must be kept open until excavator (grapple) piling fuels cleanup is accomplished. In order to treat all acres on these units, more costly machine and/or hand piling treatments would need to be administered. In any event, the fuels treatment of YTL/PB/RGPB units goes with the caveat that additional treatments may be considered after post-harvest fuel loadings are observed. Such a treatment would consist of either grapple or hand piling of slash.

The fuel prescription for units 120, 121, and 220 is yarding tops and limbs, followed by underburning. This treatment would consume nearly all hazardous fuels but has the drawback of causing mortality in approximately 10-15 percent of residual trees (FOFEM). The underburning would be during spring-like conditions to reduce impacts to soil, existing coarse woody debris, and mortality of the residual green trees.

In summary, approximately 84 percent of the project area would be treated to levels within Forest Plan S&Gs for 0-3” fuel loading. The additional 16 percent of the area would remain above S&Gs for 6-10 years while residual slash decomposes.

Effects of Alternative B – Fuel Loading

Alternative B is identical to Alternative A with regard to the treatments of yarding of tops/limbs, roadside grapple piling cleanup, and under-burning. Alternative B differs from Alternative A in that approximately 524 acres where yarding tops/limbs occurs would receive the additional treatment of hand piling and pile burning. As a result of these treatments, residual slash (0-3” fuels) on all acres within the project area would be within or below forest S&Gs. These treatments would effectively eliminate all uncharacteristic fire risk created by harvest-related logging slash, but at a significantly higher cost than alternative A. Table 28 shows a summary of treatments for alternative B.

Table 29 - Alternative B Fuel Treatment Information+

Unit Number	Recommended Fuels Treatment	Post Treatment 0-3" Fuel Loading Est. (tons)*	Approx. Percentage of Project Area	Current/Post Treatment Condition Class Estimate	Approx. Priority Acres Treated++
2,18,19	YTL/PB/RGPB/HPB	5.0	4.2%	2/1	139
11-14	YTL/PB/RGPB	10.0, 8.3	8.2%	1/1	388
15,16	YTL/PB/RGPB	10.3, 8.5	3.4%	1/1	118
30-41 (compaction)	YTL/PB/RGPB	5.0	2.0%	1/1	0
120,121,220	YTL/PB/UB	3.0	3.2%	2/1	104
201-207, 210-213, 216-218	YTL/PB/RGPB	9.9, 8.2	62.1%	1/1	209
208,209,214,219,221	YTL/PB/RGPB/HPB	5.0	10.7%	2/1	353
215	YTL/PB/RGPB	7.7, 6.7	5.2%	1/1	17
222	YTL/PB/RGPB/HPB	5.0	1.0%	2/1	321
TOTALS	N/A	N/A	100%	N/A	1,360

YTL= yarding tops/limbs, PB= pile burning of yarded material
RGPB= roadside grapple pile/burn, UB= underburn, HPB= hand piling and burning of hand piles
*All numbers are estimates only; second number represents estimated fuel loading after needles have dropped.
+Forest S&Gs for 0-3" fuels are 7-11 tons/acre.
Priority acres treated would be equal in Alternatives A and B.
++Priority acres treated are defined as acres in Condition Class 2 or 3, road corridors, and/or acres in the Wildland Urban Interface (WUI) which receive treatments sufficient to lower fine fuel loads to levels recommended by the Forest Plan (7-11 tons/acre).

Effects of Alternative C – Fuel Loading

Under alternative C, no fuels would be generated from harvest activity and forested stands would continue on a path of natural succession. However, modern fire suppression policies would continue to dictate fire exclusion from the project area. A lack of significant disturbance would mean that stands that were previously managed would continue growing into an overstocked condition. Slow growing and weakened trees would die and contribute to the fuel buildup on the forest floor. Condition class 1 stands would progress towards condition class 2 and 3. Over time, the increasing fuel loads could be associated with greater fire intensity, severity and rates of spread. Fire occurrence on the landscape would continue only under uncontrolled wildfire situations.

Cumulative Effects

Cumulative Effects of Alternative A and B – Fuel Loading

As already noted, fire suppression practices during the past 50 years have caused the greatest cumulative effects with regard to fuels in the project area. Past timber management of the Niner project area has been a secondary factor in influencing cumulative effects on forest fuel loadings. This has resulted in surface fuels loads and crown densities that are generally low-moderate in about 81 percent of the planned harvest area; these areas are represented mostly by fuel models 5 and 8. Surface and crown fuel loads in approximately 19 percent of the planned harvest area are generally heavy, and are mostly represented by fuel model 10.

Since 1970, several commercial thinning timber sales have had the secondary benefit of mitigating the cumulative effects of fire suppression by reducing stand densities on more than 2,000 acres within the 12,862 acre Niner Project area. Past thinning operations that have occurred within the current Niner Project area have included Martin Creek, Rail, Trestle, Fifth, Sixth, Seventh and Ninth thins. Thinning that would occur as a result of the Niner planning effort would thin approximately 900 acres of the project area that have not been previously thinned.

Approximately one-third of forested stands in the project area have never been managed. Surface and crown fuel densities in these stands are similar to un-thinned stands within planned Niner harvest areas. A wildfire in these stands has the potential to become larger and cause more tree mortality than a fire in thinned stands.

With recommended fuel treatments, areas that currently have low fuel loadings are expected to be within forest S&Gs after treatments are completed. From a fire danger perspective, this means that the post-treatment fire risk in these areas would be typical of other healthy stands found on the Forest. Thinning would produce the secondary benefit of long-term resistance to crown fire development and stand destroying fires in the project area. Main roads and spur roads within the project area where residual fuels have been thoroughly removed would serve as access points for firefighters and fuel breaks to reduce continuity of remaining slash. Condition class would improve and stabilize due to lower crown density and lighter fuel loads, especially as residual slash decomposes (Sources: GTR-INT-122, Willamette NF GIS timber sale data, and field obs.).

Cumulative Effects of Alternative A – Fuel Loading

In those areas that currently have heavy fuel loads, post-treatment fuel loads in thinned areas would remain above forest S&Gs for approximately 6-10 years. This would result in higher than normal fuel concentrations in about 16 percent of the planned harvest area. From a fuels perspective, the temporarily higher fuel loads are acceptable for two reasons. First, the lack of recent large fire occurrence in the project area is well documented and is partially the result of flat terrain that makes it easier for firefighters to contain wildfire spread. Second, main road and spur road cleanup of residual slash would result in fuel breaks that separate concentrations of fuels. These fuel breaks would provide access and routes of attack for initial attack firefighters in the event a wildfire occurs in the area. Commercial thinning in the project area would have the secondary benefit of mitigating the cumulative effects of fire exclusion, and condition class would

stabilize or be improved in all stands. As earlier noted, the majority of the 12,862 acre project area has never been thinned and would continue on a path of natural succession that is being unnaturally impacted by fire exclusion.

Cumulative Effects of Alternative B – Fuel Loading

Fuels on all acres of the planned harvest area would be reduced within or below forest S&Gs. The recommended treatments would virtually eliminate the potential for uncharacteristic fire danger that sometimes results from the presence of residual logging slash. These treatments would greatly reduce the chances of stand destroying fires occurring within the next 50 years. As shown in Table 4, condition class would stabilize or be improved in all treated stands. It has already been noted that the majority of stands within the 12,872 acre project area would continue to grow more dense as a result of fire exclusion policies that have continued for more than 50 years.

Cumulative Effects of Alternative C – Fuel Loading

Under the no action alternative, stands would continue on a path of natural succession. Because there has been active timber management in the project area during the past 50 years, most stands in the project area are in relatively good condition. Approximately 54 fire starts have been recorded in or immediately adjacent to the 12,862 acre project area during the era of modern fire suppression (1943-present). Approximately 93 percent of these fires were contained at one-tenth of an acre or less. Four wildfires during the fire suppression era escaped initial attack and burned a total of 2,312 acres. During the pre-suppression era, natural fires in the project area would have burned at least 3,987 acres during the same number of years. This estimate is based upon a natural fire return interval of 200 years, although the actual return interval in probably closer to 150 years (Source: INFMS Fire Regime Mapping). The cumulative effects of fire exclusion during the modern fire suppression era are well-documented and have been observed in fire prone ecosystems throughout the American West (RMRS-GTR-42 vol. 5, p.185-203). Due to the cumulative effects of fire suppression, the buildup of fuels in previously un-thinned stands would become a more significant problem over the next 50 years. Increasing stand density and the accumulation of fuels would inevitably lead to a wildfire that is much more difficult to control than a fire in a thinned stand. Condition class would continue to worsen until future treatments are accomplished or a stand destroying wildfire occurs. A severe, large wildfire may not occur in the project area for 50 years or more, but natural combinations of weather and fuel conditions would ensure that it would happen eventually

Conclusions –Fuel Loading

The fuel treatments in both Alternative A and B is for yarding tops/limbs on all acres. Yarded material would be piled and burned at landings. Under both alternatives, roadside grapple piling cleanup would occur on all affected permanent and temporary roads. Underburning would be done on 104 acres in both alternatives, and would likely cause approximately 10-15 percent mortality in residual trees. Under Alternative B, approximately 524 additional acres would be hand piled and pile burned. Alternative B fuels treatments would effectively eliminate uncharacteristic fire risk created by logging slash. Upon completion, these fuel treatments would improve Alternative B stands to Condition Class 1. Under Alternative A, fire danger in some stands that are not under-

burned or pile burned would increase for up to 10 years until residual slash has sufficiently decomposed. As a result, Condition Class in approximately 16 percent of the project area would not initially improve, but would improve gradually as fine fuels decompose. As a result of slash treatments, priority acres treated would be greater under Alternative B (1,474 priority acres treated).

Air Quality

Current Conditions – Air Quality

The State of Oregon has been delegated authority for attainment standards set by the 1990 Clean Air Act and the 1977 Clean Air Act and its amendments. To do this, the state developed the Oregon Smoke Management Plan. The Forest Service has adopted this plan for National Forest lands in Oregon.

The Oregon Smoke Management Plan establishes designated areas that are principal population centers and Class I airsheds, including wildernesses and other sensitive airsheds. One purpose of the Smoke Management Plan is to protect air quality in these high priority areas. The closest designated area (DA) to the Niner Project area is the Eugene DA, approximately 12 miles to the west. In addition, Oakridge (5 miles SW) has a special designation as a Special Protection Zone. Finally, the Three Sisters Wilderness (13 miles NE) is designated as a Class I airshed. All of these designations mean that burning of slash in the Niner Project Area must be conducted according to strict guidelines established by the Oregon Smoke Management Plan.

Direct and Indirect Effects

Effects of Alternatives A and B – Air Quality

Air quality in the designated areas could be affected by fuel treatments that include pile burning or underburning. The following table illustrates the estimated totals of PM 2.5 and PM 10 emissions (particulate matter 2.5 and 10 microns) according to treatment type.

Table 30 - Project Area Burning Emissions Estimates (tons)

Emission Type	Alternative A*	Alternative B**	Wildfire+
PM 2.5	206	264	1,487
PM 10	243	322	1,619
PM Totals	449	586	3,106

*Based on burning of approximately 660 acres of machine piles (landing and grapple piles) and approximately 104 acres of underburning (machine/grapple pile burning at landings and roadsides would occur on approximately 20% of harvest area acres).
**Based on burning approximately 660 acres of machine piles (landing and grapple piles), approximately 524 acres of hand piles, and approximately 104 acres of underburning.
+Based on wildfire burning on approximately 3,300 acres, late summer conditions.

Prescribed pile burning would occur during fall and winter months according to limitations established by the Oregon Smoke Management System forecaster. Broadcast burning (104 acres in alts. A&B) would occur in mid-late spring (depending on feasibility per spotted owl restrictions). By adhering to the smoke management daily forecast,

smoke impacts on sensitive areas should be negligible (Source: Oregon Smoke Management Emissions Estimates).

Effects of Alternative C – Air Quality

There would be no immediate impacts to air quality as a result of the No Action Alternative. However, the stands would continue to store biomass as they grow and postpone the release of smoke. Eventually a large fire would occur during the summer months when fuels are driest, resulting in high consumption of fuels and large amounts of smoke. Smoke from such a wildfire could blanket the Eugene DA, Oakridge, Bend DA, or one of the nearby wildernesses. This would amount to a significant, negative effect on air quality and visibility in the affected area. The most likely time for a large wildfire to occur is between July 1-September 15, coinciding with outdoor recreation activities and high public use of the wilderness.

Cumulative Effects

Cumulative Effects of Alternatives A and B – Air Quality

No long-term, cumulative effects on air quality are anticipated due to burning associated with this project. All burning would be completed within two years of harvest, and would create far fewer emissions than a wildfire occurring in an area of equivalent size. In order to protect air quality, the Oregon Smoke Management instructions would be strictly adhered to. The Middle Fork District's fire management strategy for prescribed burning is to avoid large, uncontrolled releases of smoke that are produced during large wildfires. By burning slash fuels in one timber sale area at a time, residual fuels are treated gradually and in a controlled manner. For this reason, emissions from prescribed burning are not greater than emissions caused by natural wildfires. The Middle Fork District currently burns approximately 1,000 acres of logging slash per year. Fire history records for the Middle Fork District from 1970-1999 indicate that wildfires burned 31,445 acres on district lands, or an average of 1,048 acres per year. Natural fire return intervals on most of the 750,000 acre Middle Fork District are 100-200 years (INFMS mapping). If we assume (as the established fire regimes suggest) that all lands on the district burned at least once every 200 years, we can determine that the historical (pre-suppression era) average annual acres burned was 3,750 acres (750,000 divided by 200—see FRCC Guidebook). In other words, natural wildfires that occurred prior to the modern fire suppression era created a significantly higher quantity of pollutants than are created by prescribed burning on the district today.

Cumulative effects of Alternative C – Air Quality

The buildup of fuels represents the threat of the uncontrolled release of large amounts of emissions in the event of a wildfire. As earlier noted fire exclusion has exacerbated the buildup of fuels in the project area and made a large wildfire more likely the longer forests go un-thinned. While there is no evidence to suggest that such a release of pollutants would be of any harm to general air quality, it is clear that such an event could have a significant impact on air quality in the Eugene DA. Table 30 gives an indication of the volume of common pollutants that would be released in the event of a wildfire.

Water Quality and Stream Conditions

The Niner project area is located in the North Fork of the Middle Fork Willamette River (NFMFWR) fifth field watershed. The NFMFWR watershed is designated as a Tier 2 key watershed in the Northwest Forest Plan. Tier 2 key watersheds are sources of high quality water and may or may not contain at-risk fish stocks. The project boundary includes the eastern portion of the Eighth Creek sub-watershed, and the northeastern portion of the Dartmouth sub-watershed. Some road work could occur in the Devils Canyon sub-watershed.

Current Conditions – Water Quality and Stream Conditions

Streams of the Niner Project Area

A combination of GIS mapping and field investigations were completed to verify project area stream locations and classification. Formal surveys have been performed on the NFMFWR reach adjacent to the project area and the upper reach of Huckleberry Creek.

Streams within or adjacent to the project area are divided into two distinct types; the large river of the NFMFWR, and the smaller tributaries streams that flow across the Huckleberry Flats.

The NFMFWR occupies a narrow mountain valley cut into an inter-canyon lava flow, and the reach along the project area can be characterized as low gradient; possessing large, deep, infrequent pools; low on in-stream wood due to the nature of the high stream power transport channel which easily floats the large wood out of this reach during large storm events; and having few side channels and braided channels within the narrow floodplain. Due to its low quantity, large woody material plays a minimal role in creating aquatic instream habitats.

The smaller tributaries streams include First, Second, Third, Fourth, Fifth, Sixth, Seventh, Huckleberry, Salal, Martie, Eighth, and Ninth Creeks. These tributaries can be subdivided into high gradient and low gradient streams to characterize their habitat conditions. The high gradient tributaries traverse the eastern valley slopes of the NFMFWR and the low gradient reaches that lie atop the Huckleberry Flats. The valley slope segments (i.e., reaches) of Huckleberry Creek and Eighth Creek are the only fish bearing reaches across this valley feature, with all other valley slope streams lacking fish. Coarse sediment (boulders and cobble) are dominant features in both the streambed and the streambanks of the valley slope channels. These conditions reduce the capacity of the stream to move laterally. These high gradient reaches possess a high degree of habitat complexity that is provided largely by boulders that form pocket pools. Instream wood is commonly found in the high gradient reach of Huckleberry Creek, and adds substantially to the quality and complexity of the habitat. The stream reaches atop the Huckleberry Flats are characterized as low gradient with the composition of the streambed and streambanks dominated by sand and gravel. The habitat is relatively simplified due to the absence of large wood in these reaches. The habitat pattern is one of a low energy, meandering stream in which streambanks provided the resistance to storm flow and account for the development of channel-spanning pools.

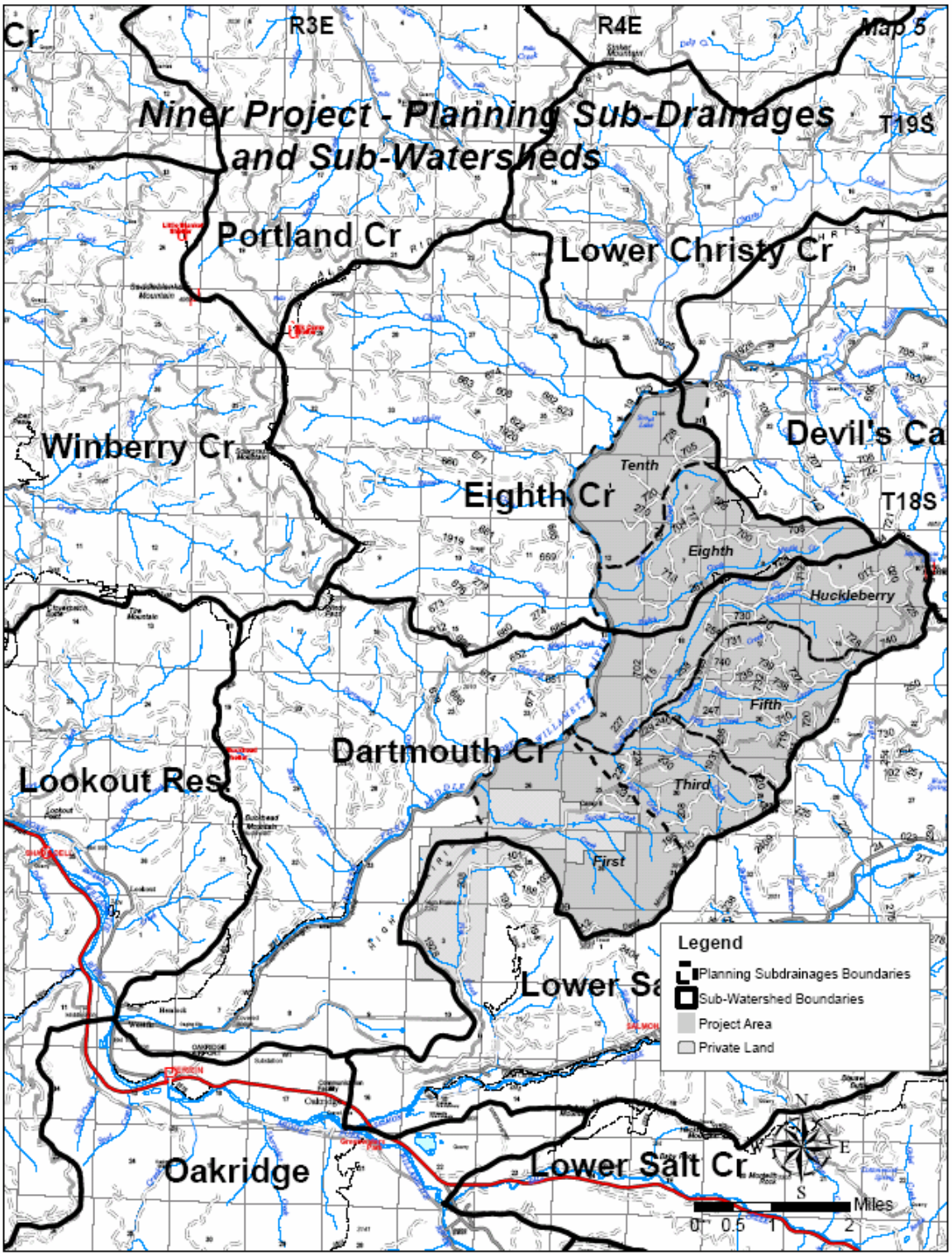

Figure 5 – Map of the Sub-Watersheds and Planning Sub-Drainages in the Project Area

Beneficial Uses of the Streams

The Oregon Department of Environmental Quality (OR DEQ) lists beneficial uses of the streams (Oregon Table 340A, Designated Beneficial Uses Willamette Basin (340-041-0340), November 2003) for the project area including: fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, and aesthetic quality. In addition, other uses downstream of the project area include: public domestic water supply industrial water supply, irrigation, livestock watering, and hydro power.

Turbidity

The recent survey of the NFMFWR (Ecosystems Northwest, 1998) suggests that fine sediment is a minor component of both the streambed and the river's exposed banks, comprising less than 7 percent. However, most surveyed stream reaches within the Dartmouth Creek sub-watershed, reported the streambed and the stream banks were composed of more than 12 percent fine sediment. Huckleberry Creek is the only surveyed stream in the project area; all other surveyed streams are on the west side of the sub-watershed. The NFMFWR watershed analysis (USDA, 1995) noted that the Eighth Creek sub-watershed likely has an influence on sedimentation within both sub-watersheds due to the presence of unstable land types associated with soils of high clay content. These unstable soils have high potential for chronic erosion and debris torrents. Specifically, Chalk Creek has a known earthflow that intersects the stream, and is a chronic source of clay inputs that result in increased turbidity. Past harvest activities and road building have added to the natural instability of the Eighth Creek sub-watershed. The watershed analysis recommends road closures in this area as well as higher midpoint Aggregate Recovery Percentage (ARP) values (i.e., 90) for future harvest planning. ARP is a model used to estimate sub-watershed area vegetative recovery and resilience during rain-on-snow events. It is important to note that the western portion of the Eighth Creek sub-watershed (i.e., Chalk Creek, etc.) is naturally highly erosive, and the streams that drain the west side pose a continual risk of sediment addition to the reaches of the NFMFWR within the project area. The east side of the Eighth Creek sub-watershed is largely within the project area. The soils in the eastern half do not possess similar erosive potential, and the streams on the east side do not appear to be delivering elevated levels of fine sediment into the NFMFWR.

