

COVER SHEET

FEDERAL ENERGY REGULATORY COMMISSION

FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE
UPPER NORTH FORK FEATHER RIVER PROJECT

Project No. 2105-089

SECTION 3

ENVIRONMENTAL ANALYSIS

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FEIS

3.0 ENVIRONMENTAL ANALYSIS

In this section, we first describe the general environmental setting in the project vicinity and any environmental resources that could be cumulatively affected by relicensing the UNFFR Project. Then, we address each affected environmental resource. For each resource, we first describe the affected environment—the existing condition and the baseline against which to measure the effects of the proposed project and any alternative actions—and then the environmental effects of the proposed project, including proposed enhancement measures. Unless otherwise stated, the source of our information is the license application for the project (PG&E, 2002a).

3.1 GENERAL DESCRIPTION OF THE UPPER NORTH FORK FEATHER RIVER BASIN

The UNFFR Project is located on the NFFR and Butt Creek, a tributary to the NFFR. The project extends from the upper end of Lake Almanor at elevation 4,500 feet (PG&E datum),¹³ approximately 3 miles north of the community of Chester, down to elevation 2,205 feet (PG&E datum), where Yellow Creek enters the NFFR. The project also makes use of Butt Creek, from approximate elevations 4,330 to 4,070 feet (PG&E datum). Figure 3-1 shows how the project is hydraulically situated with respect to other hydroelectric projects on the NNFR.

The upper end of the project is located on the western side of the crest of the Sierra Nevada Mountains at elevation 4,500 feet. Precipitation occurs primarily during the winter months, and substantial snow accumulation can occur at this elevation. Mount Lassen (elevation 10,457 feet USGS datum) is at the northwestern end of the Lake Almanor basin. Normal annual precipitation at Lake Almanor is approximately 38 inches, and summer months are typically dry and mild. Butt Valley, on Butt Creek, is located at elevation 4,140 feet. Seasonal temperatures and precipitation at Butt Valley are similar to those at Lake Almanor. Because Caribou is located at elevation 2,980 feet in the NFFR canyon, seasonal temperatures are higher at Caribou than at Butt Valley and Lake Almanor. Annual average precipitation at Caribou is 41 inches, and snow accumulation is typically rare. The Belden powerhouse is located at elevation 2,215 feet, and conditions are similar to those at Caribou.

¹³ Lake level is defined as the water surface elevation, expressed in PG&E datum, which is 10.2 feet lower than the USGS datum.

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Figure 3-1

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Project features range in elevation from 4,500 to 2,215 feet. Lake Almanor is in a very broad basin with surrounding peaks of generally 6,000 to 7,000 feet. Butt Valley reservoir is in a small basin with surrounding ridges around 5,500 feet in elevation. Below Lake Almanor dam (also known as Canyon dam), the NFFR enters a canyon with steep sides dropping from elevation 4,400 feet at the base of the dam to elevation 2,985 feet at Caribou, a distance of about 11 river miles. This canyon is generally inaccessible, except at Seneca, which is located approximately midway between Lake Almanor dam and Caribou. Butt Creek below Butt Valley dam is also in a steep canyon until it joins the NFFR.

The NFFR passes through a narrow notch in rock outcroppings just below the Caribou powerhouse. From Belden forebay dam to the confluence with the EBNFFR, the NFFR drops in elevation from 2,850 feet (USGS datum) to 2,290 feet (USGS datum), a distance of about 7.5 river miles. Over the remaining 1.75 miles to the Belden powerhouse, the NFFR drops to elevation 2,215 feet (USGS datum). The slopes of the NFFR canyon remain very steep between Caribou and Belden.

3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

According to the Council on Environmental Quality's regulations of implementing the National Environmental Policy Act (NEPA) (40 CFR §1508.7), an action may cause cumulative effects on the environment if its effects overlap in space and/or time with effects of other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over time, including hydropower and other land and water development activities. At this time, we have identified water quality and quantity, fisheries, and the federally listed bald eagle as potentially cumulatively affected resources. Our analysis of cumulative effects to these resources is found in the corresponding resource section.

3.2.1 Geographic Scope

The geographic scope of the analysis defines the physical limits or boundaries of the proposed action's effects on the resources. Because the proposed action would affect the resources differently, the geographic scope for each resource may vary. However, in this instance, we conclude that the geographic scope for all identified resources is the same and would extend from the point where the NFFR enters Lake Almanor downstream to the point where the NFFR flows into Lake Oroville. Although project operations could influence flows and associated environmental resources in the NFFR downstream of Lake Oroville, the relatively large storage capacity of Lake Oroville (3.5 million acre-feet) mutes any project influences beyond this location.

3.2.2 Temporal Scope

The temporal scope of our cumulative effects analysis in this EIS includes past, present, and future actions and their possible cumulative effects on each resource. Based on the license term, the temporal scope looks 30 to 50 years in the future, concentrating on the effects of the resources from reasonably foreseeable future actions. The historical discussion, by necessity, is limited to the amount of available information for each resource.

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

3.3.1 Water Resources

3.3.1.1 Affected Environment

Water Quantity

The UNFFR Project uses water resources of the NFFR basin to generate electricity. The river basin drains a large portion of the eastern Sierra-Cascade geomorphic area in California, and its headwaters are located on the southeastern slope of Mount Lassen. The river generally flows southwesterly and enters Lake Oroville, a primary reservoir for the California State Water Project, approximately 30 miles downstream of the Belden powerhouse.

PG&E operates one hydroelectric project upstream of the UNFFR Project. The Hamilton Branch Project uses water from the Hamilton Branch of the NFFR and some other small streams located above the UNFFR Project to produce up to 4.8 MW at its powerhouse, which is located at the mouth of Hamilton Branch along the shoreline of Lake Almanor's eastern lobe. PG&E also regulates flow in Bucks Creek, a major tributary to the lower NFFR, with its Bucks Creek Project (FERC No. 619), including the city of Santa Clara's Grizzly powerhouse which is operated in coordination with the Bucks Creek Project.

The NFFR basin has mild, dry summers and heavy winter precipitation. Mean annual precipitation in the upper NFFR basin ranges from 20 inches in eastern portions of the EBNFFR subbasin to 90 inches in the northwestern portion of the basin near Mount Lassen. Monthly average precipitation varies at Chester from less than 0.5 inch in July and August to 6.5 inches in January (table 3-1). Much of the precipitation in the headwaters of the basin comes in the form of snow during November through March. Based on monthly average snow cover, most of the snowpack at Chester is melted by April.

Table 3-1. Meteorological summary for Chester, California. (Source: Weatherbase, 2003)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Air Temperature (°F)												
30	34	38	43	50	58	64	63	57	48	38	31	46
Average Precipitation (inches)												
6.5	5.4	4.6	2.1	1.6	0.9	0.3	0.4	0.8	2.0	4.1	5.5	34.1
Average Snowfall (inches)												
39.0	27.9	22.3	7.4	1.4	0.1	--	--	--	0.8	12.5	28.2	139.7
Average Snow Cover (inches)												
16	19	11	2	--	--	--	--	--	--	1	7	5

Note: -- indicates no value reported.

Since the winter of 1952–53, PG&E has implemented the Lake Almanor Cloud Seeding Project (LACSP) to increase snowfall during November through May in the NFFR basin above Lake Almanor. PG&E’s LACSP includes a network of nine, ground-based cloud seeding burners located near the south and west boundaries of the target area. The LACSP’s goal is to increase snowfall during naturally occurring precipitation periods. Generally, operational seeding periods are set for 12 hours; however, PG&E’s meteorological staff in San Francisco, California, determines the specific operations. LACSP includes guidelines for temporary suspension or curtailment of operations under certain conditions to avoid runoff or reservoir storage beyond manageable limits. PG&E estimates that LACSP increases precipitation in the basin above Lake Almanor by 5 percent annually.

Annual runoff patterns are characteristic of snowmelt-dominated hydrology of Sierra Nevada mountain streams that experience peak runoff during the late winter and spring and low flows during the summer. Average annual runoff for the drainage area contributing to Lake Almanor is about 27 inches per year, while runoff from the upper Butt Creek basin is about 19 inches per year. Table 3-2 shows monthly and annual flows for gaged stations in the project vicinity.

The hydrology of the upper NFFR basin is affected by diverse conditions, including regional and seasonal distribution of precipitation, influence of snow melt, differing geomorphic conditions, the impoundment and diversion of flow, and the consumptive use of surface and groundwater. Subbasins associated with the project area are generally broad plateau-like areas that are densely timbered. Large meadow areas were inundated by construction of the project. Big Meadow, the largest of these, was inundated by the creation of Lake Almanor in 1914.

Table 3-2. Summary of daily average flow discharge (cfs) data, by month and overall, for the project vicinity.^a (Source: PG&E, 2003a, as modified by staff)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Overall
NF59 - NFFR below Chester, WY 1970 to 1985													
Mean	324	301	340	439	684	531	308	218	194	184	246	244	334
Maximum	5,660	1,520	1,450	1,360	1,860	1,640	1,150	878	783	652	2,850	2,280	5,660
10% Exceedance	594	593	548	699	1,165	1,073	712	399	355	335	496	485	739
25% Exceedance	351	356	433	547	840	750	394	296	279	274	336	312	433
50% Exceedance													
(Median)	193	212	295	409	651	458	246	167	121	130	161	157	240
75% Exceedance	112	109	149	250	433	221	118	86	78	99	115	118	118
90% Exceedance	97	88	100	130	258	107	64	60	62	80	86	88	80
Minimum	42	52	53	47	60	21	16	12	24	51	67	42	12
NF46 - Hamilton Branch Creek at Red Bridge Pump, WY 1970 to 2002													
Mean	98	73	118	85	137	81	51	49	47	55	61	58	78
Maximum	3,870	1,480	2,640	2,000	4,502	1,150	693	693	660	999	1,500	1,900	4,502
10% Exceedance	146	144	266	145	414	170	81	74	74	75	68	84	123
25% Exceedance	53	62	83	78	80	61	53	54	52	52	50	51	61
50% Exceedance													
(Median)	42	37	46	48	43	43	43	41	33	32	32	36	42
75% Exceedance	22	21	27	26	27	27	27	25	21	22	21	22	24
90% Exceedance	8	10	15	13	19	18	18	16	11	14	14	13	16
Minimum	0	0	0	0	0	0	0	0	0	0	3	0	0
NF83 - Hamilton Branch Powerhouse, WY 1976 to 2002													
Mean	108	124	149	125	134	128	104	61	75	75	83	92	105
Maximum	242	282	233	267	242	242	232	215	222	406	218	242	406
10% Exceedance	209	210	213	214	213	212	209	176	204	204	207	208	210
25% Exceedance	194	205	208	208	209	204	173	87	107	106	117	132	196
50% Exceedance													
(Median)	95	109	179	106	163	115	83	43	40	45	54	60	78
75% Exceedance	42	54	95	56	48	53	45	19	31	32	33	39	40
90% Exceedance	31	36	44	41	39	38	36	0	0	0	29	32	31
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0
NF2 - NFFR near Prattville, WY 1970 to 2002 (USGS No. 11399500)													
Mean	94	92	41	47	54	75	69	65	47	51	51	36	60
Maximum	2,140	1,940	722	803	730	747	709	708	505	706	694	417	2,140
10% Exceedance	41	54	41	39	40	42	40	41	39	39	40	38	40
25% Exceedance	38	39	38	38	39	39	38	38	37	37	37	37	38
50% Exceedance	36	37	37	36	37	37	37	36	36	36	36	36	37

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Overall
(Median)													
75% Exceedance	36	36	36	36	35	36	36	36	35	35	35	35	35
90% Exceedance	34	35	35	35	35	35	35	35	34	34	34	34	35
Minimum	18	5	14	16	15	6	15	10	9	5	5	15	5
NF47 - NFFR above Caribou Powerhouse Operation, WY 1970 to 1989													
Mean	140	130	146	133	124	196	174	96	76	76	85	103	123
Maximum	1,190	1,420	1,060	575	935	2,710	2,090	1,720	125	426	328	841	2,710
10% Exceedance	230	188	234	193	175	122	99	93	88	86	107	146	153
25% Exceedance	117	137	159	141	126	104	92	85	80	81	88	100	109
50% Exceedance													
(Median)	89	107	125	117	98	86	79	77	75	77	79	83	84
75% Exceedance	78	85	95	96	79	75	71	68	69	68	72	74	75
90% Exceedance	70	75	83	78	70	66	63	62	64	65	67	68	67
Minimum	51	67	71	53	51	49	47	45	43	42	48	30	30
NF4 - Butt Creek below Almanor-Butt Creek Tunnel, near Prattville, WY 1970 to 2002 (USGS No. 11400500)													
Mean	106	112	155	171	168	97	55	48	45	50	66	77	96
Maximum	2,660	2,830	1,460	1,020	1,480	590	152	205	95	160	800	1,220	2,830
10% Exceedance	167	171	251	294	340	199	80	62	59	64	91	118	193
25% Exceedance	95	116	175	220	228	105	65	55	54	58	65	74	103
50% Exceedance													
(Median)	66	79	118	140	119	69	53	48	47	50	53	59	61
75% Exceedance	53	58	84	102	73	48	39	35	35	40	45	48	48
90% Exceedance	45	49	67	78	54	40	35	32	30	36	39	42	38
Minimum	33	39	45	39	26	26	27	27	27	29	33	34	26
NF71 - Butt Valley Powerhouse, WY 1970 to 2002 (USGS No. 11400600)													
Mean	701	597	400	454	420	674	1,075	1,294	1,247	1,123	1,128	1,059	849
Maximum	2,620	2,240	2,250	2,250	2,260	2,200	2,520	2,290	2,300	2,460	2,520	2,520	2,620
10% Exceedance	2,060	1,909	1,560	2,010	1,790	1,770	1,817	2,150	2,067	1,880	2,191	2,118	2,010
25% Exceedance	1,481	1,229	694	727	622	1,207	1,676	1,841	1,710	1,570	1,858	1,669	1,530
50% Exceedance													
(Median)	215	38	0	0	0	559	1,080	1,460	1,410	1,220	1,096	1,050	839
75% Exceedance	0	0	0	0	0	0	609	921	904	729	455	323	0
90% Exceedance	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0
NF9 - Butt Creek near Caribou, WY 1970 to 1984 (USGS No. 11401100)													
Mean	18	18	30	19	29	59	70	36	16	16	17	17	29
Maximum	57	52	521	47	600	808	808	808	18	23	33	41	808
10% Exceedance	22	23	26	26	24	28	28	18	17	18	20	20	23
25% Exceedance	18	19	23	22	21	19	19	17	16	16	17	18	19

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Overall
50% Exceedance													
(Median)	16	17	18	18	18	18	17	16	16	16	16	16	17
75% Exceedance	15	15	16	16	17	17	17	16	15	15	15	15	15
90% Exceedance	14	15	15	15	15	15	15	15	14	15	15	14	15
Minimum	14	14	14	14	14	14	14	14	14	7	14	14	7
NF63 - Caribou Powerhouse No. 1, WY 1970 to 2002													
Mean	223	249	208	223	178	232	308	393	377	321	364	314	283
Maximum	1,350	1,200	1,170	1,480	1,139	1,160	1,159	1,156	1,160	1,235	1,139	1,159	1,480
10% Exceedance	695	807	752	994	866	850	771	891	944	863	938	851	871
25% Exceedance	397	492	332	288	121	388	532	652	644	484	668	543	506
50% Exceedance													
(Median)	29	27	0	0	0	0	231	348	296	250	258	189	102
75% Exceedance	0	0	0	0	0	0	0	14	0	0	0	0	0
90% Exceedance	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0
NF263 - Caribou Powerhouse No. 2, WY 1970 to 2002													
Mean	590	506	374	388	380	517	732	869	880	843	833	819	645
Maximum	1,510	1,510	1,620	1,500	1,620	1,484	1,520	1,500	1,530	1,550	1,530	1,520	1,620
10% Exceedance	1,460	1,389	1,204	1,397	1,218	1,259	1,300	1,430	1,460	1,441	1,457	1,459	1,430
25% Exceedance	1,080	915	656	677	559	900	1,136	1,270	1,290	1,210	1,318	1,292	1,120
50% Exceedance													
(Median)	435	315	177	136	172	310	799	993	981	956	904	874	642
75% Exceedance	68	32	0	0	82	114	257	506	609	550	437	416	111
90% Exceedance	0	0	0	0	0	30	88	105	4	0	35	32	0
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0
NF103 - Oak Flat Powerhouse, WY 1986 to 2002													
Mean	58	58	66	79	122	120	121	121	68	61	60	57	83
Maximum	96	112	142	160	145	153	147	143	153	145	73	100	160
10% Exceedance	66	69	82	120	139	139	139	139	120	69	65	65	132
25% Exceedance	65	65	65	108	132	132	134	134	65	65	65	65	120
50% Exceedance													
(Median)	64	64	64	65	120	120	120	120	63	64	64	64	65
75% Exceedance	57	57	57	63	112	112	114	114	57	57	57	57	63
90% Exceedance	54	53	54	56	108	110	110	110	54	53	55	34	56
Minimum	0	0	0	0	35	0	0	0	0	0	0	0	0
NF70 - NFFR below Belden Diversion Dam, WY 1970 to 2002 (USGS No. 11401112)													
Mean	131	109	106	172	168	147	140	136	120	129	136	117	134
Maximum	2,130	2,100	1,490	2,300	1,570	1,160	615	183	2,300	2,390	2,800	2,540	2,800
10% Exceedance	91	90	153	449	157	150	149	149	145	75	72	73	149

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Overall
25% Exceedance	67	68	72	146	146	145	144	144	88	67	65	67	142
50% Exceedance													
(Median)	63	64	64	68	143	142	142	142	64	63	63	63	68
75% Exceedance	61	61	62	63	140	139	140	140	61	61	61	61	62
90% Exceedance	59	60	60	60	124	134	135	107	60	59	60	60	60
Minimum	48	49	37	41	56	12	58	52	48	2	4	11	2
NF51 - East Branch of NFFR near Rich Bar, WY 1970 to 2002 (USGS No. 11403000)													
Mean	1,608	1,725	2,414	1,893	1,527	654	191	108	112	174	496	796	971
Maximum	69,276	52,099	36,617	19,700	18,729	6,170	1,270	358	593	2,210	22,400	25,789	69,276
10% Exceedance	3,463	3,560	4,824	3,704	3,795	1,733	418	199	189	278	771	1,748	2,520
25% Exceedance	1,452	1,854	2,840	2,546	1,978	776	214	128	134	215	335	668	1,090
50% Exceedance													
(Median)	503	956	1,670	1,517	971	315	129	92	102	145	209	288	278
75% Exceedance	255	401	875	769	392	138	79	59	66	96	149	195	131
90% Exceedance	166	214	494	379	188	84	56	46	52	71	118	140	78
Minimum	117	125	131	78	86	44	30	23	24	35	49	89	23
NF74 - Belden Powerhouse, WY 1970 to 2002 (USGS No. 11403050)													
Mean	896	852	675	602	519	766	1,045	1,252	1,234	1,146	1,178	1,135	942
Maximum	2,600	2,600	2,500	2,460	2,540	2,450	2,540	2,600	2,600	2,610	2,600	2,530	2,610
10% Exceedance	2,190	2,169	1,988	2,240	1,760	1,872	1,830	2,068	2,151	2,151	2,291	2,220	2,140
25% Exceedance	1,560	1,570	1,130	880	769	1,330	1,600	1,779	1,690	1,570	1,780	1,690	1,540
50% Exceedance													
(Median)	675	585	406	246	230	640	1,076	1,350	1,325	1,290	1,200	1,150	895
75% Exceedance	125	103	0	0	0	0	502	788	877	585	536	502	168
90% Exceedance	0	0	0	0	0	0	0	221	0	0	6	0	0
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0

Note: WY -- water year

The major tributaries to Lake Almanor, the reservoir for the project's uppermost development, are the upper NFFR and Hamilton Branch. Flows from Hamilton Branch into Lake Almanor include flows in the branch itself at its confluence with the lake as well as discharge from the Hamilton Branch powerhouse, which is diverted from Hamilton Branch several miles upstream. Downstream of Mountain Meadows reservoir, flows from Hamilton Branch are diverted into a 3-mile-long canal paralleling Hamilton Branch (see figure 1-1). From this canal, water passes through a penstock to the Hamilton Branch powerhouse and reenters Hamilton Branch at its confluence with Lake Almanor. The Hamilton Branch powerhouse can discharge up to 200 cfs, although mean monthly outflows are generally less than 100 cfs from August to December (table 3-2). The mean annual flows from the upper NFFR measured below Chester, Hamilton Branch at the lake, and the Hamilton Branch powerhouse are 330, 80, and 100 cfs, respectively.

The reservoir also receives surface water from minor tributaries including Benner, Last Chance, and Bailey creeks and ground water from various submerged springs. Meinzer (1927) reported that there are many large springs in the lava-covered areas of the upper NFFR basin. These springs include Pratt Spring near the Prattville intake, Dotta Spring about 1 mile north of Canyon dam, and Big Spring near what is now the northern shore of the eastern lobe of Lake Almanor. USGS reported outflows from Dotta Spring ranging from 50 to 122 cfs and averaging about 90 cfs between September 1902 and August 1906 (Meinzer, 1927). PG&E (2002a) reported that numerous springs were visible near Lake Almanor's water edge in the Big Spring area during low lake levels in 2000 and 2001. However, the current understanding of inflows from this source and other springs is limited because these springs are submerged during most periods. Inflow from submerged springs was estimated to be about 400 cfs using mass balance calculations (Jones & Stokes, 2004).

PG&E diverts water from Lake Almanor to the Butt Valley powerhouse (located along the northwest shoreline of the Butt Valley reservoir) by drafting up to about 2,100 cfs through the Prattville intake located near the shoreline of the south-central portion of Lake Almanor. Based on mean annual flows for the Butt Valley powerhouse and NFFR below Canyon dam (station NF2 in table 3-2), about 93 percent of the reservoir's outflow is routed through the powerhouse, and 7 percent continues down the NFFR past Canyon dam. These proportions vary considerably through time depending on project operations.

The project generally stores water in Lake Almanor during high flow periods in winter and spring and draws down the reservoir in summer and fall. Lake Almanor's historic storage and water levels for water years 1970-2003 are shown in figure 3-2 and summarized in table 3-3. During the droughts of 1976-77 and the late 1980s through mid 1990s, Lake Almanor did not refill. At the normal maximum water level of 4,494 feet (PG&E datum), Lake Almanor has a usable storage capacity of about 1,134,000 acre-feet and a surface area of 27,000 acres. The hydraulic retention time of the reservoir averages 291 days.

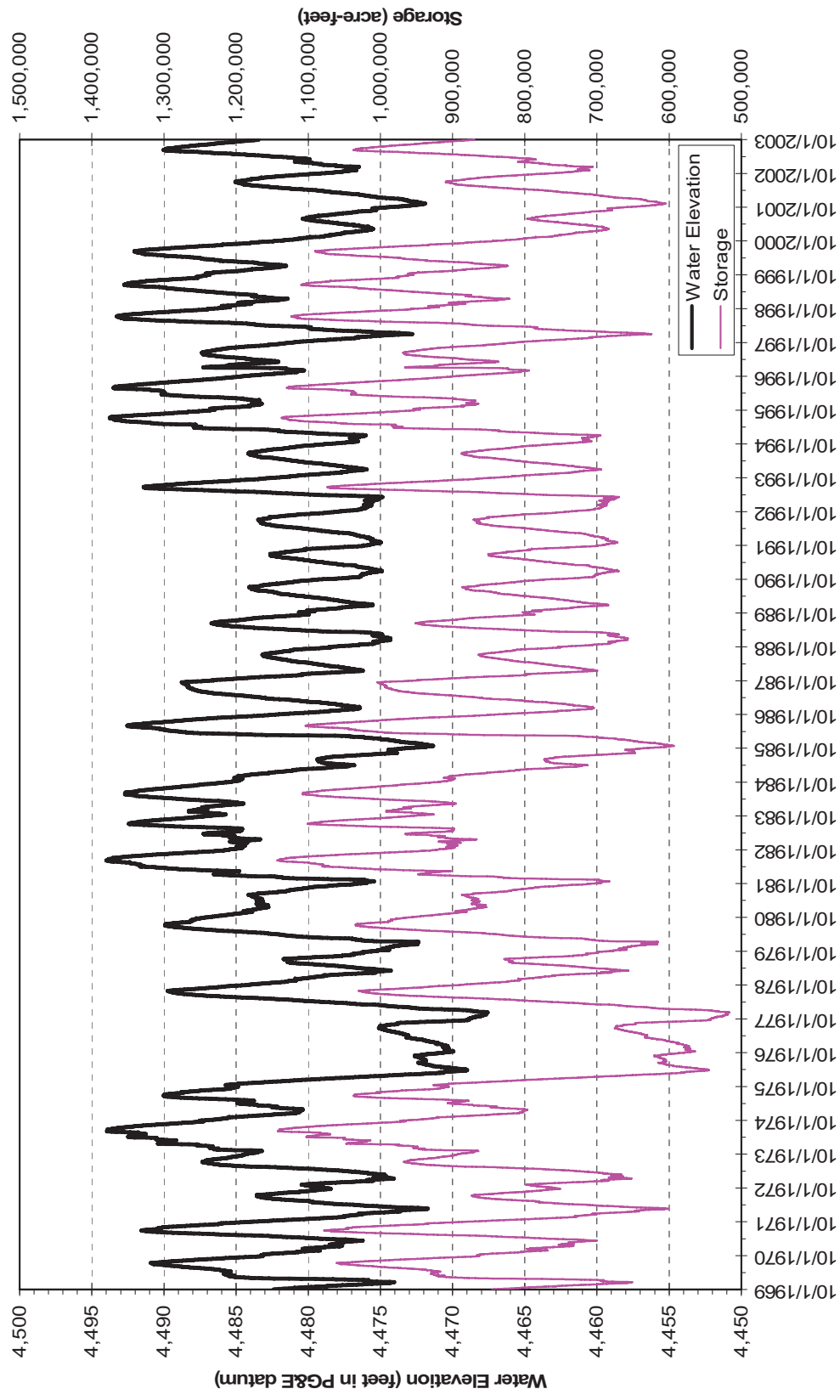


Figure 3-2. Lake Almanor (NF1) end-of-day water surface elevation and storage, water years 1970–2003. (Source: PG&E, 2003a, as modified by staff)

Table 3-3. Summary of Lake Almanor end-of-day water surface elevations, water years 1970-2003. (Source: PG&E, 2003c, as modified by staff)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	4,478.63	4,479.50	4,481.08	4,483.00	4,485.16	4,486.86	4,486.37	4,484.46	4,482.27	4,480.43	4,479.16	4,478.43	4,482.12
Maximum	4,490.43	4,490.05	4,492.03	4,492.50	4,493.71	4,494.00	4,493.78	4,492.52	4,489.35	4,487.29	4,488.29	4,487.94	4,494.00
Minimum	4,468.98	4,470.62	4,468.97	4,469.05	4,470.85	4,471.84	4,471.85	4,471.57	4,468.83	4,468.05	4,467.67	4,467.55	4,467.55
10% Exceedance	4,485.68	4,485.26	4,488.43	4,490.06	4,491.82	4,492.95	4,492.44	4,490.13	4,487.78	4,486.29	4,484.93	4,484.56	4,489.95
25% Exceedance	4,482.20	4,483.56	4,485.63	4,485.87	4,489.11	4,491.50	4,490.57	4,488.48	4,486.41	4,484.94	4,483.79	4,482.15	4,486.47
50% Exceedance (Median)	4,477.20	4,478.53	4,480.18	4,482.85	4,485.26	4,487.66	4,488.27	4,486.19	4,483.61	4,480.94	4,478.87	4,477.32	4,482.37
75% Exceedance	4,475.57	4,475.88	4,477.31	4,479.88	4,482.16	4,483.19	4,482.91	4,481.16	4,478.92	4,476.81	4,476.14	4,475.56	4,477.57
90% Exceedance	4,474.07	4,474.02	4,475.23	4,477.63	4,479.37	4,479.79	4,478.11	4,476.10	4,475.34	4,473.12	4,472.39	4,473.20	4,474.77

The Butt Valley powerhouse is typically used for peaking, which can result in discharges changing by up to about 2,000 cfs in a few minutes. As table 3-2 shows, the Butt Valley powerhouse does not discharge water on more than half the days in March, April, and May. These operations have minimal effects on water elevations of Lake Almanor, due to its large size. However, Butt Valley reservoir water levels tend to fluctuate more rapidly due to its smaller size. Butt Valley reservoir water elevations typically fluctuate between 4,132 and 4,115 feet (PG&E datum) on an annual basis, and may fluctuate about 1 foot on a daily basis. In addition to receiving water from the Butt Valley powerhouse, Butt Valley reservoir receives inflow from Butt Creek (station NF4) which has a mean annual flow of about 95 cfs (table 3-2). At an elevation of 4,132 feet (PG&E datum), the reservoir has a usable storage capacity of approximately 49,900 acre-feet and a surface area of 1,600 acres. The hydraulic retention time for the reservoir generally ranges from 14 to 32 days.

Although the project diverts up to approximately 2,100 cfs from Lake Almanor to the Butt Valley powerhouse, virtually all of this water, along with flow from upper Butt Creek, is generally routed through the Caribou nos. 1 and 2 powerhouses, thereby bypassing the lower portion of Butt Creek and a 10.8-mile-long reach of the NFFR referred to as the Seneca reach. No controlled minimum flow release is made from Butt Valley dam to lower Butt Creek; however, leakage of approximately 0.07 cfs (30 gallons per minute) occurs. Lower Butt Creek also receives inflow from springs and Benner Creek. Spills at the Butt Valley dam rarely occur because of the large capacity of the Caribou nos. 1 and 2 developments. Flows in Butt Creek monitored near its mouth (station NF9) indicate that the mean annual flow is 29 cfs, and minimum flows are generally 14 cfs (table 3-2). Butt Creek contributes these flows to the Seneca reach at a point approximately 9.6 miles downstream of Canyon dam.

At Canyon dam, water is released into the upper end of the Seneca reach, which extends 10.8 miles down to the Belden forebay. The current license mandates a year-round minimum flow of 35 cfs in the channel immediately downstream of the dam, which is accomplished by using the gated outlet tower near Canyon dam. Flows monitored by PG&E, in cooperation with USGS, at a permanent gaging station about 0.5 mile downstream of Canyon dam (station NF2) indicate little seasonal variation (table 3-2). Based on flow measurements reported by PG&E for June through September of 2000 and 2001, the Seneca reach gains about 6 to 31 cfs between the upper gaging station and the gaging station located above the Caribou No. 1 powerhouse (station NF47) excluding Butt Creek. During 2001, monthly mean accretion to this reach was 50 to 71 percent lower than in the wetter summer of 2000. In the upper portion of the bypassed reach (the 4.7-mile-long section from station NF2 to Seneca Bridge), the NFFR gained between 4 and 16 cfs during the summer of 2001. Average accretion was highest (13 cfs) in June and lowest (5 to 6 cfs) in August and September. Flows measured immediately upstream of the Butt Creek confluence indicate that the NFFR received little accretion in the 4.4-mile-long section between the Seneca Bridge and immediately

upstream of the Butt Creek confluence during the summer of 2001. Accretion to the lower portion of the Seneca bypassed reach (Butt Creek confluence to the Caribou No. 1 powerhouse) ranged from less than 1 to 5 cfs and averaged 1 cfs or less during June, July, and August.

The Belden forebay receives water from the Seneca bypassed reach, and the Caribou Nos. 1 and 2 powerhouses. Mean annual inflow from the NFFR is about 125 cfs, while inflows from the Caribou Nos. 1 and 2 powerhouses are about 280 and 650 cfs, respectively (table 3-2). Differences between the Caribou discharges demonstrate that PG&E prefers to operate the Caribou No. 2 development. NFFR inflows are generally stable, due to minimum flow releases from the Canyon dam outlet and accretion. In contrast, inflows from the Caribou powerhouses can vary considerably between days and over short periods, because of the typical peaking operations of the developments. Table 3-2 shows that the Caribou No. 1 powerhouse is operated on less than half of the days from March through June. Peaking operations may result in discharges from each of the powerhouses changing by more than 1,000 cfs in a few minutes.

Belden forebay is the smallest of all of the project's impoundments. At its normal maximum water elevation of 2,975 feet (PG&E datum), it has a usable storage capacity of 2,421 acre-feet and a surface area of 42 acres. Under normal operation, the impoundment's water elevation typically fluctuates between 2,960 and 2,973 feet (PG&E datum) with typical daily fluctuations of 5 to 10 feet when water is being released from Lake Almanor. PG&E estimates the average hydraulic retention time as 0.5 to 1 day.

Water exiting the Belden forebay is either diverted to the Belden powerhouse or continues down the NFFR. Water diverted to the Belden powerhouse bypasses a 9.3-mile-long reach of the NFFR referred to as the Belden bypassed reach. The existing license mandates minimum flows of 140 cfs below the Belden dam during the fishing season (last Saturday in April through Labor Day) and 60 cfs during the remainder of the year. Since October 1985, PG&E has typically routed its minimum flow for this reach through the Oak Flat powerhouse. The turbine has a high-flow and a low-flow runner, which are changed in the spring and fall. During change-out periods, which are a few days long, water is continuously released through the pressure release valve at the end of the outlet pipe. Monthly and annual flow summaries are presented for the Oak Flat powerhouse (station NF103) and a gaging station approximately 0.5 mile downstream of the Belden dam-Oak Flat powerhouse complex (station NF70) in table 3-2.

The Belden bypassed reach receives additional inflow from two primary tributaries. Mosquito Creek generally contributes a flow of about 2 to 10 cfs approximately 2.9 miles downstream of the Belden dam. PG&E estimated that flows averaged about 5 to 6 cfs during the summers of 2000 and 2001. The EBNFFR (station NF51) contributes a mean annual flow of nearly 1,000 cfs to the Belden bypassed reach approximately 7.5 miles downstream of the Belden dam. Flows in the EBNFFR vary considerably throughout the year. Median monthly flows are roughly 100 to 200 cfs

during July through November, but exceed 1,500 cfs during March and April (table 3-2). The Belden bypassed reach ends approximately 1.8 miles downstream of the EBNFFR confluence, where Yellow Creek joins the NFFR.

Water diverted through the Belden powerhouse is discharged into Yellow Creek immediately upstream of its confluence with the NFFR. Annual flows through the powerhouse average nearly 950 cfs. Similar to the project's upper developments, the Belden development is used for peaking, and large rapid fluctuations—more than 1,000 cfs—of its discharges are common. In the Rock Creek-Cresta SA (PG&E, 2000a), PG&E agreed to continue to implement its voluntary practice of block loading (i.e., maintaining a constant generating load for a predetermined period) at the Belden powerhouse from March through May until a level for ramping rates is established under the UNFFR Project license. During June through September, Yellow Creek also contributes about 40 to 170 cfs.

Water Use

PG&E holds water rights to store, divert, and use water from the NFFR and its tributaries for the production of power, domestic water supply, industrial and fire protection water supply, and irrigation (table 3-4). Most of these water allocations are for the non-consumptive use of producing energy, although three of them are for consumptive uses.

Table 3-4. PG&E water rights for the UNFFR Project. (Source: PG&E, 2003a, as modified by staff)

No.	Priority Date	When	Description	Use(s)
SWDU No. 922	1902	Year-round	Storage of 1,142,964 acre-feet at Canyon dam ^a	Power at licensee's powerhouses in the Feather River watershed; domestic and irrigation in the Sacramento Valley
Permit No. 21151	May 20, 1993	Oct 1–Jun 30	Storage of 500,000 acre-feet at Canyon dam	Power at Butt Valley and Caribou powerhouses
SWDU No. 923	1902	Year-round	Storage of 49,897 acre-feet at Butt Valley dam ^a	Power at licensee's powerhouses in the Feather River watershed; domestic and irrigation in the Sacramento Valley

No.	Priority Date	When	Description	Use(s)
SWDU No. 933	1913	Year- round	Divert 2,000 cfs at Canyon dam	Power at Butt Valley powerhouse
Permit No. 21152	May 20, 1993	Nov 1- Jun 30	Divert 1,000 cfs at Canyon dam	Power at Butt Valley and Caribou powerhouses
Permit No. 21153	Dec. 6, 1994	Year- round	Divert 1,400 cfs at Canyon dam	Power at Butt Valley and Caribou No. 2 powerhouses
SWDU No. 931	Pre-1914 and riparian rights	Year- round	Divert 1,000 cfs at Butt Valley dam	Power at Caribou No. 1 powerhouse
SWDU No. 932	Pre-1914 and riparian rights	Year- round	Divert 1,350 cfs at Butt Valley dam	Power at Caribou No. 2 powerhouse
SWDU No. 11477	Riparian right	Year- round	Divert 2,410 cfs at Belden diversion dam	Power at Belden powerhouse
License No. 9871	Jan. 9, 1940	Year- round	Divert 2,465 cfs at Belden diversion dam, 2,896 cfs at Rock Creek diversion dam, 3,500 cfs at Cresta diversion dam, and 3,500 cfs at Poe diversion dam	Power at Belden, Rock Creek, Cresta, and Poe powerhouses, respectively.

No.	Priority Date	When	Description	Use(s)
Permit No. 20864	Apr. 7, 1981	Year- round	Divert 135 cfs at Belden diversion dam, 604 cfs at Rock Creek diversion dam, 600 cfs at Cresta diversion dam, and 800 cfs at Poe diversion dam	Power at Belden, Rock Creek, Cresta, and Poe powerhouses, respectively.
Permit No. 18962	Nov. 2, 1982	Year- round	Divert 160 cfs at Belden diversion dam	Power at Oak Flat powerhouse
License No. 637	Jan. 10, 1924	Year- round	Divert 0.5 cfs from French Creek	Domestic, industrial and fire protection at Caribou camp
License No. 809	Jan. 10, 1924	Year- round	Divert 600 gallons per day from Oak Creek	Domestic, industrial and fire protection at Howells patrol station
SWDU No. 11477	Pre-1914	Year- round	Divert 10 cfs from Butt Creek	Irrigation in Humbug Valley

^a Western Canal Water District exercises the licensee's consumptive water rights pursuant to a 1986 contract, which stipulates that the licensee must release 145,000 acre-feet from storage in its reservoirs between each March 1 and October 31 for irrigation downstream of Lake Oroville (CDWR, 1986).

Water Quality

The NFFR basin lies within the Sacramento River basin and the Fourth Edition of the Central Valley Regional Water Quality Control Board Basin Plan (Basin Plan) for the Sacramento and San Joaquin River basins (CVRWQCB, 1998) applies to waters in the area. The Basin Plan designates existing beneficial uses for waterbodies in the basin. Existing beneficial uses designated for Lake Almanor are hydropower generation, water contact recreation, warm and cold freshwater habitat, warm spawning habitat, and wildlife habitat. Existing beneficial uses designated for the NFFR are hydropower generation, municipal and domestic supply, water contact recreation, non-water contact recreation, cold freshwater habitat, cold spawning habitat, and wildlife habitat.

Water quality standards applicable to surface waters in the project area are defined in three primary documents: the Basin Plan (CVRWQCB, 1998); the California Toxics Rule (40 CFR Part 131); and drinking water standards set in California Code of Regulations Title 22 (CDHS, 2002), which are applicable to surface waters of the NFFR designated for municipal water supply.

Table 3-5 summarizes selected applicable criteria. The California SWRCB (2003) did not include any waterbodies in the project area on its 2002 303(d) list of water-quality-limited waterbodies.

General Water Quality

General water quality is largely dependent on the geologic and hydrologic characteristics of a basin. PG&E monitored water quality and water temperature at several stations to document recent conditions in various waterbodies in the project area (figure 3-3). Table 3-6 summarizes PG&E's seasonal measurements of various water quality parameters that PG&E monitored in 2000 and supplemental monitoring that it conducted in the fall of 2002 and spring and summer of 2003. These measurements indicate that project waters are soft to moderately hard, generally have low to moderate total suspended solids and turbidities, and do not have excessively high nutrient (phosphorous or nitrogen) concentrations. Seasonal near surface chlorophyll-*a* concentrations for 2000 were typically 3 $\mu\text{g/l}$ or less in both Lake Almanor and Butt Valley reservoir (PG&E, 2003a). These concentrations indicate that the reservoirs have relatively low productivity (lower mesotrophic) based on Carlson's (1977) trophic state index. Secchi depth was measured in Lake Almanor during 2000 (May through December) and 2001 (March through September). Secchi depth averaged 5.0 meters (range 2.3–8.4 meters) during 2000 and 4.9 meters in 2001 (range 2.9–7.4 meters) in 2001. The primary cation and anion are calcium and bicarbonate, respectively.

Table 3-5. Water quality criteria for the UNFFR Project.

Objectives of Basin Plan for the Sacramento and San Joaquin River Basins (Source: CVRWQCB, 1998)		California Toxics Rule (40 CFR Part 131)	CA Drinking Water Standards^a (CDHS, 2002)
Constituent			
Temperature	Natural water temperatures shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such alteration does not adversely affect beneficial uses. At no time or place shall the temperature be increased more than 5°F above the natural receiving water.	--	--
Dissolved oxygen (DO)	Monthly median of mean daily DO concentration shall not fall below 85% of saturation in the main water mass, and the 95 percentile concentration shall not fall below 75% of saturation. DO concentrations shall not be reduced below 7.0 mg/l.	--	--
pH	The pH shall not be depressed below 6.5 nor raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 units.	--	--
Specific conductance	Shall not exceed 150 μ mhos/cm (90 percentile) in well-mixed waters.	--	--
Fecal coliform	Based on a minimum of not less than five samples for any 30-day period, shall not exceed a geometric mean of 200/100 ml, nor shall more than 10% of the total number of samples taken during any 30-day period exceed 400/100 ml.	--	--
Oil and grease	Waters shall not contain oils, greases, or other materials in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses.	--	--

Objectives of Basin Plan for the Sacramento and San Joaquin River Basins (Source: CVRWQCB, 1998)		California Toxics Rule (40 CFR Part 131)	CA Drinking Water Standards ^a (CDHS, 2002)	
Constituent				
Turbidity	Shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases in turbidity attributable to controllable water quality factors shall not exceed increases of 1 nephelometric turbidity unit (NTU) where natural turbidity is 0–5 NTU, increases of 20% where natural turbidity is 5–50 NTU, increases of 10 NTU where natural turbidity is 50-100 NTU, and increases of 10% where natural turbidity is >100 NTU.	--	--	
Tastes and Odors	Shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to domestic or municipal water supplies or to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affects beneficial uses.	--	Secondary maximum contaminant level (MCL) 3 Odor units	
Methyl- <i>tert</i> -butyl ether (MTBE)	--	--	Primary MCL 0.013 mg/l; Secondary MCL 0.005 mg/l	
Trace Metals		Dissolved Concentrations (mg/l)		
		4-day Avg.	1-hr Avg.	Ins. Max.
	Aluminum	0.087	0.750	--
	Arsenic	0.15	0.34	--
Barium	--	--	--	Primary MCL 1.0 mg/l; Secondary MCL 0.2 mg/l Primary MCL 0.05 mg/l Primary MCL 1.0 mg/l

Objectives of Basin Plan for the Sacramento and San Joaquin River Basins (Source: CVRWQCB, 1998)				California Toxics Rule (40 CFR Part 131)	CA Drinking Water Standards ^a (CDHS, 2002)
Constituent					
Cadmium ^b	--	0.0013	0.0020	--	Primary MCL 0.005 mg/l
Chromium (total)	--	--	--	--	Primary MCL 0.05 mg/l
Copper ^b	--	0.0050	0.0070		Primary MCL 1.3 mg/l Action level ^c ; Secondary MCL 1.0 mg/l
Iron	--	--	--	1.0	Secondary MCL 0.3 mg/l
Lead ^b	≤0.015 in waters designated as domestic or municipal supply	0.0012	0.030	--	Primary MCL 0.015 mg/l Action level
Manganese	--	--	--	--	Secondary MCL 0.05 mg/l
Mercury (inorganic)	--	0.00077	0.0014	--	Primary MCL 0.0020 mg/l
Nickel ^b	--	0.026	0.23	--	Primary MCL 0.1 mg/l
Selenium	--	0.005	0.02	--	Primary MCL 0.05 mg/l
Silver ^b	--	--	--	0.00105	Secondary MCL 0.1 mg/l
Zinc ^b	--	0.066	0.065	--	Secondary MCL 5.0 mg/l

^a Applicable only to the NFFR.

^b Hardness-dependent criteria. The listed criteria are for a hardness of 50 mg/l.

^c Action level based on concentration of 90th percentile exceedance of samples

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Figure 3-3

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Table 3-6. Range of general water quality parameters measured in project waters by PG&E in 2000, 2002, and 2003. (Sources: PG&E, 2003a, October 29, 2004, comments on the draft EIS)

Parameter (units)	Lake Almanor	Butt Valley Reservoir^a	NFFR^b	Butt Creek^c	Tributaries^d
pH (standard units)	6.9–8.3	6.8–8.0	7.1–8.4	7.4–8.2	7.1–8.8
	6.9–8.4 ^e	7.0–8.3	7.4–8.5 ^e	8.0–8.3 ^e	7.6–8.5 ^e
Total alkalinity (mg CaCO ₃ /l)	48–50	48–60	49–90	87–150	26–100
Total hardness (mg CaCO ₃ /l)	10–46	36–50	41–89	76–99	17–97
	41–54 ^e	41–49 ^e	43–87 ^e	82–94 ^e	24–107 ^e
Specific conductance (μmhos/cm)	85–99	85–119	89–185	159–200	44–323
	94–137 ^e	91–111 ^e	93–199 ^e	174–188 ^e	63–251 ^e
Calcium (mg/l)	<0.1–9.4	8.6–10	8.9–21	20–24	4.7–23
Magnesium (mg/l)	0.1–4.8	4.2–5.2	4.2–8.4	6.7–8.0	2.0–8.6
Potassium (mg/l)	<0.1–2.6	1.2–2.6	<0.1–2.7	<0.1–0.9	0.3–2.3
Sodium (mg/l)	2.7–4.4	3.2–7.8	3.4–27	4.9–6.1	2.8–14
Bicarbonate (mg/l)	48–50	48–60	<10–90	87–150	<10–100
Chloride (mg/l)	<0.2–1.6	<0.2–3.3	0.6–3.3	0.2–2.0	<0.2–4.5
Sulfate (mg/l)	<0.2–9.3	<0.2–2.0	<0.2–6.0	2.8–3.4	<0.2–7.4
Silica (mg/l)	8.1–20	8.1–23	8.6–22	13–26	9.0–35
Total suspended solids (mg/l)	<1–23	<1–9	<1–140	<1–1	<1–10
Turbidity (NTU)	0.4–11	0.7–15	0–17	0.5–2.3	0.2–19
	0.0–3.4 ^e	0.0–2.8 ^e	0.0–4.8 ^e	0.0–6.5 ^e	0.0–14.3 ^e
Total phosphorous (mg/l)	<0.01–0.12	<0.01–0.08	<0.01–0.13	0.02–0.11	<0.01–0.07
Orthophosphate (mg/l)	<0.01–0.01	<0.01–0.04	<0.01–0.07	<0.01–0.03	<0.01–0.13
Ammonia (mg/l)	<0.1	<0.1	<0.1–0.3	<0.1	<0.1–0.3
Total organic nitrogen (mg/l)	<0.2–1.7	<0.2–7.7	<0.2–0.2	<0.2	<0.2

Parameter (units)	Lake Almanor	Butt Valley Reservoir^a	NFFR^b	Butt Creek^c	Tributaries^d
Nitrate (mg NO ₃ /l)	<0.1–0.9	<0.1–2.7	<0.1–16	<0.1–8.0	<0.1–14
Chlorophyll- <i>a</i> (mg/l)	<0.001–0.021	<0.001–0.013	<0.001–0.013	<0.001–0.003	<0.001–0.018

^a Butt Valley reservoir and Butt Valley powerhouse tailrace.

^b Project-affected reaches of the NFFR including the Seneca and Belden bypassed reaches; Belden forebay; and Caribou No.1, Caribou No. 2, and Belden powerhouse tailraces.

^c Project-affected reach of Butt Creek (i.e., reach between the Butt Valley dam and confluence with the NFFR).

^d Inflows to Lake Almanor, Butt Valley reservoir, and the project-affected reaches of the NFFR.

^e Summary of fall 2002 and spring and summer 2003 values.

Total alkalinity measurements indicate that Lake Almanor, Butt Valley reservoir, and the NFFR generally have low to moderate buffering capacity to resist changes in pH. The data indicate that Butt Creek downstream of Butt Valley dam, which is highly influenced by ground water, has a higher buffering capacity than other project-affected waters.

PG&E's reported pH values for 2000, 2002, and 2003 indicate that relatively consistent pH levels occur throughout the upper NFFR basin. Overall, reported pH values ranged from 6.8 to 8.8 standard units (table 3-6). The Hamilton Branch powerhouse and EBNFFR were the only stations to have a reported pH value outside the criteria ranging from 6.5 to 8.5 standard units. These stations are not influenced by project operations. The overall range of discrete pH measurements for NFFR project-affected stream reaches ranged from 7.1 to 8.5 standard units.

PG&E reported that overall specific conductance ranged from 85 to 323 μ mhos/cm (see table 3-6). Conductance was most variable in tributaries to project waters and two tributaries to the Belden bypassed reach (East Branch and Mosquito Creek) and had values of greater than the 150- μ mhos/cm Basin Plan criterion. Conductance was also rather variable in the project's bypassed reaches, and exceedances of the 150- μ mhos/cm Basin Plan criterion were reported for six stations in these reaches. This criterion was exceeded in all of the measurements for lower Butt Creek and nearly all of the measurements for the lower ends of the Seneca and Belden reaches. Other locations in the Seneca and Belden reaches also had values exceeding the 150- μ mhos/cm Basin Plan criterion.

Temperature

As part of relicensing the downstream Rock Creek-Cresta Project, an SA (PG&E, 2000b) was developed and signed by PG&E, resource agencies (FS, FWS, CDFG, SWRCB, Plumas County), and NGOs (Natural Heritage Institute, Friends of the River, California Outdoors, California Trout, AW, Chico Paddleheads, and Shasta Paddlers). One of the principal goals of this agreement was to improve cold freshwater habitat in the Rock Creek and Cresta bypassed reaches. A process was established to ensure that PG&E would implement all reasonably practicable control measures to satisfy a daily mean water temperature of 20°C which was agreed would protect cold water fishes in the Rock Creek and Cresta reaches. The SA requires PG&E to develop and implement a water temperature management plan, and conduct modeling to evaluate the anticipated effectiveness of modifying the Prattville intake and implementing other potential temperature control measures. According to the Rock Creek-Cresta SA, PG&E would implement Prattville intake modifications determined by representatives of the parties signing the agreement to be reasonable and practicable measures to maintain daily mean temperatures of 20°C or less in the Rock Creek and Cresta bypassed reaches.¹⁴

On October 23, 2002, PG&E filed its water temperature monitoring plan for the Rock Creek-Cresta Project with the Commission (PG&E, 2002b). The Commission approved this plan with modifications on February 28, 2003 (FERC, 2003). The objectives of this plan include:

- documenting continuous summer temperature and flow monitoring in the Rock Creek-Cresta reaches and upstream areas;
- determining if mean daily water temperatures of 20°C or less can be met in the Rock Creek and Cresta reaches through implementation of reasonable control measures, including modification of the Prattville intake by PG&E; and
- developing and verifying a temperature model that predicts, with reasonable accuracy, the temperature profile of the NFFR.

Adoption of the plan formalized water temperature and flow monitoring along with water temperature modeling to be conducted by PG&E for the Rock Creek-Cresta Project. However, PG&E had monitored flow and water temperatures throughout the

¹⁴ While the Rock Creek-Cresta SA's signatories may bind themselves pursuant to the SA to perform effectiveness studies of potential modifications to the Prattville intake, any modifications to the UNFFR Project facilities must be authorized by the Commission.

NFFR basin in a similar manner as proposed in the plan during the years of 2000 through 2002. It did this by continuously monitoring water temperatures at 26 stations in the upper NFFR basin from June 1 to September 30 (table 3-7), and monitoring vertical profiles of temperature in Lake Almanor and Butt Valley reservoir during 2000, 2001, and 2002; and in the Belden forebay during 2000. PG&E also monitored water temperatures according to the FERC-approved plan in 2003 and 2004 (PG&E, 2004b; 2005a). Table 3-7 presents the range of daily average temperatures reported, along with an evaluation of the frequency and timing that daily average temperatures exceeded 20.0°C at each station.

In the following discussion of water temperatures, we discuss results of PG&E's 1999 through 2004 monitoring studies. The discussion proceeds in an upstream to downstream direction.

Table 3-7. Monitoring locations for Commission-approved Rock Creek-Cresta water temperature monitoring plan and summary of daily average water temperatures for continuous monitoring in June through September of 1999 through 2004.^a (Sources: PG&E, 2002a,b; 2003b; 2004b; 2003e; 2005a, as modified by staff)

Station	Monitoring Parameters ^b	Range (°C)	Greater than 20.0°C	
			Months ^c	% ^d
NFFR at Chester (NF1A)	TR, FT	8.3–16.8	None	0
Hamilton Branch Creek at Hwy A13 bridge (HB1)	TR, F	8.4–15.3	None	0
Hamilton Branch powerhouse (HB2)	TR,F	9.1–21.1	June–July	2
Lake Almanor at Canyon dam near surface (LA1-S)	TR	16.1–26.3	June–Sept.	72
Lake Almanor at Canyon dam near bottom (LA1-B)	TR	8.2–16.1	None	0
Butt Valley powerhouse (BV1)	TR, F	11.7–22.2	July–Sept.	33
Butt Valley reservoir at Caribou intake near surface (BV2-S)	TR	17.0–24.6	June–Sept.	73
Butt Valley reservoir at Caribou intake near bottom (BV2-B)	TR	9.4–21.5	July–Sept.	11
Butt Creek upstream of Butt Valley reservoir (BC1)	TR, F	8.8–16.2	None	0
Butt Creek downstream of Butt Valley reservoir (BC2)	TR	10.2–13.1	None	0
Butt Creek at mouth (BC3)	TR, FT	10.5–13.1	None	0

Station	Monitoring Parameters ^b	Range (°C)	Greater than 20.0°C	
			Months ^c	% ^d
NFFR downstream of Canyon dam (NF2) ^e	TR, F	9.4–22.5	July–Aug.	10
NFFR at Seneca Bridge (NF3A) ^e	TR, S	10.8–19.9	None	0
NFFR upstream of Butt Creek (NF3B)	--	12.8–17.2	None	0
NFFR upstream of Caribou powerhouse (NF4) ^e	TR, FT	11.4–18.1	None	0
Caribou No. 1 powerhouse (CARB1)	TR, F	10.9–21.9	July–Sept.	35
Caribou No. 2 powerhouse (CARB2)	TR, F	16.6–24.0	June–Sept.	65
Belden forebay at intake (BD1)	TR	15.5–22.8	June–Sept.	52
NFFR downstream of Belden dam (NF5)	TR, F	13.9–21.8	July–Sept.	29
Mosquito Creek at mouth (MC1)	TR, S	10.4–15.6	None	0
NFFR near Queen Lily campground (NF6)	TR	14.0–21.4	July–Sept.	21
NFFR near Gansner Bar (NF7)	TR	14.7–21.3	July–Sept.	20
EBNFFR at mouth (EB1)	TR, F	14.6–26.4	June–Sept.	64
NFFR at Belden Town Bridge (NF8)	TR	15.1–22.9	June–Sept.	51
Belden powerhouse (BD2)	TR, F	15.4–22.8	June–Sept.	49
Yellow Creek near mouth (YC1)	TR, FT	10.6–18.9	None	0
NFFR downstream of Rock Creek dam (NF-57, NF10)	TR, F	14.1–22.5	June–Sept.	51
NFFR near Tobin downstream of Granite Creek (NF11)	TR	14.1–22.8	June–Sept.	50
NFFR upstream of Bucks Creek (NF12)	TR	14.2–22.9	June–Sept.	50
NFFR upstream of Rock Creek powerhouse (NF13)	TR	13.3–23.0	June–Sept.	16
Rock Creek powerhouse (RC1)	TR, F	14.3–22.6	June–Sept.	58
NFFR downstream of Cresta dam (NF14)	TR	14.0–22.2	June–Sept.	39
NFFR downstream of Grizzly Creek (NF-56, NF15)	TR, F	14.0–22.4	June–Sept.	41
NFFR upstream of Cresta powerhouse (NF16)	TR	14.4–22.7	June–Sept.	46
Cresta powerhouse (Cresta 1)	TR, F	13.8–22.5	June–Sept.	44

Station	Monitoring Parameters ^b	Range (°C)	Greater than 20.0°C	
			Months ^c	% ^d
NFFR downstream of Cresta powerhouse (Poe-1A)	--	13.9–22.3	June–Sept.	17
NFFR downstream of Poe dam (Poe-5)	--	12.9–22.5	June–Sept.	20
NFFR at Pulga bridge (Poe-2A)	--	14.8–22.6	June–Sept.	28
NFFR at Bardee's Bar (Poe-6)	--	13.7–23.2	June–Sept.	39
NFFR upstream of Poe powerhouse (Poe-3)	--	16.9–24.5	June–Sept.	71
Poe powerhouse (Poe-4B)	--	14.0–22.7	June–Sept.	23
NFFR at Big Bend dam (Poe-7)	--	16.7–22.8	July–Sept.	40

^a Monitoring periods for the stations differed by day and year. Staff used all available June to September data.

^b F = flow gaging station or powerhouse records, FT = temporary flow gaging station, TR = temperature recorder, P = reservoir profile, S = staff gage, and -- = not included.

^c Months that had at least 1 day with an average temperature of greater than 20.0°C.

^d Percent of monitored days that had daily average temperature of greater than 20.0°C.

^e PG&E's practice has been to preferentially use the Canyon dam outlet tower low-level gates for flow releases into the Seneca reach. During 2004, while the Canyon dam outlet lower gates needed repairs, PG&E used an upper gate (#7). As a result, temperatures in discharges to the upper end of the Seneca reach were considerably warmer than occurred in other years monitored.

The primary surface inflows to Lake Almanor (NFFR, Hamilton Branch, and Hamilton Branch powerhouse) had daily average temperatures that ranged from 8.3 to 21.1°C. The warmest daily average temperatures for the NFFR and Hamilton Branch were 16.8 and 15.3°C, respectively. In contrast, discharge from the Hamilton Branch powerhouse reached as high as 21.1°C. Daily average temperatures exceeded 20.0°C at the Hamilton Branch powerhouse on 2 percent of the days with measurements.

Vertical profiling of water temperatures in Lake Almanor indicate that thermal gradients typically begin to develop in April and May, are well established during June to mid-September, and lake turnover (mixing of water throughout the entire profile) occurs in late September to November. From June through mid-September, a warm upper layer (epilimnion) exists and generally extends to a depth of 30 to 40 feet, while a much cooler layer (hypolimnion) resides below a depth of about 50 feet (figure 3-4).

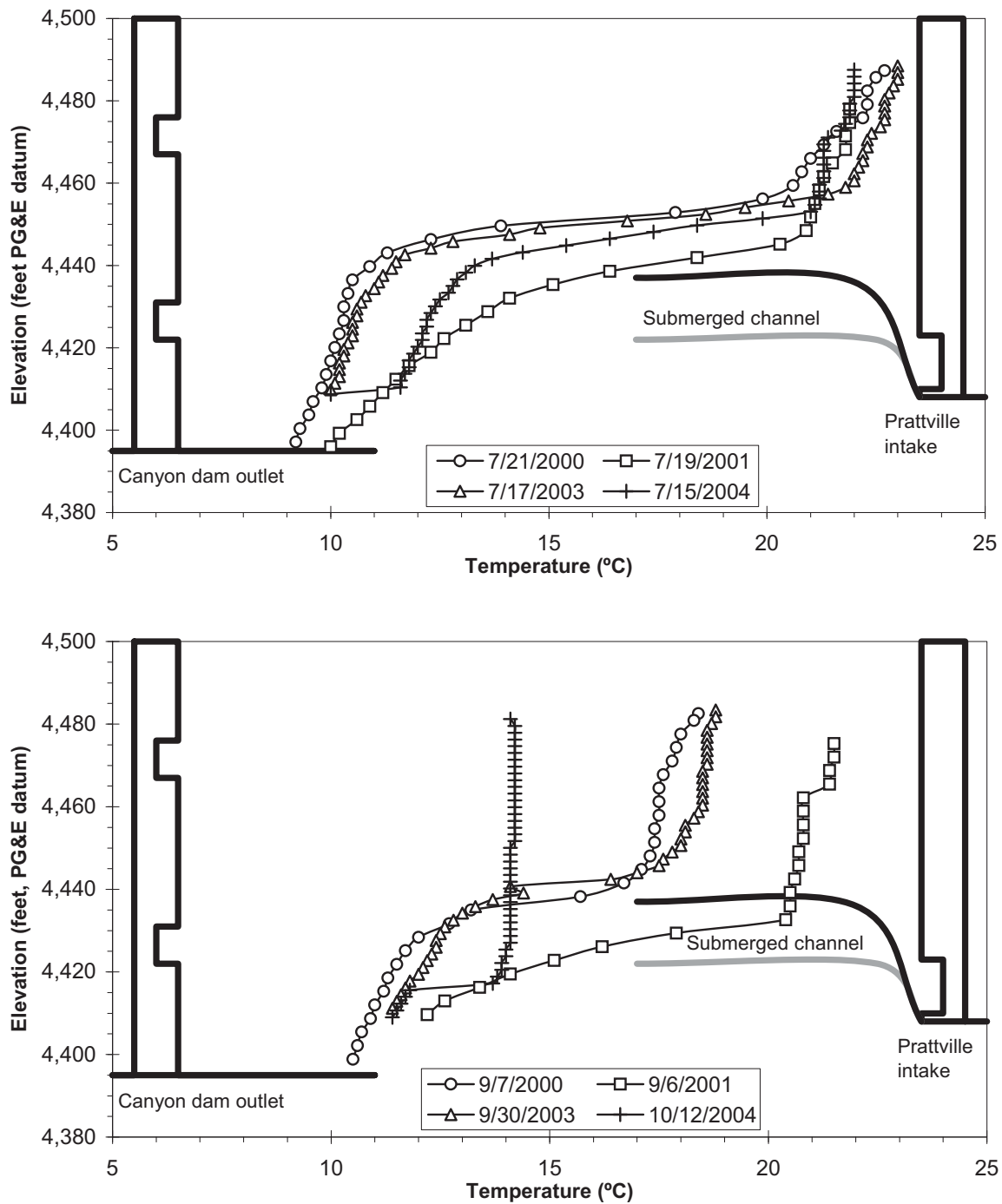


Figure 3-4. Vertical profiles of water temperature for Lake Almanor near Canyon dam along with schematics of gate elevations and general bed profiles of Prattville intake and Canyon dam outlet, mid-July and September/October. (Sources: PG&E, 2002a, 2004b, 2005a, as modified by staff)

Consequently, when the lake is stratified, water temperatures in the Seneca reach are influenced by the elevation of the Canyon dam outlet tower gate that is used (FERC, 1996). The low-level gates with an invert elevation of 4,422 feet msl (PG&E datum) are typically used to provide MIF releases to the Seneca reach (PG&E, 2004c). Daily average Lake Almanor near surface water temperature based on continuous seasonal monitoring ranged from 16.1 to 26.3°C, while temperatures near the bottom were much cooler ranging from 8.2 to 16.1°C. Surface temperatures tended to be highest during July and August, although near bottom temperatures increased as summer progressed. During the drought of 2001, Lake Almanor's water level was considerably lower than normal and likely was one of the principal causes of early summer temperatures being about 2 to 4°C warmer near the bottom than in other years monitored. Daily average temperatures of near surface (3 feet below the surface) waters exceeded 20.0°C in June through September on 72 percent of days monitored.

The temperature of water drafted through the Prattville intake and discharged from the Butt Valley powerhouse is affected by the configuration of the lake bed in the area of the intake, which was excavated in the shallower western lobe of the lake (Ettema et al., 2004). As will be discussed in more detail below, this results in warmer water being drafted than would be expected based on the depth of the intake. Daily average temperatures of discharges from the Butt Valley powerhouse were generally about 2 to 4°C cooler than the near surface waters of Lake Almanor. They ranged from 11.7 to 22.2°C and exceeded 20.0°C on 33 percent of the days monitored. Daily average temperatures of greater than 20.0°C generally occurred in July and August, although temperatures of greater than 20.0°C also occurred in September.

The thermal regime of the Butt Valley reservoir is largely dependent on discharges from Butt Valley powerhouse, due to its high proportion of the total inflow to the reservoir, along with the relatively short transit time through the impoundment (14 to 32 days) relative to Lake Almanor. Vertical profiles of temperatures in the reservoir indicate that a moderate thermal gradient exists during late spring and early summer. However, little stratification was evident during mid- to late summer. The relatively small amount of coldwater storage, short retention time, and withdrawal of cooler water through the deeper Caribou No. 1 intake probably all contribute to the thermal characteristics of Butt Valley reservoir.

