

USFS APPENDIX B Tables									
Please note that EPA translated all figures to t/mi2/yr, corrected some errors (e.g., length of period), and compared North Fork Eel data with that in the USEPA North Fork Eel River Sediment TMDL (2002), so numbers may vary from those in the draft TMDL.									
TABLE 1:									
MIDDLE FORK EEL RIVER DISCHARGE DATA (In body of report)									

TABLE 2:
LANDSLIDES: NUMBER, AREA, AND DELIVERED VOLUME (CUBIC YARDS) BY YEAR

	1940-1969	1970-1984	1985-2002	1940-2002
Number	3164	249	709	4122
Area	9307.04	835.81	3382.72	13525.57 acres
Volume*	19689648	1938039	3342149	24969836 cuyds

*Volume delivered to the stream system in cubic yards

Note: 22 landslides occupying 123.38 acres and delivering 77,036 cuyd were not dated; these were lumped with 1940-69
 To convert cubic yards to tons, multiply by 1.5

TABLE 3: LANDSLIDE DELIVERED VOLUME (CUBIC YARDS), AREA AND RATE BY WATERSHED 1940-2002

Watershed	Watershed Area (acres)	Landslide cuyds	Landslide cuyd/ac	Landslide cy/ac/yr
Black Butte River	103586	9928532	95.8482	1.545939
Elk/Dos Rios	73931	2074125	28.05488	0.452498
Round Valley	63619	1735134	27.27383	0.439901
Upper Middle Fork	131162	2342343	17.8584	0.288039
Williams/Thatcher	109581	8889701	81.12448	1.308459
Total Mid. Eel	481879	24969836	51.81765	0.835768

To convert cubic yards to tons, multiply by 1.5

TABLE 4: LANDSLIDE DELIVERED VOLUME (CUBIC YARDS) BY DISTURBANCE CLASS BY WATERSHED

	Natural	Fire	Harvest	Roads	Other	Total	Check Total
Black Butte River	9424204	23927.41	12042.22	410974.8	57383.27	9928532	
Elk/Dos Rios	1980434	555.5556	11310.18	41863.62	39962	2074125	
Round Valley	1636790	3422.222	4554.815	90367.04	0	1735134	
Upper Middle Fork	2100904	0	13868.53	75546.18	152024.6	2342343	
Williams/Thatcher	7300358	453538.8	57854.07	235379.3	842571.5	8889701	
Total Mid. Eel	22442690	481444	99629.83	854130.9	1091941	24969836	24969836

Mgt Total 953760.7

Mgt % 0.038197

Natl Total 24016075

Nat'l % 0.961803

To convert cubic yards to tons, multiply by 1.5

**TABLE 5A: TOTAL LANDSLIDE & SMALL SOURCE SEDIMENT VOLUME (CUBIC YARDS)
BY DISTURBANCE CLASS BY YEAR**

Total Cubic Yards							
	1940-1969	1970-1984	1985-2002	1940-2002			
Landslides							
Natural	18831825	1905454	3285614	24022893			
Road	775919.1	32584.74	38808.94	847312.8			
Harvest	81904.09	0	17725.74	99629.83			
Total	19689648	1938039	3342149	24969836			
Small Sources				Total small source cuyd/yr			
Roads	86670	43335	49113	179118	179118	2889	49113
Gullies	5130	2565	2907	10602	10602	171	
Timb. Harv.	1080	540	612	2232	2232	36	
Streambks	9097320	4548660	5155148	18801128	18801128	303244	
Total	9190200	4595100	5207780	18993080	18993080	306340	
All sources							
Total	28879848	6533139	8549929	43962916			

Note: Disturbance T and TC grouped with Roads, F, FH, and "Other" grouped with Natural;

Time period 4 grouped with time period 1

Note: The sum of the number of years in each photo interval equals the period of record 1940-2002 (62 years) as follows:

1940-1969 = 30 years

1970-1984 = 15 years

1985-2002 = 17 years

Total 1940-2002 = 62 years

Note: Rates per year for small sources (roads/gullies/timber) from approx. 1992-2002; (stream bank data) from Grouse Creek (1944-1998)

