THIRD PROGRESS REPORT, 1965

COOPERATIVE WATERSHED MANAGEMENT RESEARCH

IN THE

LOWER CONIFER ZONE OF CALIFORNIA

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INTRODUCTION

In 1961, cooperative watershed management research in the Lower Conifer Zone of California was started. Currently, the research is being conducted by the Pacific Southwest Forest and Range Experiment Station of the U. S. Forest Service with the cooperation of the State of California, Department of Water Resources, and the Division of Forestry. Recently, the Station entered into a cooperative agreement with Humboldt State College for joint research on the Caspar Creek Study.

Research in the Lower Conifer Zone is designed to obtain information and develop principles which will give greater insight to the effect of land management in the Zone upon water quality, floods and sedimentation, water timing, and water yield.

This Progress Report will discuss new installations and analysis of data not reported in the two previous Progress Reports.

INDIVIDUAL STUDIES

EFFECTS OF LOGGING ON STREAMFLOW, SEDIMENTATION, FISH LIFE, AND FISH HABITAT IN THE NORTH COAST REDWOOD-DOUGLAS-FIR TYPE JACKSON STATE FOREST, FORT BRAGG, CALIFORNIA

Two experimental watersheds in second growth Redwood-Douglas-fir forest type have been established on the Jackson State Forest which is under intensive management of the State Department of Conservation, Division of Forestry (fig. 1).

The 1963-64 Progress Report discussed the objectives and methodology of this cooperative research effort at Caspar Creek and presented streamflow and precipitation data for the 1963 water year. This report will discuss the instrumentation installed and data analyzed since the 1963-64 Report and will not reiterate those results previously reported.

Weir construction and streamflow recorder installation in both the North and South Forks of Caspar Creek was completed early in November 1962. The calibration period of this study. is now in its fourth year.

Activities in 1965.

Streamflow. Streamflow records are complete for both forks of Caspar Creek through water years 1964 (tables 1 and 2) and 1965 (tables 3 and 4), including the heavy December storms of 1964, The North Fork record was interrupted from May 28 to August 4 while the sediment basin. was being emptied. Since this was during a period of depletion flow and since only 0.05 inches of rain was recorded during this time, the hydrograph can be easily estimated. All instruments are currently operating satisfactorily. We now have extra clocks for both the streamflow recorders and the recording raingages at the California Division of Forestry office in Ft. Bragg. This will allow quick replacement in case of clock failure.

Precipitation. As noted in the 1963-64 Progress Report, an additional recording raingage was installed near the North Fork weir in August 1964. Hence, for water year 1965 we have rainfall intensity records for this gage (table 7) as well as for the recording gage located near the bridge to the South Fork. weir (tables 5 and 6). Measurement of precipitation at the five non-recording raingages (fig. 1) was continued.

Sedimentation. Sediment accumulation behind the weirs continues to be measured by annual surveys of the sediment surface elevations. This allows computation of the change in volume between the sediment surface and an imaginary fixed plane above the basin.

