APPENDIX F: WATER EROSION PREDICTION PROJECT (WEPP) MODEL METHODOLOGY AND CUSTOM CLIMATE DATA

The sediment export analysis performed for the Locke Mountain Fuels Management EA relied heavily on interfaces to the USDA Water Erosion Prediction Project (WEPP) model provided by the U.S. Forest Service Rocky Mountain Research Station (USFS RMRS) in Moscow, Idaho, and made available on the internet at http://forest.moscowfsl.wsu.edu/fswepp/WEPPlinks.html.

We acknowledge the timely and critical assistance of Dr. William Elliot at the RMRS with implementing these models.

Three models were applied for this analysis: (1) WEPP Fuel Management (FuME); (2) GeoWEPP; and (3) Rock:Clime. The WEPP FuME model used for this EA requires input as a series of representative hillslopes from the watershed. Hillslopes for these model runs were generated using GeoWEPP, a research-grade software product from the State University of New York (SUNY) in Buffalo, New York. GeoWEPP functions as an extension of ESRI ArcGIS 9.2 suite of products. Climate data inputs for the WEPP FuME model were generated using the Rock:Clime model (which itself is a composite of the USDA Cligen model and the PRISM dataset generated at the University of Oregon).

Essentially, WEPP FuME is an application of the WEPP model with a series of standard assumptions built in regarding the management of forests for hazardous fuels reduction. The built-in assumptions allow rapid comparison of numerous common fuel management practices without explicitly producing a WEPP model.

The WEPP FuME interface requires the following data inputs (see Figure 1):

- Climate
- Soil texture
- Road density (miles of road per square mile of watershed)
- Buffer (undisturbed forest adjacent to stream channels)
- Hillslope length and geometry characteristics (WEPP ‘S’ type)

All model outputs are computed as tons of sediment per square mile of contributing area for the year of disturbance. The WEPP FuME model will compute average sediment yield per year if a value is entered for disturbance return period.

The Rock:Clime model uses adjusted USDA Cligen WEPP climate inputs for a number of agriculturally significant sites throughout the United States. Adjustments are made to account for orographic effects on temperature and precipitation using the PRISM hydrologic contour data from Oregon State University. The prism model allows for adjustments in 2.5-minute increments (approximately 2.5 miles in the analysis area). The nearest Cligen station to the analysis area is at Westcliffe, Colorado, 38.13°N 105.48°W, 7860 feet elevation. The Westcliffe data was adjusted twice to obtain two climate estimates for the analysis area, one in the northern portion and one toward the south; at 38.29°N 105.24°E, 8587 feet elevation and 38.25°N 105.24°E, 9630 feet elevation, respectively. The estimated climates are stored for later use with the WEPP FuME model.

Soils in the study are all variations of Sandy Loam.

Road density was computed using GIS for each of the management scenarios.