**TABLE 5B:LANDSLIDE & SMALL SOURCE SEDIMENT RATE (CUBIC YARDS PER YEAR)
BY DISTURBANCE CLASS**

	Cubic Yards per Year			
	1940-1969	1970-1984	1985-2002	1940-2002
Landslides				
Natural*	649373.3	136103.9	193271.4	387466
Road	26755.83	2327.481	2282.879	13666.34
Harvest	2824.279	0	1042.691	1606.933
Total	678953.4	138431.3	196597	402739.3
Small So.				
Roads	2889	2889	2889	2889
Gullies	171	171	171	171
Tim. Harv.	36	36	36	36
Streambks	303244	303244	303244	303244
Total	306340	306340	306340	306340
All Sources				
Total	985293.4	444771.3	502937	709079.3
Total Sediment (Cuyd/yr) 1985-2002				
	Volume		% of Total	
Total Natural	496686.4		0.987572	
Total Human	6250.57		0.012428	
Grand Total	502937			

*Note: The area (753 square miles) used in computations is total watershed area

Note: Disturbance T and TC grouped with Roads, F, FH, and "Other" grouped with Natural;

Time period 4 grouped with time period 1

Note: The sum of the number of years in each photo interval equals the period of record 1940-2002 (62 years) as follows:

1940-1969 = 30 years

1970-1984 = 15 years

1985-2002 = 17 years

Total 1940-2002 = 62 years

Note: Rates per year for small sources (roads/gullies/timber) from approx. 1992-2002; (stream bank data) from Grouse Creek (1944-1998)

**TABLE 5C: LANDSLIDE & SMALL SOURCE SEDIMENT RATE (CUBIC YARDS PER ACRE PER YEAR)
BY DISTURBANCE CLASS**

	Cubic Yards/Acre/Year					
	1940-1969	1970-1984	1985-2002	1940-2002		
Landslides						
Natural*	1.347586	0.282444	0.401079	0.804073		
Road	0.055524	0.00483	0.004737	0.028361		
Harvest	0.005861	0	0.002164	0.003335		
Total	1.408971	0.287274	0.40798	0.835768		
Small So.						
Roads	0.005995	0.005995	0.005995	0.005995	2889	0.005995
Gullies	0.000355	0.000355	0.000355	0.000355	171	0.000355
Tim. Harv.	7.47E-05	7.47E-05	7.47E-05	7.47E-05	36	7.47E-05
Streambks	0.006425	0.006425	0.629295	0.629295	303244	0.629295
Total	0.01285	0.01285	0.63572	0.63572		
All Sources						
Total	1.42182	0.300124	1.0437	1.471488		

Note: Disturbance T and TC grouped with Roads, F, FH, and "Other" grouped with Natural;

Time period 4 grouped with time period 1

Note: The sum of the number of years in each photo interval equals the period of record 1940-2002 (62 years) as follows:

1940-1969 = 30 years

1970-1984 = 15 years

1985-2002 = 17 years

Total 1940-2002 = 62 years

Note: Rates per year for small sources (roads/gullies/timber) from approx. 1992-2002; (stream bank data) from Grouse Creek (1944-1998)

TABLE 5D: LANDSLIDE & SMALL SOURCE SEDIMENT RATE (TONS PER SQUARE MILE PER YEAR) AND TOTAL CUBIC YARDS BY DISTURBANCE CLASS

Tons/Square Mile/Year					Total Cubic Yards				
	1940-1969	1970-1984	1985-2002	1940-2002		1940-1969	1970-1984	1985-2002	1940-2002
Landslides					Landslides				
Natural*	1293.675	271.1448	385.0335	771.9062	Natural	18831825	1905454	3285614	24022893
Road	53.30272	4.636786	4.54793	27.22594	Road	775919.1	32584.74	38808.94	847312.8
Harvest	5.626502	0	2.077238	3.201316	Harvest	81904.09	0	17725.74	99629.83
Total	1352.605	275.7816	391.6587	802.3334	Total	19689648	1938039	3342149	24969836
Small So.					Small So.				
Roads	5.755439	5.755439	5.755439	5.755439	Roads	86670	43335	49113	179118
Gullies	0.340665	0.340665	0.340665	0.340665	Gullies	5130	2565	2907	10602
Tim. Harv.	0.071719	0.071719	0.071719	0.071719	Timb. Harv.	1080	540	612	2232
Streambks	604.1199	604.1199	604.1199	604.1199	Streambks	9097320	4548660	5155148	18801128
Total	610.2877	610.2877	610.2877	610.2877	Total	9190200	4595100	5207780	18993080
All Sources					All Sources				
Total	1962.892	886.0693	1001.946	1412.621	Total	28879848	6533139	8549929	43962916

