Appendix C

Sediment Tables for the Entire Watershed and Subwatersheds

Table 8. Sediment yield (in yds^3/mi^2/year, tons/mi^2/year and %) by domain and primary land use association, Upper Eel River watershed.

Domain (Private and Public ownership)[1] (mi^2)			Non Earthflow							Earthflow						Total sediment yield (non EF+ EF)
			No land use	Field Measured Road Related	SED MODL Input Road Related	Timber Harvest	Ag/ Graze	Fire	Total non EF sediment yield	No land use	Road Related	Timber harvest	Ag/ Graze	Fire	Total EF sediment yield	
Private	Plot <3,000 yds^3 sediment sources	yds^3/ mi^2/yr	94	26	22	30	19	0	191	15	0	0	0	0	15	206
		tons/ mi^2/yr	145	40	29	46	30	0	290	23	0	0	0	0	23	313
		%	50	14	10	16	10	0	100	100	0	0	0	0	100	100
	>3,000 yds^3 sediment sources[5]	yds^3/ mi^2/yr	56	22	0	30	2	2	112	12	1	0	0	0	13	125
		tons/ mi^2/yr	86	35	0	47	3	3	173	18	2	0	0	0	20	192
		%	50	20	0	27	2	1	100	91	9	0	0	0	100	100
	Sub-total/ %	**yds^3/ mi^2/yr**	**150**	**48**	**22**	**61**	**21**	**2**	**304**	**26**	**1**	**0**	**0**	**0**	**27**	**331**
		tons/ mi^2/yr	**230**	**74**	**29**	**93**	**33**	**3**	**462**	**41**	**2**	**0**	**0**	**0**	**43**	**505**
		%	**50**	**16**	**6**	**20**	**7**	**<1**	**100**	**96**	**4**	**0**	**0**	**0**	**100**	**100**
Public	Plot <3,000 yds^3 sediment sources	yds^3/ mi^2/yr	44	9	9	18	0	0	80	0	0	0	0	0	0	80
		tons/ mi^2/yr	68	14	12	28	0	0	122	0	0	0	0	0	0	122
		%	56	11	10	23	0	0	100	0	0	0	0	0	0	100

Table 8. Sediment yield (in yds^3/mi^2/year, tons/mi^2/year and %) by domain and primary land use association, Upper Eel River watershed.

Domain (Private and Public ownership)[1] (mi^2)			Non Earthflow							Earthflow						Total sediment yield (non EF+ EF)
			No land use	Field Measured Road Related	SED MODL Input Road Related	Timber Harvest	Ag/ Graze	Fire	Total non EF sediment yield	No land use	Road Related	Timber harvest	Ag/ Graze	Fire	Total EF sediment yield	
	>3000 yds^3 sediment sources[5]	yds^3/ mi^2/yr	177	23	0	12	<1	1	214	5	<1	<1	0	<1	5	219
		tons/ mi^2/yr	272	36	0	18	<1	2	330	7	<1	<1	0	<1	7	337
		%	82	11	0	6	<1	<1	100	94	<1	<1	0	5	100	100
	Sub-total/ %	**yds^3/ mi^2/yr**	**221**	**33**	**9**	**30**	<1	**1**	**295**	**5**	<1	<1	**0**	<1	**5**	**300**
		tons/ mi^2/yr	**340**	**50**	**12**	**46**	<1	**2**	**451**	**7**	<1	<1	**0**	<1	**7**	**458**
		%	**75**	**11**	**3**	**10**	<1	**<1**	**100**	**94**	**<1**	<1	**0**	5	**100**	**100**
Total for the 688.1 mi^2 Upper Eel River study area	Plot <3,000 yds^3 sediment sources	yds^3/ mi^2/yr	70	18	31	24	10	0	153	8	0	0	0	0	8	161
		tons/ mi^2/yr	108	28	42	38	16	0	232	12	0	0	0	0	12	244
		%	47	12	18	16	7	0	100	100	0	0	0	0	100	100
	PWA >3,000 yds^3 sediment sources[5]	yds^3/ mi^2/yr	114	23	0	22	1	1	160	8	0.7	<1	0	<1	9	170
		tons/ mi^2/yr	175	35	0	33	2	2	247	13	1	<1	0	<1	14	261
		%	71	14	0	13	1	1	100	93	7	<1	0	<1	100	100

Table 8. Sediment yield (in yds^3/mi^2/year, tons/mi^2/year and %) by domain and primary land use association, Upper Eel River watershed.

Domain (Private and Public ownership)[1] (mi^2)			Non Earthflow							Earthflow						Total sediment yield (non EF+ EF)
			No land use	Field Measured Road Related	SED MODL Input Road Related	Timber Harvest	Ag/ Graze	Fire	Total non EF sediment yield	No land use	Road Related	Timber harvest	Ag/ Graze	Fire	Total EF sediment yield	
	Sub-total/ %	yds^3/ mi^2/yr	184	41	31	46	11	1.5	315	16	0.7	<1	0	<1	17	332
		tons/ mi^2/yr	283	63	42	71	17	2	478	25	1	<1	0	<1	26	504
		%	59	13	9	15	4	<1	100	95	4	<1	0	<1	100	100

Table 8. Sediment yield (in yds^3/mi^2/year, tons/mi^2/year and %) by domain and primary land use association, Outlet Creek, Upper Eel River watershed.