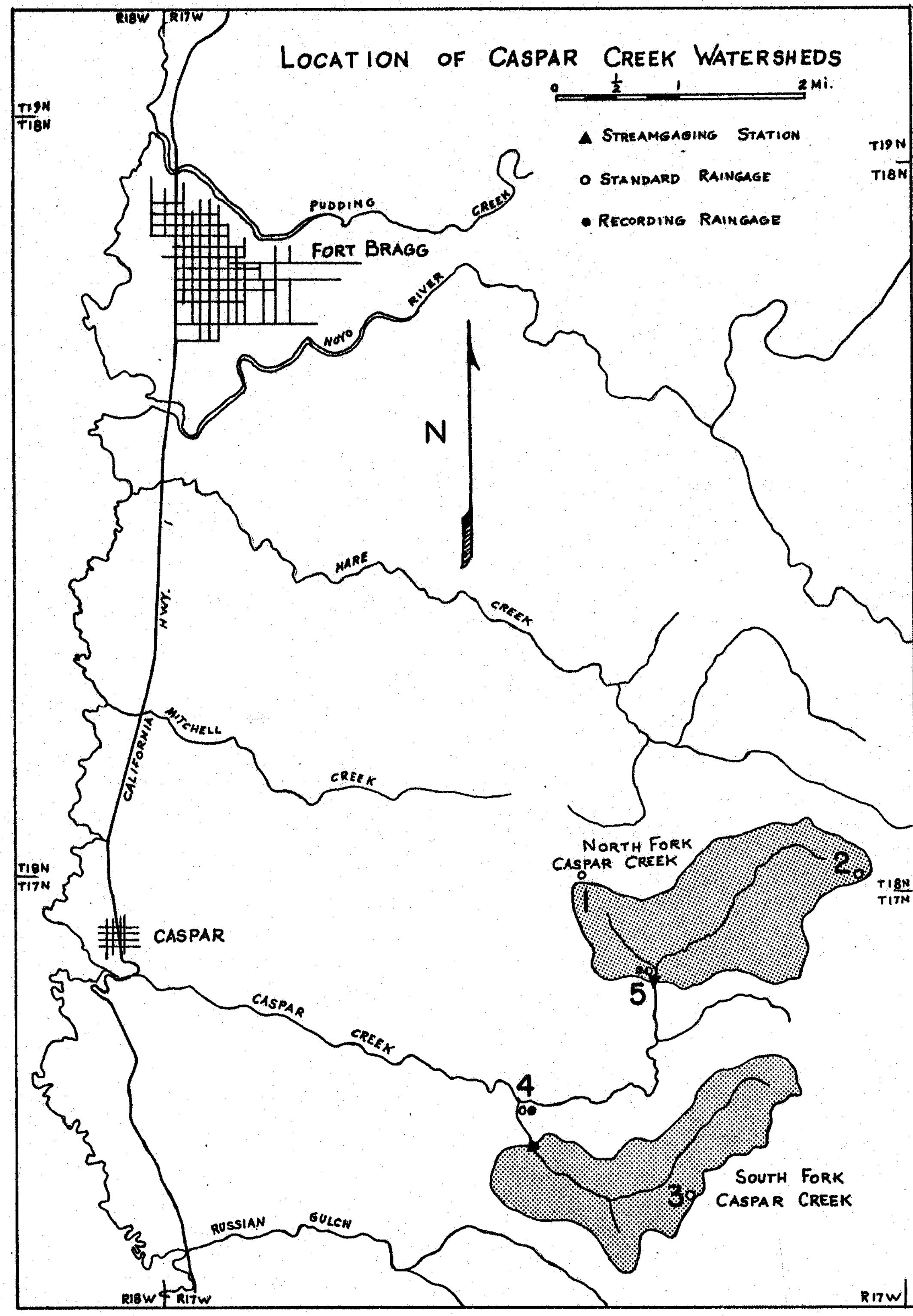

Figure 1.--Map of Caspar Creek area.

TABLE 1

NORTH FORK CASPAR CREEK

DAILY MEAN FLOW IN CUBIC FT./ SEC.   WATER YEAR OCTOBER 1963 THROUGH SEPTEMBER 1964

DATE	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.
1	0.0571	0.1897	1.6895	1.1823	2.8288	0.8742	1.0865	0.3535	0.2414	0.1404	0.0774	0.0436
2	0.0571	0.3041	1.4620	1.1989	2.6125	0.8590	0.8985	0.3628	0.2433	0.1439	0.0758	0.0423
3	0.0583	0.6854	1.2978	1.0851	2.2910	0.7503	0.8086	0.5751	0.2296	0.1410	0.0740	0.0410
4	0.0591	4.0733	1.1874	1.0055	1.9995	0.6933	0.7520	0.4661	0.2264	0.1452	0.0729	0.0395
5	0.0772	1.4108	1.1137	0.9361	1.8528	0.6927	0.6839	0.3975	0.2503	0.1478	0.0714	0.0391
6	0.0802	1.8210	1.0259	1.4877	1.7419	0.7283	0.6327	0.3656	0.2859	0.1428	0.0692	0.0390
7	0.0848	1.5617	0.9211	3.1192	1.5320	0.7032	0.5952	0.3316	0.2881	0.1370	0.0659	0.0388
8	0.0837	9.5693	1.1353	3.0140	1.4044	0.6490	0.5711	0.3182	0.2734	0.1325	0.0643	0.0377
9	0.1219	7.7858	1.6584	2.6767	1.3456	0.6225	0.5548	0.3083	0.2696	0.1297	0.0627	0.0377
10	0.5208	3.6895	1.4569	2.3511	1.2899	0.6020	0.5321	0.2944	0.2704	0.1252	0.0625	0.0377
11	0.4322	1.8886	1.2642	2.0746	1.1952	1.3309	0.5095	0.2848	0.2460	0.1191	0.0626	0.0377
12	0.2073	1.2230	1.1374	1.8261	1.1147	1.9858	0.4779	0.2867	0.2276	0.1126	0.0625	0.0376
13	0.1584	1.0493	1.0747	1.9534	1.0457	1.5852	0.4500	0.2878	0.2190	0.1061	0.0616	0.0383
14	0.1566	21.3925	1.0124	2.0943	1.0510	1.3049	0.4273	0.2819	0.2049	0.1030	0.0608	0.0386
15	1.5488	15.0144	0.9652	2.0066	1.1607	1.1241	0.4141	0.2753	0.1978	0.1052	0.0594	0.0392
16	0.6398	9.1829	0.9172	2.1178	1.0365	0.9888	0.4040	0.3236	0.1919	0.1062	0.0579	0.0387
17	0.3328	5.0475	0.8664	5.6041	0.9423	0.8781	0.4035	0.3450	0.1895	0.1064	0.0571	0.0381
18	0.2565	3.1264	0.8695	17.6140	0.8902	0.8012	0.4085	0.3076	0.1877	0.1012	0.0563	0.0374
19	0.2210	8.9155	1.0105	46.1654	0.8542	0.7270	0.4067	0.2966	0.1750	0.1002	0.0535	0.0368
20	0.1950	12.2836	1.5949	73.6020	0.8161	0.6754	0.3946	0.2801	0.1738	0.0958	0.0519	0.0361
21	0.1881	6.6011	1.5579	43.1111	0.7632	0.8540	0.3983	0.2668	0.1702	0.0954	0.0505	0.0353
22	0.3802	4.4444*	1.4626	24.6792	0.7408	1.2977	0.3947	0.2598	0.1625	0.0940	0.0490	0.0345
23	0.6331	32.7291	1.3257	21.2395	0.7313	1.4737	0.3839	0.2585	0.1521	0.0932	0.0492	0.0342
24	0.4128	24.4271	1.2533	14.7116	0.7242	1.2540	0.3789	0.2568	0.1426	0.0906	0.0492	0.0341
25	0.3255	11.8935	1.1652	10.0785	0.7169	1.0393	0.3663	0.2471	0.1355	0.0870	0.0499	0.0331
26	0.2674	6.9636	1.1372	7.4692	0.6667	0.9171	0.3593	0.2905	0.1.318	0.0844	0.0505	0.0323
27	0.2271	4.5983	1.2944	5.5922	0.6563	0.8597	0.3570	0.2732	0.1299	0.0840	0.0508	0.0314
28	0.2044	3.2991	1.3246	4.3781	0.6862	0.8033	0.3521	0.2425	0.1286	0.0843	0.0492	0.0307
29	0.1849	2.5205	1.3565	4.0681*		0.7508	0.3502	0.2334	0.1302	0.0824	0.0476	0.0301
30	0.1723	2.0205	1.3360	3.5389		0.7312	0.3369	0.2374	0.1388	0.0782	0.0459	0.0301
31	0.1642		1.2036	3.1060		0.7923		0.2431		0.0765	0.0422	
MEAN	0.2743	6.9904*	1.2283	10.1641*	1.2193	0.9467	0.5030	0.3081	0.2005	0.1094	0.0585	0.0367
AC FT	16.877	415.957*	75.525	624.967*	70.136	58.213	29.929	18.946	11.928	6.727	3.597	2.184