Note: One cubic yard = 1.5 tons = 3,000 pounds

Watershed area = 481,879 acres = 752.94 square miles

Note: Disturbance T and TC grouped with Roads, F, FH, and "Other" grouped with Natural;

Time period 4 grouped with time period 1

Note: The sum of the number of years in each photo interval equals the period of record 1940-2002 (62 years) as follows:

1940-1969 = 30 years

1970-1984 = 15 years

1985-2002 = 17 years

Total 1940-2002 = 62 years

Note: Rates per year for small sources (roads/gullies/timber) from approx. 1992-2002; (stream bank data) from Grouse Creek (1944-1998)

TABLE 6: SEDIMENT PRODUCTION IN CUBIC YARDS 1985-2002
LANDSLIDES & SMALL SOURCES BY DISTURBANCE BY WATERSHED BY OWNERSHIP

NATIONAL FOREST LANDS (CUYD)

	Small Sources: Gullies, and Streambanks					Landslides: Delivered Sediment			Total Sed.	
	Roads	Gullies	Timber Harv.	Streambanks	Total Small	Natural	Harvest	Roads	Total Landslide	
Black Butte River	9078	612	221	877472	887383	729630.2	5745.926	3448.889	738825.1	1626208
Elk/Dos Rios	7548	1326	0	0	8874	549470.1	2709.85	8161.456	560341.4	569215.4
Round Valley/Covelo	0	0	0	0	0	0	0	0	0	0
Upper Middle Fork Eel	18360	153	391	1096840	1115744	223877.3	0	2508.367	226385.7	1342130
Williams/Thatcher	1955	816	0	0	2771	761190.2	0	0	761190.2	763961.2
Total Middle Eel	36941	2907	612	1974312	2014772	2264168	8455.776	14118.71	2286742	4301514

NON-NATIONAL FOREST LANDS (CUYD)

	Small Sources: Gullies, and Streambanks					Landslides: Delivered Sediment			Total Sed.	
	Roads	Gullies	Timber Harv.	Streambanks	Total Small	Natural	Harvest	Roads	Total Landslide	
Black Butte River	1496	0	0	0	1496	190910.8	6296.296	2222.222	199429.304	200925.3
Elk/Dos Rios	1309	0	0	932314	933623	572328.5	507	6047.139	578882.7	1512506
Round Valley/Covelo	2414	0	0	356473	358887	148495.6	0	12000	160495.6	519382.6
Upper Middle Fork Eel	51	0	0	0	51	16926.67	2466.667	0	19393.33	19444.33
Williams/Thatcher	6902	0	0	1892049	1898951	92414.49	370.3704	4420.871	97205.74	1996157
Total Middle Eel	12172	0	0	3180836	3193008	1021076	9640.333	24690.23	1055407	4248415

* Included with NFS

ALL OWNERSHIPS (CUYD)

	Small Sources: Gullies, and Streambanks					Landslides: Delivered Sediment			Total Sed.	
	Roads	Gullies	Timber Harv.	Streambanks	Total Small	Natural	Harvest	Roads	Total Landslide	
Black Butte River	10574	612	221	877472	888879	920541	12042.22	5671.111	938254.4	1827133
Elk/Dos Rios	8857	1326	0	932314	942497	1121799	3216.85	14208.59	1139224	2081721
Round Valley/Covelo	2414	0	0	356473	358887	148495.6	0	12000	160495.6	519382.6
Upper Middle Fork Eel	18411	153	391	1096840	1115795	240804	2466.667	2508.367	245779	1361574
Williams/Thatcher	8857	816	0	1892049	1901722	853975.1	0	4420.871	858395.9	2760118
Total Middle Eel	49113	2907	612	5155148	5207780	3285614	17725.74	38808.94	3342149	8549929
Sum NFS + NON-NFS Lands =									3342149	8549929

Note: Rates per year for small sources (roads/gullies/timber) from approx. 1992-2002; (stream bank data) from Grouse Creek (1944-1998)

TABLE 7: SEDIMENT RATE IN CUBIC YARDS PER YEAR 1985-2002
LANDSLIDES & SMALL SOURCES BY DISTURBANCE BY WATERSHED BY OWNERSHIP

NATIONAL FOREST LANDS (CUYD/YEAR)