Domain (Private and Public ownership)[1] (mi^2)			Non Earthflow							Earthflow						Total sediment yield (non EF+ EF)
			No land use	Field Measured Road Related	SED MODL Input Road Related	Timber Harvest	Ag/ Graze	Fire	Total non EF sediment yield	No land use	Road Related	Timber harvest	Ag/ Graze	Fire	Total EF sediment yield	
Private	Plot <3,000 yds^3 sediment sources	yds^3/ mi^2/yr	80	20	55	10	10	0	175	0	0	0	0	0	0	175
		tons/ mi^2/yr	122	31	75	16	15	0	259	0	0	0	0	0	0	259
		%	47	12	29	6	6	0	100	0	0	0	0	0	0	100
	>3,000 yds^3 sediment sources[5]	yds^3/ mi^2/yr	30	11	0	5	2	0	49	73	1	0	0	0	74	123
		tons/ mi^2/yr	46	17	0	8	4	0	75	113	2	0	0	0	114	189
		%	61	23	0	11	5	0	100	98	2	0	0	0	100	100
	Sub-total/ %	**yds^3/ mi^2/yr**	**109**	**31**	**55**	**15**	**12**	**0**	**222**	**73**	**1**	**0**	**0**	**0**	**74**	**296**
		tons/ mi^2/yr	**168**	**48**	**75**	**24**	**18**	**0**	**333**	**113**	**2**	**0**	**0**	**0**	**114**	**447**
		%	**51**	**14**	**23**	**7**	**5**	**0**	**100**	**98**	**2**	**0**	**0**	**0**	**100**	**100**
Public	Plot <3,000 yds^3 sediment sources	yds^3/ mi^2/yr	0	0	0.3	0	0	0	0.3	0	0	0	0	0	0	0.3
		tons/ mi^2/yr	0	0	0.4	0	0	0	0.4	0	0	0	0	0	0	0.4
		%	0	0	100	0	0	0	100	0	0	0	0	0	0	100

Table 8. Sediment yield (in yds^3/mi^2/year, tons/mi^2/year and %) by domain and primary land use association, Outlet Creek, Upper Eel River watershed.

Domain (Private and Public ownership)[1] (mi^2)			Non Earthflow							Earthflow						Total sediment yield (non EF+ EF)
			No land use	Field Measured Road Related	SED MODL Input Road Related	Timber Harvest	Ag/ Graze	Fire	Total non EF sediment yield	No land use	Road Related	Timber harvest	Ag/ Graze	Fire	Total EF sediment yield	
	>3000 yds^3 sediment sources[5]	yds^3/ mi^2/yr	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		tons/ mi^2/yr	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sub-total/ %	**yds^3/ mi^2/yr**	**0**	**0**	**0.3**	**0**	**0**	**0**	**0.3**	**0**	**0**	**0**	**0**	**0**	**0**	**0.3**
		tons/ mi^2/yr	**0**	**0**	**0.4**	**0**	**0**	**0**	**0.4**	**0**	**0**	**0**	**0**	**0**	**0**	**0.4**
		%	**0**	**0**	**100**	**0**	**0**	**0**	**100**	**0**	**0**	**0**	**0**	**0**	**0**	**100**
Total for the 159.8 Outlet Creek CAL WAA	Plot <3,000 yds^3 sediment sources	yds^3/ mi^2/yr	77	20	56	10	9	0	172	0	0	0	0	0	0	172
		tons/ mi^2/yr	119	30	75	15	14	0	253	0	0	0	0	0	0	253
		%	47	12	30	6	5	0	100	0	0	0	0	0	0	100
	PWA >3,000 yds^3 sediment sources[5]	yds^3/ mi^2/yr	29	11	0	5	2	0	47	71	1	0	0	0	72	119
		tons/ mi^2/yr	45	17	0	8	4	0	73	110	2	0	0	0	111	184
		%	61	23	0	11	5	0	100	98	2	0	0	0	100	100

Table 8. Sediment yield (in yds^3/mi^2/year, tons/mi^2/year and %) by domain and primary land use association, Outlet Creek, Upper Eel River watershed.

Domain (Private and Public ownership)[1] (mi^2)			Non Earthflow							Earthflow						Total sediment yield (non EF+ EF)
			No land use	Field Measured Road Related	SED MODL Input Road Related	Timber Harvest	Ag/ Graze	Fire	Total non EF sediment yield	No land use	Road Related	Timber harvest	Ag/ Graze	Fire	Total EF sediment yield	
	Sub-total/ %	yds^3/ mi^2/yr	106	31	56	14	12	0	219	71	1	0	0	0	72	291
		tons/ mi^2/yr	164	47	75	23	18	0	327	110	2	0	0	0	111	438
		%	50	14	23	7	6	0	100	98	2	0	0	0	100	100

Table 8. Sediment yield (in yds^3/mi^2/year, tons/mi^2/year and %) by domain and primary land use association, Rice Creek, Upper Eel River watershed.

Domain (Private and Public ownership)[1] (mi^2)			Non Earthflow							Earthflow					Total sediment yield (non EF+ EF)
			No land use	Field Measured Road Related	SED MODL Input Road Related	Timber Harvest	Ag/ Graze	Fire	Total non EF sediment yield	No land use	Road Related	Timber harvest	Ag/ Graze	Total EF sediment yield	
Private	Plot <3,000 yds^3 sediment sources	yds^3/ mi^2/yr	0	<1	4	2	0	0	7	0	0	0	0	0	7
		tons/ mi^2/yr	0	<1	5	3	0	0	9	0	0	0	0	0	9
		%	0	11	56	33	0	0	100	0	0	0	0	0	100
	>3,000 yds^3 sediment sources[5]	yds^3/ mi^2/yr	20	3	0	12	0	0	35	0	0	0	0	0	35
		tons/ mi^2/yr	32	5	0	18	0	0	55	0	0	0	0	0	55
		%	58	9	0	33	0	0	100	0	0	0	0	0	100
	Sub-total/ %	**yds^3/ mi^2/yr**	**20**	**3**	**4**	**13**	**0**	**0**	**40**	**0**	**0**	**0**	**0**	**0**	**40**
		tons/ mi^2/yr	**32**	**5**	**5**	**21**	**0**	**0**	**63**	**0**	**0**	**0**	**0**	**0**	**63**
		%	**51**	**8**	**8**	**33**	**0**	**0**	**100**	**0**	**0**	**0**	**0**	**0**	**100**
Public	Plot <3,000 yds^3 sediment sources	yds^3/ mi^2/yr	45	10	14	3	0	0	72	0	0	0	0	0	72
		tons/ mi^2/yr	69	15	19	5	0	0	108	0	0	0	0	0	108
		%	64	14	17	5	0	0	100	0	0	0	0	0	100

Table 8. Sediment yield (in yds^3/mi^2/year, tons/mi^2/year and %) by domain and primary land use association, Rice Creek, Upper Eel River watershed.