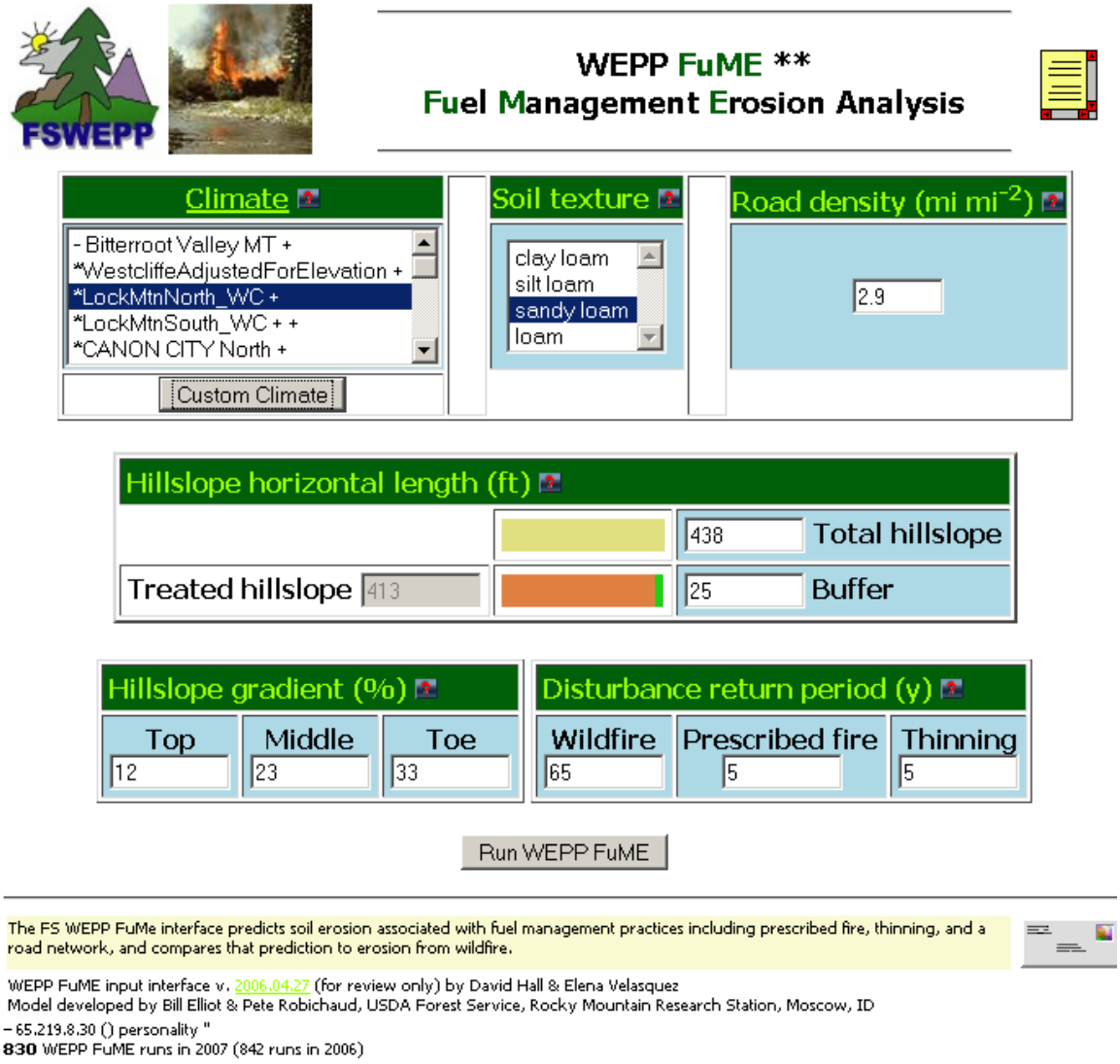

Figure 1: Sample WEPP FuME interface from web browser.

The GeoWEPP model was used to extract representative hillslopes for the analysis area. A 10-meter DEM[1] from the USGS seamless data distribution center was obtained and converted from NAD83 geographic projection to UTM Zone 13N projection for use with the model. The GeoWEPP modeled the stream network using an embedded TOPAZ model. Streams were modeled for flowpaths with 5 hectare (ha) or more of contributing area and at least 100 meters of source channel length.

Four primary watershed outlets were identified at the study area boundary on: (1) Newlin Creek; (2) Lower Newlin Creek; (3); Upper Oak Creek; (4) Oak Creek. The GeoWEPP embedded TOPAZ model was used again to delineate a subwatershed boundary for each outlet. These four subwatersheds were the analysis areas for the WEPP FuME models.

It is important to note that for this analysis, the GeoWEPP/TOPAZ delineated watersheds do not correspond exactly to the 6th level watershed (HUC 6) boundaries because of three issues: (1) The HUC 6 boundaries are drawn at 1:500K scale and do not capture the same level of detail in watershed divides as the TOPAZ analysis; (2) the outlets of the HUC 6 watersheds are beyond the extent of the analysis area, so outlets were chosen that resulted in two outlets in the Newlin Creek HUC 6; (3) No outlet was chosen for the Coal Creek HUC 6 watershed because only a very small portion of the stream contributing area is included in the analysis area boundary, and so no direct analysis was performed on that watershed.

The GeoWEPP model generated representative right and left bank hillslope profiles (WEPP S curve with Top, Middle, and Bottom slopes) for each first and second order stream. Additionally, for first order streams, GeoWEPP creates a representative hillslope for the upstream headwater area.

The GeoWepper.pl script extracted the representative hillslopes from the GeoWEPP model and made them available as an ASCII file for input in a spreadsheet.

The number of hillslopes produced per delineated watershed depended on the size of the basin and the corresponding number of first and second order streams. The number of representative hillslopes per basin is as follows: Newlin Creek – 121, Lower Newlin Creek – 23, Oak Creek – 33, Upper Oak Creek – 86.

Approximately 10% of the slopes were selected for use as representative of the watershed response to fuel management practices—the 10% were chosen using a random number selector. In addition to the randomly chosen 10%, the longest and also the steepest slopes were included.

For reporting purposes, transect results were averaged by watershed to produce one record per watershed. Approximately 65% of the analysis area is captured in the model results.

All raw data outputs, including the Hillslope data generated through GeoWEPP, are provided in the following tables.

[1] The DEM is nominally 10-meter; actual cell sizes vary slightly depending on latitude and longitude.

Hillslope Data Generated through GeoWEPP (by watershed)

Watershed: Oak Creek			Climate match: Locke Mtn North		
slope no.	hill length (ft)	top grad (%)	middle grad (%)	toe grad (%)	area (ac)
101	1091	8	11	10	15.8
102	213	16	34	35	3.9
103	781	7	17	19	14.4
112	131	67	34	33	1
113	389	6	32	35	3
121	974	11	15	35	14.8
122	746	5	6	7	17.7
123	376	11	24	18	8.9
131	833	5	9	10	15
132	261	4	4	7	7
133	262	30	23	28	7
141	797	14	21	10	13.1
142	192	18	23	19	8.7
143	478	25	16	10	21.7
22	670	13	21	33	33.1
23	596	2	21	21	29.5
32	41	52	52	52	0.6
33	404	20	37	26	5.5
42	299	28	26	14	9.7
43	448	19	28	17	14.6
52	461	23	22	20	18
53	636	7	13	22	24.8
61	766	5	13	16	14.6
62	552	11	19	17	5.6
63	149	8	10	17	1.5
71	869	3	11	20	15.7
72	401	16	9	11	14.2
73	960	7	10	12	34
81	878	5	3	2	12.6
82	121	8	11	10	4.1
83	265	6	14	12	9
92	156	33	44	41	3.8
93	165	23	40	45	4
				Total	**406.9**