Daily average temperatures, based on seasonal sampling, for near surface waters of Butt Valley reservoir ranged from 17.0 to 24.6°C, while near bottom temperatures ranged from 9.4 to 21.5°C. The seasonal pattern of surface and bottom temperatures was similar to that observed in Lake Almanor. Surface waters tended to be warmest in July and August, and bottom waters warmed throughout the summer. Near surface daily average temperatures of greater than 20.0°C were common in June, July, August, and September. Seventy-three percent of the days monitored had a daily average temperature at the surface of Butt Valley reservoir of greater than 20.0°C.

Daily average temperatures reported for Butt Creek ranged from 8.8 to 16.2°C. Both the lowest and highest values were reported for the monitoring station upstream of Butt Valley reservoir. Daily average temperatures reported for the two sites downstream of Butt Valley reservoir ranged from 10.2 to 13.1°C.

Daily average water temperatures measured in the Seneca reach ranged from as low as 9.4 to 22.5°C, both occurring a short distance downstream of Canyon dam. However, this range of temperatures does not reflect conditions that occur under typical operations because it includes temperature data collected during 2004, when one of the Canyon Dam outlet tower upper gates was used instead of the low-level gates (used under typical operations) (table 3-7). Under typical operations, the maximum daily mean temperature that was measured in the Seneca reach was 17.2°C, which occurred immediately upstream of the Butt Creek confluence; all values for the reach were below 20.0°C. Water temperatures tended to increase between the upper end of the reach (station NF2) and immediately upstream of the Butt Creek confluence (station NF3B), and decrease below the Butt Creek confluence. We suspect that the cooler conditions monitored at the lower end of the reach (station NF4) are largely due to cool inflow from Butt Creek (station BC3). None of the daily average temperatures reported for the Seneca reach exceeded 20.0°C.

The temperature of discharges from the two Caribou powerhouses differed substantially from one another. Discharges from Caribou No. 1 powerhouse ranged from 10.9 to 21.9°C, while discharges from Caribou No. 2 powerhouse ranged from 16.6 to 24.0°C. This is probably due to the shallower intake depth and approach channel of Caribou No. 2 (approach channel elevation of 4,100 feet for Caribou No. 2 versus approximately 4,085 feet for Caribou No. 1). Caribou No. 1 daily average temperatures of greater than 20.0°C were common in August, and occurred less frequently in July and September. Caribou No. 2 daily average temperatures of greater than 20.0°C were common in July, August, and September; and occurred less frequently in June. Daily average temperatures exceeded 20.0°C for 35 percent of the days monitored at the Caribou No. 1 powerhouse and 65 percent of the days monitored at the Caribou No. 2 powerhouse.

Results of vertical temperature profile monitoring in Belden forebay during 2000 indicate that little thermal stratification occurs. Temperatures within each of the vertical profiles reported varied by less than 3°C. Many factors, including the impoundment's small capacity, short (1 day or less) retention time, deep-water fish releases, and large daily changes in the impoundment's storage level during the summer, likely cause these relatively uniform temperatures throughout the water column.

Daily average temperatures reported for the Belden forebay at the intake range from 15.5 to 22.8°C, with 52 percent of the days monitored having temperatures of greater than 20.0°C. Daily average temperatures of greater than 20.0°C were common in July and August and occurred less frequently in June and September. During the

summer, inflow to the Belden forebay predominantly comes from the Caribou Nos. 1 and 2 powerhouses. Their warm discharges have considerable effect on temperatures at the intake in comparison to inflows from the Seneca reach of the NFFR. Data for 2004 were similar to other years, suggesting that the warmer releases from the upper-level Canyon dam outlet gates that year had little effect on water temperatures downstream of the Caribou powerhouses.

Daily average temperatures reported for the Belden reach ranged from 13.9 to 22.9°C, and tended to increase in a downstream direction (table 3-7). At the three stations located upstream of the confluence with the EBNFFR, daily average temperatures were generally similar and exceeded 20.0°C on 20 to 29 percent of the days monitored. Nearly all of the days with daily average temperatures of greater than 20.0°C in the upper portion of the Belden reach occurred in July or August. In contrast, daily average temperatures in the lower Belden reach (NF8) were generally about 1 to 2°C warmer and temperatures of greater than 20.0°C occurred in all of the months of June to September. Daily average temperatures exceeded 20.0°C on just over half of the days monitored. These warmer conditions are at least partially caused by warm inflows from the EBNFFR, which ranged from 14.6 to 26.4°C and exceeded 20.0°C on 64 percent of the days during the study period.

The temperature of Belden powerhouse discharges is similar to ambient conditions in the lower Belden reach. Daily average temperatures ranged from 15.4 to 22.8°C, and exceed 20.0°C on nearly half of the days monitored. Temperatures of greater than 20.0°C were reported for June to September and were common in July and August.

The warm inflow to the Rock Creek reservoir along with high ambient temperatures and solar radiation leads to warm temperatures in the lower NFFR. Daily average temperatures were frequently greater than 20.0°C in the bypassed reaches and powerhouse discharges of the Rock Creek, Cresta, and Poe hydro-developments. In the lower end of the Poe reach, daily mean temperature reached as high as 24.5°C and exceeded 20.0°C on more than 70 percent of the days monitored in June through September. Cooler discharges from the Poe powerhouse reduced peak temperatures, but still resulted in NFFR inflows to Lake Oroville frequently exceeding 20.0°C.

Dissolved Oxygen

PG&E monitored DO concentrations at 24 stations in the project vicinity during 2000. Monitoring was conducted in April, June, July, August, September, and November. Table 3-8 presents the results of this monitoring program. As part of a supplemental monitoring effort designed to address comments of the SWRCB, PG&E also monitored DO concentrations at 20 of the 24 stations during October 2002, April 2003, and July 2003 (PG&E October 29, 2004, comments on the draft EIS). Staff incorporated the results of supplemental monitoring into the following discussion.

Table 3-8. Summary of dissolved oxygen concentrations monitored by PG&E during 2000. (Source: PG&E, 2002a)

Location	Concentration (mg/l)			Percent of Saturation		
	Min.	Avg.	Max.	Min.	Avg.	Max.
NFFR at Chester (NF1)	8.0	10.1	12.2	86	100	111
Hamilton Branch Creek at Hwy A13 bridge (HB1)	8.6	9.7	11.0	89	98	106
Hamilton Branch powerhouse (HB2)	7.5	9.8	12.3	94	108	126
Lake Almanor at Canyon dam near surface (LA1-S)	5.8	7.7	9.6	77	92	102
Lake Almanor at Canyon dam near bottom (LA1-B)	0.7	5.5	9.8	8	58	99
Lake Almanor near Prattville intake near surface (LA2-S)	6.8	8.1	10.6	92	99	107
Lake Almanor near Prattville intake near bottom (LA2-B)	3.0	6.4	10.3	34	73	100
Butt Valley powerhouse (BV1)	6.3	8.0	10.2	80	90	101
Butt Valley reservoir at Caribou No. 1 intake near surface (BV2-S)	6.0	8.3	10.6	76	97	108
Butt Valley reservoir at Caribou No. 1 intake near bottom (BV2-B)	0.4	4.1	10.3	5	42	100
Butt Creek upstream of Butt Valley reservoir (BC1)	9.3	10.0	11.2	89	98	104
Butt Creek at mouth (BC3)	8.4	9.4	10.3	86	94	99
NFFR downstream of Canyon dam (NF2)	7.3	9.2	10.7	78	96	117
NFFR upstream of Caribou powerhouse (NF4)	8.6	9.4	11.2	89	94	103
Caribou No. 1 powerhouse (CARB1)	6.8	7.7	9.3	78	86	90
Caribou No. 2 powerhouse (CARB2)	6.5	7.8	10.1	76	92	102
Belden forebay at powerhouse intake near surface (BD1S)	7.4	8.1	8.8	93	99	105
Belden forebay at powerhouse intake near bottom (BD1B)	6.2	7.0	8.1	73	84	99
NFFR downstream of Belden dam (NF5)	7.2	8.5	10.5	87	94	100

Location	Concentration (mg/l)			Percent of Saturation		
	Min.	Avg.	Max.	Min.	Avg.	Max.
NFFR near Gansner Bar (NF7)	7.4	9.0	11.4	88	96	105
EBNFFR at mouth (EB1)	6.6	8.9	12.5	83	95	106
NFFR at Belden Town bridge (NF8)	7.4	8.9	11.4	84	94	98
Belden powerhouse (BD2)	6.7	8.0	10.7	77	88	99
Yellow Creek near mouth (YC1)	8.7	10.1	12.2	90	96	107

All DO concentrations reported by PG&E for the inflow to Lake Almanor were greater than 7.0 mg/l (table 3-8; PG&E October 29, 2004, comments on the draft EIS).

DO concentrations in Lake Almanor follow the typical clinograde pattern for large, thermally stratified reservoirs. Surface waters generally remain well aerated, while DO concentrations of near-bottom waters are progressively reduced during the summer and early fall, prior to turnover. Measurements of DO concentrations in the reservoir's epilimnion ranged from 5.8 to 10.6 mg/l, while concentrations measured in the hypolimnion ranged from 0.7 to 10.3 mg/l. The lowest DO concentrations monitored in the reservoir occurred near the bottom at the Canyon dam outlet tower, which is deeper and receives substantially less flow than near the Prattville intake. Near-bottom DO concentrations at this station were 7.0 mg/l or higher during April, September, and November; 1 to 3 mg/l in June, July, and October; and less than 1 mg/l in August. Near-surface DO concentrations of less than 7.0 mg/l occurred at the Canyon dam station in June 2000 (5.8 mg/l) and in July 2003 (6.4 mg/l), although these values had corresponding levels of 88 to 89 percent of saturation. Near the Prattville intake, DO concentrations of slightly less than 7.0 mg/l occurred near the surface in June 2000, and DO concentrations of approximately 3 mg/l occurred near the bottom in June and July.

During July through November 2001, PG&E monitored DO and other water quality in Lake Almanor near the Canyon dam outlet tower as part of a study to evaluate the effects of late summer releases from Canyon dam. Near-surface DO levels monitored for the 2001 study ranged from 6.5 to 7.2 mg/l and 73 to 99 percent of saturation. In contrast, near-bottom DO levels ranged from 0.2 to 4.8 mg/l and 2 to 50 percent of saturation. Anoxic (DO concentration of <0.5 mg/l) conditions occurred near the bottom during each of the monitoring visits from early August through mid-October. Since no measurements were reported prior to the August 8 value of 0.2 mg/l, it is not evident when anoxic conditions began to occur. By mid-November, turn-over had begun to occur, and the near-bottom DO concentration was 4.8 mg/l.

DO concentrations measured in 2000, 2002, and 2003 for the Butt Valley powerhouse ranged from 6.3 to 10.2 mg/l, and are quite similar to conditions in the

Lake Almanor epilimnion from which the water is drafted. DO concentrations of less than 7.0 mg/l occurred in July and August 2000.

DO concentrations measured in Butt Valley reservoir ranged from 0.4 to 10.6 mg/l. DO concentrations in the epilimnion ranged from 6.0 to 10.6 mg/l, while they ranged from 0.4 to 10.3 mg/l at depths of greater than 46 feet. Values of less than 7.0 mg/l were reported for a depth of 3 feet in July 2000 and near the bottom during the months of June through September 2000 and July 2003. Measurements near the bottom indicate that anoxic conditions occurred in August 2000 and hypoxic (DO concentration of <2.0 mg/l) conditions occurred in June and July 2000.

In 2000, DO levels were somewhat depressed in discharges from the Caribou developments, bottom of Belden forebay, and Belden powerhouse. DO concentrations of less than 7.0 mg/l were reported for both of the Caribou powerhouses in September, near the bottom of Belden forebay in June and July, and for the Belden powerhouse in July and September. DO concentrations monitored in 2002 and 2003 remained at or above 7.0 mg/l in the tailraces of the Caribou and Belden powerhouses. Results of PG&E's studies indicate that low-DO water drafted from the hypolimnion of Butt Valley reservoir via the Caribou No. 1 facility is generally re-aerated to 7 to 8 mg/l by the time it reaches the powerhouse tailrace.

All of PG&E's seasonal measurements of DO concentrations for project-affected stream reaches (i.e., the Seneca, Belden, and lower Butt Creek bypassed reaches) were greater than 7.0 mg/l.

Coliform Bacteria

Four principal sources of coliform data are available to describe bacteriological water quality conditions in the project area. Fecal coliform densities reported for a study conducted between 1993 and 1996 by Henrici Labs that sampled 12 locations along the margin of Lake Almanor for 3 months a year (typically, May, August, and October) ranged from less than 2 MPN/100 ml to greater than 1,600 MPN/100 ml (PG&E, 2003a). With the exception of four of the 134 samples analyzed, all samples had fecal coliform densities of less than 200 MPN/100 ml.

Fecal coliform densities reported for CDWR's study conducted between 1995 and 1999 at 22 stations in Lake Almanor and Hamilton Branch of the NFFR ranged from zero to 1,710 MPN/100 ml. Of the total 428 samples, all but five had values of less than 200 MPN/100 ml.

PG&E reported fecal coliform densities ranging from less than 2 to 80 MPN/100 ml for a total of 118 samples collected at 20 locations during April, June, July, August, September, and November 2000 (table 3-9).

PG&E monitored fecal coliform densities in Lake Almanor at the Canyon dam picnic area by sampling five times within 30 days (as specified in the Basin Plan) between June 29 and July 24, 2001. Samples were collected prior to and following the July 4 holiday in an effort to monitor worst-case conditions. This location receives considerable day use by swimmers and recreational watercraft, and has pit toilets located upgradient from the sample site. Fecal coliform densities reported for each of the five days monitored were less than 2 MPN/100 ml; therefore the geometric mean for the 30-day period also was less than 2 MPN/100 ml.

Table 3-9. Summary of total coliform and fecal coliform densities monitored by PG&E during 2000 to 2002.^a (Source: PG&E, 2002a)

Station	Total Coliform Range (MPN/100 ml)	Fecal Coliform Range (MPN/100 ml)
NFFR at Chester (NF1)	11–300	2–26
Hamilton Branch Creek at Hwy A13 bridge (HB1)	4–30	<2–23
Hamilton Branch powerhouse (HB2)	13–130	<2–4
Lake Almanor at Canyon dam near surface (LA1-S)	<2–2	<2
Lake Almanor at Canyon dam near bottom (LA1-B)	<2–70	<2
Lake Almanor at the Canyon dam picnic area ^b	23–900	<2
Butt Valley powerhouse (BV1)	2–50	<2–17
Butt Valley reservoir at Caribou intake near surface (BV2-S)	<2–13	<2
Butt Valley reservoir at Caribou intake near bottom (BV2-B)	<2–12	<2
Butt Valley reservoir at Ponderosa campground ^c	50–300	<2–80
Butt Creek upstream of Butt Valley reservoir (BC1)	8–500	2–80
Butt Creek at mouth (BC3)	4–50	<2–2
NFFR downstream of Canyon dam (NF2)	4–30	<2–2
NFFR upstream of Caribou powerhouse (NF4)	2–80	<2–8
Caribou No. 1 powerhouse (CARB1)	2–13	<2–2
Caribou No. 2 powerhouse (CARB2)	2–23	<2–2
NFFR downstream of Belden dam (NF5)	8–240	<2–4
NFFR near Gansner Bar (NF7)	23–300	<2–4

Station	Total Coliform Range (MPN/100 ml)	Fecal Coliform Range (MPN/100 ml)
EBNFFR at mouth (EB1)	11–500	<2–9
NFFR at Belden Town Bridge (NF8)	17–900	<2–50
Belden powerhouse (BD2)	11–110	<2–2
Yellow Creek near mouth (YC1)	8–70	<2–4

^a All rows with the exception of footnoted rows are based on samples collected in April, June, July, August, September, and November 2000.

^b Five samples taken between June 29 and July 24, 2001; fecal coliform geometric mean is <2 MPN/100 ml.

^c Five samples taken between August 29 and September 23, 2002; fecal coliform geometric mean is <5.5 MPN/100 ml.

Between August 29 and September 23, 2002 (which included the Labor Day holiday weekend), PG&E monitored fecal coliform densities in Butt Valley at the Ponderosa campground using the methodology specified in the Basin Plan. Reported fecal coliform densities for this period ranged from less than 2 to 80 MPN/100 ml, and had a geometric mean of less than 5.5 MPN/100 ml.

Study results suggest that the state criteria for fecal coliform are nearly always satisfied within waters in the project area, although fecal coliform concentrations of >200 MPN/100 ml sometimes occur along the southern part of Lake Almanor (see sampling results of Henrici Labs and CDWR discussed earlier). The source of these relatively high fecal coliform concentrations is not evident, although the Chester Sewage Treatment Plant has discharged partially treated sewage into Lake Almanor in the past. On April 23, 2004, the SRWCB issued a cease-and-desist order for the treatment plant to eliminate discharges that do not meet NPDES requirements, including prohibitions on discharges to Lake Almanor during the recreational season (i.e., from June 1 through September 30) (CVRWQCB, 2004).

Metals and Polychlorinated Biphenyls

The project may influence the concentrations of metals and polychlorinated biphenyls (PCBs) in water through its current and past operations. There are three primary pathways for this potential influence: (1) PG&E's LACSP, which vaporizes a silver iodide/acetone solution, (2) potential PCB contamination resulting from the 1984 Caribou rockslide and subsequent storage of contaminated soils, and (3) sorption/desorption of metals in sediments deposited in project impoundments as a function of cyclical redox functions.

As described earlier, PG&E implements the LACSP to increase snowfall in the upper part of the basin. It uses nine cloud seeding burners, which vaporize a silver iodide/acetone solution and form microscopic-sized crystals. During the 12 winter seasons of 1989–90 through 2000–01, the cumulative operation of cloud-seeding burners ranged from 44 hours in 1996–97 to 3,808 hours in 2000–01. PG&E estimates that these operations released an average of 102 pounds of silver iodide into the atmosphere per year during winter storm periods. Annual estimates ranged from 2 pounds of silver iodide in 1996–97 to 176 pounds of silver iodide in 2000–01.

On February 24, 1984, a large rockslide severely damaged the Caribou No. 1 penstock and Caribou No. 2 powerhouse. The slide completely destroyed the Caribou No. 2 switchyard and damage to the Caribou No. 1 penstock resulted in flooding of the switchyard, which included transformers and oil circuit breaker switches that contained PCB-contaminated mineral oil (letter from W.M. Gallavan, Vice President, PG&E, to W.F. Kopfler, II, Regional Engineer, FERC, San Francisco, CA, dated July 19, 1984). The slide ruptured some of this equipment, resulting in PCB-contaminated mineral oil leaking onto the slide area and into the water. PG&E (1984) reported that most of the mineral oil at these facilities contained less than 50 ppm PCBs, although a small amount of the oil contained greater than 50 ppm PCBs.

This leakage resulted in PCB contamination of some of the soil, slide spoil, and Belden forebay sediments. By mid-July 1984, PG&E had cleaned up and/or removed these PCB contaminated materials, with the exception of those with concentrations of less than 0.4 ppm in the Belden forebay sediments and less than 7 ppm in the Oak Flat spoil pile, which was used for disposal of dredged material. SWRCB and CDFG continued to be concerned with the potential for residual PCBs to adversely affect the fishery and wildlife resources, and required further cleanup of all detectable PCBs. PG&E continued to clean up the PCB contamination as mandated by SWRCB (letter from W.M. Gallavan, Vice President, PG&E, to W.F. Kopfler, II, Regional Engineer, FERC, San Francisco, CA, dated July 19, 1984).

PG&E sampled waters for trace metals at 20 stations in the upper NFFR basin during 2000. This sampling effort consisted of collecting samples during April, June, July, August, September, and November and analyzing the samples for total

concentrations of 12 metals (arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, selenium, silver, and zinc) and hardness. Unfortunately, method detection limits for cadmium, lead, mercury, and silver were too high to ensure that samples with non-detectable levels did not actually exceed applicable criteria. Because arsenic, cadmium, copper, lead, mercury, silver, and zinc have criteria based on concentrations of their dissolved fractions, PG&E used standard acceptable protocols for estimating their dissolved fractions (EPA, 1996) and then compared these estimated values to the appropriate criteria.

Following the 2000 sampling effort, PG&E consulted with resource agencies and modified the monitoring program to focus on obtaining information appropriate for further evaluating selected trace metals. Between July and November 2001, PG&E sampled eight stations for dissolved concentrations of iron, manganese, and silver at method detection limits of 0.050, 0.001, and 0.001 mg/l, respectively. Sampling stations were in Lake Almanor near the Canyon dam outlet tower, in the Seneca reach, and in the springs in the upper end of the Seneca reach.

PG&E developed a supplemental monitoring program that used trace metal clean methodology and had low detection limits necessary for comparison to applicable criteria. This program included sampling for cadmium, lead, mercury, and silver during 2002 and 2003. PG&E filed the results of this monitoring effort with the Commission on October 29, 2004.

We discuss the results of the 2000 through 2003 sampling programs below with a focus on exceedance of applicable criteria. As discussed above, we note that method detection limits for the 2000 study were too high to be adequate for comparison of water samples with non-detectable levels to criteria applicable to cadmium, lead, mercury, and silver.

During 2000 and 2001, copper was the only metal that was found to possibly exceed the applicable dissolved criterion. This occurred in the Caribou No. 1 powerhouse tailrace in July 2000, where the laboratory reported a total recoverable concentration of 0.0063 mg/l and a hardness of 49 mg/l as CaCO_3 . Using the metals translator (EPA, 1996), PG&E estimated a dissolved copper concentration of approximately 0.00605 mg/l, which exceeds the California Toxics Rule, Freshwater Aquatic Life Protection (CTR-FALP) hardness-dependent 4-day average criterion of 0.0049 mg/l. However, observed concentration was from a single sample, and was not a 4-day average and thus is not directly comparable to the criterion. Also, the estimated dissolved fraction was less than all of the other CTR and drinking water criteria. None of the other four samples analyzed for this station had a detectable total copper concentration of 0.00040 mg/l or greater, which converts to a dissolved concentration of less than 0.00038 mg/l. Each of these four estimated concentrations of the dissolved fraction of copper is below the applicable hardness-dependent criteria for the dates sampled.

Total iron concentrations sampled in 2000 exceeded the Title 22 Secondary MCL of 0.3 mg/l at three stations in the NFFR. These stations included the upper and lower ends of the Seneca reach (NF2 and NF4), and the lower end of the Belden reach (NF8). One of the samples analyzed (NFFR below Canyon dam [NF2] during September) had a total iron concentration of 1.7 mg/l. While this concentration is higher than the CTR-FALP instantaneous maximum criterion for dissolved iron (1.0 mg/l), it is unknown whether the concentration of dissolved iron exceeded the applicable criterion.

Dissolved iron concentrations reported for the 2001 sampling program ranged from less than the method detection limit of 0.050 mg/l to 4.02 mg/l. Concentrations of more than the allowable instantaneous maximum of 1.0 mg/l were reported for Lake Almanor at the Canyon dam outlet tower near the bottom (LA1-B) during September to mid-October, and a mineral spring located adjacent to the Canyon dam release structure (MS) during July to November. The highest dissolved iron concentration reported for any of the NFFR stations was 0.273 mg/l, which occurred in the NFFR below Canyon dam (NF2) on October 10.

Total recoverable manganese was detected above the detection limit of 0.00046 mg/l at 17 stations during 2000. Manganese concentrations exceeded the Title 22 Secondary MCL of 0.05 mg/l at the upper and lower ends of the Seneca reach (NF2 and NF4), Caribou No. 1 and No. 2 powerhouse tailraces (CARB1 and CARB2, respectively), the upper end of the Belden reach (NF5), and the Belden powerhouse tailrace (BD2).

Dissolved manganese concentrations reported for the 2001 sampling program ranged from less than the method detection limit of 0.001 mg/l to 3.23 mg/l. Reported values for the NFFR were compared to the Title 22 secondary criterion of 0.05 mg/l. Concentrations of greater than 0.05 mg/l were reported for three stations in the upper 0.6 mile of the Seneca reach in mid-September to mid-October. On both of the days with concentrations of greater than 0.05 mg/l in the Seneca reach, concentrations were reduced substantially between the Canyon dam release (NF2) and Skinner Flat (SF), which is approximately 0.6 mile downstream of the dam. For example, on September 11, the dissolved manganese concentration was 0.755 mg/l at the Canyon dam release and 0.057 mg/l at Skinner Flat.

PG&E's analysis of water samples for total mercury concentrations in 2000 is of limited value because the detection levels (0.2 µg/l) were not adequate for comparison to CTR Human Health Criteria for water and organisms (0.050 µg/l) and organisms only (0.051 µg/l), and the July samples were contaminated in the laboratory by a broken thermometer (personal communication from D. Mayugba, QA Director, ChromaLab Inc., Pleasanton, CA, to B. Mattax, Louis Berger Group, Seattle, WA, August 2, 2000). All of the valid total mercury concentrations reported for 2000 satisfied the CTR-FALP 4-day average criterion of 0.77 µg/l. To provide data sufficient to evaluate compliance with applicable standards, PG&E included total mercury in its supplemental monitoring

program for 2002-2003 (PG&E October 29, 2004, comments on the draft EIS). The maximum total mercury concentration reported for this study was 0.00656 µg/l in a sample collected from the NFFR at Chester in April 2003. None of the reported values exceeded any of the applicable mercury criteria.

The maximum dissolved cadmium concentration measured for the 2002 and 2003 sampling was 0.8 µg/l, which occurred in July 2003 at the Butt Valley powerhouse tailrace. Although it is not possible to determine exceedances of EPA's national 4-day average criteria based on single measurements, three of the discrete samples analyzed had concentrations that were higher than the corresponding EPA national 4-day average cadmium criteria of 0.11 to 0.13 µg/l. These samples included a July 2003 sample from Butt Valley powerhouse with a cadmium concentration of 0.8 µg/l, a July 2003 surface sample from Lake Almanor that had a concentration of 0.15 µg/l, and an October 2002 sample from the NFFR upstream of Lake Almanor that had a concentration of 0.18 µg/l.

The maximum dissolved lead concentration measured in the 2002 and 2003 samples that reached the laboratory in acceptable condition was 0.68 µg/l, which was reported for October 2002 at the Hamilton Branch powerhouse tailrace. All samples of acceptable quality had concentrations of less than all applicable dissolved lead criteria.

Nearly all of the water samples collected during PG&E's studies in 2000 to 2003 had undetectable silver concentrations. As discussed, the detection limits for analysis of samples collected in 2000 exceeded the applicable criteria, but the detection limits were subsequently lowered (to about 0.090 µg/l) by implementing trace metal clean sampling analysis methods for the samples collected in 2002 and 2003. The maximum detectable concentration of dissolved silver measured during PG&E's 2000 to 2003 studies was 0.155 µg/l for a sample collected from the Butt Creek bypassed reach in October 2002. All silver concentrations were well below the applicable criteria.

PG&E also evaluated bioaccumulation of mercury, silver, and PCBs in fishes and crayfish during 2001, 2002, and 2003. In 2001, PG&E collected fish and crayfish from the Belden forebay and Belden reach and analyzed homogenized whole organism samples. Prior to the 2002 sampling, PG&E modified its sampling and analysis protocol to target the collection of fish species and sizes that would represent fish caught by sport fishers and to analyze samples of fillets for total mercury, instead of methylmercury, concentrations. Because most of the mercury accumulated in fish is generally in the form of methylmercury and methylmercury analysis is relatively expensive, EPA (2000) recommends analysis of total mercury as a conservative surrogate of methylmercury in fish and shellfish tissue. The revised protocols resulted in analyzing fillets of fish collected from Butt Valley reservoir in 2002 and 2003 for total mercury concentrations and fillets of fish collected from the Belden forebay and the NFFR immediately downstream of the Oak Flat spoil pile in 2002 for PCB concentrations. Table 3-10 summarizes the results of the contaminant bioaccumulation studies conducted between 2001 and 2003.

Table 3-10. Fish and crayfish tissue analysis results for silver, mercury, and PCBs in Butt Valley reservoir, Belden forebay and Belden reach, 2001–2003.^a (Source: PG&E, 2002a, October 29, 2004, comments on the draft EIS)

Year	Species	Number of Organisms	Length (mm)	Silver (µg/kg)	Methyl Mercury (µg/kg)	Hg (II) (µg/kg)	Total Mercury (µg/kg)	Total PCBs (µg/kg)
Butt Valley Reservoir								
2002	Rainbow trout	6	266–555	--	--	--	70–120	--
2002	Brown trout	2	538–565	--	--	--	130–200	--
2003	Smallmouth bass	9	255–369	--	--	--	60–150	--
Belden Forebay								
2001	Rainbow trout	1	229	14	53.5	1.1	54.5	2.60
2001	Brown trout	1	280	10	68.1	1.4	70.6	9.70
2001	Smallmouth bass	2	175–180	2–4	55.6–111.0	1.0–3.3	56.7–114.0	5.70–14.90
2001	Sacramento sucker	3	333–358	5–6	53.2–91.1	1.4–1.9	54.7–92.8	11.00–14.60
2001	Signal Crayfish	~12 ^b	Various	23	31.5	1.8	33.3	0.80
2002	Rainbow trout	6	245–572	--	--	--	--	2.35–6.9
2002	Smallmouth bass	6	286–397	--	--	--	--	0.67–3.15
2002	Sacramento sucker	3	376–395	--	--	--	--	3.33–6.59
NFRF downstream of Dredge Disposal Pile								
2001	Rainbow trout	4	172–295	--	--	--	--	5.10–6.70

Year	Species	Number of Organisms	Length (mm)	Silver ($\mu\text{g/kg}$)	Methyl Mercury ($\mu\text{g/kg}$)	Hg (II) ($\mu\text{g/kg}$)	Total Mercury ($\mu\text{g/kg}$)	Total PCBs ($\mu\text{g/kg}$)
2001	Sacramento sucker	4	360–425	--	--	--	--	2.30–7.30
2001	Signal Crayfish	~ ^b	Various	--	--	--	--	0.20
2002	Rainbow trout	6	203–276	--	--	--	--	0.93–3.42
2002	Sacramento sucker	6	349–413	--	--	--	--	0.62–4.51

-- indicates not reported; NA indicates not applicable.

^a Tissue analyses for 2001 samples were conducted on whole specimens (i.e., entire fish and crayfish were homogenized); whereas analyses for 2002 and 2003 were conducted on fillets.

^b Single composite sample was analyzed.

The concentration of silver in all whole-organism samples of the fish and crayfish sampled during 2001 ranged from 2 $\mu\text{g/kg}$ in smallmouth bass to 23 $\mu\text{g/kg}$ in the composite sample of crayfish in Belden forebay. These results indicate that body burdens of silver in fish and crayfish are generally low in the Belden forebay.

Methylmercury concentrations reported for whole-organism samples of fish and crayfish collected from the Belden forebay in 2001 ranged from 31.5 $\mu\text{g/kg}$ for the composite crayfish sample to 111 $\mu\text{g/kg}$ in a smallmouth bass. Comparison of the total mercury and methylmercury for each sample indicates that from 95 to 98 percent of the mercury is in the methylated form. This evaluation confirms that total mercury concentrations are generally representative of methylmercury concentrations in tissues of the species sampled. Results of the 2002–2003 study of fish fillets from Butt Valley reservoir indicated that total mercury concentrations ranged from 60 to 200 $\mu\text{g/kg}$ and tended to be highest in the largest fish.

Various agencies have established mercury concentrations that they use as screening values to protect the health of humans and wildlife. The U.S. Food and Drug Administration (2000) developed and currently has an action level of 1,000 $\mu\text{g/kg}$ methylmercury in edible portions of fish and other aquatic organisms to protect human health. The California Office of Environmental Health Hazard Assessment (COEHHA) established a screening value of 300 $\mu\text{g/kg}$ following the EPA-recommended approach to identify chemical contaminants in fish tissue that may be of human health concern for frequent consumers of sport fish (Brodberg and Pollock, 1999). SWRCB established a maximum tissue residue concentration for mercury at 370 $\mu\text{g/kg}$ to be used as a guideline indicator of potential human health concerns (Rasmussen, 2000). FWS evaluated whether the 300- $\mu\text{g/kg}$ screening value set for human health also would protect the health of bald eagles, based on consumption of various trophic levels of fish, birds, and other terrestrial organisms (Russell, 2003). This evaluation indicates that applying the 300- $\mu\text{g/kg}$ screening value to the highest trophic level (e.g., adult bass) should sufficiently protect the health of bald eagle populations. All of the fish or crayfish samples analyzed had total mercury concentrations of less than the U.S. Food and Drug Administration (FDA) action level, COEHHA screening value, SWRCB maximum tissue residue level, and FWS level to protect bald eagles, suggesting that methylmercury is not at concentrations that cause significant risk to populations of humans and bald eagles.

Total PCB concentrations (a summation of the 209 separate congeners for each sampled organism) for whole-organism samples ranged from 0.8 $\mu\text{g/kg}$ in the composite crayfish sample to 14.9 $\mu\text{g/kg}$ in a smallmouth bass in the Belden forebay and from 0.2 $\mu\text{g/kg}$ in the composite crayfish sample to 7.3 $\mu\text{g/kg}$ in a Sacramento sucker in the Belden reach below the Oak Flat spoil pile. Total PCB concentrations in fillet samples from fish collected in 2002 ranged from 0.67 to 6.9 $\mu\text{g/kg}$ for the Belden forebay and 0.62 to 4.51 $\mu\text{g/kg}$ for the Belden reach downstream of the Oak Flat spoil pile.

Federal and state regulatory agencies have developed screening values for total PCBs to be used as indicators of potential increases in health risks of humans and wildlife. Screening values for potential increases in human health risks include the FDA tolerance level used to prohibit interstate commerce of fish flesh of 2,000 $\mu\text{g/kg}$, the SWRCB screening value for California lakes of 20 $\mu\text{g/kg}$ (Brodberg and Pollock, 1999), the EPA (2000) screening values of 20 $\mu\text{g/kg}$ for recreational fishers and 2.45 $\mu\text{g/kg}$ for subsistence fishers. All of the fish or crayfish samples analyzed had total PCB concentrations of less than the 2,000- $\mu\text{g/kg}$ FDA tolerance level and the 20- $\mu\text{g/kg}$ screening values of SWRCB for California lakes and EPA for recreational fishers. However, many of the fillet samples and the whole-organism samples exceeded the 2.45- $\mu\text{g/kg}$ screening value set to indicate potential risk to subsistence fishers. This value is based on the 99th percentile consumption rate of fish and shellfish from estuarine and fresh waters (142.4 grams, 5 ounces) uncooked per day and an average body weight of 70 kilograms (154 pounds). In samples collected from the Belden forebay, 83 percent of rainbow trout fillets, 17 percent of the smallmouth bass fillets, and all of the Sacramento sucker fillets exceeded the 2.45- $\mu\text{g/kg}$ screening value. Downstream of the Oak Flat spoil pile, fillet samples exceeded the 2.45- $\mu\text{g/kg}$ screening value less frequently (17 percent of the rainbow trout and 50 percent of Sacramento suckers).

Screening values for the protection of piscivorous wildlife is very limited, and no California guidelines have been set. Therefore, we use the National Academy of Sciences and National Academy of Engineering (1973, as cited in Riva-Murray et al., 2003) guideline of 500 $\mu\text{g/kg}$ and New York State Department of Environmental Conservation screening value of 110 $\mu\text{g/kg}$ (Newell et al., 1987, as cited in Riva-Murray et al., 2003) to suggest potential increased risk to the health of piscivorous wildlife. All of the 2001 whole-organism and 2002 fillet samples had total PCB concentrations that were well below the 500- $\mu\text{g/kg}$ and 110- $\mu\text{g/kg}$ screening values used as indicators of potential health risks to piscivorous wildlife.

Four samples (three Sacramento suckers and one smallmouth bass) from the Belden forebay exceeded the EPA screening level of 10 $\mu\text{g/kg}$ for PCBs; however, all of these tissue levels were below the FDA allowable level of 2,000 $\mu\text{g/kg}$.

Odors and Sulfide

PG&E reported that hydrogen sulfide odors were evident at the NFFR release from Canyon dam in both 2000 and 2001. During summer 2001, PG&E included an evaluation of conditions that could lead to odor problems in its investigation of the water quality of late summer releases from Canyon dam. Odor and sulfide levels were sampled during four events between July 10 and October 10 during typical operations of releasing 35 cfs into the upper end of the Seneca reach through the lower gates of the Canyon dam outlet tower.

Odors monitored during these four days ranged from less than 2 to 4 odor units reported as threshold odor number (TON).¹⁵ Values of greater than the 3 Odor unit (reported as TON) Drinking Water Secondary MCL were reported for two of the 32 samples taken. These high values (4 TON) were reported for October 10 near the bottom of Lake Almanor near the Canyon dam outlet tower (LA1-B) and the NFFR at the Canyon dam release (NF2).

Sulfide concentrations measured during these four days ranged from less than 0.0017 to 0.504 mg/l. The highest values were reported for near the bottom of Lake Almanor (LA1-B) between September and mid-October. Sulfide concentrations at this station increased rapidly from less than 0.0017 mg/l in August to 0.504 mg/l in September and then declined to 0.221 mg/l on October 10. Measured sulfide concentrations exceeded 0.005 mg/l at two of the other stations monitored during 2001. At the mineral spring located adjacent to the Canyon dam release structure (MS), sulfide concentrations of 0.0102, 0.0081, and 0.0059 were reported for July 10, August 8, and October 10, respectively. At the Canyon dam release into the NFFR (NF2), a sulfide concentration of 0.0086 mg/l was reported for October 10.

MTBE

MTBE, an additive to gasoline, which makes it burn more efficiently, could enter the project's reservoirs as a result of power boating. On August 17, 2000, PG&E collected near-surface and near-bottom waters of Lake Almanor and Butt Valley reservoir (LA1-S, LA1-B, BV2-S, and BV2-B) for MTBE analysis. Each of the four samples collected had a non-detectable MTBE level at a method detection limit of 0.005 mg/l. These limited data do not suggest any exceedances of the primary or secondary drinking water MCLs for MTBE.

Lake Almanor Shoreline Erosion

In 1957, PG&E executed a legal agreement, referred to as the Clifford Deed, with Edward A. Clifford and Josephine Clifford, landowners of property adjoining the project boundary at 4,500 feet (PG&E datum). The Clifford Deed grants PG&E the right to flood or erode lands owned or acquired by the Cliffords by wave action, seepage, or other actions of the water (Clifford et al., 1957) up to elevation 4,510.2 feet (PG&E datum). This agreement perpetuates with land sales, and PG&E reports that it is thereby effective on 733 of the approximate 1,000 residential lots adjoining the project boundary around Lake Almanor at an elevation of 4,500 feet (PG&E datum).

¹⁵ Odors are measured by having individuals evaluate whether samples diluted with odor-free water have a perceptible odor, and are reported as the ratio of the greatest dilution sample with a definitely perceptible odor (e.g., a sample reported as 3 TON had a perceptible odor when diluted 2 odor-free water to 1 sample water).

Under PG&E's existing shoreline management program, adjacent property owners can obtain permits for installing erosion control structures on PG&E lands below the 4,500-foot contour (PG&E datum). PG&E reports that 70 riprap permits have been issued to private parties under this program. In addition, PG&E has placed riprap on its lands adjoining 267 properties that are not under the Clifford Deed in order to prevent erosion from extending above an elevation of 4,500 feet.

Two years before increasing the normal maximum operating level of Lake Almanor to elevation 4,494 feet (PG&E datum) in 1976, Dames and Moore assessed the potential for shoreline erosion. PG&E reports that, because the original Dames and Moore report is no longer available, it used the 1975 Environmental Data Report as the source of information for the results from the study. The study concluded that the potential for erosion below elevation 4,490 feet (PG&E datum) was minimal because of low-gradient shoreline slopes. Above elevation 4,490 feet (PG&E datum), erosion was categorized by its severity and mapped. This study concluded that:

- 23 percent of the shoreline had significant erosion as determined by noticeable slope scars on the shoreline and sloughing of material into water;
- 55 percent of the shoreline had slight erosion determined by slight slope scars resulting from small wave cutting action; and
- 22 percent of the shoreline had no detectable erosion.

In 2000 (nearly 24 years after implementing the increased maximum lake level), PG&E again surveyed shoreline erosion. This survey included mapping shoreline erosion by boat with emphasis on the eastern lobe of Lake Almanor where the banks are steeper and potential for erosion is higher. Bank slopes were determined between elevation 4,490 and 4,494 feet (PG&E datum), and erosion was categorized using the same criteria as the 1974 Dames and Moore survey. Results of the 2000 survey indicate that substantial localized erosion occurs along the eastern shore of the eastern lobe and the western shore of the Almanor peninsula. Overall, approximately 4.2 miles (7 percent) of the 58-mile-long shoreline has noticeable slope scars.

3.3.1.2 Environmental Effects

Water Quantity

Reservoir Water Levels and Flows in the Bypassed Reaches

Although reservoir water level management, minimum flows in the bypassed reaches, block loading of the Belden powerhouse, winter pulse flows, summer recreational flows, and ramping rates associated with controlled releases are hydrological functions, their consequences primarily influence habitat for aquatic and riparian organisms and recreational resources. Therefore, we discuss these measures in

sections 3.3.2, *Aquatic Resources*, 3.3.3, *Terrestrial Resources*, and 3.3.5, *Recreational Resources*.

Flow and Water Level Monitoring

In the SA (PG&E, 2004a), PG&E proposes to continue monitoring flows in the Seneca and Belden reaches at its NF-2 (USGS gage No. 11399500), and NF-70 (USGS No. 11401112) stream gages under the general supervision of the USGS, and to rehabilitate the NF-9 gage (Butt Creek near Caribou) to enable flow measurement in lower Butt Creek. PG&E would complete any necessary modifications to the NF-2 and NF-70 gages for the purpose of measuring the new minimum instream flow (MIF) within 3 years of license issuance. For compliance purposes, the SA dictates that all daily mean flows should be at least as high as the monthly MIF, and the 15-minute streamflows at the compliance gages should be at least 90 percent of the applicable MIF. PG&E also would develop a stage vs. discharge rating curve for the NF-9 gage that would not be required to meet USGS standards, and would read the staff gage at this station on or about April 1, June 1, August 1, and October 1. In addition, PG&E would make daily midnight storage and water surface elevation (rounded to the nearest 100 acre-feet and 0.1 foot, respectively) of Lake Almanor available on the Internet within 7 to 10 days.

In its November 4, 2004, letter to the Commission, the FS specifies, as paragraphs 5 and 8 of final Section 4(e) condition no. 25, that PG&E operate and maintain the existing gages at NF-2, NF-70, and NF-9; and the FS specifies, as paragraph 11 of final Section 4(e) condition no. 30, that PG&E make Lake Almanor water level and storage information available as described above for the SA.

Our Analysis

The purpose of flow and water level monitoring in the context of this analysis is to allow the Commission to be able to verify compliance with flow and water surface elevation requirements that are included in a new license issued for a project. To verify compliance with MIF and specific water surface elevation requirements discussed in section 3.3.2, *Aquatic Resources*, it is necessary to monitor flows in the Seneca and Belden reaches, as well as water surface elevations in Lake Almanor, Butt Valley reservoir, and Belden forebay.

PG&E gages NF-2 and NF-70 currently monitor flows in Seneca reach and Belden reach, respectively. PG&E also currently monitors water surface elevations in Lake Almanor (NF-1), Butt Valley reservoir (NF-8), and Belden forebay (NF-67). Continued operation of the above gages would allow evaluation of compliance with required MIF and water surface elevations.

As discussed in section 3.3.2, *Aquatic Resources*, PG&E is also required to ensure that it takes no action that would reduce existing inflow to lower Butt Creek.

Although no measure proposed for this license explicitly reduces flows below the Butt Valley dam, it is possible that the change in reservoir operations after relicensing may affect groundwater recharge and leakage, which would correspondingly affect inflows to lower Butt Creek. However, as shown in section 3.3.2, the elevation in Butt Valley reservoir is likely to be the same or higher than currently observed. Since increased reservoir elevation would cause an increase in the hydraulic pressure pushing leakage through dam facilities, and would also result in an increase to the groundwater available for inflow to lower Butt Creek through exfiltration from the reservoir, the flows in lower Butt Creek are likely to be unchanged or increase slightly due to operational changes required in this license.

As part of the licensing of PG&E's downstream Rock Creek-Cresta Project, the Commission included a requirement to develop a flow and water temperature monitoring plan in the license order for that project. PG&E filed this plan with the Commission on October 23, 2002, and the Commission approved the plan on February 28, 2003. Under the approved plan, PG&E would monitor flow at 10 USGS gaging stations and 6 ungaged stations in the UNFFR Project area from June 1 through September 30 for 15 years, including gaging stations NF-2, NF-70, and NF-9. As part of the plan, gaging stations that historically have contributed greater than 10 percent of the flow in the main stem, including NF-9, are to be gaged with continuous stage recorders.

Although PG&E currently operates gaging sufficient to ensure compliance with MIF and water surface elevation requirements as discussed above, PG&E's coordination of the collection and reporting of this data would ensure that compliance is continually checked and confirmed, and the Commission can easily verify compliance as warranted.

Water Quality

Water Quality Monitoring Program

The SA (PG&E, 2004a) includes a multi-faceted WQMP that would provide data to evaluate a reasonable protection of beneficial uses of the project waters and identify project-related changes in water quality that may occur over time.

According to the SA, within 3 months of issuance of a new license for the project, PG&E would develop monitoring plans that provide specific details, analytical methods, sampling protocols, and QA/QC procedures to be used in the initial monitoring studies for the five facets of the WQMP, in consultation with SWRCB, CVRWQCB, Plumas County, the FS, CDFG, FWS, and other parties who request involvement in the WQMP. The WQMP would be adaptive and may be modified to more effectively focus on specific project-related water quality conditions identified in project waters, if agreed to by PG&E, SWRCB, CVRWQCB, Plumas County, the FS, CDFG, FWS, and other parties who request involvement in the WQMP. PG&E would

also develop, in consultation with these same parties, any future modification of the initial water quality monitoring plans. The initial water quality monitoring plans and any subsequent revisions would be filed with the Commission for approval.

PG&E would analyze the water quality data collected and prepare an annual water quality report containing elements consistent with reporting requirements from all of the plans under the WQMP, and provide the report to the Commission, SWRCB, CVRWQCB, Plumas County, the FS, CDFG, FWS, and other parties who request involvement in the WQMP by no later than March 15 of the following year. If an adverse trend in water quality is determined to be a result of O&M of the project, PG&E would develop and implement measures to mitigate project-related effects on water quality. PG&E would convene a discussion group meeting between April 15 and 28 once annually at least 30 days following distribution of the annual water quality monitoring report.

As described in the SA, the WQMP would include the following five components:

- Canyon Dam Mitigation Measures Evaluation—The objective of this sampling program is to evaluate the adequacy and efficacy of mitigating elevated odor and dissolved metal levels in the Seneca reach through seasonal gate switching at the Canyon dam outlet tower. PG&E would (1) conduct *in situ* monitoring of temperature, DO, pH, specific conductance, and turbidity throughout one vertical profile in Lake Almanor near the Canyon dam outlet tower at 1-meter intervals during June, July, August, September, and October; (2) sample hydrogen sulfide, iron, manganese, and arsenic at the surface and bottom of Lake Almanor and at three locations in the Seneca reach during the September and October sampling events; and (3) collect a sediment sample from Lake Almanor near Canyon dam during the October sampling event and analyze it for hydrogen sulfide, sulfate, iron, manganese, and arsenic. Sample timing would be coordinated with switching the release flow path from the lower gate to the upper gate at the Canyon dam outlet tower. September sampling would be done prior to the gate switch, and October sampling would be done after the gate switch. Monitoring would begin in the first year after issuance of a new license for the project, and would be conducted in a minimum of 6 water years with various hydrologic conditions. After sampling has been conducted in 2 wet water years, 2 normal water years, and 2 dry/critically dry water years after issuance of a new license for the project, PG&E would make a determination of the effectiveness of the mitigation measure and need (if any) for additional monitoring or development and implementation of alternative measures in consultation with SWRCB, CVRWQCB, Plumas County, the FS, CDFG, FWS, and other parties who request involvement in the WQMP.

- Selected Water Quality Monitoring—PG&E would conduct a special study to identify the cause of high dissolved cadmium and specific conductance levels in waters of the upper NFFR that were measured in 2002-2003. Monitoring would be conducted seasonally (spring, summer, and fall) at 20 specified locations within the upper basin, and would include analysis of dissolved cadmium, total hardness, temperature, DO, pH, specific conductance, and turbidity. At a minimum, this sampling program would be conducted in years 1 and 2 after issuance of a new license.
- Lake Almanor Water Quality Monitoring Program—The objectives of this monitoring program are to monitor long-term water quality trends in Lake Almanor; and determine if the water quality protects the designated beneficial uses for Lake Almanor and meets water quality objectives outlined in the Basin Plan (CVRWQCB, 1998), California Toxics Rule criteria (40 CFR Part 131), and National Recommended Ambient Water Quality criteria (EPA, 2002). PG&E would monitor the water quality of Lake Almanor at three representative locations: (1) in the channel near the Canyon dam outlet tower, (2) in the western lobe, and (3) in the eastern lobe. Sampling would include:
 1. monitoring *in situ* parameters (including temperature, DO, pH, specific conductance and turbidity), at 1-meter intervals;
 2. measuring Secchi depths; and
 3. collecting and analyzing surface and near-bottom samples for general analytes (hardness, sulfate, total alkalinity, and total suspended solids), minerals (calcium, chloride, magnesium, potassium, and sodium), metals (total concentrations¹⁶ of aluminum, arsenic, cadmium, copper, iron, manganese, mercury, nickel, silver, and zinc), nutrients (nitrate+nitrite, total ammonia, orthophosphate, total phosphorous, total organic nitrogen, total Kjeldahl nitrogen, total organic carbon, and chlorophyll-*a*), and petroleum products (MTBE, TPHG,¹⁷ and BTEX¹⁸).

PG&E would monitor once per season (spring, summer, and fall) every 5 years beginning in year 3 after issuance of a new license, and continue for the term of the new license. During the new license term, monitoring and

¹⁶ Dissolved concentrations would be calculated for cadmium, copper, nickel, silver, and zinc as outlined in EPA (1996a).

¹⁷ Total petroleum hydrocarbons as gasoline.

¹⁸ Benzene, toluene, ethylbenzene, and xylenes sampled only at the surface.

reporting requirements may be modified to more appropriately monitor for changes in project operations, regulatory mandates, or focus study needs, or terminated if agreed to by PG&E, SWRCB, CVRWQCB, Plumas County, the FS, CDFG, FWS, and other parties who request involvement in the WQMP. A modification that could be implemented is increasing the sampling frequency for specific parameters to once every 3 years if results exhibit a substantial increasing trend over time or if a parameter that has historically had low levels approaches or exceeds applicable federal or state water quality standards.

- Fish Tissue Bioaccumulation Screening—PG&E would monitor the potential bioaccumulation of silver, total mercury, and PCBs in tissue samples collected from resident catchable-sized (minimum total length of 8 inches) fish in waters of the project. The sampling strategy would be consistent with the field methods developed in the relicensing process in coordination with SWRCB's Toxic Substances Monitoring Program (table 3-11).

Sampling would target fish with a total length of at least 10 to 12 inches. Silver and mercury analyses would be conducted for fish collected from Lake Almanor, Butt Valley reservoir, and the Belden forebay; and PCB analyses would be conducted for fish collected from Belden forebay. Fish tissue bioaccumulation screening samples would be collected once every 5 years beginning with the first year after issuance of a new license, and continue through the term of the new license. During the term of the license, monitoring and reporting requirements may be reduced or terminated after it is demonstrated to the satisfaction of SWRCB, CVRWQCB, Plumas County, the FS, CDFG, FWS, and other parties who request involvement in the WQMP that the given requirement is no longer necessary.

Table 3-11. Fish tissue bioaccumulation screening-sampling protocols. (Source: PG&E, 2004a)

Sample Species	Analysis	Sample Description	Alternative Sample Description^a
Lake Almanor			
Smallmouth bass	Silver and mercury	18 individuals	--
Brown trout ^b	Silver and mercury	9 individuals	--
Brown bullhead	Silver and mercury	2 composites of 3 individuals ^c	--
Butt Valley reservoir			
Smallmouth bass	Silver and mercury	9 individuals	--
Brown trout	Silver and mercury	6 individuals	--
Rainbow trout	Silver and mercury	6 individuals	--
Belden forebay			
Smallmouth bass	Silver, mercury, and PCB	6 individuals	3 composites of 3 individuals ^c
Rainbow trout	Silver, mercury, and PCB	6 individuals	3 composites of 3 individuals ^c
Sacramento sucker	Silver, mercury, and PCB	2 composites of 3 individuals ^c	2 composites of 3 individuals ^c

^a This sample set may be prepared and analyzed rather than the one listed in the column to the left.

^b Sacramento pikeminnow may be substituted, if brown trout can not be reasonably obtained.

^c The total length of all individuals included in each composite sample must fall within a 25 percent range of one another.

- Bacteriological Sampling—PG&E would conduct bacteriological monitoring consistent with the Basin Plan objectives for protection of the water contact recreation beneficial uses at 10 locations in the project boundaries. Sampling would include five annually rotating stations

(stations would be selected on an annual basis and may differ by year) at PG&E-owned or managed recreation sites around Lake Almanor, three rotating stations at PG&E-owned or -managed recreation sites around Butt Valley reservoir, and two stations at recreation sites on the upper NFFR. PG&E would select sampling locations by April 30 for each upcoming field season by consulting SWRCB, CVRWQCB, Plumas County, the FS, CDFG, FWS, and other parties who request involvement in the WQMP. Five samples would be collected at each of the 10 selected sampling locations during the 30-day period that spans either the Independence Day holiday or the Labor Day holiday. Bacteriological monitoring would be conducted annually for the first 5 years after license issuance and once every other year for the remaining term of the new license. This monitoring program may be modified or terminated if agreed to by PG&E, SWRCB, CVRWQCB, Plumas County, the FS, CDFG, FWS, and other parties who request involvement in the WQMP.

In its comments on the draft EIS, filed with the Commission on November 1, 2004, the FS states that it fully supports the water quality component of the SA.

In its comments on Scoping Document 1, letter filed with the Commission on July 7, 2003, Plumas County recommends that PG&E be required to augment the water quality monitoring plan if it is insufficient to ensure that water quality problems would be detected.

Our Analysis

We agree there is a need to document that water quality conditions under any new license issued meet applicable federal and state water quality standards and meet the objectives of applicable management plans. These standards are set to protect the designated beneficial uses of surface waters. Any new license issued for the project is expected to include measures that would alter water quality in project impoundments and stream reaches. Although PG&E conducted studies to evaluate the effects that implementing various measures would have on water quality, it has not determined with reasonable certainty the effects of some measures. For instance, its test of using the upper-level Canyon dam intake gates during the fall was done under lower than normal Lake Almanor water levels, which may have resulted in substantially different results than would occur under a higher reservoir level.

Our review of available water quality information (section 3.3.1.1, *Water Quality*) indicates that project waters typically comply with the applicable federal and state standards for most water quality parameters. However, the available information indicates that the applicable criteria for water temperature and DO are frequently not satisfied in some areas, and it is questionable whether other water quality standards including specific conductance and some trace metals are typically satisfied throughout project waters. We discuss these in the following section.

Our review of temperature data reported by PG&E indicates that daily mean water temperatures of greater than 20°C generally occur more than 20 percent of the time from June through September throughout the Belden reach; in near-surface waters of Lake Almanor and Butt Valley reservoir; and in discharges from the Butt Valley, Caribou No. 1, Caribou No. 2, and Belden powerhouses (see table 3-7). Under the terms of the Rock Creek-Cresta SA (PG&E, 2000a), PG&E is required to evaluate and potentially modify the Prattville intake, implement other options for using the coldwater supply in Lake Almanor and Butt Valley reservoir, and/or implement other measures to attain cooler temperatures in the NFFR downstream of the Caribou developments. Implementation of these measures for the Rock Creek-Cresta Project along with altering operations of this project under any new license could substantially alter the thermal regimes of Lake Almanor, Butt Valley reservoir, and the NFFR downstream of the Caribou developments. We evaluate the effects of these measures below in our discussion of *Water Temperature and Dissolved Oxygen Management*.

DO concentrations of less than 7.0 mg/l are common near the bottom of Lake Almanor, Butt Valley reservoir, and Belden forebay; and occur occasionally in the surface waters of Lake Almanor and Butt Valley reservoir along with the Butt Valley, Caribou No. 1, Caribou No. 2, and Belden powerhouse tailraces (see table 3-8). Data collected by PG&E in 2000, 2002, and 2003 indicate DO levels generally satisfy the applicable standard in the Seneca, Belden, and lower Butt Creek bypassed reaches. DO levels could be altered in Lake Almanor and the Seneca reach if the Commission adopts PG&E's proposal to shift its typical use of the lower gate at the Canyon dam outlet tower to the upper gate from September and October. We address the effects of modifying the Prattville intake and other temperature control options being considered below in our discussion of *Water Temperature and Dissolved Oxygen Management*, and discuss the need for monitoring effects of switching the Canyon dam outlet tower gate used in our discussion of *Odors and Metals in the Seneca Reach*.

During relicensing studies for this project, PG&E conducted evaluations of the concentration of metals in water; however, not all of these studies analyzed the dissolved metal fraction, where appropriate, or had method detection limits sufficient to verify compliance with applicable criteria. PG&E modified its monitoring protocol for trace metals to address these concerns and sampled 20 stations throughout the UNFFR basin in fall 2002 and spring and summer 2003. PG&E reported relatively high concentrations of dissolved cadmium in samples collected from the NFFR near Chester (NF1), Lake Almanor near Canyon dam surface (LA1-S), and Butt Valley powerhouse tailrace (BV1). However, the sampling protocol did not support a comparison with the EPA 4-day average criteria.

PG&E also reported that specific conductance values exceeded the Basin Plan criterion of 150 μ mhos/cm at six stations located in the Project's bypassed reaches and two tributaries to the Belden reach. Our review of the data suggests that the high and variable conductivity in these reaches may be primarily reflective of the geology and

hydrology of the project area. This is supported by the higher conductivity observed in non-project affected tributaries than below project reservoirs, and reduced conductivities at higher flow levels at some locations, suggesting that lower conductivity surface water is diluting higher conductivity groundwater. A potential project impact is an increase in conductivity in bypass reaches caused by reduced dilution of groundwater-origin flows resulting from flow diversions.

Data obtained during implementation of a monitoring program consistent with the selected water quality monitoring described in the SA would provide additional information on both spatial and seasonal differences in these parameters. We anticipate that seasonal monitoring for a period of 1 to 3 years in combination with the results of PG&E's 2002 and 2003 studies, filed on October 29, 2004, should be sufficient to determine the extent and cause(s) of elevated dissolved cadmium and specific conductance levels and identify potential measures to remedy the situation, if the cause(s) is due to the project. We note that implementation of this monitoring program could provide sufficient information to determine the cause(s) and potential remedies in less than 3 years; review of the results of the study annually by PG&E and the appropriate agencies could determine the cause(s) and potential remedies, if necessary, and determine if monitoring should be reduced or terminated.

Lake Almanor's limnology could be substantially influenced by operational changes incorporated into a new license for this project, although these changes would be expected to improve water quality conditions. However, we acknowledge the need to document compliance with federal and state water quality standards under any new license. We conclude that it would be appropriate to monitor water quality conditions in Lake Almanor for the first wet, normal, and dry/critically dry year of any new license period to document water quality conditions that result from the modified operations. In this manner, the effects of the new operations could be readily evaluated and corrective actions, if necessary, could be made within a few years of implementing the new license terms. We concur with the SA that *in situ* monitoring of the identified water quality parameters; measuring Secchi depths; and analyzing general analytes, minerals, metals, nutrients, and petroleum products seasonally at the three indicated locations would be appropriate to document conditions in the reservoir. Data collected could be used to determine compliance with applicable federal and state water quality standards for trace metals and other water quality parameters.

Although monitoring Lake Almanor once every 5 years for the term of any new license would provide data that could be used to assess long-term trends, it is not the objective of our recommended monitoring plan and it would unnecessarily prolong determination of any adverse effects that may occur and could delay implementation of corrective actions, if necessary. We acknowledge that modifying the Prattville intake also could substantially affect Lake Almanor's limnology, as discussed later in this section. However, PG&E has not proposed modifying the Prattville intake. We conclude that monitoring Lake Almanor water quality early in any new license period

would sufficiently document project-induced changes in the lake's water quality. If the Prattville intake is later modified, it would be beneficial to conduct monitoring to document the resulting water quality conditions in Lake Almanor.

Natural, project-related, and other human-related activities have led to the concentration of metals in the sediments of Lake Almanor, some of which are subsequently mineralized and dissolve into water when DO concentrations are low at the water/substrate interface. The anoxic conditions and generally neutral pH near the bottom of Lake Almanor, along with the long hydraulic residence time (average of about 290 days), result in methylation of mercury and a buildup of mercury in the reservoir's deep water. Methylmercury concentrations may increase substantially in the overlying water column upon fall turnover of the reservoir, be drafted through the Prattville intake and discharged into the Butt Valley reservoir, and then on to the Belden forebay and the Belden reach. PG&E's cloud seeding operations, which vaporize a silver iodide/acetone solution, increase the potential for elevating silver concentrations in precipitation and subsequently surface waters. Although, the LACSP does increase the potential for silver to be introduced to Lake Almanor and consequently other project water bodies, results of PG&E's 2002–2003 study indicate that silver concentrations in water are substantially less than the applicable criteria. Concentrations of PCBs in water and biota in the project area are probably largely a result of the 1984 Caribou landslide.

Trace metals and PCBs can bioaccumulate and may, in some cases, present a hazard to the health of both biota and humans. To evaluate bioaccumulation, PG&E sampled silver, mercury, and PCB concentrations in whole-organism samples of various fish species and crayfish collected in 2001 and fillet samples of fishes collected in 2002 and 2003. The results of these studies are summarized in table 3-10. These results indicate that some silver, mercury, and PCBs are accumulating in fish and crayfish tissues. We conclude that biomagnification (higher concentrations of contaminants in successive levels of the food chain) of methylmercury and PCB could lead to elevated concentrations of these contaminants in these organisms' predators, including birds of prey and humans (Eisler, 1987, 1986). However, biomagnification of silver is unlikely (Howe and Dobson, 2002).

After reviewing the results of the 2001 bioaccumulation study, SWRCB and CDFG became concerned that the mercury and PCB concentrations reported could represent a risk to human health, and requested that PG&E evaluate that risk through further sampling. Subsequently, PG&E analyzed fish fillets for these contaminants in 2002 and 2003. The fillet sampling results suggest that methylmercury concentrations do not generally bioaccumulate to levels that significantly increase health risks for either humans or piscivorous wildlife. Results of sampling fish fillets for PCB concentrations suggest that PCBs bioaccumulate in fishes residing in the Belden forebay and the NFFR near the Oak Flat spoil site to concentrations that may potentially cause a

health hazard for subsistence fishers that consume an average of 142.4 grams (5 ounces) per day of uncooked fish.¹⁹ There is no evidence of any subsistence fishers currently using the project area. However, the results indicate that bioaccumulation of PCBs in fish do not significantly increase health risks for recreational fishers.

Implementation of the fish tissue bioaccumulation screening identified in the SA would provide additional information on the levels of mercury, PCBs, and silver in fishes in project impoundments. We question the value of analyzing fish samples for silver, however; because sampling indicates that silver body burdens are low, silver does not typically biomagnify, and we are not aware of an established action or screening level that represents the risk to human health. We conclude that monitoring for bioaccumulation of mercury and PCBs under any new license by sampling and analyzing fishes in a standardized fashion at intervals of 5 years for a period of 15 years would provide adequate information to document changes in body burdens that may be caused by altered project operations under a new license and to assess risk to the health of humans and piscivorous wildlife.

The results of historical monitoring conducted by CDWR and Henrici along with PG&E's screening-level and Basin-Plan-level investigations of fecal coliform densities suggest that fecal coliform standards set in the Basin Plan are generally satisfied in project waters. However, maintaining Lake Almanor at a higher level as PG&E proposes or project or non-project sources may result in increased contamination of Lake Almanor waters and could result in exceedance of the criteria for water contact recreation. Results of monitoring fecal coliform levels using a method that is consistent with the Basin Plan criterion and targets high recreational use periods such as the Independence Day or Labor Day holidays would ensure that project waters comply with the standard.

We concur with CDFG that it would be appropriate to select sampling stations prior to each season of monitoring based on the presence of water contact recreation and sources of potential introduction of pathogens to the water column in the immediate area. However, we conclude that by monitoring coliform levels for the first 3 years would sufficiently document coliform levels and identify non-compliance with the standard, should it occur. As recreational use of the area increases and additional recreational facilities are developed and used there could be increased contamination of surface waters. The recreation management plan discussed in section 3.3.5, *Recreational Resources*, would address appropriate actions to minimize contamination from new recreational developments and any monitoring of the effects of these developments on water quality. It is also possible that ongoing erosion along the shoreline of Lake Almanor could potentially result in contamination of the lake's waters by interception of leach fields located adjacent to eroding areas. Implementation of the

¹⁹ Assuming the person weighs 70 kilograms (154 pounds).