TOTAL RUNOFF IN ACRE-FEET   1334.985

THE ABOVE DATA IS ACCURATE TO THREE SIGNIFICANT FIGURES ONLY

* FIGURES BASED ON ESTIMATED DATA.

TABLE 2

SOUTH FORK CASPAR CREEK

DAILY MEAN FLOW IN CUBIC FT./ SEC.   WATER YEAR OCTOBER 1963 THROUGH SEPTEMBER 1964

DATE	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.
1	0.0964	0.2013	1.0447	l.1237	2.0310	0.8816	1.0262*	0.3329	0.2276	0.1453	0.0911	0.0522
2	0.0985	0.3203	0.9151	1.0841	1.8842	0.8533	0.7810*	0.3355	0.2265	0.1461	0.0887	0.0536
3	0.1034	1.2677	0.8279	0.9283	1.6399	0.6975	0.6792	0.6371	0.2163	0.1432	0.0870	0.0520
4	0.1035	4.2538	0.7593	0.8386	1.4306	0.6406	0.6238	0.4395	0.2150	0.1489	0.0854	0.0524
5	0.1438	1.2521	0.7138	0.7625	1.3218	0.6279	0.5603	0.3604	0.2365	0.1464	0.0832	0.0515
6	0.1496	1.4418	0.6610	1.4719	1.2500	0.6659	0.5175	0.3284	0.2686	0.1399	0.0768	0.0511
7	0.1301	1.2610	0.6062	3.7648	1.1001	0.6343	0.4894	0•3032	0.2586	0.1393	0.0735	0.0523
8	0.1212	12.4440	0.8732	3.0324	1.0233	0.5756	0.4730	0.2955	0.2539	0.1384	0.0752	0.0527
9	0.2018	8.2801	1.2478	2.4246	0.9834	0.5577	0.4640	0.2886	0.2.528	0.1328	0.0746	0.0516
10	0.8718	3.2789	1.1102	2.0266	0.9370	0.5432	0.4433	0.2783	0.2377	0.1304	0.0746	0.0511
11	0.5839	1.5498	0.9477	1.7101	0.8683	1.4424	0.4218	0.2718	0.2199	0.1230	0.0795	0.0523
12	0.2526	0.9632	0.8393	1.4841	0.8163	1.9164	0.4023*	0.2706	0.2092	0.1136	0.0763	0.0558
13	0.1900	0.8656	0.7862	1.6262	0.7623	1.3920	0.3926*	0.2679	O.2O48	0.1112	0.0712	0.0589
14	0.1995	26.4950	0.7335	1.7681	0.7738	1.0981	0.3810*	0.2601	0.1926	0.1152	0.0698	0.0560
15	1.9625	11.9041	0.6976	1.6369	0.9096	0.9337	0.3666*	0.2561	0.1883	0.12'29	0.0684	0.0526
16	0.5671	5.1246-	0.6647	1.7551	0.7953	0.8243	0.3491	0.3047	0.1845	0.1229	0.0676	0.0501
17	0.3125	2.9881	0.6333	5.4465	0.7300	0.7418	0.3435	0.3180	0.1832	0.1112	0.0663	0.0498
18	0.2509	1.9969	0.6333	17.2908	0.6963	0.6724*	0.3460	0.2833	0.1793	0.1068	0.0681	0.0477
19	0.2252	11.1759	0.7997	43.8714	0.6744	0.5983*	0.3458	0.2713	0.1712	0.1053	0.0625	0.0431
20	0.2027	12.4011	1.4015	77.0917	0.6432	0.5606*	0.3413	0.2610	0.1698	0.1030	0.0583	0.0402
21	0.1983	4.9614	1.3849	32.2254	0.6101	0.6817	0.3352	0.2477	0.1655	0.1046	0.0570	0.0400
22	0.4579	3.4730	1.2761	18.7925	0.6025	1.0995	0.3307	0.2423	0.1578	0.1047	0.0593	0.0449
23	0.6932	41.0509	1.1261	16.8374	0.5997	1.1621	0.3303	0.2404	0.1498	0.1006	0.0627	0.0403*
24	0.3654	17.9305	1.0651	10.1745	0.5975	0.9414	0.3284	0.2412	0.1447	0.0979	0.0650	0.0393*
25	0.2864	7.0849	1.0344	7.2130	0.5927	0.7835	0.3198	0.2345	0.1439	0.0950	0.0672	0.0388
26	0.2457	4.0382	0.9768	5.5902	0.5588	0.7074*	0.3145	0.2736	0.1416	0.0971	0.0739	0.0407
27	0.2129	2.6745	1.1916	4.2333	0.5529	0.6665*	0.3136	0.2541	0.1356	0.1012	0.0662	0.0459
28	0.1991	1.9498	1.3908	3.2950	0.5899	0.6288*	0.3100	0.2337	0.1359	0.1028	0.0596	0.0467
29	0.1900	1.5270	1.4761	2.8178		0.6043*	0.3086	0.2274	0.1399	0.0999	0.0546	0.0454
30	0.1776	1.2311	1.4213	2.4596		0.5798*	0.2988	0.2293	0.1472	0.0959	0.0519	0.0465
31	0.1717		1.2149	2.1929		0.6523*		0.2341		0.0945	0.0507	
MEAN	0.3215	6.5129	0.9824	8.9345	0.9155	0.8182*	0.4313*	0.2910	0.1919	0.1174	0.0699	0.0485*
AC FT	19.766	387.543	60.405	549.361	52.658	50.311*	25.661*	17.895	11.421	7.221	4.297	2.887*