Domain (Private and Public ownership)[1] (mi^2)			Non Earthflow							Earthflow					Total sediment yield (non EF+ EF)
			No land use	Field Measured Road Related	SED MODL Input Road Related	Timber Harvest	Ag/ Graze	Fire	Total non EF sediment yield	No land use	Road Related	Timber harvest	Ag/ Graze	Total EF sediment yield	
	>3000 yds^3 sediment sources[5]	yds^3/ mi^2/yr	84	2	0	7	0	0	93	4	0	0	0	4	97
		tons/ mi^2/yr	130	3	0	11	0	0	143	7	0	0	0	7	150
		%	90	2	0	8	0	0	100	100	0	0	0	100	100
	Sub-total/ %	**yds^3/ mi^2/yr**	**129**	**11**	**14**	**10**	**0**	**0**	**164**	**4**	**0**	**0**	**0**	**4**	**168**
		tons/ mi^2/yr	**198**	**18**	**19**	**15**	**0**	**0**	**250**	**7**	**0**	**0**	**0**	**7**	**257**
		%	**79**	**7**	**8**	**6**	**0**	**0**	**100**	**100**	**0**	**0**	**0**	**100**	**100**
Total for the 89.2 mi^2 Rice Fork CAL WAA	Plot <3,000 yds^3 sediment sources	yds^3/ mi^2/yr	39	8	18	3	0	0	68	0	0	0	0	0	68
		tons/ mi^2/yr	60	13	24	4	0	0	101	0	0	0	0	0	101
		%	59	13	24	4	0	0	100	0	0	0	0	0	100
	PWA >3,000 yds^3 sediment sources[5]	yds^3/ mi^2/yr	76	2	0	8	0	0	86	4	0	0	0	4	90
		tons/ mi^2/yr	117	3	0	12	0	0	132	6	0	0	0	6	138
		%	89	2	0	9	0	0	100	100	0	0	0	100	100

Table 8. Sediment yield (in yds^3/mi^2/year, tons/mi^2/year and %) by domain and primary land use association, Rice Creek, Upper Eel River watershed.

Domain (Private and Public ownership)[1] (mi^2)			Non Earthflow							Earthflow					Total sediment yield (non EF+ EF)
			No land use	Field Measured Road Related	SED MODL Input Road Related	Timber Harvest	Ag/ Graze	Fire	Total non EF sediment yield	No land use	Road Related	Timber harvest	Ag/ Graze	Total EF sediment yield	
	Sub-total/ %	yds^3/ mi^2/yr	115	10	18	10	0	0	153	4	0	0	0	4	157
		tons/ mi^2/yr	177	16	24	16	0	0	233	6	0	0	0	6	239
		%	76	7	10	7	0	0	100	100	0	0	0	100	100

Table 8. Sediment yield (in yds^3/mi^2/year, tons/mi^2/year and %) by domain and primary land use association, Soda Creek, Upper Eel River watershed.

Domain (Private and Public ownership)[1] (mi^2)			Non Earthflow							Earthflow						Total sediment yield (non EF+ EF)
			No land use	Field Measured Road Related	SED MODL Input Road Related	Timber Harvest	Ag/ Graze	Fire	Total non EF sediment yield	No land use	Road Related	Timber harvest	Ag/ Graze	Fire	Total EF sediment yield	
Private	Plot <3,000 yds^3 sediment sources	yds^3/ mi^2/yr	11	0	12	157	0	0	180	0	0	0	0	0	0	180
		tons/ mi^2/yr	17	0	16	242	0	0	275	0	0	0	0	0	0	275
		%	6	0	6	88	0	0	100	0	0	0	0	0	0	100
	>3,000 yds^3 sediment sources[5]	yds^3/ mi^2/yr	336	115	0	21	0	28	499	35	7	0	0	0	42	541
		tons/ mi^2/yr	518	176	0	32	0	42	768	54	11	0	0	0	65	834
		%	67	23	0	4	0	6	100	83	17	0	0	0	100	100
	Sub-total/ %	**yds^3/ mi^2/yr**	**348**	**114**	**12**	**178**	**0**	**28**	**680**	**35**	**7**	**0**	**0**	**0**	**42**	**722**
		tons/ mi^2/yr	**535**	**176**	**16**	**274**	**0**	**42**	**1043**	**54**	**11**	**0**	**0**	**0**	**65**	**1108**
		%	**51**	**17**	**2**	**26**	**0**	**4**	**100**	**83**	**17**	**0**	**0**	**0**	**100**	**100**
Public	Plot <3,000 yds^3 sediment sources	yds^3/ mi^2/yr	0	0	15	55	0	0	70	0	0	0	0	0	0	70
		tons/ mi^2/yr	0	0	20	84	0	0	104	0	0	0	0	0	0	104
		%	0	0	19	81	0	0	100	0	0	0	0	0	0	100

Table 8. Sediment yield (in yds^3/mi^2/year, tons/mi^2/year and %) by domain and primary land use association, Soda Creek, Upper Eel River watershed.