Shoreline Management Plan discussed in *Lake Almanor Shoreline Erosion* below would address appropriate actions to determine if shoreline erosion is resulting in contamination from leach fields and appropriate measures to remedy the situation, if necessary.

Water Temperature and Dissolved Oxygen Management

Daily mean water temperatures in the Belden reach frequently exceed 20°C during June through September (see table 3-7) and, as such, become suboptimal for trout. In addition, the daily mean temperature of water discharged from the Belden powerhouse frequently exceeds 20°C during July through September. As water flows downstream, its temperature tends to further increase as it equilibrates with ambient conditions, which generally include warmer air temperature (Moore and Miner, 1997). In years when Lake Almanor summer water surface levels are substantially below full pool, resulting in the drafting of warmer water, water temperatures in the Rock Creek and Cresta reaches can exceed 20°C by as much as 1 to 3°C in the Rock Creek and Cresta reaches (PG&E, 2000b, as cited in FERC and Plumas National Forest, 2001; PG&E, 2003b, 2004b), and can exceed 20°C by as much as 2 to 4°C in the Poe reach (PG&E, 2003e).

The SA for the UNFFR Project does not include any measures specifically aimed at addressing water temperature, although some of the measures included could influence water temperatures during critical periods. These measures include revising the flow regimes of the project's bypassed reaches and releasing Seneca reach instream flows from the Canyon dam outlet tower upper-level gate instead of the low-level gate from September 15 through at least November 1.

In its November 1, 2004, filing with the Commission, the FS states that it fully supports the water quality component of the UNFFR SA. In its final terms and conditions filed with the Commission on November 4, 2004, the FS does not provide any provisions addressing water temperature.

As part of the SA for the Rock Creek-Cresta Project, PG&E agreed to conduct a modeling study to predict the effectiveness of modifying the Prattville intake to maintain daily mean water temperatures of 20°C or less in the Rock Creek and Cresta reaches and implement all reasonable practicable control measures (PG&E, 2000a). PG&E has been conducting these feasibility studies, including modeling the water temperature effects of potential Prattville intake modifications, re-operation of the Canyon dam outlet gates, and modification of Caribou No. 2 intake for the past few years. In response to an AIR issued by the Commission on December 17, 2004, PG&E filed several reports addressing this issue on January 13, 2005. PG&E continues to evaluate the feasibility and effectiveness of some potential methods of reducing downstream water temperatures and meets with state and federal agencies, local counties, and interested stakeholders to discuss this issue. In a public statement that

PG&E released on November 18, 2004, it states that it does not anticipate proposing a floating thermal curtain²⁰ in Lake Almanor as a reasonable control measure for reducing downstream water temperatures in the NFFR. PG&E filed a report on water temperature for the Rock Creek-Cresta Project on July 29, 2005, and amended the report to make it clear that it presented its view, not the view of others including the ERC on September 21, 2005 (PG&E, 2005b). In this report, PG&E states that it had not identified an alternative for which the benefits were commensurate with the corresponding adverse effects and costs and concludes that there are no additional reasonable water temperature control measures for achieving a year-round water temperature of 20°C or less in the subject reaches.

Interior made its Section 10(j) recommendations in a December 1, 2003, filing with the Commission, and provided modifications to its recommendations in an October 27, 2004, filing with the Commission. On February 3, 2005, Commission staff had a teleconference with Interior and other resource agencies to resolve apparent inconsistencies with the FPA. Interior recommends that PG&E develop a water temperature management plan that includes evaluation of potential effects on the coldwater fishery of the Seneca and Belden reaches, and fund construction/modification of structure(s) to satisfy appropriate water temperature criteria beyond that provided by the Coldwater Habitat and Fishery Mitigation and Enhancement Fund under the relicensing SA for the Rock Creek-Cresta Project. Interior recommends that it be included among the consulted entities during plan development and that the plan be developed within 6 months of license issuance.

In addition, Interior recommends that PG&E establish a process to develop appropriate additional temperature criteria for the Seneca and Belden reaches by season, reach, and outlet location to avoid unintended adverse effects of sublethal temperature stress on aquatic biota as a result of structures or operations that involve planned surface water release discharge. These criteria would be included in the water temperature management plan. The plan would include a schedule for construction of structure(s) demonstrated to reasonably meet temperature targets. PG&E would complete construction within 5 years of license issuance. In the event that any new license does not include a specific measure focused on management of water temperature, Interior requests that PG&E consider temperature effects and the need for management criteria within the context of Interior's 10(j) recommendation no. 13 for adaptive management.

²⁰ The floating thermal curtain referred to is a large, flexible geotechnical-fabric sheet held in place with buoys and anchors in front of the Prattville intake to help withdraw water from deeper areas in the lake and thereby reduce the temperature of water discharged from the Butt Valley powerhouse and eventually supplied to the lower NFFR.

On October 12, 2004, Plumas County issued Resolution 04-7076, which states its concerns with the potential to modify the Prattville intake and further evaluate the use of floating curtains in Lake Almanor and Butt Valley reservoir (Plumas County, 2004). This resolution declares the county's adamant opposition to construction of the Prattville intake modification (thermal curtain) because it would substantially degrade the balance of the Lake Almanor and Butt Valley reservoir ecosystems resulting in their fisheries and the local socio-economic status being depressed, be extremely costly to PG&E's ratepayers, would only minimally reduce temperatures in the lower NFFR even with two additional curtains in Butt Valley reservoir, and provide minimal benefit to the lower NFFR fishery. In addition, the county notes that dredging of Lake Almanor for the curtain would apparently disturb cultural and burial sites of the Maidu Tribe.

The Maidu Summit (2004) and Susanville Indian Rancheria (2004) also issued resolutions expressing their opposition to installation of thermal curtains in Lake Almanor or Butt Valley reservoir, and dredging of soil on the bottoms of Lake Almanor and Butt Valley reservoir. Their resolutions support upstream restoration as an alternative method of cooling water in the NFFR.

At the meetings we held to receive comments on the draft EIS, several elected officials or their representatives provided comments on the thermal curtain and further evaluation of alternatives to provide cooler water to the lower NFFR. Representatives of Congressmen Doolittle and Herger, State Senator Aanestad, and Assemblymen Keene and LaMalfa noted that their constituency has expressed a widespread and deep opposition to installing or further study of a "thermal curtain," and recommended that other alternatives to provide cool water be evaluated more extensively.

Special interest groups and numerous members of the public also have expressed their opposition to modifying the Prattville intake or Butt Valley reservoir with a floating curtain(s) and dredging sediments from the bottom of Lake Almanor. In its October 27, 2004 letter, the Butt Lake Anglers Association indicates that using a floating curtain to draft cold water from Lake Almanor should not be considered a reasonable alternative. The Save Lake Almanor Committee filed petitions signed by more than 3,000 people that express vehement opposition to building floating curtains at Lake Almanor and Butt Valley reservoir as well as dredging 42,000 cubic yards of sediment from the bottom of Lake Almanor and placement of that sediment along the Lake Almanor shoreline.

Our Analysis

Several controllable (including project operations) and non-controllable factors can affect water temperatures in the project's impoundments and bypassed reaches and the lower NFFR. Retention of water in project impoundments warms surface waters and increases thermal stratification within the impounded reaches during spring through summer, because the water is exposed to sun and air for longer periods than would

occur naturally. This leads to the supply of warmer water than would naturally occur to downstream reaches during summer and fall, depending on the depth from which the water is drafted. In addition, diverting water from natural stream courses typically causes increases of summer temperatures in most bypassed reaches. However, diverting water around stream reaches that receive substantial groundwater inflow can have a cooling effect compared to natural conditions. Figure 3-5 shows existing NFFR basin summer water temperatures and relative water storage and flow rates to provide an overview of water temperatures in the basin and potential sources of cool water.

During the past 20 years, considerable effort has been expended by PG&E and others to evaluate the effects of numerous factors on water temperatures in the NFFR basin and identify reasonable and practicable ways to reduce summer temperatures in the lower NFFR. PG&E (2005b) summarizes the results of a wide variety of control measures that were evaluated. Potential water temperature control measures that have been evaluated by PG&E can be divided into six primary categories: (1) changes in hydro-project operations; (2) modification of hydro-project facilities; (3) water piping and pumping strategies; (4) implementation of mechanical cooling technologies; (5) enlargement or creation of reservoirs; and (6) management of streamside vegetation.

Evaluations of changes in hydro-project operations included changing instream flows in bypassed reaches of PG&E's hydro-power projects along the NFFR, reducing Butt Valley and Caribou powerhouse flows, and preferential use of the deeper Caribou No. 1 over No. 2 intake and use of deeper gates at the Cresta intake. PG&E evaluated the potential effects of modifying its hydro-project facilities to draft cooler water through the Prattville intake during critical periods and reduce warming of water as it flows through Butt Valley reservoir (see figure 1-1). Potential modifications evaluated for the Prattville intake include two bottom sill designs to promote storage of cold water in Lake Almanor prior to July, six thermal curtain configurations and three pipeline configurations with varying levels of dredging to promote drafting cooler water from Lake Almanor in the critical season. Modifications aimed at reducing warming of water as it flows through Butt Valley reservoir include a skimmer wall located up-reservoir of the Caribou intakes, two thermal curtains in the reservoir, and extending the Caribou No. 2 intake with a pipeline to draft deeper water.

The only piping and pumping strategy that was evaluated for the NFFR Project area was piping water from the lower end of the Seneca reach to just downstream of the Belden dam. Piping and pumping strategies evaluated for downstream reaches of the NFFR include piping water from Yellow Creek or the Bucks Creek powerhouse to just downstream of the next dam on the NFFR, piping water from Poe tunnel adit No. 1 to the NFFR near Bardee's Bar, pumping water from Lake Oroville to just downstream of each of PG&E's three lowermost dams on the NFFR, and pumping well water to the NFFR. Measures that would implement mechanical cooling technologies include installation of cooling towers and water chiller systems.

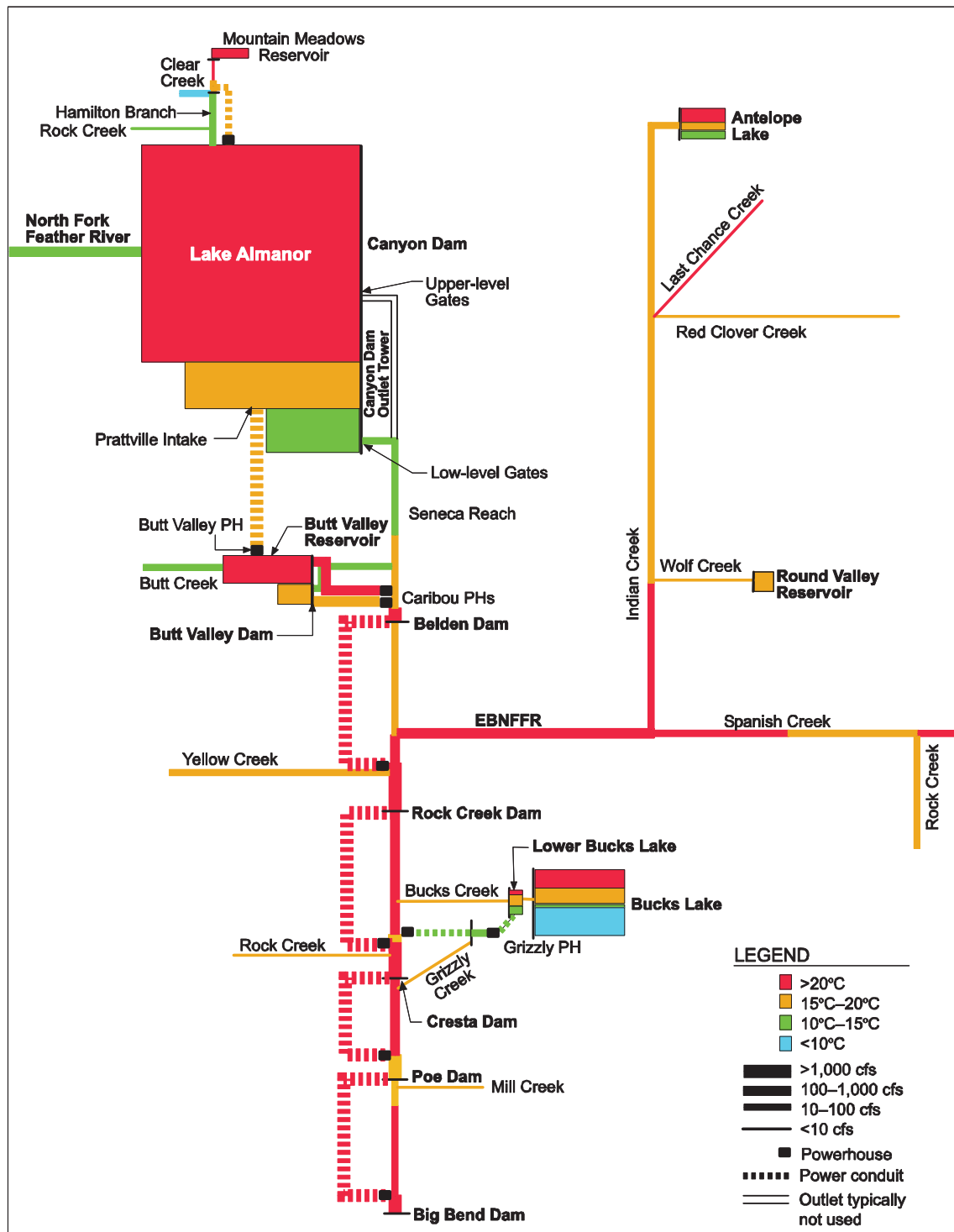


Figure 3-5. Schematic of summer water temperatures displaying relative flows and water storage in the North Fork Feather River Basin under typical existing conditions. (Sources: CDFG, 1988; EPA, 2005; PG&E 2005a, 2004b, 2003f; Plumas Corporation, 2004)

PG&E also evaluated the feasibility and effectiveness of enlarging Round Valley reservoir and creating new reservoirs in tributary basins to the NFFR. In addition, PG&E evaluated the potential effects of managing streamside vegetation in the EBNFFR and its tributaries.

In appendix D, we initially evaluate the advantages and disadvantages of 42 potential measures that could affect water temperatures. Appendix D also identifies which of these control measures we analyze further in this section of the EIS. Our initial analysis indicates that 20 of the potential control measures would not be feasible or effective at substantially reducing summer temperatures for prolonged periods in the lower NFFR reaches. Potential measures that would not be feasible or effective include preferential use of Caribou No. 1 over No. 2 powerhouse, preferential use of the deeper Cresta dam outlet gates, a pipeline extension of the Caribou No. 2 intake, all potential piping and pumping control measures evaluated, mechanical cooling towers and chillers with the exception of a cooling tower along the Rock Creek reach, all measures aimed at reducing temperatures in tributaries to the NFFR,²¹ two of the Prattville intake curtains evaluated (Curtains 1 and 2), and 3 of the 4 pipeline extensions to the Prattville intake evaluated. Although the measures aimed at reducing temperatures in the East Branch of the NFFR and its tributaries would result in localized cooling, they would have negligible effects on NFFR summer temperatures due to the quantities of water affected in comparison to NFFR quantities.

Our initial evaluation of potential Prattville intake modifications is primarily based on work completed by the University of Iowa, Iowa Institute of Hydraulic Research (IIHR). The IIHR constructed a physical model of a 3.1 by 1.9 mile section of Lake Almanor, which it used along with several numerical models to predict the effects that 14 potential Prattville intake modifications would have on the temperature of Prattville intake withdrawals and hydraulics near the intake (Ettema et al., 2004; appendix D). The IIHR conducted screening tests for six floating thermal curtains with lengths ranging from about 0.25 to 0.75 mile, and different configurations around the intake.²² Results of these screening tests indicate that Prattville intake withdrawals of 1,600 cfs in August would be 1.0 to 4.5°C cooler than existing conditions depending on the curtain configuration. The largest predicted reduction was 4.5°C for the 4,000-foot-long Curtain 5 followed by 3.5°C for the 2,770-foot long Curtain 4. The IIHR's modeling predicted that the approximately 3,000-foot-long Curtain 3 would result in a

²¹ Potential measures that we consider “aimed at reducing temperatures in tributaries to the NFFR” consist of enlarging Round Valley reservoir, constructing a new large reservoir in a tributary to the NFFR, and management of streamside vegetation along the East Branch of the NFFR and its tributaries.

²² More detailed descriptions of the Prattville intake curtains evaluated are provided in Ettema et al. (2004).

little less temperature reduction (3.1°C) in August. Results of additional testing led to predictions that Curtain 4 in combination with removal of the levees along the submerged channel to the eastern lobe of the lake would result in August withdrawal temperatures of 5.2°C cooler than existing conditions (i.e., 0.7°C cooler than the 0.25-mile-longer Curtain 5 without levee removal). Additional modeling of other Prattville intake modifications indicates that extending the intake with a long pipeline with a hooded inlet in combination with removal of the submerged levees would reduce existing August withdrawal temperatures by approximately the same amount as Curtain 4 without removal of the levees (3.8°C versus 3.6°C). The pipeline would result in adverse effects from dredging the levees and a short-term interruption of the use of Butt Valley powerhouse while the pipeline is connected to the intake; whereas, similar cooling effects with Curtain 4 would not result in these adverse effects. Therefore, we did not further consider modifying the Prattville intake with the long pipeline with a hooded inlet in combination with removal of the submerged levees. Evaluation of using curtains in Butt Valley reservoir along with Curtain 4 at the Prattville intake indicates that this would result in cooler discharges from the Caribou powerhouses, although this would add substantially to the cost. To minimize the cost-benefit ratio associated with modifying the Prattville intake and supplying cooler water to the NFFR, the Prattville intake modifications that we further evaluate are Curtain 4 with and without removal of the levees along the submerged channel to the eastern lobe of Lake Almanor.

Based on our analysis in appendix D, we focus our analysis here on the following five temperature control measures along with existing conditions, which we use as the baseline condition for comparison:

- Proposed MIF
- Modified MIF
- Proposed MIF with thermal curtain
- Proposed MIF with thermal curtain and removal of levees
- Proposed MIF with thermal curtain, removal of levees, and Canyon dam blending

PG&E's modeling effort focused on evaluating the effects of temperature control measures and other measures that affect water temperature in the project area has evolved and changed its center of focus through time. This has resulted in the use of four primary different modeling approaches and varying levels of effort being used to evaluate the effects of the five measures that we further evaluate below. As previously described, the IIHR used a physical model in combination with numerical models to predict the effects that modifying the Prattville intake would have on temperatures drafted through the Prattville intake and hydraulics within Lake Almanor (Ettema et al,

2004). In addition, PG&E used a modified version of MITEMP3 (a one-dimensional lake temperature model developed by Massachusetts Institute of Technology; Jirka et al, 1978 as cited by Bechtel and TRPA, 2004; Octavio et al., 1980 as cited by Bechtel and TRPA, 2004) to model the water temperature in Lake Almanor, Butt Valley reservoir, and their outflows. In order to more closely evaluate the effects of Curtain 4 with removal of the levees along the submerged channel, version 3.1 of CE-QUAL-W2 (a two-dimensional, laterally averaged, hydrodynamic, and water quality model developed by the U.S. Army Corps of Engineers; Cole and Buchak, 1995; Portland State University, 2005) was used to model the effects on the DO regime of Lake Almanor and Butt Valley powerhouse discharges. Because the CE-QUAL-W2 model requires modeling temperature to model DO, we also used its predictions of Lake Almanor temperatures. Water temperatures in stream reaches are typically about the same throughout the water column, but differ longitudinally. Therefore, a different model was used for these reaches. SNTMP (a steady-state stream temperature model developed by the FWS; Theurer et al., 1984) was selected and used to model temperatures in the Seneca, Belden, Rock Creek, Cresta, and Poe reaches. Generally, the thermal effects of each of the impoundments upstream of the Belden, Rock Creek, Cresta, and Poe dams were assumed to be negligible and were not modeled.

To further evaluate the effects of the five control measures selected for further evaluation, we compiled study results for the critical June through September period. The varying model assumptions and levels of effort employed by PG&E make comparing the effects of the control measures difficult. For example, it was not possible to evaluate the Modified MIF scenario in the same way as other control measures, since it had been evaluated in a different manner than the other measures. Our evaluation of the other four measures selected for further evaluation was focused on effects for normal, reasonable extreme, and extreme hydrological and meteorological conditions. We provide the details of the basis for these more detailed evaluations of control measures in appendix E. Our overall approach included consolidating data for each of the control measures selected along with the existing conditions and then plotting these data so that the predicted effects of the measures could be readily compared. Including existing conditions in these plots makes it possible to assess the level of improvement that is expected under each of these measures. Modeled normal, reasonable extreme, and extreme water temperatures for the Prattville intake and discharge-weighted Caribou powerhouse discharges are displayed in figure 3-6, and modeled temperatures for the NFFR are displayed in figures 3-7 through 3-9.

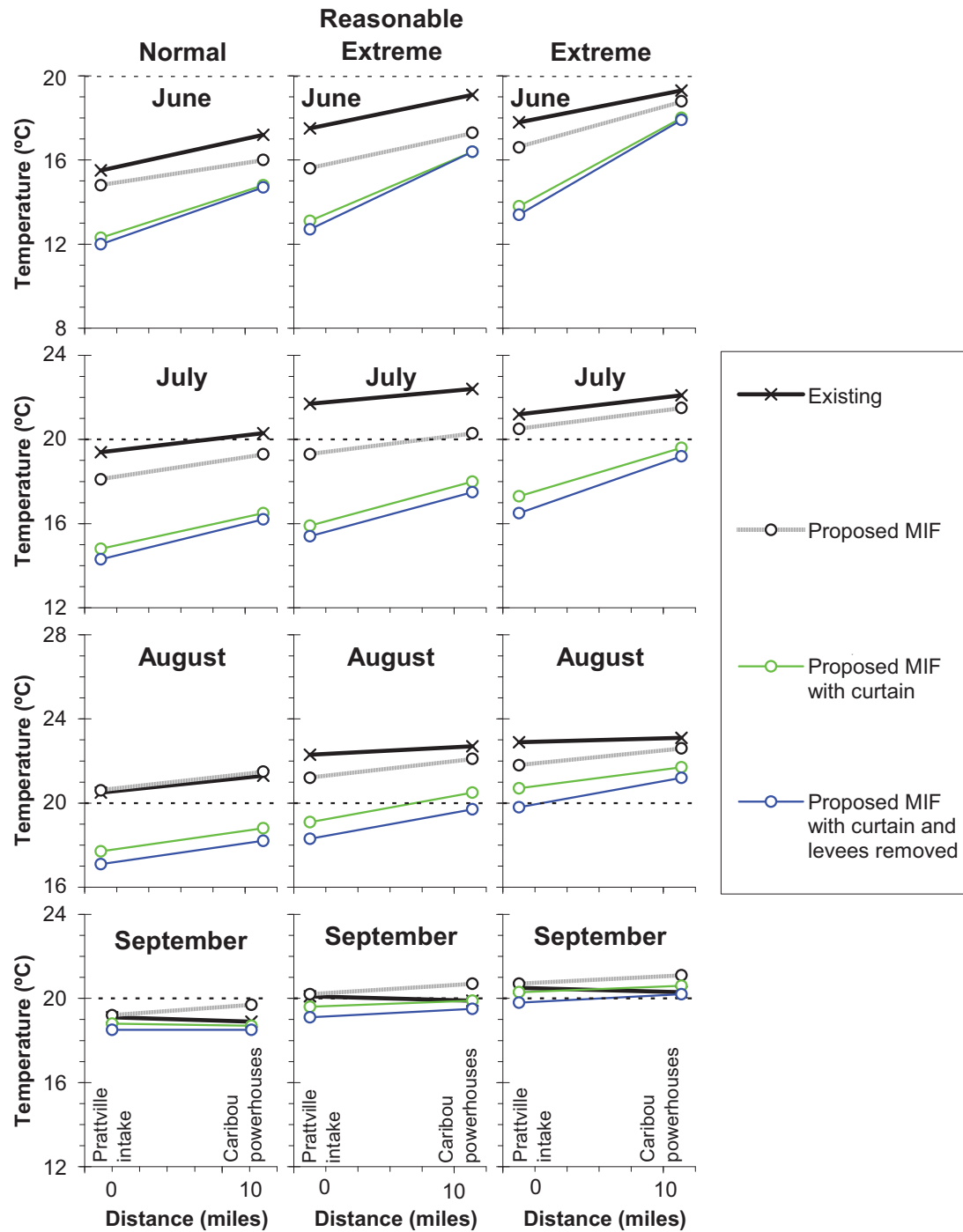


Figure 3-6. Representative Prattville intake and discharge-weighted Caribou powerhouse modeled water temperatures for normal, reasonable extreme, and extreme hydrological and meteorological conditions. (Sources: Bechtel and TRPA, 2004; PG&E, 2003c, as modified by staff)

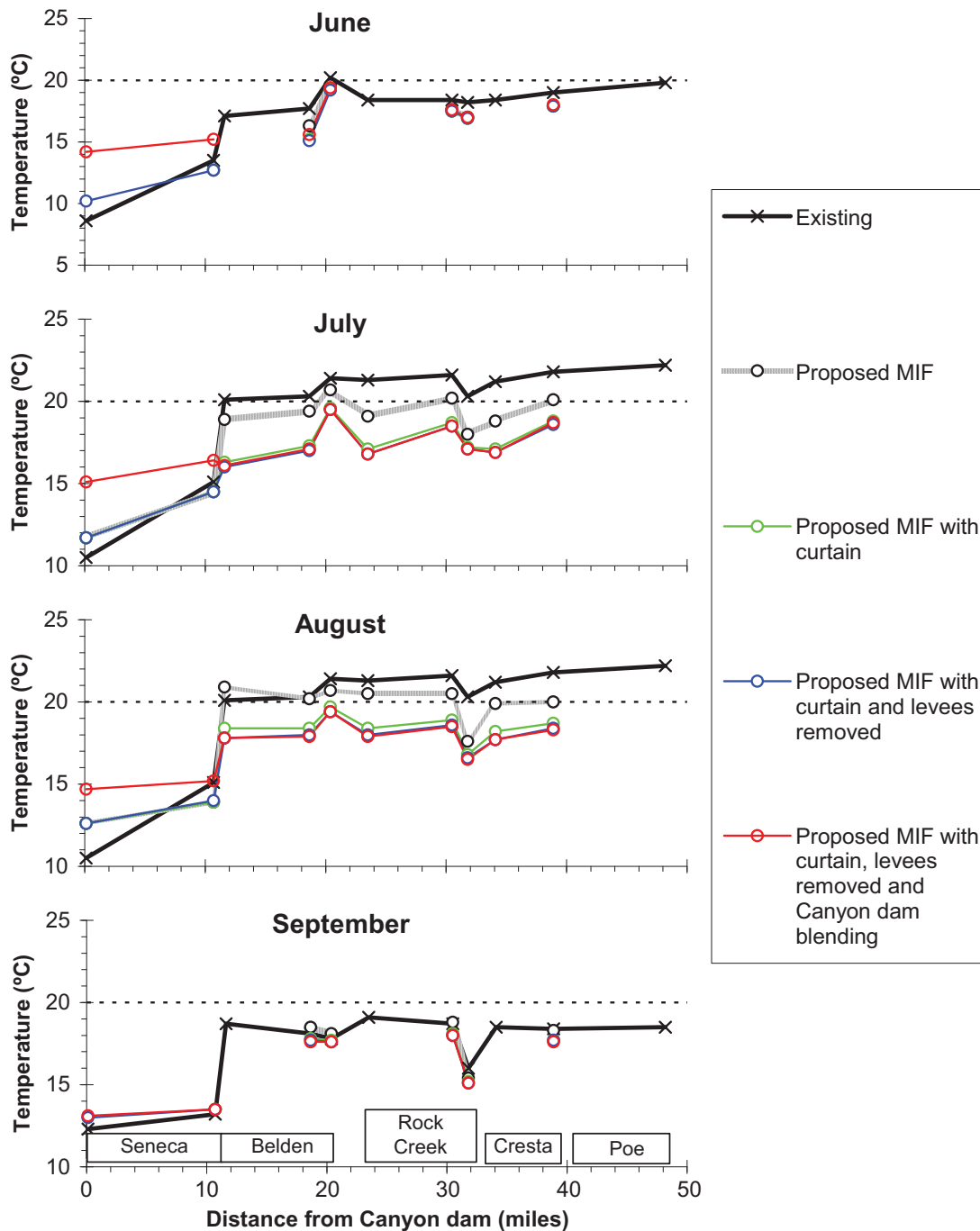


Figure 3-7. Representative modeled water temperatures for normal hydrological and meteorological conditions with Rock Creek-Cresta Project required first 5-year minimum flows and Poe reach required minimum flows. (Sources: Bechtel and TRPA, 2004; PG&E, 2004b, 2003b, 2003c, 2003e, as modified by staff)

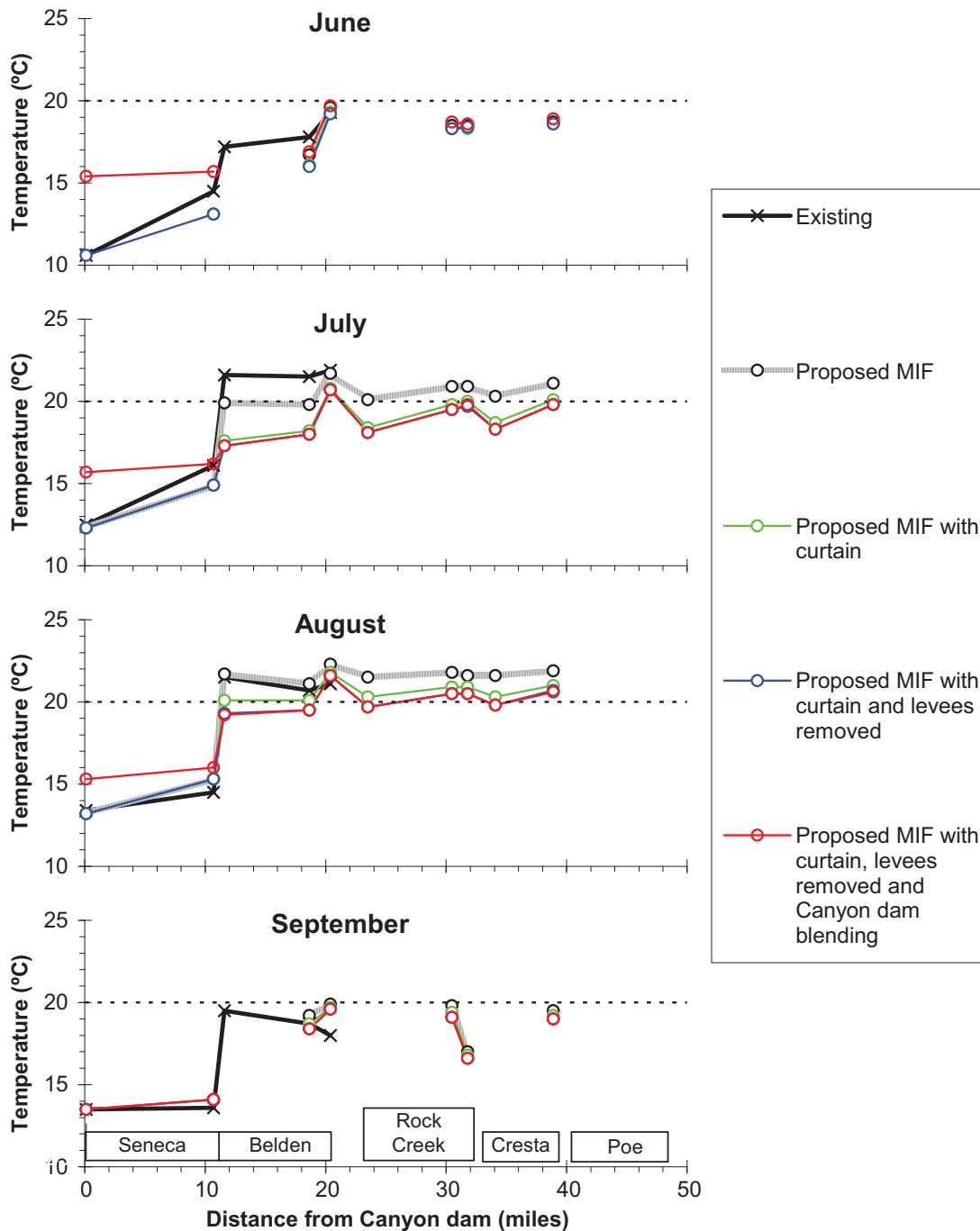


Figure 3-8. Representative modeled water temperatures for dry hydrological and reasonable extreme meteorological conditions with Rock Creek-Cresta Project required first 5-year minimum flows and Poe reach required minimum flows. (Sources: Bechtel and TRPA, 2004; PG&E, 2004b, 2003b, 2003c, 2003e, as modified by staff)

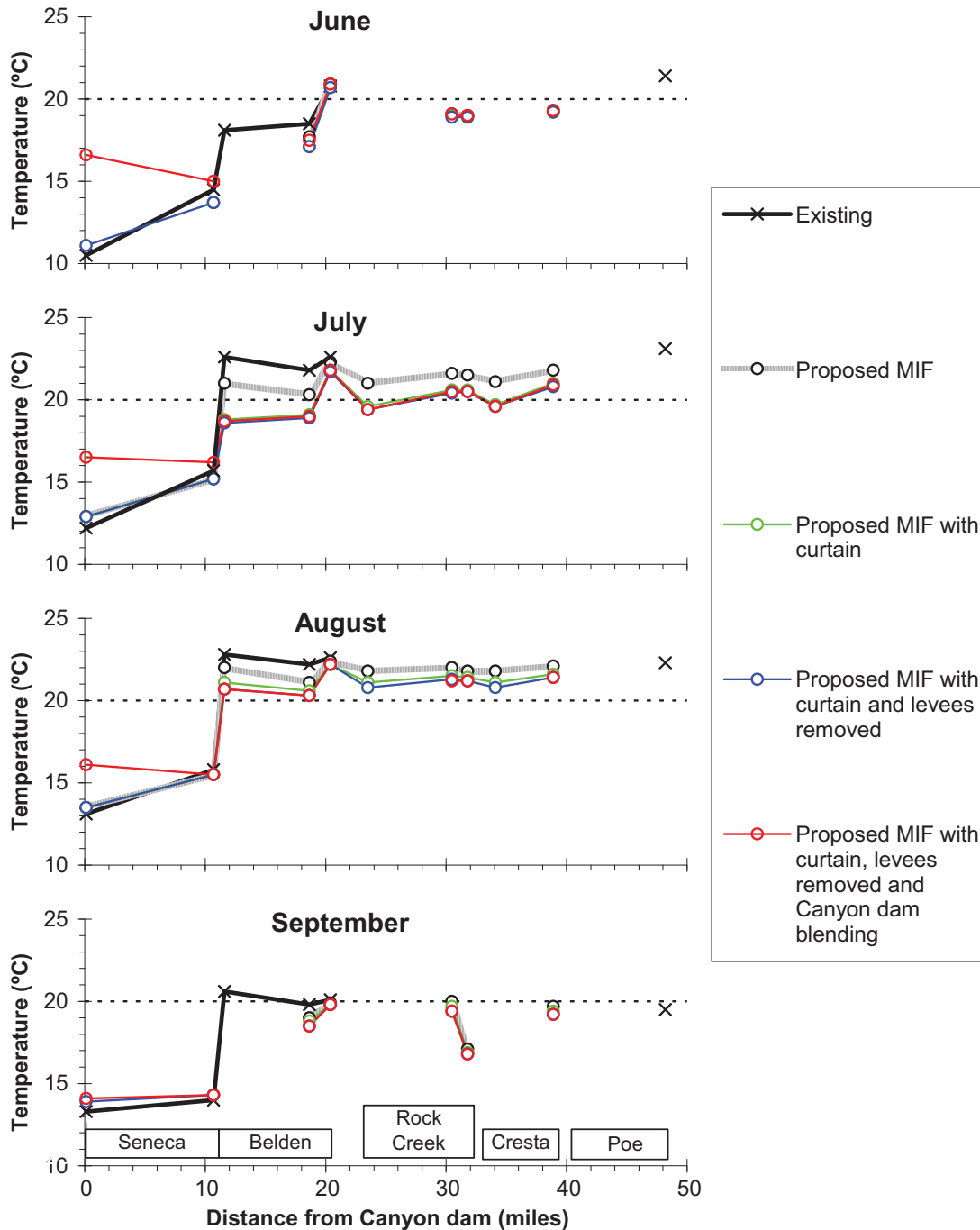


Figure 3-9. Representative modeled water temperatures for critically dry hydrological and extreme meteorological conditions with Rock Creek-Cresta Project required first 5-year minimum flows and Poe reach required minimum flows. (Sources: Bechtel and TRPA, 2004; PG&E, 2004b, 2003b, 2003c, 2003e, as modified by staff)

Existing Conditions—Under existing conditions, thermal stratification of Lake Almanor is well established from June through mid-September. The epilimnion extends down to a depth of about 30 to 40 feet and a hypolimnion resides below a depth of about 50 feet. The Prattville intake is located in a steep-sided trough in a cove of the relatively shallow western lobe of the lake. A submerged channel, which has an invert elevation of approximately 4,422 feet (PG&E datum), leads to the intake, which has an invert elevation of 4,410 feet (PG&E datum). The remainder of the area around the Prattville intake is relatively shallow and water needs to flow over a sill that has a minimum elevation of approximately 4,436 feet (PG&E datum) to reach the intake (see figure 3-3). As a result, water is typically drafted from throughout much of Lake Almanor's water column (Ettema et al, 2004), which results in discharges of greater than 20.0°C from the Butt Valley powerhouse in July, August, and September (table 3-7 and figure 3-6). As water flows through the Butt Valley reservoir and to the Caribou intakes, additional warming occurs due to solar radiation and the retention time in the reservoir. Monitoring results also indicate that water warmer than 20.0°C is drafted through the shallower, Caribou No. 2, intake in June, although the weighted temperature of water discharged from the two Caribou powerhouses remains cooler than 20.0°C in June. Peak water temperatures remain cooler than 17.0°C in the Seneca reach under typical operations, but they sometimes exceed 20.0°C in portions of the Belden reach and other downstream reaches (table 3-7 and figures 3-7 to 3-9) during the months of June through September.

The December 2003 and January 2004 underwater inspections of the Canyon dam outlet gates indicate that the rollers for the low-level gates were malfunctioning, which has resulted in PG&E using the upper-level gates instead of the low-level gates since 2004. PG&E is currently conducting restoration efforts that should enable use of low-level Gate No. 5 soon (PG&E, 2004c). Following completion of these restoration efforts, no additional construction should be needed to enable PG&E to resume its typical use of the low-level outlet gates. Therefore, no construction-related water quality effects are anticipated from continuing operations with the existing MIFs.

Proposed MIF—Modeling results (PG&E, 2003c) suggest that implementing the proposed Canyon dam MIF regime would have very little effect on temperatures and stratification within Lake Almanor. However, the model results also suggest that implementation of the proposed MIFs could result in cooler water being drafted through the Prattville intake and discharged from the Butt Valley powerhouse during June through August (figure 3-6) (Bechtel and TRPA, 2004; PG&E, 2004b, 2003c). This can be explained by the increased Canyon dam releases reducing the quantity of water drafted through the Prattville intake and thereby reducing the percentage of water drawn from the warm, less dense, epilimnion to the depth of the intake. Implementation of the proposed MIF regime is expected to have negligible effects on the temperature of water drafted through the Prattville intake and discharged from the Butt Valley powerhouse during September, due to the relatively small change in Canyon dam flow releases in

comparison to existing conditions and weaker thermal stratification in Lake Almanor at that time. Based on model results, it appears that under the proposed MIF cooler water would generally be discharged into the NFFR from the Caribou powerhouses during June through August than occurs under existing conditions.

Implementation of PG&E's proposed MIFs with all releases to the Seneca reach being drafted through the Canyon dam tower low-level outlet gates with an invert elevation of 4,422 feet msl (PG&E datum) would continue to result in water temperatures cooler than 20.0°C in the Seneca reach. Although cooler than existing conditions, Caribou powerhouse discharges would continue to substantially increase NFFR summer temperatures, and temperatures of greater than 20.0°C would still occur in the Belden reach and bypassed reaches of PG&E's downstream projects (figures 3-7 through 3-9). However, model results suggest that water temperatures would generally be reduced relative to existing conditions by 0.5 to 2°C in the Belden reach during July and August even in dry and critically dry years, which is the period when most temperatures of greater than 20.0°C occur. The unavailability of predictions of temperatures for the existing conditions in reaches downstream of the Belden powerhouse under reasonable extreme or extreme conditions limits the ability to evaluate the effects of implementing the proposed MIFs during those water year types. However, the limited model results for reaches of downstream projects suggest that July and August NFFR temperatures would be reduced by about 1 to 2.5°C under normal hydrological and meteorological conditions.

PG&E is currently conducting restoration efforts that should enable use of Canyon dam outlet low-level Gate No. 5 to provide the proposed Canyon dam MIF releases. Therefore, no construction-related water quality effects are anticipated from implementation of the proposed MIFs.

Modified MIF—PG&E recently used a simplified modeling approach to determine the effects of even higher low-level Canyon dam releases with corresponding reduced Butt Valley and Caribou powerhouse flows on NFFR temperatures (PG&E and Bechtel, 2005; McGurk and Tu, 2005). This analysis focused on the ability to maintain temperatures of 19.0°C or less at the Belden dam, which would allow 1.0°C of warming in the Belden reach before exceeding 20.0°C. Results of this analysis suggest that 200-cfs releases from the Canyon dam outlet low-level gates would reduce the frequency that temperatures exceed 19.0°C at the Belden dam in July from 82 percent with PG&E's proposed MIF to 50 percent. Similarly, model results suggest that the frequency of exceeding 19.0°C in August would be reduced from 100 percent with PG&E's proposed releases to 70 percent with a 400-cfs release. Providing these larger Lake Almanor releases through Canyon dam instead of the Butt Valley powerhouse would reduce flows through the Butt Valley reservoir during the period when the hottest ambient conditions occur and thus would increase the depth of the Butt Valley reservoir

epilimnion and temperatures in it and result in adverse effects on the Butt Valley reservoir's coldwater fishery.

Implementation of this measure would not require physical modifications of the project facilities, and is therefore not expected to result in construction-related water quality effects.

Proposed MIF with Thermal Curtain—The temperature of Butt Valley powerhouse discharges is highly influenced by the characteristics of the Prattville intake and its surrounding area. This intake is located on the southwestern shore of Lake Almanor's western lobe, which receives most of its flow from the NFFR (see figure 1-1). This lobe of the lake is much shallower than the lake's eastern lobe which receives inflow from Big Springs, Hamilton Branch, and the Hamilton Branch powerhouse. The invert of the Prattville intake is at an elevation of 4,410 feet (PG&E datum) and located at the bottom of a 40-foot-deep steep-sided constructed trough. In the 1920s, a channel that was about 90 feet wide and 13 feet deep was constructed to link the Prattville intake with the Big Springs area in the eastern lobe of the lake. This channel was constructed to facilitate the Prattville intake drafting cooler water from the springs. When the channel was constructed, excavated sediments were placed along it, creating underwater levees. However, physical modeling of a large portion of the lake shows that the channel is not particularly effective at delivering cold bottom water to the intake, and that little water flows across the fairly flat bed of the western lobe of the lake or along the submerged channel to the intake (Ettema et al., 2004). Instead, studies show that even with the channel in place, most of the water that is entrained into the Prattville intake comes from the higher levels in the water column in the vicinity of the intake and the adjoining shoreline, when operating at its normal flow of 1,600 cfs (PG&E, 2002a; Ettema et al., 2004). As a result, warmer water is discharged from the Butt Valley powerhouse than would occur if the intake drafted more water from along the bottom of the lake or the deeper eastern lobe of the lake and less from the surface.

PG&E investigated the effectiveness of modifying the Prattville intake with the placement of a 700-foot-long by 900-foot-wide U-shaped floating curtain with a bottom elevation of 4,445 feet (PG&E datum) around the Prattville intake (Curtain 4). This curtain would limit the area that water could flow under it to about 5,280 square feet along the bottom of the lake (Ettema et al., 2004). The submerged channel would provide 30 percent of the area in which water could flow under the curtain, and there would be almost no access to the intake from the relatively shallow northeast side of the curtain. Dye studies conducted in the physical model of a large portion of Lake Almanor indicate that modifying the Prattville intake with Curtain 4 would result in drawing more cold water from the deeper eastern lobe of the lake, and substantially increasing the flow of cold water that is drawn along the submerged channel (Ettema et al., 2004). The amount of warm epilimnetic water that would be drafted under the curtain would depend on flow rates through the Prattville intake. As Prattville intake

flow increases, a higher percentage of water would be drawn from the epilimnion outside of the curtain. Results of physical modeling of Curtain 4 suggest that at a Prattville intake flow of 1,600 cfs, 13.3 percent of the flow would be directly supplied by the submerged channel (Ettema et al., 2004).

Modeling predicted that operating the project with Curtain 4 and PG&E's proposed MIFs would deplete the volume of Lake Almanor's cool-water hypolimnion, increase the depth of the thermocline, and slightly increase the temperature of water in the epilimnion (Bechtel and TRPA, 2004). Water that is substantially cooler (about 4°C) than under existing conditions would be drafted through the Prattville intake during June, July, and August (see figure 3-6). September Prattville intake withdrawals would generally be only about 0.5°C cooler than without the curtain. The much cooler Butt Valley powerhouse discharges in June through August would warm at a faster rate than under existing conditions in Butt Valley reservoir, although the overall cooling effect of implementing this measure would still reduce Caribou powerhouse discharge-weighted temperatures to well below 20.0°C under normal conditions. However, Caribou powerhouse discharge-weighted temperatures would still exceed 20.0°C during extreme conditions in August and September and reasonable extreme conditions in August (see figure 3-6).

Modification of the Prattville intake as described above would have virtually no effect on temperatures in the 10.8-mile-long Seneca reach. During July, the cooler Caribou powerhouse discharges would further reduce the temperature of the proposed instream flow releases at Belden dam by about 2.0 to 2.5°C and maintain temperatures at less than 20.0°C (see figures 3-7 to 3-9). During September and critically dry Augusts, smaller reductions in Caribou powerhouse temperatures would have much less effect on NFFR temperatures than in July. Model results indicate that temperatures of greater than 20.0°C would occur at the Belden dam and in the Belden reach during reasonable extreme and extreme conditions in August, but the minor cooling effect would likely maintain Belden reach temperatures of less than 20.0°C in September. Model results also indicate that modifying the Prattville intake with Curtain 4 along with implementation of the proposed MIFs would reduce temperatures in the bypassed reaches of PG&E's downstream projects. Temperatures of less than 20.0°C would likely occur in the Rock Creek, Cresta, and Poe reaches under normal conditions. However, model results also show that temperatures of greater than 20.0°C would still occur in the Rock Creek and Cresta reaches under reasonable extreme and extreme conditions in August and extreme conditions in July. Although modeled temperatures are not available for the Poe reach, it is reasonable to conclude that temperature reductions in the Poe reach would be less than those in the Rock Creek and Cresta reaches and daily mean temperatures of greater than 20.0°C would continue to occur.

Although PG&E has not filed the results of any modeling efforts aimed specifically at evaluating the effects of the thermal curtain without removal of the levees

on DO concentrations, it conducted a CE-QUAL-W2 modeling effort to evaluate the effects that the curtain with levee removal would have on the DO regime of Lake Almanor and Butt Valley powerhouse discharges. We present the results of this modeling effort along with our conclusions for the curtain without removal of the levees in the following subsection.

Construction and installation of the curtain as designed by Black & Veatch (2004) would result in minimal effects on water quality in Lake Almanor and Butt Valley powerhouse discharges. Minor localized increases in turbidity could occur during and immediately following installation of galvanized steel walls from the shoreline of the lake to a point offshore where the bottom has an elevation of 4,463 feet (PG&E datum), and when anchors for the curtain are placed on the bottom of the lake. Filling the anchors with concrete once they are placed would increase the risk of contaminating surface waters. However, the potential adverse effects of the aforementioned actions could be minimized through the implementation of appropriate best management practices (BMPs). Implementation of appropriate BMPs would generally limit adverse water quality effects to work areas in and along Lake Almanor, although negligible effects could occur in Butt Valley powerhouse discharges.

Proposed MIF with Thermal Curtain and Removal of Levees—Removal of the levees along the submerged channel would allow water near the lakebed to flow directly toward and under the curtain, while not substantially reducing the rate of flow along the submerged channel (Ettema et al., 2004). Model results indicate that this would allow 0.5 to 1°C cooler water to be drafted through the Prattville intake than with the curtain alone (see figure 3-6). As water flows through Butt Valley reservoir, its temperature would increase and reduce this cooling effect prior to being discharged from the Caribou powerhouses. The additional cooling effect of removing the levees would be largest in the NFFR during August, when Canyon dam instream flow releases are small, accretion is relatively low, and ambient temperatures are high (figures 3-7 to 3-9). Even under these conditions, levee removal would only provide about 0.5°C of additional cooling in the Belden reach, and temperatures would still exceed 20.0°C in reasonable extreme and extreme conditions. Model results indicate that temperatures in the Rock Creek and Cresta reaches also would still exceed 20.0°C during reasonable extreme and extreme conditions in August. Although modeled temperatures are not available for the Poe reach, it is reasonable to conclude that temperature reductions in the Poe reach would be less than those in the Rock Creek and Cresta reaches and that daily mean temperatures of greater than 20.0°C would continue to occur.

In addition to modeling of water temperatures, PG&E conducted a CE-QUAL-W2 modeling effort to evaluate the effects that the curtain with levee removal would have on the DO regime of Lake Almanor and Butt Valley powerhouse discharges. Modeling results indicate that operating the project with the modified Prattville intake would produce a 0 to 10 foot deeper thermocline in Lake Almanor,

depending on time of year and water year type, and slightly increase (0.0 to 0.5°C) temperatures in the epilimnion (Jones & Stokes, 2004). CE-QUAL-W2 model results do not indicate that this scenario would cause any major shifts in Lake Almanor's DO regime, although the combination of minor temperature increases in the epilimnion with the DO concentrations would reduce available habitat for salmonids. In addition, drafting more water from near the bottom of Lake Almanor would substantially reduce DO concentrations in discharges from the Butt Valley powerhouse into Butt Valley reservoir. The model predicts that DO concentrations of 1 to 3 mg/l would be common in Butt Valley powerhouse discharges during July and August. Because these low DO concentrations in Butt Valley powerhouse discharges would adversely affect water quality and aquatic organisms in Butt Valley reservoir, mitigation may be appropriate.

Because operating the project with the curtain installed without removing the levees would draft less water from near the bottom of the lake, we conclude that Butt Valley powerhouse discharges would have slightly higher DO concentrations than with the curtain and removal of the levees. However, even under these conditions, Butt Valley powerhouse discharges would still have DO concentrations that are substantially lower than existing conditions. These lower concentrations would adversely affect water quality and aquatic organisms in Butt Valley reservoir to the extent that mitigation may be appropriate. Mitigation for the low DO concentrations that would result from operating the project with the curtain with or without levee removal could potentially be done in a number of ways including hypolimnetic oxygenation in Lake Almanor or a turbine venting. We further evaluate the effects of the above thermal and DO effects on aquatic organisms along with other effects that the curtain and levee removal would have on aquatic organisms in section 3.3.2.2 and 3.3.2.3.

The construction-related water quality effects of this measure would be primarily associated with dredging the levees along the submerged channel and subsequent handling of the dredged material, although they also would include the construction-related effects of installing the curtain as discussed above. Implementation of this measure would require dredging of approximately 23,000 cubic yards of material from along the submerged channel. Black & Veatch (2004) considered several alternative dredging methods and suggested that conducting clamshell dredging from a spud-equipped barge would be the preferred dredging method for this project. This approach would likely include the use of transfer barges and a tug boat to transport the dredged material to the shoreline, a shore-based crane to unload the transfer barges, and equipment such as a large front-end loader to place the dredged material in the selected disposal area. We anticipate that the primary effect on water quality would be increased turbidity as the dredged materials decant after being placed on the transfer barge. It also is possible, depending on metal levels in the dredged sediments, that dredging would resuspend metals and thereby increase concentrations of metals in the water column for relatively short periods. The transfer of dredged materials to the shore-based operations and subsequent transport and placement of these materials could also increase turbidity

along the lake's shoreline. We anticipate that use of a temporary silt fence around the active dredging area and implementation of other appropriate BMPs would limit turbidity increases outside of the immediate work areas.

It is likely that the dredged material would be disposed of at one of two potential disposal sites, both under PG&E ownership: (1) a site immediately north of and adjacent to the Prattville intake, or (2) a former quarry site near the Canyon dam service center, located approximately 5 miles from the Prattville intake. Due to the close proximity of the site adjacent to the Prattville intake, use of this site would limit the need for unnecessary handling and hauling of the dredged material.

Proposed MIF with Thermal Curtain, Removal of Levees, and Canyon Dam Blending—PG&E and others have indicated that using the Canyon dam outlet tower's low-level gates to provide the entire flow release to the Seneca reach could result in temperatures that are too cold for aquatic resources in the Seneca reach (Bechtel and TRPA, 2004; PG&E, 2004b). Therefore, the effects of blending summer flow releases from the Canyon dam outlet tower's upper and low-level outlet gates were evaluated. The blending approach evaluated assumes a constant 60-cfs release from the low-level gates and all remaining flow releases being provided by the 45-foot higher upper gates, which have an invert elevation of 4,467 feet msl (PG&E datum).

Due to the large storage capacity of Lake Almanor, blending of Canyon dam flow releases is expected to have negligible effects on the thermal regime of the lake and the temperature of water drafted through the Prattville intake. However, water temperatures in the upper end of the Seneca reach would be increased substantially during June through August of most years (see figures 3-7 to 3-9). These increases would depend primarily on the percentage of the total flow release that is provided with the upper gates. Depending on water year type, the percentage of total flow provided by the upper gates for the proposed Seneca reach MIFs would range from 25 to 60 percent in June, 20 to 37 percent in July, and 14 to 25 percent, with the exception of Critically Dry water years, in August. Since PG&E's proposed Seneca reach MIFs for August in Critically Dry water years, and all Septembers are 60 cfs, the entire release would be provided by the low-level gates and thus would not be affected by blending. Modeling results suggest that Canyon dam releases in June through September would generally be in the range of 13.5 to 16.5°C and would remain within this range throughout the Seneca reach. Model results indicate that blending of Canyon dam releases would increase June temperatures in the Belden reach by about 0.5°C compared to providing the entire Canyon dam release by the low-level gates along with the Prattville intake curtain and removal of the levees. During July through September, temperatures would be virtually unaffected downstream of the Caribou powerhouses.

Because the proposed MIF and blending of Canyon dam releases would not require any modifications to project facilities, the construction-related water quality

effects that would result from this measure would be the same as for the thermal curtain with removal of levees as described above.

Conclusions—Based on our analysis of the proposed and recommended measures along with other potential measures investigated to provide cooler water to the NFFR downstream of the project we make the following final conclusions:

- Providing PG&E's proposed MIFs exclusively and using the low-level gates for all Canyon dam MIF releases would have negligible effects on the thermal regime of Lake Almanor, continue to maintain cool temperatures in the Seneca reach, and generally reduce peak temperatures in the Belden, Rock Creek, Cresta, and Poe reaches. However, temperatures of a little greater than 20.0°C would continue to occur throughout most of these reaches during July and August.
- Providing low-level Canyon dam releases of 200 cfs in July and 400 cfs in August along with corresponding reduced flows through the Butt Valley and Caribou powerhouses would further reduce the frequency of high temperatures in the NFFR downstream of the Caribou powerhouses.
- Modifying the Prattville intake with a floating curtain with or without removal of the levees along the submerged channel that extends from the Prattville intake to the eastern lobe of the lake would provide additional cooling effects to the Belden reach and reaches in the lower NFFR, although temperatures would still exceed 20.0°C in portions of these bypassed reaches during July and August of some years. However, operating the project with these Prattville intake modifications would result in major degradation of summer DO concentrations in Butt Valley powerhouse discharges and Butt Valley reservoir, unless oxygen augmentation is provided.
- Dredging of approximately 23,000 cubic yards of material from the submerged levees would result in minor localized short-term water quality degradation in Lake Almanor.
- Blending flow releases from the Canyon dam low-level and upper outlet gates as described above along with PG&E's proposed MIFs would typically increase temperatures throughout Seneca reach during June to September, but only negligible to minor temperature increases would occur in downstream reaches. Effects on the thermal regime in Belden and other downstream reaches would be negligible if the Prattville intake is not modified.

Monitoring—Monitoring water temperatures and DO concentrations in Lake Almanor, Butt Valley reservoir, the project's powerhouse discharges, and the NFFR would provide a means of documenting the effectiveness of enhancing thermal and DO

conditions with measures implemented under any new license. On February 28, 2003, the Commission approved (with modifications) PG&E's water temperature monitoring plan that was filed pursuant to Article 401 of the Rock Creek-Cresta Project license (PG&E, 2002b; FERC, 2003). Pursuant to this approved plan, PG&E continuously monitors water temperature from June 1 to September 30 at 39 stations in the NFFR Basin. Many monitoring stations are located at sites affected by the UNFFR Project (table 3-7). This monitoring plan also requires PG&E to monitor vertical profiles in Lake Almanor and Butt Valley reservoir at four stations each during June to September. Vertical profiles of temperature are required to be taken from the surface to the bottom at intervals of no more than 1 month. PG&E also monitors DO at a minimum of three depths on each profile (near the surface, the thermocline, and bottom).

We conclude that monitoring water temperature according to the current FERC-approved plan for the Rock Creek-Cresta Project (PG&E, 2002b; FERC, 2003) would show whether anticipated water temperature and DO conditions occur under any new license. Although this monitoring plan does not address monitoring DO concentrations in project powerhouse tailraces or project-affected stream reaches, doing so would provide minimal benefit unless the Prattville intake is modified or another measure causes adverse conditions in these areas. Data collected under current conditions indicate that low DO levels that occur in Lake Almanor and Butt Valley reservoir are typically not propagated downstream (see table 3-8). Therefore, we conclude that DO levels would be adequately documented by monitoring DO concentrations in:

- Lake Almanor and Butt Valley reservoir according to the existing Rock Creek-Cresta Project water temperature management plan; and
- Lake Almanor at 1-meter intervals as outlined in our discussion of the water quality monitoring plan above.

Odors and Metals in the Seneca Reach

PG&E typically uses the Canyon dam outlet tower low-level gates to supply the Seneca reach with cool water; however, these operations have resulted in elevated odors and trace metal concentrations in the NFFR downstream of Canyon dam, particularly in the fall prior to turnover of Lake Almanor.

PG&E proposes to switch the release pathway used for MIFs to the Seneca reach to a Canyon dam upper-level gate in September. PG&E has been inconsistent in the specific dates that it would use the upper-level gates. In the SA (PG&E, 2004a), PG&E proposes to switch use to an upper-level gate on September 15 and to continue using the upper-level gate until at least November 1. On or after November 1, PG&E would switch releases back to the low-level gate. In its rehabilitation plan for the Canyon dam outlet tower gate (PG&E, 2004c), PG&E proposes releasing the MIFs through the Canyon dam upper-level gates during September 1 to October 15, each year. PG&E

also proposes, in its SA, to increase the MIF in the Seneca reach from 35 cfs year-round to flows ranging from 60 to 150 cfs, depending on month and hydrologic water year type. Under the terms of the SA, the Seneca reach MIF would be increased to 60 cfs during September, October, and November of all water year types.

The SA (PG&E, 2004a) includes provisions for a multifaceted WQMP that includes a Canyon dam mitigation measures evaluation. This measure would examine the adequacy and efficacy of using the upper-level gates to alleviate the strong odors and elevated trace metal concentrations in the upper end of the Seneca reach. The evaluation would include a sampling program focused on odors and trace metals in waters of Lake Almanor and the Seneca reach during June to October for a minimum of 6 years after issuance of a new license. For a full discussion of the recommended Canyon dam mitigation measures evaluation, see our discussion of the WQMP, above.

Our Analysis

Trace metal and sulfide concentrations in reservoirs such as Lake Almanor can be affected by stagnation of water in the hypolimnion for long periods of time. In large reservoirs such as Lake Almanor, near-bottom DO concentrations typically become progressively reduced during the summer to early fall (Wetzel, 1975), and PG&E's water quality measurements confirm that this condition occurs in Lake Almanor (see our discussion of DO in section 3.3.1.1). During 2001, anoxic (DO of <0.5 mg/l) conditions occurred near the bottom of Lake Almanor at the Canyon dam outlet tower from early August through mid-October. Fall turnover increased the near-bottom DO concentration to 4.8 mg/l by mid-November.

Low DO concentrations at the water/sediment interface allow reductive chemical processes to occur. Iron and manganese are converted into soluble forms and released from the sediments under anoxic conditions with pH levels of 7.5 units or less (Wetzel, 1975). These conditions also lead to sulfate being reduced to sulfide, which can lead to offensive odors from release of hydrogen sulfide to the atmosphere (Wetzel, 1975).

From mid-summer through early November 2001, PG&E conducted a study to evaluate the timing of the onset of odor problems and to determine the effects of changing operations from the typical condition of providing a 35-cfs MIF via the low-level gate to using the upper gates and increasing the flow release. Results of this study show that concentrations of sulfide, dissolved iron, and dissolved manganese were elevated near the bottom of Lake Almanor at the Canyon dam outlet tower during September and October (table 3-12). The highest measured sulfide concentration (0.504 mg/l) occurred on September 11, and October measurements were all at or above 0.186 mg/l. Dissolved iron concentrations measured in September and October ranged from 1.99 to 4.02 mg/l, with the highest level measured on October 10. Dissolved manganese concentrations measured in September and October ranged from 0.841 to 1.98 mg/l, with the highest level being recorded on October 18.

Table 3-12. Sulfide and dissolved iron and manganese concentrations in Lake Almanor and the Seneca reach, August to November, 2001. (Source: PG&E, 2002a, as modified by staff)

Location	August 8	September 11	October 10	October 17	October 18	November 14
	35-cfs release via lower gate	35-cfs release via lower gate	35-cfs release via lower gate	35 cfs release via upper gate	200-cfs release via upper gate	35-cfs release via lower gate
Sulfide (mg/l)						
LA1-S	<0.0017	0.0033	0.0018	0.0023	<0.0017	0.0017
LA1-B	<0.0017	0.504	0.221	0.265	0.186	0.0031
NF2	<0.0017	<0.0017	0.0086	0.0017	<0.0017	<0.0017
NF2A	<0.0017	<0.0017	0.0034	0.0020	<0.0017	<0.0017
SF	<0.0017	<0.0017	0.0015	0.0017	<0.0017	<0.0017
NF3	<0.0017	<0.0017	0.0007	<0.0017	<0.0017	<0.0017
NF4	0.0028	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
Dissolved Iron (mg/l)						
LA1-S	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
LA1-B	<0.050	1.99	4.02	3.84	2.12	0.055
NF2	<0.050	0.122	0.273	<0.050	<0.050	0.068
NF2A	<0.050	0.157	0.198	<0.050	<0.050	0.057
SF	<0.050	0.140	0.105	<0.050	<0.050	<0.050
NF3	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
NF4	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Manganese (mg/l)						
LA1-S	0.001	<0.001	0.004	0.002	0.004	0.006
LA1-B	0.184	0.841	1.160	1.610	1.980	0.008
NF2	0.036	0.755	0.524	0.007	0.008	0.016
NF2A	0.044	0.663	0.316	0.016	0.023	0.010
SF	0.005	0.057	0.073	0.002	0.014	0.003
NF3	0.003	0.002	0.002	0.002	0.012	0.002
NF4	0.005	0.002	0.003	0.003	0.009	0.004

Typical operation of the project includes using the low-level gates to supply the required 35 cfs to the NFFR downstream of Canyon dam. PG&E's evaluation of hydraulics in the vicinity of the Canyon dam outlet tower indicates that, when 35 cfs is routed through the low-level gate, it draws water from a 9-foot-high band that extends above and below the gate's invert elevation of 4,422 feet (PG&E datum). PG&E concludes and we agree that during wet and normal years this results in drafting water from the hypolimnion; however, the drought conditions of 2001 led to lower than normal Lake Almanor water surface elevations and resulted in drafting water primarily from the metalimnion through the low-level gate. We conclude that conditions in Lake Almanor during 2001 led to drafting water with higher DO levels and lower concentrations of sulfide and dissolved iron and manganese than contained in normal-year hypolimnetic releases through the Canyon dam outlet low-level gates.

PG&E concludes and we agree that results of this study suggest that switching the source of the 35-cfs release to the upper-level gate, which is approximately 45 feet higher (invert elevation of 4,467 feet, PG&E datum), would decrease sulfide, dissolved iron, and dissolved manganese concentrations and would increase water temperature at the Canyon dam release outlet, station NF2 (see October 10 and 17 in table E-1, appendix E). It appears that there would be little additional benefit to water quality or reduction of odors associated with increasing the flow release from 35 cfs to 200 cfs on October 18.