Hillslope Data Generated through GeoWEPP (by watershed) (continued)

Watershed: Lower Newlin			Climate match: Locke Mtn South		
slope no.	hill length (ft)	top grad (%)	middle grad (%)	toe grad (%)	area (ac)
101	1148	9	12	11	12.7
102	438	12	23	33	9.2
103	267	13	15	18	5.6
22	90	43	31	31	2.2
23	164	35	32	22	4.1
32	172	20	39	40	3
33	538	13	24	33	9.3
42	581	13	16	23	19.9
43	1351	1	8	10	46.4
51	758	10	12	17	13.7
52	529	27	18	17	18.6
53	398	15	16	18	13.9
61	770	14	11	12	14.2
62	207	8	14	16	7.4
63	926	5	12	9	33.3
72	142	19	21	20	2.1
73	946	9	10	6	13.7
81	881	17	10	11	12.4
82	134	16	18	17	4
83	40	10	10	10	1.2
91	849	8	14	16	13.8
92	37	7	7	7	0.4
93	97	24	27	26	1
				Total	**262.1**

Hillslope Data Generated through GeoWEPP (by watershed) (continued)

Watershed: Upper Oak Creek			Climate match: Locke Mtn South		
slope no.	hill length (ft)	top grad (%)	middle grad (%)	toe grad (%)	area (ac)
101	925	15	17	17	12.5
102	209	32	36	39	12
103	582	10	10	14	33.3
112	85	48	48	36	1.1
113	248	29	46	52	3.1
122	121	47	53	53	3.2
123	449	32	46	56	11.7
131	1104	6	11	13	12.6
132	258	30	35	44	5
133	804	9	15	33	15.4
141	1250	2	15	23	16.1
142	160	26	19	21	2.9
143	90	50	46	48	1.6
152	95	17	12	33	1.4
153	1061	21	18	39	15.4
161	1168	15	12	8	12.4
162	2	28	28	28	0.1
163	309	21	20	24	13.7
172	1035	4	32	31	11.9
173	344	16	15	10	3.9
181	1491	3	20	51	12.5
182	150	55	39	48	3.7
183	474	33	42	72	11.6
192	9	0	0	0	0.1
193	688	27	15	0	4.9
202	85	35	35	41	1.8
203	171	42	39	25	3.5
211	743	12	8	8	15
212	216	10	21	28	14.5
213	152	8	8	8	10.2
22	239	22	22	25	2
222	65	15	15	17	0.4
223	651	35	35	17	3.7
23	623	33	23	11	5.3
231	1008	1	3	2	12.8
232	30	14	14	14	1.7
233	236	16	14	13	13.4
242	97	23	35	34	0.5
243	320	8	26	30	1.5
251	1411	6	32	35	12.5
252	154	44	37	65	2.1
253	191	49	52	46	2.6

Watershed: Upper Oak Creek			Climate match: Locke Mtn South		
262	633	44	29	31	26.4
263	488	23	30	45	20.3
272	344	20	14	18	4.1
273	111	18	50	43	1.3
281	1033	1	11	1	12.4
282	416	9	14	33	10.8
283	432	0	6	18	11.2
292	150	19	43	38	1.9
293	81	39	23	21	1
301	938	6	13	5	12.4
302	193	9	11	18	3.4
31	734	8	18	30	14.5
311	1236	6	14	7	12.5
312	47	21	21	15	0.4
313	115	7	16	38	1
32	361	18	27	38	31.2
322	535	7	8	10	19.1
323	476	4	25	32	17
33	388	43	37	37	33.5
331	1506	6	13	19	12.6
332	219	10	24	25	5.9
341	659	3	21	24	13.2
342	1199	16	21	29	58.2
343	582	23	14	14	28.3
351	805	5	22	30	13.2
352	172	50	21	34	6.3
353	353	22	24	30	13
361	1008	17	24	2	12.4
362	397	40	24	28	26
363	524	30	29	26	34.2
42	87	7	11	13	0.3
43	124	30	12	10	0.4
52	150	21	33	31	4.8
53	152	47	62	41	4.8
62	174	38	50	50	4.7
63	602	44	40	42	16.5
71	714	6	17	39	13.5
72	659	12	11	6	31.8
73	439	27	32	45	21.2
81	801	15	17	9	14.1
82	185	50	43	46	8.3
83	375	30	41	51	16.9
92	93	29	36	32	1.5
93	334	21	50	34	5.4
				Total	**927.5**

Hillslope Data Generated through GeoWEPP (by watershed) (continued)