TOTAL RUNOFF IN ACRE-FEET 1189.426

THE ABOVE DATA IS ACCURATE TO THREE SIGNIFICANT FIGURES ONLY

* FIGURES BASED ON ESTIMATED DATA.

TABLE 3

NORTH FORK CASPAR CREEK

DAILY MEAN FLOW IN CUBIC FT./ SEC.   WATER YEAR OCTOBER 1964 THROUGH SEPTEMBER 1965

DATE	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.
1	0.0316	0.3282	9.2187	12.2008	2.5834	1.0884	1.4676	1.3149	0.4499*	0.2696*	0.1370*	0.0703
2	0.0318	0.7688	12.5170	8.9145	2.3090	0.9997	1.3821	1.2122	0.4419*	0.2635*	0.1331*	0.0707
3	0.0318	0.3175	9.0323	18.0609	2.0719	0.9288	1.2146	1.2825	0.4361*	0.2592*	0.1291*	0.0724
4	0.0315	0.2080	4.8398	19.2558	1.9950	0.8674	1.0847	1.1017	0.4283*	0.2535*	0.1264*	0.0728
5	0.0315	0.1666	2.9769	35.9763	3.7306	0.8239	0.9838	0.9998	0.4203*	0.2494*	0.1227*	0.0748
6	0.0315	0.1398	2.0881	52.1357	4.0208	0.8302	0.8770	0.9318	0.4146*	0.2438*	0.1222	0.0789
7	0.0314	0.1237	1.5857	33.6441	3.6930	0.8210	0.8860	0.8962	0.4070*	0.2397*	0.1271	0.0804
8	0.0318	0.4402	1.2950	16.6978	3.1958	0.8114	1.0056	0.8685	0.4015*	0.2343*	0.1270	0.0789
9	0.0318	2.2242	1.1784	10.3423	2.7376	0.8043	2.3175	0.8469	0.3940*	0.2303*	0.1208	0.0765
10	0.0320	7.7918	3.1648	7.4697	2.3875*	0.8043	4.4817	0.8114	0.3886*	0.2250*	0.1148	0.0741
11	0.0324	2.1701	10.3009	6.9069	2.1307*	0.8030	4.5391	0.7618	0.3813*	0.2195*	0.1244	0.0686
12	0.0338	2.7656	6.7180	6.4010	1.8837	0.7899	3.3190	0.7407	0.3760*	0.2157*	0.1368	0.0689*
13	0.0347	2.1033	4.0910	5.6811	1.7473	0.7431	2.4463	0.7498	0.3689*	0.2106*	0.1300	0.0690*
14	0.0347	1.4213	3.0015	4.8903	1.6901	0.6902	2.1051	0.7369	0.3636*	0.2068*	0.1169	0.0690*
15	0.0348	0.9476	2.3348	4.0712	1.5826	0.6781	6.1006	0.6917	0.3566*	0.2019*	0.1120	0.0690*
16	0.0335	0.6471	1.8488	3.4596	1.4627	0.6677	11.7327	0.6729	0.3494*	0.1982*	0.1103	0.0690*
17	0.0329	0.4673	1.5113	2.9701	1.3262	0.6307	8.1868	0.6553	0.3444*	0.1934*	0.1100	0.0690*
18	0.0327	0.3722	1.3580	2.6239	1.2482	0.6092	10.1238	0.6331	0.3396*	0.1884*	0.1100	0.0690*
19	0.0320	0.3147	15.4150	2.4546	1.2103	0.6034	12.4469	0.6461	0.3350*	0.1849*	0.1092	0.0690*
20	0.0313	0.2814	32.0244	2.2850	1.1909	0.5831	9.9884	0.6641	0.3283*	0.1802*	0.1037	0.0690*
21	0.0306	0.2968	125.7740	2.0940	1.1596	0.5542	8.6113	0.6420	0.3234*	0.1768*	0.1005	0.0690*
22	0.0306	0.2985	139.2273	1.9481	1.1212	0.5384	7.1738	0.6017	0.3169*	0.1723*	0.0979	0.0690*
23	0.0306	0.2674	82.9553	4.6318	1.0541	0.5500	5.3991	0.5593	0.3102*	0.1690*	0.0959	0.0690*
24	0.0309	0.3729	65.3062	10.9591	1.0032	0.5499	4.1058	0.5371	0.3055*	0.1659*	0.0937	0.0690*
25	0.0312	1.1114	46.9346	9.2346	0.9521	0.5296	3.5653	0.5227	0.2992*	0.1629*	0.0905	0.0690*
26	0.0312	1.2502	57.3257	6.5473	1.0172	0.9048	2.8246	0.5044	0.2946*	0.1586*	0.0889	0.0690*
27	0.0474	1.6642	33.5000	5.0334	1.5249	3.6542	2.2601	0.4995*	0.2864*	0.1541*	0.0870	0.0690*
28	0.4727	29.9764	18.4909	4.2338	1.1787	2.0727	1.9334	0.4851*	0.2839*	0.1511*	0.0839	0.0690*
29	0.7051	15.0813	17.1994	3.6969		1.5210	1.6872	0.4700*	0.2797*	0.1469*	0.0796	0.0690*
30	0.2199	6.2439	20.0874	3.2781		1.3952	1.4988	0.4639*	0.2755*	0.1439*	0.0764	0.0690*
31	0.1472		19.2209	2.8730		1.3151		0.4558*		0.1399*	0.0730	
MEAN	0.0783	2.6854	24.2730	10.0313	1.9003*	0.9407	4.1916	0.7407*	0.3568*	0.2003*	0.1094*	0.0710*
AC FT	4.814	159.793	1492.486	616.803	105.537*	57.843	249.419	45.541*	21.228*	12.316*	6.725*	4.225*