PG&E reported that hydrogen sulfide odors were noticeable from the road above Canyon dam in October 2000. During 2001, hydrogen sulfide odors were present downslope of Canyon dam, although they were not as strong as during 2000. An odor of 4 TON occurred at the Canyon dam release to the NFFR on October 10, 2001. Shifting to the upper-level gate on October 17 coincided with a decrease in odor to less than 2 TON, which continued through the period of the 200-cfs release via the upper-level gate.

PG&E concludes and we agree that results of this study suggest using the upper-level gate of the Canyon dam outlet tower in the fall would reduce the levels of odor; concentrations of sulfide, dissolved iron, and dissolved manganese; and would increase water temperature. However, the lower than normal Lake Almanor water levels during the 2001 study period altered water temperature and water quality in the reservoir and, consequently, conditions of water drafted from the reservoir. In addition, the upper-level gate was only used for 2 days during the 2001 study, and prolonged usage of the gate could have a much larger effect on water quality in the hypolimnion of Lake Almanor. Although the 2001 study does not document conditions that would occur with prolonged usage of the upper-level gate, we conclude that switching to the upper-level gates of the Canyon dam outlet tower is a reasonable approach to improving water quality in the NFFR downstream of Canyon dam and minimizing odors in the vicinity of the dam. We further conclude that conducting a study such as the Canyon dam

mitigation measures evaluation that is recommended in the SA would document the effects of prolonged usage of the upper-level gate during wet, normal, and dry years and could provide information to adaptively manage the gate usage. However, we emphasize that the timing in which PG&E proposes to use the upper-level gates is not identified and that implementation of this action would affect water temperatures. Because use of the gate could substantially affect water temperatures in the Seneca reach, we conclude that it would be beneficial for PG&E to consult with the SWRCB, Plumas County, the FS, CDFG, FWS, and other interested parties prior to changing the typical-use pattern of the Canyon dam outlet tower gates to ensure that stakeholder concerns are addressed appropriately.

Recreation and Pulse Flows

Although winter pulse flows and summer recreational flows could affect water quality, their consequences primarily influence habitat for aquatic and riparian organisms and recreational resources. Therefore, we discuss these measures in sections 3.3.2, *Aquatic Resources*, 3.3.3, *Terrestrial Resources*, and 3.3.5, *Recreational Resources*. Effects on water quality are incorporated into the discussion of aquatic resources.

Erosion

Lake Almanor Shoreline Erosion—Wind-generated waves and wakes from boats on Lake Almanor erode banks and may result in local degradation of water quality from turbidity and sedimentation, and endanger cultural (known and unknown), recreational, and other sites along the shoreline of the reservoir. Recreationists who drive off-road vehicles along the shoreline of Lake Almanor also contribute to ongoing localized erosion in some areas.

PG&E (2002c) developed a draft SMP for Lake Almanor, which includes an erosion control plan as one of its components. The goals of this erosion control plan are to identify and provide information on where erosion is taking place, identify where PG&E has the legal right to erode the shoreline, to guide PG&E on when and where it should implement erosion control measures, and provide information on how adjacent property owners can undertake erosion control measures on PG&E lands, while at the same time preserving and sustaining the natural environmental qualities of the reservoir.

Plumas County expresses its expectation that PG&E will amend its draft SMP to address inconsistencies of the plan with land use designations within the project boundary. The county also comments that it would like results of PG&E's investigation of a few moderate to severe erosion sites, identified by the county in a June 13, 2003, meeting with PG&E, to be incorporated into the SMP.

In its draft SMP, PG&E commits to conducting annual surveys to evaluate shoreline erosion around Lake Almanor. PG&E also plans to continue issuing cost-free

permits to adjacent landowners who desire to implement erosion control work on PG&E property. In addition, PG&E plans to implement erosion control measures, as necessary, to limit erosion associated with cultural resource sites, threatened or endangered species sites, PG&E-owned facilities or sites of high value such as developed recreation sites. These measures may include riprap revetments, hardening of trails, or construction of stairways to keep recreationists off fragile slopes in popular dispersed recreation areas.

In addition, PG&E proposes to inform the recreating public of vehicular access restrictions, federal laws regarding the protection of cultural resources, and potential penalties for violation. PG&E also proposes increased monitoring and/or patrolling during periods of reservoir drawdown in fall and winter.

In its SA, PG&E indicated that agreement has not been reached with Plumas County on shoreline erosion. In the SA, which provides limited guidance for shoreline erosion, PG&E commits to:

- provide erosion control measures to protect the Lake Almanor shoreline from wind-caused wave action at the Westwood Beach and Stumpy Beach day-use areas;
- close and rehabilitate user-created vehicular and off-road vehicle (ORV) access routes along Lake Almanor's southwestern shoreline, in consultation with the FS; and
- determine the need to update the SMP based on discussions with the FS, Plumas County, and other interested parties at annual land use meetings and meetings held once every 10 years, at a minimum, specifically for that purpose.

In its November 4, 2004, filing with the Commission, the FS specifies, as a component of final Section 4(e) condition no. 40, that PG&E consult with the FS and other interested SA signatories for the purpose of developing a final SMP within 30 days of license issuance. The FS also recommends that PG&E hold meetings at least every 10 years, as specified in the SA, to discuss the need to update the SMP.

In its July 7, 2003 comments on Scoping Document 1, Plumas County recommends that PG&E be responsible for controlling any shoreline erosion caused by project operations that adversely affect water quality, aquatic resources, cultural resources, recreation, or aesthetics. It also recommends that, at a minimum, PG&E develop in consultation with Plumas County and resource agencies, a comprehensive site-specific erosion protection plan for shoreline areas with significant erosion. In its October 29, 2004, comments on the draft EIS, Plumas County further recommends that

PG&E meet with local citizens and the 2105 Committee prior to finalizing the plan and filing it with the Commission.

Our Analysis

Shoreline erosion is noticeable along portions of the perimeter of Lake Almanor, as it is on many reservoirs. PG&E's shoreline erosion survey conducted in 2000 indicates that about 7 percent of the reservoir's shoreline has substantial erosion, as identified by slope scars on the shoreline and sloughing of material into water. This survey also indicated that erosion is generally most extensive along the southeastern shoreline near Canyon dam and the western shoreline of the Almanor peninsula. Since Lake Almanor's normal maximum water level is at elevation 4,494 feet (PG&E datum) and much of the shoreline is gently sloped, erosion above the 4,500-foot contour (PG&E datum) project boundary is relatively uncommon. However, wind and wave action has eroded steep bank areas to near the 4,500-foot contour in a few locations, which has raised concerns regarding the potential for contamination of Lake Almanor from nearby septic leach fields.

In June 2003, Plumas County informed PG&E of some locations that it viewed as having moderate to severe erosion which were not included in PG&E's draft SMP. Plumas County also noted that the draft SMP is inconsistent with county land use designations in some areas. In October 2004, Plumas County indicated that it had resolved most of its outstanding issues on the SMP with PG&E and recommended that PG&E meet with the 2105 Committee and local citizens prior to finalizing the plan. We conclude that PG&E could improve the draft SMP by revising it to include the erosion sites identified by the county in June 2003 and making it consistent with current county land use designations. We additionally conclude that PG&E could address concerns of interested parties including the 2105 Committee and local citizens by meeting with them prior to finalizing the SMP and revising the SMP, as appropriate.

We conclude that implementation of the erosion control measures proposed by PG&E would reduce erosion, particularly in areas where erosion could result in loss of cultural resources, threatened and endangered species, and project facilities including developed recreation sites; however, localized shoreline erosion could continue to occur particularly on properties not owned by PG&E that are along the 4,500-foot contour (PG&E datum). Should Plumas County adopt an ordinance that limits the use of motorized vehicles at elevations of less than 4,500 feet (PG&E datum), informing the recreating public of these regulations and enforcing them would reduce localized erosion associated with these uses.

Monitoring shoreline erosion annually as proposed by PG&E would document changes in erosion around the reservoir. It would also be beneficial for PG&E to implement a plan developed in consultation with SWRCB, CVRWQCB, CDFG, the FS, Plumas County, and the Maidu community to evaluate any adverse effects of shoreline

erosion on water quality, aquatic resources, cultural resources, recreation, and aesthetics on a regular basis. The results of the annual shoreline erosion surveys and evaluation of shoreline erosion on other resources would facilitate identification of the need for further erosion control measures in the future.

Erosion of Upland Areas—PG&E's ground-disturbing activities, and its use and management of a roadway system that is necessary to maintain and operate the project, may result in erosion and subsequent degradation of water quality. In addition, as part of the cleanup of the 1984 Caribou landslide, PG&E created a spoil pile containing PCB-laden materials at a location referred to as the Oak Flat spoil pile.

In 1998, PG&E and the Plumas National Forest (1998) entered into a road maintenance agreement. This agreement applies to all roads where PG&E and the FS have joint use of Plumas NFS roads. The intent of the agreement is to ensure maintenance of the roads in a condition that provides for their intended use, prevent and correct erosion to the roads and adjacent lands, and ensure safe and efficient use of the roads. The agreement states that PG&E and the FS shall meet annually to develop an annual maintenance plan that addresses all anticipated road maintenance work needed on the roads covered by the road maintenance agreement.

The SA provides limited guidance for controlling erosion of upland areas. As a component of the recreation facility development program, the SA would require PG&E to implement erosion control measures on the slope between the parking lot and the upper picnic area at the Belden rest stop (SR 70) and for construction of a trail down to the Lake Almanor shoreline at the East Shore group camp area. PG&E also would revegetate or harden areas with substantial erosion caused by pedestrian or vehicle traffic at Rocky Point campground and day use area. The SA also would require PG&E to re-grade the Oak Flat spoil piles along Caribou Road to create a more natural rolling topography along the roadside, and establish native plantings where possible between the road and the spoil piles. Additionally, PG&E would stabilize and revegetate all native material that is left on NFS lands following ground-disturbing activities.

In its final Section 4(e) conditions, filed November 4, 2004, the FS specifies measures to control erosion of upland areas on NFS land or lands that would affect NFS lands. Some of these lands are within the project area, although other lands are outside the project area:

- Develop a plan for the control of erosion, stream sedimentation, dust, and soil mass movement for any new ground-disturbing construction or non-routine maintenance that may affect NFS lands. Following approval of the plan by the FS, PG&E would file the FS-approved plan with the Commission 60 days prior to beginning associated construction activities (Condition 15);
- File an FS-approved visual management plan with the Commission within 60 days prior to any ground-disturbing activity. The plan would address

clearing, removal of all non-native materials from NFS lands, locating spoil piles in approved areas on NFS lands or removing spoils from NFS lands, and stabilization and revegetation of all native material left on NFS lands (Condition 40 (G));

- Within 2 years of license issuance, re-grade the Oak Flat road debris spoil piles along Caribou Road and establish native vegetation between the road and spoil pile (Condition 40 (C)); and
- Cooperate with the FS on preparation of a road condition survey and maintenance plan that includes identifying PG&E's responsibility for road maintenance and repair costs based on project-induced use (Condition 42).

In its preliminary Section 10(j) recommendations, filed December 1, 2003, Interior makes a recommendation that PG&E develop an erosion control plan for all project facilities, roads, reservoirs, and bypassed reaches in consultation with the FWS, the FS, CDFG, and SWRCB.

Our Analysis

To control erosion and limit adverse effects on water quality associated with the roadway system, it is important for PG&E to prioritize maintenance efforts and implement BMPs for ground-disturbing activities. We conclude that implementation of PG&E's road maintenance agreement with the Plumas National Forest would ensure that PG&E and Plumas National Forest regularly reevaluate the need for maintenance, prioritize efforts to address these needs, and implement maintenance accordingly.

The SA identifies numerous activities such as development of recreation sites that would necessitate ground-disturbing activities. We consider it appropriate to address erosion control in site-specific design for any recommended new recreational facilities, which could be included in a recreation management plan (discussed in section 3.3.5, *Recreational Resources*). There would be a benefit in PG&E consulting with the appropriate resource agencies along with the Maidu community during development of the plan and upon discovery of previously unidentified cultural materials to ensure that their concerns are adequately addressed.

Similarly, implementation of a visual management plan, as recommended by the FS, would limit the potential for existing and new spoil piles to erode, aid in controlling invasive weeds, and improve the aesthetics of the spoil piles. Appropriate testing of sediments in the existing spoils piles, prior to disturbing them, and after consultation with appropriate resource agencies, would maintain or improve the environmental quality around any spoil piles that contain hazardous materials (such as the potentially PCB-laden materials in the Oak Flat spoil pile).

Hazardous Substances

In its November 4, 2004, filing with the Commission, the FS specifies final Section 4(e) condition 7 to limit the potential for PG&E to introduce hazardous pollutants to waters in the project area. Under this condition, PG&E would be required to file an FS-approved hazardous substances plan (HSP) with the Commission for oil and hazardous substances storage and spill prevention and cleanup. The FS specifies that, at a minimum, PG&E develop an HSP that:

- outlines PG&E's procedures for reporting and responding to releases of hazardous substances, including names and phone numbers of all emergency response personnel and their assigned responsibilities;
- maintains in the project area, a cache of spill cleanup equipment suitable to contain any spill from the project;
- periodically informs the FS of the location of the spill cleanup equipment on NFS lands and of the location, type, and quantity of oil and hazardous substances stored in the project area; and
- informs the FS immediately of the nature, time, date, location and action taken for any spill affecting NFS lands and PG&E adjoining property.

Our Analysis

In accordance with 40 CFR §112.1, an HSP (also frequently referred to as a spill prevention, control, and countermeasure plan) is required to be in place for any facility that has a maximum oil storage capacity of greater than 1,320 gallons above ground or in greater than 660 gallons in a single container. Drawings in Exhibit F of the license application do not provide sufficient information to determine which facilities are required to have an HSP under 40 CFR §112.1. In addition to the onsite storage of lubricants and other oil products, transformers on site are likely oil-cooled; due to the total size of all transformers at each development, we also assume that the total oil capacity of the transformers cumulatively is greater than 1,320 gallons per development, and each development is therefore required to have a HSP. We also note that any other project facility, including mechanical works, maintenance and warehousing areas, and other locations that store a single 660-gallon container or a cumulative 1,320 gallons of petroleum products is required to have an HSP.

PG&E is required to develop and implement an HSP for petroleum products independent of relicensing. This plan would provide a quick reference to procedures and notifications in the case of oil spills with the goal of reducing the effects of spills on the local area including the upper NFFR and Yellow Creek if a spill occurs. Extending the plan to include other hazardous materials stored, used, or disposed of in the project area would reduce the likelihood for contamination by these products and would reduce the extent of contamination should a spill occur.

3.3.1.3 Cumulative Effects on Water Resources

Since construction, project facilities and operations have affected water temperatures throughout much of the NFFR, lower Butt Creek, and project impoundments. Increasing summer flows in the Seneca and Belden reaches would cool water within these reaches. Modifying the Prattville intake to supply cold water from Lake Almanor to downstream reaches, pursuant to the Rock Creek-Cresta SA, would result in cooler water in the Butt Valley reservoir and in the NFFR between the Caribou development and Lake Oroville, although it would also result in a deeper thermocline and a warmer epilimnion in Lake Almanor. Implementation of other coldwater supply options could also cool water in the NFFR downstream of the Caribou development, but some options would warm water in Butt Valley reservoir. Since construction of the Rock Creek-Cresta and Poe projects, a portion of the flow has typically been routed around the Rock Creek, Cresta, and Poe bypassed reaches to the respective powerhouses resulting in summer warming of remaining flows in these reaches. Based on evaluations of modifying project features associated with the Prattville intake and Butt Valley reservoir, we do not anticipate that project features would be modified to provide cold water to downstream reaches. Therefore, the cumulative effects of the project and non project facilities and operations would be cooling of water in the NFFR between the Caribou development and Lake Oroville.

Several project and non-project actions affect the concentrations of trace metals within NFFR basin waters. Since 1952, PG&E's LACSP has seasonally increased silver concentrations in the atmosphere of the watershed that contributes to Lake Almanor, and consequently has increased the likelihood of elevated silver concentrations in precipitation and runoff. Project facilities and operations have historically resulted in accumulation of sediments in the reservoir and low DO levels in water at the water/substrate interface. The naturally high levels of metals in the sediments in combination with the anoxic conditions in the reservoir's hypolimnion have historically resulted in mineralization of trace metals in the reservoir, and elevated trace metal concentrations in Lake Almanor's hypolimnion and the Seneca reach. Modifying the Prattville intake to draft deeper water from Lake Almanor would seasonally increase oxygen levels in deeper waters of Lake Almanor and consequently reduce mineralization of metals contained in the sediments deposited in the reservoir. PG&E's use of the upper gates instead of the low-level gates at the Canyon dam outlet tower during periods with elevated hypolimnetic metal concentrations would reduce the conveyance of water with high metal concentrations to the Seneca reach. Non-project related mining is expected to continue in the Seneca and Belden reaches and other streams within the basin. Mining activity is expected to continue to cause the suspension of sediments with high trace metal concentrations. However, the cumulative effect of anticipated project and non-project actions would be a reduction in trace metal concentrations in Lake Almanor's hypolimnion and the Seneca reach.

Continued operation of the project may result in portions of the Lake Almanor shoreline receding into or near septic leach fields that were constructed prior to raising

the normal Lake Almanor water level to 4,494 feet (PG&E datum) in the mid 1970s. This could result in the introduction of fecal coliform bacteria and human pathogens from the leach fields into Lake Almanor waters. The expected increase in water-oriented recreational use throughout the NFFR basin would increase the potential for fecal coliform bacteria and human pathogens to be introduced to surface waters in the basin. The cumulative effects of these actions would be additive and likely result in localized increases in concentrations of fecal coliform bacteria and human pathogens in surface waters of the NFFR basin.

3.3.1.4 Unavoidable Adverse Effects. None.

3.3.2 Aquatic Resources

3.3.2.1 Affected Environment

The project area currently supports a diverse assemblage of native and non-native fish species, many of which provide a forage base for game fish as well as for avian predators (table 3-13). The reservoirs support both coldwater and warmwater fisheries, while the bypassed reaches support a coldwater fishery dominated by rainbow trout. The rainbow trout population depends upon adequate year-round instream flows, water temperatures below 20°C, suitable spawning gravels, and access to tributaries that provide quality spawning areas and juvenile rearing habitat. Hardhead (*Mylopharodon conocephalus*) and Sacramento perch (*Archoplites interruptus*), both of which are special-status fish species in California, are known to occur in project waters and are discussed in greater detail below. Project waters also support diverse populations of aquatic macroinvertebrates, amphibians, and aquatic reptiles (PG&E, 2002a).

The historical fish community of the UNFFR likely included anadromous Central Valley spring-run and fall-run Chinook salmon (Yoshiyama et al., 2001). Central Valley steelhead may have occurred in project reaches, but there is uncertainty in regards to their original range (PG&E, 2002a). Although the majority of anadromous salmon may have been blocked by a set of naturally-occurring falls near the town of Seneca, many are reported to have ascended the entire length of the NFFR through the area now inundated by Lake Almanor and into surrounding tributary streams (Yoshiyama et al., 2001). The first man-made blockages to anadromous fish migrations in the Feather River basin were likely associated with mining operations. Hydraulic mining operations altered the river's physical and hydrologic processes, resulting in dewatered river beds, increased sediment loading, and physical alteration to gravel and cobble beds, all of which likely affected salmon populations (Yoshiyama et al., 2001). The construction of Big Bend dam in 1910 upstream of present day Lake Oroville likely blocked migratory fish from accessing waters of the NFFR and its associated tributaries. The construction of Canyon dam in 1914, and a second dam replacing it (1927), Rock Creek dam (1950), Cresta dam (1950), Poe dam (1958), and Oroville dam (1963) created additional migratory barriers in the upper Feather River. After the creation of project reservoirs, introduced fish species such as smallmouth bass, largemouth bass,

Table 3-13. Fish species identified in recent surveys (1996-2002) of waters in the UNFFR Project. (Source: PG&E 2002a, as modified by staff)

Native Species	Lake Almanor ^a	Butt Valley Reservoir	Belden Reservoir	Upper Butt Creek	Lower Butt Creek	Seneca Reach	Belden Reach
Rainbow trout (game fish)	X	X	X	X	X	X	X
<i>Oncorhynchus mykiss</i>							
Sacramento sucker	X	X	X	X		X	X
<i>Catostomus occidentalis</i>							
Sacramento pikeminnow	X	X	X				X
<i>Ptychocheilus grandis</i>							
Sacramento perch	X	X					
<i>Archoplites interruptus</i>							
Hardhead							X
<i>Mylopharodon conocephalus</i>							
Prickly sculpin	X	X				X	X
<i>Cottus asper</i>							
Riffle sculpin		X		X	X	X	X
<i>Cottus gulosus</i>							
Tui chub							
<i>Gila bicolor</i>		X					

Introduced Species	Lake Almanor ^a	Butt Valley Reservoir	Belden Reservoir	Upper Butt Creek	Lower Butt Creek	Seneca Reach	Belden Reach
Brown trout (game fish) <i>Salmo trutta</i>	X	X		X		X	X
Chinook salmon (game fish) ^b <i>Oncorhynchus tshawytscha</i>	X						
Smallmouth bass (game fish) <i>Micropterus dolomieu</i>	X	X	X				
Largemouth bass (game fish) <i>Micropterus salmoides</i>	X	X					
Brown bullhead <i>Ameiurus nebulosus</i>	X						
Wakasagi (Japanese pond smelt) <i>Hypomesus nipponensis</i>	X	X	X				
Common carp <i>Cyprinus carpio</i>	X	X					
Sacramento perch <i>Archoplites interruptus</i>	X	X					

^a Tahoe sucker, tui chub, hitch, brook trout, kokanee salmon, silver salmon, chum salmon, bluegill, green sunfish, and channel catfish have been noted to occur in Lake Almanor, but were not collected in PG&E's recent surveys.

^b Stocked in Lake Almanor by CDFG.

wakasagi (Japanese pond smelt), and brown trout exploited the new lentic environment, establishing self-sustaining populations.

Lake Almanor and Upstream Waters

Lake Almanor is the largest, most upstream project reservoir, and is approximately 10 miles long and varies between 1 and 4 miles in width. Lake Almanor has a surface area of 27,000 acres and a storage capacity of 1,142,251 acre-feet and (figure 1-1). Because the reservoir was created in what was formerly a large alpine meadow, it is relatively shallow in nature (PG&E, 2002a). Average depth of the reservoir is approximately 42 feet, with the deepest location of approximately 100 feet occurring near Canyon dam. During the summer, the lake is thermally stratified with a warm upper layer (epilimnion) that extends to a depth of 30 to 40 feet and a cold bottom layer (hypolimnion) that develops below 40 feet. The near-surface layer is typically 22°C or warmer in the summer, with temperatures at depth ranging between 10 and 14°C. Lake Almanor is also stratified with respect to the concentration of DO in the water column during summer stratification. Oxygen levels are near saturation at the surface and are diminished in the hypolimnion. In a 1962 study of the Lake Almanor fishery, CDFG reported that hypoxic conditions developed at approximately 35 feet and below, which forced coldwater game fish to seek thermal refugia where cold tributaries entered the reservoir or where upwelling springs occurred (PG&E, 2002a). Inflow into the lake comes from the Hamilton Branch powerhouse; the NFFR; the Hamilton Branch of the Feather River; and a number of smaller tributaries including Benner, Last Chance, and Bailey creeks. Various submerged springs can contribute a substantial volume of water, approximately 400 cfs, to Lake Almanor. Seasonally, elevation of the lake can vary from a low of 4,466.7 feet (PG&E datum) to a high of 4,494 feet (PG&E datum). A target level at or above 4,474 feet is established prior to September 15 to support recreational use. As lake levels recede during the late summer and fall, the shallow northwest portion of the lake de-waters more rapidly than the rest of the nearshore aquatic habitat in the lake.

Lake Almanor supports both coldwater and warmwater fish populations (table 3-12). Primary game fish occurring in the reservoir include rainbow trout, brown trout, stocked Chinook salmon, smallmouth bass, and largemouth bass. Since 1933, CDFG has stocked a variety of game and panfish in the reservoir to supplement the sport fishery. Recent CDFG stocking efforts have focused on rainbow trout, brown trout, and Chinook salmon. A creel survey conducted by PG&E in 2000 revealed that angler catch is dominated by rainbow trout and smallmouth bass, collectively comprising 93 percent of the total recorded catch of participating anglers (EA, 2001).

Wakasagi, which were introduced in the early 1970s, provide an important forage base for piscivorous fish in Lake Almanor. This species tends to aggregate at or below the thermocline in Lake Oroville, and it is likely that a similar behavioral pattern occurs in Lake Almanor (HTI, 2002; personal communication, D. Lee, Supervisory Fisheries

Biologist, CDFG, Rancho Cordova, CA, with J. Wechsler, Fisheries and Aquatic Scientist, Kleinschmidt Associates, Pittsfield, ME, February 17, 2005). Because of the collection techniques used and locations sampled, fish population studies conducted by PG&E in support of the license application do not provide a thorough understanding of the population size of wakasagi within Lake Almanor. However, entrainment studies conducted by PG&E in 2001 indicate that wakasagi accounted for 99.9 percent of all fish entrained (via the Prattville intake) through the Butt Valley powerhouse (ECORP, 2002a). A total of 91,616 wakasagi were collected during 10 days of sampling from June through October, suggesting that an abundant population of wakasagi currently exists in Lake Almanor. Entrainment of wakasagi inhabiting Lake Almanor transports them to downstream reservoirs and riverine reaches where they likely provide an important forage base for piscivorous fishes and avian predators.

Mollusc species inhabiting Lake Almanor include two native gastropods, rock fossaria (*Fossaria modicella*) and Artemesian rams-horn (*Vorticifex effuses*); two introduced gastropods, big-ear radix (*Radix auricularia*) and mimic lymnaea (*Pseudosuccinea columella*); one native bivalve, striated fingernail clam (*Sphaerium striatinum*); and one introduced bivalve, the Asian clam (*Corbicula fluminea*; also known as the Asiatic clam), which is the most dominant mollusc in the reservoir.

Butt Valley Reservoir

Butt Valley reservoir is long (4.75 miles) and narrow (0.75 mile) and has a maximum depth of about 50 feet (see figure 1-1). The surface area of the reservoir is 1,600 acres. The primary source of flow entering the reservoir is from Butt Valley powerhouse, which draws its water from Lake Almanor at the Prattville intake.

Butt Creek is the only major tributary entering the reservoir. Average monthly flows range from 40 to 188 cfs and averaged 99 cfs for the water year period 1970–1999. Butt Creek is an unregulated stream, flowing approximately 21 miles from its headwaters to Butt Valley reservoir. The creek is dominated by boulder and cobble substrates with areas of gravel that provide spawning, rearing, and foraging habitat for rainbow and brown trout. Rainbow and brown trout are the only game fish present in the creek; riffle sculpin and Sacramento sucker are also present (table 3-14). Angler harvest data revealed that 64 percent of all trout caught in the creek were 14 inches or longer (table 3-15). Rainbow trout from Butt Valley Reservoir enter the creek during early spring (March through April) to spawn while brown trout enter the creek during fall (October through November) for spawning. Juvenile rainbow and brown trout have both been documented within the creek during recent fishery surveys (ECORP, 2003a). The creek has a moderate gradient with riffle-run and step-run habitat contained in a well-defined stream channel approximately 30 to 50 feet wide.

Table 3-14. Species composition and relative abundance in Seneca reach, Belden reach, upper Butt Creek, and lower Butt Creek, 2000–2002. (Source: ECORP, 2003a, as modified by staff)

Location	Species	Yearly Abundance (Percent of Total for Location)		
		2000	2001	2002
Seneca Reach	Sculpin ^a	69	58	
	Riffle sculpin			47.8
	Prickly sculpin			5.8
	Rainbow trout	29	40	44.4
	Brown trout	1	<1	0.9
	Sacramento sucker	1	1	1.1
Belden Reach	Sculpin ^a	59.4	51.7	
	Riffle sculpin			55.9
	Prickly sculpin			1.9
	Rainbow trout	21.3	27.4	26.5
	Rainbow trout (hatchery)	-	-	0.7
	Sacramento sucker	19.1	20.9	13.9
	Sacramento pikeminnow	1	-	1.1
Upper Butt Creek	Sculpin ^a	47.5	46	
	Riffle sculpin			54.5
	Rainbow trout	28.5	33	29.4
	Brown trout	5	9.4	11.2
	Sacramento sucker	19	11.6	4.9
Lower Butt Creek	Sculpin ^a	65	61.3	
	Riffle sculpin			59
	Rainbow trout	35	38.7	41

a During 2000 and 2001 surveys sculpin were not identified to species.

Table 3-15. Total number of trout (rainbow and brown) caught by anglers in project waters surveyed in 2000, by size range. (Source: EA, 2001, as modified by staff)

	Size Range (Inches)					Total
	<8	8-11	11-14	14-17	>17	
Reservoirs						
Lake Almanor	53	85	159	109	99	505
Butt Valley reservoir	4	13	25	34	37	113
Rivers/Streams						
Upper Butt Creek	35	16	32	72	77	231
Lower Butt Creek	2	28	20	3	3	56
Belden Reach	55	43	18	2	4	122

Under normal operating conditions, Butt Valley reservoir fluctuates about 1 foot per day, 3 to 5 feet per week, and 10 feet on an annual basis. The reservoir is thermally stratified during early summer with temperatures near 20°C at the surface and less than 12°C at depths of 20 feet or greater (PG&E, 2002a). The duration of thermal stratification is influenced by the operation of the Caribou No.1 unit, a deeper intake unit that drafts colder water from deeper portions of the reservoir. By mid-July and August, the volume of cold water is typically at its minimum and the reservoir is weakly stratified.

The reservoir supports a trophy rainbow and brown trout fishery, with trout greater than 17 inches comprising a substantial portion (33 percent) of angler catch (table 3-15). The existence of this trout fishery is likely due in part to the forage base provided by wakasagi, which are entrained through the Prattville intake in Lake Almanor. Wakasagi are also reported to reproduce in the Butt Valley powerhouse tailrace and at the mouth of Butt Creek (personal communication, D. Lee, Supervisory Fisheries Biologist, CDFG, Rancho Cordova, CA, with J. Wechsler, Fisheries and Aquatic Scientist, Kleinschmidt Associates, Pittsfield, ME, July 27, 2005). Other fish species present in the reservoir include Sacramento pikeminnow, Sacramento perch, Sacramento sucker, tui chub, and smallmouth bass. Available habitat for fish, especially centrarchids, in the reservoir is limited, as most of the shoreline consists of shallow water with mud or shale substrate with little or no littoral zone present. In 1996 and 1997, fish habitat enhancement structures were constructed within the reservoir as mitigation for a dam seismic remediation project. The structures included 63 smallmouth bass cover and spawning modules in the reservoir and 25 boulder clusters grouped at three locations within Butt

Creek, the tailrace, and the reservoir. The effectiveness of these habitat enhancement structures has not been investigated.

Mollusc species inhabiting Butt Valley reservoir include four native gastropods: black juga (*Juga nigrina*), Artemesian rams-horn, nugget pebblesnail (*Fluminicola seminalis*), and marsh pondsnail (*Stagnicola elodes*). Large quantities of Asian clam shells were documented throughout the reservoir in 2001, though no live individuals were found. A prolonged severe drawdown of the reservoir from early spring 1996 through 1997 for dam safety purposes reduced the reservoir's volume to 5.8 percent of its normal amount and likely decreased the reproductive success of Asian clams in those years (Spring Rivers, 2002).

Belden Reservoir

The Belden reservoir is located on the NFFR downstream of the Seneca bypassed reach and has a surface area of 42 acres (see figure 1-1). The reservoir's daily water surface elevation can fluctuate between 5 and 10 feet depending on power operations. Flow into the reservoir comes from the Caribou No. 1 powerhouse, the Caribou No. 2 powerhouse, and the Seneca reach of the UNFFR.

Fish species inhabiting Belden reservoir include rainbow trout, brown trout, smallmouth bass, Sacramento sucker, and wakasagi. The presence of wakasagi is most likely due to their entrainment in the intakes of Caribou No.1 and No. 2 powerhouses located in Butt Valley reservoir. No data have been collected that suggest that wakasagi reproduce in or reside in Belden reservoir for prolonged periods of time.

Two species of bivalves, the native western pearlshell mussel (*Margaritifera falcate*) and the introduced Asian clam, occur within the reservoir (Spring Rivers, 2002).

Seneca Bypassed Reach

The Seneca bypassed reach of the NFFR begins at the base of Canyon dam and extends 10.8 miles to the Caribou No. 1 powerhouse at the upper end of Belden reservoir (see figure 1-1). A year-round minimum flow of 35 cfs is released into the reach from Canyon dam. Within the uppermost 0.5 mile, the reach receives additional flow from spring seepage and accretion flow. Butt Creek is the only major tributary that enters the Seneca reach. The Seneca reach has an overall stream gradient of 2 percent with varying habitat composed of low gradient riffles, runs, high gradient riffles, cascades, pools, step-runs, and pocket-water. The lower 1.25 miles of the reach, extending from the confluence with lower Butt Creek to the Caribou No.1 powerhouse, contains higher quality, more complex habitat consisting of a greater number of pools and additional flow from lower Butt Creek.

The predominant fish species found within the Seneca reach are riffle sculpin, rainbow trout, and prickly sculpin (table 3-14) (ECORP, 2003a). Less abundant fish species include Sacramento sucker and brown trout. The rainbow trout population within the Seneca reach is dominated by age 0+ and 1+ individuals (ECORP, 2003a). PG&E estimated the density of rainbow trout redds within Seneca reach to be 79 redds per river mile (TRPA, 2002b).

Molluscs inhabiting the reach include four native gastropods (nugget pebblesnail, Artemesian rams-horn, tadpole physa, and black juga) and two native bivalves (striated fingernail clam and western pearlshell mussel) (Spring Rivers, 2002).

Belden Bypassed Reach

The Belden reach of the NFFR is 9.3 miles long and extends from Belden dam to its confluence with Yellow Creek (see figure 1-1). A minimum flow of 140 cfs is released from the last Saturday in April to Labor Day from the Oak Flat powerhouse at the base of Belden dam. During the remainder of the year, 60 cfs is released. To accommodate the two flow rates, the turbine has a high-flow runner and a low-flow runner that are alternated in the spring and fall to correspond with the change in minimum flow requirements. The upper section of the Belden reach starts at the base of Belden dam and extends 7 miles to its confluence with the EBNFFR. Habitat in the upper section of Belden reach is varied, with riffles, runs, pools, pocketwater, and a 0.25- to 0.5-mile long section characterized by split channels and shallow riffles. Mosquito Creek is the largest tributary to the upper section, with flows ranging from 2 to 10 cfs from June to September.

The lower section of the Belden reach extends from the confluence of the EBNFFR to the confluence with Yellow Creek. This section is substantially wider than the upper section and also has a much greater volume of uncontrolled flow due to input from the EBNFFR, which is a large unregulated tributary of the NFFR. Data from the water year period 1970–1999 indicate that average monthly flows in the EBNFFR are highest from January until mid-May, ranging from 1,700 to 2,600 cfs, and are lowest from July until September, ranging between 100 to 300 cfs. The habitat in this section of the Belden reach consists primarily of riffles, runs, and pocket water. The Belden powerhouse discharges into Yellow Creek just upstream of the creek's confluence with the NFFR. Upstream of the Belden powerhouse tailrace, Yellow Creek, a CDFG-designated wild trout stream, contributes flows ranging from 40 to 170 cfs during June to September.

The fish community inhabiting the Belden reach is mostly composed of riffle sculpin, rainbow trout, Sacramento sucker, and prickly sculpin (see table 3-14). PG&E estimated the density of rainbow trout redds within Belden reach to be 17 redds per mile (TRPA, 2002b). Other less abundant species include Sacramento pikeminnow and the hardhead, which is a FS sensitive species (FSS) and a state species of concern (CSC).

Angling pressure throughout the Belden reach is high due to private and public campgrounds and Caribou Road, which provide easy fishing access along the reach. To increase angling opportunities, CDFG annually stocks the reach with hatchery raised rainbow trout.

The Gansner fish barrier is located on the Belden reach 0.2 river miles upstream of its confluence with EBNFFR. This 5-foot-high concrete-topped gabion rock barrier extends across the river and was constructed in 1975 by PG&E at the request of CDFG; PG&E is responsible for maintaining the structure. The barrier was designed to eliminate spawning access to the upper NFFR by Sacramento sucker and other non-game fish species. In 1971, prior to the construction of the barrier, CDFG chemically treated the Belden reach, from Belden dam to its confluence with the EBNFFR, with antimycin (Fintrol) to control non-game fish, primarily Sacramento suckers. The chemical treatment killed approximately 46,000 pounds of suckers and 300 to 500 pounds of rainbow trout. Following the treatment, CDFG restocked 483 rainbow trout that had been removed from the reach by electrofishing prior to the treatment and also stocked 10,000 hatchery-reared sub-catchable rainbow trout in the reach. PG&E noted that during several site visits in the spring of 2001, multiple rainbow trout were observed repeatedly attempting to jump over the barrier without success.

Mollusc species that inhabit the Belden reach include three native gastropods, black juga, Artemesian rams-horn, and tadpole physa, and two bivalves; the native western pearlshell mussel and the introduced Asian clam (Spring Rivers, 2002).

Lower Butt Creek Bypassed Reach

Lower Butt Creek, located in a remote, steep, and narrow canyon, is 1.4 miles long and extends from the Butt Valley dam to its confluence with the Seneca reach (see figure 1-1). It is a high gradient creek (9.4 percent), and there are no existing minimum flow requirements. Flows, which range from 14 and 21 cfs and average 18 cfs, are a result of coldwater spring inflow, seepage from Butt Valley dam, and tributary inflow from Benner Creek. During the summer months, water temperature within the creek ranges from approximately 10 to 13°C. Aquatic habitat consists primarily of high gradient riffle, cascade, and pocket water, and contains a substantial amount of large woody debris (LWD) present (TRPA, 2002; Entrix, 2002). The substrate found within the creek is dominated by boulder and cobble with areas of gravel. PG&E observed rainbow trout redd densities of 171 redds per mile, the highest density recorded in project waters (TRPA, 2002b), indicating that this reach is the most heavily used by spawning rainbow trout.

Riffle sculpin and rainbow trout were the only two fish species collected in the lower Butt Creek bypassed reach in 2000 through 2002 (table 3-14). Age 0+ trout were the dominant age class collected within lower Butt Creek, although juvenile and adult trout were also present (ECORP, 2003a). Based on the high density of trout redds and

age 0+ trout, it is evident that lower Butt Creek provides substantial spawning and rearing habitat for rainbow trout. Positioned across the creek, 0.2 mile upstream of the confluence with the Seneca reach, is a weir associated with an abandoned discharge gage, NF-9, which may act as a barrier to the upstream movement of juvenile and adult trout during low flow periods.

Compared to other project waters, lower Butt Creek possesses the greatest mollusc diversity with six native species including five gastropods; black juga, *Lyogyrus* sp., nugget pebblesnail, Artemesian rams-horn, and tadpole physa (*Physella gyrina*), and one native bivalve; striated fingernail clam (Spring Rivers, 2002).

Special-status Aquatic Species

Two special-status fish species are present within the project area. Hardhead, a FSS and a CSC, has been documented in the tailrace of the Belden powerhouse. The Sacramento perch (*Archoplites interruptus*), a FSS and the only centrarchid native to California, also occurs in project waters. The CSC designation is intended to encourage CDFG and other agencies to focus attention on a potentially imperiled species to help avert the need for costly listing under federal and state endangered species laws and associated recovery efforts that might ultimately be required. The FS has designated Sacramento perch as a sensitive species as part of its threatened, endangered, and sensitive species program, which was initiated to conserve and recover species that are management priorities for individual forests.

Hardhead are an omnivorous species that feed on plankton, aquatic plants, and invertebrates. Hardhead are typically most abundant in larger, middle, and low elevation well-oxygenated stream reaches where summer temperatures typically exceed 20°C (Moyle, 2002). Hardhead can colonize reservoirs, but persist only if exotic species, especially centrarchid basses, are not present.

Historically, Sacramento perch were widespread in the Sacramento, San Joaquin, Pajaro, and Salinas rivers and in Clear Lake (Lake County), but it has been extirpated from most of its historic range (Moyle, 2002). Today, Sacramento perch are restricted to farm ponds or reservoirs where they have been introduced. Preferred habitat consists of beds of rooted and emergent aquatic plants, which are critical for food and cover for juveniles. The species was introduced by an unknown source into project waters and was most recently documented in Lake Almanor (2000) and Butt Valley reservoir (1996-1998).

Fish Entrainment

To determine whether fish were being transported through project facilities as a result of normal operations, PG&E performed hydroacoustic and tailrace netting entrainment surveys at the Belden, Caribou No. 1, Caribou No. 2, and Butt Valley powerhouses in 2001. A total of 133,718 individual fish were collected in the tailraces,

of which 99.9 percent were wakasagi (ECORP, 2002a). The entrainment of wakasagi likely provides a substantial forage base to Butt Valley, and may contribute to the presence of its trophy trout fishery. Neither hardhead nor Sacramento perch, both species of concern inhabiting the project area, were collected during entrainment sampling efforts. The only hardhead documented in the relicensing studies were observed in the tailrace of the Belden powerhouse during the entrainment study. Because hardhead have not been documented above the Belden powerhouse, entrainment of this species is not likely to occur within the project. Because Sacramento perch tend to occupy shallow littoral zones, the potential for their entrainment from Lake Almanor or Butt Valley reservoir is not substantial. The low occurrence of other entrained species collected during the sampling (e.g., rainbow trout) indicates that these populations are only marginally affected by entrainment.

3.3.2.2 Environmental Effects

Minimum Flows

In the SA, PG&E and the settlement parties propose minimum instream flows based on water year type for the preservation and improvement of aquatic resources in the Seneca and Belden reaches of the NFFR (tables 3-16 and 3-17). The FS in its final Section 4(e) condition no. 25 specifies releases identical to the SA. In its Section 10(j) recommendation no. 1, Interior recommends similar, but somewhat higher minimum instream flows based on water year type for the Seneca and Belden reaches (tables 3-16 and 3-17). PG&E, and the FS in its final Section 4(e) condition no. 27, propose a method to classify water year type by January 10 and notify the FS, CDFG, FWS, SWRCB, Plumas County, and other signatories to the SA. The project would then be operated based on that forecast for the remainder of the month until the next forecast is issued on or about the tenth of February, March, April, and May. If the precipitation increases and water year type needs to be reclassified, operational changes would be adjusted accordingly.

For all recommended instream flow regimes, flows into Seneca reach would be released from Canyon dam and be monitored at gage NF-2. Flows into Belden reach would be released from Belden dam and monitored at gage NF-70.

In the SA, PG&E and the settlement parties do not propose any modifications to the existing flow conditions in lower Butt Creek. Interior concurs in its 10(j) recommendation no. 1, and suggests that PG&E make no efforts to reduce existing dam leakage, tunnel leakage, or spring or other natural flows that currently provide inflow to lower Butt Creek below Butt Valley dam.

Table 3-16. Recommended minimum flow releases from Canyon dam (Seneca reach) as measured at gage NF-2. (Source: SA and Interior letter, December 1, 2003, as modified by staff)

		Month											
WY Type		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Critically Dry	SA	75	75	90	90	90	80	75	60	60	60	60	70
	Interior	90	90	90	90	90	90	60	60	60	60	60	60
Dry	SA	90	100	110	110	110	110	80	70	60	60	60	75
	Interior	90	100	110	110	110	110	80	70	60	60	60	75
Normal	SA	90	100	125	125	125	125	90	80	60	60	60	75
	Interior	90	100	150	150	150	125	90	75	75	75	75	75
Wet	SA	90	100	125	150	150	150	95	80	60	60	60	75
	Interior	105	130	170	170	170	150	95	85	85	85	85	90

Note: WY -- water year

Table 3-17. Recommended minimum flow releases from Belden dam (Belden reach) as measured at gage NF-70. (Source: SA and Interior letter, December 1, 2003, as modified by staff)

		Month											
WY Type		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Critically Dry	SA	105	130	170	180	185	90	80	75	75	75	85	90
	Interior	130	130	150	150	150	130	100	100	100	100	100	100
Dry	SA	135	140	175	195	195	160	130	110	100	100	110	115
	Interior	135	140	175	185	195	160	130	110	110	110	110	120
Normal	SA	140	140	175	225	225	225	175	140	140	120	120	120
	Interior	140	140	175	225	225	225	170	140	120	120	120	120
Wet	SA	140	140	180	235	235	225	175	140	140	120	120	120
	Interior	140	140	225	250	250	250	175	140	140	130	130	130

Note: WY -- water year

Our Analysis

PG&E, in consultation with the resource agencies (FWS, FS, CDFG, and SWRCB), performed instream flow studies for the Seneca, Belden, and lower Butt Creek bypassed reaches using the Physical Habitat Simulation (PHABSIM) technique as applied under the structural framework of the Instream Flow Incremental Methodology (IFIM) (Bovee et al., 1998; Milhous et al., 1984, 1989). During the IFIM study design and scoping process, the resource agencies stated that their goal was to manage the NFFR

within the project area as a coldwater rainbow trout fishery with flows that are capable of sustaining a fully functional ecosystem (TRPA, 2002a). The objectives of the PHABSIM study were to describe existing habitat conditions for fish and other aquatic species and to develop the incremental relationship between stream flow and the weighted useable area (WUA) index to physical habitat. WUA is a quantitative index of habitat suitability used as a component of PHABSIM studies to express the amount of available habitat per thousand feet of linear river mile.

Fish species selected for the analyses were rainbow trout and Sacramento sucker, as was benthic macroinvertebrate community diversity. Rainbow trout and Sacramento sucker are two of the dominant species in the bypassed reaches (ECORP, 2003a; TRPA, 2002b). Site-specific habitat suitability criteria (HSC) were developed from field data collected in the Seneca and Belden bypassed reaches for the following life stages of the selected species: juvenile rainbow trout, adult rainbow trout, spawning rainbow trout, and adult Sacramento sucker. For the evaluation of macroinvertebrate habitat at modeled flows, HSC curves for macroinvertebrate community diversity were used from Gore et al. (2001). A similar but more limited study effort was conducted in lower Butt Creek.

As part of the IFIM study, PG&E placed transects in representative riffle, run, pocket water, and pool habitats in seven segments (49 transects) of the Seneca reach, five segments (29 transects) of the Belden reach, and two segments (13 transects) of lower Butt Creek. PG&E measured depths and velocities along transects at calibration flows to model hydraulic conditions up to a maximum flow of 2000 cfs for both the Seneca and Belden reaches and 35 cfs for lower Butt Creek. PG&E presented results for riffle, run, pocket-water, and pool habitats combined for each reach.

Seneca and Belden Reaches²³

The flow schedules proposed in the SA and recommended by Interior (tables 3-16 and 3-17) for the Seneca and Belden reaches are more variable than existing conditions because they are designed to mimic the seasonal variability that occurs within a natural hydrograph over an annual period. In addition, the flow schedules take into account water year type (critically dry, dry, normal, and wet), which affects the distribution and abundance of aquatic habitat types.

²³ The IFIM study provided separate results for the upper and lower sections of the Belden reach. For our analysis of recommended flow regimes for the Belden reach, we used the IFIM study results for the upper reach because this 7-mile section of habitat is not influenced by the unregulated flow of the EBNFFR, which enters at the start of the lower Belden reach.

Adult Rainbow Trout

For adult rainbow trout in the Seneca reach, WUA would increase rapidly up to approximately 250 cfs and then increase more gradually to a maximum at 800 cfs. At flows greater than 800 cfs, WUA would gradually decline (figure 3-10). In the Belden reach, WUA for adult rainbow trout increased steadily up to 300 cfs and then remained stable at all higher flows modeled (figure 3-11).

Both recommended flow regimes for the Seneca and Belden reaches would increase suitable habitat for adult rainbow trout during normal and wet water year types. The 60 cfs minimum flow as proposed by PG&E in the Seneca reach for the drier fall months would increase maximum WUA from 39 percent under existing conditions to 55 percent. Releases of 150-170 cfs in the spring would increase WUA to 82 percent of maximum. The flows recommended by Interior would result in a maximum available WUA of 62 percent of in the drier fall months and a maximum available WUA of 85 percent in the spring. In the Belden reach, habitat suitability would increase from 39 percent of the maximum WUA under existing conditions to 56 to 75 percent and 58 to 75 percent of maximum WUA under the proposed measures in the SA and Interior's recommendations, respectively.

During dry and critically dry water year types the available habitat for adults would be 55 to 67 percent (SA) and 55 to 73 percent (Interior) of the maximum WUA for the Seneca reach and 48 to 70 percent (SA) and 52 to 70 percent (Interior) of the maximum WUA for the Belden reach. Although the increase in habitat during dry and critically dry water year types would be less than for normal and wet water year types, they represent an increase over the existing conditions, especially during the winter.

Both proposed measures for minimum instream flows would improve habitat suitability for adult rainbow trout in each reach over that which exists under current flows.

Rainbow Trout Spawning

PG&E gathered site-specific habitat suitability information for spawning rainbow trout in 2001. Figures 3-12 and 3-13 show the expected quantity of WUA for rainbow trout spawning and egg incubation expected under varying flow conditions. Because rainbow trout spawning habitat is typically composed of unembedded gravel substrates at pool-tail outs and at point bar riffles, a reduction in suitability is likely at higher flows as these habitats become less available due to increased depth and velocity. However, the ratio and proximity of such habitat to downstream young-of-year habitat is more important to maintaining trout populations than the total amounts of spawning WUA (Bovee, 1982).

Maximum spawning and egg incubation WUA for rainbow trout in the Seneca reach occurs at 225 cfs, rapidly declines until a flow of 600 cfs, and then fluctuates

between WUA values of 57 and 92 at higher flows (figure 3-12). Spawning habitat suitability in the Belden reach achieves a plateau between 100 to 400 cfs, with a peak at 125 cfs and then steadily declines at higher flows (figure 3-13).

During wet and normal years the recommended flows in March and April²⁴ for the Seneca reach would provide 71 to 100 percent of the maximum WUA (SA) and 71 to 98 percent (Interior) of maximum rainbow trout spawning WUA in the reach compared to 39 percent under existing conditions. In the Belden reach, flows in March and April would provide 95 to 96 percent (SA) and 96 to 98 percent (Interior) of maximum rainbow trout spawning WUA in the reach, compared to 58 percent under existing conditions.

During dry and critically dry years for the Seneca reach, proposed (SA) and recommended (Interior) flows in March and April would provide 71 to 84 percent of the maximum spawning WUA compared to 39 percent under existing conditions. In the Belden reach, recommended flows in March and April would provide 95 to 96 percent (SA) and 96 to 98 percent (Interior) of the maximum spawning WUA compared to 58 percent under existing conditions.

In summary, the IFIM analyses show that both the proposed (SA) and recommended (Interior) flow regimes would provide for increases in spawning and incubation habitat in all water year types compared to existing flows. The predicted WUA increases over existing conditions are similar in the SA and Interior's recommendations.

Juvenile Rainbow Trout

Juvenile rainbow trout habitat suitability peaks at 50 and 75 cfs in the Seneca and Belden reaches, respectively (figures 3-10 and 3-11). After maximum WUA is attained in each of the reaches, habitat suitability rapidly declines as shallow stream margins decrease in aerial extent and water velocities increase.

The existing year-round minimum flow of 35 cfs in the Seneca reach provides 99 percent of the maximum WUA for juvenile rainbow trout on an annual basis. The proposed (SA) and Interior recommended flow regimes during the late summer/fall period (September through November) would continue to provide 99 percent and 97 to 99 percent of the maximum juvenile WUA, respectively. From December through August, the proposed (SA) and recommended (Interior) flows would provide 89 to 99 percent and 88 to 99 percent of the maximum juvenile WUA, respectively.

²⁴ Rainbow trout spawning was documented in the Seneca and Belden reaches from late March through April (TRPA, 2002b).

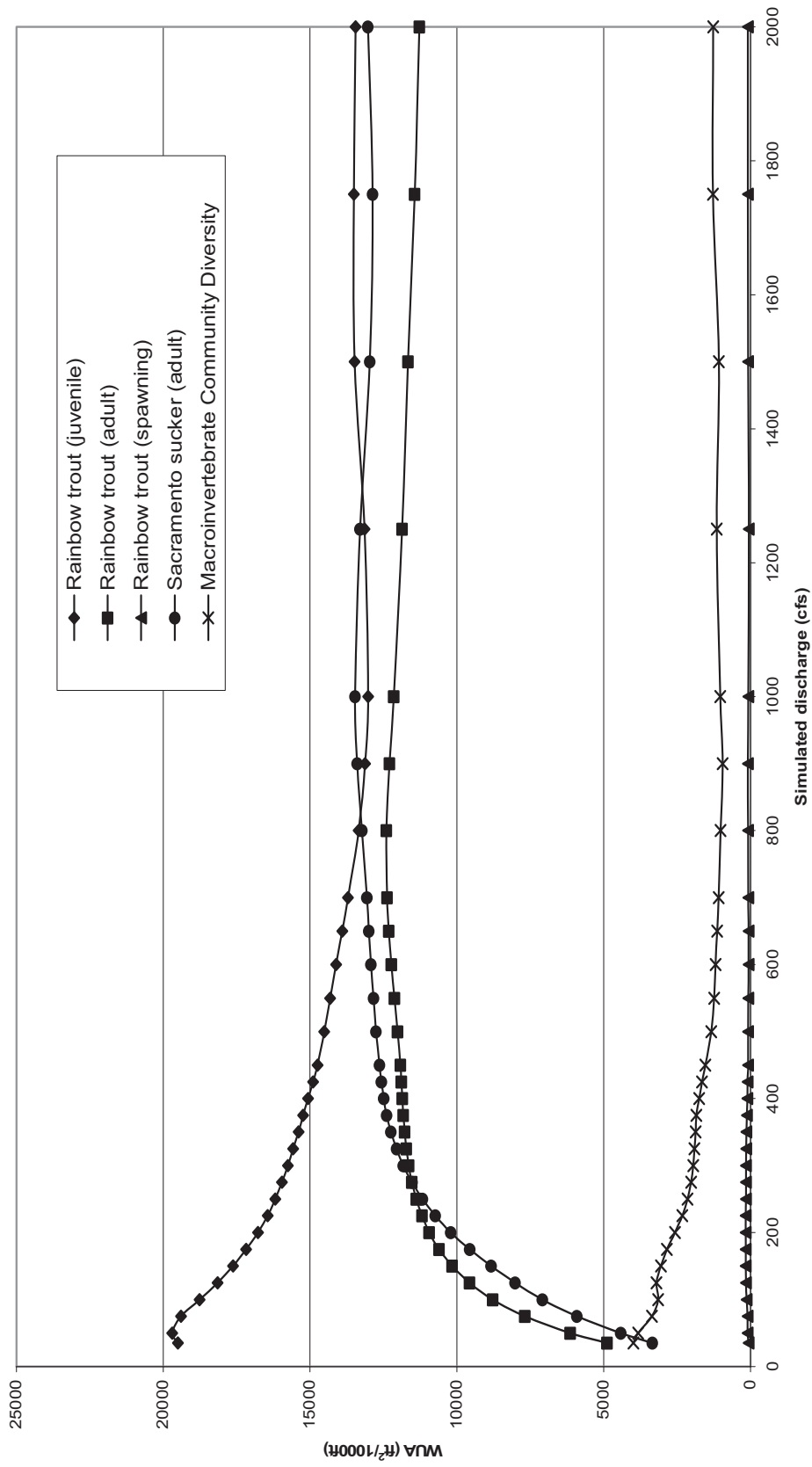


Figure 3-10. Total WUA values for species and life stages evaluated (one velocity calibration method) in the Seneca reach.
 (Source: TRPA, 2002a, as modified by staff)

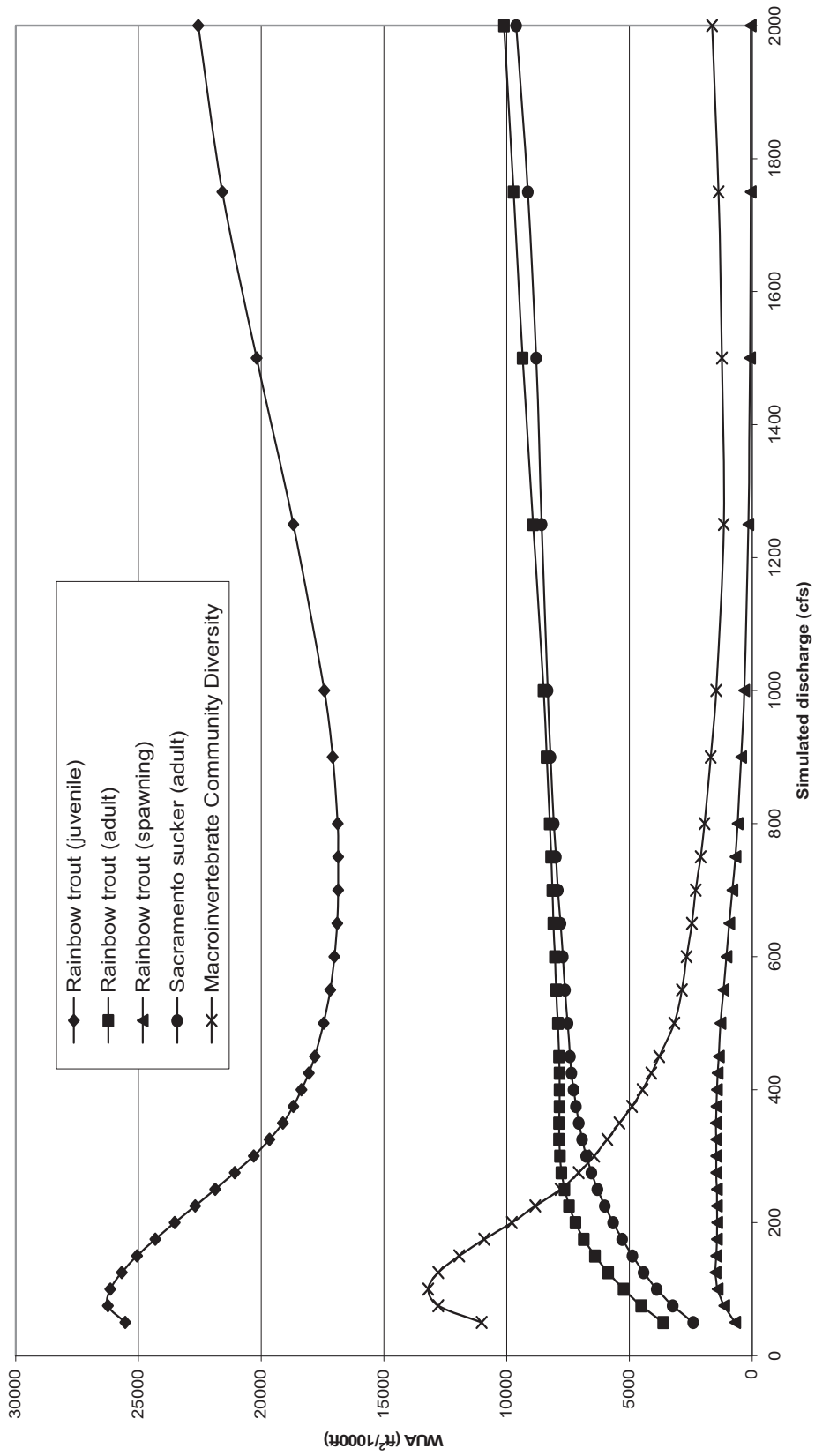


Figure 3-11. Total WUA values for species and life stages evaluated (one velocity calibration method) in the upper Belden reach. (Source: TRPA, 2002a, as modified by staff)

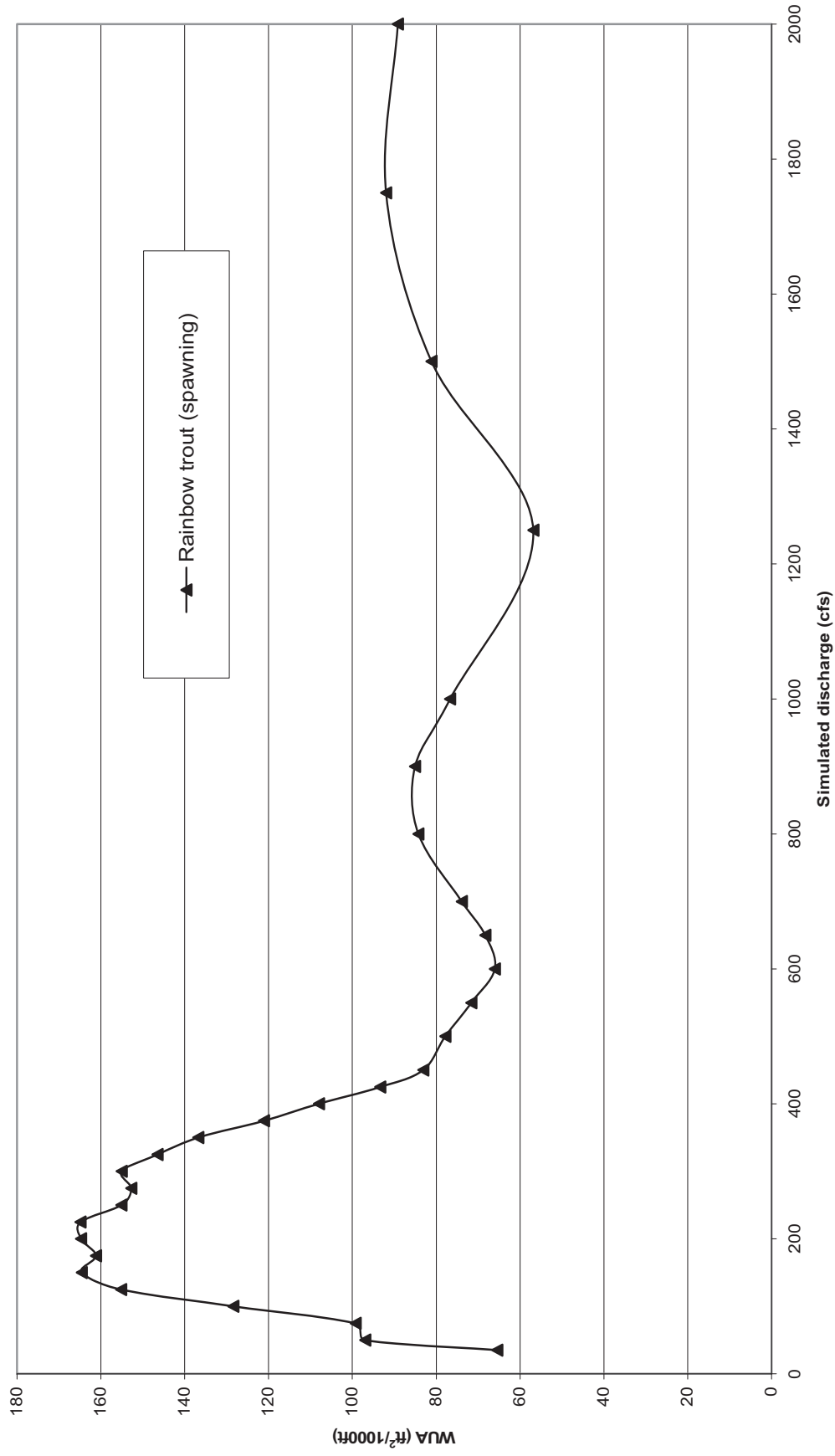


Figure 3-12. Total WUA values for rainbow trout spawning as evaluated (one velocity calibration method) in the Seneca reach. (Source: TRPA, 2002a, as modified by staff)

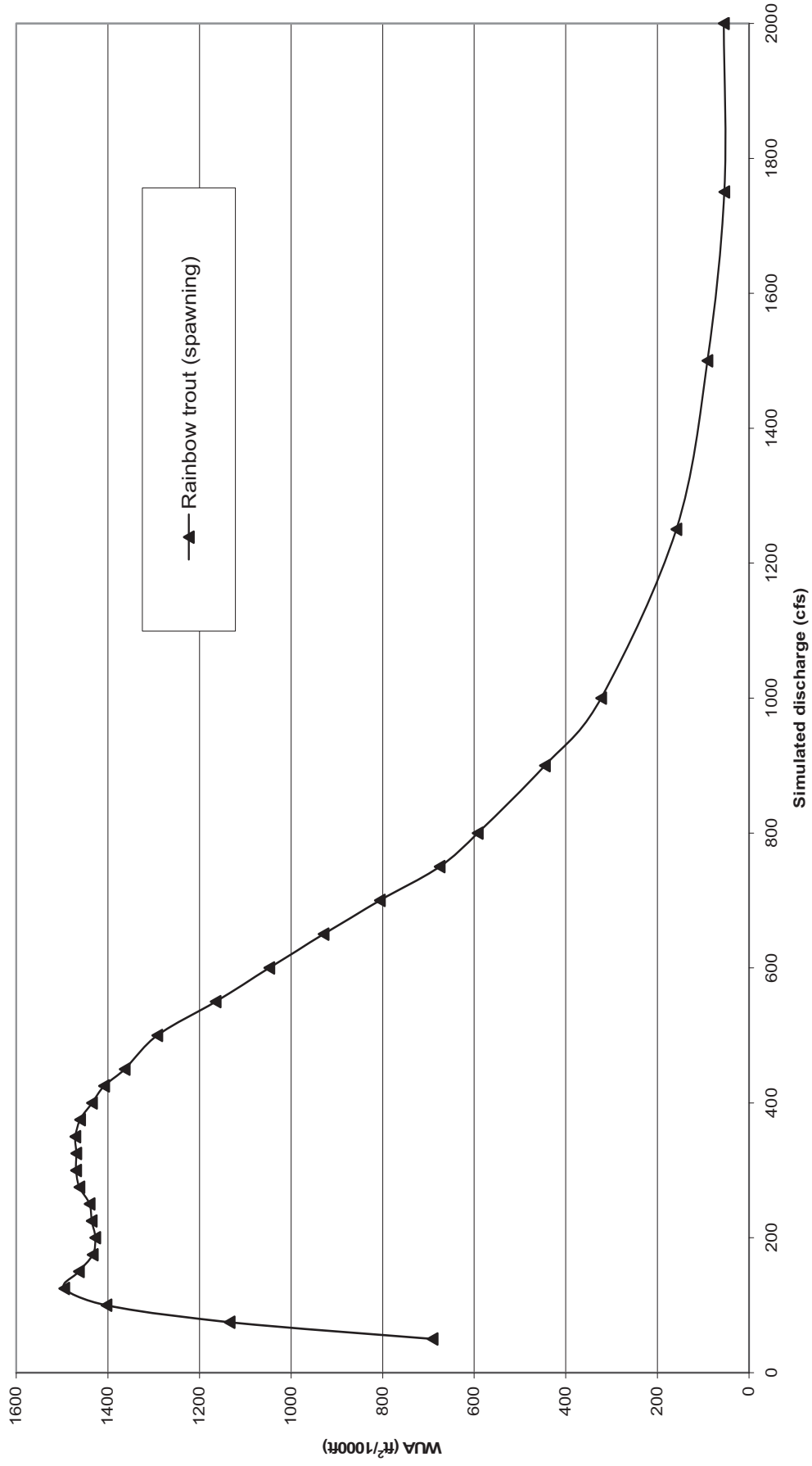


Figure 3-13. Total WUA values for rainbow trout spawning as evaluated (one velocity calibration method) in the upper Belden reach. (Source: TRPA, 2002a, as modified by staff).