Direct and Indirect Effects

Effects of Alternatives – Turbidity

The direct effect would be a small (immeasurable) increase in turbidity regardless of action Alternative A or B, but a slightly larger impact with Alternative A due to the temporary bridge installation. The direct effect would be pulse of fine sediment at the construction sites and windborne dust drifting directly into streams during the dry season of timber haul, from June through late October. Because the quantity of fines would be so small, it is unlikely that any widespread behavioral changes to forage, feeding, or hiding cover for aquatic species would occur. Individual species that occupy habitats immediately downstream of the temporary bridge or culvert locations may be displaced during the short duration sediment pulse at the construction sites. But the impact would subside within a short timeframe allowing the individuals to re-establish their dominant habitat. There would also be an indirect effect of increased turbidity due to storm runoff

delivering fine sediments from the roads to the streams. The storm runoff would cause a transfer of sediment generated on the road surface into the road ditchline. Most of these ditchline sediments would be redirected through relief culverts, but some segments of the ditchlines drain into the stream. The amount of sediment reaching the stream would be reduced by strategic placement of sediment traps in the ditchline. The net effect would be a reduction of road-derived sediments so any increase in turbidity would be insignificant in magnitude. A positive indirect effect would be the reduction in the overall capacity of the road network to generate fine sediment due to the road maintenance, road closures, and soil tilling that would occur under either action alternative A and B. By reducing compaction through tilling, the rate of runoff would be reduced. By closing roads and removing culverts along those road segments, the likelihood of road failure and the resultant massive pulse of sediment released into the stream network, would be reduced.

There is no direct effect to turbidity from Alternative C – No Action. The indirect effect to turbidity of Alternative C would be that compacted surfaces would remain compacted and road segments would continue to degrade, causing a slight chronic increase in turbidity due to these degraded road segments.

Stream Peak Flow

The effects of timber management within the project area include the potential for changes in base and peak stream flows. Reduced rates of evapo-transpiration due to the timber harvest would contribute to a small increase in water yield, including an increase in summer base flows. The vegetative condition of the area as it relates to management effects on snow accumulation and melt is termed hydrologic recovery. The Aggregate Recovery Percentage (ARP) methodology can be used to quantify hydrologic recovery. For planning purposes, the Forest Plan describes the sensitivity of planning sub-drainages based on the overall slope of the drainage and the percent of the area in the transient snow zone. The planning sub-drainages were assigned a mid-point ARP value as a reference for assessment purposes. The mid-point ARP values provide a relative measure of drainage sensitivity. These may be viewed as thresholds of concern below which there would be a greater risk of increased peak flows and associated adverse effects such as stream bank or channel bed erosion.

Table 31 - ARP Values by Planning Sub-drainages in Project Area.

Planning Sub-drainages Number and Name	Current ARP 2006	Forest Plan Midpoint ARP
172 Tenth	94.6	65
173 Eighth	94.7	70
174 Huckleberry	90.7	70
175 Fifth	93.6	65
176 Third	85.0	70
177 First	75.8	70

All the planning sub-drainages of the project area are currently above the Forest Plan midpoint ARP values. With current ARP values above the midpoint ARP values, the risk of changing stream bank and channel erosion is low for the Niner project area.

Direct and Indirect Effects

Effects of Alternatives – Peak Flows

For both Alternatives A and B, it is anticipated that there would be no increased risk of stream flows, resulting from rain on snow events in the Niner project area.

Table 32 - ARP Values by Alternative by Planning Sub-drainages of the Niner Planning Project

PSUB#	No Action (Alternative C)	Alternative A	Alternative B
	2009 [1)]		
172	95.4	95.3	95.3
173	95.2	94.8	94.8
174	91.8	90.0	90.0
175	94.1	91.8	91.8
176	88.7	88.4	88.4
177	76.7	74.1	74.1
	2014		
172	96.8	96.8	96.8
173	96.2	96.1	96.1
174	94.0	93.6	93.6
175	95.1	94.6	94.6
176	93.7	93.6	93.6
177	78.1	77.5	77.5
	2019		
172	97.7	97.7	97.7
173	97.2	97.2	97.2
174	96.2	96.2	96.2
175	96.3	96.3	96.3
176	96.3	96.3	96.3
177	78.1	78.8	78.8

[1)] Timber harvest year = 2009

For both Alternatives A and B, it is anticipated that there would be no direct nor indirect effect to stream flow, even though rain on snow events in the Niner project area are

common throughout the winter. The current ARP levels are above the midpoint ARP percentages, the level of vegetative recovery at which these sub-drainages would be expected to endure increased peak flows and reduced base flows. The level of exposure after the thinning efforts would not be sufficient to trigger a measurable change in peak or base flows. Therefore, there is no expectation of an indirect effect to flows that would flush fish from their habitat. Nor would the riparian habitat be negatively affected due to increased channel scour or streambank erosion. Table 32 gives the projected changes to the ARP values throughout the expected lifetime of the harvest activities. The table values assume a worst case scenario in which all timber felling would begin and end in 2009, the expected first year of harvest efforts. Comparing the midpoint ARP to the projected ARP for each of the drainages across a ten year timeframe, indicates that proposed activities would not have a measurable effect on the rate or timing of water delivery to the tributaries or to the NFMFWR.

There would be no direct no indirect effects to the peak or the base flows of project area streams by Alternative C (No action). Alternative C permits the current condition to persist.

Soil Erosion

Field reconnaissance (winter 2005/2006) has identified some minor soil erosion from ditch lines and road surfaces resulting in a slight increase in stream turbidity during high-runoff winter storm events. Roads of the project area are mostly gravel surfaced in varying degrees of quality depending on the source and length of time the gravel has been in place. Many of the main roads had been recently maintained with culvert cleanout, ditch line cleanout as needed, and re-crowning for water to run off the road surfaces. As described by the Engineering Technician (Jim Fritz, per. com.), the designed main system roads have experienced a widening from the intended single lane configuration to almost a double lane roadway. Culvert lengths seem shortened due to the to road surface widening. Road surface often appear to run directly into the ditch lines with little roadside vegetation to help minimizing sedimentation. Approximately 2.31 (12,220 feet) miles of road surfaces and ditch lines could potentially interact at stream crossings.

No evidence of surface erosion was observed under forested areas where the surface is covered with either conifer or deciduous tree litter or low ground vegetation. Without disturbance the litter and ground cover is adequate to protect the soils from erosion. No excessive soil erosion was observed in the project area.

Air photo interpretation and field reconnaissance has not detected any landslides or unstable areas. No recent roadside land failures have been identified in the Niner project area.

Direct and Indirect Effects

Effects of Alternatives – Soil Erosion Potential and Land Stability

Table 33 displays surface soil erosion potentials and ranks the soil categories for the Alternatives A and B treatment unit acreage. Land stability potential is displayed in Table 34 and is ranked by soil categories.

The logging methods proposed in each of the action Alternatives have the potential to cause ground disturbance. Tractor ground-based logging ranks highest in ground

disturbance, with skyline second, and helicopter third. About 50 percent of Alternative A's treatment acreage would be tractor yarded, whereas over 80 percent of Alternative B's treatment acreage would be skyline yarded (see Table 10 in Chapter 2). The lengths of temporary roads construction proposed in the Alternatives A and B are 6.3 miles and 5.0 mile, respectively. All proposed temporary roads are located on low to moderate sloped, stable lands. All temporary roads would be restored after completion of the harvest activities.

Table 33 - Acres of Harvest Treatment by Soil Erosion Potential.

Soil Category	Surface Erosion Potential Ranking	Surface/ Subsurface Erosion Potentials	Alt A and B Acres (Percent)
5	First (Least Erosive)	Low to Moderate	2792 (84%)
1	Second	Moderate	15 (0.5%)
2	Third	Moderate to High	15 (0.5%)
4	Fourth	High to Severe	357 (11%)
3	Fifth (Most Erosive)	Moderate to Severe	149 (4%)

Table 34 - Acres of Harvest Treatment by Land Stability Rating.

Soil Category	Erosion Potential Ranking	Land Stability Rating	Alt A and B Acres (Percent)
5	First (Most Stable)	Stable to Moderately Stable	2792 (84%)
1, 2, and 3	Second	Moderately Stable	179 (5%)
4	Third	Moderately Stable to Unstable	357 (11%)

As indicated in the NFMFWR WA, where existing soil erosion has occurred due to past management activities, sites would likely continue to erode at a low rate until vegetative cover is established. Soil erosion effects are not anticipated from the current proposed actions because the vegetation treatments retain more than 35 percent canopy, a no-treatment buffer would protect all streams in the project area, and fuels treatment effects would not increase soil instability. The legacy of a high road densities in the project area (i.e., greater than 4mi/mi^2) suggests that the road ditchlines with direct connection to the stream network would continue to be a chronic source of fine sediment inputs to the streams, but the magnitude of the inputs would be low given the relatively high stability of the roads in the project area. The NFMFWR WA acknowledges that the age of most of the midslope roads is more than 20 years, and that the portion of the road system crossing unstable soils will continue to be at risk, especially on the portion of the Eighth Creek sub-watershed on the west side of the NFMFWR (i.e., the natural earthflow feature

within the Chalk Creek drainage basin outside of the project area). Culvert maintenance will remain a key to preventing substantial road failures that can occur, if they become blocked.

Road Maintenance and Reconstruction

For both Alternative A and B, this project would utilize about 36 miles of existing roads. Approximately 11.1 miles of the roads are native-surfaced, 21 miles are aggregate surface roads, and 4 miles are paved roads (see Table 9 in Chapter 2 for a listing of roads). The aggregate surface Road 1928 would funnel most of the haul to the paved road system. No native surfaced roads would be used for haul during the wet season, and only the aggregate roads would be used for all-season haul.

About 17.5 miles of road maintenance would occur in both Alternative A and B. These haul route roads would receive varying levels of maintenance which may include:

- Brushing the road prism to insure safe visibility during log haul,
- Blading the aggregate surfaced roads to compact the road surface and reduce the potential for rutting and loss of fines soil particles,
- Cleaning the ditch lines where necessary, with minimal disturbance of existing vegetation,
- Replacement and upgrade of ditch line relief culverts to replace those that have rusted out or to increase the size of culvert to meet the standards for expected runoff, The relief culverts drain to permeable soils and do not have a hydrologic connection to a stream channel,
- Hazards tree removal along all haul route roads,
- Spot-rocking the aggregate and native surface roads where needed.

Road maintenance would not be done when soils are saturated or when there is water draining from the road surfaces.

Alternative A and B would reconstruct about 3.95 miles of haul route roads. Approximately 500-1,000 ft. of Road 1928 would be paved north from the FS boundary near the private residential area to reduce dust. About 3.75 miles of Road 1928 would receive new aggregate surfacing where necessary to increase the quality of the surfacing and improve road drainage.

There would be no new permanent roads constructed, but there would be about 6.3 miles of temporary roads constructed in Alternative A and 5.0 miles in Alternative B. The temporary road construction would include vegetative removal to establish the road tread, using an excavator to level the ground in order to create a natural surface road tread, placement of quarry rock if needed to produce a passable tread, and the installation of one ditch relief culvert. All constructed temporary roads would be rehabilitated upon completion of the timber sale activities.

Tables 5, 6, 7, and 8, in Chapter 2 identifies the specific listing of roads scheduled for maintenance, reconstruction, major culvert replacement and their locations, and road closures for Alternative A and B.

All haul roads would be maintained in stable condition with effective surface water drainage. This typically requires blading and dust abatement. Table 9 provides a full list of potential haul routes scheduled for maintenance efforts.

For Alternatives A and B, there would be a short duration of sediment input during the first storm after the road maintenance and reconstruction. Application of the BMPs during the road work on would maintain low sediment input of either aggregate or native surface roads over time.

Alternative C (No Action) would have no road maintenance or reconstruction completed on the roads of the Niner project. Some roads would provide some level of sediment due to their current conditions especially from high runoff winter storm events. Over time, the roads not maintained or reconstructed would likely show a higher level of sediment input than roads that have had regular maintenance or reconstruction work. These effects are likely to be focused at the road stream crossing where the road surface and ditch lines interact

Table 35 – Summary of Road Work by Alternatives

Type of Road Work (miles)	Maintenance	Reconstruction	Temporary Spur Road Construction
Alternative A	17.5	3.95	6.3
Alternative B	17.5	3.95	5.0
Alternative C (No Action)	0	0	0

Stream Culvert Replacement

For both Alternative A and B, the three main haul routes (Roads 1928, 1928700, and 1931) are scheduled to have aged culverts replaced to bring the road surfaces to a level of stability capable of handling the heavy use during log haul: All these roads are located atop the Huckleberry Flats. In order to reduce the amount of sediment entering the live streams, culverts would be replaced in the ODFW in-stream work period with exceptions outside of the dry season, and a de-watering plan would be implemented on all perennial streams scheduled for culvert replacement. Erosion control measures such as spreading straw, seeding, hay bales, erosion booms or other means deemed effective for individual sites would be used when there is potential for off-site delivery of sediment to the streams.

Table 7, Chapter 2 provides a summary of the major culvert replacement plan. All of these culvert replacements would meet estimated flows for 100 year flood event. The culvert replacement work would be restricted to locations where streams are flowing in well-defined channels.

For Alternative C (No Action), no culverts would be replaced. These culverts would remain undersized and continue to deteriorate over time. Given a major storm event, some road flood damage could be anticipated in the future, if the existing culverts remain. For Alternative C, there would be some level of sediment input to the streams of the Niner project area. The amount of sediment would depend on the storm magnitude and the resulting damage to the road system.

Bridge Installation

Alternative A would install a temporary bridge (modular or portable) across Huckleberry Creek to provide log haul access to Unit #209. The location, more than 3.5 miles of channel length from the NFMFWR, would connect an old spur road on the south bank of Huckleberry Creek with the existing spur from Road 1928-712. The site was forded in the past with a log stringer bridge, and decayed elements of the bridge are still present at the site. Since the intent is for the bridge to be removed and the spur to be closed after completion of harvest activities, a simple footing (e.g., wood or steel plate) would be used to reduce the amount of site disturbance and substructure cost.

The installation would not require de-watering and the impacts to water quality are limited to short duration, low intensity pulses of sediment if the installation process makes contact with the log ford that currently exists at the site. After the simple footings are placed, the bridge would be either lifted into place using a crane or "launched" into place by a combination of pulling with cables and pushing with heavy equipment. If a crane is used, approximately 20 cubic yards would be excavated from the existing cut slope on the north side and about 30 feet from water's edge. Potential sedimentation from this excavation would be controlled through the use of sediment retention structures such as hay bales, silt fences, trenching, etc. Minimal vegetation would be removed in the form of minor brush cutting on the log ford and the removal of 3 alders and 3 small diameter conifers on the north side of the bridge site.

Installation and removal of this structure would occur within the ODFW in-stream work period (July 15 to October 15). Additional erosion control measures such as spreading straw, seeding, hay bales, silt fence or other means deemed effective for individual sites would be used if there is potential for off-site delivery of sediment from the construction site to Huckleberry Creek.

Alternative B would helicopter yard Unit #209 and a bridge would not be installed. The stream crossing would remain as it is currently. The stream at the bridge crossing site would continue to recover without disturbance. Sediment input into the stream would remain at current low levels.

Under Alternative C, the stream crossing would remain as it is currently. The stream of the bridge crossing site would continue to recover without disturbance. Sediment input into the stream would remain at current low levels.

Road Closures

For both Alternative A and B, in order to reduce the density of open road miles, approximately 19.5 miles of classified roads would be closed by blocking the entrance to the roads. Closure would reduce disturbance to big game habitat and minimize sediment contribution to streams. See Table 8 in Chapter 2 for the list of roads to be closed and the closure prescription. Most of the roads are scheduled for a low level of closure due to their relatively flat and stable configuration. But all of these roads would be storm-proofed as needed to reduce the risk of storm damage. This type of closure would reduce travel impacts, allowing the roads to naturally re-vegetate and still maintain the low level closed roads in long-term storage mode so that they could be used in the future. The

roadblock devices would be maintained over time to ensure the effectiveness of the closure.

As part of the road closures, about 10 miles of these classified roads would be available for conversion to OHV trails pending a decision on Huckleberry Flats OHV Trail Expansion Project. Access would be restricted to only OHV type vehicles through the placement of boulders or other traffic constrictors. Both action Alternatives include the option of reducing the road tread width by about 5 feet as part of the mitigation measures for soil restoration. This would be accomplished by both blocking access to standard passenger vehicles and tilling approximately 50 to 75 percent of the tread width of these proposed closed roads.

For Alternative C (No Action), there would be no road closures.

Chemical Contamination

There are no known point sources of contamination within the watershed. It is likely that some residential use of pesticides and fertilizers in the first few miles of the river may have led to low levels of contamination, but neither data nor circumstantial evidence exists to affirm such a condition. The City of Westfir uses the streamflow from the NFMFWR as its municipal water source, and their continued monitoring of the water quality of their withdrawals have not shown contaminants to be a concern.

Direct and Indirect Effects

Effects of Alternatives – Chemical Contamination

With timber harvest operations in which any equipment other than hand tools are involved, there is an increased probability of chemical contamination as a result of machine failure. A leaking fuel tank or a blown hydraulic line could release contaminants indirectly to the streams. The record of past projects clearly indicates that the probability of a effect of contamination is discountable. Since the majority of the machine activity is outside of the no-treatment buffer, and given the capacity of the soils to adsorb contaminants, and the required mitigation of spill kits available during all machine operations, the likelihood of an indirect effect to habitat through the migration of contaminants to the streams is very small. For both action alternatives A and B, the probability of either a direct or indirect effect to water quality as a result of chemical contamination is discountable.

There are no direct or indirect effects to water quality due to chemical contamination via the Alternative C because of no use of machinery.

Stream Temperatures

Stream temperature data has been collected by the Forest Service at several locations within and adjacent the Niner project area. Above the proposed project area at Road #1925 (closest site near the upper stream reach of the project area) the NFMFWR's 7-day maximum average temperatures for the years 2000 thru 2003 are respectively 18.2, 18.3, 18.5, and 17.9 degrees C. Below the proposed project area at Road #1912 (closest stream temperature downstream from the project area) the NFMFWR's 7-day maximum average temperatures for the years 2000 thru 2003 are respectfully 19.2, 19.8, 19.7, and 20.2 degrees C. Near the mouth of NFMFWR in 2004, off Federal lands, the 7-day average

maximum for the lowest site on the NFMFWR was recorded at 22.3^{o}C (72.1^{o}F). The lower 11 miles of the NFMFWR are believed to be used by adult Chinook for rearing and as a spawning migration corridor and these same reaches are available to foraging bull trout adults. No bull trout have yet been documented within this watershed. This portion of the NFMFWR which is adjacent and influenced by streams draining from the Niner project area is listed by Oregon Department of Environmental Quality (OR DEQ) as 303d water quality limited for stream temperature. No other streams are listed in the project area, and maximum daily temperature data taken during the survey of Huckleberry Creek (Ecosystems Northwest, 1998) never exceeded 14^{0}C (i.e., 57^{0}F). Since Huckleberry is the largest NFMFWR tributary within the project area, this suggests that there are not likely to be any other reaches in the project area that have temperature concerns.

Past management of the Niner project area has affected most of the stream side riparian vegetation of both permanently flowing streams (Class II, and III) and the non-permanent (intermittent) streams (Class IV). Currently trees cover most of the riparian reserves of the Niner project area. The tree height ranges from 111 to 126 feet for the Niner project riparian areas. Average tree height is 119 feet.

Many of the streams of the Niner project area are oriented in a east to west direction and existing tree covered riparian areas provide adequate shading for the streams of the Niner project area. For shade values higher than 80 percent some small benefits are gained in stream temperature reduction. Most of the streams in the Niner project area are nearly 100 percent shaded from the adjacent riparian area forest.

An effective shade distance for the streams of the Niner project area would be from approximately 38 to 43 feet (USDA and USDI, 2005). The 38 to 43 feet would be considered a primary shade zone and provide for nearly 100 percent shade during the primary hours of 1000 -1400 (most critical period).

Some shading would come from trees in the secondary shade zone and other topographic shading (surrounding topography and inner gorge relief) would provide additional shade to the narrow stream channels averaging 6 feet in width. During those periods outside of 1000-1400, there would be partial shading from the secondary shade zone. Maintaining an overall effective stream shading of 80 percent or greater, the likelihood of any measurable downstream changes would be none (Boyd, 1996). The non-permanent flowing streams (class IV) would not have any effect on stream temperature since intermittent streams do not contribute to stream heating during the peak temperature time period of July through September (USDA and USDI, 2005). Maintaining effective shade for the primary shade zone area on all permanently flowing streams, there would not be any measurable temperature change in the permanent (perennial) streams of the project area or adjacent NFMFWR.

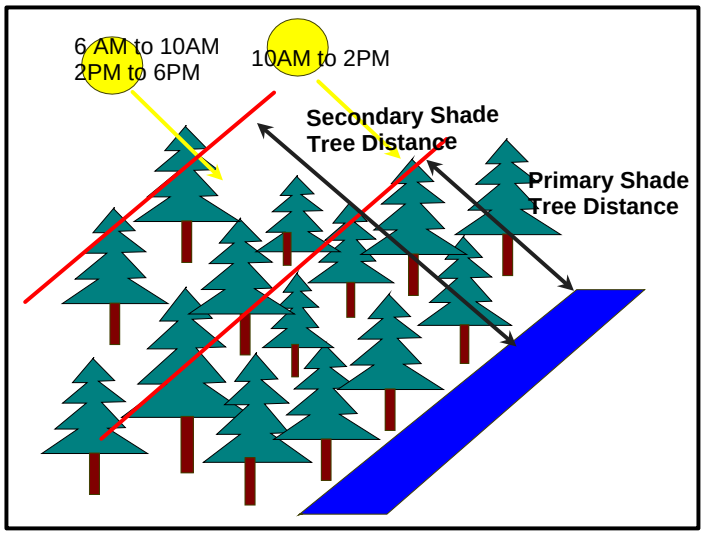

Figure 6 - Relationship of primary and secondary shade zone (USDA and USDI, 2005)

Direct and Indirect Effects

Effects of Alternatives – Stream temperatures

See the section on Riparian Management below for discussion of the affects of the Alternatives on stream temperatures.

Cumulative Effects –Soil Erosion, Turbidity, Stream Peak Flows

The cumulative effects to water quality were considered at the sub-drainage level and at the entire NFMFWR watershed. Appendix B contains a summary of the past harvest and foreseeable future timber sales within the entire NFMFWR watershed. As indicated in the NFMFWR Watershed Analysis, existing soil erosion has occurred due to past management activities and may continue at some level until vegetation cover is established. Some short-term soil erosion effects are anticipated from the proposed actions. However, as BMPs are implemented and vegetation recovers to protect the area, soil erosion would be reduced to the background rate. No other foreseeable management actions are anticipated that would affect the vegetation cover and subsequent land stability of the area. The potential for cumulative erosion and stream turbidity would decrease as the vegetation recovers over the area.