TOTAL RUNOFF IN ACRE-FEET   2776.729

THE ABOVE DATA IS ACCURATE TO THREE SIGNIFICANT FIGURES ONLY

* FIGURES BASED ON ESTIMATED DATA.

TABLE 4

SOUTH FORK CASPAR CREEK

DAILY MEAN FLOW IN CUBIC FT./ SEC. WATER YEAR OCTOBER 1964 THROUGH SEPTEMBER 1965

DATE	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.
1	0.0455	0.4583	9.5520	8.1390	1.8963	1.0042	1.4730	0.8827	0.3859	0.2881	0.1657	0.1039
2	0.0440	1.1405	9.8529*	5.8254	1.7133	0.9174	1.3637	0.8207	0.3850	0.2770	0.1616	0.1082
3	0.0419	0.2801	7.0603*	14.8473	1.5754	0.8522	1.1027	0.7907	0.3919	0.2800	0.1544	0.1068
4	0.03.83	0.1804	4.6912*	14.3457	1.5523	0.7898	1.0099	0.7567	0.4061	0.2766	0.1483	0.1058
5	0.0385	0.1466	3.6097*	34.6495	3.5978	0.7497	0.9054	0.6917	0.4040*	0.2716	0.1480	0.1097
6	0.0411	0.1266	2.5167*	41.2590	3.6851	0.7535	0.8008	0.6544	0.3834*	0.2771	0.1538	0.1143
7	0.0452	0.1154	1.8112*	23.4636	3.0934	0.7564	0.8054	0.6388	0.3851*	0.2725	0.1635	0.1099
8	0.0462	0.5563	1.2651*	10.9658	2.5601	0.7424	0.9975	0.6223	0.3817*	0.2544	0.1610	0.1082
9	0.0457	3.4085	0.9323*	6.8096	2.1588	0.7315	3.3119	0.6172	0.3445*	0.2364	0.1497	0.1021
10	0.0453	12.9800	2.2695	5.0788	1.8630	0.7315	5.2684	0.6007	0.3178*	0.2273	0.1423	0.1015
11	0.0457	3.0282	7.9038	4.8482	1.6538	0.7253	4.1417	0.5737	0.3083*	0.2228	0.1532	0.0989
12	0.0456	7.1647	4.7772	4.6075	1.4825	0.7111	2.6987	0.5612	0.2894*	0.2205	0.1698	0.1005
13	0.0465	3.6341	2.8719	4.0679	1.3946	0.6756	1.9109	0.5710	0.2862*	0.2199	0.1504	0.1004
14	0.0460	2.0740	2.1444	3.5108	1.3455	0.6444	1.5292	0.5663	0.3220*	0.2184	0.1403	0.0990
15	0.0452	1.1932	1.6803	2.9800	1.2573	0.6327	6.2164	0.5333	0.3257*	0.2130	0.1408	0.0953
16	0.0423	0.7414	1.3404	2.4949	1.1654	0.6241	10.0670	0.5222	0.3213	0.2066	0.1409	0.0856
17	0.0381	0.5061	1.0739	2.1610	1.0735	0.5927	6.3597	0.5099	0.3135	0.2010	0.1429	0.0778
18	0.0376	0.3779	0.9741	1.9379	1.0163	0.5764	12.0876	0.4934	0.3183	0.2021.	0.1424	0.0746
19	0.0353	0.3146	25.6797	1.8489	0.9903	0.5670	11.1407	0.5065	0.3063	0.1989	0.1359	0.0731
20	0.0335	0.2782	30.8486	1.7711	0.9743	0.5555	7.4648	0.5215	0.3013	0.1957	0.1293	0.0727
21	0.0335	0.2900	122.0471	1.6640	0.9638	0.5373	6.4675	0.5115	0.3124	0.1900	0.1226	0.0760
22	0.0343	0.3082	119.4378	1.5743	0.9274	0.5264	5.0926	0.4774	0.3239	0.1812	0.1226	0.0810
23	0.0367	0.2607	59.0814	3.9275	0.8809	0.5244	3.8215	0.4467	0.3143	0.1790	0.1215	0.0860
24	0.0392	0.3598	50.9914	9.3133	0.8457	0.5202	2.8028	0.4318	0.3054	0.1833	0.1173	0.0904
25	0.0413	1.4346	36.2598	6.7802	0.8124	0.5104	2.1754	0.4208	0.2921	0.1944	0.1175	0.0993
26	0.0430	1.6723	44.4644	4.6360	0.8852	0.8988	1.7901*	0.4140	0.2760	0.1951	0.1158	0.1081
27	0.0753	1.8384	24.8035	3.5557	1.6685	4.0899	1.5332*	0.4139	0.2649	0.1764	0.1120	0.1110
28	0.7840	50.5971	14.4346	3.0033	1.1209	1.9162	1.2860*	0.4087	0.2606	0.1679	0.1094	0.1017
29	0.8460	17.0760	12.3646	2.6392		1.3417	1.1342	0.4039	0.2640	0.1656	0.1041	0.0944
30	0.2130	6.1916	15.0182	2.3357		1.2455	1.0057	0.3995	0.2892	0.1697	0.0986	0.0867
31	0.1500		13.9287	2.0840		1.3332		0.3907		0.1720	0.1010	
MEAN	0.1014	3.9578	20.5060*	7.6492	1.5773	0.8960	3.6284*	0.5533	0.3260*	0.2172	0.1367	0.0961
AC FT	6.235	235.503	1260.865*	470.331	87.597	55.095	215.902*	34.024	19.399*	13.358	8.403	5.718