The existing minimum flow regime in the Belden reach provides 96 percent of the maximum juvenile WUA from the last Saturday in April to Labor Day and 99 percent the remainder of the year. For normal and wet water year types, the proposed (SA) and recommended (Interior) flows would continue to provide substantial habitat for juvenile rainbow trout, representing 85 to 98 percent and 83 to 98 percent of the maximum juvenile WUA, respectively. During dry and critically dry water year types, the proposed flows would range between 75 and 195 cfs, providing juvenile rainbow trout with 90 to 100 percent of the maximum juvenile WUA. Interior's recommended flows ranging between 100 and 195 cfs would provide 90 to 99 percent of the maximum juvenile WUA.

In summary, the proposed (SA) and recommended (Interior) flow regimes for all water year types would provide essentially the same juvenile rainbow trout habitat suitability as the existing flow regime.

Adult Sacramento Sucker

WUA for Sacramento sucker adults increases steadily up to a flow of 300 cfs in the Seneca reach and 350 cfs in the Belden reach, then slowly increases at higher flows for both reaches (figures 3-10 and 3-11).

Under the recommended Seneca reach flow regimes, total available suitable habitat for adult Sacramento sucker would range between 38 and 68 percent (SA) and 38 and 72 percent (Interior) of maximum habitat suitability, compared to 26 percent under the current instream flow regime. Proposed and recommended flows in the Belden reach should provide 45 to 63 percent (SA) and 45 to 65 percent (Interior) (normal and wet water year types) and 33 to 58 percent (SA) and 40 to 58 percent (Interior) (critically dry and dry water year) of adult Sacramento sucker maximum habitat suitability. Current Belden reach instream flows provide 49 percent of maximum habitat suitability from the last Saturday in April to Labor Day, and 28 percent during the rest of the year.

In summary, the increases in adult Sacramento sucker habitat suitability would occur in all water year types under the proposed (SA) and recommended (Interior) flow regimes for the Seneca and Belden reaches compared to existing flow conditions.

Macroinvertebrate Community Diversity

Habitat suitability for macroinvertebrates is maximized at 35 cfs in the Seneca reach and at 100 cfs in the Belden reach (figures 3-10 and 3-11). In each reach, habitat suitability steadily decreases as flow increases above the flow providing maximum WUA. The proposed and recommended flow regimes would provide 76 to 91 percent (SA) and 72 to 91 percent (Interior) of maximum habitat suitability in the Seneca reach, and 64 to 97 percent (SA) and 59 to 100 percent (Interior) in the Belden reach. Though the recommended flows would decrease habitat suitability for macroinvertebrates during the spring and early summer over existing flows, a major amount of the habitat relative to the maximum potential would still be preserved, while at the same time providing higher

quality habitat for the other members of the aquatic community represented in the PHABSIM model. Further, increased wetted stream perimeter would increase the area available for epifaunal and infaunal colonization, and improve over wintering conditions by providing greater water depths, which would reduce the likelihood that ice formation would encroach on the substrate colonized by these organisms.

We conclude from these data that both the proposed (SA) and recommended (Interior) flow regimes would be benign to this component of the river ecosystem while benefiting the fish species, which is consistent with the resource agency study goals.

Hardhead

The IFIM study did not analyze the flow requirements for hardhead within the Belden reach, but focused on the fish species of interest (rainbow trout and Sacramento sucker) that were identified by PG&E, in consultation with CDFG, FWS, FS, and SWRCB. The only hardhead documented in relicensing studies were observed in the tailrace of the Belden powerhouse during the entrainment study conducted in 2001. Preferred hardhead habitat is riverine environments with deep pools (>1 m) composed of sand-gravel-boulder substrates, slow water velocities (< 40 cm sec⁻¹), with water temperatures ranging from 17 to 28°C (Moyle, 2002). Spawning is presumed to occur in the spring in gravel riffle habitats (Moyle, 2002). The minimum flow regimes for the Belden reach proposed in the SA and recommended by Interior would not adversely affect hardhead because the aquatic habitat characteristics would be similar to what currently exists.

Water Temperatures

As described in section 3.3.1, *Water Resources*, PG&E performed 5 years of summer water temperature monitoring (2000 through 2004) in the Seneca and Belden reaches (see table 3-7). In the Seneca reach, daily average water temperature ranged from 9.4–22.5°C below Canyon dam (NF2), 10.8–19.9°C at the Seneca Bridge (NF3A), and 11.4–18.1°C upstream of the Caribou powerhouses (NF4). However, the temperature data presented by PG&E does not necessarily reflect conditions that occur under typical operations because it includes temperature data collected during 2004, when one of the Canyon Dam outlet tower upper gates was used instead of the low-level gates (used under typical operations) (table 3-7). Under typical operations, the maximum daily mean temperature that was measured in the Seneca reach was 17.2°C, which occurred immediately upstream of the Butt Creek confluence; all values for the reach were below 20.0°C. We suspect that the cooler conditions monitored at the lower end of the reach (station NF4) are largely due to cool water inflow from Butt Creek. None of the daily average temperatures reported for the Seneca reach exceeded 20.0°C.

In the upper Belden reach, daily average water temperature above the Gansner Bar fish barrier ranged from 13.9 to 21.8°C (NF5). Daily average temperature as measured in the middle section of the Belden reach ranged from 14.0 to 21.4°C and 14.7 to 21.3°C

(NF6 and NF7). In the lower Belden reach, downstream of the confluence with the EBNFFR, water temperature ranged from 15.1 to 22.9°C due to the addition of warmer water from the EBNFFR. PG&E also conducted additional analyses to assess the likely temperature changes in the bypassed reaches and reservoir outflows that would be expected as a result of the proposed SA flows and proposed modifications to the Prattville intake (Bechtel and TRPA, 2004).

By comparing the results of PG&E's SNTTEMP model runs and the Bechtel and TRPA (2004) report to baseline monthly mean summer water temperatures in the bypassed reaches, we have determined that the increased minimum flow schedule as proposed in the SA would likely reduce stream temperatures by as much as 1.6°C in the Seneca reach, depending on water year type and month. For all water year types modeled, the water temperatures within the Seneca reach would remain below 16°C for the recommended flow regimes. We do not anticipate that the flows recommended by Interior would result in summer water temperature reductions substantially greater than that proposed in the SA or a more favorable temperature regime for salmonids than the SA.

The Belden reach water temperature-flow relationship modeling conducted by PG&E included two varying conditions: (1) flow within the Seneca and Belden reaches, and (2) configuration (existing or modified) of the Prattville intake. In this section, we analyze the results of the modeling (specifically those for the existing Prattville intake, with a flow release of 75 cfs in the Seneca reach, and a flow of 140 cfs in the Belden reach (see section 3.3.1.2) to approximate the effects of the recommended summer flow release schedule on water temperatures within the Belden reach. Results of the modeling indicate that, in average water years and with normal meteorological activity, monthly median water temperatures from June to September would range from 17.6 to 20.5°C (PG&E, 2003c), which is similar to expected temperatures under existing instream flow conditions (see figure 3-7). Further downstream, below the confluence with the EBNFFR, similar conditions would likely result in water temperatures ranging from 17.9 to 21.4°C, which do not differ substantially from baseline conditions (see figure 3-7).

For the Belden reach, PG&E's SNTTEMP model and Bechtel and TRPA (2004) indicate that the water temperature in the Belden bypassed reach is expected to remain below 20.2°C from June through September in all water year types and could be as much as 2°C cooler than existing conditions as a result of the implementation of the flows proposed in the SA. Any reduction in stream temperatures in the bypassed reaches is considered to be beneficial to the system because these streams support coldwater riverine fisheries. Section 303 of the Clean Water Act authorizes the designation of beneficial uses for the navigable waters of the United States. The Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River basins defines cold freshwater habitat as a beneficial use of the Feather River.

Rainbow trout prefer ambient temperatures between 15 and 18°C, Sacramento sucker prefer temperatures between 15 and 25°C, and hardhead prefer temperatures above 20°C (Moyle, 2002). Under the existing Prattville intake configuration, the proposed (SA) and Interior-recommended flow regimes would reduce or maintain water temperatures within the Seneca and Belden reaches. This would retain preferred temperatures for rainbow trout and Sacramento sucker in both reaches, and in the lower Belden reach it would provide temperatures at the lower end of the preferred range for hardhead.

Conclusion

We expect the flow regime proposed in the SA to maintain or improve existing aquatic resources in both the Seneca and Belden bypassed reaches. Specific effects of the proposed minimum instream flows would (1) maintain rainbow trout juvenile habitat suitability near or at existing high levels; (2) improve adult and spawning rainbow trout and adult Sacramento sucker habitat suitability; (3) maintain significant macroinvertebrate habitat suitability; (4) maintain suitable water temperatures within both reaches for rainbow trout and Sacramento sucker; (5) maintain water temperatures in the Belden reach that are within the preferred range of hardhead, and (6) enhance geomorphic and channel functionality of the bypassed reaches through the movement of sediment and debris. The flow regime recommended by Interior, though providing somewhat higher flows during certain seasons for different water year types, would not provide for a substantial increase in habitat suitability for the evaluated species' life stages over the flow regime proposed in the SA.

Lower Butt Creek

Based on the results of the instream flow study conducted in lower Butt Creek, the maximum WUA for spawning, adult, and juvenile rainbow trout is provided at 18, 23, and 16 cfs over the range of flows that were modeled (5 to 35 cfs) (figure 3-14). Habitat suitability changes gradually across the range of flows modeled with no distinct peaks or inflection points; a relatively wide range of flows would provide similar levels of habitat suitability for most species and life stages modeled. The flow regime is not necessarily a limiting factor to habitat suitability in lower Butt Creek.

Flows under existing conditions range from 14 to 21 cfs and average 18 cfs. The average flow provides 100 percent of the maximum WUA for rainbow trout spawning, 98 percent of the maximum WUA for rainbow trout adults, and 99 percent of the maximum WUA for rainbow trout juveniles. In addition, the average flow provides 96 percent of the maximum WUA predicted for macroinvertebrate community diversity.

Currently, summer water temperatures in lower Butt Creek range from 10 to 13°C. The preferred temperature range for rainbow trout is 15 to 18°C (Moyle, 2002). The relatively high density of trout redds (171 per mile), many of which were found below

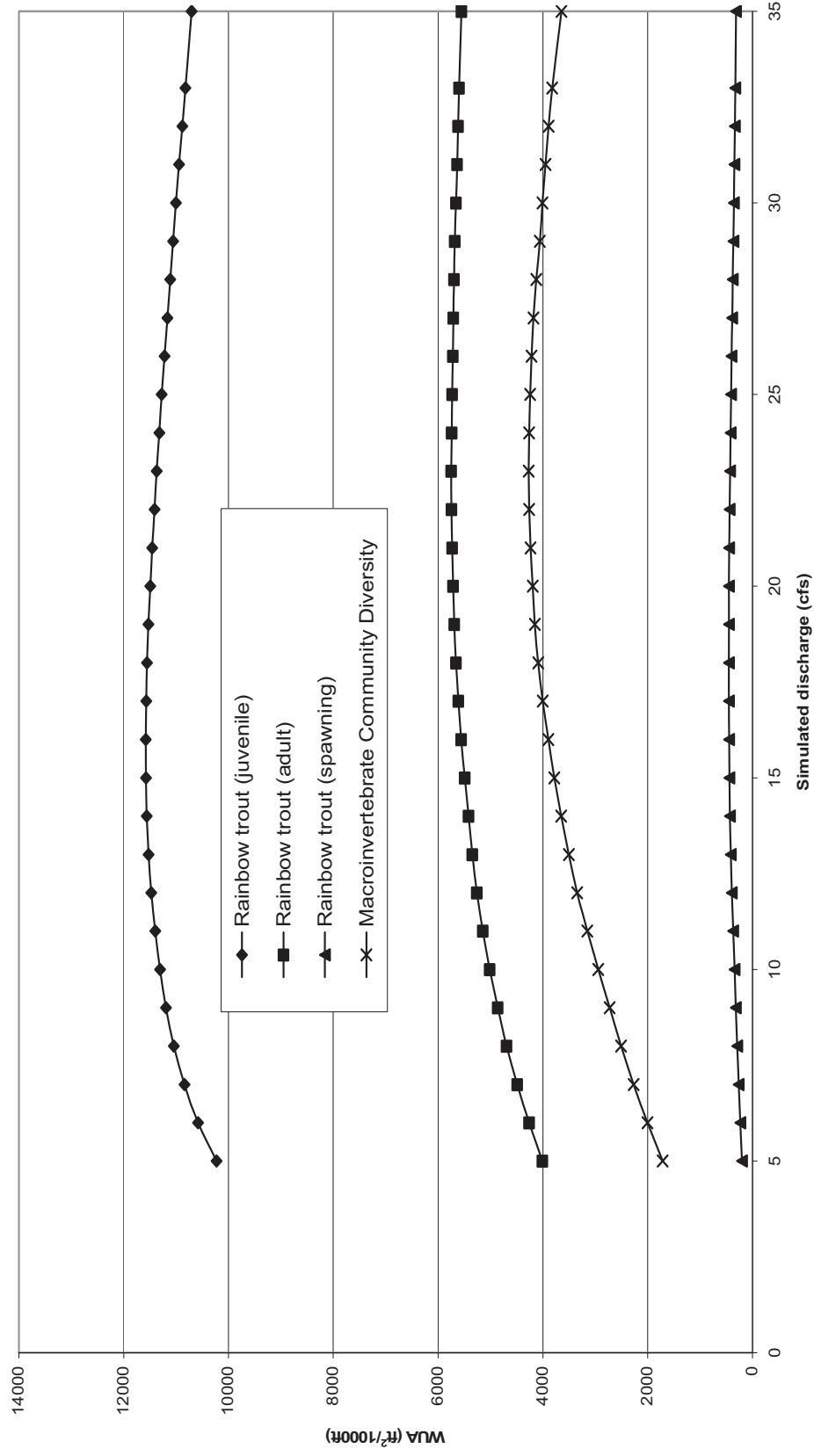


Figure 3-14. Total WUA values for species and life stages evaluated (one velocity calibration method) in lower Butt Creek.
 (Source: TRPA, 2002a, as modified by staff)

gage NF-9 (TRPA, 2002b) and young trout throughout lower Butt Creek (ECORP, 2003) indicates that, during the spring, adult trout are currently successful in moving into Butt Creek to spawn. During the summer, the relatively cool water temperature, which is actually below the preferred range for trout, may induce some percentage of juvenile and adult trout populations to move downstream into the Seneca reach where the water is slightly warmer, and ranges from approximately 10 to 17°C (see table 3-7), and more often in the preferred range for trout. Because the Seneca reach is more accessible to anglers than Butt Creek, our hypothesized movement pattern would make trout produced in lower Butt Creek more accessible to anglers.

In summary, the continuation of the current flow regime in lower Butt Creek would provide near optimal physical habitat conditions for trout and macroinvertebrates. This would maintain the native rainbow trout fishery and provide high quality spawning habitat for rainbow trout inhabiting the creek as well as for trout from the Seneca reach that might spawn in lower Butt Creek.

Pulse Flows

Within riverine systems, periods of high flow entrain, transport, and redeposit sediments, detritus, and woody debris along the stream channel, floodplain, and within tributary confluence areas. These events provide substrates used by fish during spawning and rearing, provide habitat for the development of prey and food items for aquatic species, and maintain the quality and diversity of mesohabitats. The presence of dams and the diversion of flow to powerhouses can reduce or eliminate such seasonal high flow events, which may reduce the quality of aquatic habitat in affected bypassed reaches.

Seneca and Belden Reaches

In the Seneca and Belden bypassed reaches, PG&E proposes the release of one pulse flow in January, February, and March in water years classified as wet and normal to assist in the enhancement of riverine habitat in the UNFFR Project area (table 3-18). The pulse flows would consist of releases from both Canyon dam (Seneca reach) and Belden dam (Belden reach). No pulse flows are proposed by PG&E during water years classified as dry or critically dry. The FS (in its final Section 4(e) condition no. 25(3)A) specifies and CDFG (in its November 26, 2003 filing) recommends similar measures. Pursuant to its authority under Section 10(j), Interior recommends that PG&E release pulse flows of a higher magnitude than those proposed in the SA during wet and normal years, and that pulse flows of 700 cfs be implemented in March of water years classified as dry (table 3-18). To protect trout spawning, Interior also recommends that pulse flows not be required in March in the respective reaches if 2 successive days of mean daily water temperature greater than 10°C are measured at gages NF-2 (Seneca reach) or NF-70 (Belden reach), or if rainbow trout spawning in the Seneca or Belden reaches is observed and reported to PG&E by either CDFG or the FS.

Table 3-18. Recommended pulse-flow releases for the Seneca and Belden reaches.
(Source: SA CDFG letter dated November 27, 2003, the FS, letter dated December 1, 2003, and Interior, letter filed December 1, 2003)

Water Year Type	Recommending Party	Pulse Flow Release
Wet	SA, the FS, CDFG	One release per month in January (675 cfs), February (1,200 cfs), and March (1,200 cfs)
	Interior	One release per month in January, February, and March of 1,500 cfs. (2,200 acre-feet volume ^a)
Normal	SA, the FS, CDFG	One release per month in January (675 cfs), February (1,000 cfs), and March (1,000 cfs)
	Interior	One release per month in January, February, and March of 1,200 cfs. (1,800 acre-feet volume ^a)
Dry	SA, the FS, CDFG	No pulse flows
	Interior	One release in March of 700 cfs, only if no other pulse was released in January or February. (1,000 acre-feet volume ^a)
Critically Dry	SA, the FS, CDFG	No pulse flows
	Interior	No pulse flows

^a Estimated volume only; each release would be 12 hours, plus period of ramping at a standard rate.

The pulse flows proposed in the SA would be released at a ramping rate of 0.5 foot per hour until the maximum volume is attained. Peak releases would be held for 12 hours, after which the release volume would be reduced at 0.5 foot per hour. March pulse flows in the Seneca reach would be scheduled such that after peak flow releases, discharge would be ramped down at 0.5 foot per hour to 400 cfs and held there for 6 hours between 9 a.m. and 3 p.m. on weekends to provide recreational boating opportunities (see section 3.3.5, *Recreational Resources*). After recreational flow conditions are met, reductions would occur at the 0.5 foot per hour ramping rate until the specified minimum stream flow is reached.

In its letter filed with the Commission on November 1, 2004, Interior stated that, as a modification of its original Section 10(j) recommendation, the Commission could assume that the additional dry year pulse flows recommended by Interior would be subject to the temperature criteria described in the SA (no pulse flow would occur if water temperature exceeded 10°C for two consecutive days in March) to protect recently constructed rainbow trout redds from scour by pulse flows. During the Section 10(j)

teleconference on February 3, 2005, Interior described the likely ecologic, geomorphic, and sedimentologic benefits it believed would occur due to increased flow to the bypassed reaches. Interior also expressed its concern with the potential for consecutive years without any pulse flows in project reaches and cautioned that, if insufficient frequency of spring pulse flow is allowed for benefits to the ecosystem, there may be potential for a negative impact on organisms and ecosystem processes that rely on such pulse flows. Interior also expressed its desire to see a pulse flow of some magnitude in dry years, especially since the draft EIS and SA allow for recreation flows in dry and critically dry years. Interior reiterated its modified Section 10(j) recommendation, which provides for a pulse flow of 700 cfs in March of dry years, but qualifies that no pulse flow would occur if water temperature exceeded 10°C for two consecutive days in March, or if pulse flow releases of a similar magnitude have occurred in January or February.

Monitoring of Substrates and Spawning Gravels

To evaluate the effects of pulse flows on the availability, distribution, and recruitment of substrates in the bypassed reaches, PG&E proposes to develop and implement a gravel monitoring plan in consultation with CDFG, SWRCB, the FS, and FWS. Although the emphasis of this program would be on spawning-sized gravel, it is expected that information on smaller- and larger sized materials would also be gathered. The gravel monitoring plan would be approved by the FS and filed with the Commission for final approval before implementation. If, after review of the data collected through gravel monitoring efforts, the FS, CDFG, FWS, and SWRCB determine that the pulse flow schedule could be improved to enhance the availability and distribution of spawning-sized gravel or enhance riparian function, the agencies may propose revisions to the magnitude, duration, or frequency of pulse flows.

In its Section 10(j) recommendation nos. 6 and 8, Interior recommended that two monitoring plans be developed to document geomorphic and sedimentologic changes that may occur in the bypassed reaches as a result of pulse flows. These two plans were:

1. a geomorphologic monitoring plan (10(j) recommendation no. 6) to monitor streambed cross-sections, longitudinal profiles, and overall channel dynamics, including mesohabitat dimensions, distribution, and net channel changes in years 1, 5, 10, and 20 of the license; and
2. a coarse sediment management plan (10(j) recommendation no. 8), which includes (a) a program for monitoring spawning gravel quantity and quality, (b) contingency actions for improving the quality and availability of such gravels, (c) triggers for the implementation of contingency actions, and (d) a special study of pulse flows.

The FS specifies in its final Section 4(e) condition no. 25(3B) and NOAA Fisheries, in its Section 10(j) recommendation no 1, recommends that PG&E provide

gravel monitoring and gravel augmentation plans for the UNFFR. The FS specifies that PG&E provide a gravel monitoring plan within 12 months of license issuance to evaluate the movement and recruitment of gravels in the Belden and Seneca bypassed reaches during pulse and other high flow events. NOAA Fisheries recommends, in conjunction with its modified Section 18 fish passage prescription, that within 12 months of license issuance, PG&E submit a plan to evaluate the amount of gravel needed to support anadromous fish in the Seneca reach. Upon approval of a plan submitted to NOAA Fisheries, PG&E would be required to implement gravel augmentation within 3 years of license issuance.

During the Section 10(j) teleconference on February 3, 2005, and in letters filed with the Commission on October 27, 2004, and November 1, 2004, Interior indicated that, while it prefers its original recommendation for a geomorphological monitoring plan, as an alternative, it would be satisfied with geomorphological monitoring once during the license term (approximately mid-term) instead of four times (in years 1, 5, 10, and 20) as it originally recommended, in addition to spawning gravel monitoring as described in the SA. However, Interior would like to see standard monitoring conducted, including longitudinal profiling and mesohabitat measurements, as well as monitoring of changes resulting from the modified minimum flow schedule or pulse flows, vegetation encroachment (or lack of), and cumulative effects due to the project or other large-scale events.

During the Section 10(j) teleconference, Interior also indicated that it would be agreeable to the gravel monitoring plan as recommended in the draft EIS if contingency actions for gravel management (e.g., gravel supplementation, vegetation management) are more clearly defined in the final EIS.

Our Analysis

We reviewed information on peak flows recorded in the Seneca reach (USGS gage No. 113995) and the Belden reach (USGS gage No. 1140112). Our review of the data for the 31 water years extending from 1970 through 2001 indicates that in the Seneca and Belden reaches, peak flows exceeded 1,000 cfs in 9 years and 1 year, respectively.

Median sediment size among transects ranged from 22 to 362 mm in the Seneca reach and 32 to 256 mm in the Belden reach (Entrix, 2002). Sediments are actively transported through the Seneca reach and deposited in Belden reservoir. Sediment in the reservoir has a median size of 50 mm 0.3 mile below the Caribou powerhouse tailraces, with sediments in the lower end of the reservoir being much finer silts and sands that have a median size ranging between 0.02 to 0.1 mm.

Several sediment sources are present in each reach that could contribute to sediment recruitment. These sources include mining sites, tributary streams, and hill-slope landslides in the Seneca reach. Along the Belden reach, sediment sources include

major project spoil sites and hill-slope landslides. Boulder is the dominant substrate associated with hill-slope landslides in both reaches primarily due to a few large rockfalls. Outside of rockfalls, sand (particles 0.06 to 2 mm in diameter) is the most frequently observed dominant particle size followed by cobble (64 to 256 mm in diameter) and gravel (2 to 64 mm in diameter) in deposits adjacent to the channel within both the reaches (Entrix, 2002).

Surveys relating to the development of habitat suitability criteria for spawning rainbow trout documented 229 redds within the study sections of lower Butt Creek, Seneca reach, and Belden reach. Survey results showed that gravel used for spawning ranged from 6.4 to 76 mm (TRPA, 2002b).

The existing minimum flow in the Seneca reach (35 cfs) is sufficient to mobilize particles of up to 10 mm in diameter. This flow allows sand to remain lodged in most spawning-sized gravel degrading the quality of this habitat for rainbow trout spawning. Such particles would be flushed from the gravel with the proposed and Interior-recommended pulse-flow releases, which would enhance the quality of the spawning gravel.

The existing winter (60 cfs) and summer (140 cfs) minimum flows in the Belden reach are sufficient to mobilize particles up to 4 and 7 mm in diameter, and these flows allow sand to remain lodged in most spawning-sized gravel degrading the quality of this habitat for rainbow trout spawning. Such particles would be flushed from the gravel with the proposed and Interior-recommended pulse-flow releases, which would enhance the quality of the spawning gravel.

The existing, proposed, and Interior-recommended minimum flow regimes specified in tables 3-16 and 3-17 are not sufficient to mobilize most gravel that would be suitable for trout spawning. Seasonal pulse-flow releases sufficient to mobilize spawning gravel would enable material that is potentially available for transport by stream flow (estimated to be 880 cubic yards per mile adjacent to the Seneca reach and 3,580 cubic yards per mile adjacent to the Belden reach) to actually be transported. Some of this material would be gravel suitable for trout spawning, and would serve to replenish gravel that may be washed out of both reaches during flood events of much greater magnitude than the recommended pulse flows. Pulse flows also would enable redistribution of spawning gravel already in the reaches. This could represent a positive effect, if the surface area of gravel is increased or the gravel is more accessible to spawning by adult trout. If such gravel redistribution results in less overall surface area or gravel deposits being less accessible to adult trout, pulse flows could represent a negative effect.

The pulse flows proposed for the Seneca reach by PG&E of 1,000 cfs (normal water years) and 1,200 cfs (wet water years) would likely entrain gravel up to approximately 130 mm in diameter, allowing for the transport and redistribution of a wide range of particles, including 6.4- to 76-mm diameter gravels that are appropriate for

trout spawning in project reaches (Entrix, 2002). PG&E's proposed pulse flows also would increase turbidity as fine sediments from the channel bottom and along the banks are entrained. We anticipate that turbidity would quickly increase to peak levels within the first few hours after increasing the flow followed by a rapid decrease and then a more gradual decrease to near baseline levels. The recreational flows likely would result in peak turbidity levels that are greater than 5 NTU over baseline conditions and would exceed the limits set in the Basin Plan. Interior's recommended pulse flows of 1,200 cfs (normal water years) and 1,500 cfs (wet water years) would likely initiate movement of particles approximately 150 mm in diameter, and produce similar increases in turbidity as the proposed pulse flows. In general, substantially greater flows would be required in the Seneca reach to initiate motion of the median bed sized materials in both the bypassed reaches.

In the Belden reach, the pulse flows proposed in the SA would likely enable the movement of substrates up to 140 mm during wet water years and up to 130 mm in normal water years (Entrix, 2002). As in the Seneca reach, PG&E's pulse flows would increase turbidity to peak levels that are greater than 5 NTU above baseline being reached within a few hours of increasing the flow, and then turbidity would initially decrease rapidly and then more slowly as time passed. Interior's recommended pulse flows of 1,200 cfs (normal water years) and 1,500 cfs (wet water years) would likely initiate movement of particles approximately 150 mm in diameter during wet water years and up to 140 mm during normal water years. The relatively slight difference in particle-size entrainment indicates that the implementation of Interior's recommendation may not result in a substantial increase in riverine sediment movement and distribution or turbidity. The pulse flow schedule proposed by PG&E would also be of sufficient level to inundate some of the floodplain and cause movement of LWD in the bypassed reaches, thereby restoring geomorphic characteristics that have not been in place under current project operation.

The approximated minimum flow needed to mobilize the median bed material from representative sites in both the Seneca and Belden reaches would be 1,600 to 3,600 cfs (Entrix, 2002). Based on the presence of established mature vegetation on mid-channel bars at several of the study transect that were able to survive the 1997 floods of 2,160 cfs in the Seneca reach and 3,500 cfs in the Belden reach, it is likely that it would take flows of even greater magnitude to modify mid-channel bars and to alter the mature vegetation present on these mid-channel bars.

A pulse flow of 700 cfs in March of dry water years in the Seneca and Belden reaches would ensure that periodic flows are provided to flush fine substrates from spawning gravels, redistribute organic materials and small gravels (primarily in the 25 to 50 mm size class), and activate floodplain habitat in the Seneca reach (PG&E, 2002a). These actions would improve conditions for the aquatic resources in the bypassed reaches, especially during periods of drought, by creating or modifying physical habitat

and by stimulating overall riverine productivity through the influx of nutrients from the floodplain.

The gravel monitoring plan proposed by PG&E (SA; section 1, item 3B) and specified by the FS would ensure that the effectiveness of these pulse flows can be assessed. If the amount of gravel transported out of either the Seneca or Belden reaches is greater than the amount of gravel that enters the reaches from the material known to be available for transport adjacent to each reach, pulse releases could result in a decrease in trout spawning habitat. We consider it especially important to monitor the status of gravel within the Seneca reach because the material available for transport per mile is about a quarter of that available to the Belden reach. Although the existing density of redds in the Seneca reach is high (128 per mile), our review of figure 3-10 reveals relatively low quantities of available spawning habitat. We interpret this to mean that the trout spawning habitat in Seneca reach may be susceptible to extensive changes with the implementation of pulse flows, or other altered flow regimes. Monitoring of gravel at representative locations in both reaches would provide data to assess whether unintended consequences from pulse flows are occurring and quantify the actual benefits of pulse-flow releases, and, as PG&E proposes, enable contingency actions to be developed and implemented, if needed.

We conclude that the pulse flows proposed by PG&E and the settlement parties in the SA would likely achieve the overall habitat objectives for the bypassed reaches, including recruitment of new substrates into the active channel, downstream movement of sediment, activation of the floodplain, and movement of detritus and woody debris. In addition, the flushing of fine substrates from gravel beds and the redistribution of gravel within the stream channel would likely enhance spawning habitat availability, abundance, and distribution for salmonids and other fish that spawn in gravel beds. Enhancement of macroinvertebrate habitat may also occur as the interstices of larger substrates (gravel, cobble, and boulders) would be annually flushed of fines thereby creating more habitat within the substrates. The release of a 700 cfs pulse flow in March of dry years, if a flow of that magnitude has not occurred in the preceding January or February, would ensure that some geomorphic and sedimentological processes occur in the bypassed reaches in dry years, which would benefit fish and other aquatic biota by increasing nutrient influx and modifying riverine habitat. Additionally, we conclude that the gravel monitoring plan and coarse sediment management plan proposed by PG&E in the SA would allow for a sufficient assessment of spawning gravel availability for anadromous fish as requested by NOAA Fisheries in its 10(j) recommendation no. 1. The adaptive nature of both the gravel and coarse sediment management plans would allow for modifications to pulse flows to be made and the development of contingency actions to supplement gravel if necessary.

Lower Butt Creek

In the SA, PG&E and the settlement parties propose that pulse flows not be released into lower Butt Creek unless the results of habitat monitoring indicate that they are necessary (SA, section 1, item 4—Pulse Flows in Lower Butt Creek and item 8—Lower Butt Creek Streamflow and Habitat Monitoring). The FS (final Section 4(e) condition no. 25(4) specifies and CDFG (in its November 26, 2003, filing) recommends similar measures. If pulse flows are required based on results of the habitat monitoring, PG&E would provide them via use of the Butt Valley Reservoir spillway or an acceptable alternative. The magnitude, ramping, and duration of the pulse flow(s) would be determined in consultation with CDFG, SWRCB, the FS, and FWS. The timing of any pulse would be coordinated and occur simultaneously with pulse flows in the Seneca reach.

In its Section 10(j) recommendation no. 3, Interior recommended that within 6 months of license issuance, PG&E develop a Lower Butt Creek pulse flow plan in consultation with CDFG, SWRCB, the FS, and FWS, which would be implemented within 5 years of license issuance. Interior's recommendation included measures to assess the frequency, magnitude, and duration of high flows that exist in this reach and include actions such as loosening of woody debris and excavation of excess vegetation. Components of the test flow study also include pre- and post-monitoring of mesohabitat, surveys to assess LWD and vegetation density, substrate characterization, longitudinal and cross-sectional profiling, and tracer gravel implementation. Interior states that the need for a one-season test pulse flow is based on "a larger than historical width to depth ratio, a higher proportion of fine to very fine sediments in surface samples, a very high density of large wood, and encroachment of vegetation onto bars, further stabilizing sediments."

In its letter filed with the Commission on November 1, 2004, Interior agreed that the actions called for in the SA would be acceptable, as long as adaptive management remained a viable and attainable component of the proposal. Interior also suggested two modifications to our recommendation: (1) modify the criterion determining the need for pulse flows so that it is based on the expectation that the flow would provide a benefit, rather than just be provided in response to a degraded condition, and (2) delegate the final decision on the need for pulse flows to the Commission if the agencies and PG&E disagree on the need for pulse flows. During the Section 10(j) teleconference on February 3, 2005, PG&E described the problems associated with providing pulse flows to lower Butt Creek: Butt Valley dam has no low-level outlet and, at present, the only way to release pulse flows would be through the spillway. During the Section 10(j) teleconference, Interior restated its agreement with our recommendation if adaptive management is a component of it.

Our Analysis

Recent fishery, mollusc, habitat mapping, and IFIM studies conducted in lower Butt Creek document high quality coldwater habitat that shows no sign of impairment, and there is no evidence of a need for pulse flows (ECORP, 2003a; Spring Rivers, 2002; TRPA, 2002a, b). Pulse-flow releases, even on a trial basis, have the potential to result in adverse effects on water quality and aquatic resources, and, given the existing high quality habitat for aquatic biota, we conclude that there is no need to evaluate pulse-flow releases.

Although, the geomorphic study conducted in the 1-mile-long reach below Butt Valley dam showed that a larger than expected width to depth ratio currently exists (24.2 vs. 15), the study characterized this finding as “not unexpected for areas with large boulder channel materials (PG&E, 2002a, appendix E3.1-12, page 4-41). Additionally, the study found that sediment transport under existing conditions is not substantially different than under historical conditions. Furthermore, the incipient motion analysis conducted by PG&E concluded that particles 25 mm in diameter are mobilized at a flow of 10 cfs in lower Butt Creek. Existing flows within lower Butt Creek exceed 10 cfs 90 percent of the time for all months (see table 3-2), therefore, current flows are likely sufficient to flush fines from larger substrates and transport gravels within the creek. The IFIM study conducted by PG&E indicated that lower Butt Creek had the highest density of rainbow trout redds (171 redds per mile) amongst the three bypassed reaches (TRPA, 2002b), indicating that sufficient spawning gravel currently exists in lower Butt Creek.

Following the Section 10(j) teleconference on February 3, 2005, we evaluated the feasibility of designing and providing a siphon system at Butt Valley dam. Because of the steep slope at the dam, and the distance necessary to move water over the dam, we also considered a pumping plant. After considering the expected benefits of providing a pulse flow in lower Butt Creek, we determined that the installation of a siphon system or pumping plant to provide future pulse flows is not warranted at this time.

In summary, we conclude that because lower Butt Creek contains high-quality aquatic habitat, functioning sedimentologic and geomorphic processes, and a diverse and healthy fish community, a pulse flow test plan as recommended by Interior is not warranted. However, if the results of monitoring indicate that the quality of the habitat has degraded, or that aquatic habitat could be enhanced and that pulse flows are necessary, the implementation of these flows would proceed as indicated in the SA and FS final Section 4(e) conditions, whereby the applicant would provide pulse flows through the use of the spillway or other acceptable alternative. The magnitude, timing, duration, and ramping of any agreed upon pulse-flow releases into lower Butt Creek would be determined by PG&E in consultation with the FS, FWS, CDFG, SWRCB, and other parties as described in the SA (section 1, item 4) and after approval by the Commission.

Ramping Rates and Block Loading

As flows rapidly change (either up or down), areas of suitable habitat shift back and forth across the river channel (Bovee et al., 1998). If the rate of habitat movement during upramping exceeds the ability of aquatic organisms to move into areas containing suitable velocities, the organisms may either drift downstream (e.g., fish larvae, macroinvertebrates) or die (e.g., fish eggs) as a result of displacement from a redd or nest (Vehanen et al., 2000; Bovee et al., 1998). Downramping (rapidly decreasing flows) can strand organisms when flows subside more quickly than organisms can respond. Potential impacts from stranding include desiccation, increased predation, and deteriorating water quality conditions. Non-mobile life stages, such as fish eggs, and organisms with low-mobility (macroinvertebrates and molluscs) are typically more affected by downramping because they are either physically unable to move or unable to move fast enough in response to receding flows. As high flow releases in the bypassed reaches are typically of short duration, on the order of hours or days, only more mobile life stages, such as juvenile and adult fish, would be able to use newly submerged habitat and potentially be subjected to possible stranding as flow recedes.

Interior's 10(j) recommendation no. 20, recommends that, within 6 months of license issuance, PG&E develop a ramping rate plan for lower Butt Creek in consultation with CDFG, SWRCB, the FS, and FWS. Interior's plan would include specified rates of release change (up and down) from project facilities, and the rationale for selection of these rates. PG&E proposes, the FS (final Section 4(e) condition no. 25(6) specifies, and CDFG (in its letter dated November 26, 2003) recommends that, for the preservation and improvement of aquatic resources in the project area, PG&E would control river flows by ramping regulated streamflow releases from project dams. During periods when ramping could be controlled by the project, ramping rates would apply to releases made from Canyon and Belden dams for winter pulse flows, summer recreation flows, and all other releases from dams that PG&E makes for operational purposes. The basic ramping rate at Canyon and Belden dams would be 0.5 foot per hour in all months as measured immediately downstream of the dams (gaging stations NF-2 and NF-70, respectively). Changes in Canyon dam streamflow releases because of gate size and other factors may exceed the ramping rate in any particular hour, but PG&E would make a good faith effort to return to the overall basic ramping rate in the next and subsequent hours.

PG&E did not directly evaluate the potential effects of upramping and downramping in its license application. We consider gradual ramping (either up or down) of flows to the Seneca and Belden bypassed reaches to be more preferable than a non-ramping situation because the impacts associated with not ramping on non-mobile and low-mobility organisms (fish larvae, molluscs, macroinvertebrates) would be minimized. The ramping rates proposed by PG&E for Canyon and Belden dams would allow organisms in the Seneca and Belden reaches to more effectively relocate to suitable habitat as flows are adjusted.

Block loading of Belden powerhouse would allow PG&E's downstream Rock Creek and Cresta projects to comply with the required ramping rates that were developed to mitigate for the effects of unregulated increases and decreases associated with project operation in the Rock Creek and Cresta bypassed reaches. Block loading would likely provide flow changes that would be similar to those that occur in the unregulated EBNFFR.

Emergency and Planned Maintenance Outage Spill Plan

The FS, in its preliminary Section 4(e) condition no. 30, specified that PG&E develop a notification and minimization of emergency and planned outage spill plan for the purpose of minimizing the negative ecological effects of uncontrolled high flows into the project bypassed reaches resulting from emergency and planned hydropower facilities maintenance outages. However, in its final 4(e) conditions submitted on November 4, 2004, the FS removed this condition, indicating that the objectives of its preliminary condition were met by the Belden block loading and ramping protocols.

Recreational Flows—Belden Reach

In the SA, PG&E proposes to implement recreational flow releases in the Belden reach during the summer to provide for recreational boating opportunities (table 3-19). FS final Section 4(e) condition no. 28 specifies that PG&E should implement recreational flow releases as specified in the SA and, CDFG (in its letter dated November 26, 2003), and Interior (10(a) condition no. 1) also recommend the implementation of recreational flow releases (discussed in greater detail in section 3.3.5, *Recreational Resources*). As a condition of the SA and FS final Section 4(e) condition no. 28, PG&E would establish, within 6 months of license issuance, a recreation river flow TRG to assist with the design of recreation and resource river flow management and monitoring plans. The TRG would also be responsible for review and evaluation of recreation and resource data, and the development of recreation river flow release schedules in the Belden reach. The TRG would consist of representatives from CDFG, SWRCB, FWS, NPS, Plumas County, AW, and PG&E. The TRG would evaluate the existing available ecological information regarding recreation river flows and effects on aquatic resources, determine if recreation flows would negatively effect aquatic resources, and conduct test flows for a three year period. A monitoring plan to determine the effects of test flows on aquatic resources would be developed, with monitoring conducted during the test flow period. Based on the monitoring, a determination as to whether to continue recreation flow releases would be made. Additionally, in its Section 10(j) recommendation no. 14, Interior recommends that PG&E develop a recreational activities monitoring plan within 6 months of license issuance to assess the effects of flow releases (in addition to camping, angling, and public access) on fish and wildlife resources.

Table 3-19. Recommended Belden reach recreational flow schedule. (Source: SA, CDFG letter dated November 27, 2003, the FS, letter dated December 1, 2003, and Interior letter dated December 1, 2003)

Month	Release amount (cfs)		Release Days per Month				Use Day Triggers	
	Dry/ Critical Dry	Normal/ Wet	Critical Dry Start	Critical Dry Cap	Dry/ Normal/ Wet Start	Dry/ Normal/ Wet Cap	Wet & Normal/Dry Up	Down
July	650	750	1 day	1 day	1 day	2 days	>100	<100
August	650	750	1 day	1 day	1 day	2 days	>100	<100
September	650	750	1 day	1 day	1 day	2 days	>100	<100
October	650	750	1 day	1 day	1 day	2 days	>100	<100

AW, in a letter dated December 3, 2003, recommends recreational flow releases in the Belden reach similar to those in table 3-19, but with different trigger numbers. We discuss boater trigger numbers in section 3.3.5, *Recreational Resources*.

In its comments on the draft EIS filed October 27, 2004, Interior makes an additional Section 10(j) recommendation, which calls for a 6-year delay of recreational flow releases to ensure that biological data under the flow regime that may be specified in a new license can be collected and analyzed without being confounded by recreational releases. Because the new minimum and pulse flow schedules for the UNFFR would likely result in substantial changes to the biotic community, Interior recommends delayed recreational flow implementation and emphasizes the need to exercise caution in light of studies showing recreational flow disruption of macroinvertebrates, including those for the Rock Creek-Cresta Project license.

Our Analysis

Flow fluctuations and sustained high flows from recreation releases could result in adverse effects to water quality and the aquatic community in the Belden reach. Recommended recreational flows of 650 or 750 cfs are of a magnitude about four to five times greater than the instream flows recommended by Interior and proposed by PG&E in the SA for July through October. A substantial flow increase could increase turbidity, disrupt fish and amphibians, displace macroinvertebrates, and affect channel processes.

Increases to turbidity would likely occur immediately following increasing flow releases for each recreational release. As with the proposed and recommended pulse flows, we anticipate that peak turbidity would occur within a few hours of the initiation of the recreational flow releases followed by a rapid decrease in turbidity and then slowly drop back to near the level prior to the recreational flow release. The magnitude of

increases in turbidity would be dependent on recent hydrological and meteorological conditions, with the largest increases likely occurring after long dry periods with relatively low flows.

During collection of rainbow trout spawning habitat suitability criteria data in 2001, rainbow trout were observed spawning in the Belden reach from late March through April (TRPA, 2002b). During this period, water temperatures ranged between 8 to 14°C. At these water temperatures, rainbow trout eggs would hatch in 24 to 48 days (Piper et al., 1982), and fry would start appearing in the project reaches by mid to late May. During the first few months after hatching, trout require protective cover and low velocity areas (Behnke, 1992). If they were unable to find such low velocity areas, rainbow trout fry in the Belden reach could be washed downstream by the recreation flows during the months of July and August.

The monthly recreation flow releases during the summer could adversely affect the standing crop of macroinvertebrates at a time when food requirements of trout and other fish are at a maximum due to warmer summer water temperatures. A macroinvertebrate drift study was conducted in the fall of 2000 as a component of whitewater flow release evaluations in the Seneca and Belden reaches of the NFFR. Sampling results for the Belden reach demonstrated an increase in the abundance percentage of burrower and crawler behavioral groups collected during the test flow (approximately 600 cfs) release period (ECORP, 2002b). Organisms in these macroinvertebrate behavioral groups live in the interstices of substrate and are generally considered to be non-drifting organisms.

The overall effect of recreational flows on the aquatic community currently remains largely unclear as few detailed studies have been performed on such flows. The ERC for the Rock Creek – Cresta Project released results of biological monitoring performed in 2003 and 2004 to document the effects of recreational flow releases in the Rock Creek and Cresta reaches of the NFFR, which are located downstream of the UNFFR Project. This on-going study will be of significance in evaluating the effects of recreational flows in reaches throughout the UNFFR. The monitoring conducted in 2003 and 2004 investigated the stranding of aquatic organisms (fish, macroinvertebrates, and foothill yellow-legged frog [FYLF]), displacement of juvenile fishes, impacts on all life stages of FYLF, and macroinvertebrate drift. The study results demonstrated that recreational flow releases have some effects on aquatic resources within the study reaches. Stranding of benthic macroinvertebrates (n=932 in 2003 and 204 in 2004), fish (n=156 in 2003 and 137 in 2004), and FYLF tadpoles (n=2 in 2003 and zero in 2004) occurred during downramping of recreational flow events with most instances of stranding occurring during the June recreational flow release (ERC, 2004; 2005). Displacement studies found that resident fish, specifically fry and juvenile life stages, were able to avoid being displaced by the recreational flow releases by avoiding areas of high water velocities. Documented impacts on the macroinvertebrates within the Rock

Creek reach, the selected study reach due to lower thresholds for sediment mobilization, included displacement of benthic organisms from their preferred velocity regime immediately following flow events, an overall decline in the benthic community measures from June through October which is a trend contrary to what would be expected as part of natural seasonal variability, and an eventual re-equilibration (after flow releases) of the benthic community to a degraded state (fewer taxa and displacement/shift in abundance) (ERC, 2004). The ERC (2005) reported that peak turbidity levels measured during the recreational flow releases in 2004 were 34 NTU in the Rock Creek reach and 20.4 NTU in the Cresta reach, in comparison to baseline levels of 0.1 to 2.1 NTU. These results were similar to conditions monitored in 2003. The results of continuing this recreational flow effects study at the Rock Creek-Cresta Project would help to more fully evaluate the overall effect of recreational flows on the aquatic community within the Belden reach.

As discussed, the recommended recreational flows could have adverse effects on the aquatic resources in the Belden reach. Monitoring the effects of recreational flows on aquatic resources within the Belden reach, if the 3-year test period is conducted, utilizing information from the evaluation of recreation flows in the Rock Creek and Cresta reaches of the NFFR, and incorporating the results of other pertinent studies would provide a better understanding of how recreation flows affect turbidity, substrate conditions, macroinvertebrates, amphibians, and fish populations in the reach. The adaptive approach to recreation river flow management as outlined in the SA and by Interior would allow for the identification of any potential negative impacts on water quality or the aquatic community from existing studies or literature prior to the release of the test recreation flows and provide for the adequate protection of aquatic resources if negative impacts are found to result from the release of test recreation flows.

Delaying the implementation of recreational test flows would have no adverse effect on the existing aquatic community. The biotic community would have the opportunity to adapt to the revised instream flow schedule without being disrupted by recreational release flows, which would improve the likelihood of enhancing macroinvertebrate and fish populations. The delay also would allow PG&E to implement monitoring to assess changes to the biotic community that may have resulted from implementation of the new flow schedule without the confounding effects of recreational flow releases.

Monitoring of Aquatic Resources in Bypassed Reaches

For the Seneca and Belden reaches, PG&E proposes to develop an aquatic monitoring plan, in consultation with CDFG, SWRCB, the FS, and FWS. Habitat monitoring would be initiated between 10 and 12 years after license issuance, with sampling occurring every 2 years over a 6-year period, for a total of three sampling periods. The FS final Section 4(e) condition no. 26 specifies a sampling plan similar to that proposed in the SA. The plan proposed in the SA would include monitoring of fish

populations and benthic macroinvertebrates (including population robustness, feeding group, and tolerance/intolerance trend monitoring) in at least three sites in each reach. Sampling could be deferred to the following year in the event of a critically dry year.

PG&E proposes to provide the results of monitoring and any flow change recommendations to the Commission, the FS, FWS, SWRCB, CDFG and other interested parties in a draft technical report prepared by June of the year following completion of each sampling effort. PG&E would finalize the technical report by the following December. In addition to describing the results, the report would compare the results with those of previous surveys. The fisheries sampling report would discuss trends in fish abundance. The benthic macroinvertebrate sampling report would enumerate any changes over time regarding the composition of functional feeding groups, overall population heterogeneity and robustness, and pollution tolerance/intolerance trends.

At the conclusion of the monitoring program, PG&E, the FS, CDFG, FWS, SWRCB, Plumas County, and other interested parties would meet to review the results of the monitoring. If, after review of the data collected during the monitoring, the parties specified determine that aquatic species or other ecological attributes may benefit from modifications to the minimum streamflows, the parties would evaluate and determine whether such modifications: (1) can be implemented within PG&E's operational capabilities; (2) would maintain the total annual volume of water that has been allocated for minimum streamflows in any given water year; and (3) would not adversely impact other beneficial uses, including hydroelectric power generation, Lake Almanor surface water elevation, and recreation. If all parties concur and propose revised minimum streamflows that meet these criteria, PG&E would file the proposal with the Commission for approval.

For lower Butt Creek, PG&E proposes to develop, in consultation with CDFG, SWRCB, the FS, and FWS, a plan to monitor and assess aquatic habitat quality in lower Butt Creek between Butt Valley dam and its confluence with the NFFR. Monitoring of habitat quality would occur at intervals of 3 to 5 years, depending on water year type and other appropriate factors. If the monitoring results conclude that habitat quality has degraded, PG&E, in consultation with CDFG, SWRCB, the FS, and FWS, would initiate a pulse flow program if it is concluded such a flow would provide a significant benefit.

In 10(j) recommendation no. 10, Interior calls for development of a comprehensive fish monitoring plan by PG&E that includes a program to monitor all project bypassed reaches, impoundments, impoundment tributaries, and bypassed reach tributaries to determine the species status and size composition of the fish community, assess trout spawning activity, and track fish planting information and recreational use (angler surveys). Assessments would be performed in years 1 through 3, 8 through 10, 15, 20, and 25 of a new license, with reports issued 6 months following completion of studies and distributed to CDFG, SWRCB, the FS, and FWS. Further, a

macroinvertebrate monitoring plan for the bypassed reaches would be developed and surveys conducted upon license issuance and at 5-year intervals thereafter.

Our Analysis

New environmental measures, such as instream flow regimes, pulse flows, recreation flows, and ramping rates proposed by PG&E and recommended by Interior would likely affect aquatic resources in the Seneca, Belden, and lower Butt Creek bypassed reaches. It would be appropriate to collect biological data to document the response of the aquatic community (fish and macroinvertebrate populations) to changes in project operation. This information would allow for a determination to be made as to whether the expected benefits of the new flow regime are occurring and, if not, whether any adjustments to the flow regime are necessary. Because the measure proposed in the SA does not call for monitoring until years 10–12, we are concerned that changes, negative or positive, to the fish, amphibian, and macroinvertebrate communities would not be evident in a timely manner under this proposed monitoring program. Interior's recommended sampling protocol calls for biological monitoring to begin in years 1–3, which may be too early to detect responses of the community to the changes in flow regimes and pulse flows. Adequate baseline studies of the fish populations in the Seneca and Belden reaches, under existing conditions, have been conducted by PG&E in 2000 through 2002 and they provide a reference for comparison with future monitoring results.

PG&E does not propose to monitor fish populations and macroinvertebrates in lower Butt Creek but instead proposes a plan to monitor and assess aquatic habitat between Butt Valley reservoir and the confluence of lower Butt Creek with the NFFR. Recent studies in lower Butt Creek conducted by PG&E (2002a, appendix E3.1-1, appendix E3.1-4) document high fish density, naturally reproducing populations of riffle sculpin and rainbow trout, high redd density, and high mussel diversity. There are no plans by any party for modifying the existing flow regime. Therefore, we conclude that the habitat monitoring plan proposed in the SA (section 1, item 8) is sufficient and would document habitat trends in this reach of the project. PG&E's proposal would provide a quantitative analysis of the aquatic habitat in lower Butt Creek, and an indirect assessment of project operation effects on fish and macroinvertebrate communities by assessing available spawning gravel, embeddedness of substrates, mesohabitat characteristics, and available LWD. The adaptive nature of the lower Butt Creek monitoring plan would allow for modifications to be made to project operations if it is determined to be necessary by the cooperating resource agencies (see discussion on *Pulse Flows* above). Monitoring every 3 to 5 years, as proposed in the SA (section 1, item 8), would provide PG&E and resource agencies a comparative dataset that would ensure that the high quality aquatic habitat and its associated aquatic community in lower Butt Creek are maintained.

Woody Debris Management Plan

Interior's 10(j) recommendation no. 9 is that within 6 months of license issuance that PG&E develop, in consultation with CDFG, SWRCB, the FS, and FWS, a woody debris management plan that includes: (1) a program for monitoring bypassed reaches for LWD, (2) woody debris placement program sufficient to determine if placement is feasible, and (3) a plan for maintaining adequate amounts of woody debris throughout the bypassed reaches. PG&E would consider and test two woody debris placement options: (1) the recovery and transport of LWD around the project dams; and (2) the placement of individual pieces of LWD at selected locations. The tests would determine residence time as a function of piece size, flow (particularly pulse flows of different magnitude), methods of introduction, and also monitor changes in mesohabitat in the vicinity of the test material. Interior recommends the management and addition of woody debris as a means to help restore missing ecosystem functions because it believes there is currently a lack of sufficient LWD within the bypassed reaches.

Our Analysis

PG&E documented the distribution and occurrence of LWD within the Seneca, Belden, and lower Butt Creek bypassed reaches in its geomorphic study (Entrix, 2002). It reported that LWD was present throughout the reaches, and there was continual recruitment from dead and dying trees along the channel margins. LWD deposits tended to be within the active channel, but above the low-flow channel in the Seneca and Belden reaches. PG&E found a total of 21 LWD occurrences, all individual logs in the Belden reach. The Seneca reach had 141 LWD occurrences (including individual pieces as well as debris jams). At Belden dam, PG&E annually removes about four to five truckloads of LWD, mostly alder, which is subsequently burned.

Lower Butt Creek had 224 LWD occurrences, of which 47 were debris jams. LWD, in both individual and jam form, was uniformly distributed throughout lower Butt Creek, with 45 percent of the LWD features associated with the formation/maintenance of scour pools, creating areas of sediment retention, or providing bank protection. The estimated recruitment potential for LWD for all of lower Butt Creek was rated as high overall. Based on the high abundance and even distribution of LWD throughout lower Butt Creek, we conclude that there is no identified need for managing LWD within this reach.

Implementation of the woody debris management plan would allow for an increase in the abundance of LWD within the Belden reach where it is currently limited, by collecting and transporting LWD around Belden dam. The review and testing of methods and the subsequent placement of LWD within the low-flow channels of the Seneca and Belden reaches could benefit the aquatic resources by providing further habitat complexity. If placement of LWD at specific locations is implemented, safeguards, such as erosion control measures, should be implemented to reduce the impact on both the riverbed and riparian zone from construction and anchoring activities.

Adaptive Management

Interior's 10(j) recommendation no. 13 is that PG&E, in consultation with CDFG, SWRCB, the FS, and FWS, periodically review the results of monitoring and studies to facilitate adaptive management of environmental measures over the term of the license. A review would be conducted every 5 years for the term of the license and would examine monitoring results to comprehensively assess the effectiveness of monitoring plans, identify adverse effects on fish and wildlife resources, and assess whether agency-specified conditions are being met. If it is determined that there are adverse effects as a result of project operation, the review process would allow the resource agencies and PG&E to identify whether actions can be taken through an alternative flow schedule or lake storage level. However, any adjustments to PME related operations would require that the same annual volume of water is released via instream or pulse flow.

Our Analysis

Changes to the flow regime in the bypassed reaches could affect many resources including water quality, fisheries, macroinvertebrates, amphibians, riparian vegetation, and recreational use. Although individual resources would be monitored in a number of resource-specific plans, a periodic comprehensive review would allow PG&E to evaluate the effects of project operations on all resources and make adjustments to project operations if necessary.

Reservoir Operations and Lake Levels

In the SA, PG&E proposes to operate the project such that reservoir levels in Lake Almanor meet ecological and recreational objectives. The FS (in its final Section 4(e) condition no. 30) specifies and CDFG (in its letter filed November 26, 2003) and Interior (in its 10(j) recommendation no. 4), recommend the same measures. The SA proposes and Interior recommends that PG&E operate Lake Almanor as follows:

- Wet and Normal Water Years—By May 31, the water surface elevation would be at or above 4,485.0 feet²⁵ (908,000 acre-feet) and from June 1 through August 31, would remain at or above 4,485.0 feet (908,000 acre-feet).
- Dry Water Years—By May 31, the water surface elevation would be at or above 4,483.0 feet (859,000 acre-feet) and from June 1 through August 31, at or above 4,480.0 feet (787,000 acre-feet).
- Critically Dry Water Years—By May 31, the water surface elevation would be at or above 4,482.0 feet (835,000 acre-feet) and from June 1 through

²⁵ In this section the lake level is defined as the water surface elevation, expressed in PG&E datum, which is 10.2 feet lower than the USGS datum.

August 31, the water surface elevation is at or above 4,480.0 feet (787,000 acre-feet).

- Multiple Dry Water Years—In the event of multiple, sequential dry or critically dry water years, PG&E would be allowed to decrease surface water elevations below those specified above, as well as the current minimum elevations specified for the Butt Valley reservoir (4,120.0 feet from June through September and 4,115.0 feet for the rest of the year) and the Belden reservoir (2,905.0 feet).

Our Analysis

Currently, PG&E operates Lake Almanor such that, from the period January 1 through June 1, the reservoir stores water from snowmelt and spring rains. From June 1 through September 15, the water surface elevation is maintained above 4,475 feet. The year round minimum water surface elevation is 4,466.7 feet and the maximum 4,494 feet. The lake levels proposed by PG&E and recommended by Interior provide for water surface elevations from June 1 through August 31 that are 10 feet higher in wet and normal water years and 5 feet higher in dry and critically dry water years than under current operations.

Lake Almanor supports both warmwater and coldwater fisheries. Maintaining lake levels during the late spring and summer at higher elevations would increase the lake's surface area by approximately 12 percent during wet year types and 6 percent during normal year types as compared to existing conditions. This increased surface area would provide additional shallow water habitat in areas of the lake that are currently not watered, providing spawning habitat for centrarchids, such as smallmouth bass, largemouth bass, and Sacramento perch, which generally prefer shallow water habitat (Moyle, 2002; Robison and Buchanan, 1988; Mathews, 1965). An increase in the surface area of Lake Almanor during summer months would also likely promote the development of littoral zone vegetation and associated macroinvertebrate communities.

Potential Measures for the Reduction of Water Temperature in the Rock Creek-Cresta, Poe, and UNFFR Project Bypassed Reaches

Because SWRCB targeted a 20°C maximum summer water temperature in the NFFR to provide for coldwater fish habitat, and pursuant to the SA, PG&E investigated the feasibility of conveying colder water from Lake Almanor to downstream bypassed reaches of the NFFR. Under this scenario, releases of colder water would be made to improve summer conditions for the riverine coldwater fish community. Lake Almanor is the primary water storage facility in the NFFR and is drafted for the operation of downstream facilities. The Prattville intake, located on the western shore of Lake Almanor, releases water to the Butt Valley powerhouse, where it is subsequently conveyed downstream via a combination of reservoirs, power generation penstocks and

the NFFR channel to the Rock Creek-Cresta Project. Under current operating conditions, the Prattville intake draws water from throughout the Lake Almanor water column, which can result in the release of water that regularly exceeds 20°C in the summer and thereby likely increases downstream water temperatures (see table 3-7). The methods evaluated by PG&E to draft cold water from Lake Almanor focus primarily on the installation of a thermal curtain, physical modifications to the Prattville intake, and alterations to project operations (see section 3.3.1.2, *Water Resources*, and appendix D, for a more detailed description and evaluation of the proposed modifications). Because conveying colder water to the NFFR bypassed reaches would result in changes to the hydrologic and limnologic conditions of UNFFR Project waters, we have analyzed the potential effects of such actions on aquatic resources as part of this EIS.

In 2004, IIHR Hydraulic and Engineering, College of Engineering, University of Iowa, performed hydraulic modeling studies to determine the potential effectiveness of a thermal curtain in Lake Almanor and of physical modifications to the Prattville intake. Of the six configurations for a thermal curtain in Lake Almanor that were modeled, two were considered in greater detail: Curtain 4 and Curtain 4 configuration with levee removal (Ettema et al., 2004). If implemented, a thermal curtain would be suspended from the lake surface near the Prattville intake to draft a higher volume of cold hypolimnetic water and to reduce the amount of warm epilimnetic water released into downstream project waters. The levees referred to are remnants of past construction (excavation) undertaken to better channel water from the Big Springs area to the Prattville intake area (TRPA, 2004b). The current configuration of the submerged levees may restrict lateral movement of hypolimnetic water and therefore levee removal could allow colder water to be drafted for downstream release.

Specific physical modifications evaluated consist primarily of adjustments to the hood and piping system of the intake structure to enable more effective withdrawal of colder water. Various flow release strategies have also been considered by the applicant as a means to provide colder water downstream including: modifications to dam and reservoir operations, blending of outflows from Canyon dam lower and upper gates, changing the minimum instream flows in summer and fall months, and piping water from Yellow Creek and Bucks Creeks into the NFFR (see appendix D for a complete list of the alternatives considered by the applicant).

We evaluated the potential effects the following proposed measures would have on aquatic resources:

- Proposed MIF
- Proposed MIF with thermal curtain
- Proposed MIF with thermal curtain and removal of levees

- Proposed MIF with thermal curtain, removal of levees, and Canyon dam blending

Our Analysis

For our evaluation of the potential effects of the thermal curtain with or without levee removal on aquatic resources in project reservoirs, we relied primarily on the TRPA (2004a) and the Jones and Stokes (2004) reports, which were provided by PG&E pursuant to our December 17, 2004 AIR. We also used PG&E's MITEMP3 and SNTEMP modeling studies to determine what effects hydrologic changes in Lake Almanor, Butt Valley reservoir, and the bypassed reaches would have on the associated coldwater fishery habitat. The MITEMP3 model simulated vertical water temperature profiles in the reservoirs and patterns of thermal stratification over time. The SNTEMP model was used to predict daily average stream temperature in the project bypassed reaches by calculating heat fluxes among all substantial heat sources. Because shading is also a significant factor, the SNTEMP model takes into consideration the effects of canyon topography and existing vegetation on water temperature (PG&E, 2002a).

