RNSP staff.
1997 Suspended Sediment Data: 1992-1997 Water Years; Sediment and Water Discharge Measurements in Tributaries: 1980-1990; Summary of Watershed Conditions in the Vicinity of Redwood

B. MAM - % ratio bedload.
- prior year data.
- ann. max peak to improve water years.

Greg B. S. Park gauge
Feb 86 storm comp.
82-83 similar years.

Redwood Creek Suspended Sediment Data: 1992-1997 Water Years

Jack Lewis ← re Caspar Ck. 425-2929 MON

Redwood Creek near Blue Lake (RWC)

Water Year	Peak Flow (cfs)	Streamflow (cfs-days)	Streamflow (acre feet)	Suspended Sediment (tons)	Suspended Sediment (tons/mi^2)
1993	5,185	94,204	186,854	125,684	1,870
1994	2,209	37,713	74,804	14,377	214
1995	6,205	129,757	275,374	268,096	3,990
1996	8,884	118,505	235,056	505,855*	7,528*
1997	7,052	102,062	202,440	388,040	5,774

stage record? w/bedl. 4836 - storage = 3675

1100 acres. East incoherent mudstone coherent sandstn $\bar{X}$ = 3869 more erosion.

Lacks Creek (LAC)

mixed geology

Water Year	Peak Flow (cfs)	Streamflow (cfs-days)	Streamflow (acre feet)	Suspended Sediment (tons)	Suspended Sediment (tons/mi^2)
1992	435	9,377	18,600	310	18
1993	2,645	33,117	65,688	12,513	740
1994	835	10,754	21,331	868	51
1995	1,279	32,062	63,596	6,809	403
1996	3,017	30,192	59,886	14,348	849
1997	4,391	25,056	49,699	59,292	3,508

53%.

Panther Creek (PAN) west schist Splans total 1000 - 3800 w/bedload = $\bar{X}$ = 927 1159 less erosion

Water Year	Peak Flow (cfs)	Streamflow (cfs-days)	Streamflow (acre feet)	Suspended Sediment (tons)	Suspended Sediment (tons/mi^2)
1992	87	2,112	4,190	38	6
1993	306	11,187	22,189	2,693	444
1994	133	4,132	8,195	112	18
1995	259	10,977	21,772	1,630	269
1996	505	10,363	20,556	7,729	1,273
1997	2,021	10,345	20,520	39,706	6,541

5747 ~~2490~~ w/o 97
$\bar{X}$ w/o 97 = 442

incoherent $\bar{X}$ 1425 w/ bedload 1781

Coyote Creek (COY: discontinued after WY 1995)

east

Water Year	Peak Flow (cfs)	Streamflow (cfs-days)	Streamflow (acre feet)	Suspended Sediment (tons)	Suspended Sediment (tons/mi^2)
1992	284	4,451	8,829	332	43
1993	1,086	17,128	33,974	13,380	1,720
1994	606	7,428	14,734	3,300	424
1995	775	16,228	32,189	5,662	728

$\bar{X}$ = 729

Little Lost Man Creek (LLM) as baseline for Prairie Ck.

east

Water Year	Peak Flow (cfs)	Streamflow (cfs-days)	Streamflow (acre feet)	Suspended Sediment (tons)	Suspended Sediment (tons/mi^2)
1993	143		9,595	156	45
1994	102		3,804	59	17
1995	370		9,112	635	184
1996	498		10,024	910	263
1997					

$\bar{X}$ = 127

Redwood Creek at Orick (RWC)

Water Year	Peak Flow (cfs)	Streamflow (cfs-days)	Streamflow (acre feet)	Suspended Sediment (tons)	Suspended Sediment (tons/mi^2)
1993	11,700	433,132	859,117	388,111	1,396
1994	7,798	167,403	332,045	73,070	263

w/ bedload

Targets
East ~~schist~~ sandstone/mudstone 1000 t/mi²/yr × 42% = 420 525
West schist less erodable? 1500 t/mi²/yr × 58% = 870 1102
Assume rest of upper basin behaves as schist 1290 1627
To determine redn. mean RWC = 3424 = 62% reduction.

1995	18,564	461,206	914,802	751,906	2,705
1996	31,660	490,647	973,199	1,080,307	3,886
1997	42,784	622,441	1,204,423	1,845,251	6,638

$\bar{x} = 2978$

w/ bedload ~~stor~~ 3723

- storage = 2829

request
streamflow x yield

mean Blue Lk + Orick, - storage =

- storage 3252 t/

Lack

LL Man

Panther

Orick	Lachs (east)	Panther west
2829	1159	1781

- storage 5%

$1101 \times 42\% = 462$ + $1692 \times 58\% = 981$ = 1443

$\div 2829$

Disturbance = 51%

reduc needed based on recent data:

area weighted

Orick
recent $\boxed{3723}$
sed. budget (54-80) $\boxed{5952}$

$\frac{5952}{3723}$ = 60% higher

plot sed yied x total water yield

average inherent/ mgmt weighted vulnerability to calculate sed. yields

ERA type

Appendix B-4

Sediment and Water Discharge Measurements in Tributaries

Lacks Creek (16.9 mi², 43.8 km²)