Domain (Private and Public ownership)[1] (mi^2)			Non Earthflow							Earthflow						Total sediment yield (non EF+ EF)
			No land use	Field Measured Road Related	SED MODL Input Road Related	Timber Harvest	Ag/ Graze	Fire	Total non EF sediment yield	No land use	Road Related	Timber harvest	Ag/ Graze	Fire	Total EF sediment yield	
	>3000 yds^3 sediment sources[5]	yds^3/ mi^2/yr	199	33	0	11	0	0	242	6	0	0	0	2	8	250
		tons/ mi^2/yr	307	50	0	17	0	0	373	10	0	0	0	3	13	386
		%	82	13	0	5	0	0	100	74	0	0	0	26	100	100
	Sub-total/ %	**yds^3/ mi^2/yr**	**199**	**33**	**15**	**65**	**0**	**0**	**312**	**6**	**0**	**0**	**0**	**2**	**8**	**320**
		tons/ mi^2/yr	**307**	**50**	**20**	**101**	**0**	**0**	**478**	**10**	**0**	**0**	**0**	**3**	**13**	**491**
		%	**64**	**11**	**4**	**21**	**0**	**0**	**100**	**74**	**0**	**0**	**0**	**26**	**100**	**100**
Total for the 60.1 mi^2 Soda Creek CAL WAA	Plot <3,000 yds^3 sediment sources	yds^3/ mi^2/yr	4	0	26	94	0	0	124	0	0	0	0	0	0	124
		tons/ mi^2/yr	7	0	36	144	0	0	187	0	0	0	0	0	0	187
		%	4	0	19	77	0	0	100	0	0	0	0	0	0	100
	PWA >3,000 yds^3 sediment sources[5]	yds^3/ mi^2/yr	251	64	0	14	0	10	340	17	3	0	0	1	21	361
		tons/ mi^2/yr	387	98	0	22	0	16	523	27	4	0	0	2	33	556
		%	74	19	0	4	0	3	100	81	13	0	0	6	100	100

Table 8. Sediment yield (in yds^3/mi^2/year, tons/mi^2/year and %) by domain and primary land use association, Soda Creek, Upper Eel River watershed.

Domain (Private and Public ownership)[1] (mi^2)			Non Earthflow							Earthflow						Total sediment yield (non EF+ EF)
			No land use	Field Measured Road Related	SED MODL Input Road Related	Timber Harvest	Ag/ Graze	Fire	Total non EF sediment yield	No land use	Road Related	Timber harvest	Ag/ Graze	Fire	Total EF sediment yield	
	Sub-total/ %	yds^3/ mi^2/yr	255	64	26	108	0	10	463	17	3	0	0	1	21	484
		tons/ mi^2/yr	393	98	36	167	0	16	710	27	4	0	0	2	33	743
		%	55	14	5	24	0	2	100	81	13	0	0	6	100	100

Table 8. Sediment yield (in yds^3/mi^2/year, tons/mi^2/year and %) by domain and primary land use association, Tomki Creek, Upper Eel River watershed.

Domain (Private and Public ownership)[1] (mi^2)			Non Earthflow							Earthflow						Total sediment yield (non EF+ EF)
			No land use	Field Measured Road Related	SED MODL Input Road Related	Timber Harvest	Ag/ Graze	Fire	Total non EF sediment yield	No land use	Road Related	Timber harvest	Ag/ Graze	Fire	Total EF sediment yield	
Private	Plot <3,000 yds^3 sediment sources	yds^3/ mi^2/yr	113	30	22	16	23	0	204	25	0	0	0	0	25	229
		tons/ mi^2/yr	175	46	30	24	35	0	310	39	0	0	0	0	39	349
		%	56	15	10	8	11	0	100	100	0	0	0	0	100	100
	>3,000 yds^3 sediment sources[5]	yds^3/ mi^2/yr	41	16	0	57	2	<1	116	15	<1	0	0	0	15	131
		tons/ mi^2/yr	63	25	0	87	4	<1	179	22	1	0	0	0	23	202
		%	35	14	0	49	2	<1	100	96	4	0	0	0	100	100
	Sub-total/ %	**yds^3/ mi^2/yr**	**154**	**46**	**22**	**72**	**25**	<1	**320**	**40**	**<1**	**0**	**0**	**0**	**40**	**360**
		tons/ mi^2/yr	**238**	**71**	**30**	**111**	**39**	<1	**490**	**61**	**1**	**0**	**0**	**0**	**62**	**552**
		%	**49**	**14**	**6**	**23**	**8**	<1	**100**	**98**	**2**	**0**	**0**	**0**	**100**	**100**
Public	Plot <3,000 yds^3 sediment sources	yds^3/ mi^2/yr	83	46	0.9	28	0	0	158	0	0	0	0	0	0	158
		tons/ mi^2/yr	128	70	1.3	43	0	0	242	0	0	0	0	0	0	242
		%	53	29	<1	18	0	0	100	0	0	0	0	0	0	100

Table 8. Sediment yield (in yds^3/mi^2/year, tons/mi^2/year and %) by domain and primary land use association, Tomki Creek, Upper Eel River watershed.

Domain (Private and Public ownership)[1] (mi^2)			Non Earthflow							Earthflow						Total sediment yield (non EF+ EF)
			No land use	Field Measured Road Related	SED MODL Input Road Related	Timber Harvest	Ag/ Graze	Fire	Total non EF sediment yield	No land use	Road Related	Timber harvest	Ag/ Graze	Fire	Total EF sediment yield	
	>3000 yds^3 sediment sources[5]	yds^3/ mi^2/yr	369	21	0	34	1	8	434	12	<1	0	0	0	12	446
		tons/ mi^2/yr	569	32	0	52	2	13	668	18	1	0	0	0	19	686
		%	85	5	0	8	<1	2	100	97	3	0	0	0	100	100
	Sub-total/ %	**yds^3/ mi^2/yr**	**452**	**66**	**0.9**	**62**	**1**	**8**	**591**	**12**	**<1**	**0**	**0**	**0**	**12**	**603**
		tons/ mi^2/yr	**697**	**102**	**1.3**	**95**	**2**	**13**	**910**	**18**	**<1**	**0**	**0**	**0**	**19**	**929**
		%	**77**	**11**	**<1**	**10**	**<1**	**1**	**100**	**97**	**3**	**0**	**0**	**0**	**100**	**100**
Total for the 200 mi^2 Tomki Creek CAL WAA	Plot <3,000 yds^3 sediment sources	yds^3/ mi^2/yr	107	34	23	18	18	0	200	20	0	0	0	0	20	220
		tons/ mi^2/yr	164	52	32	28	27	0	303	30	0	0	0	0	30	333
		%	54	17	11	9	9	0	100	100	0	0	0	0	100	100
	PWA >3,000 yds^3 sediment sources[5]	yds^3/ mi^2/yr	113	17	0	52	2	2	185	14	<1	0	0	0	14	200
		tons/ mi^2/yr	173	26	0	80	3	3	285	21	1	0	0	0	22	308
		%	61	9	0	28	1	1	100	96	4	0	0	0	100	100

Table 8. Sediment yield (in yds^3/mi^2/year, tons/mi^2/year and %) by domain and primary land use association, Tomki Creek, Upper Eel River watershed.