At the sub drainage analysis scale, no reasonably foreseeable future actions in the project area would affect the current ARP values. It is anticipated that there would be vegetative recovery over time (refer to Table 32 displaying ARP values for 2009, 2014, and 2019), reducing sensitivity to rain-on-snow events. None of the project's alternatives have any measurable capacity to change the cumulative effects to water quality from past activities.

Conclusions

The thinning proposed in both action Alternatives A and B would cause a slight, but immeasurable increase in fine sediment delivered directly to the stream network via the

road ditchlines or bridge. The road maintenance and soil tillage treatments would reduce the capacity for runoff to transport fine sediment to the stream network.

Alternative A and B would not lead to measurable changes in peak streamflow as a result of an rain on snow event because the thinning would maintain about 40 percent canopy cover and there would not be any large clearings created.

The effect of Alternative C - No Action would be a quicker recruitment of natural wood to the streams, but at a smaller size class, due to competition as discussed above. The currently undersized culverts that are scheduled for replacement would continue to present a risk of plugging during a stormflow event, with plugging causing the road to fail, and this failure substantially increasing the amount of fine sediment entering the stream network. The condition of the roads and compacted soils would persist and continue to influence peak flows that are a response to the inability of the forest soils to absorb precipitation. An indirect effect of the Alternative C would be that compacted soils would remain compacted and road segments would continue to degrade, causing a slight, but immeasurable, increase in turbidity as these degraded road segments continues to add sediment to the stream network.

BMPs would be implemented for all the harvest activities and road work proposed by the Alternative A and B. Soil erosion from the managed road segments and landing features would be kept to a minimum. All temporary roads (except about 1 mile) would be restored completely following the harvest activities. The harvest operations and road maintenance would result in an increased sediment delivery potential at the site scale (primary pathway is stream road crossings) but diminish at a larger watershed scale, due to the storage capacity of the immediate stream channels and the long distance to the NFMFWR. In addition to the BMPs, the no harvest stream buffer zones provide vegetative cover on permeable lands adjacent to roads, skid trails, and landings that would act as a sediment trapping feature to any runoff possibly reaching the stream channels. The effects of sediment from the roads, skid trails, and landings is anticipated to be short term and diminished to produce an immeasurable turbidity change, as BMPs are implemented.

Riparian Management

Current Conditions – Riparian Management

Large Woody Debris

The large woody debris (> 24 inch diameter) was inventoried and summarized by 6th field sub-watersheds. See Figure 5 for a map and location of the sub-watersheds. The Dartmouth Creek sub-watershed which includes the lower section of the NFMFWR averaged about 1.2 pieces of LWD per mile and its tributary streams (e.g., Huckleberry Creek) averaged 15 pieces of LWD per mile. The sections of NFMFWR located in the two upstream sub-watersheds, Eight Creek and Devils Canyon, were inventoried with slightly higher number of LWD per mile. Eight Creek ranged from 0.3 to 8.2 pieces per mile and Devils Canyon ranged from 5.5 to 12.1 pieces per mile. These values are still low compared with the threshold standard of 80 pieces/mile that are >24” diameter.

No stream surveys have been conducted on the tributaries within the Eighth Creek and Devils Canyon sub-watersheds. It is reasonable to assume that Huckleberry Creek would

represent a good indication of conditions in these tributaries due to the morphological similarity of all streams draining the Huckleberry Flats, and the similarity of past management efforts along the riparian corridors of all of these west-draining streams. It is likely that the conditions occurring in Huckleberry Creek would be repeated in the tributaries to the NFMFWR within the Eighth Creek and Devils Canyon sub-watersheds (i.e., Eighth, Ninth, Tumble Creeks).

In the short-term, the supply of potentially recruited large wood in the watershed is probably sufficient to maintain current densities of in-stream wood. In the long-term, the quality and quantity of significant woody material) is expected to improve as previously managed stands within the watershed mature, and pieces of LWD are recruited into the NFMFWR channel.

For complete description of the inventoried riparian and stream conditions refer to the Watershed Report in the Analysis File (Murdough, 2006)

Direct and Indirect Effects

Effects of Alternative A and B – Riparian Management

Riparian area no harvest buffers for action alternatives are described in Mitigating Measures Common to the Action Alternatives in Chapter 2. The riparian area no harvest buffers would be established along all streams and wet areas within or adjacent to the harvest acres. Fish-bearing streams (Class 1 and 2) in the project area include the NFMFWR, Huckleberry Creek, Second Creek, Third Creek, Fourth Creek, Fifth Creek, and Sixth Creek, Seventh Creek, and Eighth Creek. There are several intermittent and perennial streams (Class 3 and 4) within the project area which lack fish. No timber felling would occur within the stream corridor defined by the widest of three conditions: the primary shade zone, the inner gorge or the floodplain of a stream. Adjacent to the NFMFWR, no harvest activity would occur within 170 ft. from the channel. The average distance from nearby proposed thinning units to the NFMFWR is 385 ft. The ditch-line for Road 1900 would function as the boundary for five of the proposed thinning units nearest the NFMFWR. For most of the streams associated with planned thinning units, the no-harvest corridor would typically be 40 to 60 feet, measured from the high water mark. The outer 110 to 130 feet of the Riparian Reserve associated with these streams would receive the same thinning prescription as the upland acres within the associated harvest unit. In order to include all of the floodplain along Huckleberry Creek, the no-harvest corridor adjacent to Huckleberry Creek would be considerably broader, ranging from 200 to 600 ft. The remainder of the Riparian Reserve for Huckleberry Creek would receive the same harvest prescription as the adjacent upland acres. All timber would be directionally felled away from the stream channels and no yarding is planned through the no harvest buffer zones of the Riparian Reserves to reduce the chance of disturbance.

The thinning treatments in the riparian reserves would maintain and/or restore the hydrologic functions, water quality, and riparian processes. Stand densities reduction in the outer portion of the riparian reserves would restore species composition, structural diversity and large wood recruitment potential.

Table 36 - Riparian Reserve Acres proposed to be Thinned in Alternative A and B

Unit (1	Perennial Riparian Reserves Thinning (acres)	Intermittent Riparian Reserve Thinning (acres)	Wetland Riparian Reserve Thinning (acres)	Total Riparian Reserve Thinning (acres)
11A	6.25	-	-	6.25
11B	4.15	1.13	-	5.27
11C	1.62	0.53	-	2.16
11D	-	-	-	0.0
12	2.59	8.29	-	10.88
12A	0.41	-	-	0.41
13	-	20.12	-	20.12
13A	-	6.80	-	6.80
14	9.19	23.22	-	32.42
15	-	4.90	-	4.90
15A	-	5.04	-	5.04
15C	-	3.21	-	3.21
16	0.23	4.06	-	4.29
18	-	7.15	-	7.15
19	-	9.10	-	9.10
29	-	-	-	0.0
30	-	-	-	0.0
31	-	-	-	0.0
32	-	-	-	0.0
33	-	-	-	0.0
34		-	-	0.0
35	-	-	-	0.0
36	-	-	-	0.0
37	-	-	-	0.0
38	-	-	-	0.0
39	-	-	-	0.0
40	-	-	-	0.0
41	-	-	-	0.0
120	-	0.03	-	0.03
121	-	-	-	0.00

Unit (1	Perennial Riparian Reserves Thinning (acres)	Intermittent Riparian Reserve Thinning (acres)	Wetland Riparian Reserve Thinning (acres)	Total Riparian Reserve Thinning (acres)
201	-	1.40	-	1.40
202	14.35	17.40	-	31.76
203	10.77	5.68	-	16.45
204	63.26	0.15	4.39	67.80
205	65.02	1.39	14.70	81.10
206	14.11	-	0.25	14.36
207	14.11	-	-	14.11
208	5.15	16.31	-	21.46
209	0.13	10.98	-	11.11
210	-	1.97	-	1.97
211	11.60	3.86	-	15.46
212	20.49	30.58	-	51.07
214	-	5.20	-	5.20
215	5.62	30.83	-	51.07
216	-	15.65	-	15.65
217	10.63	5.22	-	15.85
218	-	4.10	-	4.10
219	-	9.82	-	9.82
220	-	1.99	-	1.99
222	2.40	7.13	-	9.53
223	15.34	-	-	15.34
Total (acres)	277.42	263.24	19.35	574.63

A total of about 575 acres of the riparian reserves would be thinned in both Alternatives A and B. The 575 acres of riparian thinning is 15 percent of the 3,915 total acres of riparian areas within the project area.

Under both alternative A and B, the primary shade zone is retained and effective shade is maintained. No management activities are planned that would significantly affect existing stream shading of permanent flowing streams. Some shading would come from trees in the secondary shade zone and other topographic shading (surrounding topography and inner gorge relief) would provide additional shade to the narrow perennial stream channels. By maintaining an overall effective stream shading of 80 percent or greater,

the likelihood of any measurable downstream temperature changes would be zero (Boyd, 1996). The non-permanent flowing streams (class IV) would not have any effect on stream temperature since intermittent streams do not contribute to stream heating during peak temperature time periods (USDA and USDI, 2005). Maintaining effective shade for the primary shade zone area on all permanently flowing streams would prevent any measurable temperature change in the permanent (perennial) streams of the project area or adjacent NFMFWR. The primary shade zone riparian reserve buffer would protect the streams from changes in stream temperature for the project area and immediately downstream of the project area.

The no-harvest buffers adjacent to streams and the road-related BMPs would insure that only minor amounts of fine sediment would make their way into any stream in the project area. Culvert and temporary bridge activity are the probably the greatest contributors to a direct effect on riparian habitat from sediment additions, but the short duration in which these additions would occur suggests that there would be no lasting measurable effect on the habitat indicators. This minimal addition of fine sediment would be added to streams that have evolved in a location where the streambed and its banks are dominated by fine sediment. It is highly unlikely that any measurable direct effect to habitats, such as pool filling, would occur due to impacts under either Alternative A or B. Stream cover would remain unaffected since no trees within the primary shade zone would be cut; off-channel habitat would likely remain a minor contributor to total available habitat due to the legacy of the low density of instream wood. The channels' bankfull width to depth ratios would remain unchanged, since there would not be a change to the predictable bankfull streamflow as a result of Project activities.

Alternative A and B would result in a reduction in the total available number of trees that serve as the supply source for instream LWD. The trees growing within one site potential tree height of a stream channel make up the large majority of the potential recruitment trees that may, over time, fall and interact with the stream channel, to function as LWD. Depending on the steepness of the side slopes on either side of the channel, trees may be recruited from further up the slope than one site potential tree, as the tree falls and slides down the slope. For the purposes of this assessment, it is determined that any tree within 200 feet of any stream channel is classified as a potential stream recruitment tree (site potential tree height of 170 feet + potential sliding distance of 30 feet = 200 feet). The probability of any given tree being recruited to a stream channel is closely related to the distance from the channel, so that trees growing further from the stream channel have a much lower probability of falling and interacting with the stream then a tree growing on the stream bank.

There are 12 perennial streams, and approximately 16 miles of stream (both intermittent and perennial) adjacent to proposed harvest units. Assuming an average of 125 ft.-wide harvested portion of the potential tree recruitment zone (200 ft minus the average width of the riparian reserve no-harvest buffer), Alternative A and B would affect approximately 485 acres of the potential LWD recruitment zone.

The growth response of the leave trees after the thinning would provide a long term benefit to direct wood recruitment into the NFMFWR and tributaries. Alternative A and B would enhance the availability of large trees in the potential recruitment zone as trees growth in both diameter and height from the effects of the thinning. The remaining trees

in the thinned stand (at an approximate density of 65 trees per acre) within the 170 to 200 ft. zone would grow more quickly to a size that would make their recruitment into the NFMFWR more likely to have a beneficial effect on the LWD in streams. It would take about 30 years for these trees to grow to a size where the wood is capable of enhancing the stream habitat.

The thinning of the outer portion of the Riparian Reserves would reduce the total supply of available woody material in the watershed and potentially indirectly effect the wood recruitment into the NFMFWR. However, with the exception of Huckleberry Creek, the tributaries adjacent to harvest units and with a direct connection to the NFMFWR average less than 8 feet bankfull width and lack the power to transport wood under all flows except the most extreme (e.g., a debris torrent). These conditions suggest that these tributaries have very little capacity to deliver wood via normal streamflow to the NFMFWR. Most wood transported to the NFMFWR from the harvest units riparian area would be delivered by Huckleberry Creek. Huckleberry Creek is the only tributary with enough stormflow energy to transport large woody debris. Given the present stand condition, the only size class of woody material likely to be delivered in the next 30 years via this tributary would be of the small size (less than 24 inches).

The indirect, long term effect of the Alternatives A and B to riparian habitat would be positive due to several factors. The expected acceleration in the growth rates of the residual trees beyond the no-harvest zone would likely increase the capacity of the thinned portions of the Riparian Reserve to deliver functional wood to the streams. Thinning in the Riparian Reserve beyond the primary shade zone would provide the conditions for rapid tree growth in the treated portions that over time would yield an increase large, persistent wood in the Huckleberry Flats streams that currently lack it. As more wood is delivered, habitat complexity, available cover, and the accumulation of spawning gravels would all increase. Road maintenance and closures, soil tilling, culvert removals, and the reduced susceptibility of the treated stands to wildfire resulting from fuels treatments would reduce the chronic influx of fine sediment that causes habitat degradation.

Effects of the Alternative C (No Action) – Riparian Management

There are no direct or indirect effects to temperature of the Alternative C because stream temperature is a function of shade which would not be affected.

There would be no direct effect to riparian habitat with Alternative C. The indirect effect to habitat of the Alternative C would be mixed. The present riparian forest would begin to self-thin due to competition, and this self-thinning would lead to natural recruitment of large woody debris. For the streams on Huckleberry Flats, the present stand of trees would be of adequate size to be persistent in these small streams; and forming more pools. This new wood would be small diameter than would be expected from the stands produced by the action alternatives. At this smaller size, such wood would have little influence on habitat within the NFMFWR because powerful stormflow would move this class of small woody debris. Low level habitat degradation from fine sediment would continue.

Cumulative Effects – Riparian Management

The NFMFWR fifth field watershed has approximately 39 percent of the area in Riparian Reserves. On a watershed scale, past regeneration harvest has occurred within approximately 20 percent (12,106 acres) of the NFMFWR watershed's riparian reserves. The stream temperatures, peak flow, and riparian vegetation condition are a reflection of this past timber management activities and have contributed to the OR DEQ 303d listing of the NFMFWR for stream temperature. The riparian reserve thinning proposed in Alternatives A and B would not add to the cumulative effects on stream temperatures and peak flows at a watershed scale. There is no proposed riparian thinning that would affect: 1) the primary stream shade of permanently flowing streams; 2) no canopy cover changes that would decrease ARP values, resulting in higher stream peak flows; and 3) no actions in the foreseeable future that would change riparian vegetation. Alternative C would not affect riparian vegetation and therefore have no cumulative effect.

On a sub-watershed scale, Dartmouth Creek and Eighth Creek have been significantly altered by previous harvest, with riparian harvest a major component of the change. Nearly 30 percent of the Riparian Reserves of these two adjacent sub-watersheds has had stand replacement harvest in which the entire canopy component was removed. By comparison, the adjacent upstream sub-watersheds of Devils Canyon and Fisher Creek have had a Riparian Reserve harvest of just over 20 percent. The NFMFWR has been listed as water quality limited for temperature, and this listing reflects the degree to which past clearcut harvest within the Riparian Reserve continues to influence the stream. Although not listed for temperature levels, certain tributaries are likely adding warm water to the NFMFWR reflecting the slow rate of recovery from past Riparian Reserve harvest. The result is elevated temperatures in the NFMFWR that will likely persist.

The project would protect 100 percent of the primary shade zone. Thinning in Riparian Reserve would occur beyond this zone. However, that riparian harvest would still retain more than 35 percent of the existing canopy after harvest, and this added shade during mornings and afternoons would nearly eliminate direct warming by sunlight. Therefore, there is a low probability of changes to stream temperature following harvest. Table 35 presents treatment units and acreages of riparian thinning for both Alternative A and B.

Since little of the effective shade would be removed by the action Alternatives, there would not be any measurable change to the heat load of the NFMFWR. The stream temperature of the river would be unaffected by the project activities. Because the project area is located in the sub-watersheds occupying the lowest third of the NFMFWR watershed, past management in the upstream portion of the watershed has greatly influenced the aquatic conditions in the reaches of the NFMFWR within the vicinity of the Project. Previous harvest efforts within the project area have affected project area fish-bearing habitat. Past riparian harvest in the managed sub-watersheds of the NFMFWR watershed totals more than 30 percent. Temperatures within the NFMFWR have increased 2 to 4 ^{0}C due to riparian harvest and channel widening (USDA, 1995). The NFMFWR tributaries within the project area would continue to have little effect to stream temperature due to two factors. The streams of the project area account for a small percentage of the total streamflow of the NFMFWR (less than 2 percent); and the primary shade zone of every stream would receive total protection. A natural mitigation to temperature increase is the nature of the tributary reaches that merge with the NFMFWR.

The coarse nature of the streambeds permits cooling of the surface water by contact with hyporheic flow within the streambeds of these reaches immediately adjacent to the NFMFWR. Regardless of the Action alternative selected, there would not be any additional cumulative impact to temperature. Temperatures would remain unchanged by the implementation of either Action alternative.

Alternative C (No Action) would also have no impact to temperature of any tributary stream or to the NFMFWR. The NFMFWR and its tributaries would continue to bear the heat load that derives from past riparian harvest.

Conclusion – Riparian Management

Riparian management was evaluated on the acres of riparian area thinned and a discussion of the potential for change to the water quality and remaining riparian vegetation. There is no difference between the Alternative A and B as the treatment acres and riparian prescriptions are the same. With thinning in riparian reserves to increase diameter growth of residual trees, both Alternative A and B promote creation of large wood for future recruitment into the streams. Thinning would also improve species and structural diversification by releasing understory shrubs and hardwoods which promote the development of multistoried canopies. The riparian thinning prescription retains a primary shade zone and portions of a secondary shade zone which would maintain stream temperatures. Maintaining stream temperatures in the project area streams would result in stable temperatures of downstream OR DEQ, 303d temperature listed streams. The harvest prescription maintains canopy cover and there would not be an increased peak flow to change the stream channels and associated riparian vegetation. Alternative C (No Action) would move the riparian areas toward desired future conditions at a steady natural rate.

Consistency with Direction and Regulations

Northwest Forest Plan and Aquatic Conservation Strategy

An integral part of the Northwest Forest Plan is the Aquatic Conservation Strategy (ACS). The ACS is intended to maintain and restore the ecological health of the watersheds and ecosystems within the Northwest Forest Plan area. The Northwest Forest Plan was amended in March 2004 to clarify provisions relating to the ACS. The objectives of the ACS are intended to apply only at the fifth-field watershed scale. Attaining these objectives at these large scales may take decades or longer and the effectiveness of the strategy can only be assessed over the long-term. Although application of the standard and guidelines in the Northwest Forest Plan limit the potential for adverse effects to occur from the implementation of individual projects, the ACS objectives are not intended to be interpreted as standards and guidelines for individual projects. Compliance with the ACS in regard to ongoing and potential future projects is to be evaluated at the fifth-field watershed scale. Compliance with current standard and guidelines and implementation of appropriate Best Management Practices (BMPs) (USDA, 1988) would insure the action Alternatives A and B compliance with ACS objectives at the fifth-field scale.

Clean Water Act

The action Alternatives A and B would comply with the various water quality goals of the Clean Water Act through on the implementation of BMPs for preventing and reducing the amount of non-point pollution sources.

Turbidity

The current State of Oregon turbidity standard (OAR 340-41- (Basin)(2)(C), allows no more than a ten percent cumulative increase in natural stream turbidities. It is not anticipated that any of the activities proposed for the Niner project would generate sediments that would exceed the current State of Oregon standards for stream turbidity increases. BMPs would be implemented to minimize the stream turbidity affects from all the management activities proposed. In addition all erosion control methods would be utilized should any unforeseen soil disturbance conditions occur during project implementation.

Sufficiency Analysis for Stream Temperature

All alternatives maintain shade in compliance with Clean Water Act and state water quality standards for stream temperature. The riparian thinning prescription retains a primary shade zone and portions of a secondary shade zone which maintains stream temperatures. Maintaining stream temperatures in the project area streams would maintain temperatures in the NFMFWR downstream on the project area.

Fisheries

Current Conditions – Fisheries

Fish habitat within the project area is limited by natural migration barriers that occur on nearly all of the tributaries to the NFMFWR. Of the streams that drain the project area and are direct tributaries to the NFMFWR, only Eighth Creek and Huckleberry Creek support fish populations. However, there are several fish bearing tributaries to Huckleberry Creek that lie atop the Huckleberry Flats.

The NFMFWR provides habitat for two ESA-listed species, the Willamette spring Chinook (*Oncorhynchus tshawytscha*) and Columbia River bull trout (*Salvelinus confluentus*); although bull trout are not known to presently use the NFMFWR in the project area. Additional resident species also use this segment of the NFMFWR, including rainbow trout (*Oncorhynchus mykiss*), cutthroat trout (*Oncorhynchus clarkii*), mountain whitefish (*Prosopium williamsonii*), largescale sucker (*Catastomus macrocheilus*), speckled dace (*Rhinichthys osculus*), redside shiner (Richardsonius balteatus), torrent sculpin (*Cottus rhotheus*), Paiute sculpin (*Cottus beldingi*), and shorthead sculpin (*Cottus confusus*).

The Forest Plan separates the assemblage of fish species into two groups of "Management Indicator Species" (i.e., MIS); the anadromous MIS and the resident MIS. An MIS is a species whose condition can be used to assess the impacts of management actions within a particular area (USDA 1990). The anadromous MIS specie in the NFMF watershed is the Willamette spring Chinook salmon. The list of resident MIS within the streams of the watershed includes native and nonnative fish (USDA, 1995) and can be segregated into two groups based on sensitivity to declining water quality. The more

sensitive group includes bull trout, rainbow trout, cutthroat trout, mountain whitefish, sculpin, torrent sculpin, and shorthead sculpin. The group with greater tolerance to higher temperatures and greater concentrations of fine sediment include western brook lamprey, largescale sucker, speckled dace, and redside shiner.

The only native fish living in the Huckleberry Flats stream segments of Eighth Creek and Huckleberry Creek and its tributaries is cutthroat trout (*Oncorhynchus clarkii*). Eastern brook trout (*Salvelinus fontinalis*), a non-native species, is also present in Fourth Creek, a tributary to Huckleberry Creek atop the Huckleberry Flats. Culverts along Road 1928 pass water for several fish bearing Huckleberry Creek tributaries; however, these old culverts fail to provide passage for all age classes of fish under all flow conditions. Fish habitat atop the Huckleberry Flats is dominated by low gradient reaches with fine sediment dominant in the streambed and banks, relatively low habitat complexity, and low densities of large wood.