Water Year	Water Discharge (cfs-days)	Annual Runoff (mm)	Qss (tons)	Qbd (tons)	Qs Total (tons)	Qs (t/mi²)	Qs/Qw (tons/cfs-days)
81	16,252	910	14,333	3,178	18,055	1068	1.11
82	33,638	1920	22,241	11,776	33,996	2012	1.01
83	38,039	2240	52,846	12,299	65,154	3855	1.71
84	35,691	1990	13,313	5,493	18,798	1112	0.53
85	19,462	1120	6,116	2,425	8,544	506	0.44
86	25,460	1560	42,006	13,354	55,325	3274	2.17
87	15,340	880	3,715	664	4,375	259	0.29
88	13,046	900	11,478	4,865	16,383	969	1.26
89	28,204	1,570					
90	19,704	1,110					

Panther Creek near Orick (6.07 mi², 15.7 km²)

Water Year	Water Discharge (cfs-days)	Qw Runoff (mm)	Qss (tons)	Qbd (tons)	Qs Total (tons)	Qs (t/mi²)	Qs/Qw (tons/cfs-days)
80	10,195	1580	1758	486	2,244	370	0.21
81	5,683	880	300	136	436	72	0.08
82	16,668	2550	8076	2378	10,452	1722	0.63
83	13,325	2070	3941	1433	5,373	885	0.40
84	12,145	1890	2519	941	3,460	570	0.28
85	6,890	1160	579	461	1,040	171	0.15
86	9,138	1590	6236	5388	11,579	1908	1.27
87	5,527	940	265	112	378	62	0.07
88	4,354	870	788	875	1,663	274	0.38
89	8,719	1350					
90	5,492	850					

Coyote Creek near Orick (7.78 mi², 20.15 km²)

Water Year	Water Discharge (cfs-days)	Annual Runoff(mm)	Qss (tons)	Qbd (tons)	Qs Total (tons)	Qs (t/mi²)	Qs/Qw (tons/cfs-days)
80	16,377	1990	52,124	10,763	62,963	8177	3.88
81	8,321	1010	7,951	2,512	10,466	1345	1.26
82	22,280	2790	58,651	22,480	81,131	10428	3.64
83							
84	17,108	2070	6,904	3,932	10,828	1392	0.63
85	9,142	1140	1,793	1,166	2,955	380	0.32
86	12,590	1690	9,932	6,187	16,149	2076	1.28
87	7,797	970	1,008	265	1,274	164	0.16
88	6,416	960	2,796	1,740	4,537	583	0.71
89	18,539	2250					

Steve

JUL 26 1979

S. VEIRS

SUMMARY OF WATERSHED CONDITIONS IN THE VICINITY OF REDWOOD NATIONAL PARK, CALIFORNIA

By Richard J. Janda

U.S. GEOLOGICAL SURVEY

Open-File Report 78-25

Menlo Park, California
1977

ABSTRACT

The Redwood Creek Unit of Redwood National Park is located in the downstream end of an exceptionally rapidly eroding drainage basin. Spatial distribution and types of erosional landforms, observed in the field and on time-sequential aerial photographs, measured sediment loads, and the lithologic heterogeneity of streambed materials indicate (1) that sediment discharges reflect a complex suite of natural and man-induced mass movement and fluvial erosion processes operating on a geologically heterogeneous, naturally unstable terrain, and (2) that although infrequent exceptionally intense storms control the timing and general magnitude of major erosion events, the loci, types, and amounts of erosion occurring during those events are substantially influenced by land use. Erosional impacts of past timber harvest in the Redwood Creek basin reflect primarily the cumulative impact of many small erosion problems caused not so much by removal of standing timber as by the intensity and pattern of ground surface disruption accompanying removal.

Recently modified riparian and aquatic environments reflect stream channel adjustments to recently increased water and sediment discharges, and are classified by the National Park Service as damaged resources because the modifications reflect, in part, unnatural causes.

Newly strengthened State regulations and cooperative review procedures result in proposed timber harvest plans being tailored to specific site conditions, as well as smaller, more dispersed harvest units and more sophisticated attempts at minimizing ground-surface disruption than those used in most previous timber harvesting in this

basin. However, application of improved timber harvest technology alone will not assure protection of park resources. Much remaining intact and residual commercial old-growth timber is on hillslopes that are steeper, wetter, more susceptible to landsliding, and more nearly adjacent to major stream channels than most of the previously harvested hillslopes in the lower Redwood Creek basin. Moreover, natural debris barriers along streams flowing through remaining old-growth forest have temporarily stored substantial quantities of sediment introduced into streams by recent storms and upstream land-use changes. Removal of merchantable timber from these barriers may destroy their stability and cause rapid release of stored sediment. Additionally, massive erosion in some recently harvested areas suggest that they are so erosionally sensitive that following rehabilitation and reforestation, they should not be reharvested. Thus, in order to maintain site productivity and to protect downstream park resources, some erosionally critical areas may have to be maintained as perpetual timber reserves dedicated to watershed protection. Selective Federal acquisition of just erosionally critical acreage would create ownership patterns that would make management of both parklands and commercial timber lands exceedingly difficult.