Domain (Private and Public ownership)[1] (mi^2)			Non Earthflow							Earthflow						Total sediment yield (non EF+ EF)
			No land use	Field Measured Road Related	SED MODL Input Road Related	Timber Harvest	Ag/ Graze	Fire	Total non EF sediment yield	No land use	Road Related	Timber harvest	Ag/ Graze	Fire	Total EF sediment yield	
	Sub-total/ %	yds^3/ mi^2/yr	219	51	23	70	20	2	385	33	<1	0	0	0	34	419
		tons/ mi^2/yr	338	78	32	108	31	3	590	52	1	0	0	0	53	643
		%	57	13	6	18	5	<1	100	98	2	0	0	0	100	100

Table 8. Sediment yield (in yds^3/mi^2/year, tons/mi^2/year and %) by domain and primary land use association, Upper Main Eel River, Upper Eel River watershed.

Domain (Private and Public ownership)[1] (mi^2)			Non Earthflow							Earthflow						Total sediment yield (non EF+ EF)
			No land use	Field Measured Road Related	SED MODL Input Road Related	Timber Harvest	Ag/ Graze	Fire	Total non EF sediment yield	No land use	Road Related	Timber harvest	Ag/ Graze	Fire	Total EF sediment yield	
Private	Plot <3,000 yds^3 sediment sources	yds^3/ mi^2/yr	<1	1	4	97	0	0	102	0	0	0	0	0	0	102
		tons/ mi^2/yr	<1	2	5	150	0	0	157	0	0	0	0	0	0	157
		%	<1	1	3	96	0	0	100	0	0	0	0	0	0	100
	>3,000 yds^3 sediment sources[5]	yds^3/ mi^2/yr	78	88	0	47	0	0	213	0	0	0	0	0	0	213
		tons/ mi^2/yr	121	136	0	72	0	0	328	0	0	0	0	0	0	328
		%	37	41	0	22	0	0	100	0	0	0	0	0	0	100
	Sub-total/ %	**yds^3/ mi^2/yr**	**79**	**89**	**4**	**144**	**0**	**0**	**316**	**0**	**0**	**0**	**0**	**0**	**0**	**316**
		tons/ mi^2/yr	**121**	**137**	**5**	**222**	**0**	**0**	**485**	**0**	**0**	**0**	**0**	**0**	**0**	**485**
		%	**25**	**28**	**1**	**46**	**0**	**0**	**100**	**0**	**0**	**0**	**0**	**0**	**0**	**100**
Public	Plot <3,000 yds^3 sediment sources	yds^3/ mi^2/yr	45	2	22	11	0	0	80	0	0	0	0	0	0	80
		tons/ mi^2/yr	69	3	30	17	0	0	119	0	0	0	0	0	0	119
		%	58	3	25	14	0	0	100	0	0	0	0	0	0	100

Table 8. Sediment yield (in yds^3/mi^2/year, tons/mi^2/year and %) by domain and primary land use association, Upper Main Eel River, Upper Eel River watershed.

Domain (Private and Public ownership)[1] (mi^2)			Non Earthflow							Earthflow						Total sediment yield (non EF+ EF)
			No land use	Field Measured Road Related	SED MODL Input Road Related	Timber Harvest	Ag/ Graze	Fire	Total non EF sediment yield	No land use	Road Related	Timber harvest	Ag/ Graze	Fire	Total EF sediment yield	
	>3000 yds^3 sediment sources[5]	yds^3/ mi^2/yr	169	33	0	9	<1	<1	211	2	0	<1	0	0	2	213
		tons/ mi^2/yr	261	50	0	14	<1	<1	325	4	0	<1	0	0	4	329
		%	80	15	0	4	<1	<1	100	98	0	2	0	0	100	100
	Sub-total/ %	**yds^3/ mi^2/yr**	**214**	**35**	**22**	**20**	<1	<1	**291**	**2**	**0**	<1	**0**	**0**	**2**	**293**
		tons/ mi^2/yr	**329**	**54**	**30**	**31**	<1	<1	**444**	**4**	**0**	<1	**0**	**0**	**4**	**448**
		%	**74**	**12**	**7**	**7**	<1	<1	**100**	**98**	**0**	**2**	**0**	**0**	**100**	**100**
Total for the 179 Upper Main Eel River CAL WAA	Plot <3,000 yds^3 sediment sources	yds^3/ mi^2/yr	41	2	26	17	0	0	86	0	0	0	0	0	0	86
		tons/ mi^2/yr	64	3	35	27	0	0	129	0	0	0	0	0	0	129
		%	50	2	27	21	0	0	100	0	0	0	0	0	0	100
	PWA >3,000 yds^3 sediment sources[5]	yds^3/ mi^2/yr	163	37	0	12	<1	<1	211	2	0	<1	0	0	2	213
		tons/ mi^2/yr	250	56	0	18	<1	<1	326	4	0	<1	0	0	4	329
		%	77	17	0	6	<1	<1	100	98	0	2	0	0	100	100

Table 8. Sediment yield (in yds^3/mi^2/year, tons/mi^2/year and %) by domain and primary land use association, Upper Main Eel River, Upper Eel River watershed.

Domain (Private and Public ownership)[1] (mi^2)			Non Earthflow							Earthflow						Total sediment yield (non EF+ EF)
			No land use	Field Measured Road Related	SED MODL Input Road Related	Timber Harvest	Ag/ Graze	Fire	Total non EF sediment yield	No land use	Road Related	Timber harvest	Ag/ Graze	Fire	Total EF sediment yield	
	Sub-total/ %	yds^3/ mi^2/yr	204	39	26	29	<1	<1	298	2	0	<1	0	0	2	280
		tons/ mi^2/yr	314	60	35	45	<1	<1	454	4	0	<1	0	0	4	458
		%	69	13	8	10	<1	<1	100	98	0	2	0	0	100	100

Upper Eel River TMDL SEDMODL2 Analysis

Methods

SEDMODL2 is a GIS based road erosion and delivery model designed to identify road segments with high potential for delivering sediment to streams and to estimate the annual tonnage of delivery. Boise Cascade Corporation and the National Council on Air and Stream Improvement (NCASI) developed version 2.0 of SEDMODL2.