The Dartmouth Creek and Eighth Creek sub-watersheds are believed to have historically provided marginal spawning and rearing habitat for spring Chinook and foraging habitat for bull trout. The Devils Canyon sub-watershed upstream of the project area provides a significant portion of the spawning habitat for Chinook in the watershed. Based on the size of the watershed, quantity of flow, and the downstream location of Dartmouth Creek and Eighth Creek in the NFMFWR watershed, spring Chinook salmon are not believed to have used substantial portions of any streams within or adjacent to the Project area, other than the main stem of the NFMFWR. While the mouths of tributaries to the NFMFWR may have provided some winter refugia, their small size and steep gradients would have prevented their use as spawning streams. Currently, the lower reaches of the NFMFWR do not provide substantial spawning habitat for spring Chinook. The lower NFMFWR reaches provide a reduced level of rearing habitat for spring Chinook juveniles when compared to historic use, due to the lack of large wood and elevated stream temperatures during the summer.

Bull trout are currently reintroduced into the upper Middle Fork Willamette River (MFWR), approximately 23 miles upstream of the confluence of the NFMFWR with the MFWR. Should bull trout pass through the Hills Creek Dam project into the MFWR below Hills Creek, they would have unimpeded access to the NFMFWR Willamette River system. At present, there have been no confirmations of bull trout within the NFMFWR watershed.

Little is known concerning the population sizes of the non-anadromous species in the project area. Populations using the NFMFWR appear to be healthy from data collected during a recent stream survey to assess the population sizes. However, the survey method is known to favor water column fish and older age classes, such as adult trout, and to under-represent the younger age classes and benthic species, such as sculpin. Habitat conditions suggest that the populations of these resident fish are stable.

Direct and Indirect Effects

Effects of Alternatives A and B – Fisheries

As discussed in the previous water quality and riparian management sections, the direct effects of both action Alternative A and B to fish are likely to be small in magnitude because of the BMPs and mitigation measures designed to reduce and isolate sediment before it reaches the stream network. Mitigating measures such as the no-harvest stream buffers zones, the BMPs applied to the road maintenance work, the logging systems, and the prescribed fuels treatments were designed to minimize the potential for soils erosion.

The no-harvest buffers protect the primary shade zone and thinning in the outer portion of the Riparian Reserves. These conditions would insure that there would be no measurable increase in stream temperature of occupied fish habitat; therefore there would be no direct effects to the migration, spawning, rearing, or feeding of fish.

The no-harvest stream buffers would also reduce the direct delivery of fine sediment derived from felling and yarding to an inconsequential magnitude by retaining sufficient roughness to overland flow to promote absorption of the runoff and deposition of the entrained sediments atop the forest floor. Some road dust disturbed during haul would be directly deposited into the stream network, but again, at levels too small to measure. The installation of the temporary bridge of Alternative A would also liberate some small amount of fine sediment, causing localized turbidity for short periods of time (i.e., less than 1 hour for each impact with a total time estimate of 5 hours) during both the installation and the removal of the bridge, as would the period of re-watering after culvert replacement. Once water is permitted to flow freely through a culvert replacement site, a small pulse of fine sediment is likely to be released. But under both the bridge and culvert activities, the likely magnitude of the effect would be immeasurable and of short duration (i.e., less than 1 hour for each disturbance).

The replacement of three fish barrier culverts would immediately reconnect more than two miles of fish bearing stream to the downstream habitat of three streams (i.e., Fourth, Fifth, and Sixth Creeks). These replacements would have no effect on the MIS groups occupying the NFMF. But, the result of the replacements on both the MIS-resident streambed and the MIS-resident water column groups would be the re-creation of a single population as downstream fish breed with members of the same species that had previously been isolated upstream of the culverts. The two separated populations of the MIS-resident groups would begin to merge into single populations in each of the three affected streams. This broadening of the gene pool would increase the vigor of the fish populations presently isolated upstream of the culverts.

Indirect effects to fish from Alternative A and B are difficult to predict, but commercial thinning would not lead to measurable changes in peak streamflow as a result of any rain on snow event because the thinning would maintain about 40 percent canopy cover and there would not be any large clearings created. There would be a slight, but immeasurable increase in fine sediment delivered directly to the stream network via the road ditchlines or bridges. This sediment pulse would be the result of several factors; log haul pulverizing road rock, naked ditchline eroding during storm runoff; and storm runoff mobilizing the dust and pulverized rock generated during haul that was transported to the ditchlines of haul routes. The ditchline and the Road 1912 bridge could also receive mud

from trucks during winter haul. Given the relatively flat nature of most of the haul routes, the use of sediment traps in segments of ditchlines immediately adjacent to streams, and the added precaution of intentionally plugging the drain holes through the bridge deck, the magnitude of the fine sediment delivered to the stream network and the resulting turbidity would be immeasurable. Culvert replacement would require temporary displacement of the MIS-resident water column group at the construction sites. There would be a slight, immeasurable increase in turbidity regardless of the Alternative A or B, but a slightly larger impact with Alternative A due to the temporary bridge installation. The minor pulses of sediment would affect all the age classes of the MIS groups (streambed and water column) occupying the Huckleberry Flats streams. This is due to the proximity of occupied habitats to the expected winter haul routes atop Huckleberry Flats that are common to both action alternatives. Clearly, the most sensitive MIS fish group would be the streambed residents (i.e., trout eggs and alevins) since they have no behavioral mechanism to avoid the increased quantity of fine sediment transported and deposited during runoff from storm events. A positive indirect effect would be the reduction in the capacity of the road network to generate fine sediment due to the road maintenance, road closure, and soil tilling that would occur under either action alternative. By reducing compaction through tilling, the rate of runoff would be reduced. Road closures and removing culverts along those road segments would reduce the likelihood of road failure, and the resultant massive pulse of sediment released into the stream network.

Eighth Creek, Huckleberry Creek, and several of the tributaries to Huckleberry Creek are fish bearing. While all gilled organisms would suffer gill abrasion when the concentration of fine sediment reaches a sufficient concentration, it is expected that fish would actively seek areas of lower concentration of fine sediment by avoiding a localized source. For fish occupying the NFMF or its tributaries, localized increases in fine sediment would be avoided by moving upstream of the source or swimming to zones within the river that retain low concentrations of fine sediment. These avoidance behaviors are not equally available to all fish, or to all life stages of a species.

The mobility of fish would be essential to the survival of an individual under severe stormflow circumstances. This basic avoidance mechanism suggests that the immobile life stages of embryo and alevin are likely to incur greater risk than the more mature and mobile life stages of juvenile and adult. Of both MIS groups, the species most susceptible to an increase in fine sediment is spring Chinook. The species has status as a threatened species due to the migration barriers that the downstream dams have created; but the reaches of the NFMF adjacent to the project area do not provide the primary spawning opportunities for this species in this watershed; the prime spawning reaches begin more than a mile upstream. It is during the developmental stages within the salmon redd that this species is most susceptible to fine sediment effects because the developing eggs and alevin depend on the flow of water through the pore spaces between the gravels that form their redd. Clogging these pores with fine sediment would deprive these individuals of oxygen. The most severe runoff events are a combination of rain falling on accumulated snow; and such events are most common from November to March, the period in which the salmon redd is occupied.

The moderate level of thinning in the Riparian Reserve and the no-treatment zone adjacent to all streams would insure that there would be no measurable change in peak flows regardless of the alternatives. The MIS-resident fish streambed group (i.e., trout eggs and alevins) atop Huckleberry Flats is the group most susceptible to scour and deposition that occurs with major storm events. The projected ARP values indicate that the project would have no direct or indirect effect on their populations, nor would the project affect peak flows enough to harm the other three MIS fish populations.

The remaining MIS species are less susceptible to an increase in fine sediment either because their eggs are tended or kept free of sediment (e.g., the sculpin species); or their eggs are less at risk because they are not buried in the streambed (e.g., largescale sucker); or the species has a higher tolerance for increased fine sediment (e.g., Oregon chub).

There would be localized increases of nutrients available as a result of fuels treatments (i.e., pile burning and under-burning); and there is a risk of localized hot burn spots that generate hydrophobic soils, which lead to increased rates of erosion. But, since these nutrient releases and potential hot spots would remain outside of the no-treatment buffers, it is probable that the nutrients as well as any additional runoff would be absorbed by the remaining vegetation or adsorbed by clay particles in the soil. The reduction in fuels would reduce the probability of a severe fire that sterilizes the soil that would lead to substantial increases in sediment delivery to streams in succeeding storm events. Tilling of compacted soils and old roadbeds and culvert removal would reduce the rate at which runoff is converted to streamflow, and reduce the capacity for runoff to transport fine sediment to the stream network. But the effect of tilling on sediment delivery would again, be immeasurable.

The project activities would have no negative measurable direct or indirect effect, nor would it compromise the viability of any of the populations of resident MIS. The increase in turbidity would be immeasurable and would not cause a change in fish behavior, with all life stages capable of enduring the indirect effects to turbidity. Native cutthroat trout atop the Huckleberry Flats and presently isolated upstream of barrier culverts would benefit from an influx of genes presently isolated downstream of these culverts.

Effects of Alternative C (No Action)

The direct effect of the Alternative C - No Action would be a young forest of trees competing for light and water, and exhibiting this competition by continued vertical growth, but suppressed diameter growth. The low quantities of sediment presently produced from the road system would continue to degrade aquatic habitat and reduce overall spawning success rate in the streams with MIS fish at a very low rate. Current barrier culverts would continue to prevent upstream migration of fish on the three affected streams. The road segments scheduled for closure would continue to deteriorate due to the lack of road maintenance funds. Fuels would continue to accumulate, increasing the risk of fire-produced sediments and their delivery to the stream network. Increased fine sediment would continue to be transported to streams along the connected segments of the road ditch network. Increased fine sediment would reduce survival of all MIS-anadromous and MIS-resident populations due to gill abrasion by fine sediment

suspended in the streamflow; and increased fine sediment would reduce survival of eggs as the pore spaces between gravels are filled with fine sediment particles

The present riparian forest would begin to self-thin due to competition, and this self-thinning would lead to natural recruitment of large woody debris. For the streams atop Huckleberry Flats, the present stand of trees would be of adequate size to be persistent in these small streams; and this persistence would promote the development of more pools, the retention of spawning gravels, and the creation of additional hiding cover. This influx of new wood would likely be at a smaller diameter than would be expected from the stands produced by the Action alternatives, and at this smaller size, such wood would have very little influence on habitat within the NFMF due to the power of the NFMF stormflow to move this class of small woody debris should such wood migrate into the NFMF. The continued low level habitat degradation that results from inputs of fine sediment derived from unmanaged roads and their ditchlines would continue. However, there would be no measurable change in the populations of any of the MIS fish groups in any of the associated streams.

There are no direct or indirect effects to temperature by Alternative C – No Action because stream temperature is a function of shade, and the alternative would not reduce shade. Therefore, there would be no indirect effect from changes to temperature due to the Alternative C - No Action to any of the four MIS fish groups.

There is no direct effect to turbidity by Alternative C - No Action, and no MIS fish group would endure any direct change in turbidity. The indirect effect to turbidity of the Alternative C - No Action would be that currently compacted surfaces (i.e., soils and roads) would remain compacted and road segments would continue to degrade. This slow deterioration would cause a slight, chronic increase in turbidity due to these degraded road sediments adding to the stream network. Again, the likely increase would be immeasurable, and there would not be a change in fish behavior, with all life stages capable of enduring this indirect effect to turbidity. Therefore, no MIS fish group occupying the streams within the project area would endure any indirect change in survival due to turbidity.

There would be no direct or indirect effects to the peak or the base flows of project area streams. Alternative C - No Action permits the current condition to persist. Therefore, no MIS fish group occupying the streams within the project area would endure any direct or indirect change in survival due to peak flows.

The indirect effect of the Alternative C - No Action would be a steady recruitment of natural wood to the streams, but at a smaller size class, due to competition as discussed above. The currently undersized culverts that are scheduled for replacement would continue to present a risk of plugging during a stormflow event, with plugging causing the road to fail, and such a failure would substantially increase the amount of fine sediment entering the stream network. The continued condition of the roads and skid trails as compacted surfaces would persist, and the percent of peak flow that is a response to the inability of the forest soils to absorb precipitation on these compacted soils would continue. The indirect effect of the Alternative C - No Action would be the continued genetic isolation of the upstream populations of MIS fish groups from the genes present in the downstream populations. The indirect effect to turbidity of the Alternative C - No

Action would be that compacted surfaces would remain compacted and road segments would continue to degrade, causing a slight, but immeasurable, increase in turbidity as these degraded road segments continue to add sediment to the stream network.

Genetic isolation of the MIS-resident fish (streambed and water column groups) would continue, and this isolation would reduce the resilience of the population, but at an immeasurable level since the genes would persist in fish that migrate downstream of the culverts and spawn with the resident downstream fish population.

Consultation - Fisheries

A Biological Assessment was completed in 2006 that addressed the potential impacts to the threatened Willamette spring Chinook salmon and to the threatened Columbia River bull trout (Sheehan, 2006). Both regulatory agencies (i.e., NMFS and USFWS) concurred through separate Biological Opinions with the findings that it would not be likely that the two populations of federally ESA listed fish mentioned above would be adversely affected by the project. A Letter of Concurrence from each of those agencies has been received for the project (USDI, 2006 and NMFS, 2006). It is unknown if bull trout are presently using the NFMFWR, while hatchery-reared spring Chinook salmon are released in the NFMFWR to foster natural reproduction of Chinook. Using the number of salmon adults released into the NFMFWR and comparing that number to the estimate of salmon adults at Willamette Falls in Oregon City, the NFMFWR population consists of less than 7 percent of the population. But, regardless of the actual numbers of ESA listed fish using the NFMFWR, it is estimated that zero percent of either population would be adversely affected by the Project. This evaluation is based on the site potential tree width of 170 ft. that would separate the harvest and yarding impacts from the ESA listed fish habitat of the NFMFWR, and the specific mitigation measures designed to reduce the potential transportation via the haul route of fine sediment into the NFMFWR.

Magnuson-Stevens Act – Essential Fish Habitat

The Magnuson-Stevens Act implementing regulations (50CFR Part 600), specifically states that "Federal agencies must consult with National Marine Fisheries Service (NMFS) regarding any of their actions authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken that may adversely affect Essential Fish Habitat (EFH).

Streams in the project area are not considered EFH by the NMFS. The EFH designation ends at Dexter Dam, more than 40 miles downstream. The action Alternatives A and B would have no effect on EFH, and as already stated would have no measurable impact to the continued occupation by spring Chinook salmon or the health of the species' population.

Cumulative effects - Fisheries

The analysis area for the cumulative effects on fisheries was the entire 5th field watershed of the NFMFWR. Appendix B contains a summary of past harvest, road construction, and the foreseeable future timber sales within the watershed. Due to past management activities (timber harvest and road construction), most fish bearing streams within the NFMFWR watershed possess rates of sediment transport, stream temperatures and stream habitats that are not likely to reflect a truly functioning watershed. These effects have

lead to a reduced carrying capacity for all four MIS fish groups and other aquatic organisms. Past management activities have decreased the habitat suitability of the NFMFWR and its tributaries for their native fish assemblages, but the populations of the native MIS fish groups appear stable, and the constraints on the spring Chinook population are the result of factors beyond the NFMFWR watershed. The Niner Project would have direct benefits to the cutthroat trout and brook trout populations atop Huckleberry Flats that would have increased access to upstream habitats at the culvert replacement sites. All MIS-anadromous and MIS-resident species are likely to indirectly benefit from an increase in the complexity of the habitat as larger trees from the thinned portion of the Riparian Reserves begin to die, fall into the fish bearing streams, and diversify the habitat. Increased habitat diversity would foster increases in the size of the populations of all four MIS fish groups. Recreational fishing would remain unaffected by the project since the project's effects would remain up on the Huckleberry Flats, while angling is focused in the NFMFWR

No foreseeable management actions are anticipated that would affect the vegetation cover and subsequent land stability of the area. The potential for cumulative erosion and stream turbidity would likely decrease as the vegetation recovers over the area, provided standard road maintenance continues. There would be no anticipated cumulative detrimental soil conditions beyond those of the existing roads, proposed timber harvest activities, past timber harvest, and fuels treatment. The project area is located in the sub-watersheds occupying the lowest third of the NFMFWR watershed, but past management in the upstream portion of the watershed has greatly influenced the aquatic conditions of the reaches of the NFMFWR within the vicinity of the project. The stream temperature of the NFMFWR has caused the river to be listed as water quality limited for temperature, and this listing likely reflects the degree to which past harvest within the Riparian Reserves continues to have an influence on the stream temperature. The existing trees cannot shield the entire primary shade zone of the NFMFWR from solar radiation; and although not listed for as temperature limited, certain tributaries to the NFMFWR are likely adding warmed tributary streamflow that continues to reflect the slow rate of recovery following harvest within the Riparian Reserves adjacent to those tributaries. Regardless of the Action alternative selected, there would not be any additional cumulative impact to temperature; that is, temperatures would remain unchanged by the implementation of either Action alternative. This would mean that none of the four MIS fish groups would endure any measurable effects due to temperature.

Activities outside of the NFMFWR watershed have had a cumulative effect on fish within the watershed. For more than 40 years, the Dexter and Lookout Point dams on the Middle Fork Willamette River downstream of the NFMFWR have blocked all upstream migration of fish. For the first three decades after completing Dexter dam, spring Chinook salmon had been absent from the NFMFWR watershed. Beginning in the early 90's adult spring Chinook salmon have been collected below Dexter and then trucked above both reservoirs, to be released in the NFMFWR. The effect to the native fish assemblage is not entirely clear, but certainly, the absence of juvenile Chinook as a prey base for adult fish has likely caused some species populations, and their age structures to adjust. The re-introduction in the 90's of adult Chinook salmon relies on trucking the

fish to the NFMFWR. Therefore, the presence of spring Chinook salmon in the NFMFWR watershed is entirely dependent on this foreseeable future action.

Conclusion

The effects to fish from either action Alternative A or B are likely to be small in magnitude because of the BMPs and mitigation measures designed to reduce and isolate sediment before it reaches the stream network, no-harvest stream buffers zones. As well, the logging systems and prescribed fuels treatments are designed to minimize disturbance of the soils. There would be no measurable increase in stream temperature of occupied fish habitat; therefore, there would be no direct affect to the migration, spawning, rearing, or feeding of any MIS fish groups. Stream cover should remain unaffected since no trees within the primary shade zone would be cut; off-channel habitat would likely remain a minor contributor to total available habitat due to the legacy of the low density of instream wood. The channels' bankfull width to depth ratios should remain unchanged, since there would not be a change to the predictable bankfull streamflow as a result of project activities. The removal of three barrier culverts would immediately reconnect more than two miles of fish bearing stream to the downstream habitat on those three streams. Culvert replacement would require temporary displacement of the fish at the construction sites. There would likely be a slight, immeasurable direct increase in turbidity regardless of the action Alternative, but a slightly larger impact is expected from Alternative A due to the temporary bridge installation of Alternative A. For both action Alternatives A and B, the probability of either a direct or indirect effect to fish habitat as a result of chemical contamination is discountable due to the standard mitigation efforts and common separation of machinery from aquatic habitat. Project activities would not have a measurable effect on the rate or timing of water delivery to the tributaries or to the NFMFWR; that is, peak and base flows would not measurably change.

The effects of Alternative C (No Action) would be a young forest of trees competing for light and water, and exhibiting this competition by continued vertical growth, but suppressed diameter growth. The low quantities of sediment presently produced from the road system would continue to degrade aquatic habitat, albeit at a low rate. Current barrier culverts would continue to prevent upstream migration of the MIS-resident water column fish on the three affected streams. The road segments scheduled for closing would continue to deteriorate due to the lack of road maintenance funds. Fuels would continue to accumulate, increasing the risk of fire-produced sediments and their delivery to the stream network. The direct effect of Alternative C would be the continuation of a disconnected network of habitats on more than two miles of occupied streams. The indirect effect of the Alternative C would be the continued genetic isolation of the upstream MIS-resident populations from the genes present in the downstream populations.

Vegetation

Current Conditions - Vegetation

The North Fork of the Middle Fork of the Willamette River watershed has been altered by almost 90 years of timber management. The majority of the second growth stands within the project areas were established after the early railroad logging in the 1920s and 1940s. These stands create large contiguous patches (100-600 acres) of even-aged closed canopy forest on the landscape. The more recent harvest of the 1970s to 1990s created smaller (20-40 acres) patches in a dispersed pattern across the landscape. Interspersed among these managed stands are natural stands of late-successional and old-growth forests located in various no harvest (Wildlife Habitat and Late Successional Reserves) allocations and the General Forest allocation.

The stands proposed for treatment average 79 years in age, 15 inches in diameter, and 122 feet in height (refer to Table 37). The stands have densities that range from 89 to 416 trees per acre. These second growth managed stands are classified as being in the stem exclusion development stage (Oliver and Larson, 1990). Stands in this stage have dense crowns which block out the light to the forest floor, and limit additional tree regeneration in the understory. Typically, shade-tolerant understory trees that are present persist but grow slowly. Intermediate or suppressed trees that do not tolerate shade well suffer from competition and have a high mortality rate. Shade-intolerant shrubs and forbs frequently disappear at this stage.

There are many methods of expressing or evaluating density or stocking levels of plantations. The method used for determining the timing of commercial thinning treatments in the proposed units was Curtis Relative Density (Curtis, 1982). This relative density method relates existing or planned density to a maximum biological potential density, hence the term "relative". The two factors used in the formula are the quadratic mean diameter and stand basal area per acre. For Douglas-fir a relative density of 50 and above has been determined to be a stand density sufficient to cause competition mortality. The recommended density for managing Douglas-fir to maximize stand vigor and growth is within the range of 35 to 50. The relative densities in these stands range from 44 to 84 with an average of 55. These relative densities suggest that stand vigor and growth is declining in these stands. Some trees have begun to die due to overcrowding and competition between trees for nutrient and light, as evidenced by competition-induced mortality. Based on the guidelines, the majority of the proposed units have relative densities greater then 50. The growth and yield projection model - Forest Vegetation Simulator (FVS) (Curtis et al, 1981) was used to model the future growth of the stands.

Table 37 - Current conditions of stands being considered for treatment.