Lake Almanor and Butt Valley Reservoirs

A combination of adequate water temperature and DO levels at the thermocline defines the boundaries of available summer habitat for coldwater fish in Lake Almanor. Data from PG&E indicate that, in the summer months, temperature and DO begin to stratify around a depth of 30 to 35 feet (PG&E, 2002a). As a result, the conditions required to support coldwater fish ($< 20^{\circ}\text{C}$ and > 6.5 mg/l of DO) are suboptimal above or below the thermocline. Generally, this results in a relatively thin band of suitable habitat that is available for species that require cold, well-oxygenated water (e.g., salmonids, wakasagi). With the existing Prattville intake configuration, available coldwater fish habitat during summer stratification includes coldwater refuge habitat within or near the thermocline or areas that contain sources of inflowing colder freshwater or springs (PG&E, 2002a). Under existing summertime conditions, the amount of suitable coldwater habitat in Lake Almanor is reduced to approximately seven percent of total reservoir volume through naturally occurring limnological stratification processes. The installation of a thermal curtain is expected to further reduce the amount of coldwater habitat to approximately four percent of total reservoir volume during summer stratification, a decrease of 38 percent (TRPA, 2004a). The installation of a thermal curtain would also likely change the location of the summer thermocline in the water by lowering it as much as 10 feet in normal or warm summers (TRPA, 2004a). As well as reducing overall habitat availability habitat, these changes would also likely increase inter- and intra-specific competition and predation among fish populations utilizing this portion of the reservoir. During cooler summers, the thermal curtain is expected to have little effect on coldwater habitat in Lake Almanor.

The TRPA report also indicates that in years when lake surface levels are high, modifications to the Prattville intake would likely reduce or eliminate the number of wakasagi entrained through the Butt Valley powerhouse by altering water flow patterns at the intake structures of the Butt Valley powerhouse and through resultant modifications to the dissolved oxygen and temperature of water drafted (TRPA, 2004a). Wakasagi are the prime forage for a trophy trout fishery in Butt Valley reservoir, which would likely be affected by a reduction in wakasagi entrainment, potentially affecting the current fishery, trophic structure, and ecological processes (e.g., predator-prey relationships) in Lake Almanor and the Butt Valley and Belden reservoirs. The TRPA (2004a) study predicts a reduction in wakasagi entrainment that ranges from 14 to 100 percent depending on the dissolved oxygen concentration in water drafted into the Butt Valley powerhouse. A reduction in wakasagi entrainment would not be expected in years when reservoir levels are low. Our analysis focuses primarily on salmonids and wakasagi because data gathered from reservoir and entrainment studies indicate that the potential direct effects of Prattville intake modifications would be related to changes in the thermocline and in turn to species that are closely associated with this component of the Lake Almanor ecosystem. The availability of coldwater fish habitat would not be adversely affected by a thermal curtain during the winter and spring, when the lake is not stratified.

Jones and Stokes (2004), using the U.S. Army Corps of Engineers CE-QUAL-W2 water quality model in concert with suitability index and volume threshold methods, report that the installation of a thermal curtain is expected to have little effect on coldwater fish habitat as it pertains to Lake Almanor water quality because the thermal curtain is not expected to significantly alter dissolved oxygen concentrations or water temperature in Lake Almanor. However, similar to the TRPA (2004a) report, Jones and Stokes (2004) indicate that the volume of available coldwater fish habitat would be decreased substantially by the installation of a thermal curtain. Their study also reports that the installation of a thermal curtain is expected to increase the depth of the thermocline by up to 10 feet. If habitat availability is currently a limiting factor to salmonid species in Lake Almanor, further reductions in habitat availability would likely exacerbate the situation.

To further assess potential changes to Lake Almanor's aquatic habitat and coldwater fishery that could result from modifications to the Prattville intake, we evaluated PG&E's MITEMP3 temperature model scenarios ANEB, ANMB, DNEB, and DNMB (table 3-20).

Table 3-20. Naming convention matrix for modeled scenarios in Lake Almanor.
(Source: PG&E, 2002a, as modified by staff)

Lake Almanor Modeling Scenarios				
Water Year	Meteorology	Prattville Intake	Canyon Dam Release	Scenario ID
Normal	Normal	Existing	B (75 cfs)	ANEB
Normal	Normal	Modified	B (75 cfs)	ANMB
Dry	Normal	Existing	B (75 cfs)	DNEB
Dry	Normal	Modified	B (75 cfs)	DNMB

We selected a release flow of 75 cfs from Canyon dam because it was the closest flow that simulated the releases proposed in the SA for Seneca reach during the summer months (July through September). Scenarios ANEB and ANMB provided results during normal water year types. The hypolimnion²⁶ under scenario ANEB has a minimum upper limit elevation of 4,445 feet, which correlates to a volume of approximately 156,000 acre-feet during mid-June. With the modified Prattville intake, scenario ANMB, the hypolimnion's minimum upper limit elevation is approximately 4,435 feet, also occurring in mid-June, which correlates to approximately a volume of 57,000 acre-feet, a reduction of 64 percent from the existing intake configuration (PG&E, 2002a).

To investigate the impacts on the hypolimnion during a dry water year, we used scenarios DNEB and DNMB. The hypolimnion under scenario DNEB has a minimum upper limit elevation of 4,435 feet, which correlates to a volume of approximately 57,000 acre-feet in mid-June. With the modified Prattville intake, scenario DNMB, the hypolimnion's minimum upper limit elevation is approximately 4,430 feet also occurring in mid-June, which correlates to a volume of approximately 21,000 acre-feet, a reduction of 64 percent from the existing intake configuration (PG&E, 2002a).

Upper North Fork Feather River

The installation of a thermal curtain would likely have mixed results on the fish assemblages in the bypassed reaches of the UNFFR Project. At the 50 percent exceedance level, Bechtel and TRPA (2004) indicate that the installation of a thermal curtain combined with levee removal could maintain temperatures less than 20°C and reduce temperatures in normal water years by as much as 2.4°C in the Belden reach

²⁶ The hypolimnion is the lower stratum of cold water, extending from the thermocline (upper limit) to the lake's bottom (lower limit), that exists during summer stratification.

during the summer months as compared to water temperatures that would likely result from implementation of the minimum flows only (figure 3-7). A temperature-conditioned relative habitat suitability study for the bypassed reaches of the NFFR was conducted to determine the percent change in suitable habitat that would be expected for rainbow trout, hardhead, Sacramento pikeminnow, and Sacramento sucker in normal and critically dry water years based on changes in water temperature (TRPA, 2004b). Although reductions of 2.4°C would likely increase available suitable habitat for rainbow trout, it is also likely that warmwater species of fish (e.g., hardhead and Sacramento pikeminnow) would see a substantial loss of suitable habitat. This could have negative implications for the sustainability of localized populations or force them to seek preferential conditions elsewhere (TRPA, 2004b). Hardhead are classified as FS and a CSC, and therefore warrant consideration in our analysis as to the effects of modifying water temperature in the NFFR.

The blended-release approach, which would change project operations so that water would be released into the Seneca reach from both the lower and upper gates of the Canyon dam outlet tower, is also being considered as a means to create colder riverine conditions in project bypassed reaches. Releasing warmer surface water into the Seneca reach from the upper Canyon dam gates would likely increase the volume of cold water in Lake Almanor that would be available for release through the Prattville intake with a thermal curtain installed. Currently, releases from Canyon dam occur primarily from the low-level gate. This results in the release of water that is typically colder than 12°C, which is below the temperature preference of rainbow trout and hardhead, as well as Sacramento pikeminnow and Sacramento sucker (TRPA, 2004b). The TRPA (2004b) study indicates that in normal water years the blended-release approach in combination with a thermal curtain could result in increased summer water temperatures of up to 4.4°C in the Seneca reach (figure 3-7). As a result, suitable habitat would likely be improved by approximately 30 percent for rainbow trout, hardhead, Sacramento pikeminnow, and Sacramento sucker in the Seneca reach in June. Increases in suitable habitat of approximately 15-20 percent for all species would also be likely in July and August, while values in September would not change significantly from existing conditions (figure 3-7).

For the Belden reach, the TRPA (2004b) study indicates that the installation of a thermal curtain, levee removal, and the blending of Canyon dam releases would likely increase the availability of suitable habitat for juvenile and adult rainbow trout in most summer months. Alternatively, these actions also have the potential to cause a shift in the spatial distribution of native non-game fish warmwater species (e.g., hardhead and Sacramento pikeminnow) by reducing the amount of habitat available due to a reduction in water temperature. Suitable habitat for hardhead, Sacramento pikeminnow, and Sacramento sucker in the Belden reach is predicted to decrease in all months in both normal and critically dry water years. Upstream of the East Branch Feather River confluence, suitable habitat for rainbow trout would likely increase by 8.5 percent in

August, however, the model predicts a reduction of 14.7 percent in June of normal water years as temperatures are predicted to fall below the optimum temperature range for rainbow trout of 17-20°C (TRPA, 2004b) (figure 3-7). Suitable habitat would likely remain stable in July and September for juvenile and adult rainbow trout. Downstream of the East Branch Feather River confluence, increased availability of suitable habitat for rainbow trout would be expected in July and August in normal water years, and in all summer months in critically dry water years, although substantial reductions would be expected for hardhead, Sacramento pikeminnow, and Sacramento sucker in all months of both water year types due to the influx of colder water.

In summary, alterations to the limnological and hydrological processes in the UNFFR Project reservoirs and bypassed reaches as a result of efforts to convey colder water downstream could have a substantial effect on aquatic resources. Because the volume of available coldwater habitat in Lake Almanor is likely already a limiting factor under current conditions during summer stratification (TRPA, 2004a), the installation of a thermal curtain could adversely affect salmonids and other coldwater fish by further reducing the availability of coldwater refugia habitat and increasing inter- and intra-specific competition and predation. Under existing summertime conditions, the amount of suitable coldwater habitat in Lake Almanor is reduced to approximately seven percent of total reservoir volume through naturally occurring limnological stratification processes. The installation of a thermal curtain is expected to reduce the amount of coldwater habitat to approximately four percent of total reservoir volume during summer stratification, a decrease of 38 percent (TRPA, 2004a). Additionally, the results of the MITEMP3 modeling efforts indicate that modifications to the Prattville intake would likely accelerate the depletion of Lake Almanor's coldwater pool (water less than 20°C) throughout the summer by 10 to 15 percent in July, 15 to 20 percent in August, and 20 to 25 percent in September as a result of drafting water into Butt Valley reservoir via the Prattville intake (PG&E, 2002a). Decreasing the volume of the coldwater pool would likely further affect coldwater fish by concentrating them in a narrower band of habitat, which would increase the likelihood of competition and subject them to intensified angling pressure. Additionally, entrainment studies conducted in 2001 as part of the relicensing efforts documented entrainment of over 130,000 individual wakasagi into Butt Valley reservoir (PG&E, 2002a). These forage fish support a popular trophy trout fishery in Butt Valley reservoir that would likely be affected by a reduction in wakasagi numbers. The installation of a thermal curtain is expected to significantly reduce or eliminate entrainment of wakasagi by altering water flow patterns at the intake structures of the Butt Valley powerhouse (TRPA, 2004a).

It is also likely that a reduction in available riverine habitat for hardhead, Sacramento pikeminnow, and Sacramento sucker in the bypassed reaches would occur as a result of efforts to reduce temperature downstream as part of the Rock Creek – Cresta Project. Although the implementation of the proposed minimum instream flows would be expected to increase overall habitat availability in the riverine reaches of the UNFFR,

it likely would not reduce riverine water temperatures significantly with or without modification of the Prattville intake (see figure 3-7).

We conclude that structural or operational modifications to the Prattville intake that were evaluated would likely have detrimental effects on the coldwater fishery in Lake Almanor and Butt Valley reservoir, and would provide only limited benefit to the coldwater fish populations in Seneca and Belden reaches of the UNFFR and even less benefit to the downstream Rock Creek, Cresta, and Poe reaches.

Fish Passage

On November 26, 2003, NOAA Fisheries filed its original Section 18 fish passage prescription for the UNFFR Project, which included the construction of pool-weir passage systems at Belden and Butt Valley dams in addition to positive barrier-screening devices for the intakes at the Belden and Caribou powerhouses.

On March 14, 2005, NOAA Fisheries submitted a modified Section 18 fishway prescription for the UNFFR Project to the Commission. The prescription calls for the release of adult Central Valley spring-run Chinook salmon and Central Valley steelhead into the Seneca bypassed reach and into Yellow Creek, an unregulated stream that enters the UNFFR in the vicinity of the Belden powerhouse. Both species are listed as threatened under the ESA, but do not currently occur in the project area. The prescription also calls for the trap and transfer of outmigrants (e.g., smolts and post-spawned steelhead) from the Seneca bypassed reach and Yellow Creek to below Oroville dam, part of FERC Project No. 2100. The upstream migration of anadromous fish in the Feather River is currently blocked at the Fish Barrier dam, a facility associated with the Feather River Fish Hatchery, located approximately 5 miles downstream of Oroville dam. NOAA Fisheries plans to file a preliminary prescription for the Oroville Project by October 2005, which would likely specify that the CDWR (licensee for the Oroville Project) implement a program to capture adult anadromous fish at or below the Fish Barrier dam and transport (truck) them to areas upstream of the Oroville facilities (letter from R. McInnis, Regional Administrator, NOAA Fisheries, Long Beach, CA, to the Commission, dated March 11, 2005).

Specifically, the prescription submitted for the UNFFR Project calls for PG&E to:

- submit within 1 year of license issuance, design drawings for appropriate release sites for adult anadromous fish transported from the Oroville Project;
- construct receiving structures and implement water-to-water transfer of adult anadromous fish from the Oroville Project within 3 years of NOAA Fisheries approval of facility design;
- monitor adult fish, their interactions with existing project fish and wildlife species, including disease monitoring, and submit an annual report to appropriate resource agencies;

- submit within 1 year of license issuance, design drawings for approval by NOAA Fisheries for the construction and operation of a screening device to capture outmigrating salmonids at or above the intake of Belden powerhouse. The screening device would meet the criteria specified in NOAA Fisheries “Fish Screening Criteria for Anadromous Salmonids,” which specifies variables such as approach velocity, material quality, and bypass entrance design;
- implement downstream fish passage collection within 3 years of license issuance in the Seneca reach unless NOAA Fisheries approves an implementation delay as a result of integration with fish passage efforts prescribed for the Oroville Project;
- submit within 5 years of license issuance, design drawings for approval by NOAA Fisheries for the construction and operation of a screening device to capture outmigrating salmonids above the Belden powerhouse on Yellow Creek. The screening device would meet the criteria specified in NOAA Fisheries “Fish Screening Criteria for Anadromous Salmonids,” which specifies variables such as approach velocity, material quality, and bypass entrance design;
- implement downstream fish passage collection within 10 years of license issuance in Yellow Creek unless NOAA Fisheries approves an implementation delay as a result of integration with fish passage efforts prescribed for the Oroville Project;
- include provisions for the transportation of emigrating fish to temporary holding facilities for marking and tagging purposes and for transport to downstream release areas;
- target 99.5 percent survivability for trap and transfer efforts of outmigrating salmonids in the Seneca reach and in Yellow Creek;
- maintain and document 98 percent survivability for trap and transfer efforts of outmigrating salmonids in the Seneca reach and in Yellow Creek; and
- submit within 1 year of license issuance, a plan to NOAA Fisheries identifying means to monitor safe, timely, and effective anadromous fish passage, and the potential effects of this PM&E measure upon the environment.

In its reply comments to NOAA Fisheries’ Section 18 modified prescription, PG&E states that the trap-and-transfer methods as proposed would be technically infeasible and would fail to produce a self-sustaining population of anadromous salmonids in the UNFFR (letter from T. Jereb, PG&E, UNFFR Relicensing Project Manager, to M.R. Salas, Secretary, FERC, Washington, DC, May 2, 2005). Furthermore, PG&E indicated that the modified NOAA Fisheries prescription would not assist in the recovery of Central Valley spring-run Chinook salmon and Central Valley steelhead nor

would it create a wild or natural fishery. As such, passage and restoration efforts as proposed by NOAA Fisheries would likely require a substantial amount of long-term maintenance and human intervention. PG&E also pointed out that the genetic integrity of salmonid stocks and disease transmission in the UNFFR watershed are major issues that would require additional research. PG&E indicated that there is a strong consensus in the region for restoration efforts and that it would be a willing party in anadromous fisheries restoration efforts in watersheds that are more likely to produce large and sustainable populations of Chinook salmon and steelhead.

The Commission also received comments on NOAA Fisheries Section 18 fishway prescription from Bobby Kempkes (letter from B. Kempkes, San Diego, CA, to M.R. Salas, Secretary, FERC, Washington, DC, May 2, 2005), the Carmel River Steelhead Association (letter from R.L. Thomas, President, Carmel River Steelhead Association, Monterey, CA, to M.R. Salas, Secretary, FERC, Washington, DC, May 3, 2005), the Fisherman's Alliance of California (letter from F. Emerson, president, Fisherman's Alliance of California, Monterey, CA, to M.R. Salas, Secretary, FERC, Washington, DC, May 3, 2005), the State Water Contractors (letter from T.L. Erlewine, General Manager, State Water Contractors, Sacramento, CA, to M.R. Salas, Secretary, FERC, Washington, DC, May 5, 2005), Erik Kolstoe (letter from E. Kolstoe, San Francisco, CA, to M.R. Salas, Secretary, FERC, Washington, DC, May 7, 2005), and CDWR (letter from M.A. Swiger, Counsel, CDWR, Washington, DC, to M.R. Salas, Secretary, FERC, Washington, DC, May 16, 2005).

The Carmel River Steelhead Association, the Fisherman's Alliance of California, Mr. Kempkes, and Mr. Kolstoe all provided comments in support of the NOAA Fisheries Section 18 fishway prescription. The State Water Contractors and CDWR both pointed out that settlement negotiations regarding fish passage are currently underway at the downstream Oroville Project and stated their concerns with prescribing fish passage upstream of the Oroville Project before those negotiations are complete. CDWR expressed many of the same concerns with the fishway prescription that PG&E did. CDWR indicated that fish passage at Oroville Project is unlikely to be successful, is highly experimental, and is not based on sound scientific principles. Furthermore, CDWR stated that before substantial resources are expended on a highly questionable trap-and-haul program, further investigation is required. CDWR also suggested that the Commission defer issuing a new project license for the UNFFR Project until settlement negotiations for the Oroville Project have concluded. The State Water Contractors indicated that there is still considerable disagreement among the participants in the Oroville Project relicensing settlement discussions as to the likelihood of success or implementation of fish passage, which would affect the implementation of fish passage measures at UNFFR. The State Water Contractors also indicated that NOAA Fisheries has not provided substantial evidence in support of the fish passage prescription it is imposing in the licensing proceedings upstream of Oroville dam and that the risk of upstream disease transmission outweighs any biological benefits associated with the proposed fish passage program. In addition, the State Water Contractors indicated that

the environmental conditions in upstream reaches (e.g., aquatic habitat, water temperature) would likely result in a net loss of anadromous fish resulting from passage efforts.

Our Analysis

NOAA Fisheries' fishway prescription for the UNFFR Project appears to be a part of its larger strategy to reintroduce anadromous salmonids into historical habitat from which they have been absent for almost 100 years (since the construction of Big Bend dam in 1910). During that time, numerous events have occurred, primarily the construction of additional dams and associated reservoirs (culminating with the completion of Oroville dam and its 16,000-acre reservoir in 1968) which make such a reintroduction a daunting task.

From an engineering standpoint, we agree that a trap-and-haul approach, such as that prescribed by NOAA Fisheries for the UNFFR Project, in conjunction with a complementary prescription for the Oroville Project, would likely, for the foreseeable future, be a more effective means of providing access for anadromous salmonids to the UNFFR than more traditional fish passage measures such as fish ladders and downstream bypass systems at each of the dams. That said, the success of any such program involves many more factors other than the trap and transport of fish. For example, sufficient instream flows, water temperature, suitable spawning and rearing habitat, the potential for the spread of pathogens, interspecific competition, and injury and mortality of transported fish are just some of the factors that would affect the success of spawning and the availability of juveniles for downstream transport.

At the outset, we must note that the fishway prescription for the UNFFR Project is completely dependent upon the issuance and implementation of a complementary prescription for the Oroville Project. Absent that, there are no adult salmonids for PG&E to stock into the Seneca Reach and Yellow creek, and consequently no outmigrants, either smolts or post-spawned steelhead, to capture and transport downstream of Oroville. While NOAA Fisheries has indicated that it will file such a fish passage prescription for the Oroville project, it has yet to do so. In addition, NOAA Fisheries indicated that settlement negotiations for the Oroville Project may affect the specific conditions and timing of their prescription for that project, which in turn would likely affect the implementation of fish passage for the UNFFR Project. Under the current schedule for the Oroville Project, the final fishway prescription is due January 30, 2006.

On August 12, 2005, pursuant to the ESA, NOAA Fisheries issued its final designation on critical habitat for Central Valley spring-run Chinook salmon and Central Valley steelhead (Federal Register, 50 CFR Part 226). The designation includes approximately 3,500 miles of riverine habitat in California for the conservation and protection of these species. These areas are considered by NOAA Fisheries as currently occupied riverine reaches that contain the physical and biological features essential to the conservation of the species, which may require special management considerations or

protection. However, we note that the designation did not include habitat above the Oroville Project. In previous assessments of the conservation value of river reaches upstream of Oroville, the NOAA Fisheries' Technical Recovery Team, formulated to evaluate habitat requirements for Central Valley spring-run Chinook salmon and Central Valley steelhead, concluded specifically that within the Feather River watershed, only inaccessible stream reaches of the NFFR upstream of Lake Almanor were to be considered as "unoccupied habitat outside the Evolutionarily Significant Unit (ESU) range that may be essential to conservation" (Federal Register, 50 CFR Part 226). Despite this conclusion by NOAA Fisheries, the modified prescription as submitted would not provide for fish passage above Lake Almanor. It is interesting to note that NOAA Fisheries did not designate Seneca reach or Yellow Creek (the focus of its Section 18 prescription) either as critical habitat or as areas outside the current range that are essential to the conservation of the species.

The introduction of Central Valley spring-run Chinook salmon and Central Valley steelhead into project waters would provide them access to approximately 15 miles of riverine habitat; 10.8 miles in the Seneca reach and 4.1 miles in Yellow Creek. NOAA Fisheries, in its March 14, 2005 modified Section 18 prescription, and PG&E in its license application indicate that spawning gravel in the lower 7.3 miles of the Seneca reach has the potential to support 172 pairs of steelhead and 96 pairs of Chinook salmon. The substrate quality in the upstream portion of Seneca reach above Seneca Falls was not evaluated. There is no data available on the availability of spawning gravels for steelhead or Chinook salmon in Yellow Creek.

The IFIM study conducted by PG&E indicates that the flow schedules proposed by PG&E and the resource agencies would substantially improve conditions for rainbow trout as compared to current conditions in the Seneca reach. Because juvenile steelhead, Chinook salmon, and rainbow trout have similar freshwater habitat requirements and are often sympatric in distribution (Raleigh et al, 1984, 1996; Moyle, 2002), it is likely that the flows proposed by PG&E and the resource agencies would provide suitable conditions for juvenile anadromous salmonids in the Seneca reach. However, because the habitat requirements for adult Chinook salmon, steelhead, and rainbow trout differ, it is not certain if suitable habitat for adults of each species would be made available by the flows proposed by PG&E and the resource agencies. In its modified prescription for the UNFFR, NOAA Fisheries provides anecdotal evidence indicating that suitable water depths were present in the reaches targeted for fish release. Additionally, improvements of the depth, velocity, substrate, and temperature conditions for coldwater fish are expected from the flows proposed by PG&E and recommended by the resource agencies. Therefore, the aquatic habitat in the Seneca reach would likely be usable by adult and juvenile Chinook salmon and steelhead in the Seneca reach, although there is little site-specific data available that empirically describes habitat suitability for anadromous salmonids. Little information is available regarding the suitability of habitat in Yellow Creek, but because it supports a wild rainbow trout fishery, it is likely that the creek

would support juvenile steelhead and juvenile Chinook salmon, provided that adult spawning was successful.

Assuming that adult anadromous fish are introduced into the Seneca reach and Yellow Creek and that physical habitat in those reaches can support successful adult anadromous salmonid spawning and juvenile rearing, we must consider the effects of the fishway prescription on other resources. The introduction and subsequent collection of these fish and the construction of the physical facilities specified in the prescription have the potential to adversely affect several facets of the currently existing aquatic biota in the UNFFR Project area including:

1. the population dynamics of the existing fish community through predation, competition, and habitat partitioning;
2. populations of federally threatened California red-legged frogs, CSC and FSS (e.g., hardhead) through predation or interspecific competition;
3. the transport, range, and intensity of fish-borne disease including infectious hematopoietic necrosis virus (IHN), *Ceratomyxa shasta* (CS), and whirling disease (*Myxobolus cerebralis*);
4. riparian habitat, instream habitat, and aquatic biota at from construction of adult release and juvenile collection facilities and associated construction;
5. behavior and migratory patterns of existing fish populations in and around Yellow Creek and the Seneca reach where downstream collection and upstream release facilities are prescribed;
6. hydrological and geomorphic riverine processes in and around Yellow Creek and the Seneca reach where downstream collection and upstream release facilities would be constructed;
7. spawning gravel availability for resident trout species in the Seneca reach and in Yellow Creek; and
8. current fishery harvest management objectives, enforcement of fishing regulations, and recreational angling opportunities in the Seneca reach and in Yellow Creek.

Populations of sculpin, rainbow trout, and Sacramento suckers currently account for approximately 99 percent of the fish community in the Seneca reach (PG&E, 2002a). The introduction of anadromous salmonids into the Seneca reach could potentially disrupt the population dynamics of the currently existing fish community through competition and predation. Although rainbow trout and steelhead do often occur in the same system, the tendency is for either the steelhead or the non-migratory rainbow to dominate a given population (Moyle, 2002). Therefore, the introduction of steelhead into the UNFFR has the potential to affect the population structure of the currently existing rainbow trout population and associated fishery in both Yellow Creek and Seneca reach.

Additionally, the aggressive nature of juvenile rainbow trout often leads to their dominance over juvenile life stages of other sympatric salmonids (Moyle, 2002). This behavioral interaction could affect the success of efforts to establish Central Valley spring-run Chinook salmon in the UNFFR because of the dominant role that rainbow trout currently play in the UNFFR and in Yellow Creek.

The introduction of anadromous salmonids also has the potential to affect hardhead, a CSC species, which although not reported in the Seneca reach by PG&E, may occur in Yellow Creek. Hardhead, which are reported in the Belden reach, could be affected through competition and predation if the range of introduced anadromous fish in the UNFFR expands to include areas not specifically targeted by the NOAA Fisheries Section 18 prescription.

Although little information is available regarding the existing fish community in Yellow Creek, we assume that the fish composition is similar to the Seneca and Belden bypassed reaches and that it is dominated by rainbow trout, Sacramento sucker, and sculpin. Yellow Creek is a CDFG-designated wild trout stream with flows ranging from 40 to 170 cfs during June through September. The introduction of anadromous salmonids into Yellow Creek could disrupt the population dynamics of the currently existing fish community through competition and predation as well as negatively affect the recreational trout fishery through the legal restrictions imposed by implementation of the ESA.

The potential exists for both FYLF and CRLF to inhabit waters associated with the UNFFR Project. Juvenile anadromous fish prey on certain life stages of amphibian species and therefore have the potential to adversely affect these species. Although data from relicensing studies indicates that these species have not been observed in the Seneca reach (PG&E, 2002a), the presence of anadromous fish in the Seneca reach could potentially affect populations of FYLF and CRLF if their range expands or if they are found to occur in Yellow Creek.

Several fish diseases and pathogens are known to occur in the Feather River basin, including the IHN virus and the CS parasite, which are both known to kill significant numbers of salmonids (CDWR, 2004b). It is possible that hydroelectric facilities within the NFFR may have contributed to a decline in the range of IHN by blocking the virus from upstream transmission, although little is known about its current distribution in the NFFR (CDWR, 2004b). There is disagreement among the various agencies involved with this proceeding as to what effect the introduction of anadromous fish into the UNFFR would have on the transmission of fish borne pathogens. In its modified Section 18 fish passage prescription, NOAA Fisheries has indicated that it is likely that whirling disease and CS are widespread throughout the NFFR. Additionally, NOAA Fisheries states that the spread of IHN is less likely in wild stocks of Chinook as compared to hatchery fish, which are currently stocked in Lake Almanor. However, CDFG has expressed concerns indicating that disease transmission could be expected from the transport of anadromous salmonids to project waters (notes from the Fish Passage Focus

Group meeting, December 2, 2004, submitted by T. Jereb, PG&E, UNFFR Relicensing Project Manager, to M. Salas, Secretary, FERC, December 20, 2004). NOAA Fisheries indicates that water disinfection devices would be required at Oroville, which would likely aid in reducing the spread of disease. Because whirling disease and CS most likely already occur in the NFFR watershed, and because NOAA Fisheries has prescribed preventative measures (e.g., disinfectants, containment of fish in specific reaches), the introduction of anadromous salmonids to upstream reaches of the NFFR would likely have little effect on the overall spread of these diseases in the watershed.

The construction and installation of specific facilities for receiving and trapping anadromous fish as specified in the NOAA prescription (e.g., water-to-water release sites for upstream migrants and downstream screening structures) would likely have both short- and long- term effects, including: restricting the migratory patterns of resident fishes, blocking sediment movement, altering large-woody debris movement patterns, and changing the hydrologic flow patterns through and around screening devices. Road building and construction activities would likely increase sedimentation and affect riparian vegetation in the immediate vicinity of areas slated for construction, but these effects would likely only be short-term. If wetlands are affected by construction activities, it is expected that mitigation for these effects would be required by the Commission. In addition, although NOAA Fisheries does not indicate where on the Seneca reach or on Yellow Creek the release and recapture facilities would be located, the siting and construction of these facilities may be difficult from a land ownership perspective. NOAA Fisheries has stipulated that PG&E should acquire the legal right to access lands outside of the current boundary or modify existing project boundaries to implement anadromous fish passage at the UNFFR Project. Because the majority of the Seneca reach and the Yellow Creek watershed lie within Plumas National Forest, implementation of NOAA Fisheries fish passage prescription would likely require cooperation and facilitation from the FS.

NOAA Fisheries has specified that PG&E target 99.5 percent survivability and maintain and document 98 percent survivability during the transport of outmigrating salmonids in the Seneca reach and in Yellow Creek. A targeted survivability criterion for transport of adult fish was not specified; that would likely be contained in the complementary prescription for the Oroville project. Although truck transport of juvenile and adult salmonids is a common and extensively used management practice by fisheries agencies, mortality associated with truck transfer can occur and is generally associated with the initial loading of fish into a transfer vehicle (CDWR, 2004a). In fact, studies indicate that large-scale transport efforts undertaken in the Columbia and Snake Rivers in the 1970s and 1980s may not have substantially contributed to the recovery of protected salmonids and that mortality rates can average around 15 percent (Ward et al., 1997). Appendix A of CDWR's Fish Passage Model for the Oroville Project indicates that survivability for juvenile Chinook salmon ranges from 1 percent to 12 percent. Matthews et al. (1986) observed high levels of stress in Chinook salmon juveniles, especially if transported concurrently with steelhead juveniles. Additionally, NOAA Fisheries 98

percent survivability criteria is based on a fish passage prescription established for the Baker River Project (P-2150) in northern Washington. The Baker River Project has a different set of Section 18 requirements, and does not include a tagging and storage component as is specified for the UNFFR Project. Transport of fish in the UNFFR Project area would cover a longer distance, which could also affect survivability. Additionally, because Chinook salmon and steelhead would likely be transported together, overall Chinook survivability would likely be diminished upon release as a result of competition at release sites. We conclude that overall survivability of salmonids associated with the fish passage measures prescribed for the UNFFR Project would likely be lower than the 98 percent survivability level targeted by NOAA Fisheries and do not consider those targets realistic.

The introduction of federally listed salmonids into waters associated with the UNFFR Project and in Yellow Creek has the potential to adversely affect the existing trout fishery because project waters would then contain species protected under the ESA. Because angling for these two species would likely be prohibited, we assume there would be changes in fishing regulations to ensure that ESA take prohibitions are not violated. Furthermore, poaching and incidental takes could hamper efforts to establish populations of anadromous fish in these reaches. Because access to the Seneca reach is made difficult by mountainous terrain, it is likely that the effects of introducing federally protected species on the recreational fishery may be more prevalent in Yellow Creek, which is a recognized wild trout fishery and is subject to increased fishing pressure. Further complications could arise if anglers are not able to differentiate between wild steelhead and rainbow trout, which may adversely affect both angler compliance with the ESA and introduction efforts in the Seneca reach or in Yellow Creek.

As part of the Oroville relicensing studies, the Oroville Fish Passage Model was developed to assess the likelihood of successfully establishing self-sustaining populations of Chinook salmon upstream of Oroville dam to the first impassable barrier (CDWR, 2004a). The model is an interactive tool that allows users to adjust input parameters such as survival at various life stages, homing rate, capture rates, etc., to predict how variation in these parameters might affect the return rate of adults. The model output reports a range of values assessing the best case, worst case, and expected results to describe the feasibility of potential fish passage efforts. One of the critical output parameters in the model is the ratio between returning adult fish and the number of adult fish passed upstream. If the ratio is less than 1:1, fewer adult fish would return than were passed over a migratory obstruction and the fish passage effort would not be considered sustainable. If the ratio is greater than 1:1, then fish passage efforts would be considered successful and sustainable, with adult returns exceeding adults released.

In its March 14, 2005 prescription, NOAA Fisheries utilized the model in support of its contention that the trap and haul program specified in their prescription would result in a feasible fish passage program. They modified a model run previously conducted by the Oroville Facilities Environmental Working Group (EWG) by adjusting the numerical value for the variable “juvenile release to adult return for the stream-type

life history” from 0.46% to 1.41% based on Odenweller’s (2004) data for winter-run Chinook salmon in the Sacramento River. The value used by the EWG (0.46%) was based on adult returns of coded wire tagged spring-run Chinook salmon in the Feather River (CDWR 2004a) and resulted in an adult return to adult passed ratio of 0.74 (i.e., fewer adults returning than passed upstream of Oroville). NOAA Fisheries’ value of 1.41% resulted in an adult return to adult passed ratio of 1.72 (i.e., more adults returning than were passed upstream of Oroville, which represents a sustainable fish passage program for the “Expected Case” scenario).

The Oroville Fish Passage Model, and other similar models, are often powerful tools for decision making, particularly when basin wide decisions on fish passage issues are being considered. However models, or other data interpretive tools, are limited by the quality and representation of the data they are built upon and the expertise of those individuals involved in the exercise. NOAA Fisheries states that by adjusting one sensitive assumption within the model, the results of the modeling exercise indicate that a fish passage program is feasible. PG&E provides arguments that NOAA Fisheries use of data from the Odenweller model is not appropriate because it does not incorporate all sources of loss to the population, is based on winter-run Chinook salmon and not spring-run fish, and is derived as an estimate of estimates. In this case, NOAA considers data from winter-run fish of the Sacramento River as representative of conditions on the Feather River, whereas PG&E feels that data from studies on spring-run fish from the Feather River is more appropriate. While no empirical data is available for juvenile release to adult returns for the North Fork of the Feather River, we believe that the use of data derived from studies of spring-run fish from the Feather River is more appropriate and that the NOAA Fisheries calculated value likely results in an overestimation of the expected adult return to adult passed ratio.

In summary, although it is likely that the implementation of NOAA Fisheries’ Section 18 prescription for the UNFFR would provide access to approximately 15 river miles of spawning and juvenile rearing habitat for Central Valley spring-run Chinook salmon and Central valley steelhead (assuming the prescription and implementation of a complementary prescription for the Oroville project), the overall degree of success of the program would be highly dependent on the effects of many other factors. However, the introduction of these fish has the potential to negatively affect a number of resources in the UNFFR Project area, including resident trout populations and the fisheries they support, populations of sensitive amphibian and fish species, and geomorphic processes.

Mining Activities

NOAA Fisheries recommends that PG&E “partially offset impacts to anadromous fish caused by the inundation of habitats and minimize adverse effects to the safe, timely and effective passage of anadromous fishes, by providing suitable compensation from active mining interests in the Seneca Reach or Yellow Creek through conservation easements and the purchase and rehabilitation of sites used for mining operations.

NOAA fisheries contends that the project, by reducing flows, enables mining operations to occur that would otherwise be impeded by unimpaired flows.

Our Analysis

We agree that mining has historically and, to a lesser degree, is currently impacting aquatic habitat in the project area. Historically, mining activities in the NFFR have contributed to a decline in water quality, increased sedimentation rates, affected geomorphic processes through the alteration of natural channel configurations and removal of substrates, and adversely affected anadromous and resident fish species as well as other components of the aquatic biota in the NFFR (Yoshiyama, 2001). At present, 206 active mining claims exist in the NFFR, many of which occur in the Seneca reach. However, since mining in the watershed predated construction of the project by over 50 years, we do not agree that there is a nexus between project operation and mining. We also note that this mining is regulated by the state of California and outside the jurisdiction of the Commission.

Fish Barriers

The NF-9 gage and weir were historically operated and maintained by PG&E to monitor lower Butt Creek stream flow. They are no longer operational and PG&E has proposed to rehabilitate, operate, and maintain them in the LA. The gage and weir are located in lower Butt Creek approximately 0.2 mile upstream of its confluence with the NFFR. In the SA, PG&E also proposes to develop, in consultation with CDFG, SWRCB, the FS, and FWS, a plan to monitor and assess aquatic habitat quality as well as upstream fish passage at the NF-9 gage weir in lower Butt Creek between Butt Valley dam and its confluence with the NFFR. If it is determined during monitoring that the existing gaging weir is acting to block fish passage, then removal or modification of the weir would be undertaken.

In the SA, PG&E and the settlement parties propose to remove the Gansner Bar fish barrier located in the lower Belden reach to allow rainbow trout from downstream waters to migrate into the upper Belden reach for spawning. The Gansner Bar fish barrier is located in the Belden reach of the NFFR about 0.2 miles upstream from the confluence with the EBNFFR. It was originally constructed in 1975 by PG&E under direction by CDFG to protect the upstream rainbow trout fishery by eliminating spawning access to the upper Belden reach by Sacramento sucker and other non-game fish species.

Our Analysis

During the May 2003 site visit, Commission staff inspected the existing gage NF-9 weir in lower Butt Creek. The gaging weir may potentially be a barrier to upstream movement of both juvenile and adult life stages rainbow trout under low flow conditions. The concrete apron extending below the weir may limit the ability of rainbow trout to successfully ascend the structure. Rainbow trout redds and spawning adults have been

documented upstream and downstream of the gage (TRPA, 2002a, b). In our review of the information contained within PG&E's license application, fishery reports, and the HSC development report, no conclusive evidence was provided that spawning rainbow trout and redds upstream of the weir were comprised of rainbow trout that reside in the Seneca reach. We conclude that monitoring the ability of adult and juvenile rainbow trout to ascend upstream of the weir would provide the data necessary for PG&E to determine the need, if any, to modify the structure to improve rainbow trout upstream passage.

PG&E noted that, during several site visits in the spring of 2001, multiple rainbow trout were observed repeatedly attempting to jump over the Gansner Bar fish barrier, without success. Neither the chemical treatment of the upper Belden reach in 1971 nor the construction of the Gansner Bar fish barrier were effective in completely removing non-game fish from this river reach because Sacramento sucker and Sacramento pikeminnow, both species endemic to the UNFFR, currently inhabit the reach (ECORP, 2003). The removal of the barrier would allow adult rainbow trout and other endemic species in lower Belden reach and Rock Creek reservoir to access the upper areas of the reach and associated tributaries and to utilize habitat above the barrier. Additionally, if the barrier was removed, juvenile rainbow trout that are either hatched downstream of the barrier or move below the barrier would be able to regain access to habitat, forage, and coldwater refugia found in the upper reach and its associated tributaries.

A wild, naturally reproducing rainbow trout population currently exists upstream of the Gansner Bar fish barrier in the presence of non-game species. Therefore, the removal or modification of the barrier would not result in a change to the existing fish community, but would likely improve the overall condition of the coldwater fishery in this reach of the river by restoring ecological and hydrologic connectivity.

Fish Pathogens

CDFG, in its letter dated, June 17, 2003, stated that CS, a parasite that afflicts salmonids, is endemic to the NFFR and the relationship between project operations and the occurrence of the disease should be reviewed. CS is a microscopic myxosporean protozoan parasite that infects the internal organs of affected fish. Natural transmission occurs when susceptible salmonids are exposed to water or sediments containing the infective stage; fish to fish transmissions have not been documented in either natural or laboratory environments (Bartholomew et al., 1989). Research indicates that the infection potential is enhanced when water temperatures are high, water flow is low, and/or numbers of infectious CS actinospores are relatively high (Bartholomew, 2001). There is no known treatment for reducing or eliminating CS spores in a natural environment. As CS is endemic to the NFFR, spores and actinospores likely are present within the bypassed reaches and reservoirs.

Our Analysis

High water temperatures (above 20⁰C) during summer in the Belden reach and downstream waters likely increase the susceptibility of rainbow and brown trout to infection by CS. Because CS already occurs in the NFFR, changes in project operations are not likely to increase its transmission. In fact, proposed modifications to the Belden reach instream flow schedule, combined with any other measures that may be implemented (such as blending of Canyon dam releases), would likely provide colder water to the Belden, Rock Creek, and Cresta bypassed reaches, which could reduce CS infection rates of salmonids (CDWR, 2004b).

Effects of Proposed Recreation Measures on Aquatic Resources

In its June 17, 2003, letter to the Commission, The Anglers Committee against Artificial Whitewater Flows requested an evaluation of the effects of proposed recreation related activities, particularly those contemplated in the SMP, on aquatic habitats, fisheries, and angling opportunities.

Our Analysis

Recommended recreational enhancements (see section 3.3.5, *Recreational Resources*) would have minimal effects on aquatic habitat and fisheries. In the SA, PG&E proposes dredging a boat channel from the North Shore campground public boat launch to provide access to approximately 4,480 feet elevation that would be approximately 1,000 feet long, 50 feet wide, and 6 feet deep (PG&E datum). The dredging would alter the depth and potentially the substrate type of approximately 1 acre of aquatic habitat. This represents approximately 0.003 percent of all aquatic habitat found within Lake Almanor at the maximum water surface elevation. Scheduling dredging activities during fall, when the lake level is typically lower and centrarchid spawning is not occurring, would reduce potential impacts on fish utilizing habitat within the dredge zone. In fact, it appears that much of this work could proceed “in the dry,” since the 4,480 foot elevation is well within the historical range of seasonal lake level fluctuation. Performing the work when the lake is below the 4,480 elevation would also simplify the protection of any cultural resource sites that may be in the area.

The proposed SMP, once approved by the Commission, would require PG&E to institute permitting processes that would analyze the effects of any proposed actions, such as rehabilitating swimming beaches, construction of waterside trails, and construction of fishing platforms, on aquatic and other resources.

Potential scheduled recreation flow releases into the Belden reach could adversely affect the aquatic community and are discussed earlier in this section under *Recreation Flows—Belden Reach*.

3.3.2.3 Cumulative Effects on Aquatic Resources

Construction of the UNFFR Project reservoirs and downstream reservoirs (Rock Creek, Cresta, Poe, and Oroville) has reduced the total amount of riverine habitat in the NFFR. Between the West Branch and Hamilton Branch of the NFFR, riverine habitat has been reduced from approximately 90 miles under historic conditions to 41 miles (PG&E, 2002a). Current riverine habitat availability is divided among the Seneca, Belden, Rock Creek, Cresta, and Poe bypassed reaches. Although some of the reservoirs in the Feather River basin provide suitable rearing habitat for rainbow trout, the habitat created by the construction of dams has allowed coolwater fish populations to become established in reservoir impoundments. Diversion of water for hydroelectric generation has substantially reduced flow volumes and altered temperature regimes in the bypassed reaches, but trout fisheries remain in good condition, especially in the Seneca, Belden, and lower Butt Creek reaches.

Several measures proposed by PG&E and recommended by the agencies are expected to provide benefits to the aquatic biota in the Seneca and Belden bypassed reaches. These include: providing pulse flow releases in both bypassed reaches for gravel entrainment and recruitment to improve spawning habitat for trout and enhance channel functionality; increasing minimum flows in these bypassed reaches to increase the amount of physical habitat that is available and to improve summer water temperatures in the Belden bypassed reach; and finalizing a plan for ramping spill flows to avoid rapid onset and termination of spill flows that may flush aquatic biota downstream, if sufficient opportunity to seek cover from high velocities is not provided, or strand trout and invertebrates.

PG&E's proposed minimum flows to the Seneca and Belden bypassed reaches would improve conditions for rainbow trout adults and provide near-optimal conditions for rainbow trout spawning, although juvenile habitat would decrease slightly compared to existing conditions with the flow schedule proposed in the SA (figures 3-11 and 3-12). Consequently, there would not be much of an increase in production of the number of rainbow trout in the Seneca and Belden bypassed reaches. However, because of the near-optimal flow conditions, and slight decrease in the prevailing water temperature in these reaches, the growth and condition of the rainbow trout would be expected to improve. This could result in anglers catching larger trout from the Seneca and Belden bypassed reaches downstream from Canyon and Belden dams, respectively. Monitoring fish and macroinvertebrate populations would enable determinations of trout responses to new project operations and evaluation of the need to implement adaptive management measures.

Providing scheduled whitewater flows in the Belden reach, if implemented, could adversely affect trout populations and macroinvertebrate communities. Recreational flow releases could result in the continued modification of aquatic habitat through the release of artificial flows in the bypassed reaches. Recreational flow releases could continue to

alter the habitat availability, spatial distribution, and behavioral patterns of aquatic fauna in the bypassed reaches. Algae scour, movement of leaf-litter and substrates, redistribution of macroinvertebrates, and entrainment of juvenile fish could occur in the late-summer months as a result of recreational flow releases. Ecological monitoring during such events would enable agencies and PG&E to identify any substantial effects and provide a basis for taking corrective actions.

Modifying the configuration of the Prattville intake pursuant to the Rock Creek-Cresta SA and using project operations to maintain water temperature criteria in river reaches outside the project boundary represents a cumulative effect that would likely cause a reduction in the amount of coldwater habitat in Lake Almanor, which would affect the existing coldwater fish community. Modifications, as modeled, to the Prattville intake would cause a substantial depletion of the hypolimnion (64 percent), which would negatively affect salmonid (rainbow trout, brown trout, and stocked Chinook salmon), and wakasagi populations in Lake Almanor by decreasing available coldwater habitat during the summer. This decrease in coldwater habitat would concentrate fish that prefer such habitat into a substantially smaller area. Currently, wakasagi provide forage to predacious fish in the lake and, when entrained in the Prattville intake, a substantial forage base for trout inhabiting both Butt Valley and Belden reservoirs. Any modifications to the intake that reduce the coldwater habitat could increase entrainment of wakasagi if they become more concentrated in the vicinity of the Prattville intake. This could affect salmonids in Lake Almanor, Butt Valley reservoir, Belden reservoir, and the waters of the Rock Creek-Cresta Project, at least on a short-term basis, by increasing the available forage base. By reducing downstream temperatures, implementation of some of the proposed modifications to the Prattville intake would likely enhance habitat suitability for coldwater fish species in the Rock Creek – Cresta bypassed reaches.

3.3.2.4 Unavoidable Adverse Effects

Continued operation of the UNFFR Project with proposed and recommended measures would result in unavoidable adverse effects on aquatic resources, including the continued replacement of riverine with reservoir habitat, blockage of upstream fish movement by project dams, losses of fish through entrainment, and interruption of sediment transport processes. Lake Almanor and Belden reservoir would continue to inundate approximately 50 percent of the riverine habitat that existed between Hamilton Branch and the current location of the Rock Creek reservoir.

3.3.3 Terrestrial Resources

3.3.3.1 Affected Environment

The project area's varied elevation and geological characteristics support a diversity of vegetation types. Plant communities include mixed coniferous forest, riparian, oak woodland, chaparral, and meadow. We describe specific information on

vegetation associated with the tributaries, UNFFR, reservoirs, and other project features in the following section.

The project area is situated within the California Floristic Province (Hickman, 1993) at the northern edge of the Sierra Nevada Mountains. In the Lake Almanor area, granite and metamorphic rocks of the northern end of the Sierra Nevada are buried beneath young volcanic deposits, and the topography is level to gently sloping. Vernal wet volcanic flats and wet meadows are common in the Almanor region. The upper reaches of Lake Almanor contain large, grassy meadows subject to flooding at high water levels. Vegetative cover in the vicinity of Lake Almanor and Butt Valley is generally mixed conifer forest except in populated areas where development has occurred. The project area between Butt Valley and Caribou is also generally mixed conifer forest with outcrops of serpentine in a steep, eroded landscape. Between Caribou and Belden, the vegetation varies between mixed conifer forest and chaparral. The steep, rocky slopes are dominated by canyon live oak forests. Seeps and springs are fairly common in the area around the Belden forebay, and many rare plants associated with the serpentine outcrops are present.

PG&E identified and mapped seven upland cover types and four riparian vegetation series within the project boundary (table 3-21). In general, upland vegetation in the project area can be characterized as mixed conifer forest and oak woodland. The most common species in the mixed conifer stands are Douglas fir, white fir, Jeffrey and ponderosa pine, lodgepole pine, and incense cedar. Common shrubs include several species of ceanothus and manzanita, vine maple, leather oak, and deer brush. Oak woodland species include canyon live oak and black oak with an understory of deer brush, poison oak, toyon, western mock orange, and pipevine.

Table 3-21. Vegetation series mapped within the UNFFR Project boundary. (Source: GANDA, 2000)

Vegetation Series	General Description and Dominant Species
Upland Series	
Canyon live oak	Open canopy with diverse shrub and herbaceous layers, including introduced annuals; canyon live oak, western mock orange, whiteleaf and Indian manzanita, deer brush, poison oak, and California pipevine
Mixed conifer	Densely shaded by Douglas fir, ponderosa pine, incense cedar, and white fir, poorly developed shrub and herbaceous layer of leaf litter and saprophytes

Vegetation Series	General Description and Dominant Species
Lodgepole pine	Single species forest of lodgepole pine found at higher elevations along edges of wet montane meadows, low diversity and sparse understory
Leather oak	Leather oak and wedgeleaf ceanothus found in mixed serpentine chaparral along with whiteleaf manzanita, rubber rabbitbush, and prickly phlox
Greenleaf manzanita or montane chaparral	Dense chaparral to about 15 feet in height found often in disturbed areas; greenleaf manzanita, mountain whitethorn, Sierra gooseberry, bloomer's goldenbush, and Mahala mat
Dry montane meadow	Herb dominated community found at the periphery of Last Chance Marsh, along the north and west shore of Lake Almanor, and behind Chester Airport; Kentucky bluegrass, tufted hairgrass, common yarrow, meadow penstemon, beaked sedge, Jones' muhly, long-stalked clover, sheep sorrel, and cinquefoil
Tufted hairgrass	Herb dominated community found in a band of seasonally moist meadow at Last Chance Marsh; tufted hairgrass, bluegrass, field mint, timothy, and Baltic rush
White alder	Narrow, discontinuous montane riparian forest found throughout the NFFR corridor; white alder, some black cottonwood, arroyo willow, and redbud
Wetland Series	
Freshwater seeps	Herb dominated community associated with wet meadows or fractured serpentine on steep slopes or cliff faces, found in Last Chance Marsh and Caribou and Belden areas; native sedges and rushes, seep-spring monkeyflower, big-leaved avens, meadow barley, leopard lily, white-flowered bog orchid, and wild azalea
Freshwater marsh	Aquatic and emergent species found along the fringes of marsh habitat at Lake Almanor and Butt Valley reservoir and a disturbed site behind Chester Airport; pondweeds, water smartweed, common waterweed, inflated sedge, water sedge, common

Vegetation Series	General Description and Dominant Species
	bladderwort, hairy-leaved meadow arnica, American brooklime, creeping spikerush, mountain spikerush, and mannagrass
Wet montane meadow	Highly diverse herbaceous community found at Last Chance Marsh; woolly sedge, small-fruited bulrush, mountain spikerush, water plantain buttercup, tinker's penny, Baltic rush, field mint, Nevada rush, and primrose monkeyflower

The UNFFR Project area contains abundant riverine and lacustrine open water wetlands associated with the NFFR, its tributary streams, and the project reservoirs. Palustrine scrub-shrub wetlands are found along the shoreline of the river and its tributaries and are usually dominated by deciduous shrubs like willow and alder. Persistent emergent wetlands are found to a limited extent along the west shore and causeway arm of Lake Almanor and are characterized by bull rush, cattails, and sedges. Other common riparian and wetland vegetation includes grasses, sedges, willows, rushes, alders, cottonwoods, and ferns. Freshwater seeps and wet meadow habitats also occur locally.

Special-status Plant Species

PG&E's review of information published by the FS, FWS, CDFG, and the California Native Plant Society (CNPS) indicated that 118 special-status species could potentially occur in the project area. PG&E conducted field surveys for rare plants during the spring and summer of 2000 along the NFFR corridor from Lake Almanor dam to the Belden powerhouse at the confluence with Yellow Creek. Surveys were also conducted around Butt Valley reservoir, Lake Almanor, and associated project facilities and recreational sites. Surveyors identified and mapped 114 occurrences of 12 rare plants that are known to occur in the project vicinity or are documented within the project area (table 3-22). No federal- or state-listed threatened, endangered, or candidate plant species were documented within the project area.

Table 3-22. Special-status plant species that are known to occur within the UNFFR Project area. (Source: GANDA, 2000)

Species	Status	Habitat and Location Where Found
Geyer's sedge (<i>Carex geyeri</i>)	CNPS 4, FSI	Open mixed conifer forest. Documented during PG&E's surveys at Skinner Flat and approximately 1 mile downstream of Canyon dam.
Starry clarkia (<i>Clarkia stellata</i>)	FSS	Mixed conifer forest; road embankments or open areas. Documented during PG&E's surveys on the southeast shore of Lake Almanor and along Butt Valley reservoir Road.
California lady's slipper (<i>Cypripedium californicum</i>)	CNPS 4, FSI	Seeps and springs on serpentine rock outcrops. Documented during PG&E's surveys at Caribou No. 1 and No. 2; and at a permanent spring approximately 1 mile north of Queen Lily campground.
Round-leaved sundew (<i>Drosera angelica</i>)	FSI	Bogs and swamps, mixed conifer forest. Documented during PG&E's surveys at Last Chance Marsh.
Cantelow's lewisia (<i>Lewisia cantelovii</i>)	CNPS 1B, FSS	Broadleaf upland forest; chaparral, cismontane woodland; steep, north to northeast-facing cliffs, rocky outcrops, often mossy sites. Documented during PG&E's surveys in the Caribou area, 2 miles north of Queen Lily campground and the confluence of NFFR and EBNFFR.
Quincy lupine (<i>Lupinus dalesiae</i>)	CNPS 1B, FSS	Dry slopes in mixed conifer, often on phyllite. Lower coniferous and upper coniferous forests. Documented during PG&E's surveys at Butt Valley reservoir.
Northern bugleweed (<i>Lycopus uniflorus</i>)	CNPS 4, FSI	Lake margins, wet meadows, and floating bogs and fens. Documented during PG&E's surveys at Last Chance Marsh.

Species	Status	Habitat and Location Where Found
Stebbin's monardella (<i>Monardella stebbinsii</i>)	CNPS 1B, FSS	Broadleaf upland forest; chaparral, lower coniferous forest; rocky serpentine slopes and outcrops. Documented during PG&E's surveys in the Caribou area.
Marsh skullcap (<i>Scutellaria galericulata</i>)	CNPS 2, FSI	Swamps and wet places, 4,000 – 7,000 feet elevation; lower montane coniferous forest, meadows (mesic). Documented during PG&E's surveys at Last Chance Marsh.
Feather River stonecrop (<i>Sedum albomarginatum</i>)	CNPS 1B, FSS	Crevices and ledges on steep, serpentine cliff faces, partially shaded. Chaparral, lower coniferous forest. Documented during PG&E's surveys in the Caribou area.
Flat-leaf bladderwort (<i>Utricularia intermedia</i>)	CNPS 2, FSI	Shallow water; 4,000-7,500 feet elevation. Bogs and meadows, marshes, and swamps (lake margins). Documented during PG&E's surveys at Last Chance Marsh.
Cream-flowered bladderwort (<i>Utricularia ochroleuca</i>)	FSI	Shallow water; 1,435-1,440 meters elevation. Meadows (mesic); marshes, and swamps (lake margins). Documented during PG&E's surveys at Last Chance Marsh.

Notes: FSS – FS sensitive species
FSI – FS special interest
CNPS 1B – rare or endangered in California and elsewhere
CNPS 2 – rare or endangered in California, but more common elsewhere
CNPS 3 – plants for which more information is needed
CNPS 4 – plants of limited distribution

Noxious and Invasive Weeds

The California Department of Food and Agriculture (CDFA) lists 135 plants as noxious weeds in California (CDFA, 2002). Based on literature review and information obtained from CDFA, the California Exotic Pest Plant Council (CalEPPC), and the FS, PG&E determined that 38 of these could potentially occur in the project area. PG&E conducted surveys for noxious weeds in the project area together with surveys for rare plants in 2000. Surveyors identified and mapped 145 occurrences of eight noxious weed

species (table 3-23). A ninth species, Himalayan blackberry, was not mapped because it was found to be so widespread in the project area. Although not listed by CDFA as “noxious,” it is widely accepted as an invasive exotic plant. It was found throughout the NFFR corridor from the Belden powerhouse to approximately 4,200 feet elevation at Butt Valley reservoir.

Most weed populations were observed along project access roads, around the powerhouses, and at recreational facilities, where vehicle and foot traffic serve as vectors for the spread of weed seed. However, weed infestations were also documented at low use areas, such as the northern tip of Lake Almanor, suggesting that plant fragments and seed are also spread by a combination of high flows or water levels and by recreationists.

Table 3-23. Noxious and invasive weeds documented in the UNFFR Project area.
(Source: GANDA, 2000)

Species	Status	Documented Occurrences
Cheat grass (<i>Bromus tectorum</i>)	CalEPPC A-1, CDFA C	Common throughout project area, particularly on access roads and near facilities.
Hairy whitetop (<i>Cardaria pubescens</i>)	CDFA B	West side of Lake Almanor near the 4,510 elevation contour; also at the north end of Butt Valley reservoir and Belden forebay.
Spotted knapweed (<i>Centaurea maculosa</i>)	CalEPPC Red Alert, CDFA A	Highway 36 embankment on west side of bridge over Lake Almanor.
Yellow star-thistle (<i>Centaurea solstitialis</i>)	CalEPPC A-1, CDFA C	Common throughout project area along access roads and near facilities.
Canada thistle (<i>Cirsium arvense</i>)	CalEPPC B, CDFA B	Mud Creek Rim Road; east shore north end of Lake Almanor.
Klamathweed (<i>Hypericum perforatum</i>)	CalEPPC B, CDFA C	Large occurrences at Butt Valley reservoir in vicinity of sensitive species plants. Common along access roads, facilities, and recreation areas.
Dalmation toadflax (<i>Linaria genistifolia</i>)	CDFA A	West side of Lake Almanor; colonizing edge of montane meadow habitats.

Species	Status	Documented Occurrences
Bouncing-bet (<i>Saponaria officinalis</i>)	CalePPC A-2, CDFA C	Near confluence of NFFR and EBNFFR.
Himalayan blackberry (<i>Rubus discolor</i>)	CalePPC A-1	Intermittent band of riparian vegetation on NFFR from Seneca to Belden powerhouse.

Notes: **CalePPC List Designations:**
A-1 – most invasive wildland pest, widespread
A-2 – most invasive wildland pest, regional
B – wildland pest plants of lesser invasiveness
Red Alert – pest plants with the potential to spread explosively
CDFA List:
A – targeted for eradication or containment
B – more widespread, counties determine control efforts
C – very widespread, control efforts typically targeted only in nurseries or seed
lots

Wildlife

The UNFFR Project area provides habitat for a variety of wildlife species that use the mixed conifer forests of varying stand ages, oak woodlands, riparian areas along the NFFR and its tributaries, and project reservoirs. The coniferous forest in the project area supports various species of upland game birds including blue grouse, California and mountain quail, ring-necked pheasant, mourning dove, and wild turkey. Mammals expected to occur include mule deer, black bear, Douglas' squirrel, snowshoe hare, western gray squirrel, raccoon, gray fox, and ermine. The most important game species in the project vicinity are deer, including black-tailed deer and California mule deer. At lower elevations, the UNFFR Project area serves as the winter range for the Bucks Mountain Herd and the summer range for the East Tehema Deer Herd.

Riparian habitats are of particular importance, because they support a greater density and diversity of wildlife than any other terrestrial habitat in California. Waterfowl such as mallard, wood duck, wigeon, common mergansers, common goldeneye, cinnamon teal, canvasback, and Canada goose occur in the project area. Great blue heron, osprey, and belted kingfisher are often observed near the project reservoirs and along the NFFR. Furbearers such as beaver, muskrat, and mink also benefit from the project's abundant riparian habitat. Reptiles and amphibians known to occur in the vicinity of the project area include bullfrog, garter snake, treefrog, Pacific rattlesnake, western toad, and California newt.

Special-status Wildlife

A number of sensitive wildlife species are known to, or have potential to, occur in the project vicinity including several FS sensitive species. We address species that are

listed as threatened or endangered under the ESA in section 3.3.4, *Threatened and Endangered Species*.

PG&E's consultation with the FS, FWS, and CDFG indicated that 18 species with special status could occur in the project area. Three additional species, the VELB, CRLF, and bald eagle, are federally listed as threatened, and are discussed in section 3.3.4, *Threatened and Endangered Species*. The amphibians, reptiles, birds, and mammals shown in table 3-24 include federal species of concern; sensitive species in FS Region 5; and state-listed threatened, endangered, or species of concern. We evaluated the likelihood of occurrence of these species in the project area based on their historical range, known occurrences, habitat associations documented in the literature, and the results of PG&E's field surveys. The current status of each species was identified after reviewing CDFG's current list of special-status animals (CDFG, 2002a).

Table 3-24. Special-status species that could occur or are documented to occur in the project vicinity. (Source: PG&E, 2002a; CDFG, 2002a).

Species	Status	Optimum Habitat
Amphibians and reptiles		
Cascades frog (<i>Rana cascadae</i>)	FSC, CSC, FSS	Breeds in ponds or bogs at elevations above 3,000 feet NGVD; associated with wet meadows, moist forests, along forested small streams or pond edges in summer
Foothill yellow-legged frog (<i>Rana boylei</i>)	FSC, FSS, CSC	Typically found close to tributaries, with cobble/boulder substrate and exposed rock for sunning; permanent foothill streams
Mountain yellow-legged frog (<i>Rana muscosa</i>)	FSC, CSC, FSS	Typically found at high elevation ponds, lakes, and streams
California red-legged frog (<i>Rana aurora draytonii</i>)	CSC, FT	Typically found in perennial ponds or pools with deep, still or slow moving water containing dense emergent or riparian vegetation
Northern leopard frog (<i>Rana pipiens</i>)	CSC, FSS	Typically found near quiet water with emergent or submergent vegetation for breeding and overwintering

Species	Status	Optimum Habitat
Western pond turtle (<i>Clemmys marmorata</i>)	FSC, FSS, CSC	Typically found near still or slow-moving water of ponds, marshes, streams, rivers, and reservoirs containing substrates for aerial or aquatic basking
Birds		
American peregrine falcon (<i>Falco peregrinus anatum</i>)	FSC, FSS, SE	Montane hardwood-conifer, cliff sites for nesting
California spotted owl (<i>Strix occidentalis occidentalis</i>)	FSS, CSC	Montane hardwood-conifer
Greater sandhill crane (<i>Grus canadensis tabida</i>)	FSS, ST	Wet meadows interspersed with emergent wetlands. Irrigated pastures are important for resting during migration and through the winter
Northern goshawk (<i>Accipiter gentilis</i>)	FSC, FSS, CSC	Montane hardwood-conifer, middle and higher elevations
Willow flycatcher (<i>Empidonax traillii</i>)	FSS, SE	Montane hardwood-conifer, wet meadow
Mammals		
California wolverine (<i>Gulo gulo luteus</i>)	FSC, FSS, ST	Montane hardwood-conifer, montane riparian
Pacific fisher (<i>Martes pennanti pacifica</i>)	FSC, FSS, CSC	Montane hardwood-conifer, montane riparian
Pine marten (<i>Martes americanus</i>)	FSS	Montane hardwood-conifer
Sierra Nevada red fox (<i>Vulpes vulpes necator</i>)	FSC, FSS, ST	Montane hardwood-conifer, montane riparian
Pallid bat (<i>Antrozous pallidus</i>)	FSS, FSM, CSC	Montane hardwood-conifer, montane riparian; uses caves, tunnels, abandoned mine shafts, and sometimes buildings
Townsend's big-eared bat (<i>Plecotus townsendii pallescens</i>)	FSC, FSS, CSC	Montane hardwood-conifer, montane riparian; typically found in caves, mines, tunnels, attics and other human-made structures

Species	Status	Optimum Habitat
Western red bat (<i>Lasiurus blossevillii</i>)	FSS, CSC	Montane hardwood-conifer, strongly associated with riparian forest, uses tree foliage for day roosting

Notes: FSC – federal species of concern
 FT/FE – federally threatened or endangered
 FSS – FS sensitive species, Region 5
 FSM– FS survey and manage species
 SE – state endangered
 ST – state threatened
 CSC – state species of concern

Several of the wildlife species discussed above and shown in table 3-24 as having special FS or state status are also considered FS Management Indicator Species (MIS). MIS do not necessarily have special status, but are important in representing certain habitats and other species or guilds associated with such habitats. The FS uses MIS to evaluate the effects of various management actions on wildlife populations. For its analysis of the impacts of relicensing the UNFFR Project, the FS selected nine wildlife MIS that were identified in the Plumas and Lassen National Forest land and resource management plans: osprey, woodpeckers (pileated and hairy), bear, deer, bufflehead duck (Lake Almanor), mallard, Canada goose, and western gray squirrel (FS, 1988; FS, 1992). Currently little or no information is available about the numbers of these species, and some occurrences within the project area likely fluctuate yearly with annual migration.