SEDMODL2 uses an elevation grid (Digital Elevation Models, or DEMs) along with road and stream coverages to determine which road segments may deliver to streams. The quantity of sediment delivered from these road segments is determined using road erosion factors from the Washington Department of Natural Resources Standard Method for Conducting Watershed Analysis, surface erosion module (WDNR, 1997) and the Water Erosion prediction Project (WEPP) soil erosion model.

SEDMODL2 data requirements

SEDMODL2 requires GIS coverages including: topography (DEM), stream, road, drainage divide, precipitation, geology, soils (optional), and culverts (optional).

Road attributes used by SEDMODL2 include road use, surface type, road width, construction year, culvert or drainage structure locations, cutslope height, road prism geometry type, percent cutslope cover, and road gradient.

Road use factors are based on WDNR (1997), Reid and Dunne (1984), and Foltz (1996) and are based on how heavily used the road is. Surface type factors were developed by WDNR (1997), Burroughs and King (1989), Swift (1984), and Foltz and Burroughs (1990). Highways are attributed with a use factor of 120. Other paved roads are attributed with a factor of 50. Gravel roads are attributed with a factor of 10.

Surface type for roads in the study area are classified using digital imagery (1-meter pixel digital orthophoto quarter quads – DOQQ) as a guide to determine whether a road is asphalt or gravel with ruts. Since other surface types are difficult to determine with this method, these are the only two surface types determined with certainty.

Road width was estimated to be 40’ for highways, 25’ for other paved roads, and 18’ for gravel roads. Width was estimated based on roads measured by field geologists during the field inventory of random plots. Additional spot checks for these widths were made using digital imagery (DOQQ).

Road age can be of three ranges, zero to one year, one to two years, and greater than two years. Since road construction data are also non-existent, it was assumed all roads are over 2 years in age, the default road age chosen by SEDMODL2.

Cutslope height is not an attribute in the road coverage, this attribute is determined by SEDMODL2 based on hillslope gradient determined with the elevation grid (DEM). SEDMODL2 uses field-averaged cutslope height versus hillside slope from unpublished field measurements taken during Boise Cascade road inventories in Washington, Idaho, and Oregon.

Road prism geometry determines the flow path of water and sediment along each road segment. Road configurations can be outsloped, insloped, or crowned. Since most roads in the study region are insloped and there are no better data, all roads in the study are attributed as insloped.

Percent cutslope cover describes the percent vegetation or rock cover on cutslopes that protect bare soil from erosion. Since no data exist for these features, a default value of 70% was chosen.

Road gradient data are derived for each road segment from the elevation grid (DEM.) A road slope factor is assigned based on a square of this gradient (Luce and Black, 1999, Reinig et al., 1991).

Geologic erosion factors have been related to measured erosion rates reported in studies of road surfacing, traffic, slope, and precipitation factored out (Reid, 1981, Reid and Dunne, 1984, Swift, 1984, Dryess, 1975, Ketcheson and Megahan, 1996, Foltz, 1996, Bilby etal., 1989, Vincent, 1985, Luce and Black, 1999, Kochenderfer and Helvey, 1987). The geologic erosion factor is selected for each road segment based on the geology coverage. Geologic erosion factors for each geologic unit were assigned based on dominant geologic units used in the Upper Eel River TMDL. Erosion factors for dominant geologic units 1 – 5 are 2, 2, 3, 1, 1; respectively.

Precipitation in average annual inches of rainfall is used to create a rainfall factor. Source data for precipitation are from 2001 PRISM climatic data. The PRISM derived rainfall coverage is provided by NCASI. The rain factor = 0.016 (average annual rainfall in inches)$^{1.5}$ A rainfall factor is assigned to each road segment.

Soil data are not available for the entire basin, so the default average soil depth of 36” is used. The bulk density value used in this analysis was 1.6 g/cc, the highest value possible.

Background sediment input is calculated using an estimate of soil creep derived sediment flux into stream channels. The length of the channel along with the slope from the elevation grid (DEM), are used to determine the average creep rate. The creep volume is determined by relating the creep rate and the bulk density with a conversion factor. The volume is doubled, for each side of the stream.

Results

Model results generate data that include background erosion, as well as road segment erosion. When comparing the ratio of road erosion to soil creep, one can assess whether the road erosion is having a significant impact on water quality. If the road : background ratio is less than 0.5, then roads in the basin are having a minor effect on water quality. If the road : background ratio is 0.5 to 1, then roads are having a small but chronic effect on water quality. If the ratio is larger than 1, then roads are likely having a significant effect on water quality and aquatic resources. Overall, The Upper Eel River watershed TMDL assessment area has an approximate Background/Road sediment ratio equal to 2. Subwatershed Background/Road sediment ratios range from 1 (Rice Fork) to 3 (Outlet Creek). As a result, erosion associated with chronic fine sediment inputs from roads in the Upper Eel River TMDL assessment area are considered to have a significant impact on water quality.

Limitations

Limitations to the certainty of the model output can be directly related to the quality of the data one uses. Poorly located roads or streams can alter the amount of direct sediment delivery on each road segment and the amount of sediment delivered. Incomplete road feature attributes may change the sediment production values as well. If all roads are assumed to be insloped and there are some outsloped roads, the data will be skewed. Road and stream coverages that are incomplete will generate an underestimate in sediment production.

SEDMODL2 was developed using empirical relations based on forest roads in Idaho, Oregon, Washington, and the Appalachian Mountains (North Carolina and West Virgina). Rainfall factors are based on Water Erosion prediction Project (WEPP) runs made with climates from northern California, Idaho, Montana, Oregon, and Washington. The model may not account for variability in these relations if the study is done in an area not mentioned here.