Units	Acres	Age	DBH	HGT	TPA	BA	RD	CC		Species Composition			
11A	6.2	78	12	122	305	236	68	77		71% DF	21% BM	7% GF	1% IC
11B	7.4	78	12	122	305	236	68	77		71% DF	21% BM	7% GF	1% IC
11C	2.9	78	12	122	305	236	68	77		71% DF	21% BM	7% GF	1% IC
11D	1.8	78	12	122	305	236	68	77		71% DF	21% BM	7% GF	1% IC
12	98.9	78	13	126	232	217	60	71		65% DF	13% BM	9% GF	6% WH
12A	7.7	78	13	126	232	217	60	71		65% DF	13% BM	9% GF	6% WH
13	52.2	78	13	126	232	217	60	71		65% DF	13% BM	9% GF	6% WH
13A	31.0	78	13	126	232	217	60	71		65% DF	13% BM	9% GF	6% WH
14	82.4	78	13	126	232	217	60	71		65% DF	13% BM	9% GF	6% WH
15	29.4	86	13	122	255	220	62	70		47% DF	33% RC	8% GF	7% WH
15A	11.4	86	13	122	255	220	62	70		47% DF	33% RC	8% GF	7% WH
15C	5.2	86	13	122	255	220	62	70		47% DF	33% RC	8% GF	7% WH
16	59.4	86	13	122	255	220	62	70		47% DF	33% RC	8% GF	7% WH
18	41.7	73	11	111	416	278	84	84		64% DF	18% WH	17% RC	1% BM
19	35.4	73	11	111	416	278	84	84		64% DF	18% WH	17% RC	1% BM
29	4.5	78	12	100	150	153	44	68		82%DF	10%WH	7%RC	1%BM
30	5.5	78	12	100	150	153	44	68		82%DF	10%WH	7%RC	1%BM
31	2.3	78	12	100	150	153	44	68		82%DF	10%WH	7%RC	1%BM
32	3.2	78	12	100	150	153	44	68		82%DF	10%WH	7%RC	1%BM
33	3.5	78	12	100	150	153	44	68		82%DF	10%WH	7%RC	1%BM
34	5.1	78	12	100	150	153	44	68		82%DF	10%WH	7%RC	1%BM

Units	Acres	Age	DBH	HGT	TPA	BA	RD	CC		Species Composition			
35	6.5	78	12	100	150	153	44	68		82%DF	10%WH	7%RC	1%BM
36	3.5	78	12	100	150	153	44	68		82%DF	10%WH	7%RC	1%BM
37	5.6	78	12	100	150	153	44	68		82%DF	10%WH	7%RC	1%BM
38	3.3	78	12	100	150	153	44	68		82%DF	10%WH	7%RC	1%BM
39	4.5	78	12	100	150	153	44	68		82%DF	10%WH	7%RC	1%BM
40	4.9	78	12	100	150	153	44	68		82%DF	10%WH	7%RC	1%BM
41	7.0	78	12	100	150	153	44	68		82%DF	10%WH	7%RC	1%BM
120	37.2	78	14	116	222	239	64	71		80% DF	10% WH	10% RC	
121	29.9	78	14	116	222	239	64	71		80% DF	10% WH	10% RC	
201	582.5	78	17	120	102	185	45	50		100% DF			
202	468.5	78	17	120	102	185	45	50		100% DF			
203	43.0	78	18	124	89	185	44	49		100% DF			
204	465.5	78	18	124	89	185	44	49		100% DF			
205	220.4	78	18	124	89	185	44	49		100% DF			
206	28.5	78	18	124	89	185	44	49		100% DF			
207	45.7	78	18	124	89	185	44	49		100% DF			
208	172.1	78	14	124	256	276	73	76		97% DF	1% RC	1% WH	
209	94.3	78	14	124	260	270	73	76		87% DF	12% RC	1% WH	

Units	Acres	Age	DBH	HGT	TPA	BA	RD	CC		Species Composition			
210	2.6	78	17	120	102	185	45	50		100% DF			
211	25.0	78	18	124	89	185	44	49		100% DF			
212	83.4	78	18	124	89	185	44	49		100% DF			
214	15.1	78	14	116	222	239	64	71		80% DF	10% WH	10% RC	
215	172.7	78	18	124	89	185	44	49		100% DF			
216	57.9	78	17	120	102	185	45	50		100% DF			
217	31.5	78	18	124	89	185	44	49		100% DF			
218	26.1	78	14	126	246	264	70	78		94% DF	4% GC	1% OT	
219	106.6	78	14	126	246	264	70	78		94% DF	4% GC	1% OT	
220	36.9	78	14	126	246	264	70	78		94% DF	4% GC	1% OT	
221	13.8	78	14	116	222	239	64	71		80% DF	10% WH	10% RC	
222	32.1	78	17	120	102	185	45	50		100% DF			
223	61.9	78	17	120	102	185	45	50		100% DF			
		79	**15**	**122**	**200**	**207**	**55**	**65**					

All stand parameters are for trees > 7 " DBH,
DBH = Diameter Breast Height, HGT = Height, TPA = Trees per Acres, BA = Basal Area, RD = Relative Density, CC = Canopy Closure, DF = Douglas-fir, WH = Western Hemlock, RC = Western Redcedar, GF = Grand Fir, BM = Big leaf Maple, GC = Giant Chinkapin, OT = Other Hardwood Species

Direct and Indirect Effects

Effects of Alternatives A and B - Vegetation

The proposed silvicultural treatments have been designed to meet the purpose and need to maintain or improve stand growth and health of these stands. Commercial thinning would maintain growth rates and promote stem wood quality and tree vigor, diversify the species composition and stand structure, capture competition-induced mortality for use as commercial wood products, and reduce long-term fuel buildup (Graham, et al, 1999).

Thinning would maintain or improve overall stand growth and health by reducing competition for limiting resources such as light, water, and soil nutrients. Reduced stand densities and competition allows residual trees to maintain a higher growth rate than would occur with no thinning.

Alternative A would commercially thin a total of about 3,328 acres and Alternative B would thin about 3,268 acres. Alternative A would thin about 362 acres at a light intensity (71-76 TPA >7inches DBH), 1,574 acres at a moderate intensity (67-68 TPA>7inches DBH), and 1,392 acres at a heavy intensity (56-58 TPA>7inches DBH). Alternative B would thin similar acreages at the light and heavy intensities, but would reduce the moderate intensity thinning by 60 acres with group selection cuts for soil restoration.

The thinning would be applied by identifying targeted trees per acre with a plus or minus variance which translates to a variable tree spacing rule. The variable tree spacing would generally favor the largest diameter trees, but is designed to release crop trees without regard for their position in the crown canopy. The thinning method is generally called “thinning from below”.

The thinning prescription would also incorporate many of the elements of what is referred to in today’s terminology as “variable density thinning”. The thinning would include a combination of elements to introduce diversification into the stands. Units would have portions of the stand in an un-thinned condition, such as within the protection buffers adjacent to the streams and around special habitats. Units would have portions of the stand in small naturally occurring openings, openings created for logging landings and corridors, and dominate tree release prescription elements. Dominant tree release would select individual dominant trees or small clumps of large trees and release them by cutting all conifers >7 inch DBH within a 60 foot radius around these trees. All hardwoods species would be protected where possible and left for species and structural diversity.

Included in the thinning acres mentioned above are 575 acres of thinning in the upland portion of the Riparian Reserves and 291 acres of thinning within the Wild and Scenic River corridor in both of these alternatives. Again, treatments are designed to meet the purpose and need to ensure the health and growth of these stands in these allocations, to diversify the stand structure, and to accelerate their development of late-successional forest characteristics. All remnant overstory old-growth trees located in the Wild and Scenic River corridor would be protected. In the Riparian Reserves, contrary to the General Forest/Matrix thinning, defective trees with imperfections such as wolfy

branch patterns, double stemmed or broken tops and some trees (Western hemlock) with low concentrations of mistletoe would be left if they have a reasonable chance of surviving through stand development.

Alternative B would also regenerate 60 acres in small group selection cuts as mentioned above. These small (2 -7 acre) patch cuts are located in areas of compacted soil and generally have a low number of trees. The overstory trees would be removed to allow for soil tillage treatments. The patch cuts would be reforested by planting conifer seedlings after the fuel and soil tillage treatments. The small group selection cuts would also improve the diversity of the stand by introducing spatial heterogeneity into the overall stand's structure.

The commercial thinning treatments would open up the tree canopy allowing more sunlight and precipitation to reach the forest floor. This would result in changes in the microclimate (increased air and soil temperatures, relative humidity's, and air movement) (Chan, 1995), under the main canopy for a short term (10-20 years) until the canopy expands and grows back together. These changes in microclimate provide favorable growing conditions for increased growth of most plant species.

Thinning would promote the development of diverse, multi-layered stands (Bailey and Tappeiner, 1998, Muir et al, 2002), primarily by providing those conditions that favored the establishment of shrubs, hardwoods, and conifer in the understory after thinning, and by releasing saplings and intermediate-crown class trees in the stand.

Thinning would maintain or enhance stand level, plant species diversity. Species richness for herbaceous species and total species richness across trees, shrubs, and herbaceous vegetation would be greater in thinned stands than in un-thinned and old-growth stands (Bailey et al, 1998). A portion of the increased species richness would be associated with exotic species, but grasses and nitrogen-fixing species also were more abundant in thinned stands

Thinning promotes the crown differentiation by allowing overstory trees to develop deep canopies and larger diameter branches in open stand (McGuire et al 1991).

The heavier thinning would likely promote rapid growth of trees with characteristics normally associated with old trees in old-growth stands. Many old trees grew rapidly when they were young (30-100 years), and produced large stems and crowns. Recent evidence (Franklin et al, 1981, Tappeiner et al. 1997; Poage and Tappeiner 2002) suggests that growth rates of some older forests indicate slow regeneration and at low densities over a long period with little tree-to-tree competition.

Other old-growth forests also appear to have developed from relatively even-aged cohort that has undergone long-term suppression mortality, little understory regeneration of Douglas-fir, and episodic release of established tolerant conifers (Winter et al, 2002a, 200b). Therefore, stand management can follow multiple routes that emulate natural processes to move dense young stands towards structure similar to old-growth forest. About 1,160 acres of these second growth stands evaluated in this project were not proposed for thinning in either Alternatives A or B.

Some stages of forest succession may be shortened or side-stepped by commercial thinning in young stands (Andrews, et al, 2005).

Thinning may help these stands to develop resistance to environmental variables. Studies have compared live-crown ratio and height: diameter (H:D) ratios of trees in young stand managed for timber production to those of trees in old-growth stands (Poage 2001). Live –crown ratios averaged about 50 percent or higher in the old trees, and 30 percent or less in trees in young stands, depending on stand density and whether or not the trees had been thinned. Old trees also had low H:D ratio (often <40-50), which suggests that they are resistant to disturbances by agents such as wind, fire, and ice (Wilson and Oliver 2000, Wonn and O'Hara 2001). In young stands, these ratios were often closer to 70, which suggest that these trees are relatively unstable, and have relatively low resistance to wind, fire, and ice. Thinning reduces the densities and promotes greater diameter growth of residual trees that increases the stability of these stands over time by making them more resistant to windthrow. However, the heavier thinning could possibly make the residual trees more susceptible to windthrow initially (Garmen, et al. 2003). Following thinning, some trees may blow down as a result of increased exposure to wind. Windthrow creates canopy gaps and supplies coarse woody material as a fine-scale disturbance (Hayes et al 1997).

Effects of Alternative C – No Action

These over-stocked stands would continue to grow, but at slower rates as trees compete with each other for growing space. Diameter growth would be low or would decline and live crown ratios would get smaller. These trees would become less vigorous and more susceptible to insects and diseases. Competition-induced mortality would increase thus increasing both snag and down wood levels. The down material would increase fuel loadings making the stands more vulnerable to wildfire and insect infestations. The competition-induced mortality would not be available for commercial wood products. Low light levels in un-thinned stands would suppress development of shade-tolerant trees and limit understory vegetation. The diameter and product value of trees harvested in the future would be reduced without treatment.

Table 38 below compares stand conditions for pre and post treatments in thinned units for the proposed action.

Table 38 - Pre and Post Treatments Stand Conditions for the Proposed Units of Alternative A and B

Unit	Acres	Silvicultural Prescription	Canopy Closure		Trees Per Acre		Relative Density		Basal Area	
			Pre	Post	Pre	Post	Pre	Post	Pre	Post
11A	6.2	Commercial Thin	68	44	188	75	57	36	217	146
11B	7.4	Commercial Thin	68	44	188	75	57	36	217	146
11C	2.9	Commercial Thin	68	44	188	75	57	36	217	146
11D	1.8	Commercial Thin	68	44	188	75	57	36	217	146

Unit	Acres	Silvicultural Prescription	Canopy Closure		Trees Per Acre		Relative Density		Basal Area	
			Pre	Post	Pre	Post	Pre	Post	Pre	Post
12	98.9	Commercial Thin	66	43	173	67	54	33	209	146
12A	7.7	Commercial Thin	66	43	173	67	54	33	209	146
13	52.2	Commercial Thin	66	43	173	67	54	33	209	146
13A	31.0	Commercial Thin	66	43	173	67	54	33	209	146
14	82.4	Commercial Thin	66	43	173	67	54	33	209	146
15	29.4	Commercial Thin	64	40	156	56	53	30	212	139
15A	11.4	Commercial Thin	64	40	156	56	53	30	212	139
15C	5.2	Commercial Thin	64	40	156	56	53	30	212	139
16	59.4	Commercial Thin	64	40	156	56	53	30	212	139
18	41.7	Commercial Thin	80	44	290	76	75	30	269	125
19	35.4	Commercial Thin	80	44	290	76	75	30	269	125
29	4.5	Group Selection	50	0	150	0	44	0	153	0
30	5.5	Group Selection	68	0	150	0	44	0	153	0
31	2.3	Group Selection	68	0	150	0	44	0	153	0
32	3.2	Group Selection	68	0	150	0	44	0	153	0
33	3.5	Group Selection	68	0	150	0	44	0	153	0
34	5.1	Group Selection	68	0	150	0	44	0	153	0
35	6.5	Group Selection	68	0	150	0	44	0	153	0

Unit	Acres	Silvicultural Prescription	Canopy Closure		Trees Per Acre		Relative Density		Basal Area	
			Pre	Post	Pre	Post	Pre	Post	Pre	Post
36	3.5	Group Selection	68	0	150	0	44	0	153	0
37	5.6	Group Selection	68	0	150	0	44	0	153	0
38	3.3	Group Selection	68	0	150	0	44	0	153	0
39	4.5	Group Selection	68	0	150	0	44	0	153	0
40	4.9	Group Selection	68	0	150	0	44	0	153	0
41	7.0	Group Selection	68	0	150	0	44	0	153	0
120	37.2	Commercial Thin	69	42	194	67	61	30	233	130
121	29.9	Commercial Thin	69	42	194	67	61	30	233	130
201	582.5	Commercial Thin	50	37	102	68	45	25	185	102
202	468.5	Commercial Thin	50	37	102	68	45	25	185	102
203	43.0	Commercial Thin	49	36	89	58	44	25	185	100
204	465.5	Commercial Thin	49	36	89	58	44	25	185	100
205	220.4	Commercial Thin	49	36	89	58	44	25	185	100
206	28.5	Commercial Thin	49	36	89	58	44	25	185	100
207	45.7	Commercial Thin	49	36	89	58	44	25	185	100
208	172.1	Commercial Thin	75	44	236	71	71	33	272	145
209	94.3	Commercial Thin	74	44	231	71	70	33	265	145
210	2.6	Commercial Thin	50	37	102	68	45	25	185	100

Unit	Acres	Silvicultural Prescription	Canopy Closure		Trees Per Acre		Relative Density		Basal Area	
			Pre	Post	Pre	Post	Pre	Post	Pre	Post
211	25.0	Commercial Thin	49	36	89	58	44	25	185	100
212	83.4	Commercial Thin	49	36	89	58	44	25	1854	100
214	15.1	Commercial Thin	69	42	194	67	61	30	233	130
215	172.7	Commercial Thin	49	36	89	58	44	25	185	100
216	57.9	Commercial Thin	50	37	102	68	45	25	185	100
217	31.5	Commercial Thin	49	36	89	58	44	25	185	100
218	26.1	Commercial Thin	76	43	216	59	67	30	257	134
219	106.6	Commercial Thin	76	43	216	59	67	30	257	134
220	36.9	Commercial Thin	76	43	216	59	67	30	257	134
221	13.8	Commercial Thin	69	42	194	67	61	30	233	130
222	32.1	Commercial Thin	50	37	102	68	45	25	185	100
223	61.9	Commercial Thin	50	37	102	68	45	25	1853	102

Note: Pre and post conditions only consider merchantable trees (>7" dbh).

Cumulative Effects - Vegetation

The cumulative effect to the vegetation was analyzed at the scale of the project area. The project area is delineated by the First, Third, Fifth, Huckleberry, Eighth and Tenth drainages. This area provides a logical analysis area to assess stand conditions based on the patch size of stands for the plant association series and the size of the typical natural disturbance event. Past timber harvest, road construction, and the OHV trail system have been the prominent action which have affected the vegetation conditions. Appendix B contains summary of past harvest rate per decade and foreseeable future timber sales within the whole NFMFWR fifth field watershed.

As a result of past management actions the current development stage distribution in the project area is 1,084 acres of stand initiation, 7,480 acres of stem exclusion, 1,635 acres of understory reinitiation, 1,984 acres of late-successional and 678 acres of non-forest (see Table 39). There are no present actions that would affect the seral stage distribution in the analysis area. The only reasonably foreseeable future action affecting vegetation is timber stand improvement treatments such as pre-commercial thinning on 354 acres of managed plantations. This young stand thinning would not change the seral class condition in those stands.

The following table displays the acres and percent of each development stage in the project area.

Table 39 – Acres and Percents of Development Stages

Development Stage	Current Conditions	Alternative A	Alternative B	Alternative C (No Action)
Stand Initiation	1,084 ac (8%)	1,084 ac (8%)	1,114 ac (+60) (9%)	1,084 ac (8%)
Stem Exclusion	7,480 ac (58%)	7,480 ac (58%)	7,420 ac (-60) (57%)	7,480 ac (58%)
Understory Re-Initiation	1,635 ac (13%)	1,635 ac (13%)	1,635 ac (13%)	1,635 ac (13%)
Old Growth	1,984 ac (15%)	1,984 ac (15%)	1,984 ac (15%)	1,984 ac (15%)
Non Forest	678 ac (5%)	678 ac (5%)	678 ac (5%)	678 ac (5%)

Alternatives A and B would have no cumulative effects on development stages. Proposed thinning in Alternative A would not alter the development stage but it does change the number of trees per acre and the canopy density, in treated stands. The treatments would move these stands along the successional pathway toward the understory re-initiation stage. The 60 acres of group selection patch cuts in Alternatives B would increase stand initiation by 1 percent of the project area to 9 percent and would decrease stem exclusion from 58 percent of the analysis area to 57 percent.

Cumulative effects to growth rates would be the same as described in direct effects except for the contribution of accelerated growth from the 354 acres of pre-commercial young stand thinning. This cumulative effect would be the same for thinning in all Alternative A and B.

There is about 784 acres of private or other ownership land in the analysis area. A majority of these lands are non-forest such as agricultural lands. The rest of the private lands are in the stand initiation stage.

Conclusions - Vegetation

The stands proposed for treatment are in a condition based on stocking levels, average stand diameters, and crown ratios that would respond and benefit from commercial thinning. Commercial thinning would improve the growth and maintain the health of the residual trees by reducing the competition between trees, develop the understory and diversify the species composition by opening up the tree canopies, and provide for an intermediate harvest of merchantable size trees from the excess trees which would normally die out from competition.

Commercial thinning does not change the seral stage classifications of these stands. The treatments would move these stands along the successional pathway toward understory re-initiation and the development of late-successional forest characteristics. The treatments promote the development of large trees, multi-storied canopies, horizontal patchiness, and species diversification.

The overall percentage of seral conditions within the project area does not change substantially. The treatments move these stands toward the desired conditions of sustained growth and development of late-successional forest conditions.

Invasive Weeds

Current Conditions – Invasive Weeds

The weed infestations in the Niner Thin sale area that pose the most serious threat to native vegetation are Scot's broom (*Cytisus scoparius*), Himalayan blackberry (*Rubus discolor*), evergreen blackberry (*Rubus laciniatus*), and everlasting peavine (*Lathyrus polyphyllus*). Reed canarygrass (*Phalaris arundinacea*), tansy ragwort (*Senecio vulgaris*), oxeye daisy (*Leucanthmum vulgare*), St. John'-wort (*Hypericum perforatum*), Canada and Bull thistle (*Cirsium arvense and C. vulgare*) are also present in the analysis area. Slender false brome (*Brachypodium sylvaticum*) is found nearby in the watershed and could easily invade into stands adjacent to Road 19.

Scot's broom is a well-established, widespread woody shrub in the legume family up to ten feet tall that favors roadsides and early seral plantations. It is long-lived, early seral colonizer which does not grow well in forested areas and becomes shaded out when forest canopy closes. It is scattered along several roads in the Niner area. Flowers are showy, yellow and abundant; the seeds of this plant can persist in the soil for decades and germinate if the soil is disturbed.

Slender false brome is a highly invasive perennial grass that has the capability to dominate the forest floor to the exclusion of native species. It has been reported to competitively exclude other species in the understory of coniferous forests it invades, even inhibiting establishment of tree seedlings by sequestering much-needed soil moisture (Kaye, T.N. 2001). It has broad ecological amplitude that allows it to succeed in heavy shade or in openings, such as meadows and roadsides. It does not appear to have forage value for big game and so receives little or no grazing pressure. This grass is of particular concern as it has recently (spring of 2006) been reported to be growing

along Road 19 above Road 1912, and along the banks of the NFMFWR within the project area.

Himalayan and evergreen blackberries are robust evergreen shrubs that prefer open areas and roadsides but can also persist and spread under the forest canopy. Both species are spread by birds and other animals that eat the berries and both species spread vegetatively by root tipping. These species are found along the roads in or adjacent to several stands several.

Everlasting peavine is a rhizomatous deep-rooted legume that climbs or forms a thick viney mat. Flowers are pink to deep purple. It grows best in full sunlight, thus is not uncommon along roadsides and in disturbed areas. It has been used as a wildlife cover and erosion control plant.

Reed canary grass is found at scattered locations on near roads in wet areas. This is a tall (2-7 foot stems), perennial rhizomatous grass with a deep root system. It is aggressive and especially well suited to invade aquatic ecosystems, particularly wet meadows, riparian areas, and lakeside habitat.

Tansy ragwort is a widespread tap-rooted biennial or short-liver perennial. Stems are 1-6 feet tall, with yellow flowers at the top of the plant. This plant is toxic to livestock; containing several alkaloids that causes irreversible liver damage. The plant occurs in scattered locations in the project area.

Oxeye daisy is an established rhizomatous perennial in the sunflower family found nearly throughout the forest in open meadows disturbed areas such as roads and landings. Flower heads are solitary at the ends of plant stems with white ray and yellow disk flowers.