TOTAL RUNOFF IN ACRE-FEET 2412.430

THE ABOVE DATA IS ACCURATE TO THREE SIGNIFICANT FIGURES ONLY

FIGURES BASED ON ESTIMATED DATA.

Table 5

DAILY PRECIPITATION AT CASPAR CREEK STATION 4
October 1963 - September 1964

(All entries in inches)

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1		0.44		0.28	*	0.63		0.07				
2				.02	*	.06		.18				
3		1.60			*			.15				
4		.17	*		*	.07		.50	0.04			
5	0.39	.41	*		0.92*	.05			.12			
6		.29	*	.85		.18			.15			
7		.27	*	.04								
8	.06	1.64	*						.10			
9	.33	.11	.68*	.22								
10	1.62								.04			
11	.13					*						
12						*						
13		.68		.48		*			.04			
14	.53	1.62		.02	.30	*						
15	1.22	.31			.05	*						
16				.31		*		.33				
17				1.00		*						
18			.24	1.28		1.06*						
19		1.64	.71	.69								
20			.02	2.26		.05						
21	.05			.43		.25						
22	.77	.92		_.39#		.52						
23		1.39		*								
24		.02	.08	*								
25				*				.02				
26			.21	*				.15				
27			.17	*								
28				*	.13							
29												
30				*		.52						
31				*		.08						
Monthly Totals	5.10	11.51	2.11	# 8.27	# 1.40	3.47	0.00	1.40	0.49	0.00	0.00	0.00

Total Annual Precipitation 33.75 inches

* Indicates missing record. Value at last * is the total for this period.
# Indicates total in question due to missing record.

Table 6

DAILY PRECIPITATION AT CASPAR CREEK STATION 4

October 1964 - September 1965

(All entries in inches)

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1		0.29	0.48				0.01					
2			.07	0.76			.01					
3			.16	.60								
4				.23	0.45		.01					
5				1.85	.45		.01					
6			.12	1.02		0.15	.01					
7			.13				.19					
8		1.21	.12				.51					
9		2.65	.05	.11			.80					
10		.58	.73	.20			.11					
11		.77		.10			.01				0.05	
12		.63					.01					
13		.22	.30				.01					
14					.09		.10		0.04			
15							1.48					
16												
17							.57					
18			.41				.46					
19			2.03	.21			.06					
20			.53				.45					
21		.28	4.44		.03							
22		.01	2.13									
23			1.32	1.20								
24		.61	.40	.09								
25		.26	1.31	.05		.05						
26		.15	.61		.70	1.27						
27	0.40	.74	.24	.02	.10	.45						
28	2.35	2.53	.48		.01	.05						
29	.34	.02	.22			.19						
30	.05	.69	.62									
31	.89		.l0			.39						
Monthly Totals	4.03	11.64	16.87	6.57	1.83	2.55	4.81	0.00	0.04	0.00	0.05	0.00