Table 9. Total past erosion and sediment delivery from plot features <3,000 yds^3 and PWA identified landslides >3000, by terrain type, to each of the three ownerships , Upper Main Eel River, Upper Eel River watershed study area.

Ownership	Terrain Type/ Geology	Feature <3,000 yds^3 (plots)^2				Landslides >3,000 yds^3 (PWA air photo identified)		
		Non earthflow Erosion (yds^3)	Non earthflow Sediment Delivery (yds^3)	SEDMODL Road Related Sediment Delivery (yds^3)	Earthflow Erosion (yds^3)	Non earthflow erosion (yds^3)	Non earthflow sediment Delivery (yds^3)	Earthflow erosion (yds^3)
Private	1	112,860	82,782	23,962	0	149,593	130,312	2,554
	2	0	0	0	0	0	0	0
	3	0	0	7,256	0	0	0	0
	4	0	0	0	0	0	0	0
	5	0	0	10,779	0	89,334	48,374	0
	Totals	**112,860**	**82,782**	**41,997**	**0**	**238,927**	**178,686**	**2,554**
Public	1	288,399	74,193	93,070	0	2,235,776	915,314	1,867
	2	378,339	207,459	101,115	0	1,692,444	788,235	45,038
	3	79,732	78,338	21,410	0	19,350	19,350	0
	4	0	0	0	0	0	0	0
	5	332,964	253,833	39,825	0	1,083,937	520,916	14,442
	Totals	**1,079,433**	**613,823**	**255,420**	**0**	**5,031,507**	**2,243,815**	**61,347**
Totals		**1,192,293**	**696,605**	**297,417**	**251,972**	**5,270,434**	**2,422,501**	**63,901**

[1] Total erosion and sediment yield for plot features <3,000 yds^2 for each subwatershed will not add up to the total yield for the entire Upper Eel River basin because each ownership is treated as a separate, smaller sample population which is applied to each domain.

Table 9. Total past erosion and sediment delivery from plot features <3,000 yds^3 and PWA identified landslides >3000, by terrain type, to each of the three ownerships Outlet Creek, Upper Eel River watershed study area.

Ownership	Terrain Type/ Geology	Feature <3,000 yds^3 (plots)^2				Landslides >3,000 yds^3 (PWA air photo identified)		
		Non earthflow Erosion (yds^3)	Non earthflow Sediment Delivery (yds^3)	SEDMODL Road Related Sediment Delivery (yds^3)	Earthflow Erosion (yds^3)	Non earthflow erosion (yds^3)	Non earthflow sediment Delivery (yds^3)	Earthflow erosion (yds^3)
Private	1	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0
	3	120,582	119,826	79,155	0	0	0	0
	4	0	0	134,624	0	491,310	253,948	0
	5	1,518,862	1,068,638	351,922	0	387,636	230,538	84,114
	Totals	**1,639,444**	**1,188,464**	**565,701**	**0**	**878,946**	**484,486**	**84,114**
Public	1	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0
	4	0	0	1,729	0	0	0	0
	5	0	0	1,043	0	0	0	0
	Totals	**0**	**0**	**2,772**	**0**	**0**	**0**	**0**
Totals		**1,639,444**	**1,188,464**	**568,473**	**0**	**878,946**	**484,486**	**84,114**

[1] Total erosion and sediment yield for plot features <3,000 yds^2 for each subwatershed will not add up to the total yield for the entire Upper Eel River basin because each ownership is treated as a separate, smaller sample population which is applied to each domain.

Table 9. Total past erosion and sediment delivery from plot features <3,000 yds^3 and PWA identified landslides >3000, by terrain type, to each of the three ownerships , Rice Creek, Upper Eel River watershed study area.

Ownership	Terrain Type/ Geology	Feature <3,000 yds^3 (plots)^2				Landslides >3,000 yds^3 (PWA air photo identified)		
		Non earthflow Erosion (yds^3)	Non earthflow Sediment Delivery (yds^3)	SEDMODL Road Related Sediment Delivery (yds^3)	Earthflow Erosion (yds^3)	Non earthflow erosion (yds^3)	Non earthflow sediment Delivery (yds^3)	Earthflow erosion (yds^3)
Private	1	1,624	1,456	8,271	0	3,968	1,190	0
	2	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	8,505
	4	0	0	0	0	0	0	0
	5	0	0	12,032	0	72,019	25,101	5,478
	Totals	**1,624**	**1,456**	**20,303**	**0**	**75,987**	**26,291**	**13,983**
Public	1	22,658	13,062	12,357	0	59,624	15,121	830
	2	0	0	1,054	0	29,198	8,759	6,947
	3	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0
	5	382,299	270,928	66,310	0	1,088,179	438,533	42,808
	Totals	**404,957**	**283,990**	**79,721**	**0**	**1,177,001**	**462,413**	**50,585**
Totals		**406,581**	**285,446**	**10,024**	**0**	**1,252,988**	**488,704**	**64,568**

[1] Total erosion and sediment yield for plot features <3,000 yds^2 for each subwatershed will not add up to the total yield for the entire Upper Eel River basin because each ownership is treated as a separate, smaller sample population which is applied to each domain.

Table 9. Total past erosion and sediment delivery from plot features <3,000 yds^3 and PWA identified landslides >3000, by terrain type, to each of the three ownerships , Soda Creek, Upper Eel River watershed study area.