St. John's wort or Klamath weed is another well established non-native perennial herb that reproduces by seed or short runners. The flowers are bright yellow and numerous in flat-topped cymes. It can be differentiated from a similar native by numerous punctuate dots on the leaf blade that can be seen when held up to a light. It produces compounds that cause skin irritations and illness in light haired animals in strong sunlight (photo dermatitis) and is usually avoided by grazing animals, which help to give it a competitive edge. This rhizomatous plant is difficult to remove from meadows as it easily breaks at the soil surface when pulled. It is probably one of the biggest threats to the higher elevation native meadow/prairie systems near the project area.

Canada and bull thistle are abundant in open areas throughout the forest. Canada thistle is a colony-forming perennial with deep, extensive horizontal roots and forms both male and female flowers on separate plants. Canada thistle is difficult to control or remove; breaking up roots only increases the plants, as the fragments will re-grow to form new plants. Bull thistle is an early successional stouter biennial or perennial that reproduces by seed and establishes well in open disturbed sites, but declines as other vegetation dominates.

Direct and Indirect Effects

Effects of Alterative A and B – Invasive Weeds

The action Alternatives A and B incorporate all the standards associated with the 2005 Forest Plan amendment for invasive plants and the corresponding mitigation measures identified in Chapter 2.

The alternative with the greatest number of disturbed acres and miles of road for hauling logs would create the most habitats for invasive weed introduction. Creation of habitat by harvest includes both opening of the canopy by felling trees and by yarding systems using ground-based equipment: tractor, skyline (trees drag along ground in skyline corridors). Roads would have to be maintained and, in some cases, upgraded for harvest. All these activities increase to the risk of invasive weed introduction through potential contamination from off-road equipment that is not cleaned off as well as simply opening up a seed bed for weedy species to grow in.

A combination of soil disturbance and transport of seed constitutes the direct effects of timber harvest on weed introduction and persistence. In the action alternatives, the areas that would be permanently opened up to light and disturbance would be most at risk, e.g., roads OHV trails and landings. These areas are disproportionately subject to ground disturbance and exposure to vehicles and equipment that may bring seed in. Risk decreases in areas where roads and landings are closed, rehabilitated, and seeded with desirable species.

Alternative A has a higher risk of increasing weed sites than Alternative B because it proposes tractor yarding of trees in 1,652 acres where potential soil disturbance could provide seed beds. In addition, Alternative A constructs 6.3 miles of new, native-surface, temporary spur road. Alternative B reduces the miles of temporary road by 1.3 miles. This additional disturbance increases risk of weed establishment. Roads are well documented as vectors of weeds and new populations could easily establish.

Alternative B reduces the amount of ground-based tractor yarding significantly, thus reducing potential for vectoring in Invasive weeds via heavy machinery. However, the additional 60 acres of soil tillage may likely result in short term stimulation of germination of weed seed banks.

Alternative A and B both include about 496 acres of grapple pile adjacent to roads with the potential to create invasive weed habitat from the soil disturbance. Alternative B includes an additional 524 acres of hand piling and burning which creates scattered burned spots of bare soil. These burned spot increase the risk for creating sites favorable for invasive plants. Similarly, 104 acres of underburning in both alternatives may likely promote weed seed germination in the short term.

The location of FS Road 19 where slender false brome resides is within the 170’ no harvest buffer along the NFMFWR. The road position within the buffer is variable with respect to unit boundaries, and distance could be as little as 20-30 feet between the road prism and units in some locations. These riparian buffers would help to isolate the slender false brome sites; the maintenance of a denser canopy adjacent to the road sites would help to limit this species from spreading into thinned stands by reducing travel potential through the more densely vegetated barrier. Helicopter logging is proposed in

these units. Limiting mechanical disturbance would also help to prevent facilitating spread the existing weed seed bank into the stands, if no other mechanized logging occurs in proximity to slender false brome locations.

Implementation of both action alternatives: thinning activities, spur road construction, soil tillage and system road maintenance increases risk of invasive weed seed dispersal and establishment from development of conditions that allow invasive weeds to pioneer disturbed sites and eventually out-compete native plants. Weed invasion into adjacent thinned stands could lead to competition with tree and shrub seedling establishment and growth, which in turn could affect future potential vegetation associated with sensitive botanical species. Weeds also directly compete with sensitive species like tall bugbane should they invade habitat.

Effects of Alterative C –No Action – Invasive Weeds

Alternative C would allow existing Invasive weed populations to persist in the project area. It is unknown whether Invasive weed species are increasing, decreasing or stable because there is no available data on rates of weed spread on federal or non-federal lands in the watershed. Long-term data collection and monitoring of weed populations has not been done on road systems in the project area. Because no logging or road maintenance machinery would be dispatched to the site, there should be no risk of additional introduction from contaminated off-road equipment. No ground would be opened providing a seed bed for invasive species, therefore this alternative has the least risk of spreading weeds. Many shade intolerant weed species cannot survive the deeper darker conditions that would result from foregoing thinning in these stands; thus there is less risk that weeds would spread into the closed canopy stands, not only due to light limitations but also because there would be no equipment in the stands that could potentially spread weed seeds. However, for the most part most weeds already present in perpetually open areas in the Niner area would remain growing unchecked and left largely unmanaged, unless other funding provided treatment opportunities.

In Table 40 below, Alternative A shows the greater risk of promoting Invasive weeds due to the amount of ground disturbance of the tractor yarding and it's potential for habitat modification. Alternative A also poses slightly higher risk due to the construction of 1.3 more temporary spur road miles than Alternative B.

Table 40 - Comparison of Invasive Weed Introduction and Establishment Potential by Alternative

Activity	Alt. A acres	Alt. B acres	Alt. C acres
Total acres treated through thinning	3328 ac	3268 ac	0
Acres yarding systems			
Tractor	1652 ac*	60 ac*	0
Skyline	1233 ac	2734 ac	0
Helicopter	443 ac	534 ac	0

Activity	Alt. A acres	Alt. B acres	Alt. C acres
Road Management			
Temporary Spur Road	11 ac (6.3 mi)*	8 ac (5.0 mi)*	0
Road Maintenance	53 ac (17.5 mi)*	53 ac (17.5 mi)*	0
Road Closures	21 ac (19.3 mi)	21 ac (19.3 mi)	
Soil restoration treatment			
Soil tillage restoration	0*	60 ac*	0
Subsoil landings/skid trails	206*	126*	0
Fuel treatments			
Under-burning	104 ac*	104 ac*	0
Machine grapple piling	496 ac*	496 ac*	
Supplemental hand piling and burning	0	524 ac	0

* Treatment acres used in cumulative effects analysis

Cumulative Effects – Invasive weeds

Cumulative effects of Alternative A and B – Invasive Weeds

Cumulative effects for weeds were analyzed on a watershed scale because weeds most often travel along road systems. Refer to Appendix B for the history of the development of the road system in the NFMFWR watershed and past, present and foreseeable future activities. Alternative A and B would close about 19.5 miles of classified open roads and reduce the roads in the watershed by 3 percent. Alternative C would not reduce the open road system.

It is unknown whether any new roads are planned for private land. No new roads are proposed for Forest Service currently or in the foreseeable future. Road maintenance activities occur in this watershed on an as needed basis depending upon level of use. Approximately 17.5 miles of road would be maintained under both Alternative A and B and would represent about 53 acres of potential ground disturbance or less than 1 percent of the watershed. Additional upgrading for hauling would occur on 3.95 miles of roads (3.75 miles aggregate rock and .2 mile paved). These activities would also perpetuate habitat for invasive weeds.

It is assumed that clearcut harvesting (stands < 20 years are assumed to be un-recovered), and other treatments such as tractor yarding, temporary road construction, road maintenance, soil restoration treatments, grapple piling and burning, and under burning would contribute to early seral (potential weed) habitat in the watershed. These activities were used as measure to analysis the cumulative impacts of the alternatives. The watershed contains approximately 158,280 acres. Past actions that created habitat for weeds within the watershed include clear-cut and shelterwood harvesting by the Forest Service (3,030 acres since 1990). Alternative A would create about 2,522 acres of potential habitat for weeds. Alternative B would create

approximately 907 acres of potential habitat, and Alternative C would not create any additional habitat. These acreages represent less than 2 percent, less than 1 percent, 0 percent, respectable, of the watershed.

Cumulative effect of Alternative C (No Action) – Invasive Weeds

No project activities would take place. Weeds are spread through a combination of human and wildlife activities, and natural events including wind and rain. Foreseeable activities within the project area are expected to be similar to past and current activities. Human activities that would vector weeds onto and within federal and non-federal lands in the watershed such as recreational use (such as stock use, off road vehicle traffic, etc.), motor vehicle use, road construction and maintenance, forest product collection and agriculture would all continue to occur regardless of whether or not either of the two Niner action alternatives occur. Incremental measures of weed infestations, whether by human or natural disturbances, cannot be accurately predicted because of all the variables involved in vectoring weeds.

Conclusion

All alternatives, including No Action, would result in new and continued disturbances that promote introduction of new weed species and colonization by existing species to the project area. Affected acres can be quantified; however, the rates of spread and densities of invasive weeds in the watershed cannot be reliably predicted with any accuracy. The risk of future weed infestation can be reduced by implementation of Best Management Practices (BMPs) that are incorporated into project design. The mitigating measures to be applied would cumulatively lower the risk of invasive plants within the watershed.

Sensitive Plants and Survey and Manage Botanical Species

Current Conditions – Sensitive Plants and Survey and Manage Botanical Species

Habitat exists in the project area for 38 of the 72 botanical species listed as sensitive on the Forest.

Pre-field review and subsequent surveys resulted in documentation of one sensitive vascular plant species in the project area. A population of *Cimicifuga elata* (Tall bugbane) is located partially on Forest Service land. The majority the plants in the population are on private property. The plants are located in Vine maple (Talus) - NTS2 11 and Western hemlock (*Tsuga heterophylla*), sword fern (*Polystichum munitum*) habitat on steep northern slopes just west of Camp 6 and southeast of proposed Unit 12 on June 5, 1999. No surveys were conducted for the 17 fungi species because single pre-disturbance surveys for these species have been deemed impractical (USDA 1998, USDA, 2000, USDA, 2004) because fungi fruit inconsistently and would require multiple year surveys to determine their presence.

Other Botanical Species of Special Concern

One site discovered in June 2001 of Sierra cliffbrake (*Pellaea brachyptera*), a fern in the Maidenhair fern family, is located in a non-forested habitat adjacent to a segment of the Huckleberry Flats OHV trail (old spur road 742). The habitat is a dry, open south-facing rock garden that becomes desiccated in summer. Though considered common

elsewhere in Oregon, this is the only documented site of this species in Lane County, and is on the Lane County Rare and Endangered plant list. It is included in the Willamette National Forest Botany Species of Concern database created to track and maintain biodiversity. Management activities associated with the Niner EA would not affect this population.

Direct and Indirect Effects

Effects of Alternatives A and B – Sensitive Plants

Vascular Plants

The special habitat on Forest Service land where the tall bugbane population resides is buffered within a 300 foot no cut prescription area and no other project activities (yarding, road construction, soil tillage, etc.) are planned in this area. The vine maple talus habitat provides a natural gap setting for this population and no further stand manipulation is prescribed at this time. No direct or indirect impacts to this portion of the population are anticipated in Alternatives A and B. No information about protection of the population growing on private land is available at this time.

Lichens and Bryophytes

Changes in hydrology, including water temperature and sediment may affect aquatic lichens found on submerged rocks in clear, cold streams (USDA, USDI 2003). Persistence of the other lichen species may be threatened by host tree removal, wind throw, changes in microsite conditions, changes in epiphyte ecology and competition in more open stands, and by dispersal limitations in more widely spaced stands (USDA, USDI 2003). In some cases, thinning may be beneficial to these epiphytes by enhancing tree species diversity, including Pacific yew and bigleaf maple, two tree species known for their abundant lichen communities.

Fungi

Under both of these alternatives, there would be direct effects to fungi, but severity and amount of habitat disturbance differs by prescription. Removal of host trees for mycorrhizal species would occur. One difference between the Alternative A and B is that 60 acres of group selection patch cuts would occur in Alternative B as compared to being thinned as in Alternative A. Stand treatments would result in the disruption of mycelial networks (Kranabetter and Wylie, 1998; Amaranthus and Perry, 1994). It is likely that individual sites of fungi may be negatively affected in the short term by host tree removal, physical disturbance, soil compaction, and disruption of mycelial networks if the fungi are present (Kranabetter and Wylie 1998, Amaranthus and Perry 1994). Reductions in the number of fruiting bodies of chanterelles, a common mycorrhizal species, were noted after initial thinning in similar second growth stands but appear to rebound after several years (Pilz et al 2003). In Alternative A, 1,592 more acres are thinned with tractor equipment than in Alternative B. Given this, Alternative A would likely have greater direct impacts on fungi if they occur in these stands. Although individual and short term impacts may occur, it is not likely to result in a trend toward Federal listing or loss of viability for survey and manage and sensitive fungi species.

Indirect effects to survey and manage and sensitive species and their habitats vary. Two studies have shown that fungal species richness declines in forest openings (Durall, et al, 1999, Kranabetter and Wylie 1998). Therefore, in the short term, thinning prescriptions may reduce habitat for sensitive mycorrhizal fungi. The prescriptions in both alternatives would take place in such a way to enhance late-successional characteristics over the long term. This includes greater diversity in stand structure and stand species. The addition of understory trees and shrubs may benefit the sensitive mycorrhizal species. Duff retention and coarse woody debris creation would benefit the sensitive saprophytic species. The stand prescription for Alternative B includes the creation of 13 patch cut areas that would also benefit from soil restoration activities and would lead to an increase in habitat complexity over the long term (20-100 years).

Reducing heavy equipment yarding through forested stands to be beneficial to forest vegetation. Skyline yarding causes fewer disturbances to the top soil horizons than tractor yarding; soils are less likely to become compacted with partial (or full suspension) skyline yarding than ground based systems. Cable yarding of trees causes localized soil compaction and disturbance along yarding corridors. This causes a loss of ectomycorrhizal root tips (Amaranthus et al, 1996) and can disturb litter-dwelling and saprophytic fungi within the logging corridors. Alternative A proposes 1,652 acres of tractor yarding, 1,233 acres of skyline yarding, and 443 acres of helicopter yarding. Alternative B proposes 60 acres of tractor yarding, 2,734 acres of skyline yarding, and 534 acres of helicopter yarding. Alternative A would construct 6.3 miles of temporary road and Alternative B would construct 5.0 miles. Both action alternatives include 496 acres of grapple piling adjacent to roads. Both of these activities would potentially create soil compaction and disturbance that would affect fungi habitat. Alternative C would result in no additional soil disturbance and compaction.

Culvert replacement may cause some disturbance to soil-dwelling fungi through direct disturbance and potential removal of habitat, but in a much localized area. Development of temporary access roads and helicopter landing areas would have a similar localized direct effect to fungi in the soil.

The Niner project area has history of past management actions from timber harvest to fire suppression. Potential sensitive plant habitat could be indirectly affected by increased risk of stand replacing fire disturbance due to heavier fuel loads. Effects of burning on fungi have been the subject of many scientific investigations. Loss of large downed woody debris that can act as moisture reservoirs and refugia is a concern (Penttila and Kotiranta, 1997).

Prescribed burning in the analysis area would cause loss of litter, so it could reduce substrates for litter-dwelling fungi. Bruns (2002) studying short-term effects of ground fire in the Sierra Nevada found a short-term reduction in the biomass of ectomycorrhizal fungi correlated with incineration of the litter layer but that lower layers, where the greatest specie richness occurs, were preserved. Stendell et al., (1999) found a similar pattern in a Sierra Nevada ponderosa pine forest after prescribed fire where litter/organic species biomass decreased eightfold but no difference was detected in mineral layers. Both alternatives prescribe 104 acres of underburning, which is 3 percent of the total area considered for thinning. Alternative B prescribes an additional

224 unit acres of hand piling and burning to mitigate for fuel loading, increasing localized litter loss under higher intensity burn piles.

Effects of Alternative C – No Action

Under this alternative, no acres would be thinned and the stands would undergo a slow decline before presumably opening up enough to provide an understory. An indirect effect of no action may be natural succession which may change the underground species composition. Windthrow, snowdown, and insect and disease pockets would create openings. Coarse woody debris would be abundant as trees die due to overcrowding. Indirect effects to sensitive fungi would likely be minimal. As stands get older, the underground species composition also gets more diverse (Visser, 1995; Bradbury et al, 1998; Smith et al, 2002). Alternative C would result in the least amount of short term impacts through thinning to survey and manage and sensitive fungi because most of them form mycorrhizal relationships with conifers and thinning has been shown to have negative short term (5-7 years) impacts to fungi (Pilz et al 2003).

Although only one sensitive plant population was found, the stands do provide potential habitat for 38 sensitive botanical species. Potential habitat for many of these plants would deteriorate as the dense canopies of Douglas-fir close in and darken the forest floor. For example, *Botrychium* species require the presence of western redcedar. Without thinning, the western redcedar would be suppressed by the dominant Douglas-fir and would not provide habitat for these species. *Cimicifuga elata* prefers more open stands with a well developed hardwood component. Foregoing thinning would delay the development of these stand characteristics. Alternative C does not provide any soils or fuels treatment scenarios that could promote short term weed flushes, however, invasive weeds would remain growing unchecked without mitigations in place to provide prescriptive treatments to abate or eradicate weed populations in the project areas.

Cumulative Effects – Sensitive Plants

The area analyzed for cumulative effects to botanical resources was the project area. The Niner project area has a history of timber harvest, road construction, fire suppression, and off highway vehicle (OHV) recreation. Most of the project area is managed as Management Area-14A - General Forest by the Forest Plan. This allocation provides merchantable timber products, social and recreational opportunities. The Huckleberry Flats OHV trail area was intensely harvested from the 1920's through the 1940's. Commercial thinning activities took place in much of the area in the 1980's. These forests likely contained multiple populations of survey and manage and sensitive botanical species. Fungal diversity declines with clear-cutting and fire (Byrd, et al 2000, Bruns, et al 2002) and stands were typically burned after harvest. Numerous western redcedar stumps attest to the past presence of a greater amount of cedar that may have provided habitat for the *Botrychium* species. Other habitat disturbing activities have been limited to recreation such as OHV use, and road maintenance that affect smaller localized areas.

It is probable that there has been some recovery of mycorrhizal diversity in stands over 20 years of age following clearcut activity which affects mycorrhizal diversity within the project area by harvesting the host species they depend upon.

There are 3,619 acres (28 percent) of the project area in mature and old-growth forests stand conditions. These stands serve as refugia for many of survey and manage and sensitive species that would be able to re-colonize the younger stands as they mature and become more complex in structure and diversity.

In the long-term (20-100 years) habitat for survey and manage and sensitive botanical species would be enhanced in the action alternatives. Many species would re-colonize the younger stands as they mature and become more complex in structure and diversity.

No thinning treatments would take place under Alternative C – No Action, so there would be no cumulative effects.

Conclusions

In summary, both action alternatives were given a May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Loss of Viability for the Population or Species rating (MIIH, NLCT) for the fungi species.

For rest of the species, there would be no impact because either no populations were found, or in the case of tall bugbane, the population and associated special habitat was sufficiently buffered from the impacts of project activities.

Table 41 - Summary of Effects Determination by Alternative

Species	Alternative A	Alternative B	Alternative C No Action
Botrychium minganense	NI	NI	NI
Botrychium montanum	NI	NI	NI
Bridgeoporus nobillisimus	NI	NI	NI
Carex livida	NI	NI	NI
Cimicifuga elata	NI	NI	NI
Corydalis aqua-gelidae	NI	NI	NI
Eucephalis(Aster) vialis	NI	NI	NI
Iliamna latibracteata	NI	NI	NI
Hypogymnia duplicata	NI	NI	NI
Leptogium burnetiae var. hirsutum	NI	NI	NI
Leptogium cyanescens	NI	NI	NI
Lycopodium complanatum	NI	NI	NI
Mycorrhizal Fungi	MIIH, NLCT	MIIH, NLCT	NI
Nephroma occultum	NI	NI	NI
Pannaria rubiginosa	NI	NI	NI
Peltigera neckeri	NI	NI	NI
Peltigera pacifica	NI	NI	NI
Pseudocyphellaria rainierensis	NI	NI	NI
Saprophytic on Litter fungi	MIIH, NLCT	MIIH, NLCT	NI
Saprophytic on wood	MIIH, NLCT	MIIH, NLCT	NI
Scouleria marginata	NI	NI	NI
Tetraphis geniculata	NI	NI	NI
Usnea longissima	NI	NI	NI

Key to Abbreviations in Table 2 (See attachment 4).
NI=No Impact
MIIH, NLCT=May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Loss of Viability for the Population or Species

Special Habitat

Current Conditions – Special Habitat

Many of the stands in Niner project area contain naturally occurring features that are designated as special habitats. Hardwood inclusions, scattered small wetlands and drier non-forested openings are the most common special habitats in the area. These areas provide habitat for various plant communities and contribute species diversity to the area, which is otherwise fairly uniform.

Some of the non-forested openings found in the project area have compacted soils and these openings may be artifacts from past management activities. They contain mixes of native and non-native plants and presently some may be considered marginal or non-functional habitat for many TE&S and Survey and Manage botanical species. The Invasive weeds most frequently inhabiting these areas are blackberries (*Rubus spp*.), oxeye daisy (*Leucanthemum vulgare*), tansy ragwort (*Senecio jacobea*), St John's-wort (*Hypericum perforatum*), bull and Canada thistles (*Cirsium spp*.) and several weedy grasses. Though a native species, another invasive plant present in many of the dry openings of note due to its competitive and allelopathic nature is western bracken fern (*Pteridium aquilinum*).

The Botanical Report (McMahan, 2006) located in the Analysis File provides a specific listing of special habitats located in the proposed units.

Direct and Indirect and Cumulative Effects – Special Habitats

Unique natural features such as meadow openings, talus slopes, ponds, etc. that are designated as special habitats in the project area with no or little previous history of habitat alterations caused by past management activities are excluded from new physical disturbance in all alternatives. No special habitats occur in direct proximity to planned temporary spur roads or landings. Buffer prescriptions would be sufficient to protect microclimates and minimize invasive weed introduction. Therefore, no adverse direct, indirect, or cumulative effects on naturally occurring special habitats are anticipated as a result of implementation of any alternative. Existing openings that occur within the project area are thought to be the result of, or influenced by, soil compaction that may not be considered as optimal functional habitat for many native plants. These areas may be enhanced through soil restoration activities, native species seeding and weed control efforts.

Economics

The high cost of planning and implementing a timber sale project may affect the overall economic efficiency of the project. The economic efficiency is primarily dependent on the cost associated with planning the project, type and cost of log yarding systems used, amount and cost of road management work, the timber benefit produced from the thinning, amount and cost of fuel reduction treatments, cost of mitigating measures to reduce effects, and potential costs for funding other resource improvement projects within the sale areas. The designs and decisions made on these aspects of thinning projects influences the net revenues returned by the project.