	Small Sources: Gullies, and Streambanks				Total Small	Landslides: Delivered Sediment			Total Sed.	
	Roads	Gullies	Timber Harv.	Streambanks		Natural	Harvest	Roads	Total Landslide	
Black Butte River	534	36	13	51616	52199	42919.43	337.9956	202.8758	43460.3	95659.3
Elk/Dos Rios	444	78	NA	0	522	32321.77	159.4029	480.0856	32961.26	33483.26
Round Valley/Covelo	NA	NA	NA	NA	0	0	0	0	0	0
Upper Middle Fork Eel	1080	9	23	64520	65632	13169.26	0	147.551	13316.81	78948.81
Williams/Thatcher	115	48	NA	0	163	44775.89	0	0	44775.89	44938.89
Total Middle Eel	2173	171	36	116136	118516	133186.3	497.3986	830.5124	134514.3	253030.3

NON-NATIONAL FORESET LANDS (CUYD/YEAR)

	Small Sources: Gullies, and Streambanks				Total Small	Landslides: Delivered Sediment			Total Sed.	
	Roads	Gullies	Timber Harv.	Streambanks		Natural	Harvest	Roads	Total Landslide	
Black Butte River	88	NA	NA *		88	11230.05	370.3704	130.719	11731.14	11819.14
Elk/Dos Rios	77	NA	NA	54842	54919	33666.38	29.82353	355.7141	34051.92	88970.92
Round Valley/Covelo	142	NA	NA	20969	21111	8735.033	0	705.8824	9440.915	30551.92
Upper Middle Fork Eel	3	NA	NA *		3	995.6863	145.098	0	1140.784	1143.784
Williams/Thatcher	406	NA	NA	111297	111703	5436.147	21.78649	260.0512	5717.984	117421
Total Middle Eel	716	0	0	187108	187824	60063.29	567.0784	1452.367	62082.74	249906.7

* Included with NFS

ALL OWNERSHIPS (CUYD/YEAR)

	Small Sources: Gullies, and Streambanks				Total Small	Landslides: Delivered Sediment			Total Sed.	
	Roads	Gullies	Timber Harv.	Streambanks		Natural	Harvest	Roads	Total Landslide	
Black Butte River	622	36	13	51616	52287	54149.47	708.366	333.5948	55191.43	107478.4
Elk/Dos Rios	521	78	NA	54842	55441	65988.15	189.2265	835.7997	67013.18	122454.2
Round Valley/Covelo	142	NA	0	20969	21111	8735.033	0	705.8824	9440.915	30551.92
Upper Middle Fork Eel	1083	9	23	64520	65635	14164.94	145.098	147.551	14457.59	80092.59
Williams/Thatcher	521	48	0	111297	111866	50233.83	0	260.0512	50493.88	162359.9
Total Middle Eel	2889	171	36	303244	306340	193271.4	1042.691	2282.879	196597	502937
Sum NFS + NON-NFS Lands =									196597	502937
Harv + Rd = 3325.57 % Human = 0.016916										

Note: Rates per year for small sources (roads/gullies/timber) from approx. 1992-2002; (stream bank data) from Grouse Creek (1944-1998)

TABLE 8A: COMPARISON OF LANDSLIDE SEDIMENT IN NORTH AND MIDDLE FORKS OF EEL RIVER

NORTH FORK EEL

Total Tons Delivered

Tons Deliv.	1944-1960	1960-1975	1975-1990	1990-1998	1944-1998
None	233900	566800	72400	2500	875600
Road	6800	16500	0	0	23300
Harvest	2300	6600	0	0	8900
Road/Harv.	0	20800	0	0	20800
Total	243000	610700	72400	2500	928600

Rd+Harv+Rd&Harv 53000

SRNF lands = 112 sq.mi. Sq. Miles Acres
112 71680

Human Natural Ratio %
53000 875600 0.057075 5.707517

Tons per square mile per year

Tons/sqmi/yr	1944-1960	1960-1975	1975-1990	1990-1998	1944-1998	tons/ac/yr 1944-1998	cuyd/ac/yr 1944-1998
None	131	337	43	1	145	0.226211	0.150792
Road	4	10	0	0	4	0.00602	0.004013
Harvest	1	4	0	0	1	0.002299	0.001533
Road&Har.	0	12	0	0	3	0.005374	0.003582
Total	136	364	43	1	154	0.239904	0.15992
Rd+Harv+Rd/Harv						0.013693	

tons/ac/yr 1944-1998
Human Natural Ratio %
0.013693 0.226211 0.057075 5.707517

Data from Mark Smith, USFS Six Rivers National Forest 2003; personal communication; Addresses Forest Service lands only.