Watershed: Newlin Creek			Climate match: Locke Mtn North		
slope no.	hill length (ft)	top grad (%)	middle grad (%)	toe grad (%)	area (ac)
101	884	10	10	8	22.8
102	360	13	15	17	7.8
103	310	6	14	14	6.7
111	803	8	13	4	12.4
112	138	6	19	25	2.5
113	289	17	12	9	5.2
122	328	10	24	18	4.5
123	264	31	33	21	3.6
131	934	16	9	10	13.1
132	202	2	8	13	9.5
133	217	32	19	19	10.2
142	145	24	16	23	1.4
143	101	23	52	39	1
151	798	16	10	8	12.5
152	184	6	13	8	7.6
153	239	8	8	15	9.8
161	948	5	8	8	12.5
162	69	15	15	13	1.7
163	1196	24	13	14	29.7
172	778	20	23	23	18.2
173	323	22	32	46	7.6
182	905	22	26	30	7.9
183	152	16	29	33	1.3
192	326	18	30	19	6.4
193	98	23	16	7	1.9
202	547	29	21	27	8.4
203	27	7	7	7	0.4
211	868	25	20	28	13.9
212	118	18	31	33	1.1
213	394	15	18	25	3.5
22	514	36	37	35	13.3
222	91	32	16	18	1.5
223	135	11	33	37	2.2
23	306	10	25	26	7.9
232	360	45	26	19	11.7
233	908	9	12	34	29.6
241	880	8	7	14	15.6
242	346	10	11	20	5.7
243	287	9	19	20	4.7
252	168	8	15	29	3.6
253	528	27	18	12	11.4
262	515	8	15	8	3.5

Watershed: Newlin Creek			Climate match: Locke Mtn North		
263	119	5	9	16	0.8
273	82	10	6	8	0.2
281	743	19	12	7	13
282	585	5	11	4	16.7
283	199	14	12	17	5.7
291	812	4	10	9	14.1
292	173	14	17	17	4.5
293	478	10	13	15	12.4
301	1142	3	10	17	12.4
302	79	4	9	5	1.5
303	20	3	3	3	0.4
311	1171	4	3	7	13.1
312	66	11	11	10	2.7
313	479	2	3	4	19.4
32	295	20	38	37	12.8
322	99	45	45	44	0.2
33	472	19	31	55	20.4
332	529	19	21	13	15.1
333	556	4	14	15	15.9
342	311	39	12	13	8.5
343	159	23	15	14	4.3
351	1047	7	3	4	12.5
352	395	5	7	13	23.1
353	383	3	3	2	22.4
362	106	8	11	11	1.1
363	294	6	11	14	3.1
371	1041	6	5	1	12.4
372	772	6	8	10	18.7
373	134	10	15	20	3.2
381	1072	8	5	5	12.9
382	681	1	4	6	49.5
383	378	3	3	3	27.5
392	787	8	11	11	10.4
393	290	2	7	7	3.8
401	1113	8	5	3	19.1
402	560	3	7	7	41.1
403	541	1	2	3	39.7
412	165	6	11	9	3
413	1105	6	9	3	19.9
42	554	11	20	31	29.5
421	737	3	5	6	15.2
422	315	1	3	4	12.5
423	437	1	5	7	17.3
43	674	12	15	15	35.8
431	963	4	6	11	12.5
432	148	6	10	13	2.1
433	211	4	11	14	3

Watershed: Newlin Creek			Climate match: Locke Mtn North		
441	790	1	12	2	12.8
442	80	37	46	36	0.8
443	344	17	25	30	3.5
451	783	6	13	19	12.7
452	338	21	34	24	6
453	330	13	26	13	5.9
462	255	8	16	13	8.2
463	396	2	14	11	12.8
471	886	9	6	4	12.9
472	590	2	4	5	37
473	454	10	13	14	28.4
481	915	8	17	11	14.3
482	342	11	13	11	14
483	962	14	17	14	39.2
491	924	19	9	9	15.1
492	250	16	16	4	9
493	753	33	24	23	27.1
501	848	30	20	24	14
502	621	21	24	20	38.7
503	519	28	22	22	32.3
52	882	9	16	15	12.9
53	274	8	22	31	4
61	892	5	8	18	13.5
62	316	6	7	11	7.5
63	546	15	9	7	12.9
72	599	5	13	9	20.1
73	1146	13	11	10	38.4
82	667	7	4	5	26.1
83	799	7	12	9	31.3
91	1033	6	9	2	12.4
92	500	10	8	7	13.1
93	329	18	16	15	8.6
				Total	**1546.7**

Custom Climate Data

Custom climate data summaries for Locke Mountain North and Locke Mountain South are provided on the following pages. These summaries have been exported directly from the Rock:Clime WEPP interface.

WEPP FuME Results

All raw model results are provided on the following pages.

Climate Parameters for LockeMtnNorth_WC+

38.29ºN 105.24ºE; 8587 feet elevation
45 years of record

Month	Mean Maximum Temperature (ºF)	Mean Minimum Temperature (ºF)	Mean Precipitation (in)	Number of wet days
January	36.9	9.8	0.71	3.7
February	39.9	11.4	1.10	4.4
March	45.0	16.0	1.92	6.2
April	54.2	23.1	1.70	6.1
May	63.4	30.7	2.43	6.9
June	74.1	37.8	1.93	6.4
July	78.7	42.5	2.84	11.8
August	76.2	41.1	3.39	11.3
September	70.2	33.8	1.62	6.0
October	60.4	23.5	1.31	4.7
November	46.2	14.9	1.09	4.2
December	38.6	10.0	0.96	3.8
Annual			20.99	75.6