Total Annual Precipitation 48.39 inches

Table 7
DAILY PRECIPITATION AT CASPAR CREEK STATION 5

October 1964 - September 1965

(All entries in inches)

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1		0.95	0.71				0.02					
2		.12	.15	0.85			.01					
3			.15	.70			.01					
4			.10	.26	0.46		.01					
5				1.86	.60		.01					
6				1.07	.02	0.20	.01					
7				.14			.24					
8		1.18	.17				.52					
9		2.67	.07	.14			.87					
10		.40	1.15	.24			.24					
11		.47		.16							0.05	
12		.35										
13		.20	.30		.09							
14			.02				.02		0.05			
15			.02				1.72					
16												
17							.63					
18			.42				.55					
19			2.23	.22			.06					
20			.57									
21		.30	4.88		.02							
22		.04	2.55	.02								
23			1.57	1.49								
24		.70	.72	.10								
25		.30	1.65	.05		.02						
26		.18	.69		.74	1.33						
27	0.46	.87	.24	.02	.13	.57						
28	2.38	2.41	.70			.06						
29	.35	.01	.40			.25						
30		.75	.77									
31	.17		.11			.36						
Monthly Totals	3.36	11.92	20.32	7.32	2.06	2.79	5.41	0.00	0.05	0.00	0.05	0.00

Total Annual Precipitation 53.28 inches

The cumulative deposit of sediment in the North Fork basin was removed by the California Division of Forestry in early summer 1965. An access ramp was built over the weir and the sediment was removed by end loader and dump truck. During this operation samples were taken to find the particle size distribution of the sediment. The sediment removed from the basin was to be used to surface the North Fork road. However, the texture was too fine for this purpose and the sediment was dumped off the side of the road where it would not contribute to stream sediment.

Surveys of the sediment surface were taken both before and after the basin was emptied to allow computation of the yearly deposition and to find the amount removed. The contractor estimated that 2502 cubic yards of material was removed from the North Fork basin. This estimate is based on a count of 834 dump truck loads of 3 cubic yard capacity, which was required to complete the job. The actual volume of material removed, based on our survey of the basin, is currently being computed and will not be included at this time.

Suspended sediment continues to be measured with fixed stage and with DH-48 hand samplers. All these data collected before the end of the 1965 water year have been analyzed for sediment concentration. However, no integrating study has yet been made of these data and thus, no results are included this time.

Stream ecology phase of the Caspar Creek Study - Humboldt State College.

In July 1965 the Station entered into a cooperative agreement with Humboldt State College to conduct research on the stream ecology phase of the Caspar Creek Study. The following is a report of progress to December 21, 1965 by Dr. John W. DeWitt.

Introduction. During the summer, orientation surveys were carried out and initial plans for the conduct of the project were completed. Generally, the plans are for the investigation of the short and long-term effects of logging and associated activities on the nature, the ecology, and the productivity of one branch (the South Fork) of Caspar Creek. The North Fork watershed is not to be logged and the North Fork will thus serve as a "control" area for the study. The detection and measurement of any effects resulting from logging activities are to be facilitated by studies of the South Fork for about two years before, as well as after, logging is commenced on its watershed, and by simultaneous studies on the North Fork.

In this, the stream ecology phase of the overall Caspar Creek watershed project, the resources of ultimate concern are assumed to be the fisheries resources, rather than, say, the domestic, industrial, or agricultural water resources. Accordingly, the ecology research plan is based on the salient requirements of fishes for their well-being and productivity. These requirements include those of:

1. living space
2. food
3. water temperature
4. dissolved oxygen
5. protection

Since not all stream conditions and all aspects of stream ecology can be emphasized in this study, only those, among the most important ones, expected to be altered to the most significant degree by logging will be studied extensively. Only limited attention, initially at least, is expected to be given to protection, dissolved oxygen, other chemical qualities of the water, and other factors.

The extent of the living space for fishes in a stream is a function of the instantaneous amount of water available in the stream, the depth of the water, its velocity, the surface area of the water, the wetted perimeter of the bottom of the stream, and the nature of the bottom materials. Changes in the volume of flow in a stream can affect all these factors. Since there is reason to expect logging to result in changes in flows, in the evaluation of the effects of logging on fishes, it is deemed necessary to monitor these conditions.

Fish food organisms are produced both in the water and out of the water. The effects of logging on the production of and availability of both aquatic organisms and of important terrestrial organisms must be given adequate consideration. Logging can affect the production of aquatic organisms through its influence on the amount of light reaching the stream, on water temperature, on the amount of living space available to the organisms, and on the abundance and distribution of stream bottom materials, as well as other factors. Thus, possible changes in the composition, distribution, abundance, and production of important aquatic fish food animals and the plants and animals they are dependent upon are to be ascertained and correlated wherever possible, mainly with changes in stream illumination, water temperature, and amount of living space for these organisms. The availability of terrestrial animals as food for fishes is expected to be affected by logging through its alteration of the composition and extent of the floral canopy over the stream and streamside and other nearby vegetation. In this study these aspects of the vegetation are to be measured and correlations between them and the contribution of terrestrial organisms by this vegetation to the supply of food to the stream are to be sought.