ORICK

Water Year	Streamflow (cfs-days)	Suspended Sediment (tons)	Bedload (tons)
1971	514,592	2,177,712	–
1972	536,198	3,799,775	–
1973	281,843	757,634	–
1974	629,915	2,228,626	371,804
1975	476,089	2,768,664	251,070
1976	308,627	745,314	100,551
1977	70,117	22,567	2,277
1978	425,877	948,518	330,195
1979	231,035	292,989	52,100
1980	404,268	704,585	190,778
1981	235,647	187,877	174,021
1982	584,833	1,276,880	377,890
1983	600,462	1,329,818	370,806
1984	458,970	625,810	279,372
1985	265,181	280,541	139,376
1986	362,162	1,010,226	148,237
1987	201,675	103,782	61,790
1988	176,750	156,514	62,255
1989	353,450	463,771	60,950
1990	184,274	191,317	62,215
1991	127,467	34,965	22,967
1992	102,919	18,184	10,884
1993	433,132	388,111	
1994	167,403	73,070	
1995	461,206	751,906	
1996	490,647	2,739,995	

OKANE

Water Year	Streamflow (cfs-days)	Suspended Sediment (tons)	Bedload (tons)
1973	70,264	184,689	–
1974	149,725	657,618	301,502
1975	124,160	695,296	243,860
1976	67,873	81,189	21,295
1977	16,117	1,217	724
1978	95,406	122,233	65,950
1979	51,081	54,296	28,436
1980	98,573	162,674	36,152
1981	50,793	46,873	7,143
1982	132,041	255,056	74,039
1983	131,297	373,940	85,292
1984	120,542	173,401	56,666
1985	63,422	81,351	8,956
1986	83,886	239,826	24,563
1987	44,747	12,310	3,654
1988	37,076	28,769	5,623
1989	82,174	89,666	6,385
1990	41,912	32,804	1,618
1991	25,986	5,108	420
1992	22,294	2,870	176
1993	94,204	125,684	
1994	37,713	14,377	
1995	129,757	268,096	
1996	118,505	607,792	
1997	102,062	388,040	

Bedload

Bedload consists of sand, gravel, and cobbles that roll and slide over the streambed. Bedload is of concern because almost all of the coarse sediment that threatens alluvial redwood groves is transported in this manner. Large amounts of coarse sediment, delivered from hillslopes during the flood of 1964, remain stored in the channel system (Madej, 1995). Landslides and other processes have continued to provide coarse sediment to the channel, but at lower rates over the past 25 years than during the 1953-75 period that included large floods. Hence, bedload movement in Redwood Creek in the past three decades has been largely a re-distribution of coarse sediment deposited in 1964.

Bedload accounts for roughly 20 to 25 percent of the total sediment load (commonly computed

Orick

Water Year (tons)	Streamflow (cfs-days)	Suspended Sediment (tons)	Bedload
1971	514,592	2,177,712	—
1972	536,198	3,799,775	—
1973	281,843	757,634	—
1974	629,915	2,228,626	371,804
1975	476,089	2,768,664	251,070
1976	308,627	745,314	100,551
1977	70,117	22,567	2,277
1978	425,877	948,518	330,195
1979	231,035	292,989	52,100
1980	404,268	704,585	190,778
1981	235,647	187,877	174,021
1982	584,833	1,276,880	377,890
1983	600,462	1,329,818	370,806
1984	458,970	625,810	279,372
1985	265,181	280,541	139,376
1986	362,162	1,010,226	148,237
1987	201,675	103,782	61,790
1988	176,750	156,514	62,255
1989	353,450	463,771	60,950
1990	184,274	191,317	62,215
1991	127,467	34,965	22,967
1992	102,919	18,184	10,884
1993	433,132	388,111	
1994	167,403	73,070	
1995	461,206	751,906	
1996	490,647	2,739,995	

Okane

Water Year (tons)	Streamflow (cfs-days)	Suspended Sediment	Bedload (tons)
1973	70,264	184,689	—
1974	149,725	657,618	301,502
1975	124,160	695,296	243,860
1976	67,873	81,189	21,295
1977	16,117	1,217	724
1978	95,406	122,233	65,950
1979	51,081	54,296	28,436
1980	98,573	162,674	36,152
1981	50,793	46,873	7,143
1982	132,041	255,056	74,039
1983	131,297	373,940	85,292
1984	120,542	173,401	56,666
1985	63,422	81,351	8,956
1986	83,886	239,826	24,563
1987	44,747	12,310	3,654
1988	37,076	28,769	5,623
1989	82,174	89,666	6,385
1990	41,912	32,804	1,618
1991	25,986	5,108	420
1992	22,294	2,870	176
1993	94,204	125,684	
1994	37,713	14,377	
1995	129,757	268,096	
1996	118,505	607,792	
1997	102,062	388,040	