Show map | Show PAR | Return to input screen

INTERPOLATED DATA

Station	Weighting	Station	Weighting
Wind Stations		Solar Radiation and Max .5 P Stations	
ALAMOSA CO	41.1 %	PUEBLO, COLORADO	59.1 %
PUEBLO CO	40.2 %	DENVER, COLORADO	26.8 %

AURORA/BUCK. CO	18.7 %	ALBUQURQUE, NEW ME	14.2 %
Dewpoint Stations		**Time-to-Peak Stations**	
PUEBLO CO	65.4 %	MANITOU SPRINGS CO	57.5 %
CLAYTON NM	17.5 %	GREENLAND 9 SE CO	42.5 %
GRAND JUNCTION CO	17 %		0 %

Modified by Rock:Clime on August 20, 2008 from WESTCLIFFE CO 58931 0

Rock:Clime 'descpar.pl' version 2005.06.07
USDA Forest Service, Rocky Mountain Research Station

Climate Parameters for LockeMtnSouth_WC ++

38.25ºN 105.24ºE; 9630 feet elevation
45 years of record

Month	Mean Maximum Temperature (ºF)	Mean Minimum Temperature (ºF)	Mean Precipitation (in)	Number of wet days
January	33.4	6.9	0.67	3.7
February	36.4	8.5	1.14	4.4
March	41.5	13.1	1.98	6.2
April	50.8	20.2	1.82	6.1
May	60.0	27.9	3.33	6.9
June	70.7	34.9	2.31	6.4
July	75.2	39.6	3.08	11.8
August	72.8	38.3	3.62	11.3
September	66.8	30.9	1.62	6.0
October	56.9	20.6	1.40	4.7
November	42.8	12.1	1.13	4.2
December	35.2	7.1	1.03	3.8
Annual			23.14	75.6

Show map | Show PAR | Return to input screen

INTERPOLATED DATA

Station	Weighting	Station	Weighting
Wind Stations		**Solar Radiation and Max .5 P Stations**	
ALAMOSA CO	41.1 %	PUEBLO, COLORADO	59.1 %
PUEBLO CO	40.2 %	DENVER, COLORADO	26.8 %

AURORA/BUCK. CO	18.7 %	ALBUQURQUE, NEW ME	14.2 %
Dewpoint Stations		**Time-to-Peak Stations**	
PUEBLO CO	65.4 %	MANITOU SPRINGS CO	57.5 %
CLAYTON NM	17.5 %	GREENLAND 9 SE CO	42.5 %
GRAND JUNCTION CO	17 %		0 %

Modified by Rock:Clime on August 20, 2008 from LockMtnNorth_WC + 998931 0

Rock:Clime 'descpar.pl' version 2005.06.07
USDA Forest Service, Rocky Mountain Research Station