Special-status Amphibians and Reptiles

Six amphibians and aquatic reptiles were considered to have potential for occurring in the NFFR watershed (see table 3-24). Amphibian and aquatic reptile surveys, performed by Garcia and Associates in 2001, identified a range of suitable habitat for target special-status species. While the NFFR provides suitable habitat for many water- or wetland-dependent species, PG&E concludes that the UNFFR Project area does not appear to currently support populations of Cascades frog, mountain yellow-legged frog, foothill yellow-legged frog (FYLF), CRLF, or other special-status amphibians and aquatic reptiles (GANDA, 2002). Likely causes for species' absence include destruction or disruption of habitat, predation, changes in water level elevations and flow, and general low to moderate habitat suitability.

Special-status Bird Species

The FS has identified five special-status bird species as being of particular interest in the project area (PG&E, 2002a). These include the American peregrine falcon, California spotted owl, greater sandhill crane, northern goshawk, and willow flycatcher. Below, we provide additional information about these species.

American peregrine falcon (*Falco peregrinus anatum*)—The American peregrine falcon was removed from the federal list of threatened and endangered species in 1999, due to the success of recovery efforts throughout its range (64 FR 46,541-46,558). However, the peregrine continues to be protected under the Migratory Bird Treaty Act, and is considered sensitive in FS Region 5.

Peregrine falcons nest on steep and inaccessible cliffs that offer protection from predators. They prey almost exclusively on birds captured in flight. Cliffs along the NFFR reaches may provide suitable nesting habitat for peregrine falcons. One known eyrie located in the NFFR canyon on cliffs just upstream of the confluence with Ohio Creek was documented during helicopter surveys for bald eagles in 2001. No other peregrine falcon breeding areas were documented. Limited availability of suitable nest sites and other historical effects resulting from human activity due to logging, grazing, and recreation may contribute to the paucity of nesting peregrines.

California spotted owl (*Strix occidentalis occidentalis*)—The California spotted owl is an FS sensitive species and is not currently protected under provisions of either the state or federal ESA. Spotted owls typically occur in dense, old-growth, multi-layered, mixed coniferous forest and oak woodland habitats. Key habitat requirements for this species include blocks of mature forest with permanent water and dense, multi-layered canopy cover for roost seclusion. Nesting territories are often found in narrow, steep-sided canyons on north-facing slopes. Open areas are usually avoided by these owls, although they may occasionally make hunting forays into secondary forest. The largest threat facing the spotted owl is the loss of habitat from logging.

The FS maintains 300 acres of Protected Activity Centers (PACs) for the California spotted owl on Plumas National Forest lands. One PAC has been established near the Butt Valley dam and another is located adjacent to the east shore of the reservoir. PG&E used FS protocols to conduct surveys for spotted owls in the project area during the 1994 and 1995 breeding seasons. Surveyors received responses from spotted owls in the two previously identified FS PACs, but did not observe any owls or nests during a daylight follow-up survey. However, database searches and agency consultation in 1999 identified 18 area records for spotted owl within a one-mile radius of the reach between Canyon and Belden dams. The status of these sites remains unknown.

Greater sandhill crane (*Grus canadensis tabida*)—Suitable habitat for this state threatened species exists in the open water areas and shallow lakes of the project area. Fresh emergent wetlands for nesting and open shortgrass plains, grain fields, and open water wetlands for foraging occur along and adjacent to the western shoreline of Lake Almanor. One pair of adult cranes with young was observed in 1981 during ground reconnaissance in a large meadow immediately north of Lake Almanor. Four other records exist within the project vicinity.

Northern goshawk (*Accipiter gentilis*)—The project area provides suitable habitat for the northern goshawk. The northern goshawk typically nests on the Plumas National Forest in mature or older mixed conifer stands, but uses a variety of stand ages during foraging. Nests are well built stick nests located high in a hardwood tree. The nest is often built in the crotch of the tree.

PG&E conducted northern goshawk surveys in 1994 according to FS survey protocol and conducted database searches in 1999. No goshawks were found nesting in the immediate vicinity of the project in 1994. The nearest confirmed recently active northern goshawk nesting area is located on private land south of the town of Chester and approximately 10 miles northwest of Canyon dam.

Willow flycatcher (*Empidonax traillii*)—The state endangered willow flycatcher breeds in California from Tulare County north, along the western side of the Sierra Nevada and Cascades and along the northern coast. This species is strongly associated with large wet meadow complexes that support willow or willow/alder thickets at elevations between about 2,000 to 8,000 feet, but breeding habitat may be extremely variable (RHJV, 2000).

PG&E did not document any willow flycatchers during ground reconnaissance or database searches. The nearest records found were located approximately 3 miles west of Butt Valley reservoir and 10 miles northeast of Lake Almanor. Suitable large stands of willow habitat are not found in the project area, making it unlikely that the species occurs here.

Special-status Forest Carnivores

Although the California wolverine, Pacific fisher, pine marten, and Sierra Nevada red fox have not been documented in the project area, suitable habitat is present in the vicinity, and the FS has categorized them as sensitive species (PG&E, 2002a). We describe these species below.

California wolverine (*Gulo gulo luteus*)—The California wolverine occurs in mixed conifer, fir, and lodgepole forests at elevations between about 4,300 to 7,300 feet, but may also use lower elevations in areas where it is undisturbed by development and human activity (Banci, 1994). The California wolverine uses caves, hollows in cliffs or rock outcrops or ground burrows in dense forest stands for den sites, but forages in more open areas.

The current range of the California wolverine extends from Del Norte and Trinity counties through Shasta County, and south through the Sierra Nevada to Tulare County. However, no wolverines were detected during forest carnivore surveys in 1994 and 2000 or winter carnivore surveys in 1998. The presence of roads, facilities, residential development, and recreation may limit habitat potential for the California wolverine.

Pacific fisher (*Martes pennanti pacifica*)—The Pacific fisher is typically found in late-successional conifer forests and riparian areas, and avoids open, hardwood-dominated stands (Powell and Zielinski, 1994). Stand attributes that appear to be important for the Pacific fisher include a diversity of tree sizes and shapes, openings that allow for the growth of understory vegetation, abundant dead and down material, and limbs close to the ground (Powell and Zielinski, 1994). Very few dens have been found in the western United States, but fishers typically den high in cavities in large-diameter live trees or snags. In California, fishers prey on small- to medium-sized mammals, including mice, voles, shrews, moles, squirrels, birds, snowshoe hare, and porcupines, and fisher foraging habitat coincides with forested and riparian habitats where these species are abundant (Powell and Zielinski, 1994).

At one time, the range of this species extended from British Columbia to Central California, but populations declined dramatically around the turn of the last century, due to trapping and logging. In the south-central Sierra Nevada, the Pacific fisher is reported from habitats between about 3,300 to 6,600 feet NGVD; the Southern Sierra Fisher Conservation Area encompasses the known occupied range in the Sierra Nevada, which is considered to be an elevational band from 4,500 to 8,000 feet (Golightly, 1997). No fishers were detected during forest carnivore surveys conducted in 1994 and 2000 or during winter carnivore surveys conducted in 1998. As with the wolverine, presence of roads, facilities, residential development, and recreation may limit habitat potential for this species.

Pine marten (*Martes americanus*)—The pine marten is an FS sensitive species that occurs in dense fir, lodgepole pine, and mixed coniferous forest. Suitable marten habitat is present throughout the project area, particularly at the higher elevations. However, no individuals were detected during forest carnivore surveys conducted in 1994 and 2000 or during winter carnivore surveys conducted in 1998. As with the wolverine and fisher, the presence of roads, facilities, residential development, and recreation may limit habitat potential for this species.

Sierra Nevada red fox (*Vulpes vulpes necator*)—The Sierra Nevada red fox is typically found in late-successional coniferous forest interspersed with riparian and meadow habitat and in brush fields. Its range extends from the California Cascades east to the Sierra Nevada Mountains in northern California, with most sightings reported between 5,000 and 7,000 feet NGVD. Although habitat may exist in the higher elevations of the project vicinity, no Sierra Nevada red fox were detected during forest carnivore surveys in 1994 and 2000 or winter carnivore surveys in 1998. However, one individual was sighted near the town of Chester on the west shore of Lake Almanor in 1973. As with the other forest carnivores, the presence of roads, facilities, residential development, and recreation may limit habitat potential for this species.

Special-status Bats

In addition to surveys for general forest and riparian biota, PG&E conducted specific surveys for bats in the project area in 2001. Using a variety of methods, biologists documented the presence of four different species of bats that use project features to roost. None, however, were special-status bats (i.e., pallid bat, Townsend's big-eared bat, and western red bat).

Below, we provide additional information about the three special-status species. General information about their range, distribution in California, foraging or roosting patterns is based on species accounts presented in California's Wildlife, Volume III: Mammals (Zeiner et al., 1990), with updates from CDFG's Wildlife and Habitat Data Analysis Branch website (www.dfg.ca.gov/whdab/html/cawildlife.html). Site-specific information was obtained through field studies conducted in the project vicinity in 2001 by Garcia and Associates (PG&E, 2002a). Important roost sites for non-target species bats (where several hundred bats were observed at the locations) were documented at Belden dam, Caribou No. 1 powerhouse, Caribou No. 1 and No. 2 intake towers, Caribou No. 2 valve house, Butt Valley powerhouse, upper penstock portal, and Canyon dam and Butt Valley intake towers.

Pallid bat (*Antrozous pallidus*)—The pallid bat occurs throughout California. In central California, the pallid bat occurs in a variety of habitats, including oak woodland, ponderosa pine, and mixed conifer forest at elevations below 6,000 feet. The pallid bat uses rock outcrops, caves, tree hollows, and human-made structures as day-roosts. Night roosts may be located under bridges or in caves or mines, where temperatures do not exceed 40°C (104°F). During the 2001 surveys, biologists did not detect pallid bats using project facilities or other human-made structures at the 58 project survey stations.

Townsend's big-eared bat (*Corynorhinus townsendii*)—The Townsend's big-eared bat occurs throughout California, from low desert to mid-elevation forests. It relies on caves, mines, tunnels, or attics, where it roosts in clusters on open surfaces. While this species occasionally uses human-made structures that resemble caves, none of the powerhouses, dams, or associated project features provide suitable day roosting habitat. It is most readily detected by surveying potential roost sites, but is not easily captured or acoustically recorded. During the 2001 surveys, biologists did not detect Townsend's big-eared bats using project facilities or other human-made structures at the 58 project survey stations. However, probable evidence of its presence was documented in the Caribou Clubhouse at a single site, but this facility was never confirmed as an active roost site.

Western red bat (*Lasiurus blossevillei*)—The western red bat is found throughout California at low elevations. Most occurrences of breeding females are from low elevations along major drainages in the Central Valley, but males and non-reproductive females may use elevations up to about 8,000 feet. The western red bat uses tree foliage

for day-roosting and is strongly associated with riparian forest. During the 2001 acoustical surveys, biologists did not obtain any acoustic records of red bats, nor did they detect the bats using project facilities or other human-made structures.

3.3.3.2 Environmental Effects

Vegetation Management

Vegetation management at project facilities, including recreational sites, transmission line corridors, and access roads, has the potential to beneficially or adversely affect native plant communities, rare plants, and wildlife habitat. Vegetation management also may create conditions that decrease or increase the risk of establishment and spread of non-native plants and invasive weeds.

Recreational and other land use activities may adversely affect vegetation in the project area, as well. ORV traffic may cause erosion, soil compaction, and loss of vegetative cover. Vehicles, anglers, hikers, and even domestic pets can serve as vectors for the spread of weeds at both formal and dispersed recreational sites.

To address these concerns, PG&E proposes, in cooperation with interested parties, to design and implement a resource management plan that would benefit sensitive biological resources at the UNFFR Project. The plan would include measures to enhance and protect rare plants, wetlands, riparian communities, cultural resources, and sensitive wildlife habitats in the causeway area of Lake Almanor, from Last Chance campground south along the west shore of the lake to approximately the northern edge of the flood control channel south of the Chester airport. The plan would examine current land use and project-related effects and would provide enhancement opportunities to improve habitat suitability, grazing and land use practices, riparian zone revegetation, and weed control. In addition, PG&E proposes to include BMPs in the planning of all new construction activities within the project boundary to help prevent the introduction and spread of invasive weeds in the watershed.

The SA and FS final Section 4(e) condition no. 31 would require PG&E to develop a habitat enhancement plan within 1 year of license issuance. The plan would be developed in consultation with FS, FWS, CDFG, SWRCB, and Plumas County. This recommended plan would include the same enhancement measures proposed in PG&E's resource management plan discussed above. FS final Section 4(e) condition no. 5 specifies that PG&E would provide the FS with a minimum of 60 days to review and approve the plan before filing it with the Commission. According to the SA, the primary elements of the plan would include fencing and vehicle exclusion measures that would allow continued public foot access to the area. These measures would be implemented within 2 years of license issuance.

In addition to the habitat enhancement plan, the FS recommends that PG&E file an FS-approved visual management plan prior to conducting any ground-disturbing activity

on NFS lands within the project boundary, as specified in final Section 4(e) condition no. 40. PG&E, in its January 15, 2004, response to the FS Section 4(e) conditions, does not object to this recommendation. In addition, FS final Section 4(e) condition no. 41 specifies that PG&E develop a vegetation management plan that addresses the assessment and treatment of hazardous vegetative conditions that surround project facilities and may accelerate the spread of a wildfire onto NFS lands. FS final Section 4(e) condition no. 5 specifies that PG&E would provide the FS with a minimum of 60 days to review and approve the plan before filing it with the Commission.

Interior's 10(j) recommendation no. 7, included in its December 1, 2003, filing, called for PG&E to develop a comprehensive vegetation management plan to evaluate and implement actions to improve channel function during various flows, reduce the spread of exotic vegetation, and protect and monitor special-status species. Interior indicates that the plan should be developed in consultation with the FS, FWS, CDFG, and SWRCB within 6 months of license issuance. The plan and results of vegetation management activities and monitoring would be described in an annual report to be submitted to the agencies for review and comment before filing with the Commission for approval.

In its response to Interior, filed with the Commission on January 15, 2004, PG&E states that it disagrees with some of the measures included in Interior's recommended vegetation management plan, stating that there are too many highly involved tasks to be collectively included in the plan. However, some of Interior's recommended weed control measures would be addressed in the invasive weed management plan (discussed below) specified by the FS and agreed to by PG&E.

Currently, PG&E is engaged in a long-term riparian monitoring program and BMPs for prevention of the introduction and spread of noxious weeds immediately downstream of the UNFFR Project on the Feather River as part of the license requirements of the downstream Rock Creek-Cresta Project. PG&E does not expect to see substantial changes to the riparian vegetation resulting from proposed UNFFR Project instream flows and pulse flows and therefore does not agree that additional monitoring of riparian vegetation at the UNFFR Project is needed. PG&E is currently conducting annual noxious weed surveys and monitoring all known populations of noxious weeds at the downstream Rock Creek-Cresta Project. In addition, comprehensive project area surveys for noxious weeds are repeated at 3- to 5-year intervals to document any new populations and update the status of populations for which control measures were not initially recommended.

PG&E opposes Interior's recommendation to mechanically excavate riparian vegetation from banks and bars as a control method. PG&E indicates that such manipulation would compromise any attempts to monitor flow-related effects by altering baseline channel conditions or could lead to the further spread of noxious weeds, such as Himalayan blackberry, to other areas of the watershed.

PG&E also disagrees with the need to submit annual vegetation management activity and monitoring reports to the agencies, stating that quantifying and annually reporting the results of maintenance activities associated with routine vegetation management would be burdensome, costly, and unwarranted.

In its letter filed with the Commission on November 1, 2004, Interior expressed its concern that staff's recommended vegetation management plan did not include its pilot test for control of encroached vegetation. Interior recommends an additional test measure to control excess encroached vegetation for the purpose of enhancing riparian and riverine habitat. During the Section 10(j) teleconference on February 3, 2005, Interior proposed an approach to test vegetation management in the riparian corridor with a pilot plan to monitor four modest-size sites: two for invasive weeds/native replanting, and two specifically designed to create low velocity river edge habitat through such techniques as recontouring and/or vegetation thinning or removal. The FS offered to work with Interior to fully develop this proposal.

FS final Section 4(e) condition no. 44 specifies that PG&E annually review the current list of special-status plant and wildlife species (species that are listed as endangered or threatened by the federal government, species that are listed as sensitive by the FS, or species that occur on the watch lists for the Lassen and Plumas National Forests) that might occur within the UNFFR Project boundary in consultation with the FS. When a species is added to one or more of the lists, the FS specifies that PG&E, in consultation with the FS, would determine if the species or unsurveyed suitable habitat for the species is likely to occur within the UNFFR Project boundary. If the FS determines that a newly added species is likely to occur, the FS specifies that PG&E would develop and implement a study plan in consultation with the FS to reasonably assess the effects of the UNFFR Project on the species. The FS specifies that PG&E would prepare a report on the study including objectives; methods; results; recommended resource measures, where appropriate; and a schedule of implementation, and provide a draft of the final report to the FS for review and approval. The FS further specifies that PG&E would file the FS-approved report, including evidence of consultation, with the Commission and would implement those resource management measures required by the Commission.

In addition, the FS specifies that PG&E would resurvey areas within the UNFFR Project boundary that have suitable habitat or known occurrences of selected special-status wildlife or plant species every 10 years to (1) determine if special-status plant or wildlife species have changed in location (i.e., migrated into or moved within the project boundary) and (2) monitor for impacts caused by ongoing project activities. The FS specifies that PG&E would consult with the FS to determine which species need to be resurveyed. The FS specifies that the survey interval may be adjusted based on the amount of movement or impacts on the species that are observed. The FS specifies that PG&E would provide the FS with the survey results. If the FS determines that negative

impacts have occurred, the FS specifies that PG&E would submit a proposal to the FS for actions to reduce or eliminate impacts on special-status species. The FS specifies that PG&E would file the report, including evidence of consultation, with the Commission and would implement those resource management measures required by the FS and approved by the Commission.

FS final Section 4(e) condition no. 45 specifies that PG&E prepare a threatened, endangered, proposed for listing, and sensitive species protection plan to assess the potential effects on federally proposed or listed species or FS sensitive species, of any actions to construct (including, but not limited to, proposed recreational developments), operate, or maintain project facilities, and submit it to the FS for approval. This recommendation would cover plants, fish, and wildlife, and their habitats. FS final Section 4(e) condition no. 5 specifies that PG&E would provide the FS with a minimum of 60 days to review and approve the plan before filing it with the Commission.

FS final Section 4(e) condition no. 46 specifies that PG&E develop a plan to control and contain the spread of project-related invasive weeds on PG&E and NFS lands, which might be related to project activities. The invasive weed management plan would be approved by the FS and filed with the Commission within 1 year of license issuance. FS final Section 4(e) condition no. 5 specifies that PG&E would provide the FS with a minimum of 60 days to review and approve the plan before filing it with the Commission. PG&E has agreed to address control of existing known populations of weeds as well as ensure that BMPs would be followed during all ground-disturbing activities for the prevention of new invasive weed infestations.

Our Analysis

Vegetation management encompasses a wide variety of activities, such as roadside mowing, weed control, and revegetation of eroding soils. Vegetation management can have adverse or beneficial effects, or both, on natural resources, cultural values, recreation, aesthetics, health and safety, and socioeconomics. Field surveys have identified numerous sensitive plant populations throughout the project area. In addition, numerous populations of noxious and invasive plants have been documented. For this reason, consultation with the FS, FWS, CDFG, and California Department of Parks and Recreation (CDPR) to develop and implement a plan that would include measures to enhance and protect rare plants, wetlands, riparian communities, and sensitive wildlife habitats is reasonable. In the following section, we address development of a vegetation management plan, and focus on two aspects of vegetation management having to do with terrestrial resources: protection of special-status plants and control of noxious and invasive weeds. Vegetation management at recreational sites is addressed in section 3.3.5, *Recreational Resources*.

Protection of Special-Status Plants

During field surveys in spring and summer of 2000, biologists documented the occurrence of 12 special-status plants (GANDA, 2000). Most of these plants were found well above the high water mark, and are not threatened by project flow regimes or reservoir water level management. Although no federal- or state-listed plant species were found within the project area, special-status plants were found in the Last Chance Marsh area and could be influenced by widely fluctuating water levels. A few species could also potentially be threatened by noxious and invasive weed populations that are in proximity and share the same habitat, such as Geyer's sedge and Klamathweed found in a recently logged area. Since these are sites that could be affected by the spread of noxious and invasive weeds or a variety of vegetation management activities (e.g., brushing, mowing, herbicide application, replanting projects), recreation-related activities (e.g., camping, wood-cutting, ORV use), and other ground disturbances, we conclude that consultation with the FS, FWS, and CNPS to identify any measures that may be needed to protect these species is appropriate. Presently, PG&E maintains a project GIS data base that allows PG&E to map and track occurrences of special-status plants and animals in order to assist in evaluating plans for management, siting for new recreational facilities, and considering other activities that would cause ground disturbance or habitat alteration. Revisiting the database on an annual basis to assess the current status of special-status plant and wildlife species would ensure that it remains current and any special needs are addressed appropriately. With appropriate measures in place, relicensing the project should not adversely affect special-status plants.

The SA measure to design and implement a wildlife habitat enhancement plan, to be developed in consultation with the FS, FWS, CDFG, SWRCB, and Plumas County, would benefit sensitive biological resources at the UNFFR Project. Such a plan should include measures to enhance and protect rare plants, wetlands, riparian communities, cultural resources, and sensitive wildlife habitats, including fencing and vehicle exclusion measures. Any plan should also examine current land use and project-related effects and provide enhancement opportunities to improve habitat suitability; grazing and land use practices, riparian zone revegetation, and weed control. Implementation of this plan would provide a reasonable level of protection to sensitive resources in the project area.

Measures that would be included in the FS-specified threatened, endangered, proposed for listing and sensitive species protection plan would serve to protect federally listed or FS sensitive species from potential effects associated with project-related site-specific construction, operation, and maintenance activities. Having a plan in place that includes consultation would protect sensitive vegetation (as well as fish and wildlife) and should enable such activities to comply with the Northwest Forest Plan, current FS direction, and the two applicable forest land and resource management plans. However, the measures that are likely to be specified in this plan should be closely coordinated with measures specified in a wildlife habitat enhancement plan, discussed in the previous

paragraph. Additionally, this plan could include measures addressing an annual review of the current list of special-status plant species (species that are listed as endangered or threatened by the federal government, species that are listed as sensitive by the FS, or species that occur on the watch lists for the Lassen and Plumas National Forests) that might occur within the UNFFR Project boundary as specified in FS Section 4(e) condition no. 44. Additionally, the plan also could include provisions for resurveying those areas within the UNFFR Project boundary that have suitable habitat or known occurrences of selected special-status plant species every 10 years and addressing any negative impacts that may have occurred as a result of project operations.

Because development of such a plan to manage wildlife habitat would require the same type of systematic, cooperative approach that would be needed for development of a plan to manage and protect threatened, endangered, proposed for listing, and sensitive species and would involve consultation with the same resource agencies, landowners, and other interested parties, consideration should be given to combining the two plans into a single habitat enhancement and protection plan. A separate section within the plan could address protective measures for FS-sensitive or special interest plant species. Incorporating the threatened, endangered, proposed for listing, and sensitive species protection plan as one element of wildlife habitat enhancement plan would prove more practical and cost effective than development of a separate plan.

Control of Noxious and Invasive Weeds

Noxious weeds are a growing threat to California's environment, because of their potential to degrade native plant communities, outcompete rare species, and reduce wildlife habitat values. Both federal and state laws require landowners to manage noxious weeds within their ownerships. Currently, the species of greatest concern are spotted knapweed, identified as a CalEPPC "red alert" species and designated as a Class A weed by CDFA; and Himalayan blackberry, identified as a CalEPPC Class A-1 species.

Successful weed control requires a cooperative effort by all landowners and land managers in the vicinity, since untreated weeds on adjacent lands provide a ready seed source for infestation by new species and re-infestation after treatment of existing problem weeds. Development of an invasive weed management plan as part of the vegetation management plan would facilitate an integrated approach to control effects, and is appropriate for all project lands. Implementation of weed control measures on its adjacent non-project lands would help reduce the risk of spread of weed infestations.

The FS specifies detailed identification, control, and monitoring measures for invasive weed management in its final Section 4(e) condition no. 46. As such, any invasive weed management plan should, *at a minimum*, include: (1) periodic inventory and mapping of existing and new populations of invasive weeds; (2) actions/strategies to prevent and control the spread of known populations or introductions of new populations;

(3) treatment of all new infestations (any class) and existing infestations of California class A and B rated weeds; (4) and monitoring of known populations of noxious weeds to evaluate the effectiveness of revegetation and noxious weed control measures and BMPs. Eradication may be attainable for species that are currently limited in distribution, but attempts to eradicate species that are already well-established and widespread, such as Himalayan blackberry, would not be likely to succeed, except at unacceptably high cost to other resource values.

Noxious and invasive weeds can interfere or degrade ecological function of native species or impair recreational experiences. As such, noxious and invasive weed monitoring could be included as an element within other plans that could entail monitoring for erosion, such as the erosion and sedimentation control plan and the spoil pile management plan (both discussed in section 3.3.1, *Water Resources*), the recreation management plan (discussed in section 3.3.5, *Recreational Resources*), and the road and facilities management plan (discussed in section 3.3.6, *Land Use and Aesthetic Resources*).

Effects of Flow Releases on Riparian Habitat

The UNFFR Project contains abundant riverine and lacustrine open water wetlands associated with the NFFR, its tributary streams, and the project reservoirs. Riparian habitat in the project area occurs in narrow bands along the shorelines of project reservoirs and waterways. Under the current flow regime, riparian vegetation is encroaching into the active stream channel onto formally active gravel bar, floodplain, and bank surfaces. Higher stem densities may reduce water velocities, allowing increased sediment deposition and further encroachment of vegetation.

Measures in the SA are intended to improve riparian habitat by providing flows that would remove vegetation that has encroached into the active channel, while promoting the establishment of vegetation on gravel bars, floodplains, and terraces. To accomplish these objectives, the SA calls for increasing minimum instream flows and shaping them seasonally. The SA's proposed flow regime is described in detail in section 3.3.2, *Aquatic Resources*.

The FS and Interior recommend PG&E develop an adaptive management plan to evaluate the degree of success associated with the various flow improvements. As part of this plan, PG&E would need to evaluate the response of riparian vegetation and aquatic species to changes in the flow regime and recreational use and activity.

Interior further recommends, for the conservation and development of fish and wildlife resources, within 6 months of license issuance, PG&E develop in consultation with FWS, NPS, the FS, CDFG, and SWRCB, a recreational activities monitoring plan. The purpose of the plan would be to monitor the potential effects of recreational activities on fish and wildlife resources. Elements of the plan would include a comparison of data

on recreational activities use, distribution, and expanded fisheries and raptor monitoring data. In addition, the plan would include elements to assess the effects of recreational use and facility development on local vegetation resources.

PG&E states that a similar draft RRMP, already been developed for the license, contains a monitoring program and resource integration and coordination program that addresses Interior's concerns. As part of the monitoring program, PG&E would monitor recreation activities and distribution on project lands and waters over the license period. This monitoring effort would include monitoring ecological capacity indicators such as site size, litter and debris, sanitation, erosion, vegetation damage, proximity to wetlands, and proximity to riparian vegetation, at developed and dispersed recreation sites. Additionally, if recreational river flows are provided on the Belden reach, as part of the SA, PG&E would monitor the amount of recreational boating use and impacts on other recreation and natural riverine resources. Furthermore, PG&E would conduct consultation and coordination meetings, at least annually, with the resource agencies and other stakeholders to discuss recreation monitoring results and other inter-related resource issues as part of the RRMP resource integration and coordination program.

Our Analysis

Proposed and recommended recreation flows may indirectly promote or affect riparian vegetation in the project bypassed reaches. Recreational use monitoring, as recommended by Interior, would be a means for evaluating the effects of proposed flows and associated recreational use on biological resources within the project area. A plan for avoiding or minimizing the biological effects of current and proposed project recreational facilities and related activities would provide a reasonable level of protection to biological resources in the project area. A more detailed discussion of recreation monitoring plans can be found in section 3.3.5, *Recreational Resources*.

Bypassed reach flows proposed in the SA more accurately mimic the natural hydrograph in seasonality by allowing for larger flows in the spring and lesser flows in the summer and fall. The increases in flows that are proposed in the UNFFR reaches would likely result in small changes in the amount of riparian vegetation growing along the river margins. Under the current flow regime, riparian vegetation is encroaching into the active stream channel onto formally active gravel bar, floodplain, and bank surfaces. Higher stem densities may reduce water velocities, allowing increased sediment deposition and further encroachment of vegetation.

Proposed flows would increase water velocities, decrease sediment deposition, and reduce further encroachment of vegetation in the stream channel while promoting the establishment of beneficial vegetation on gravel bars, floodplains, and terraces. The amount of vegetation that would become established would likely vary from site to site along the affected stream reaches, depending on factors such as aspect, slope, width of the floodplain, substrate, stream gradient, and existing plant community, in addition to

flow volumes. However, as the areas of new riparian vegetation become established, the existing vegetation could be lost as higher flows inundate the habitat. The final proposed flow regime is described in detail in section 3.3.2, *Aquatic Resources*.

Higher minimum instream flows than are currently provided to project-affected reaches would have both positive and negative effects on riparian habitat. We agree that flows proposed in the SA that more closely mimic the natural hydrograph would promote more active riverine processes in terms of surface water and groundwater interactions, instream habitat complexity, and primary productivity. We also note that existing riparian vegetation supports unique plant communities and provides important habitat for wildlife.

Riparian vegetation occupies a very small proportion of the landscape, and the loss of this habitat type as a result of increased flows in the UNFFR reaches could adversely affect amphibians, reptiles, songbirds, small mammals, and aquatic furbearers that depend on riparian plant communities for foraging, hiding, nesting, or denning. Loss of riparian vegetation could also reduce bank stability and increase the risk of establishment and spread of noxious and invasive weed populations on exposed soils. Riparian vegetation established as a result of the new higher flows would ultimately replace these functions and values. In considering these positive and negative effects, we conclude that long-term benefits of higher instream flows are likely to outweigh the adverse effects of short-term habitat loss and alteration. Additionally, monitoring the response of riparian vegetation to the flow regime specified in any license issued for this project, would ensure that sufficient re-establishment of riparian vegetation consistent with the new flow regime occurs to support the dependent beneficial aspects of the aquatic and wildlife communities.

Effects of Flows on Special-status Amphibians and Reptiles

Declines in several native frog populations have been observed in California (Jennings, 1996). Reasons for decline may include habitat loss or alteration, disease, climate change, or a combination of these factors. Declines have been notable for the foothill yellow-legged frog, especially in the west slope drainages of the Sierra Nevada (Jennings, 1996). The FS maintains that habitat for the foothill yellow-legged frog has been lost as a result of reservoir inundation and lower stream flows. Additionally, the FS contends that habitat has been degraded by channel sediment, loss of edgewater habitat, and fragmentation of populations by dams and reservoirs. Changes in the flow regime in the project reaches (including increases in minimum flows, implementation of pulse flows, restricted ramping rates, and whitewater boating releases) may also affect aquatic and riparian habitat that currently supports potential habitat of FYLF and CRLF.

To evaluate project effects on special-status amphibians, FS final Section 4(e) condition no. 26 specifies that PG&E, within 1 year of license issuance, develop and implement an amphibian monitoring plan, concurrent with the Seneca, Butt Valley Creek,

and Belden reaches biological monitoring, in consultation with other agencies, that is approved by the FS, and filed with the Commission. FS final Section 4(e) condition no. 5 specifies that PG&E would provide the FS with a minimum of 60 days to review and approve the plan before filing it with the Commission.

Interior's 10(j) recommendation no. 12 calls for PG&E to develop an amphibian monitoring plan for the Belden and Seneca reaches in consultation with the FS, FWS, CDFG, and SWRCB. This plan would be filed with the Commission within 6 months of license issuance. The plan would evaluate possible changes in amphibian numbers and diversity in response to changes in instream flow, water temperature, or other actions associated with project operations and required license conditions. Amphibian surveys would be conducted upon license issuance and at 5 year intervals thereafter.

PG&E, in its responses to the FS and Interior (letters filed with the Commission on January 15, 2004), and in the SA, agreed to develop an amphibian monitoring plan. As described in the SA, the plan would be developed in consultation with the FWS, the FS, CDFG, and SWRCB, as part of the Seneca, Butt Creek, and Belden reaches biological monitoring plan. The amphibian monitoring plan would include targeted monitoring of FS sensitive and special-status amphibians, such as FYLF and CRLF, conducted at 3-year intervals beginning no later than 3 years following license issuance. If target amphibians are located in project reaches, focused annual monitoring of population health, life stages, reproductive success, and distribution would be required.

FS final Section 4(e) condition no. 44 specifies that PG&E annually review the current list of special-status plant and wildlife species (species that are listed as endangered or threatened by the federal government, species that are listed as sensitive by the FS, or species that occur on the watch lists for the Lassen and Plumas National Forests) that might occur within the UNFFR Project boundary in consultation with the FS. When a species is added to one or more of the lists, the FS specifies that PG&E, in consultation with the FS, would determine if the species or unsurveyed suitable habitat for the species is likely to occur within the UNFFR Project boundary. If the FS determines that a newly added species is likely to occur, the FS specifies that PG&E would develop and implement a study plan in consultation with the FS to reasonably assess the effects of the UNFFR Project on the species. The FS specifies that PG&E would prepare a report on the study including objectives; methods; results; recommended resource measures, where appropriate; and a schedule of implementation, and provide a draft of the final report to the FS for review and approval. The FS further specifies that PG&E would file the FS-approved report, including evidence of consultation, with the Commission and would implement those resource management measures required by the Commission.

In addition, the FS specifies that PG&E would resurvey areas within the UNFFR Project boundary that have suitable habitat or known occurrences of selected special-status wildlife or plant species every 10 years to (1) determine if special-status plant or

wildlife species have changed in location (i.e., migrated into or moved within the project boundary) and (2) monitor for impacts caused by ongoing project activities. The FS specifies that PG&E would consult with the FS to determine which species need to be resurveyed. The FS specifies that the survey interval may be adjusted based on the amount of movement or impacts on the species that are observed. The FS specifies that PG&E would provide the FS with the survey results. If the FS determines that negative impacts have occurred, the FS specifies that PG&E would submit a proposal to the FS for actions to reduce or eliminate impacts on special-status species. The FS specifies that PG&E would file the report, including evidence of consultation, with the Commission and would implement those resource management measures required by the FS and approved by the Commission.

Our Analysis

Although no special-status amphibian species were documented in the project area, certain reaches in the UNFFR may provide some potential habitat for special-status species such as FYLF and CRLF. Habitat requirements and effects of flow on the threatened CRLF are discussed in section 3.3.4, *Threatened and Endangered Species*. The effects of instream flow increases on a year-round basis on amphibian habitat in the Belden reach, for instance, are expected to be minimal at the proposed flow release level. In riverine environments, breeding habitat for the foothill yellow-legged frog typically consists of low-velocity, shallow water and rocky substrates, near sparsely vegetated gravel and cobble bars (Hayes and Jennings, 1988).

The recreational boating flow study (PG&E, 2002a) included an evaluation of the effects of potential recreational releases on amphibian habitat and found that, in the Seneca reach, a release of 250 cfs did not result in a substantial change in the overall quality at potential sensitive species habitat sites. At 400 cfs, however, the depth and velocity were substantially increased, resulting in decreased overall amphibian habitat quality. In the Belden reach, the 350 cfs release resulted in a slight decrease in the overall quality of habitat at potential sensitive species habitat sites with the exception of one site where habitat quality remained generally the same. At 600 and 850 cfs, the depth and velocity were substantially increased, resulting in decreased overall habitat quality.

Reducing rapid flow fluctuations, as proposed in the SA, would benefit potential foothill yellow-legged frogs, and other amphibian species, since abrupt changes in water velocity and water surface elevation have the potential to reduce the abundance of the aquatic invertebrate prey base, dislodge or desiccate egg masses, and impair the development of eggs and juveniles through changes in water temperature.

We anticipate that higher minimum flows and reduction of flow fluctuation as outlined in the SA would be adequate to maintain and possibly improve habitat for the foothill yellow-legged frog and other amphibian species, but conclude it would be

reasonable to monitor the effects of changes in the flow regime, including effects of minimum flows, pulse flows, ramping rates, and whitewater boating flows. Initial surveys would be used to evaluate population abundance, distribution, and habitat use following implementation of a new flow regime. An amphibian monitoring plan would serve as a means for detection of new species in the project area and serve as a basis for adaptive management. If previously unknown populations of federally listed or special-status species are discovered during the term of the license, the adaptive management plan should specify the process by which consultation with FWS and others would be initiated. A more detailed discussion of adaptive management can be found in section 3.3.2, *Aquatic Resources*.

If PG&E develops, in consultation with FWS, the FS, CDFG, and SWRCB, an amphibian monitoring plan for listed, sensitive, and special-status amphibian species in the Belden, Seneca, and Butt Creek bypassed reaches within 1 year of license issuance, the plan would serve to determine effects of the proposed changes in minimum flows, pulse flows, and other project operations on amphibian habitat. The first set of surveys are not needed until 5 years after license issuance, since extensive surveys in the project area were completed as part of project relicensing studies, and no sensitive amphibians were found. We expect that a new flow regime that may be included in a new license would enhance the quality of the habitat for amphibians, but it may take at least 5 years for populations to become established to the point where they are likely to be detected by monitoring. We conclude that the amphibian monitoring plan also should include provisions for annually reviewing the current list of special-status wildlife species (species that are listed as endangered or threatened by the federal government, species that are listed as sensitive by the FS, or species that occur on the watch lists for the Lassen and Plumas National Forests) that might occur within the UNFFR Project boundary and, if a species of amphibian or reptile is likely to occur within the project boundary, addressing that species in the amphibian monitoring plan to assess the effects of the UNFFR Project on the species. Additionally, the amphibian plan also should address the need to resurvey those areas within the UNFFR Project boundary that have suitable habitat or known occurrences of selected special-status amphibians or reptiles every 10 years and addressing any negative impacts that may have occurred as a result of project operations.

Effects on Special-status Birds and Mammals

Existing project facilities and on-going project operations have the potential to affect some special-status birds and mammals. Proposed changes (such as construction of new recreational facilities, increases in minimum flows, and vegetation management measures) could also affect special-status birds and mammals.

As discussed under the Vegetation Management subheading, PG&E proposes to develop and implement a resource management plan that would benefit sensitive

biological resources at the UNFFR Project. This plan would include measures to enhance and protect sensitive wildlife habitats.

Interior's 10(j) recommendation no. 18 calls for PG&E to also develop a plan for the annual monitoring of active peregrine falcon eyries and suitable nesting habitat in the project area. The plan would be developed in consultation with the FS, FWS, and CDFG upon issuance of a new license. Interior indicates that, if new eyries are identified during the monitoring efforts, consultation with the aforementioned agencies would be appropriate to determine if protective measures are necessary. The results of the monitoring would be submitted to the agencies for review and comment prior to being filed with the Commission.

PG&E agrees that some monitoring of existing and potential peregrine falcon nesting in the project area is appropriate and proposes to include this activity with monitoring required for the nesting bald eagle population, discussed in section 3.3.4, *Threatened and Endangered Species*.

Interior's 10(j) recommendation no. 21 called for PG&E to develop a wildlife monitoring plan. The plan would be developed in consultation with the FS, FWS, and CDFG within 6 months of license issuance and would evaluate changes in wildlife use in response to changes in flows, lake levels, implementation of the vegetation management plan, and other activities associated with project operations and required license conditions.

In its response to Interior, filed with the Commission on January 15, 2004, PG&E states that, although it believes there is a need for wildlife management at the UNFFR Project, Interior's recommended wildlife management plan lacks definition and clarity and is poorly focused on addressing any ongoing effects of the project on wildlife populations. PG&E indicates that any wildlife monitoring that is needed at the project should be specifically focused on identifiable project effects on specific special-status wildlife species (e.g., bald eagles), groups of species (e.g., waterfowl), or their habitat.

In its letter filed with the Commission on November 1, 2004, Interior revised its initial recommendation to wildlife monitoring focusing on changes in habitat types and avian surveys for PG&E-owned lands as specified by the FS in its preliminary Section 4(e) condition no. 37. During the Section 10(j) teleconference on February 3, 2005, Interior further refined its recommendation to a more focused request for wildlife studies specific to the causeway area (between Last Chance Creek Campground and the Chester Airport). Interior explained that this area is sensitive to water levels, and, under the new license, water levels would be slightly higher and less variable. The causeway area is important for wading birds and waterbirds, and Interior believes a focused study here would be appropriate. Interior pointed out that this area is approximately the same area specified by the FS in its final 4(e) recommendation no. 31: "lands owned by the licensee on the shoreline of Lake Almanor from Last Chance Campground westward to

approximately the northern edge of the flood control channel south of the Chester Airport.”

The FS final Section 4(e) condition no. 31 specifies that PG&E develop a wildlife habitat enhancement plan within 1 year of the date of license issuance. Implementation of this plan would benefit sensitive biological resources at the UNFFR Project and would include measures to enhance and protect riparian communities and sensitive wildlife habitats. The plan would be developed in consultation with FS, FWS, CDFG and Plumas County.

FS final Section 4(e) condition no. 44 specifies that PG&E annually review the current list of special-status plant and wildlife species (species that are listed as endangered or threatened by the federal government, species that are listed as sensitive by the FS, or species that occur on the watch lists for the Lassen and Plumas National Forests) that might occur within the UNFFR Project boundary in consultation with the FS. When a species is added to one or more of the lists, the FS specifies that PG&E, in consultation with the FS, would determine if the species or unsurveyed suitable habitat for the species is likely to occur within the UNFFR Project boundary. If the FS determines that a newly added species is likely to occur, the FS specifies that PG&E would develop and implement a study plan in consultation with the FS to reasonably assess the effects of the UNFFR Project on the species. The FS specifies that PG&E would prepare a report on the study including objectives; methods; results; recommended resource measures, where appropriate; and a schedule of implementation, and provide a draft of the final report to the FS for review and approval. The FS further specifies that PG&E would file the FS-approved report, including evidence of consultation, with the Commission and would implement those resource management measures required by the Commission.

In addition, the FS specifies that PG&E would resurvey areas within the UNFFR Project boundary that have suitable habitat or known occurrences of selected special-status wildlife or plant species every 10 years to (1) determine if special-status plant or wildlife species have changed in location (i.e., migrated into or moved within the project boundary) and (2) monitor for impacts caused by ongoing project activities. The FS specifies that PG&E would consult with the FS to determine which species need to be resurveyed. The FS specifies that the survey interval may be adjusted based on the amount of movement or impacts on the species that are observed. The FS specifies that PG&E would provide the FS with the survey results. If the FS determines that negative impacts have occurred, the FS specifies that PG&E would submit a proposal to the FS for actions to reduce or eliminate impacts on special-status species. The FS specifies that PG&E would file the report, including evidence of consultation, with the Commission and would implement those resource management measures required by the FS and approved by the Commission.

On January 25, 2005, Interior filed a biological opinion with the Commission. Interior recommended that PG&E include Western and Clark's grebes (*Aechmophorus* grebe) conservation measures in the Wildlife Habitat Enhancement Plan as one of the conservation recommendations included in the biological opinion. Interior also recommended that PG&E incorporate management considerations outlined in the "Conservation Assessment and Management Plan for Breeding Western and Clark's Grebes in California" (Ivey, 2004) in its Wildlife Habitat Enhancement Plan.

No specific measures were proposed or recommended by any entity for forest carnivores such as California wolverine, Pacific fisher, pine marten, or Sierra Nevada red fox, or other mammals that may occur within the project boundary.

Our Analysis

We concur with Interior that some monitoring of existing and potential peregrine falcon nesting in the project area is appropriate because some project-related activities (e.g., construction, operation, maintenance, and recreational activities) have the potential to disturb peregrines during the breeding season. We conclude that such monitoring could be combined with monitoring of the nesting bald eagle population, discussed in section 3.3.4, *Threatened and Endangered Species*, and should be consistent with the strategy FWS outlines in its monitoring plan for the American Peregrine Falcon (FWS, 2003).

We did not concur with Interior's original recommendation for development of a wildlife management plan, as it was written. Hundreds of wildlife species may occur in the project area, but other than recommending special emphasis on special-status species, Interior did not identify which populations it believes PG&E should monitor or explain why monitoring is needed. However, during the Section 10(j) teleconference on February 3, 2005, Interior recommended wildlife studies specific to the causeway area (between Last Chance Creek Campground and the Chester Airport). Interior explained that this area is sensitive to water levels and, under the new license, water levels would be slightly higher and less variable. The causeway area is important for wading birds and waterbirds, and Interior believes a focused study here would be appropriate. We conclude that it would be beneficial to have a broader plan to guide the interpretation of monitoring results and consideration of potential effects on all resources, if any measures are adjusted via adaptive management, and agree that the wildlife habitat enhancement plan management plan should include the additional monitoring recommended by Interior.

Implementation of the FS recommendations for wildlife habitat enhancement for special-status species that may occur in the project area and that could be affected by the project should protect such species is appropriate. Because habitat protection and enhancement measures for wildlife, vegetation, and fish are frequently inter-related, including such measures in an overall natural resource management plan, as proposed by

PG&E, would facilitate coordination and cross-referencing of related measures. We conclude that any recommended enhancement and protection measures should be restricted to those species known to occur in the vicinity of the project. Suitable habitat for sensitive species of wildlife occurs in the vicinity of the project. We conclude that monitoring for the presence of those species with suitable habitat in the project should be included in a natural resource management plan, and if the presence of new sensitive species is established, consultation with FS, FWS, and CDFG should occur to determine the nature of any protective measures, if any are needed.

Western and Clark's grebes are covered under the Migratory Bird Treaty Act, which protects migratory birds and their nests. Western and Clark's grebes have previously nested on the northwest shore of Lake Almanor. Including these species in the wildlife habitat enhancement plan would possibly reduce nest mortality and disturbance, resulting in a beneficial effect on the population.

Relicensing the project as proposed would likely maintain habitat at current levels or close to current levels for all FS-selected wildlife MIS. These include mallard, osprey, pileated woodpecker, hairy woodpecker, deer, black bear, and gray squirrel.

Preferred habitat for forest carnivores such as California wolverine, Pacific fisher, pine marten, or Sierra Nevada red fox exists within the project area. However, the presence of roads, facilities, residential development, and recreation may limit habitat potential for these species.

3.3.3.3 Unavoidable Adverse Effects

None.

3.3.4 Threatened and Endangered Species

3.3.4.1 Affected Environment

Three federally threatened listed species of wildlife have been identified as potentially occurring within the project area: VELB (*Desmocerus californicus dimorphus*), CRLF (*Rana aurora daytoni*), and bald eagle (*Haliaeetus leucocephalus*) (letter from W.R. Taylor, Interior, to the Commission, dated December 1, 2003). FWS also indicated that the threatened slender Orcutt grass (*Orcuttia tenuis*) could also occur in the project area (letter from D.L. Harlow, FWS, to the Commission, dated June 19, 2003). However, relicensing studies indicate that there are no populations of, or suitable habitat for, this threatened grass within the UNFFR Project area (GANDA, 2000). For the purpose of consultation under the ESA, this EIS constitutes our Biological Assessment for these federally listed species. We describe each species' life history below.

Valley Elderberry Longhorn Beetle

The VELB was listed as a threatened species in 1980 (45 FR 52,803). The range of the VELB extends throughout California's Central Valley and associated foothills from generally below the 3,000-foot elevation contour on the east to the watershed boundary of the Central Valley on the west. The project features located upstream of the Belden forebay are above 3,000 feet in elevation (USGS datum), and features located below 3,000 feet include the Oak Flat and Belden powerhouses. The beetle relies entirely on its host plant, the elderberry (*Sambucus* spp.). Elderberry shrubs are a common component of riparian forests in the Central Valley, and optimal habitat is usually considered moist valley oak woodlands or hardwood stands with a large variety of species, such as cottonwood, sycamore, Oregon ash, or willow. The VELB is a wood-boring insect and lays its eggs in the stems of elderberry shrubs that are at least 1 inch in diameter at ground level. Frequently, there is no sign of the VELB except for the exit holes that the larvae create as they emerge just prior to the pupal stage. For this reason, surveys for the VELB focus on searching for elderberry shrubs.

We conducted a California Natural Diversity Database search, which indicated that to date there have been no recent documented occurrences of the VELB in the project area or in Plumas County (CDFG, 2002a). One potential host plant²⁷ was identified along Caribou Road south of Oak Flat powerhouse during 1999 surveys, but there was no indication of VELB presence. The project lies at the upper elevation limit of this species, and habitat suitability here is considered low. Surveys completed in 1998 for the downstream Rock Creek-Cresta Project and associated transmission lines identified a number of host plants in the vicinity of Camp Creek, north of Pulga (outside the UNFFR Project boundaries). These records are the only known records of VELB habitat in the project vicinity.

California Red-legged Frog

The CRLF is the only sensitive amphibian species federally listed as threatened within the project area. On March 13, 2001, the FWS formally designated critical habitat for this species. The NFFR and selected tributary drainages were included in critical habitat Unit 1 – North Fork Feather Unit. However, on June 8, 2001, a lawsuit challenging the designation was filed in the U.S. District Court for the District of Columbia, and on November 6, 2002, the court entered a consent decree remanding the designation to the FWS and vacating most of the 2001 designation. On April 13, 2004, the FWS proposed designating critical habitat for the CRLF identical to the configuration of the previously published final designation of critical habitat (which included the NFFR

²⁷ PG&E uses the term “host plant” in its application, which we assume to mean an elderberry shrub that has stems at least 1 inch in diameter at ground level.

and selected tributary drainages). The FWS accepted comments on this proposal until July 14, 2004.

Critical habitat Unit 1, the North Fork Feather Unit, includes areas as far upstream as the Butt Creek confluence with the NFFR in the Seneca reach and the upper Mosquito Creek drainage east of Butt Valley reservoir (69 FR 19,619–19,642). Historically, CRLF populations were found at the western slope of the Sierra Nevada Mountains at elevations below 4,900 feet. The current range is greatly reduced, with a few, highly restricted populations in the Sierra Nevada, and most remaining populations occurring along the coast from Marin County to Ventura County.

The primary constituent elements of CRLF habitat include essential aquatic habitat, associated uplands, and dispersal habitat connecting essential aquatic habitat (66 FR 14,625–14,674). Breeding sites are varied, including marshes, springs, permanent and semipermanent natural ponds, ponded and backwater portions of streams, as well as artificial impoundments such as stock ponds, irrigation ponds, and siltation ponds (66 FR 14,625–14,674). Dense, shrubby, or emergent riparian vegetation closely associated with deep (> 2.3 feet), still or slow-moving water is needed during the November to March breeding season for attachment of egg masses and escape cover (Hayes and Jennings, 1988). Rocks, boulders, small mammal burrows, organic litter such as downed trees or logs, and leaf litter within 300 feet of riparian areas provide estivation habitat and refugia at any time of the year (61 FR 25,813–25,833).

Potential habitat for CRLF was found in four locations during the 2001 herpetofauna surveys (Sites #3, #38, #45, and Lippy Lake) (GANDA, 2002). Sites #3, #38, and #45 represented good potential habitat, while Lippy Lake had a low habitat potential for CRLF. Sites #38, #45, and Lippy Lake contain trout, which limits the possibility they would successfully be used by CRLF. Site #3 is a small pond located along a small ephemeral drainage that flows northeast into Lake Almanor, near the access road into Butt Valley reservoir. This site does not appear to be hydraulically influenced by project flows. Site #38 is located on China Bar along the NFFR about 3 miles downstream of Seneca. Site #45 is located below the surge chamber for the Butt Valley Tunnel near the beginning of the penstock that feeds the Butt Valley powerhouse. Lippy Lake is adjacent to the NFFR at the old mining town of Seneca. The field surveys were conducted using FWS protocol (FWS, 1997) with one FWS pre-approved modification. No individuals were documented within the project area during the 2001 amphibian and aquatic reptile survey, the 2001 visual encounter survey, or the 2000 recreational boating flow study (PG&E, 2002a). The nearest known occurrence of CRLF to the UNFFR Project area is approximately 20 miles southwest of Belden powerhouse (GANDA, 2002).

Bald Eagle

In 1999, FWS proposed to remove the bald eagle from the list of threatened and endangered species, due to the success of recovery efforts throughout the United States (64 FR 36,453–36,464). Overall recovery goals for the bald eagle in the Pacific Region (which includes California) were met in 1990 and have been reached or exceeded in every year since. Goals for nest productivity and wintering population stability in the region also have been met or exceeded. Although the recovery goal of 800 breeding pairs has not yet been reached in California, the number of breeding pairs has increased dramatically. About 30 pairs were documented in 1977, whereas surveys in 1999 indicated the number had increased to over 150 (CDFG, 2002b). In addition to increasing in numbers, bald eagles are recolonizing their former range in California. In 1977, bald eagles were known to nest in 8 of the 58 counties in the state, and as of 1999, bald eagle nests were documented in 28 counties.

There are currently 14 known bald eagle nesting territories in the UNFFR Project vicinity: 9 at Lake Almanor, 3 at Butt Valley reservoir, and 2 at Mountain Meadows reservoir (table 3-25). Of these, 12 were confirmed active in 2001. However, no bald eagle nests are located within the project boundary. Between 1988 and 2001, PG&E's reports show the number of young per occupied territory averaged 1.0, and an average of about 61 percent of the occupied territories were successful each year (table 3-25).

In California, bald eagles forage primarily on fish (Jackman et al., 1999). Studies in the project area showed that bald eagles preyed primarily on carp, brown bullhead, and Sacramento sucker. Carp accounted for 82 percent of the prey biomass for eagles in the NFFR project area. Birds were found to account for 7.4 percent of the prey biomass.

In 1988, PG&E developed bald eagle management zones for the seven nesting territories occurring at that time. Nesting territory management plans with specific protection measures have been developed and would continue to be implemented for most of the existing active nest sites within the project area.

Table 3-25. Reproduction in 14 bald eagle nesting territories in the UNFFR Project vicinity, 1988-2001. (Source: PG&E, 2002a)

Nest Territory	1988-2001														1988-2001 (yng/ occ.yr.)
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	
Butt Valley 1	ONS	NO	1	ONS	ONS	2	1	ONS	2	1	2	ONS	ONS	ONS	(0.7)
Cool Springs	2	ONS	NO	NO	1	2	2	ONS	2	ONS	ONS	ONS	ONS	ONS	(0.8)
Butt Valley 2	2	2	2	1	OSU	2	2	ONS	2	2	1	1	1	2	(1.5)
Rocky Point	ONS	ONS	ONS	SU	ONS	NO	ONS	ONS	ONS	1	2	1	1	2	(0.6)
Switchback										2	ONS	1	2	1	(1.2)
Rock Lake									ONS	1	1	2	1	1	(1.0)
Collins Pine	SU	OSU	NO	1	2	SU	NO	2	2	2	2	2	ONS	1	(1.6)
South															
Collins Pine	ONS	ONS	NO	ONS	ONS	OSU	ONS	1	ONS	NO	ONS	2	ONS	NO	(0.3)
North															
Chester								2	2	2	NO	1	2	1	(1.7)
(Church)															
Mud Creek	SU	1	2	1	ONS	ONS	2	NO	ONS	2	1	1	1	2	(1.1)
Rim															
Catfish Beach														ONS	(0.0)
Eastside											2	2	2	1	(1.8)
Mountain	ONS	ONS	OSU	OSU	ONS	SU	SU	ONS	1	2	1	ONS	ONS	ONS	(0.4)
Meadows West															
Mountain	2	OSU	SU	NO	NO	SU	SU	NO	NC	ONS	NO	NO	NO	NO	(1.0)
Meadows East															
No. Occupied	7	6	4	5	7	4	6	8	10	11	11	12	12	12	115
Territories of															
Known															
Outcome															
Total Young	6	3	5	3	3	6	7	5	11	15	12	13	10	11	110
Produced															

Nest Territory	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	1988-2001 (yng/ occ.yr.)
Young per Occupied Territory	0.9	0.5	1.3	0.6	0.4	1.5	1.2	0.6	1.1	1.4	1.1	1.1	0.8	0.9	1.0
No. of Successful Territories	3	2	3	3	2	3	4	3	6	9	8	9	7	8	70
% Successful Occupied Territories	43%	33%	75%	60%	29%	75%	67%	38%	60%	82%	73%	75%	58%	67%	61%
ONS – occupied, not successful NO – not occupied OSU – occupied, success unknown SU – success unknown NC – not checked															

3.3.4.2 Environmental Effects

Valley Elderberry Longhorn Beetle

PG&E proposes no specific measures for protection of the VELB. Although the FS recommends no specific measures for protection of the VELB, it recommends development of protective measures in a land management and visual resource protection plan, as well as development of a vegetation management plan prior to ground-disturbing activities, as specified in final Section 4(e) condition nos. 40 and 41 (discussed in section 3.3.3, *Terrestrial Resources*). The FS recommends that PG&E perform necessary surveys prior to ground-disturbing activities in locations for which current information about population occurrence for some species is lacking (e.g., VELB). In final Section 4(e) condition no. 45, the FS specifies that PG&E prepare a biological evaluation (BE) in consultation with other appropriate agencies evaluating the potential impact of an action on any species listed or proposed for listing or any special-status species. The FS recommends that the BE should include: (1) developing procedures to minimize adverse effects on listed species; (2) ensuring that project-related activities meet restrictions included in site management plans for listed species; and (3) developing implementation and effectiveness monitoring of measures taken or employed to reduce effects on listed species.

Interior, in its December 1, 2003, filing with the Commission, makes a 10(j) recommendation that PG&E develop and implement a vegetation management plan that incorporates FWS' July 9, 1999, Conservation Guidelines for the Valley Elderberry Longhorn Beetle (FWS, 1999). As part of this plan, PG&E would detail the types and schedules of planned road and project-related maintenance activities that may affect vegetation resources, develop survey methods for the protection of listed species, and develop contingency measures to avoid and minimize effects on special-status species. The plan would provide environmental awareness training for employees and contractors conducting work in sensitive areas.

PG&E, in its response to Interior's December 1, 2003, 10(j) recommendation, states that it maintains a geographic information system that contains the known locations of sensitive plant and animal resources and PG&E employees are already required to take annual training on environmental laws and protection of sensitive species and habitats. PG&E feels that these measures, along with pre-activity surveys prior to construction of all new project features (e.g., recreation facilities), are adequate to provide a reasonable level of protection to sensitive species in the project area.

Additionally, PG&E states that Interior's reference to the FWS conservation guidelines is not relevant because PG&E is currently operating under an incidental take statement issued by FWS on June 27, 2003, for VELB throughout PG&E's service territory. The incidental take statement already provides for mitigation and monitoring related to O&M that could affect the VELB. PG&E feels that it is not necessary or

appropriate for the Commission to consult with FWS regarding the VELB in the relicensing proceeding, nor is it appropriate for FWS to impose conditions that differ from those set forth in the June 27, 2003, incidental take statement.

Interior, in its biological opinion filed with the Commission by letter dated January 25, 2005, pursuant to Section 7 of the ESA, states that PG&E previously consulted with FWS for routine operations and maintenance activities that occur on all PG&E lands within the range of the beetle and that the incidental take statement authorized take for a term of 30 years. As a result, Interior has determined that the project is not likely to adversely affect the VELB.

Our Analysis

Only one elderberry shrub that would be suitable as a VELB host plant was located in the project area, along Caribou Road, south of Oak Flat powerhouse, during the 1999 surveys, but there was no indication of VELB presence. We conclude that potential habitat for the VELB in the project area is extremely limited, and occurrences of this species are unlikely. A vegetation management plan that includes FWS Conservation Guidelines (FWS, 1999) and addresses PG&E's management of activities affecting vegetation, including maintenance, construction, or other ground-disturbing activities, with consideration for their potential to affect elderberry shrubs, would be protective of VELB habitat at sites within the project boundary that either contain elderberry shrubs, or may not have been previously surveyed (i.e., sites where recreation facilities would be constructed). Such a plan would be consistent with FS final Section 4(e) condition no. 45. Examples of project-related activities that could affect elderberry shrubs include: mowing, brushing, herbicide application, culvert replacement, and other road repairs; ground-clearing needed to improve or expand recreation sites; and thinning or burning for fire fuels management.

FWS (1999) specifies that complete avoidance is required to assume no adverse effects would occur. Complete avoidance is defined as protection of a 100-foot (or wider) buffer around elderberry plants containing stems measuring 1.0 inch or more in diameter at ground level. Based on available information, such a buffer would only be necessary around a single plant. Pre-construction surveys to identify the presence of previously unknown potential host plants or verify the absence of such plants, and PG&E's continuing to provide training and education for maintenance crews, would ensure that incidental observations of potential habitat for the VELB can be reported and appropriate actions can be taken that would provide additional protection to the VELB, if needed. To the extent that the existing incidental take statement measures, which have not been filed with the Commission, address provisions of a vegetation management plan, they can be incorporated into such a plan.

Our determinations regarding the three federally listed species that may occur in the vicinity of the project, including the VELB, are specified in section 5.5.4, *Endangered Species Act*.

California Red-legged Frog

Although PG&E proposes no specific measures for the protection of the CRLF, the SA proposes an amphibian monitoring plan for FS sensitive species. The plan would include sampling within the Seneca, Butt Creek, and Belden bypassed reaches to be conducted at 3-year intervals beginning no later than 3 years following license issuance. If target amphibians are located in project reaches, focused annual monitoring of population size, health, life stages, reproductive success, and distribution would be required.

Neither the FS nor Interior recommend specific measures for the protection of the CRLF, however, they both recommend amphibian monitoring plans. Although one of the amphibians for which presence would be monitored would be the CRLF, we discuss the amphibian monitoring plan in section 3.3.3, *Terrestrial Resources*.

Interior, in its biological opinion filed with the Commission by letter dated January 25, 2005, pursuant to Section 7 of the ESA, states that the project is not likely to adversely affect the CRLF because surveys were conducted in suitable habitat and no CRLFs were detected, and the PG&E-proposed amphibian monitoring plan would include continuing surveys for the CRLF.

Our Analysis

Although suitable habitat exists for the CRLF at the downstream end of the project, no individuals were documented within the project area during the 2001 amphibian and aquatic reptile survey, the 2001 visual encounter survey, or the 2000 recreational boating flow study (PG&E, 2002a). Bypassed reach flows proposed in the SA more accurately mimic the natural hydrograph in seasonality, and magnitude, by allowing for larger flows in the spring and lesser flows in the summer and fall, and higher base flows throughout the year. Additionally, pulse flows proposed in the SA would be released in January, February, and March depending on the water year type (wet, normal, dry, critically dry), potentially flooding some additional pools. However, because the CRLF requires deep (> 2.3 feet), still or slow-moving water for attachment of egg masses and escape cover during the November to March breeding season (Hayes and Jennings, 1988), these flows may not increase the availability of appropriate habitat for the CRLF at the appropriate time of year, and may negatively affect the quality of the habitat by increasing velocity in the pools.

The recreational boating flow study (PG&E, 2002a) studied the effects of the recreational releases on amphibian habitat. Lippy Lake was the only potential CRLF site studied. The 250-cfs release did not result in a substantial change in the overall quality of

habitat at the Lippy Lake site. At 400 cfs, however, the depth and velocity were substantially increased, resulting in decreased overall habitat quality. Site #3 does not appear to be directly hydraulically connected to the project waters, so we assume that a change in project operations would not affect its potential as CRLF habitat. Site #38 has not been studied to determine how they would be affected by recreational releases. Site #45 would not be affected by recreational flow releases. No potential CRLF habitat sites were identified in the Belden reach. However, potential habitat was only assessed under the existing flow regime. Under a new flow regime that would be specified in any license that may be issued for this project, potential CRLF habitat may develop in alternative and additional locations, especially following the adjustment of riparian vegetation to the new flow regime (which could take up to 10 years for shrubs).