Timber revenues are returned to the U.S. Treasury and a proportion of the revenues re-distributed back to local county governments. The thinning project also generates benefits to the economy by providing timber products, direct and indirect employment from the planning and implementation of the project to the processing, production, and manufacturing of the raw wood material.

Direction for the financial efficiency analysis can be found in the Forest Service Manual 2430-2432 (Amendments 2400-95-1 through 3) and Forest Service Handbook 2409.18, Chapters 10-30 (Amendments 2409.18-95-1 through 6). The financial efficiency analysis provides information relevant to the future financial position of the program if the project is implemented. The analysis basically compares estimated Forest Service direct expenditures with estimated financial revenues. Financial efficiency analysis measures two things – revenue/cost ratio and financial present net value.

A financial efficiency analysis was completed for the project and can be found in the Analysis File. This analysis includes revenues generated from timber sale receipts, and costs of the planning, sale preparation, administration, roads, fuel treatments, reforestation activities, other mitigating measures, and Knutson Vandenberg (KV) funded sale area improvement projects. The analysis did not include an estimate of non-market amenities values due to the unpredictable nature of these values. Non-market values are required "only when excess demand exists for non-market goods (Forest Service Handbook 2409.18 32.24) or the project has detrimental effects on non-market output. For a comprehensive discussion of the social and economic considerations at the forest level, refer to the Willamette Forest Plan FEIS, Chapter III, pages 213-235 and Chapter IV, pages 119-130.

Direct and Indirect Effects

Effects of Alternative A, B, and C - Economic

Table 42 – Logging Cost and Financial Efficiency of the Alternatives.

	Alt. A	Alt B	Alt. C No Action
Logging Cost	$356/mbf	$408/mbf	0
Present Net Value	$16,519,031	$13,913,473	(-$180,000)
Revenue/Cost ratio	2.20	1.85	0

Alternative A has the lowest logging cost per acre mainly due to the proposed acreage of ground-based logging systems. Alternative B logging costs are slightly higher due to proposed acreage of skyline and helicopter logging systems. Alternative C does not propose any harvest, therefore has no logging cost. Alternative A's present net value and revenue/cost ratio are slight higher than Alternative B due to the lower costs. Alternative C (No Action) would have a negative present net value because no benefits are produce to offset the cost of planning the project.

Cumulative Effects - Economics

The cumulative effects of an alternative on the socioeconomic environment are quite difficult to estimate (WNFP FEIS, page IV-127). In terms of cumulative effects, District or Forest timber volumes for sale may have little influence on any one mill, for example an owner can purchase from Bureau of Land Management and private woodlot owners to get additional supply. They can also purchase logs from the Umpqua or Siuslaw National Forests. Or, at the owner's choice, they can increase or reduce the size of the mill operation, sell the operation to another company, or simply close the mill. All of these have occurred in the last decade and few, if any, of the changes to companies or communities can be tied directly to the sale of the Willamette National Forest timber.

Both Alternatives A and B would produce about 50 MMBF. This timber volume represents about 64 percent of the Middle Fork District's timber probable sale quantity for fiscal years 2007 to 2009 and 28 percent of the Forest's timber probable sale quantity for the next three years. Alternative C (No Action) would not produce any timber volume and does not provide timber volume to the District's or Forest probable sale quantity. The timber volume produced from these alternatives would have no cumulative effects to the economy of Lane, Linn, and Douglas counties given the timber land base in these three counties.

Recreation

Wild and Scenic River

Current Conditions – Wild and Scenic River

About 2,000 acres of the 12,872 acres Niner project area are within the lower portions of the recreation segment of the river corridor of the North Fork of the Middle Fork of the Willamette Wild and Scenic River (Forest Plan Management Area 6e). The entire 25 mile long recreation segment of the corridor contains about 6,000 acres of land, approximately 60 percent of which has been affected by past regeneration harvest over the last 80 years.

The Outstanding Remarkable Values (ORVs) identified for North Fork of the Middle Fork of the Willamette Wild and Scenic River (WSR) are: Water Quality, Scenic, Recreation, Geologic/Hydrologic, Vegetation/Ecology, Historic, Fish, and Wildlife, as listed in Appendix A of the Environmental Assessment and River Management Plan for the North Fork of the Middle Fork of the Willamette Wild and Scenic River (USDA, 1992).

The Wild and Scenic River Plan (USDA, 1992, page D-4) identifies desired future conditions for managed stands, as further discussed in this project's Silvicultural Prescription. Thinning within the Wild and Scenic River corridor is proposed to meet those desired stand conditions, which in general are to have at least 50 percent of the corridor in old-growth structural conditions. Due to past harvest activities this particular segment of the Wild and Scenic River currently contains limited amounts of old-growth forest. More specifically, the desired conditions for 100 year-old stands are to have 70 to 100 trees per acre with a diameter greater than 22 inches, at least 20

percent species other than Douglas-fir, and an understory layer that has 10 to 20 trees per acres greater than two inches in diameter. Page D-5 of the WSR Plan (USDA, 1992) specifically directs that stands between 60 and 120 years of age with closed canopies and which lack species diversity or shade tolerant understory species would be evaluated for thinning. The stands proposed for thinning do not contain the above desired conditions and the Niner project constitutes the prescribed evaluation and remedy to help achieve the desired future stand conditions.

The river is associated with a viewshed corridor, the viewpoints for which are defined as the river itself, Road 19, and the North Fork trail which is on the western side of the river (MA-6e-08). The Willamette Forest Plan (USDA, 1990a) S&Gs, as amended by USDA, 1992 for the North Fork WSR corridor specify that implementation of any management activities should result in meeting the Visual Quality Objective (VQO) of Retention (MA-6e-08). This means a majority of the area would remain naturally appearing. The Vegetation Management S&Gs for the WSR corridor (MA-63-10 through 24) provide prescribed restrictions for the amount and size of stand replacement harvest units but do not contain any restrictions for thinning. MA-6e-21 specifies that stands less than 100 years old should be evaluated to assure that existing stand characteristics would evolve into a 200 year old stand with 60 to 80 overstory trees and 6 to 20 understory trees per acre, and if stocking is excessive, thinning is to be employed to create the desired stand conditions. Thinning is proposed within the Niner project area to comply with this direction.

The Forest Plan FEIS (USDA, 1990) defines Retention from a scenic perspective as a landscape where human activities are not evident to the casual Forest visitor (page III-114). S&Gs for Scenic Retention foreground and middle ground areas (Management Areas 11e and f) also regulate the amount of even-aged harvest but do not mention thinning. The desired future condition for these retention areas (USDA, 1990a, page IV-210 and 213) is to maintain a natural or near natural setting, and activities would be conducted in such a way as to be completely subordinate to the character of the natural landscape and not evident to the casual Forest visitor. Important landscape elements would be retained to meet forest visitor expectations. These include large trees, shrubs and ground cover, and a variety of tree species and age classes.

Direct and Indirect Effects

To mitigate the effects the proposed thinning operations could have on recreation use, including that on Road 19 as well as the OHV area, the following measures would be implemented to provide for public safety: 1) Logging operations in the vicinity of OHV trails would be restricted to weekdays to avoid the need to temporarily close trails during popular use times; 2) Helicopter yarding over Road #19 would also only occur on weekdays, and would require the use of flaggers to stop traffic during over-flights.

Effects of Alternatives A and B – Wild and Scenic River

Both action Alternatives A and B would thin about 291 acres within the portion of the North Fork of the Middle Fork - Wild and Scenic River Management Area 6E in the project area.

The following discussions on ORVs are based in part on past analysis and results of implementing other similar thinning projects within the recreation segment of the Wild and Scenic River. These projects include the Short Hem Thin timber sale that occurred downstream of the Niner project area about 20 years ago; and the Angel Thin, Christy Thin, and Jump Up Thin timber sales which have been planned but not yet implemented.

Water Quality –Water quality effects resulting from the Niner thinning proposal are addressed in the Water Quality, Riparian Management, and Fisheries sections in this Chapter. The analyses documented in those sections did not identify a likelihood of water quality impacts. Such impacts would typically be due to soil erosion that enters the stream channel system, creating water turbidity. Soil erosion potential for this project is limited since thinning activities would retain an intact canopy, root mat, and understory vegetation layer; no road construction is proposed on the steep slopes within the Wild and Scenic River corridor; and helicopter yarding would be utilized to minimize soil disturbance.

Scenic –The proposed thinning activities would retain important landscape elements to meet forest visitors' scenic expectations. These include large trees, shrubs and ground cover, and a variety of tree species and age classes. These are the characteristics that the proposed thinning prescription seeks to create and enhance within the WSR corridor (for further discussion, see the Silvicultural Prescription contained in the Niner project's Analysis File).

The proposed thinning activities would maintain a natural or near natural setting and a casual Forest visitor would not notice the effects of management activities. The proposed thinning would retain about 70 trees per acre and helicopter yarding would likely not disturb the relatively dense understory brush layer to a noticeable extent. The slopes to be thinned within the corridor are generally quite steep and not easily viewed by drivers on Road 19. A dense and relatively wide unthinned buffer would remain between the river and the stands proposed for thinning, and in some places the no harvest riparian buffer for the North Fork of the Middle Fork River extends above Road 19 for 20 to 30 feet. The thinning activities would result in retention of all the characteristics the natural landscape; therefore the proposed action would not have negative effects on the Scenic ORV.

Recreation – The slopes proposed for thinning within the WSR corridor, approximately 291 acres, are on relatively steep ground above Road 19 (which is also designated as the Aufderhedie Drive/West Cascades National Scenic Byway) and in some places the no harvest riparian buffer for the North Fork extends above Road 19. These steep, densely forested slopes do not contain any recreational features such as developed and dispersed sites, or trails. About the only recreational use of these slopes would be hunting, and that use is likely limited due to the steep terrain and dense vegetation. The effects of thinning activities upon the recreation ORV would be limited to the scenic aspects associated with use of Road 19, as discussed above.

There would be one temporary effect upon recreation associated with the use of helicopters to yard the thinned trees on the slopes above Road 19. The proposal involves flying logs across Road 19 and the North Fork River to a landing on a

tributary spur of the 1912 road system. If logs are flown across Road 19, traffic would have to be temporarily stopped to provide for public safety in the event that any of the logs fell. It is estimated that approximately 1100 helicopter trips would have to be made across Road 19, so there is the potential to temporarily delay recreational traffic on that road during helicopter operations. The yarding is projected to last no more than 30 days, or less if more than one helicopter is used.

Geologic/Hydrologic –The unique geologic feature identified in Appendix A of the WSR Plan (USDA, 1992) is the two to four million year old North Fork Intra-canyon lava flow. This lava flow is what formed the ten mile long by three mile wide bench known collectively as High Prairie and Huckleberry Flats. The steep slopes proposed for thinning within the WSR corridor are the edge of this lava flow exposed by the North Fork river as its has eroded through the flow due to uplift of the Cascade Mountains. The proposed thinning activities would have no effect upon a feature of this magnitude.

Vegetation/Ecology – As mentioned above, the 291 acres of stands proposed for thinning within the WSR corridor are all created by past clearcutting. The thinning is proposed to accelerate the development of old-growth structural conditions in these stands that may be somewhat less diverse structurally and in species composition than natural stands. The proposed thinning would have a positive effect upon vegetation and ecological conditions in the river corridor as it would allow these stands to achieve the desired future conditions faster than they would without management intervention (see the Silvicultural Prescription).

Historic – The historic logging activities that created the stands proposed for thinning has been identified as an ORV. Some interpretive facilities exist along Road 19 that address this historic activity. The area proposed for thinning has been surveyed for historic features and none were found. Only the stand itself is considered historic, as it was created by the historic logging effort. The proposed thinning activities would have no affect upon the Historic ORV.

Fish – The North Fork of the Middle Fork of the Willamette River contains a population of native trout and it is managed as a quality fishing resource. Only fly fishing is allowed on the main stem river, and the river is open to catch-and-release fishing year-around. During the normal summer fishing season creel limits are less than other waters. In addition, and subsequent to the completion of the Wild and Scenic River Plan, spring Chinook salmon have been reintroduced into the NFMFWR by trucking adults over the downstream Dexter and Lookout Point dams. These salmon have spawned and there are now salmon smolts coming down the river during certain times of the year.

Water quality is the main environmental factor that affects fish populations and as mentioned above there are no anticipated effects to the water quality and fish ORVs. See also the Fisheries report for this project for more information on the potential effects to fish. The proposed thinning activities would not have an effect upon this ORV.

Wildlife – The quality and diversity of habitat and wildlife species throughout the river corridor, which ranges in elevation from 1,100 to 5,500 feet, are some of the factors

that resulted in wildlife being identified as an ORV. While the thinning activities would have some effects on individuals, and provide a subtly different sort of habitat than currently exists now on the 291 acres proposed for thinning (see the Wildlife Report for full details), the proposed activities would not have an effect on wildlife at the landscape or populations level, nor the wildlife ORV at the scale at which it was identified.

Effects of Alternative C - Wild and Scenic River

Alternative C (No Action) does not propose any thinning and would not affect the ORVs.

Cumulative Effects - Wild and Scenic River

Cumulative effects upon the WSR corridor were estimated for the entire 25 mile long recreation segment of the corridor. As mentioned to above, virtually all the river corridor in the lower 16 miles of the recreational segment was clearcut harvested in the 1920's to the 1940's. While this past action had a dramatic effect upon the scenic resources of the area, that effect has long since disappeared as the young forest has re-grown. These harvest created stands are now naturally appearing and it is known from numerous past public comments and questions that this past harvest is not at all apparent to the casual observer.

About 100 acres was thinned about 20 years ago in a portion of the WSR corridor along Road 19 south of the Niner project area. None of these thinned areas are evident to the casual or even non-casual visitor at this time. As in the discussion above regarding the proposed thinning effects upon the WSR, this past thinning, which was completed some years before the NFMFWR was listed as a Wild and Scenic River, did not have a negative effect on the river's ORVs.

Three other thinning projects within the recreation segment of the WSR corridor have been approved but have not yet been implemented. One is the Jump Up Thin timber sale located across the river from the lower portions of the Niner project area. The Jump Up Thin sale would thin about 400 acres of stands of similar age and structure to those proposed for thinning by the Niner project. The Jump Up Thin project is planned to be implemented in 2008. Two timber sales from the Christy Basin FEIS, Angel Thin and Christy Thin, are planned to be implemented in 2007. These commercial thinning sales occur in somewhat younger stands than those occurring in the Niner project area, and were also created by past even-aged harvest. Together these two sales would thin about 160 acres within the recreation segment of the WSR corridor, and are located from two to five miles upstream of the Niner project area and on the opposite side of the river.

The past and current actions have similar effects to those discussed above for the Niner project and none have affected WSR corridor ORVs with the exception of a positive effect upon Vegetation and Ecology. Cumulatively, the past, current and proposed Niner projects would improve stand diversity and structure within over 900 acres within the approximately 6,000 acre recreation segment of the river corridor. There are no reasonably foreseeable future actions that could affect ORVs.

Conclusion

The Niner project would not have adverse impacts on any of the eight ORVs that have been identified for this Wild and Scenic River, as discussed in detail above.

Huckleberry Flats Off Highway Vehicles (OHV) Trail Area

Current Conditions – Huckleberry Flats OHV

The Huckleberry Flats Off Highway Vehicles (OHV) Trail area was officially established about 15 years ago. It currently provides about 30 miles of trail less than 48 inches wide for use by trail bikes and all-terrain vehicles. These trails have been established for the most part on abandoned roads and skid trails created by the 1920-1940 harvest of this area. In addition to the trail system, the area contains a parking lot with an associated day-use area and a vault toilet facility. The area is well-used; visitation is about 2000 person days per year and it is typically used most during the early summer and fall. It is one of two official and sanctioned OHV recreation destinations provided within the Willamette National Forest.

The 30 miles of trail currently developed and available do not provide for a full day's worth of use without riding some of the trails twice. Since use of the area is relatively high, trail wear is beginning to become evident. To provide a greater variety of OHV experience, and to provide enough trail mileage to offer a full day of OHV riding without the need to ride a given trail more than once, a proposal to extend the trail system available for OHV use has been initiated in the Huckleberry OHV Trail Expansion Project Environmental Assessment. The proposed action is to approximately double the OHV trail mileage, primarily by using existing road beds or skid trails, along with some new trail construction to provide for trail connections. Environmental analysis of this proposal is being done separately from and concurrently with the Niner Project, but the Niner analysis does consider proposals to close certain roads in anticipation of converting them to OHV trails.

Direct and Indirect Effects

Effect of Alternative A and B – Huckleberry Flats OHV

Proposed tree felling and logging activities adjacent to OHV trails would result in trail closure for public safety. A total of about 37 miles of existing and proposed trails would be affected by the proposed thinning activities. These trails would be closed at some point during project implementation. Not all the trails would be closed at any given time. It is estimated that as much as 10 percent of the trails would be closed concurrently and a given trail segment would be closed for two weeks or less when log falling or yarding would be occurring within striking distance of the trail.

Log truck traffic on Road 1928 (the main access to the OHV area) and tributary system roads would impact OHV users to some extent, particularly when OHVs are crossing those open roads or when users are driving to and from the area. This log truck traffic would generally not restrict use but it could pose a hazard to OHV riders and would require them to be especially cautious when crossing or driving upon the open road system throughout the OHV area. Log truck traffic would be on this road system for a total of about 215 days, but this length of time could be shorter or longer, depending upon the number of log landings that are operating at a given time. The 215 day total is

based upon the assumption that there would be four landings operating at the same time.

Effects of Alternative C (No Action) - Huckleberry Flats OHV

The Alternative C - No Action C would have no affect on OHV users. Commercial thinning and associated road management activities would not take place; therefore no part of the trail systems would be closed for any length of time.

Cumulative Effects – Huckleberry Flats - OHV

Cumulative effects on the OHV area were estimated for the entire OHV area including the proposed trail expansion mentioned above. While many of the roads currently designated as OHV trails were created by past timber harvest, past timber harvest no longer has any effects upon OHV use in terms of restricting when and where such use can occur. Conflicts with logging disturbance or traffic only last as long as logs are being moved. There are no current or reasonably foreseeable future projects that would temporarily restrict OHV use in the Huckleberry Flats area similar to and which would accumulate with the Niner project effects. The aforementioned project to expand the trail system is a reasonably foreseeable future action but its effects would be to expand OHV trail riding opportunities, not temporarily restrict them. Therefore, the effects of the expansion project do not accumulate upon the effects of the Niner proposal in reference to this issue.

Social

Public Safety

The yarding of the trees and the log truck traffic may affect the safety of recreationists along Road 1900, recreationists in the Huckleberry Flats OHV trail area, and landowners and the general public along Road 1928 and the High Prairie area. Several units are proposed to be helicopter yarded to a landing on the opposite side of the North Fork of the Middle Fork of the Willamette River. The North Fork of the Middle Fork of the Willamette River corridor is a high recreation use area. Also, the majority of the timber would haul down the Road 1928 and through the High Prairie area. The helicopter yarding presents the danger of a log falling and possibly hitting the road or the river. The increased log truck haul traffic creates a danger and noise disturbance to landowners and general public driving the roads in the area.

Management Direction

Highway Safety Act of 1966 (HSA) requires each Federal agency to implement the HSA program standards to the extent that they are relevant to the activities of the agency. It requires the Federal agencies, through cooperation with the Federal Highway Administration (FHA) and National Highway Traffic Safety Administration (NHTSA) to determine the applicability of the specific highway standards to agency roads. Memorandum of Understanding (MOU) with the FHA and NHTSA, 76-SIE-005 of October 14, 1975 and 76-SIE-004 of October 17, 1975, respectively, identifies those safety standards that are applicable to the Forest Service (FSM 1535.11). The MOU makes portions of Standard 12 - Highway Design, Construction, and Maintenance applicable to Forest Service roads. Section 2 F - Traffic Regulations and Warning at

Construction and Maintenance Sites requires compliance with Manual on Uniform Traffic Control Devices (MUTCD) standards for traffic control on construction zones in all maintenance or construction projects on "roads open to public travel. Standard 14 – Pedestrian Safety requires the use of pedestrian and vehicle traffic control devices, such as signs, pavement markers, and parking regulations and pedestrian signals, to reduce pedestrian/vehicle conflicts.

Direct and Indirect Effects

Effects of Alternative A and B – Public Safety

Alternative A and B would have appropriately 10 log truck loads per day which travel down Road 1928 and through the High Prairie area. The timber haul would take about 1,250 days (50 mmbf / 10 loads per day X 4 mbf per truck load) staggered over about 8 years time period. The mitigating measure that restricts logging operations to weekdays around the OHV trail system and during the helicopter yarding across the NFMFWR River would be implemented through timber sale contract provisions. These contract provisions ensure the appropriate measures for public safety and traffic control devices meet the requirements of MUTCD.

As mentioned in the ORV Recreation section under the Wild and Scenic River, it is estimated that approximately 1100 helicopter trips would have to be made over Road 19 and the NFMFWR River. Temporary traffic control methods to provide for public safety would be required during helicopter operations. The yarding is projected to last no more than 30 days, or less if more than one helicopter is used.

Alternative C (No Action) does not propose harvest, therefore would have no have log truck traffic on Road 1928 or helicopter flights over the river and Road 19.

Cumulative Effects – Public Safety

Cumulative effects upon the WSR corridor were estimated for the lower 25 mile long recreation segment of the corridor. Three other thinning projects within the recreation segment of the WSR corridor were mention above. One is the Jump Up Thin timber sale located across the river from the lower portions of the Niner project area. The Jump Up Thin sale would thin about 400 acres of stands and shares and a common helicopter landing on Road 1912. The two timber sales from the Christy Basin FEIS, Angel Thin and Christy Thin, are located about two to five miles upstream of the project area and would not influence any helicopter landing sites or the haul roads except for the lower part of Road 19.

The past and current actions have similar effects to those discussed above for the Niner Project and none have affected WSR corridor ORVs with the exception of a positive effect upon Vegetation and Ecology. Cumulatively, the past, current and proposed Niner projects would improve stand diversity and structure over 900 acres within the approximately 6,000 acre recreation segment of the river corridor. There are no reasonably foreseeable future actions that could affect ORVs.

Road Management

Current Conditions- Roads

About 36.6 miles of forest roads are proposed to be used as haul routes within the project area. Most of these roads were constructed 50 – 70 years ago. Some of the roads were constructed on the old railroad grades used during the railroad logging in the 1920s to 1940s. The galvanized steel culverts used for drainage have a design life of about 30 years. Many of the culverts have passed their design life and are starting to fail.