TABLE 8B: COMPARISON OF LANDSLIDE SEDIMENT IN NORTH AND MIDDLE FORKS OF EEL RIVER

MIDDLE FORK EEL

Total Tons

	1940-1969	1970-1984	1985-2002	1940-2002
Landslides				
Natural	28247737	2858181	4928421	36034340
Road	1163879	48877.1	58213.41	1270969
Harvest	122856.1	0	26588.61	149444.7
Total	29534472	2907058	5013223	37454754

Total Cubic Yards

	1940-1969	1970-1984	1985-2002	1940-2002
Landslides				
Natural	18831825	1905454	3285614	24022893
Road	775919.1	32584.74	38808.94	847312.8
Harvest	81904.09	0	17725.74	99629.83
Total	19689648	1938039	3342149	24969836

Tons/square mile/year

	1940-1969	1970-1984	1985-2002	1940-2002
Landslides				
Natural	1293.675	271.1448	385.0335	771.9062
Road	53.30272	4.636786	4.54793	27.22594
Harvest	5.626502	0	2.077238	3.201316
Total	1352.605	275.7816	391.6587	802.3334

TABLE 9: COMPARISON OF LANDSLIDE SEDIMENT IN MIDDLE, NORTH, AND SOUTH FORKS EEL RIVER

CUBIC YARDS PER ACRE PER YEAR

Watershed	N.Fk. Eel	M.Fk. Eel	M.Fk. Eel	M.Fk. Eel	S.Fk. Eel
Agency	USFS	USFS	USGS*	SCS	TetraTech*
Year	2003	2003	1986	1970	1998
Land Base	FS Land	All Lands	All Land	All Land	All Land
Time Period	1944-1998	1940-2002		1941-1965	1942-1965

Natural	0.150792	0.804073	NA	NA	NA
Road	0.007595	0.028361	NA	NA	NA
Harvest	0.001533	0.003335	NA	NA	NA
Total	0.15992	0.835768	5.934809	1.33	2.26

TONS PER SQUARE MILE PER YEAR

Watershed	N.Fk. Eel	M.Fk. Eel	M.Fk. Eel	M.Fk. Eel	S.Fk. Eel
Agency	USFS	USFS	USGS*	SCS	TetraTech**
Year	2003	2003	1986	1970	1998
Land Base	FS Land	All Lands	All Land	All Land	All Land
Time Period	1944-1998	1940-2002			1942-1965

Natural	145	772	NA	NA	NA
Road	7	27	NA	NA	NA
Harvest	1	3	NA	NA	NA
Total	153	802	5697	1277	2170

*USGS (1986) Values for the Middle fork of the Eel are for total sediment

476800 acres

4245000 tons/yr

2829717 cuyd/yr

5.934809 cuyd/ac/yr

Cubic yards per acre * 960 = tons per square mile (1.5 tons/cuyd * 640 acres/sqmi = 960)

**Tetra Tech also reported cuyd/ac/yr values for: 1966-81 = 1.03 and 1981-96 = 0.54

North Fork Eel data address Forest Service Lands only; Mark Smith USFS Six Rivers N.F. 2003

TABLE 10: LANDSLIDE SEDIMENT DELIVERY IN MIDDLE FORK EEL RIVER FROM USFS REPORT 2001
CUBIC YARDS PER ACRE PER YEAR PER SUBWATERSHED

Watershed	USFS TMDL STUDY 2003				USFS REPORT 2001
	Watershed Area (acres)	Landslide cuyds	Landslide cuyd/ac	Landslide cy/ac/yr	Landslide cy/ac/yr
Black Butte River	103586	9928532	95.8482	1.545939	1.33
Elk/Dos Rios	73931	2074125	28.05488	0.452498	0.96
Round Valley	63619	1735134	27.27383	0.439901	no data
Upper Middle Fork	131162	2342343	17.8584	0.288039	0.62
Williams/Thatcher	109581	8889701	81.12448	1.308459	1.17
Total Mid. Eel	481879	24969836	51.81765	0.835768	no data