ALTERNATIVE A - FuME Results

Watershed	Slope	Undisturbed	Wildfire	Rx Fire	Thinning	LoAcc min	LoAcc max	HiAcc min	HiAcc max	Hill Length	Top Grad	Middle Grad	Toe Grad	Area	Alt	Road
Newlin	403	0	25.6	0	0	0	0	0	0	541	1	2	3	39.7	NoAction	1.4
Newlin	353	0	57.6	0	0	0	0	0	0	383	3	3	2	22.4	NoAction	1.4
Newlin	431	0	275.2	0	0	0.3	0.4	0.3	0.8	963	4	6	11	12.5	NoAction	1.4
Newlin	72	0	697.6	6.4	0	0.3	0.5	0.4	0.8	599	5	13	9	20.1	NoAction	1.4
Newlin	363	0	409.6	6.4	0	0.3	0.4	0.3	0.8	294	6	11	14	3.1	NoAction	1.4
Newlin	401	0	249.6	0	0	0.2	0.4	0.2	0.8	1113	8	5	3	19.1	NoAction	1.4
Newlin	252	0	435.2	6.4	0	0.4	0.5	0.5	0.9	168	8	15	29	3.6	NoAction	1.4
Newlin	92	0	390.4	0	0	0.2	0.4	0.3	0.8	500	10	8	7	13.1	NoAction	1.4
Newlin	101	0	608	6.4	0	0.3	0.4	0.3	0.8	884	10	10	8	22.8	NoAction	1.4
Newlin	102	0	691.2	12.8	0	0.3	0.5	0.5	0.8	360	13	15	17	7.8	NoAction	1.4
Newlin	213	0	876.8	19.2	0	0.4	0.7	0.6	1.6	394	15	18	25	3.5	NoAction	1.4
Newlin	193	0	268.8	6.4	0	0.3	0.6	0.5	1.6	98	23	16	7	1.9	NoAction	1.4
Newlin	143	0	800	25.6	0	0.6	1.8	1.6	4.9	101	23	52	39	1	NoAction	1.4
Newlin	163	0	960	6.4	0	0.3	0.5	0.4	0.8	1196	24	13	14	29.7	NoAction	1.4
UpperOak	133	0	1568	6.4	0	0.4	0.6	0.5	0.9	804	9	15	33	15.4	NoAction	1.4
UpperOak	143	0	908.8	25.6	0	0.7	1.8	1.7	4.9	90	50	46	48	1.6	NoAction	1.4
UpperOak	312	0	134.4	0	0	0.4	0.8	0.7	1.5	47	21	21	15	0.4	NoAction	1.4
UpperOak	203	0	1427.2	51.2	0	0.6	1.5	1.3	4.2	171	42	39	25	3.5	NoAction	1.4
UpperOak	223	0	3379.2	38.4	0	0.5	1.4	1.1	3.7	651	35	35	17	3.7	NoAction	1.4
UpperOak	181	0	2348.8	12.8	0	0.4	0.8	0.8	1.7	1491	3	20	51	12.5	NoAction	1.4
UpperOak	43	0	300.8	6.4	0	0.3	0.5	0.4	0.8	124	30	12	10	0.4	NoAction	1.4
UpperOak	52	0	1107.2	38.4	0	0.5	1.2	1.1	2.5	150	21	33	31	4.8	NoAction	1.4
UpperOak	53	0	1753.6	64	0	0.8	2.3	2.1	6.2	152	47	62	41	4.8	NoAction	1.4
UpperOak	63	0	3628.8	51.2	0	0.5	1.5	1.4	3.7	602	44	40	42	16.5	NoAction	1.4
UpperOak	81	0	1804.8	12.8	0	0.3	0.7	0.5	1.5	801	15	17	9	14.1	NoAction	1.4
LowerNewlin	52	0	1689.6	19.2	0	0.4	0.7	0.6	1.5	529	27	18	17	18.6	NoAction	1.4
LowerNewlin	103	0	825.6	12.8	0	0.3	0.5	0.5	0.8	267	13	15	18	5.6	NoAction	1.4
LowerNewlin	43	0	729.6		0	0.3	0.4	0.3	0.8	1351	1	8	10	46.4	NoAction	1.4
LowerNewlin	32	0	1420.8	51.2	0	0.5	1.5	1.4	3.7	172	20	39	40	3	NoAction	1.4
Oak Creek	123	0	1126.4	25.6	0	0.4	0.8	0.7	1.6	376	11	24	18	8.9	NoAction	1.4
Oak Creek	23	0	1126.4	19.2	0	0.4	0.7	0.7	1.6	596	2	21	21	29.5	NoAction	1.4
Oak Creek	83	0	518.4	6.4	0	0.3	0.4	0.3	0.8	265	6	14	12	9	NoAction	1.4
Oak Creek	101	0	659.2	6.4	0	0.3	0.4	0.4	0.8	1091	8	11	10	15.8	NoAction	1.4
Oak Creek	32	0	339.2	0	0	0.6	1.8	1.7	4.9	41	52	52	52	0.6	NoAction	1.4