Changes in stream width, depth, volume of flow, and velocity, and changes in the amount of light reaching the stream can be expected to occur upon logging near the stream and elsewhere on its watershed. Many combinations of such changes could markedly alter stream temperature conditions. Changes in temperature can affect the production rates of fishes, fish-food organisms, and the plants and animals on which these organisms are dependent for their production. The species of organism and the prevailing temperature level will determine whether changes will be favorable or unfavorable for organism production. Changes in temperature could occur which could be lethal to some organisms. The specific causes of water temperature change associated with logging will be sought as will some of the relationships between degree of change of temperature and degree of change in the causative factors.

The bulk of the effort on the project will be placed on studies of the South Fork during the two years before logging is to be commenced on its watershed. Since completely adequate attention cannot be given to both forks of the creek and since the watershed of the North Fork is not to be logged, less effort will be given to this fork during this time.

Summary of work undertaken to date. Both forks in the main study sections were staked at 100-foot intervals for permanent reference.

Detailed maps were made of two sections totalling 2000 feet of the South Fork. The maps indicate the location and extent of pools and riffles, stream width, meander, general nature and extent of bottom materials, prominent landmarks, and the location and extent of beds of aquatic vegetation. The mapping was complemented by photographs of sections of the stream, of bottom materials, and of the floral canopy.

Measurements of the daily amount of light reaching the stream at many stations on the South Fork were made with a recording pyroheliometer. Records were .kept of water temperature change over stretches of stream on both forks variously exposed to the sun.

Some preliminary work was done on the characterizing of the principal types of stream bottom materials.

Exploratory sampling of bottom and drift organisms was completed. Regular collections of terrestrial and aquatic organisms dropping to the water surface were made at a number of stations on the South Fork. Cursory observations of the organisms being consumed by juvenile salmon and trout were made.

Short sections of the South Fork were screened and occasional observations were made on the fishes in each. Data gathered were mainly on species, abundance, weight, and length. Specimens were collected for food habit studies.

Frequent observations were made of general conditions throughout the length of the South Fork study area and occasional survey trips were taken to the North Fork. Obvious changes in water flow, aquatic plant growths, fish distribution, abundance of invertebrates, and other conditions were noted.

Stream sections to be studied intensively in the future were selected tentatively after much general observation and consideration of the requirements of the project.

The field work described above was carried out from June to September. Since September the work has been mainly in the laboratory and the office on identification and enumeration of collected specimens, compilation and analysis of data on temperature and light, surveying literature, and the refinement of plans of action.

Representative preliminary results. Thirty-eight simultaneous continuous daily records of water temperatures, two stations at a time, on the South Fork were obtained. The minimum recorded temperature change between two stations (600 feet apart) on a clear day was 0°F. The maximum recorded change between two stations (300 feet apart) was 3°F. In the former case, the stream was well-shaded between the two stations, and in the latter case, it was fairly well exposed. Heating of the water during daylight hours on clear days was, of course, more pronounced at stations not well-shaded than at well-shaded sites.

Only a few water determinations of water temperature were made on the North Fork, but one set of observations there showed the possible extreme effect of stream-bed disturbance accompanying extensive exposure of the stream to sunlight. In this case, the temperature increased from 60°F. to 75°F. over a distance of only 578 feet.

Generally, it is clear that increased exposure of this stream to sunlight, during the summer at least will considerably affect the temperature of it. Spreading and leveling of the stream bed by logging activities in the bed may result in a further increase in the degree of heating of the water.

The degree of stream shading and thus, of course, stream heating, is indicated by the amount of solar radiation being received at the water surface. Pyroheliograph (Taylor No. 5-3850) recordings at numerous stations in the study area on the South Fork indicate water surface shading conditions from extreme to moderate. The minimum recorded radiation was

12.6 Langleys. This amounts to only 1.9 percent of the average maximum radiation available at that time (680 Langleys). The maximum recorded radiation was 15.8 Langleys, or 20.5 percent of the average maximum available at that time.

Stream sections well-exposed to the sun contained dense growths of algae, while well-shaded sections did not. Fingerling salmonids appeared to be considerably less abundant in sections where these growths were extensive.

Samples of organisms dropping to the water surface were collected with shallow boxes of 1 square-yard surface area, equipped with plastic liners and filled with a formalin solution. About one-fifth of the 155 samples taken have been analyzed. Seventeen orders of aquatic and terrestrial insects are represented by these samples. Members of both groups were present in numbers sufficient to indicate that both may contribute considerably to the food supply of fishes in the stream. The minimum number of insects collected per (24-hour) box-day was 5. The maximum was 62.

Work plan for the winter period, 1965-66. Regular laboratory and office activities will be continued throughout the winter. Sometime during December and January representative winter conditions of flow, depth, width, water temperature, illumination, and floral canopy will be ascertained. Also, samples of bottom and drift organisms, "drop" organisms, and fishes will be collected.

Personnel participating in the work to date.

Dr. John W. DeWitt
Dr. Richard L. Ridenhour
Mr. James Andrews

Most of the field work was accomplished by Mr. Andrews, although Dr. DeWitt spent 20 days and Dr. Ridenhour spent 8 days in the field. Dr. Ridenhour has mainly been responsible for the planning of the work with fishes and the analysis of the data on fishes. Dr. DeWitt was mainly responsible for planning the other aspects of the work completed and underway.