Road 19 is a 2 lane paved road, designated as the Aufderheide Drive National Forest Scenic Byway, that provides year round recreational access to the NFMFWR and the heavily used Huckleberry OHV trail system. This road is the main access for recreation use throughout the watershed. The road is also the main haul route out of the watershed.

Road 1928 is the main road through the project area and is heavily used throughout the year by OHV recreationalist. Road 1928 is a single lane gravel road with turnouts that is maintained for passenger car use. The Huckleberry Flats OHV trail system is in the middle of the project area and adjacent to this road. The existing width of Road 1928 is wider than originally designed in most places as a result of blading practices where the emphasis was on removing potholes and washboards rather that keeping an established ditch dimension and running surface width. The consequence of this practice is decreased surfacing depth, and structural strength, insufficient cover heights over culverts, inadequate ditch dimensions, poor roadway drainage, and over-steepened fills. Although fill heights are relatively small due to the flat topography, a safety issue has developed at culvert locations where the fill is near vertical at the inlet and outlet ends.

Roads 1912 and 1931 are also single lane gravel, and are maintained for passenger car use. The rest of the roads in the project area are single lane gravel or native surfaced roads designed for high clearance vehicle use. These roads consist of mostly short dead end spurs. Some of these roads are currently used for trails in the OHV's system.

The road density in the project area is 7.5 miles/square mile. There is currently 2.51 miles of roads in the project area that have closed naturally (1928017, 1928020, 1928021, 1928226, 1928227, and the end of 1928708). This results in an open road density of 7.0 miles/square mile. If all recommendations for closure from the District Roads Analysis are implemented in this watershed the road open density will be reduced to 3.26 miles/square mile in the project area.

Un-roaded Areas

The Forest Roads Analysis (USDA, 2003) has identified an unroaded area greater than 1000 acres in the NFMFW Wild and Scenic River (Forest Plan Management Area -6E) corridor along the western edge of the project area. This area covers a narrow band of land above Road 19 along the eastern slopes of the lower section of the NFMFWR.

This area is less than 5,000 acres in size and not contiguous with any existing wilderness, primitive areas, Administration-endorsed wilderness, or roadless area in other federal ownership.

There are no inventoried roadless areas as identified in the Forest Service Roadless Area Conservation FEIS (USDA, 2000) within the project area.

The action alternatives propose no new or temporary roads in this un-roaded area. Helicopter yarding is proposed in the action Alternatives A and B that commercial thin about 291 acres in the NFMFW – WSR allocation.

Management Direction

There is no formal direction on un-roaded areas other then the informal advice from the Regional Office in September 2004. Management direction for inventoried roadless areas (IRA) is provided by Interim Directive No. 1920-2001, December 14, 2001 and the Regional Forester letter (1920) to Forest Supervisors, August 23, 2004 which establish checkpoints and information exchange for forest planning projects in IRAs. The 2001 Roadless Area Conservation Rule (page 3245) describes resource values and characteristic of un-roaded areas and Forest Service Manual 1909.12 Chapter 7.11 provides recommendations on un-roaded area and wilderness designations.

Direct and Indirect Effects-Unroaded Area

The effects of the alternatives can be summarized by using the roadless values and characteristics from the 2001 Roadless Area Conservation Rule (page 3245).

1. High quality or undisturbed soil water, and air- The alternatives have been evaluated for their effects on soil, water, and air in different sections of this Chapter 3. All the alternatives meet the intent of the Clean Water Act, Clean Air Act, and the Willamette Forest Plan Standards and Guidelines for soil disturbance.
2. Sources of public drinking water – NFMFWR is tier 2 watershed as designated in the Northwest Plan. NFMFWR serves as the primary water sources for the city of Westfir. As mention above and in the Water Quality section, all of the alternatives would meet the intent of the Clean Water Act.
3. Diversity of plants and animal communities - The action alternative would either maintain or enhance the diversity of plant and animal communities. The proposed activities would maintain or improve stand growth and health of these stands and diversify the species composition and stand structure for wildlife habitat. Commercial thinning would not change the community types. The treatments would move these stands along the successional pathway toward the development of late-successional forest characteristics. The treatments promote the development of large trees, multi-storied canopies, horizontal patchiness, and species diversification. The alternatives proposed no new or temporary roads in the un-roaded area. The area is not unique in terms of its plant and animal communities.
4. Habitat of threatened, endangered, proposed, candidate, and sensitive species – Alternatives were evaluated under Wildlife – TE&S. Northern spotted owls and spring Chinook salmon are the two species which are federally listed and inhabit the area. Proposed activities in Alternatives A and B result in an effects determination of “may affect, likely to adversely affect” the northern spotted owl for its short-term habitat modification and a “may affect but not likely to adversely affect” the northern spotted owl for disturbance. The effects determination for spring Chinook salmon is a “may affect but not likely to adversely affect”. Alternative C would have “no effect” to species

5. Primitive, semi-primitive non-motorized, and semi-primitive motorized classes of dispersed recreation – The steep, densely forested slopes do not contain any recreational features such as developed and dispersed sites, or trails. The main dispersed recreation is hunting, and that use is likely limited due to the steep terrain and dense vegetation. All the alternatives would meet the standards and guidelines for this WSR.
6. Reference landscapes – As mention above, this un-roaded area is located in the NFMF-WSR (Management Area 6E). The recreation segment of the corridor contains about 6,000 acres of land , about 60 percent of which has been affected by past regeneration harvest over the last 80 years The alternatives would affect a range between 0 (Alternative C – No Action) to 5 percent (Alternatives A and B) of this area by thinning treatments. The treatments would move these stands along the successional pathway toward late –successional forest conditions.
7. Natural appearing landscapes with high scenic quality – The proposed thinning units are second growth stands from the railroad logging in 1920-1940s. The alternatives affect the appearance of stands by the thinning out about half of the trees. The cut stumps of the thinned trees would leave evidence of management activity throughout these stands, even though large decayed tree stumps from the original clearcut harvest are still present. Scenic quality and alternative effects are also addressed in the Recreation – Wild and Scenic River section of this Chapter. The proposed thinning would maintain a natural or near natural setting and a casual Forest visitor would not notice the effects of management activities. The thinning would result in retention of all the characteristics the natural landscape; therefore the proposed action would not have negative effects on the scenic quality. No Action -Alternative C would have no effects to the scenic quality.
8. Traditional cultural properties and sacred sites – Cultural resource surveys have been completed for all proposed activities. Sites have been protected, avoided, or mitigated. Alternative B proposes a larger percentage of skyline and helicopter yarding to minimize soil disturbance. There are no known or recognized sacred sites in the area.
9. Other locally identified unique characteristics – There are no known or identified unique characteristics in this area. Special habitat would be buffered according to Forest Plan S&Gs and any interesting features from the railroad logging era will be protected.

Based on the preceding evaluation, none of the alternatives would preclude the future considerations of the unroaded area as an inventoried roadless area or wilderness.

Other Disclosure

Short term Uses and Long term productivity

NEPA requires consideration of the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity (40 CFR 1502.16). As declared by Congress, this includes using all practicable means and measures to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social,

economic, and other requirements of present and future generations of Americans (NEPA Section 101).

The Multiple Use – Sustained Yield Act of 1960 requires the Forest Service to manage National Forest System lands for multiple uses (including timber, recreation, fish and wildlife, range, and watershed). All renewable resources are to be managed in such a way that they are available for future generations. The harvest and use of standing timber can be considered a short term use of a renewable resource. As a renewable resource, trees can be re-established and grown again if the productivity of the land is not impaired.

Maintaining the productivity of the land is a complex, long-term objective. All alternatives protect the long-term objective of the project area through the use of specific Forest Plan S&Gs, mitigation measures, and BMPs. Long-term productivity could change as a result of the various management activities proposed in the alternatives. Management activities could have a direct, indirect, and cumulative effect on the economic, social, and biological environment. Those effects are disclosed in the analyses presented in this Chapter 3.

Soil and water are two key factors in ecosystem productivity, and these resources would be protected in all alternatives to avoid damage that could take many decades to rectify. Sustained yield of timber, wildlife habitat, and other renewable resources all rely on maintaining long-term soil productivity. Quality and quantity of water from the analysis area may fluctuate as a result of short-term uses, but no long-term effects to water resources are expected to occur as a result of timber management activities.

All alternatives would provide the fish and wildlife habitat necessary to contribute to the maintenance of viable, well distributed populations of existing native and non-native vertebrate species. The abundance and diversity of wildlife species depends on the quality, quantity, and distribution of habitat, whether for breeding, feeding, or resting. The alternatives vary in risk presented in both fish and wildlife habitat capability.

None of the alternatives would have an effect on the long-term productivity of timber resources.

Irreversible and Irretrievable Commitment of Resources

NEPA requires that environmental analysis include identification of ". . . any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented." Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources have on future generations.

Irreversible effects primarily result from use or destruction of a specific resource (e.g., minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action (e.g., disturbance of wildlife habitat); or is lost as a result of inaction (e.g., failure to monitor and treat forest vegetation to prevent infestation of insects).

The proposed thinning project would result in few direct and indirect commitments of resources; these would be related mainly to thinning operations.

The anticipated effects for all action alternatives described in this document are the same as those discussed in the FEIS for the Forest Plan (USDA, 1990b) on page IV-178. Some erosion and soil movement would result from thinning activities. Small amounts of crushed rock from quarries would be committed to construction of temporary spur roads and landings or maintenance of the existing classified road system and would be irretrievable, if used. Energy used to grow, manage, and harvest trees, and in other management activities is also generally considered irretrievable

The analysis revealed no significant irreversible or irretrievable commitment of resources associated with implementing the alternatives that are not already identified in the Willamette National Forest Plan FEIS

Unavoidable Adverse Effects

Several expected adverse effects, including some that are minimal and/or short term, were identified during the analysis. Resource protection measures or mitigations were identified and considered for each of these as a means to lessen or eliminate such effects on specific resources. See mitigation measures starting on Chapter 2. Resource areas determined to have potential adverse effects (resulting from any of the alternatives – including No Action and the Action Alternatives) are documented within the appropriate Environmental Consequences sections of each resource in this chapter. See the following sections:

Soils - Detrimental Soil Conditions

Wildlife - Big Game Habitat

Wildlife - Coarse Woody Debris

Wildlife - Threatened and Sensitive Species

Wildlife - Survey and Manage Species

Wildlife – Management Indicator Species

Fire and Fuels- Fuel Loading

Air Quality

Water Quality and Stream Conditions

Vegetation: Invasive Weeds

Vegetation – Sensitive Species and Survey and Manage Species

Recreation – Wild and Scenic River

Recreation – Huckleberry OHV trails

Cultural Resources

The areas proposed for ground-disturbing activities have been surveyed and evaluated for the presence of cultural resources. Several areas containing these resources have been identified. The action alternatives were either designed to avoid or exclude these

areas from any management activities, have mitigated the effects by protecting the sites with down logs, and or minimized the site disturbances with yarding log suspension requirements. The action alternatives would have no adverse effects to cultural resource (See Project Review for Heritage Resources from State Historic Preservation Officer (SHPO) in the Analysis File). If any cultural sites are found during any proposed activity, the activity would be discontinued, and timber sale contract provisions would be invoked until the site is evaluated for significance and appropriate mitigation measures are performed.

Special Forest Products

There is increasing recognition of the economic value of special forest products (SFP) and their potential role in supporting the diversification of forest products dependent communities. The SFP program on the Forest provides a potentially wide range of products.

The Niner treatments areas have a potential to contribute to the supply of special forest products. SFP's available within the proposed treatment areas are limited to some of the basic greenery plants species and some mushrooms. These species include salal, Oregon grape, sword fern, various mosses, and golden chanterelle and morel mushrooms. These SFP's are defined as “non-timber renewable, vegetative natural resources” that can be utilized either for personal or commercial use.

The collections of SFPs are directed by the Forest Plan Amendment No. 23 and the SFP's Management Plan (USDA, 1993b). The latter document suggests that collection of certain SFP's be focused upon areas that are scheduled for harvest, so the proposed actions would provide for a greater amount of potential SFP harvest. This direction ensures resource protection that is consistent with current Forest Plan goals and resource protection and ensures a sustainable long-term supple of desired products. FW-323 to 338 provides direction, such as acceptable harvest levels of various plants/products, acceptable methods of harvest, measures needed to protect other resource values, and where harvesting would be allowed.

At this time, though SFP's provide a potential for economic development, there is a low amount of interest in their collection, and the supply of various renewable forest products existing in the project area and throughout the NFMFWR watershed far exceeds the demand for these products.

Effects on Recreational Fisheries (Executive Order 12962)

This 1995 order's purpose is to conserve, restore, and enhance aquatic systems to provide for increased recreational fishing opportunities nationwide. It requires federal agencies to evaluate the effects of federally funded actions on aquatic systems and document those effects relative to the purpose of this order.

There is a potential short term impact of sediments into the streams as a result of the thinning and road management activities. This short term impact would not threaten fish species. The short term impacts are outweighed by the long term benefits to the water quality and fisheries resource. Mitigating measures have been applied in the action alternatives to maintain anadromous fish and resident fish populations and habitat. These mitigating measures include no harvest zones adjacent to streams and

other best management practices during harvest activities. Stream rehabilitation projects have been proposed to improve stream temperatures, channel complexity and diversity. Road reconstruction and closures have been proposed to reduce the risk of sedimentation to water quality and fisheries resources.

All action alternatives including associated mitigation actions and BMPs are consistent with current management direction including Willamette Forest Plan Standards and Guidelines, Aquatic Conservation Strategy (ACS) Objectives (at the watershed analysis level) and the Federal Clean Water Act. Implementation of required BMPs would insure protection of water quality and beneficial uses under all alternatives.

Effects on Consumers, Civil Rights, Minority Groups and Women

Implementation of any alternative may not by itself have any effect upon consumers, but in combination with other timber harvest projects may have an effect upon the local economy, especially on communities of Lowell, Oakridge, Springfield and Eugene. The Forest Plan FEIS addresses social and economic effects on pages IV 119-128.

Implementation of this project has not been planned to either favor or discriminate against any social or ethnic group. Contracting procedures would ensure that projects made available through this project would be advertised and awarded in a manner that gives proper consideration to minority and women-owned business groups and meet Equal Employment Opportunity requirements. Because of this consideration, there would be no direct, indirect, or cumulative effects to consumers, minority groups with implementation of any of the alternatives

Effects on Minorities, Low-Income Populations, or Subsistence Users (Environmental Justice – Executive Order 12898)

Niner Project is located near the Cities of Oakridge, Westfir, and Lowell in Lane County, Oregon. These communities have minority populations of 8 percent, 7 percent and less than 1 percent, respectively. Lane County, in its entirety, has a minority population of 9 percent, (U.S. Census Bureau, 2000).

For the City of Oakridge, approximately 14.5 percent of the population is at or below poverty level; approximately 12.2 percent of the population of the City of Westfir is at or below the poverty level, while 11.5 percent of the City of Lowell is at or below poverty level, (U. S. Census Bureau, 2000). According to information from the Oregon Economic and Community Development Department (OECDD), Lane County, (excluding areas within the city limits of Eugene, Springfield, Coburg and Dunes City), is rated 1.30, (threshold 1.20), on the distressed area index.(OECDD, 2002). These Cities, as well as much of Lane County, have experienced a significant decline in timber-based jobs over the past decade, contributing to factors used to determine a distressed community.

Implementation of any alternative that provides the opportunity for employment may positively affect low-income families who are either unemployed or underemployed. Implementation of any alternative is not expected to impose a disproportionately high or adverse effect to those populations.

Subsistence and cultural use levels are difficult to quantify and differential patterns of subsistence consumption are unknown at this time. However, the Forest provides

access to firewood, Christmas trees, mushrooms and other consumables through a personal-use permit system. Middle Fork Ranger District sells and issues permits for about 800 cords of firewood; about 2,000 Christmas tree permits; and about 300 personal-use mushroom permits per year.

The proposed thinning treatments have the potential to contribute to the supply of special forest products (SFP) available within the area, such as basic greenery plant species and some mushrooms. Interest in commercial harvest of SFPs is low in this area at this time, and supply far exceeds demand in the NFMFWR watershed. (See "Special Forest Products," discussed above)

Effects on fisheries are mitigated in all action alternatives to maintain anadromous fish and resident fish populations and habitat.

Road closures may impact subsistence in the immediate project area, but these impacts would be mitigated by the availability of other access routes throughout the area.

The Willamette National Forest has Memorandums of Understanding (MOU) with the Confederated Tribes of the Grand Ronde, the Confederated Tribes of Warm Springs, and the Confederated Tribes of Siletz. These MOUs provide the mechanism for regularly scheduled consultations on proposed activities. Beyond this, the Forest notifies and consults with tribal governments in a manner consistent with the government-to-government relationship on any matters that ripen outside of the meeting schedule. Any potential impacts are discussed and mitigated through these processes.

All alternatives comply with Executive Order 12989 "Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations".

Effects on American Indian Rights

The Confederated Tribes of the Siletz, Grand Ronde, and Warm Spring, Klamath Tribe and Kalapooya Sacred Circle Alliance were notified of the project during the scoping of issues as part of the public participation process.

The Niner Project has been included in the annual Program Review of Work with the Conferated Tribes of the Siletz and Grand Ronde for the last couple of years. Assorted presentation was given on the major Forest's timber sale planning efforts. No specific comments were received from these tribes as a result of scoping letters and annual Program Review meeting. No specific sacred sites have been identified in the proximity of the proposed units. No impacts, as outlined in the American Indian Religious Freedom Act, are anticipated upon American Indian social, economic or subsistence rights.

All alternatives comply with Consultation and Coordination with Indian Tribal Governments Executive Order 13084 and Indian Sacred Sties Executive Order 13007.

Effects on Farmlands, Rangelands, Forest Land, and Floodplains

Executive Orders 11988 and 11990 direct Federal agencies to avoid, to the extent possible, both short-term and long-term adverse impacts associated with the modifications of floodplains and wetlands. None of the alternatives have specific actions that adversely affect wetlands and floodplains. Wetlands and streams with

associated riparian reserves (includes adjacent floodplains) have been delineated for the Niner project area. All of the wetlands and streams near treatment areas have been buffered to protect the natural and beneficial values and minimize any detrimental effects to those wetlands and streams. Proposed activities are compliant with the orders and USDA Departmental Regulation 9500-3. See discussions related to this topic in the hydrology, fisheries and soils resource sections in Chapter 3 for more information.

Monitoring

Based upon the purpose and need for the action, the issues identified during the scoping process and used in the design of the alternatives, the following Forest Plan S&Gs are recommended to be used as a guide for monitoring key components of the project.

Commercial Thinning (Purpose and Need**)**

Did the project meet Management Area 14A – 13 Standard and Guideline on when commercial stocking level control, based on DBH, basal area, and economically feasible should begin?

Road Closure (Purpose and Need)

Did the project meet the recommendations in the District's and Forest's Road Analyses?

Detrimental Soil (Purpose and Need and Significant Issue)

Did the project meet the Forest-wide Standards and Guideline FW-081 on detrimental soil conditions?

1. Monitoring of tractor skid trail detrimental soil conditions relative to use of existing skid trails and whether new skid trails are created.
2. Monitoring of winter haul and logging operations to determine whether assumptions for soil erosion and sedimentation are correct.
3. Monitoring of landing size assumptions to validate for future modeling of detrimental soil conditions.
4. Monitoring of cable corridors to determine extent of detrimental soils created and validate assumptions for future modeling.
5. Monitoring of winter haul and logging operations to determine whether assumptions for soil erosion and sedimentation are correct.
6. Monitoring of landing size assumptions to validate for future modeling of detrimental soil conditions.

Fuel Loading (Purpose and Need and Issue)

Did the project meet Forest–wide Standard and guideline FW-252 for management activity-created fuel loadings?

Big game Habitat (Issue**)**

Did the project meet the Forest-wide S&Gs FW-135 to 138, FW-152 and 153 for deer and elk management?

Wild and Scenic River (Issue)

Did the project meet the Willamette Forest Plan management goals and objectives for Management Area - 6E – Wild and Scenic River and the S&Gs associated with management area?

Water Quality and Soil Erosion (Issues)

Did the project implement Best Management Practices?

Did the project meet Forest-wide S&Gs FW-084 on soil erosion?

Other Standard Monitoring

Monitoring will occur at many points in time during the implementation process of the project such as during timber sale layout and preparation, timber sale contract administration, and service contracts administration.

The Silviculturist will review marking guides or contract provisions for designation by description for the thinning prescription with the presale crew prior to marking or after a portion of the unit is completed by the purchaser and monitor quality both during and after the unit is completed marked.

Logging operation will be monitored by the sale administer, soil scientist, and Silviculturist. If S&Gs, best management practices, mitigation measures, or the silvicultural prescriptions are not being met, additional measures will be prescribed to insure compliance. The sale administrator will inform the appropriate staff member if logging feasibility issues may make it impossible to meet the desired conditions outlined in the environmental document.

The District fuels specialist, soil scientist, and Silviculturist will monitor post harvest fuel loading to determine if slash treatment is still warranted. If the unit's fuel loadings are within S&Gs, the slash treatments may be adjusted or waived to promote long term site productivity.

The project will be subject to randomly selected implementation monitoring trips sponsored by either provincial, regional, forest, or district level management teams to determine if the objectives, standard and guidelines, and management practices specified in the Forest Plans are being implemented.

Additional information about monitoring can be found in the individual resource reports in the project's Analysis File.

Sale Area Improvements - Funded Project Priority List

Essential KV

1. Reforestation and the associated activities such as; planting, replanting, exams or stocking surveys, and animal damage control (on approximately 60 acres of soil restoration units if Alternative B is selected).

Mitigating Measures

2. Soil tillage of skid trails, temporary spur roads, landings, and restoration units (Alt B) Includes closed road narrowing and rehabilitation.
3. Temporary Spur Road Closure and Rehabilitation (spurs not closed with timber sale contract). Includes closing off old skid trail and temporary spurs adjacent to the Camp Six area with boulder barriers
4. Erosion Control Seeding and Fertilization.
5. Wildlife Tree/Snag and Down Wood Creation and Monitoring.
6. Invasive Weed Control and Surveys.

Resource Opportunity Projects – Should money be available from timber stumpage payments after implementation of an action alternative or from other sources not connected with the proposed timber sale, the following projects would be implemented, in order of descending priority;

1. OHV trail maintenance
2. Fire wood inventory and removal.
3. Timber stands improvement treatment on 394 acres of young plantations (precommercial thinning, pruning, fertilization).
4. Closure of spur road with ford across 4th Creek (Road# 228 & 229)
5. In stream placement of large woody debris in project area streams and the NFMFWR
6. OHV trail interpretive signing
7. Clean of garbage dumps and abandoned vehicles in project area
8. North Fork Trail maintenance.
9. Installation of fish passage culverts on 3rd, 7th, 8th and Huckleberry Creeks.