Ownership	Terrain Type/ Geology	Feature <3,000 yds^3 (plots)^2				Landslides >3,000 yds^3 (PWA air photo identified)		
		Non earthflow Erosion (yds^3)	Non earthflow Sediment Delivery (yds^3)	SEDMODL Road Related Sediment Delivery (yds^3)	Earthflow Erosion (yds^3)	Non earthflow erosion (yds^3)	Non earthflow sediment Delivery (yds^3)	Earthflow erosion (yds^3)
Private	1	1.187.376	227.244	12,445	0	674.610	428,341	27,410
	2	0	0	16,006	0	103,509	87,836	28,376
	3	0	0	0	0	0	0	0
	4	45,316	19,012	17,069	0	459,319	211,874	14,614
	5	0	0	2	0	0	0	0
	Totals	**1,232,692**	**246,256**	**45,522**	**0**	**1,237,438**	**728,051**	**70,400**
Public	1	220,274	130,622	56,170	0	915,639	539,462	18,553
	2	0	0	0	0	0	0	2,,082
	3	0	0	0	0	0	0	0
	4	0	0	343	0	65,516	39,213	0
	5	0	0	2	0	0	0	0
	Totals	**220,274**	**130,622**	**56,515**	**0**	**981,155**	**578,675**	**20,635**
Totals		**1,452,966**	**376,878**	**102,037**	**0**	**2,218,593**	**1,306,726**	**91,035**

[1] Total erosion and sediment yield for plot features <3,000 yds^2 for each subwatershed will not add up to the total yield for the entire Upper Eel River basin because each ownership is treated as a separate, smaller sample population which is applied to each domain.

Table 9. Total past erosion and sediment delivery from plot features <3,000 yds^3 and PWA identified landslides >3000, by terrain type, to each of the three ownerships , Tomki Creek, Upper Eel River watershed study area.

Ownership	Terrain Type/ Geology	Feature <3,000 yds^3 (plots)^2				Landslides >3,000 yds^3 (PWA air photo identified)		
		Non earthflow Erosion (yds^3)	Non earthflow Sediment Delivery (yds^3)	SEDMODL Road Related Sediment Delivery (yds^3)	Earthflow Erosion (yds^3)	Non earthflow erosion (yds^3)	Non earthflow sediment Delivery (yds^3)	Earthflow erosion (yds^3)
Private	1	0	0	0	0	2,218,593	1,306,726	91,035
	2	804,243	241,575	23,934	15,546	532,967	338,343	125,330
	3	0	0	11,858	0	0	0	0
	4	230,615	147,105	6,152	0	187,220	160,636	7,830
	5	2,763,011	1,471,254	244,641	236,426	999,388	618,871	16,978
	Totals	**3,797,869**	**1,859,934**	**286,585**	**251,972**	**1,767,475**	**1,160,510**	**157,742**
Public	1	78,776	68,242	0	0	1,034,037	757,718	27,815
	2	0	0	2,389	0	48,526	21,396	5,824
	3	0	0	0	0	0	0	0
	4	93,342	73,704	0	0	240,494	220,285	0
	5	353,160	296,262	9,799	0	625,629	213,031	0
	Totals	**525,278**	**438,208**	**12,188**	**0**	**1,948,686**	**1,212,430**	**33,639**
Totals		**4,323,147**	**2,298,142**	**298,773**	**251,972**	**3,716,161**	**2,372,940**	**191,381**

[1] Total erosion and sediment yield for plot features <3,000 yds^2 for each subwatershed will not add up to the total yield for the entire Upper Eel River basin because each ownership is treated as a separate, smaller sample population which is applied to each domain.

Table 9. Total past erosion and sediment delivery from plot features <3,000 yds^3 and PWA identified landslides >3000, by terrain type, to each of the three ownerships in the Upper Eel River watershed study area.

Ownership	Terrain Type/ Geology	Feature <3,000 yds^3 (plots)^2				Landslides >3,000 yds^3 (PWA air photo identified)		
		Non earthflow Erosion (yds^3)	Non earthflow Sediment Delivery (yds^3)	SEDMODL Road Related Sediment Delivery (yds^3)	Earthflow Erosion (yds^3)	Non earthflow erosion (yds^3)	Non earthflow sediment Delivery (yds^3)	Earthflow erosion (yds^3)
Entire Upper Eel River study area	1	1,369,130	467,783	206,277	0	5,121,147	2,830,120	86,633
	2	1,311,878	485,764	144,497	18,209	2,406,644	1,244,569	222,102
	3	209,884	207,674	119,679	0	19,350	19,350	0
	4	943,469	613,337	159,918	0	1,443,858	885,955	22,444
	5	5,963,218	3,627,160	736,353	320,428	4,346,122	2,095,365	163,821
	Totals	**9,797,579**	**5,401,718**	**1,366,724**	**338,637**	**13,337,121**	**7,075,359**	**495,000**
Private	1	829,728	237,448	44,679	0	876,071	602,504	37,568
	2	942,041	282,967	39,940	18,209	636,476	426,179	162,211
	3	130,152	129,336	98,269	0	0	0	0
	4	759,035	467,705	157,845	0	1,137,848	626,458	22,444
	5	4,867,629	2,784,053	619,374	320,428	1,548,377	922,885	106,570
	Totals	**7,528,585**	**3,901,509**	**960,107**	**338,637**	**4,198,772**	**2,578,026**	**328,793**
Public	1	539,402	230,335	161,598	0	4,245,076	2,227,615	49,065
	2	369,837	202,797	104,558	0	1,770,168	818,391	59,891
	3	79,732	78,338	21,410	0	19,350	19,350	0
	4	184,434	145,632	2,072	0	306,010	259,497	0

Table 9. Total past erosion and sediment delivery from plot features <3,000 yds^3 and PWA identified landslides >3000, by terrain type, to each of the three ownerships in the Upper Eel River watershed study area.

Ownership	Terrain Type/ Geology	Feature <3,000 yds^3 (plots)[2]				Landslides >3,000 yds^3 (PWA air photo identified)		
		Non earthflow Erosion (yds^3)	Non earthflow Sediment Delivery (yds^3)	SEDMODL Road Related Sediment Delivery (yds^3)	Earthflow Erosion (yds^3)	Non earthflow erosion (yds^3)	Non earthflow sediment Delivery (yds^3)	Earthflow erosion (yds^3)
	5	1,095,589	843,107	116,979	0	2,797,765	1,172,480	57,251
	Totals	**2,268,994**	**1,500,209**	**406,617**	**0**	**9,138,349**	**4,497,333**	**166,207**

[1] Total erosion and sediment yield for plot features <3,000 yds^2 for each ownership will not add up to the total yield for the entire Upper Fork Eel River study area because each ownership is treated as a separate, smaller sample population which is applied to each domain.