ALTERNATIVES B & C - FuME Results

Watershed	Slope	Undisturbed	Wildfire	LowFire	ModFire	Rx Fire	Thinning	LoAcc min	LoAcc max	HiAcc min	HiAcc max	Hill Length	Top Grad	Middle Grad	Toe Grad	Area	Alt	Road
LowerNewlin	32	0	1420.8	128	416	51.2	0	1.1	3.1	2.9	7.7	172	20	39	40	3	Action	2.9
LowerNewlin	43	0	729.6	6.4	172.8	0	0	0.6	0.8	0.6	1.7	1351	1	8	10	46.4	Action	2.9
LowerNewlin	52	0	1689.6	76.8	435.2	19.2	0	0.8	1.5	1.3	3.2	529	27	18	17	18.6	Action	2.9
LowerNewlin	103	0	825.6	38.4	185.6	12.8	0	0.7	1.1	1	1.7	267	13	15	18	5.6	Action	2.9
Newlin	72	0	697.6	32	128	6.4	0	0.6	1	0.8	1.7	599	5	13	9	20.1	Action	2.9
Newlin	92	0	390.4	12.8	70.4	0	0	0.5	0.8	0.6	1.7	500	10	8	7	13.1	Action	2.9
Newlin	101	0	608	19.2	115.2	6.4	0	0.5	0.9	0.7	1.7	884	10	10	8	22.8	Action	2.9
Newlin	102	0	691.2	32	128	12.8	0	0.7	1.1	1	1.7	360	13	15	17	7.8	Action	2.9
Newlin	143	0	800	70.4	185.6	25.6	0	1.3	3.8	3.4	10.1	101	23	52	39	1	Action	2.9
Newlin	163	0	960	32	198.4	6.4	0	0.6	1	0.9	1.7	1196	24	13	14	29.7	Action	2.9
Newlin	193	0	268.8	12.8	44.8	6.4	0	0.6	1.3	1	3.2	98	23	16	7	1.9	Action	2.9
Newlin	213	0	876.6	44.8	166.4	19.2	0	0.9	1.4	1.3	3.3	394	15	18	25	3.5	Action	2.9
Newlin	252	0	435.6	19.2	83.2	6.4	0	0.8	1.1	1.1	1.9	168	8	15	29	3.6	Action	2.9
Newlin	353	0	57.6	0	6.4	0	0	0	0	0	0	383	3	3	2	22.4	Action	2.9
Newlin	363	0	409.6	12.8	70.4	6.4	0	0.6	0.8	0.6	1.7	294	6	11	14	3.1	Action	2.9
Newlin	401	0	249.6	0	44.8	0	0	0.4	0.8	0.4	1.7	1113	8	5	3	19.1	Action	2.9
Newlin	403	0	25.6	0	0	0	0	0	0	0	0	541	1	2	3	39.7	Action	2.9
Newlin	431	0	275.2	6.4	51.2	0	0	0.6	0.8	0.6	1.7	963	4	6	11	12.5	Action	2.9
Oak Creek	23	0	1126.4	64	211.2	19.2	0	0.9	1.5	1.4	3.3	596	2	21	21	29.5	Action	2.9
Oak Creek	32	0	339.2	25.6	64	0	0	1.3	3.8	3.5	10.1	41	52	52	52	0.6	Action	2.9
Oak Creek	83	0	518.4	25.6	96	6.4	0	0.6	0.9	0.6	1.7	265	6	14	12	9	Action	2.9
Oak Creek	101	0	659.2	19.2	115.2	6.4	0	0.6	0.9	0.7	1.7	1091	8	11	10	15.8	Action	2.9
Oak Creek	123	0	1126.4	57.6	211.2	25.6	0	0.8	1.7	1.4	3.3	376	11	24	18	8.9	Action	2.9
UpperOak	43	0	300.8	19.2	51.2	6.4	0	0.6	1	0.8	1.7	124	30	12	10	0.4	Action	2.9
UpperOak	52	0	1107.2	96	300.8	38.4	0	1	2.5	2.3	5.3	150	21	33	31	4.8	Action	2.9
UpperOak	53	0	1753.6	179.2	537.6	64	0	1.6	4.8	4.3	12.9	152	47	62	41	4.8	Action	2.9
UpperOak	63	0	3628.8	236.8	1062.4	51.2	0	1.1	3.2	3	7.7	602	44	40	42	16.5	Action	2.9
UpperOak	81	0	1804.8	76.8	454.4	12.8	0	0.7	1.4	1.1	3.1	801	15	17	9	14.1	Action	2.9
UpperOak	133	0	1568	57.6	384	6.4	0	0.8	1.2	1.1	1.9	804	9	15	33	15.4	Action	2.9
UpperOak	143	0	908.8	76.8	236.8	25.6	0	1.4	3.8	3.6	10.2	90	50	46	48	1.6	Action	2.9
UpperOak	181	0	2348.8	108.8	627.2	12.8	0	0.9	1.7	1.6	3.5	1491	3	20	51	12.5	Action	2.9
UpperOak	203	0	1427.2	128	409.6	51.2	0	1.2	3.1	2.7	8.7	171	42	39	25	3.5	Action	2.9
UpperOak	223	0	3379.2	204.8	953.6	38.4	0	1.1	2.9	2.3	7.6	651	35	35	17	3.7	Action	2.9
UpperOak	312	0	134.4	6.4	25.6	0	0	0.8	1.6	1.4	3.2	47	21	21	15	0.4	Action	2.9

AVERAGES SUMMARY OF HIGH DENSITY ROAD SCENARIO (Alts. B & C)

	Undisturbed	Wildfire	LowWildfire	ModWildfire	Rx Fire	Thinning	LoAcc min	LoAcc max	HiAcc min	HiAcc max	Hill Length	Top Grad	Middle Grad	Toe Grad	Area
Newlin Creek	0.0	481.8	21.0	92.3	6.9	0.0	0.6	1.1	0.9	2.3	542.4	10.9	13.4	13.4	
Lower Newlin Ck	0.0	1166.4	62.4	302.4	20.8	0.0	0.8	1.6	1.5	3.6	579.8	15.3	20.0	21.3	
Upper Oak Ck	0.0	1669.2	108.2	458.5	27.9	0.0	1.0	2.5	2.2	6.0	462.1	28.8	30.9	29.3	
Oak Creek	0.0	753.9	38.4	139.5	11.5	0.0	0.8	1.8	1.5	4.0	473.8	15.8	24.4	22.6	

IMPACT FORMULAS

Alt A

Wildfire + Range[LoAccMin to LoAcc Max]

Alt B

Low Intensity Wildfire + RxFac(Rx Fire) + MxFac(Thinning) + Range[HiAccMin to HiAcc Max]

RxFactor = 100% for Alt B, all areas would be burned. The MxFactor is irrelevant since all "Thinning" results in 0.0 sedimentation.

Alt C

Mod Intensity Wildfire + RxFac(Rx Fire) + MxFac(Thinning) + Range[LoAccMin to LoAcc Max]

RxFactor for Alt C varies by watershed. The MxFactor is still irreleveant.

ALTERNATIVE A - No Action

		Undisturbed	Wildfire	LowWildfire	ModWildfire	Rx Fire	Thinning	LoAcc min	LoAcc max	HiAcc min	HiAcc max	Tons/mi2 Watershed Total	Tons Tons	
Newlin Creek	1546.7	0.0	481.8					0.30				482.1	1165.2	
Lower Newlin Ck	262.1	0.0	1166.4					0.35				1166.8	477.8	
Upper Oak Ck	406.9	0.0	1669.2					0.50				1669.7	1061.6	
Oak Creek	927.5	0.0	753.9					0.40				754.3	1093.2	
			ton/mi^2									Sum Total Tons	3797.8	Tons exported from modeled watersheds
												/ Modeled Area	773.3	Tons / mi^2 of modeled watershed
												x Total Area	5842.7	Total Tons Exported from Analysis Area in Year of Disturbance
	Avg. per year in 65 year FRI		7.4					0.30				7.7	18.6	
			17.9					0.35				18.3	7.5	
			25.7					0.50				26.2	16.6	
			11.6					0.40				12.0	17.4	
												Sum Total Tons	60.2	SHORT AND LONG TERM
	2.42											/ Modeled Area	12.3	
	0.41											x Total Area	92.6	
	0.64													
	1.45													
Modeled area	**4.911**													
Total Area	7.556													

ALTERNATIVE B - Mechanical Treatments followed by Prescribed Fire Treatments

		Undisturbed	Wildfire	LowWildfire	ModWildfire	Rx Fire	Thinning	LoAcc min	LoAcc max	HiAcc min	HiAcc max	Watershed Total	Tons		
Newlin Creek	1546.7	0.0		21.0		6.9	0.0				2.3	30.2	72.9		
Lower Newlin Ck	262.1	0.0		62.4		20.8	0.0				3.6	86.8	35.5		
Upper Oak Ck	406.9	0.0		108.2		27.9	0.0				6.0	142.1	90.4		
Oak Creek	927.5	0.0		38.4		11.5	0.0				4.0	53.9	78.2		
			ton/mi^2									Sum Total Tons	277.0	Tons modeled	Percent of A in the event of Immediate Wildfire
												/ Modeled Area	56.4	Tons / mi^2 modeled	7.3%
												x Total Area	426.2	Total Watershed Tons	
				Current Avg. per year in 65 year FRI											
			481.8	7.4		6.9					2.3	16.6	40.0		
			1166.4	17.9		20.8					3.6	42.3	17.3		
			1669.2	25.7		27.9					6.0	59.6	37.9		
			753.9	11.6		11.5					4.0	27.1	39.3		
				Contribution of Rx Fire Alone								Sum Total Tons	134.6	SHORT TERM	Percent of A Short Term
	2.42			16.6								/ Modeled Area	27.4		223.7%
	0.41			8.5								x Total Area	207.0		
	0.64			17.8											
	1.45			16.7											
Modeled area	**4.911**			59.5	modelled										
Total Area	7.556			91.6	total										
ratio	1.538461538														
				Reduced Avg. per year in 65 year FRI											
				0.3		0.1		0.30				0.7	1.8		
				1.0		0.3		0.35				1.6	0.7		
				1.7		0.4		0.50				2.6	1.6		
				0.6		0.2		0.40				1.2	1.7		
												Sum Total Tons	5.8	LONG TERM	Percent of A Long Term
	2.42											/ Modeled Area	1.2		9.6%
	0.41											x Total Area	8.9		
	0.64														
	1.45														
Modeled area	**4.911**														
Total Area	7.556														

ALTERNATIVE C - Mechanical or Prescribed Fire Treatments

	Undisturbed	Wildfire	LowWildfire	ModWildfire	Rx Fire	Thinning	LoAcc min	LoAcc max	HiAcc min	HiAcc max	RxFac	RxContr.	Watershed Tota	Tons		
Newlin Creek	1546.7	0.0		92.3	6.9	0.0		1.1			0.4	2.7	96.1	232.4		
Lower Newlin Ck	262.1	0.0		302.4	20.8	0.0		1.6			0.3	6.2	310.3	127.1		
Upper Oak Ck	406.9	0.0		458.5	27.9	0.0		2.5			0.8	20.9	481.9	306.4		
Oak Creek	927.5	0.0		139.5	11.5	0.0		1.8			0.7	8.1	149.3	216.4		
		ton/mi^2											Sum Total Tons	882.2	Tons modeled	Percent of A in the event of Immediate Wildfire
													/ Modeled Area	179.6	Tons / mi^2 modeled	23.2%
													x Total Area	1357.3	Total Watershed Tons	
			Current Avg. per year in 65 year FRI													
		481.8	7.4					1.1			0.4	2.7	11.2	27.1		
		1166.4	17.9					1.6			0.3	6.2	25.8	10.6		
		1669.2	25.7					2.5			0.8	20.9	49.1	31.2		
		753.9	11.6					1.8			0.7	8.1	21.4	31.0		
			Contribution of Rx Fire Alone										Sum Total Tons	99.9	SHORT TERM	Percent of A Short Term
	2.42		6.6										/ Modeled Area	20.3		166.1%
	0.41		2.6										x Total Area	153.7		
	0.64		13.3													7.0541 Tons per Year per Mi^2 difference from B
	1.45		11.7													53.2992 Tons per year difference from B
Modeled area	**4.911**		34.2													
Total Area	7.556		52.6													
ratio	1.538461538															
				Reduced Avg. per year in 65 year FRI												
				1.4			0.30					0.0	1.8	4.3		
				4.7			0.35					0.1	5.1	2.1		
				7.1			0.50					0.3	7.9	5.0		
				2.1			0.40					0.1	2.7	3.9		
													Sum Total Tons	15.2	LONG TERM	Percent of A Long Term
	2.42												/ Modeled Area	3.1		25.3%
	0.41												x Total Area	23.4		
	0.64															
	1.45															
Modeled area	**4.911**															
Total Area	7.556															