The development of an amphibian monitoring plan to determine what effects the proposed changes in minimum flows, pulse flows, and other project operations have on amphibian, including CRLF, habitat in the Belden and Seneca reaches, as discussed in section 3.3.3, *Terrestrial Resources*, would ensure long-term protection for the CRLF. The surveys included in any plan should be designed to detect the presence of the CRLF and determine how potential CRLF habitat is affected by the proposed changes in project operations. However, based on our review of PG&E's survey results, potential CRLF habitat that could be influenced by changes in the project flow regime is limited (Lippy Lake and Site #38). Consequently, we conclude that specific sites to be monitored for CRLF presence should be identified in any amphibian monitoring plan that may be developed, along with the rationale for monitoring the identified sites. Additional sites may need to be monitored besides the sites that represent potential habitat under the existing flow regime, and provisions for doing so should be included in an amphibian monitoring plan as well as how the influence of the new flow regime on this habitat would be addressed.

Bald Eagle

PG&E has previously established bald eagle protection policies and management zones in the UNFFR Project vicinity for all nest sites occurring at that time (1988). These management zones provide up to a 0.5-mile buffer zone around existing nesting trees, less if sheltered by topography, to protect the nest from human disturbance and development, and to provide suitable habitat for future nesting opportunities.

Based upon its 1988 findings, PG&E proposes the following management recommendations for each bald eagle nesting territory currently found in the project vicinity:

1. Limit habitat alterations within the management zone to those that would enhance bald eagle nesting habitat and pose no hazard to eagles. For example, silvicultural practices that encourage long-term regeneration of large pines and reduction of fuel loading where necessary.

2. Between January 1 and July 31 of each year, no compatible habitat alterations would be allowed within a management zone with the exception of emergencies. If a nesting attempt fails during a certain year, this restriction may be eased at the approval of the land or wildlife manager.
3. Discourage new recreational developments or policy changes that would alter the current use of the nesting area by public users and prohibit new permanent access roads within a management zone.
4. Schedule non-emergency maintenance of power lines, such as vegetation removal or trimming operations, outside of the bald eagle nesting season.
5. Managers should consider the effects of any proposed alterations to the operation or configuration of existing water facilities on the abundance of bald eagle prey species and availability of eagle foraging habitats at Lake Almanor, Butt Valley reservoir, and Mountain Meadow reservoir.

None of the bald eagle nests in the project vicinity are located on project lands or PG&E-owned lands. The lands within the 0.5-mile buffer zone around each nest are primarily owned by United States (and managed by the FS), PG&E, and private timber companies.

FS final Section 4(e) condition no. 47 specifies that PG&E develop a new bald eagle management plan for the project area within 2 years of license issuance. The plan would be developed in consultation with the FS, and other appropriate agencies; consultation would be initiated within 90 days of license issuance. The FS indicates that this bald eagle management plan would assist in the ongoing bald eagle recovery efforts and would be a tool for future management of all lands around these projects. At a minimum, the FS believes the plan should include: (1) periodic monitoring of human use patterns to discern human/bald eagle interaction conflicts; (2) annual monitoring of bald eagle reproduction around Lake Almanor; (3) coordination of any plans for timber harvest or mining on PG&E lands within the project boundary with the FS and other appropriate agencies to reach the goals and requirements of this plan; and (4) coordination of woodcutting activities on PG&E lands. FS final Section 4(e) condition no. 5 specifies that PG&E would provide the FS with a minimum of 60 days to review and approve the plan before filing it with the Commission.

Because changes in project operations, management, and visitor use are proposed by PG&E, Interior feels that disturbance from these activities may adversely affect bald eagle productivity and survival (letter filed December 1, 2003). Although the eagles are currently doing well in the project vicinity with the current level of human interaction, the tolerance threshold is unknown. Interior makes a 10(j) recommendation that PG&E should develop an interagency bald eagle management plan within 6 months of license issuance in consultation with FWS, the FS, and CDFG. Interior states that this plan should address land and resource management strategies to promote the conservation and

recovery of bald eagles associated with Butt Valley reservoir, Mountain Meadows reservoir, and other project lands and waters.

Interior states that the interagency bald eagle management plan should identify steps to minimize eagle disturbance and ensure that proposed changes in project operations, management, and visitor use does not impair bald eagle productivity and survival. Interior feels this plan is necessary because the FS's September 2003 "Bald Eagle Management Plan, Lake Almanor and the Upper Feather River, Recovery Zone 26, Lake Almanor Basin Area" only applies to FS lands in the Lake Almanor area. Interior feels that the interagency bald eagle management plan would address management of recreation, timber harvesting, housing development, and fisheries management on project lands and waters and other private lands in the basin.

Interior also makes a 10(j) recommendation that PG&E conduct bald eagle monitoring in order to ensure that sufficient and effective protection measures are in place. Interior recommends the development of a bald eagle monitoring plan, within 180 days of license issuance, in consultation with FWS, the FS, and CDFG. Interior states that this plan should include annual bald eagle surveys on project and waters, monitoring bald eagle reproductive success, eagle distribution and abundance, and human use to evaluate eagle/human interactions. Interior adds that these annual surveys should be conducted according to protocols acceptable to the consulting agencies and submitted to the agencies for review and comment prior to being filed with the Commission.

The biological opinion filed by Interior with the Commission on January 25, 2005, finds that relicensing the project would not be likely to jeopardize the continued existence of the bald eagle, and no critical habitat would be adversely modified or destroyed. However, Interior also states that the proposed project could cause the incidental injury or death of one bald eagle while foraging or perching in the area at some time during the term of any new license issued. The biological opinion requires the Commission to implement the project description as described in the draft EIS and final FS Section 4(e) conditions and requires that any new buyers of any lands in the project area previously owned by PG&E must abide by the same terms and conditions as the licensee, report the finding of any listed species not addressed in the biological opinion or unanticipated harm to the bald eagle, and report compliance on an annual or quarterly basis.

The biological opinion also contains two conservation recommendations. These recommendations state that PG&E should continue to assist FWS in recovery efforts for the bald eagle and include *Aechmophorus* grebe conservation measures in the wildlife habitat enhancement plan.

PG&E, in its responses to the FS Section 4(e) conditions and Interior's 10(j) recommendations (letters filed with the Commission on January 15, 2004), agrees with the need to develop an interagency bald eagle management plan in the project area. PG&E would cooperate with FWS, the FS, and CDFG to incorporate project-related

activities into the existing FS September 2003 Bald Eagle Management Plan for Lake Almanor. PG&E believes the 2-year schedule recommended by the FS is more reasonable than the 6-month schedule recommended by Interior due to the magnitude and complexity of this plan. PG&E agrees that initial consultation regarding this plan with the appropriate agencies could occur more quickly, as the FS recommends. PG&E also feels that the monitoring requirement detailed in Interior 10(j) recommendation no. 17 should be included with the management plan and developed in cooperation with the participating agencies.

Our Analysis

Since 1995, five new bald eagle breeding territories have been established in the project vicinity for a total of 14. Overall productivity of the nests in the project vicinity (1.0 young per occupied territory) was at or near the statewide averages of 1 young per occupied territory from 1988 to 2001. The FWS bald eagle recovery plan (1986, as cited in the letter from Interior filed with the Commission on December 1, 2003) specifies a goal of 16 occupied territories for the project vicinity. Based upon this information, the bald eagle population in the project vicinity appears to be doing well under existing operating conditions. However, several changes in operating conditions and facilities are proposed in the SA, including those that are designed to enhance recreation opportunities and experiences.

Fish make up the vast majority of the bald eagles' diet in the project vicinity. Studies in the project area showed that bald eagles preyed on carp, brown bullhead, and Sacramento sucker. Carp accounted for 82 percent of the prey biomass for eagles in the NFFR project area. For this reason, proposed changes in reservoir operation or the flow regime (including implementation of higher minimum flows, pulse flows, more restrictive ramping rates, and recreation releases) that affect fish populations or foraging conditions would have the potential to affect bald eagles.

The proposed raising of lake levels during the late spring/summer period over existing conditions would provide for increases in the available habitat for spawning centrarchids, such as smallmouth bass, largemouth bass, and Sacramento perch. Carp have a propensity to flourish in most lakes and reservoirs where they have been introduced, regardless of the water level management regime that is in place. This often results in carp populations reaching nuisance proportions, which may serve to detract from the native fish populations and associated fisheries, but should continue to provide an abundant prey source for bald eagles. Although few carp would be expected to occur in the bypassed reaches, most operating conditions (higher minimum flows, pulse flows and more restrictive ramping rates) proposed in the SA would generally enhance fish habitat for other potential fish prey species. In particular, Sacramento sucker populations in the bypassed reaches should increase, thus enhancing the prey base. Sacramento suckers are a common prey for eagles in California that reside near hydroelectric projects where carp have not yet been introduced (FERC, 2004).

Effects of implementing recreation flows, as PG&E proposes in the SA, would depend to a large extent on the timing (both time of day and time of year) of release flows. Restricting boaters to the 10:00 a.m. to 4:00 p.m. period of the day would help to avoid disturbance during prime foraging hours. Since bald eagles are thought to be less sensitive to disturbance after fledging is complete (WDFW, 2004), restricting the program to the months of August, September, and October would have a lower potential for harm than would be the case earlier in the season. Although, the timing of the proposed recreation flows would be dependent upon approval of the Recreation River Flow Technical Group (CDFG, SWRCB, FWS, NPS, Plumas County, and AW), the flows currently proposed include releases in July. These flows would be more likely to adversely affect the latter stages of bald eagle nesting.

The proposed recreational releases could have an adverse effect on aquatic resources. However, the adaptive approach to recreation river flow management, as outlined in the SA, should allow for the identification of any potential negative effects prior to the release of the test recreation flows. If negative effects are found after the release of test recreation flows, the adaptive approach should provide for the protection of aquatic resources. (Further discussion of the effects of proposed flows on fishery resources is contained in section 3.3.2, *Aquatic Resources*.) As a result, with implementation of the adaptive approach, the proposed operating conditions are unlikely to have a long-term adverse effect on bald eagle prey populations.

Bald eagles could also be affected by increases in recreational activities, because they are sensitive to disturbance. PG&E proposes a number of recreational enhancements and development throughout the project area. These include new campsites, access routes, boat launching facilities, trails, and parking areas, as well as improvements, relocations, and expansion of existing facilities. FS Section 4(e) condition 44 (filed with the Commission on December 1, 2003) also calls for similar recreational enhancements. Some of these recreation areas, such as Rocky Point and Almanor campgrounds, are in close proximity to bald eagle foraging areas. In these cases, the construction, maintenance, and use of the facilities could create human disturbance to eagles during the nesting season. The recommended recreation resource measures are discussed in more detail in section 3.3.5, *Recreational Resources*.

Recreational use which has the potential to disturb bald eagles is highest during the summer, when recreation use is at its highest. Boating, fishing, and hiking during spring and early summer months would coincide with the time of year when eagles are laying eggs and feeding young at the nest. Eagles may be slightly less sensitive to disturbance during June and early July than they are earlier in the nesting stage, but forage availability and undisturbed access to forage can strongly affect rearing success (Johnsgard, 1990).

Construction projects, including improvements to roads and existing facilities and development of new facilities, could probably be timed to occur outside the breeding

season to prevent disturbance to nesting birds, but several of these proposals have the potential to cause long-term disturbance to bald eagles. Special care would be needed to prevent adverse effects where proposed recreational sites overlap with areas that are known to provide important foraging opportunities for bald eagles (such as Rocky Point and Almanor campgrounds).

The bald eagle population in the project vicinity is currently being protected from recreational development by the existing PG&E bald eagle protection policies. The development of an interagency bald eagle management plan, as recommended by the FS and Interior, would address changes in project operations and recreational facilities and flows. This plan would appropriately identify possible adverse effects to bald eagles resulting from changes in project operations, facilities, and human disturbance resulting from recreation use and provide a mechanism to enforce protection measures. Compliance with the management measures specified in an interagency bald eagle management plan could be monitored by implementing a bald eagle management plan as described by the FS. An interagency bald eagle management plan would also facilitate assistance of the FWS in the implementation of recovery efforts of the FWS for the bald eagle, as specified in the conservation recommendations.

However, we conclude that some elements of the bald eagle management plans recommended by the FS and Interior are beyond the jurisdiction of the Commission. In order for the Commission to have jurisdiction, there must be a nexus of a measure to project purposes. The Commission would not be able to enforce measures that pertain to timber harvesting, mining, and housing development outside the project boundary, whether the land affected is owned by PG&E or private entities, unless a connection to project purposes is established. Because existing management practices are already in place on PG&E lands, and also because the FS has already developed a bald eagle management plan that PG&E can use as a guide, and PG&E has experience in developing such bald eagle management plans at some of its other hydroelectric projects (e.g., the Pit 3, 4, 5 Project [FERC No. 233]), we believe that this plan could be developed within less than 2 years of license issuance. However, consulting with many different entities to produce a plan poses significant time-related challenges, so we do not believe that development of the plan within 6 months of license issuance is realistic.

Condition 1.b of Interior's biological opinion would require any new owners of lands in the project area previously owned by PG&E, including holders of any conservation easements, to agree in writing to abide by the terms and conditions of the biological opinion. The Commission has the authority to enforce the terms and conditions of a license, including provisions of the biological opinion to the extent that those provisions would be included in a new license. If PG&E sells or transfers any project lands, it would not be relieved of complying with license conditions as long as those lands remain within the project boundary.

For land that would be removed from the project boundary, the Commission would consider the potential for adverse effects on project purposes, including protection of endangered species. The Commission, however, can neither impose nor enforce any conditions on that removal, including any covenants running with the land. To receive protection from incidental take of listed species, PG&E and perhaps any new landowners would have to comply with the provisions of the biological opinion.

3.3.4.3 Cumulative Effects on Bald Eagles

Construction of several dams downstream of the UNFFR Project, including the Big Bend dam (1908-1910), Cresta dam (1949), Rock Creek dam (1950), Poe dam (1957 – 1958), Oroville dam (1961-1968), and Thermalito diversion dam (1962-1967) blocked the upstream migration of anadromous fish that once may have provided a large, concentrated food resource for bald eagles. However, construction of the UNFFR Project and other reservoirs in the Feather River watershed has provided a stable and abundant warmwater prey base for the bald eagle, and regulated flows in the NFFR maintain foraging opportunities in smooth, shallow water. Modest increases in flows, such as those proposed in the SA, would be likely to maintain or increase the prey base, as well as foraging opportunities, and result in a cumulative benefit to the bald eagle.

3.3.4.4 Unavoidable Adverse Effects

None.

3.3.5 Recreational Resources

3.3.5.1 Affected Environment

The UNFFR Project is located in northeastern California in a sparsely populated area composed of forest and river canyon and valley landscapes. The project lies partially within and adjacent to the Lassen National Forest and the Plumas National Forest, which both provide a variety of formal and informal recreational facilities and opportunities; much of the NFS lands are open to the public for recreation. Chester, California, a full-service community with a year-round population of 2,316 (Census, 2000), is located at the northern end of the project area (see figure 1-1).

Because the project location is remote and there are no developed winter recreation facilities, recreation use at the UNFFR Project occurs primarily during summer months. During the summer recreation season, recreationists in the region participate in walking, hiking, motor boating, fishing, canoeing, watersports, bicycling, equestrian use, camping, picnicking, wildlife viewing, off-highway vehicle use, and whitewater boating. During the fall, hunters visit the area, and during the winter season, visitors participate in snowmobiling, cross-country skiing, snowshoeing, ice skating, and ice fishing. However, because winter use is minimal, PG&E has not studied winter recreation use.

Recreation opportunities at the UNFFR Project are varied, and recreationists can access different areas around the project for different experiences and activities. Recreationists who prefer opportunities with developed recreation facilities tend to visit Lake Almanor and Butt Valley reservoir.

Three reservoirs, Lake Almanor, Butt Valley reservoir, and Belden reservoir, are located within the project area. Lake Almanor, with a surface area of 27,000 acres and approximately 52 miles of shoreline, has abundant access in the form of state highways, FS and county roads, and many privately owned lands developed with homes and businesses. Lake Almanor provides a setting for local, community-based year-round recreation activities as well as seasonal tourist-based activities. Butt Valley reservoir, which is just under 5 miles long and almost a mile wide with a surface area of 1,600 acres, is surrounded by undeveloped NFS land, and is more remote with access by county and FS roads, some of which have a dirt or gravel surface. Belden reservoir, or forebay, is small with a surface area of 42 acres and a daily water surface elevation that can fluctuate between 5 and 10 feet, depending on power operations. There are no developed recreation facilities at the Belden reservoir.

Recreational Access and Facilities

Table 3-26 lists the developed recreation facilities for project reservoirs, and figure 3-15 shows their locations. In addition to the developed sites, PG&E documented a total of 25 dispersed recreation sites in the area of the project reservoirs: 22 sites at Lake Almanor and three sites at Butt Valley reservoir.

Lake Almanor Recreation Facilities

All public developed recreation facilities at Lake Almanor are owned and operated by either PG&E or the FS. Most of the FS facilities on Lake Almanor are on the Lassen National Forest. Facilities at the southeast end of Lake Almanor are on the Plumas National Forest.

FS Facilities—The Almanor Family Campground, which is located outside of the UNFFR Project boundary on the west shore of Lake Almanor, is owned by the FS. A concessionaire operates and maintains the campground for the FS under a special-use permit. The campground comprises two loops. The north loop has 49 campsites, each of which includes a picnic table and a fire ring/cooking grill; there are eight vault toilets in the north loop of the campground. The Lake Almanor Recreation Trail (LART) passes through the north loop of the campground and provides opportunities for walking, hiking, and bicycling. In addition there is an outdoor amphitheater that is shared with the south loop of the campground. Through its recreation facility condition inventory, PG&E determined that most of the facilities at the north loop of the Almanor Family Campground are generally in good condition with the exception of the older toilets, which should be replaced. PG&E also determined that some of the picnic tables and the amphitheater are in need of some maintenance. Through its ADA-accessibility study,

Table 3-26. Public recreation sites on UNFFR Project reservoirs. (Source: PG&E, 2002a)

Facility	Lake Almanor	Butt Valley Reservoir
Boat Ramps/Lanes	Almanor boat launch (FS) Canyon dam boat launch and day-use area (FS)	Alder Creek day-use area and boat launch
Car-top Boat Access	None	None
Picnic Areas/Tables	Almanor picnic area (FS) Almanor scenic overlook Canyon dam boat launch and day-use area Canyon dam day-use area East shore day-use area	Alder Creek day-use area and boat launch
Angler Access Sites	Almanor boat launch (FS) Almanor beach (FS) Canyon dam boat launch and day-use area (FS) Canyon dam day-use area Dyer View day-use area East shore day-use area Rocky Point campground	Alder Creek day-use area and boat launch Cool Springs campground
Trailheads	Dyer View day-use area (FS) Lake Almanor recreation trail (FS)	
Campgrounds/Campsites or (Bunkhouses)	Rocky Point campground (Loops 1, 2, and 3) Camp Connery group camp Last Chance campground and group camp Almanor Family campground Almanor group campground	Cool Springs campground
Swimming Areas	Almanor beach (FS) Canyon dam day-use area Dyer View day-use area (FS) Rocky Point campground	Alder Creek day-use area and boat launch Cool Springs campground

Non-Internet Public

FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE UPPER NORTH FORK FEATHER RIVER PROJECT Project No. 2105-089

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Figure 3-15

Public access for the above information is available only
through the Public Reference Room, or by e-mail at
public.referenceroom@ferc.gov.

PG&E determined that none of the campsites or water faucets at this facility are ADA-accessible. Each of the four toilet buildings has one accessible toilet, but they do not have accessible access routes or accessible trash receptacles.

The south loop of the Almanor Family Campground has 53 campsites, each with a picnic table and fire ring/cooking grill. Nine of the sites can be reserved, while the remaining 44 sites are available on a first-come, first-served basis. There are 12 vault toilets in the south loop of this facility. The LART is adjacent to the west side of the south loop of the campground and is available for walking, hiking, and bicycling. Through its recreation facility condition inventory, PG&E determined that most of the facilities at the south loop of the campground are generally in good condition with the exception of the older toilets, which should be replaced. Through its ADA-accessibility study, PG&E determined that none of the campsites or water faucets in the south loop of this facility are ADA-accessible. Only one of the vault toilets is accessible and also has an accessible access route. The trash receptacles are an accessible type, but most do not have accessible access routes. The Almanor picnic area is located approximately 10 miles south of the town of Chester adjacent to SR 89 on NFS land outside of the UNFFR Project boundary. There are two vault toilets, a paved parking area, a picnic area with seven picnic tables and cooking grills, two interpretive signs, and an informational sign. This facility was constructed by and is operated and maintained by the FS. Through its recreation facility condition inventory, PG&E determined that most of the facilities at Almanor picnic area are generally in good condition with the exception of the picnic tables and cooking grills, which need some maintenance, and the water faucet and the water pump, which need to be repaired. Through its ADA-accessibility study, PG&E determined that the two vault toilets at this facility are new and ADA-accessible. None of the other elements at this facility are ADA-accessible.

The FS owns and operates a primitive group camping area located outside of the UNFFR Project boundary on NFS land adjacent to the Almanor picnic area known as the Almanor Group Campground. The site contains enough room for approximately 10 sites, each with a picnic table, and fire ring or cooking grill. There are no amenities at the site. Campers use the vault toilets at the adjacent rest area. Through its recreation facility condition inventory, PG&E determined that most of the facilities at the Almanor Group Campground are generally in good condition with only the picnic tables and fire rings in need of maintenance. The FS plans to relocate the entire facility to a more suitable location away from the highway. Through its ADA-accessibility study, PG&E determined that none of the elements at this facility are ADA-accessible. Group campers may use the two ADA-accessible toilets at the Almanor picnic area.

An overflow camping area is also adjacent to the Almanor picnic area along State Route 89. The FS used to manage this area, which is outside of the UNFFR Project boundary, as overflow for RV and tent camping during peak usage in the Lake Almanor area. According to comments on the draft EIS filed by the FS on November 1, 2004, the

FS recently closed this area. There are no developed campsites. Previous users of the area constructed 40 fire rings and campers used the two ADA-accessible toilets in the nearby rest area. Through its ADA-accessibility study, PG&E determined that none of the elements at this facility were ADA-accessible.

The Dyer View day-use area is located on NFS land outside of the UNFFR Project boundary, along the west shore of Lake Almanor. The FS operates and maintains this facility which has paved parking, interpretive signs, benches, and a vault toilet. The site provides views of Mount Lassen to the north and Dyer Mountain to the south and functions as a trailhead for the LART and a shoreline beach. Through its recreation facility condition inventory, PG&E determined that all of the facilities at Dyer View day-use area are generally in good condition. Through its ADA-accessibility study, PG&E determined that the new vault toilet at this facility is fully accessible and the access route to the adjacent paved portion of the LART is also accessible. There are no accessible access routes between the parking area and the primary activity areas, or to the accessible trash receptacles. The benches located at this facility are also not ADA-accessible.

The Almanor boat launch is located outside of the UNFFR Project boundary on the west shore of Lake Almanor adjacent to Almanor campground north on NFS land. A concessionaire operates and maintains the facility for the FS under a special-use permit. The facility has two concrete boat launching lanes, a wooden courtesy dock, a large paved area with space for 53 vehicles and trailers, a flush restroom, a single vault toilet, and an accessible picnic table. Through its recreation facility condition inventory, PG&E determined that most of the facilities at Almanor boat launch are in good condition with the exception of the access road and the parking area, which are in need of repair; the ramp, which needs to be resurfaced; and the restroom and courtesy dock, both of which need to be replaced. Through its ADA-accessibility study, PG&E determined that there is an accessible restroom with four flush toilets at this facility and a new accessible vault toilet on the road leading to the boat launch. However, there are no accessible access routes from the parking area to the primary activity areas, or to the accessible trash receptacles. None of the other elements at this facility are ADA-accessible.

Almanor beach is located on the west shore of Lake Almanor adjacent to the Almanor boat launch on NFS lands. A concessionaire operates and maintains the facility for the FS under a special-use permit. The facility has seven picnic tables, cooking grills, a vault toilet, a flush restroom, and a large swimming beach with a buoy safety line. Through its recreation facility condition inventory, PG&E determined that most of the facilities at Almanor beach are generally in good condition with the exception of the vault toilet, which is in need of some maintenance, and the flush restroom, which is old and is not accessible. Through its ADA-accessibility study, PG&E determined there is one accessible picnic table available at this location; however, it is segregated from the rest of the facility. None of the remaining elements at this facility are ADA-accessible.

The Canyon dam boat launch/day-use area is located on the south end of Lake Almanor on NFS land. O&M of the facility is accomplished by a concessionaire under a special-use permit from the FS. The facility has two concrete boat launching lanes, five picnic tables with cooking grills, two vault toilets, one flush restroom, and a paved parking area with 13 single vehicle spaces and 51 vehicle with trailer spaces. The site also has a paved ADA accessible trail and fishing pier near the boat launch. Through its recreation facility condition inventory, PG&E determined that some of the facilities at the Canyon dam boat launch/day-use area are in good condition while others are in need of maintenance, including the beach area, the picnic tables, and the parking area. PG&E also determined that the large informational sign at the entrance is in disrepair and should be repaired or replaced. Through its ADA-accessibility study, PG&E determined that the new shoreline fishing station is accessible and meets ADA guidelines and there is one accessible flush restroom. There are three accessible parking spaces provided at this facility but there are no accessible access routes to the picnic tables, barbecues, or the accessible trash receptacles. The water faucets and picnic tables at this facility are not ADA accessible.

The FS manages the LART, a paved, 10-foot-wide trail on the southwest side of Lake Almanor that is currently 9.5 miles long. This multi-use trail, which extends from a gravel road opposite Humbug Road, just off State Highway 89 to Rocky Point Road, adjacent to the southern end of Loop 3 of PG&E's Rocky Point campground, is open to walking, hiking, bicycling, and cross-county skiing. Most of the LART is located outside of the UNFFR Project boundary, but the section that goes through the Rocky Point campground is located within the UNFFR Project boundary. Motorized use of the trail is not permitted. The trail passes through campgrounds and public and private properties and near private residences. Through its recreation facility condition inventory, PG&E determined that most of the recreational elements associated with the LART are in good condition, including the trailheads and parking areas, signs, and bollards. PG&E also determined that the trail surface is in need of maintenance and repair in approximately 20 locations along the trail. Through its ADA-accessibility study, PG&E determined there is no ADA-accessible access route from the trailhead parking areas to the LART, except at the Dyer View day-use area. The LART is paved and generally accessible in most segments; however, in some areas, the trail is too steep and does not include rest areas. Additionally, the informational signs at the trailheads do not provide basic accessibility information, such as maximum grade, length, width, maintenance practices, and types of surface materials. The FS anticipates extending the LART 1.5 miles to the FS Canyon dam boat launch and day-use area.

PG&E Facilities—PG&E owns and operates the Camp Connery group camp, which is a reservation-only facility located within the UNFFR Project boundary east of Canyon dam and inland from the reservoir approximately 0.25 mile. The group camp can accommodate groups of up to 50 persons and includes five bunkhouses, an indoor/outdoor central group meeting and food service facility, a large campfire area, a

paved parking lot, a volleyball court and an area for basketball. RVs are allowed to park in the parking area, but there is no designated RV camping area. Through its recreation facility condition inventory, PG&E determined that all of the developed facilities at Camp Connery group camp are in good condition including the bunkhouses, the group meeting facility, the picnic tables and the restrooms. However, portions of the access road are in need of maintenance. Through its ADA-accessibility study, PG&E determined that none of the elements at this facility are ADA-accessible except for the trash receptacles, which do not have accessible access routes.

PG&E manages the Rocky Point Campground, which was previously known as the Lake Almanor Campground. The public often confused the Lake Almanor Campground with Almanor Campground, which is located just north on Highway 89, so the name was changed in 2003. This facility is located on the west shore of Lake Almanor within the UNFFR Project boundary on PG&E-owned land. The campground is comprised of three loops. Loop One, the northernmost loop, consists of 68 campsites, each with a picnic table, cooking grill, fire ring, paved spurs, a camp cupboard, and tent pads in some cases. Loop One also has 10 overflow campsites. Through its ADA-accessibility study, PG&E determined that four of the campsites in Loop 1 are ADA-accessible, but many of the elements at the four campsites are not actually accessible. All of the toilets in Loop 1 are accessible. The telephone and water faucets are not accessible and there are no accessible access routes to the host's site, the shoreline, the entry sign, the pay station, the camp library box, or to the accessible trash receptacles. Loop Two has 41 campsites with similar amenities as the campsites described for Loop One. Through its ADA-accessibility study, PG&E determined that two of the campsites in Loop 2 are ADA-accessible, but many of the elements at the two campsites are not actually accessible. All of the toilets and one water faucet in Loop 2 are accessible. The telephone is not accessible and there are no accessible access routes to the host's site, the shoreline, the entry sign, the pay station, the camp library box, or to the accessible trash receptacles. Loop Three consists of 22 campsites, with 20 overflow campsites. The LART ends on the south side of Loop Three. Through its ADA-accessibility study, PG&E determined that two of the campsites in Loop 3 are ADA-accessible, but many of the elements at the two campsites are not actually accessible. All of the toilets in Loop 3 are accessible as is one of the water faucets. The telephone is not accessible and there are no accessible access routes to the host's site, the shoreline, the entry sign, the pay stations, the camp library box, or to the accessible trash receptacles. Through its recreation facility condition inventory, PG&E determined that most of the elements at the Rocky Point Campground are generally in good condition with the exception of many of the older Klamath stoves, which should be replaced.

The upper arm of Lake Almanor transitions from lake to lacustrine wetland and includes the Last Chance Marsh. The Last Chance Campground/group camp, is located within the UNFFR Project boundary, on the edge of the Last Chance Marsh and is owned and operated by PG&E. The facility has a family campground area with 12 campsites and a group camping area with 13 campsites. Each campsite has a picnic table, camp

cupboard, fire ring, cooking grill, and graveled parking spur. PG&E maintains four vault toilets in two separate buildings at the campground. In addition to the campsites, there are two horseshoe pits at the site. Through its recreation facility condition inventory, PG&E determined that most of the facilities at the Last Chance Campground are generally in good condition with the exception of a few recreation elements within the developed campsites, including several older picnic tables, many of the older Klamath stoves, and some water faucets, only in need of maintenance. PG&E also determined that the playground area was in need of maintenance. Through its ADA-accessibility study, PG&E determined that none of the campsites at this facility are ADA-accessible. The interior design of the existing toilets does not meet draft proposed ADA guidelines, and one restroom does not have an accessible access route, even though signage indicates that they are both accessible. There are also no accessible access routes from the main access gravel roadway to the primary activity areas at this facility.

PG&E owns and operates the East Shore day-use area which is located along the eastern shore of Lake Almanor on PG&E-owned land outside of the UNFFR Project boundary. PG&E maintains nine picnic tables and two vault toilets. Anglers can access the shoreline via a steep, unmarked trail. Through its recreation facility condition inventory, PG&E determined that most of the facilities at the East Shore day-use area are generally in fair condition with the exception of the picnic tables, which are in need of maintenance, the user-defined shoreline access trail, which is currently undeveloped and eroding, and the existing hand-pumped water spigot, which should be removed or replaced. Through its ADA-accessibility study, PG&E determined that one vault toilet at this facility is fully accessible. There are no accessible access routes from the parking area to the picnic area, or to the accessible trash receptacles. None of the other elements at this facility are ADA-accessible.

PG&E owns and operates the Almanor Scenic Overlook which is located on PG&E-owned land within the UNFFR Project boundary on the east shore of Lake Almanor near Canyon dam. This facility has a paved parking area and two vault toilets. The site offers views of Canyon dam to the south and of Lake Almanor, and formerly provided a view to the north of Mt. Lassen, which has become obscured by vegetation. Through its recreation facility condition inventory, PG&E determined that the parking area at the Almanor scenic overlook is generally in good condition but the vault toilets are in need of maintenance. Through its ADA-accessibility study, PG&E determined that there is one accessible vault toilet at this facility; however, it does not have an accessible access route. The paved parking area is accessible, but there are no designated accessible spaces.

PG&E owns and operates the Canyon dam day-use area, which is located within the UNFFR Project boundary just east of Canyon dam on the north side of SR 89. This facility has 19 picnic tables, cooking grills, an undeveloped swimming beach, two vault toilets, a circular drop-off and parking area, and a separate parking lot further upslope.

Through its recreation facility condition inventory, PG&E determined that some facilities at the Canyon dam day-use area are in good condition while others are need of maintenance including the beach area, the picnic tables, and the parking area. PG&E also determined that the large informational sign at the entrance was in disrepair and should be replaced or repaired. Through its ADA-accessibility study, PG&E determined that the two vault toilets at this facility are fully accessible as are two picnic tables, which have a firm and stable access route. There are accessible access routes from the parking area to the primary activity areas. However, there are no accessible access routes to the shoreline, the informational sign at the entrance, or to the accessible trash receptacles. None of the other elements at this facility are ADA-accessible.

Other Facilities—Visitors to Lake Almanor also use 22 dispersed undeveloped recreation sites. Visitors at these sites enjoy fishing, relaxing, swimming, sunbathing, and camping. Fires are not permitted by county ordinance except in developed sites. Potable water and restrooms are not provided at any of these sites. These dispersed sites are located on lands owned by a variety of entities including PG&E, the FS, and private entities.

In addition to the public facilities on Lake Almanor, there are 22 privately-owned recreation facilities. These entities provide lodging, tent and RV camping, picnic facilities, swimming beaches, stores, fishing access, boat launching, and boat slip use/rental.

Butt Valley Reservoir Recreational Facilities

All of the public developed recreation facilities at Butt Valley reservoir are owned and operated by PG&E.

PG&E owns and operates the Ponderosa Flat Campground located within the UNFFR Project boundary on PG&E-owned land at the north end of Butt Valley reservoir. The facility has 61 campsites and an overflow area with 20 campsites. Each campsite has a picnic table, fire ring, cooking grill, camp cupboard, paved spur, and some have tent pads. There are 10 vault toilets at the campground. Through its recreation facility condition inventory, PG&E determined that most of the facilities at the main Ponderosa Flat Campground are in good condition with the exception of the water faucets and several of the older Klamath stoves, which are in need of maintenance. In the less-used overflow area of the campground, PG&E found that the older vault toilets need replacement and several other recreational elements have broken or missing components, structural damage, or are otherwise in obvious disrepair. Through its ADA-accessibility study, PG&E determined that four of the campsites in the main campground are ADA-accessible, but many of the elements at the four campsites are not actually accessible. All of the vault toilets in the main campground area are accessible. The water faucets and the shoreline area are not accessible and there are no accessible access routes to the accessible trash receptacles.

PG&E owns and operates the Cool Springs Campground located within the UNFFR Project boundary on PG&E-owned land on the east shore of Butt Valley reservoir. There are 30 campsites at this campground, each with the same amenities as listed for the Ponderosa Flat Campground. There are eight vault toilets at the site. Through its recreation facility condition inventory, PG&E determined that some of the facilities at the Cool Springs Campground are in good condition while others are in need of maintenance, including the pay station, several of the older Klamath stoves, and the water faucets. Through its ADA-accessibility study, PG&E determined that two of the campsites at this facility are ADA-accessible, but they do not have accessible water faucets. All of the vault toilets at this facility are fully accessible. The water faucets and the shoreline area are not accessible and there are no accessible access routes to the accessible trash receptacles.

PG&E owns and operates the Alder Creek day-use area/boat launch, which is located within the UNFFR Project boundary on PG&E land on the east shore of Butt Valley reservoir. There are three picnic tables, cooking grills, a single boat launching lane and a paved parking area at this site. Guests camping at the Ponderosa Flat campground must launch their boats at the Alder Creek boat launch to access Butt Valley reservoir. Through its recreation facility condition inventory, PG&E determined that most of the facilities at the Alder Creek day-use area/boat launch are in good condition. Through its ADA-accessibility study, PG&E determined that the vault toilet at this facility is accessible. The picnic tables and the shoreline at this facility are not accessible, and there are no accessible access routes to the accessible trash receptacles.

Visitors to Butt Valley reservoir also use three dispersed, undeveloped sites. These undeveloped sites are primarily used by anglers for fishing access. There are no facilities at any of the dispersed recreation sites.

Recreational Use at Project Reservoirs

The primary recreational activities occurring at the project reservoirs during the summer period include wildlife viewing, picnicking, swimming, canoeing, motorboating, fishing, hiking, backpacking, camping, equestrian use, and sightseeing. During the winter, the primary activities include: snowshoeing, cross-country skiing, ice-skating, and ice-fishing. Since there are no facilities in the project area that have been developed exclusively for winter activities such as groomed trails or commercial ski areas, these activities all take place in a dispersed manner on unplowed roads and trails.

As a part of the FERC Form 80 recreational monitoring process, in 2002 PG&E estimated that Lake Almanor receives 1,214,000 visits annually and Butt Valley reservoir receives 40,900 visits annually.

Camping

There are three developed campgrounds at Lake Almanor and two developed campgrounds at Butt Valley reservoir. PG&E studied camping use at the public campsites during 2001.

PG&E estimated total annual camping use at Lake Almanor public, developed campsites to be 53,471 recreation days (PG&E, 2001). Recreation day is defined as “each visit by a person to a development for recreational purposes during any portion of a 24 hour period.” Table 3-27 includes a breakdown of the numbers by campsite and season. In addition to the total number of camping days, PG&E investigated the number of times that the campgrounds were at or above capacity. On Lake Almanor, PG&E determined that the Last Chance Campground was the only campground that reached capacity; this was noted on two occasions in 2001.

PG&E estimated total camping use in 2001 at Butt Valley reservoir public, developed campsites to be 18,970 recreation days. Table 3-27 includes a breakdown of the numbers by campsite and season. In addition to the total number of camping days, PG&E investigated the number of times that the campgrounds were at or above capacity. On Butt Valley reservoir, PG&E determined that both the Cool Springs campground and the Ponderosa campground reached capacity on eight and two occasions, respectively in 2001.

Table 3-27. Recreation visits to campgrounds at the project reservoirs in 2001. (Source: PG&E, 2002a)

Campground	Total Recreation Days	Percent of visitation during peak season	Number of days at or above capacity
Lake Almanor			
Rocky Point	34,921	80	0
Last Chance Creek	1,693	58	2
Almanor Family	16,857	79	0
Butt Valley Reservoir			
Cool Springs	4,180	86	8
Ponderosa Flat	14,790	82	2

Boating

Lake Almanor and Butt Valley reservoir offer a variety of boating opportunities. When Lake Almanor is at full pool (4,494 feet PG&E datum), recreationists have access to 27,000 acres of surface water for boating, fishing, swimming, waterskiing,

wakeboarding, and personal watercraft use. Boating access to Lake Almanor is provided at public boat ramps, private marinas, and on private land adjacent to the project. PG&E observed boat use on the reservoir during the summer of 2001. PG&E counted the total number of boats on Lake Almanor on 14 days between May 12 and October 13, 2001. PG&E has provided information about the number of boats by type across a number of seasons. Table 3-28 contains information regarding boat use on Lake Almanor.

Table 3-28. Average daily boating use on Lake Almanor between May 12 and October 13, 2001. (Source: PG&E, 2002a)

Boats At-One-Time						
Season	Powerboat	PWC	Canoe/Kayak	Sailboat	Float-tube	Total
Non-Peak Season	47.8	1.4	2.2	0.2	1.2	52.8
Peak Season	101.7	29.8	5.5	1.5	0.3	138.7
Peak Holiday Season	103	37.3	12.7	4.3	2	159.3

Butt Valley reservoir at full pool, 4,140 feet (PG&E datum) consists of 1,600 acres of surface water for boating, fishing, and swimming. Boating access to Butt Valley reservoir is provided at one public boat ramp located at the Alder Creek day use area. Due to a requirement of the current FERC license, the reservoir contains many stumps, which are more obvious in the shallower upper end of the reservoir. Personal watercraft and water skiing are not allowed on this reservoir due to safety hazards presented by the stumps and posted regulations limit boat speeds on Butt Valley reservoir to 25 miles per hour.

PG&E observed boat use on the reservoir during the summer of 2001. PG&E counted the total number of boats on Butt Valley reservoir on 14 days from May 12 through October 13, 2001. PG&E reported that use of Butt Valley reservoir was low with counts ranging from 1 to 10 boats at one time, with the highest number of boats reported during observations conducted between 4:00 and 7:00 pm.

Recreational Use in River Reaches

Recreational Access and Facilities

Table 3-29 contains information about the developed public recreation sites on the Belden and Seneca reaches (9.3 and 10. miles long, respectively), and figure 3-15 shows the location of these sites.

Table 3-29. Public recreation sites on UNFFR Project River reaches. (Source: PG&E, 2002a)

Facility	Seneca Reach	Belden Reach
Boat ramps/lanes	None	None
Car-top boat access	None	None
Picnic areas/tables	None	Belden rest stop Gansner Bar campground
Angler access sites	None	Belden rest stop North Fork campground Queen Lily campground
Trailheads	North Fork fishing trail	Belden rest stop
Campgrounds/campsites or (bunkhouses)		Gansner Bar campground North Fork campground Queen Lily campground
Swimming areas	None	Ponderosa Flat campground

Seneca Reach Recreational Facilities—The North Fork fishing trail begins within the UNFFR Project boundary at the Caribou No. 1 powerhouse. Access around the powerhouse is provided via steel stairs and a narrow, metal catwalk which extends across the face of the powerhouse, above the tailrace. The trail then continues down to the NFFR, eventually paralleling the river and leaving the UNFFR Project boundary, and extending for approximately two miles upstream of the Caribou powerhouse to Butt Creek. The trail includes two single span footbridges over the NFFR. The FS maintains the North Fork fishing trail, including the maintenance and repair of the two trail suspension bridges, with the exception of the metal catwalk that crosses the powerhouse. PG&E does not provide parking at the powerhouse. Anglers who use the trail must use small roadside pull-outs along Caribou Road or park at the Belden forebay and walk up Caribou Road.

There are two dispersed campsites in the Seneca reach. There are no facilities at the sites and they appear to receive low levels of use.

Belden Reach Recreational Facilities—The FS owns and operates three campgrounds outside of the UNFFR Project boundary along the Belden reach. At each of the campgrounds, each campsite has a picnic table, cooking grill, paved spur, and some have tent pads. The Queen Lily campground is located on the west branch of the NFFR along Caribou Road and has 12 campsites, a flush restroom, and potable water. The North Fork Campground is located on the west branch of the NFFR along Caribou

Road approximately 1 mile from the Queen Lily campground. This facility has 20 campsites, a flush toilet, and potable water. The Gansner Bar campground is located on the west branch of the NFFR along Caribou Road approximately 1 mile from the North Fork campground and approximately 2 miles from the Queen Lily campground. This facility has 14 campsites, a flush restroom, and an amphitheater. Through its recreation facility condition inventory, PG&E determined that most of the facilities along the Belden reach are in good condition.

PG&E owns and operates the Belden rest stop, which is located within of the UNFFR Project boundary adjacent to the Belden powerhouse. There are four picnic tables, informational and interpretive signs, a vault toilet, and a paved parking lot at this site. Visitors can access three recreational trails from this site: Yellow Creek Trail, Indian Springs Trail, and the Pacific Crest Trail. Through its recreation facility condition inventory, PG&E determined that some of the facilities at the Belden Rest Stop are in good condition while others need maintenance, including the vault toilets, the picnic tables, signs, and the cooking grills. PG&E also determined that the two water faucets near the open pavilions are broken, and since there is no longer water at the site, they should be removed. Through its ADA-accessibility study, PG&E determined that the two vault toilets and the trash receptacles at this facility are fully accessible and meets ADA guidelines and there is one accessible flush restroom. The picnic tables at this facility are not accessible and there is no accessible route to the adjacent creek.

In addition, there is a well-defined, but undeveloped site that provides access to the Belden forebay. Anglers use a small gravel parking area within the UNFFR Project boundary off of Caribou Road at the northwest end of the forebay and follow a steep trail to the forebay shoreline. There are no formal facilities at the site and boats are currently not allowed on the forebay.

There are 20 dispersed sites in the Belden reach used primarily for dispersed camping. Some of the sites serve as overflow areas for the developed FS campgrounds. PG&E documented camping at 16 of the 20 sites in 2001, while the remaining sites appear to be used to access the shoreline for angling and hiking.

In addition to the public sites on the Belden reach, there are two privately-owned campgrounds on the Feather River just below the project.

Recreational Use at Project Reaches

The primary recreational activities occurring at the project river segments during the summer include: wildlife viewing, picnicking, swimming, canoeing, motorboating, fishing, hiking, backpacking, camping, equestrian use, and sightseeing. During the winter, the primary activities include: snowshoeing and cross-country skiing. Since there are no facilities in the project area that have been developed exclusively for winter activities such as groomed trails or commercial ski areas, these activities all take place in a dispersed manner on unplowed roads and trails.

Camping

The Belden reach has 3 public developed campgrounds owned and operated by the FS. PG&E studied camping use at these campgrounds in 2001.

PG&E estimated total camping use at Belden reach public, developed campsites to be 14,020 recreation days. Table 3-30 includes a breakdown of the numbers by campground and season. In addition to the total number of camping days, PG&E investigated the number of times that the campgrounds were at or above capacity. On the Belden reach, PG&E determined that all three of the campgrounds exceeded capacity; Queen Lily campground on 18 occasions, Gansner Bar campground on 35 occasions and North Fork campground on 10 occasions.

Table 3-30. Recreation visits to campgrounds in the project reaches in 2001. (Source: PG&E, 2002a)

Campground	Total recreation days	Percent of visitation during peak season	Number of days at or above capacity
Queen Lily	3,252	69	18
Gansner Bar	5,396	56	35
North Fork	5,372	65	10

Whitewater Boating

The Seneca reach of the UNFFR begins below Lake Almanor dam and runs south approximately 11 miles to Caribou No. 1 powerhouse. The Seneca reach has limited access because of the steep, rugged terrain and private land ownership along the river.

The Belden reach of the UNFFR begins at Caribou No. 1 powerhouse and runs southwesterly approximately 9 miles to the confluence with the EBNFFR near State Route 70. Caribou Road runs parallel to the Belden reach, which makes it relatively accessible.

PG&E conducted a whitewater controlled flow assessment in September/October 2000. PG&E scheduled three boating releases on each of the two reaches. The Seneca reach was assessed at 210, 325, and 410 cfs and the Belden reach was assessed at 350, 600, and 850 cfs.

For the whitewater controlled flow study, nine boaters participated in the study on the Seneca reach. Participants were asked to evaluate the flows that they experienced. PG&E reported that boaters would prefer flows higher than 210 and 325 cfs and a majority of participants would prefer flows at 410 cfs or slightly higher. Additionally, PG&E determined that, based on the participants' responses to specified flow questions, if they were to provide a single release, a flow of 400 cfs would be recommended until

locations of rapids and lines became better known. After these became known, a single release of about 450 cfs would provide quality boating.

On the Belden reach, 24 boaters participated in the study. PG&E reported that all of the participants considered the 350 cfs flow to be too low and a majority of the participants considered the 600 cfs to also be too low. A majority of the participants preferred the 850 cfs flow and those who did not prefer it were roughly split as to whether the flow was too high or too low. Additionally, PG&E determined that, based on the participants' responses to specified flow questions, if it was to provide a single release, a flow of 750 cfs would be appropriate to provide quality standard kayaking and rafting opportunities and 850 cfs would be needed to provide some higher challenge boating.

Participants were asked to compare the runs in comparison to other northern California Rivers. Nearly two-thirds of the respondents rated the Seneca reach as "better than average" or "excellent"; while participants were split for the Belden reach with half indicating that the run is "worse than average" or "average" and half indicating that the run is "better than average" or "excellent."

Angling

Angling is a popular activity at the project reaches and reservoirs. The shoreline fishing opportunities along the Seneca and Belden reaches were assessed at various flows by PG&E in a fishability study during May of 2001.

PG&E evaluated flows of 700, 300, and 100 cfs in the Seneca reach on separate days. In addition, researchers evaluated the reach at 35 cfs. At the end of each day, participants were asked to indicate their preferences for similar, higher, or lower flows. All participants considered the 700 cfs flow to be too high and two-thirds of the participants would definitely not return to fish at that flow. At 300 cfs, all of the participants preferred lower flows. In response to items regarding likelihood of return, one-third of the participants would not return and two-thirds would possibly return at the 300 cfs flow. At 100 cfs, all anglers reported that they preferred flows at about this level and two-thirds of the participants indicated that they would definitely return, while one-third indicated that they would possibly return. The core participants were asked to rate a range of flows that would be suitable for fishing. The 4 study participants who were fly anglers indicated a range of 50 to 200 cfs, with an optimal flow of 100 cfs. The study participant who was a bait/spin angler on the panel indicated an acceptable range of 100 to 300 cfs, with the optimal range from about 150 to 250 cfs.

PG&E provided flows of 700 and 300 cfs in the Belden reach on separate days. In addition, researchers evaluated the reach at 100 cfs. At the end of each day, participants were asked to indicate their preferences for similar, higher, or lower flows. All participants considered the 700 cfs flow to be too high and two-thirds of the participants

indicated that they would definitely not return to fish at that flow. At 300 cfs, three-quarters of the participants preferred lower flows, while the remainder indicated that they preferred flows at about this level. In response to likelihood of return at the 300 cfs flow, one-quarter of the participants would not return, half would possibly return, and one-quarter would definitely return. Participants were asked to rate a range of flows for fishing. The 4 study participants who were fly anglers indicated a range of acceptable flow levels between 50 and 250 cfs, with an optimal flow of about 150 cfs. The study participant who was a bait/spin angler on the panel indicated a range of 275 to 600 cfs with an optimal flow of 300 cfs.

Accessibility

PG&E conducted a field assessment of both FS and PG&E-owned public recreation facilities at Lake Almanor, Butt Valley reservoir, and Belden reach to determine present adequacies and future accessibility needs for persons with disabilities who may use public recreation facilities and use areas associated with the project, or who may participate in primary recreation activities (i.e., camping, fishing, picnicking, swimming, shoreline access and boating) occurring in the project area. The current guidance for accessibility is the ADA. ADA-related elements at each site include: restrooms, toilets, picnic areas, campsites, group sites, water sources, trash receptacles, fishing areas, boating and swimming areas/shoreline access, outdoor recreation access routes to primary elements, and recreation trails to non-primary elements.

PG&E determined that the North Fork Feather Trail is not accessible and likely could not be made accessible due to topography. Likewise, PG&E determined that the shoreline was too steep for accessible fishing access at Belden forebay. PG&E also determined that none of the dispersed recreation use areas along the two bypassed reaches are accessible for persons with disabilities.

Table 3-31 summarizes the accessibility of existing PG&E and FS facilities and indicates whether the FS facilities are located on the Lassen National Forest (LNF) or the Plumas National Forest (PNF).

Both the FS and PG&E have provided opportunities for persons with disabilities to participate in primary recreational activities in the project area and each has emphasized different activities, to help fill gaps in access.

Table 3-31. Summary of the accessibility of existing public, FS, and licensee recreation facilities. (Source: PG&E, 2002a)

Facility	Toilets/ Restrooms	Telephones	Trash Receptacles	Water faucets	Picnic Tables	Swimming Areas/ Shoreline Access	Fishing Sites	Parking Areas	Boat Launches	Campsites	Recreation Trails
FS Facilities											
Almanor Family Campground (LNF)	X		X								X
Almanor boat launch (LNF)	X		X								
Almanor beach (LNF)					X						
Canyon dam boat launch/day-use area (LNF)	X		X		X		X	X			
Almanor picnic area (SR 89) (LNF)	X										
Almanor group campground (LNF) (SR 89)	X										
Dyer View day-use area (LNF)	X		X					X			X
Lake Almanor recreation trail (LART) (LNF)											X
Gansner Bar campground (PNF)	X		X							X	
North Fork campground (PNF)	X		X							X	
Queen Lily campground (PNF)			X								

Facility	Toilets/ Restrooms	Telephones	Trash Receptacles	Water faucets	Picnic Tables	Swimming Areas/ Shoreline Access	Fishing Sites	Parking Areas	Boat Launches	Campsites	Recreation Trails
PG&E Facilities											
Rocky Point campground loop 1	X		X							X	
Rocky Point campground loop 2	X		X	X						X	
Rocky Point campground loop 3	X	X	X	X						X	
Camp Connery group camp											
Canyon dam day-use area	X		X		X						
Almanor scenic overlook	X							X			
East shore day-use area	X		X					X			
Last Chance campground/group camp											
Ponderosa Flat campground	X		X	X						X	
Alder Creek day-use area/boat launch	X		X								
Cool Springs campground	X		X							X	
Belden rest stop (SR 70)	X		X	X				X			

Notes: X – the existing recreational element in the corresponding column is fully or partially accessible at that facility.
However, the number of accessible facilities may not be fully adequate.

LNF – Lassen National Forest

PNF – Plumas National Forest

3.3.5.2 Environmental Effects

Recreation Resource Management Plan

PG&E presented a draft RRMP in the final license application, which provides both existing and future recreation resource needs associated with the UNFFR Project and PG&E's proposed involvement and responsibilities in managing those identified needs over the term of the new license. PG&E prepared the draft RRMP in consultation with the Recreation, Land Use, and Aesthetics Work Group (RLA Work Group). The RLA Work Group included representatives of federal, state, and local agencies; adjacent landowners; shoreline homeowner and country and community club associations; and other stakeholders. The RLA Work Group participated in the development and review of technical studies, proposals included in the final license application, and the preparation of the draft RRMP.

In the SA, PG&E proposes to finalize the draft RRMP in consultation with the FS and Plumas County within 1 year of license issuance.

In its November 4, 2004, filing with the Commission, the FS specifies in its final Section 4(e) condition no. 32, that PG&E finalize the draft RRMP in consultation with the FS and Plumas County.

In the draft RRMP, PG&E proposes both site-specific and programmatic measures and the details for implementing them. A brief description of the six programs included in the draft RRMP defining PG&E's roles and responsibilities for recreation resources over the term of the new license is presented here:

- A recreation facilities development program that defines PG&E's proposed responsibilities related to construction, including details of proposed recreation development projects, estimated costs, and schedules.
- A recreation O&M program that defines PG&E's proposed existing and future recreation O&M responsibilities, including annual maintenance costs and maintenance standards to be used. The O&M program also details programmatic costs for draft RRMP implementation.
- An I&E program that defines how hydroelectric energy production, environmental, cultural, and informational I&E would be coordinated and conducted by PG&E at project facilities.
- A recreation monitoring program that defines how PG&E proposes conducting recreation resource monitoring, including monitoring standards and indicators, and how the monitoring information would be used in decision-making.

- A resource integration and coordination program that defines how PG&E would integrate recreation resource needs with other resource management needs over time, such as cultural, wildlife, and aquatic resources and discusses how actions would be coordinated through annual meetings.
- A RRMP review and revision program that defines how the RRMP would be updated or revised over the term of the new license.

Our Analysis

The draft RRMP would provide a framework for PG&E to implement recreational site improvements and coordinate management of recreational resources with the FS and Plumas County. The proposed recreation facilities development program includes measures that are extensive and provide substantial improvements to existing recreational resources associated with the project and significant development of new resources at the project to address visitor demand and reduce the potential for overcrowding. The operations and maintenance program clearly defines PG&E's responsibilities related to operating and maintaining the project facilities, and describes how PG&E intends to accomplish them. The interpretation and education program provides a means to disseminate information regarding project-area resources, facilities, and management issues to members of the public who either currently use the project area or may be interested in using the area. The recreation monitoring program would help PG&E identify changing recreational needs during the term of any new license. The resource coordination and integration program allows for a variety of parties with interests in various natural resources to express their individual concerns and resolve potential conflicts among resources. The RRMP review and revision program provides an opportunity to modify the RRMP, if necessary, and presents guidance on the timing and frequency of any modifications.

The terms of the draft RRMP, as well as all of the proposed site-specific measures, were developed in close coordination with the RLA Work Group and are consistent with the Lassen and Plumas National Forest Land and Resource Management Plans (LRMPs). As specified in the LRMPs, the recreational sites would continue to provide developed recreational opportunities for the public, including day-use areas, campgrounds, parking areas, and boat ramps, while protecting and improving the natural forest setting surrounding these facilities and providing future recreational opportunities that meet changing recreational demand.

Recreational Facility Development Program

As a component of the draft RRMP and identified in the SA, PG&E proposes to develop a recreation facilities development program to help meet existing and future recreation facility needs identified in the project area during the term of the license. PG&E proposes to focus on upgrading existing recreation facilities and constructing new recreation facilities when appropriate, based on demonstrated need. PG&E proposes that

this program would address (1) proposed recreation facility development measures and upgrades in the project area, (2) locations of the proposed recreation facilities or use area improvements, (3) recreation facility design guidelines and approvals, (4) ADA compliance and facility upgrades, (5) compliance with NEPA and CEQA as well as acquisition of all necessary permits and approvals prior to construction of any of the proposed recreation facilities, (6) agency and public review of planned recreation development, and (7) facility construction coordination, scheduling, and phasing. PG&E proposes to implement a number of recreational facility enhancement measures after initial license issuance and during the license term based on target completion dates and monitoring triggers (standards) included in the draft RRMP in the license application. PG&E also proposes to improve accessibility at various sites in accordance with the ADA.

In its November 4, 2004, filing with the Commission, the FS specifies in its final Section 4(e) condition no. 32, that PG&E implement a variety of recreation facility enhancement measures and improvements after license issuance and during the license term, based on target completion dates provided in the facility enhancement description and recreation monitoring indicators and standards included in the draft RRMP. The FS specifies that all FS recreation facilities be constructed in accordance with ADAAG guidelines at the time the recreation facilities are upgraded or constructed.

Some portions of FS final condition no. 32 are not under FS jurisdiction because the facilities they address are not located on NFS lands. These facilities are the Last Chance Family and Group campgrounds; the Rocky Point Campground and day-use area; the East Shore Group Camp Area, Family Campground, and day-use area; the North Shore public boat launch; the Stover Ranch day-use area; Marvin Alexander Beach; the Canyon Dam day-use area; Westwood Beach; Stumpy Beach; Catfish Beach; the Almanor Scenic Overlook; Camp Connery; Butt Valley powerhouse trails; Ponderosa Flat Campground; Cool Springs Campground; the Alder Creek boat launch; and the Belden Rest Stop. The FS fully supports all elements of condition no. 32, even those parts pertaining to facilities outside of its jurisdiction, and recommends including all parts in the license under Section 10(a) of the FPA.

Our Analysis

The recreation facility development program is one of the components of PG&E's draft RRMP and would provide direction for the coordination of the development, management, and maintenance of recreational opportunities and facilities associated with the project. All of the measures outlined provide improvements to facilities that are either within the project boundary or are proposed to be added to the project boundary, or provide access to recreation opportunities that are within the project boundary. Additionally, PG&E has developed the proposals in consultation with a number of appropriate parties as a part of settlement discussions. PG&E's implementation schedule targets high priority needs first, including ecological and safety concerns, excess

recreation site capacity, ADA needs, and distribution of access sites around the reservoir shorelines. Campground and day use facilities which would be significantly modified or newly built would conform with ADA, increasing the number of accessibility related opportunities. For future improvements to facilities, PG&E has developed monitoring triggers that would ensure that such improvements are necessary for public use of the areas. Facilities would be made safer due to replacement of old stoves and grills and accordingly, by implementing the proposed recreation measures, PG&E would be responsible for ensuring that the recreational needs of the public are met throughout the licensing period.

Section 2.7(b) of the Commission's regulations requires a project licensee to consider the needs of the physically disabled in the design and construction of public recreational facilities on project lands and waters, including public access to such facilities. The Commission has no statutory role in implementing or enforcing the ADA as it applies to its licenses. A licensee's obligation to comply with the ADA exists independent of its project license. In this regard, the RRMP developed by PG&E for project recreational facilities should include a discussion of how the licensee considered the needs of physically disabled individuals in the design and construction of the proposed recreational enhancements.

Staff lists PG&E's and FS specific recreation facility development proposals in the following sections. Figure 3-16 shows the location of these facilities.

Proposed Recreation Facilities and Improvements

Lake Almanor Recreational Facilities and Access

Last Chance Family and Group Campground

In accordance with ADA guidelines, PG&E proposes to modify two campsites and existing toilet buildings and provide a 150-foot access route leading to the nearby creek. PG&E intends to initiate and complete the implementation of this measure within 1 to 3 years after license issuance. FS Section 10(a) condition no. 32(1) A.1.a recommends the same proposal as PG&E, including the same implementation timeline.

Non-Internet Public

FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE
UPPER NORTH FORK FEATHER RIVER PROJECT
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Figure 3-16

Public access for the above information is available only
through the Public Reference Room, or by e-mail at
public.referenceroom@ferc.gov.

Rocky Point Campground and Day-Use Area

Within 5 to 10 years after license issuance, PG&E proposes to convert the Loop 3 overflow camping area into a day-use swim area containing an approximately 1-acre sand beach above the high water level (4,494 feet elevation, PG&E datum), a swimming delineator, a paved parking area to accommodate 35 to 40 vehicles, and a double vaulted restroom; relocate the 20 Loop 3 overflow campsites to the Loop 1 camp overflow area and provide a new double vaulted toilet building at this location; provide a new entrance kiosk at the campground, three fee-based shower facility buildings (one for each loop) with hot water, and bear-proof food lockers at each campsite (151); replace older Klamath stoves with campfire rings; and revegetate or harden areas significantly disturbed by pedestrian or vehicle traffic. PG&E also proposes the following accessibility improvements in accordance with ADA guidelines: modify 10 campsites (four at Loop 1, three at Loop 2, and three at Loop 3); an accessible access route to the high water level (4,494-foot elevation, PG&E datum) at the sandy beach; improvements to existing recreation facilities as needed, such as the campground library box, telephones, and the envelope box at the pay station and provide appropriate ADA-accessible access routes; modify existing water faucets near accessible elements, such as toilets and campsites, to be ADA-accessible; accessible routes to the toilet buildings near the campground entrance and near campsite # 100); and relocate the interior pay station directly across the road on a level, firm, and stable surface (Loop 2). FS Section 10(a) condition no. 32(1) A.1.b also recommends the same proposal as PG&E, including the same implementation timeline.

Forest Service Almanor Shoreline Facilities

Within 1 to 13 years after license issuance, PG&E proposes to partner with the FS and provide approximately 40 percent of matching funding up to a maximum of \$5,000,000 (2004 dollars) for the FS to complete recreation improvements, including reconstruction of existing facilities and construction of new facilities, at the following FS-owned recreation facilities: the Almanor Family Campground, the Almanor Group Campground, the Almanor amphitheater, the Almanor picnic area, and the Almanor beach. According to the SA, the FS would provide the remaining 60 percent of the cost to construct the recreation improvements. PG&E also proposes to apply to the Commission to adjust the UNFFR Project boundary to include the Almanor Family Campground, the Almanor Group Campground, the Almanor amphitheater, and the Almanor beach within 6 months after the FS has completed construction of all of the recreation improvements it has planned for each of these facilities.

If PG&E has not paid the FS the maximum \$5,000,000 (2004 dollars) at the end of the thirteenth year after the license is issued because the FS has been unable to obtain its corresponding share of the matching funds, then PG&E proposes to use the remaining funds (the difference between the amount PG&E has already paid the FS in matching funds and the \$5,000,000 cap [2004 dollars]) for recreation improvements at the Almanor

beach and the East Shore family campground, which would include the addition of up to 28 campsites in a third loop as funding permits. The recreation improvements anticipated to be completed with the matching funding are described in the following section.

Almanor Family Campground and Amphitheater

Within 1 to 13 years after license issuance, reconstruction of the north and south loops of the Almanor Family Campground including general improvement of travel ways and campsite spurs, upgrading sanitation facilities, providing utility hookups, and constructing an amphitheater, would be completed.

The FS specified, in preliminary Section 4(e) condition no. 44A.1, that within 5 years of issuance of a new license, or no later than January 1, 2009, PG&E provide matching funding for the FS to rehabilitate the Almanor Family Campground by converting those campsites in proximity to existing underground utilities (approximately one-half of the sites in the south loop) to accommodate RVs with longer level spurs, to provide water and power hookups, and to be ADA-accessible; reconstructing the main access roads and spurs to improve traffic flow and to accommodate modern recreational vehicles, including leveling, lengthening, and widening of campsite spurs; replacing all non-accessible vault toilets; constructing shower buildings with showers and toilet facilities (possibly flush, vault and/or composting toilets) at both the north and south campground loops; and paving small vehicle parking areas to provide additional vehicle parking for campground visitors to access recreation facilities. Additionally, the FS specified that PG&E take over full O&M of the Almanor Family Campground under an annual agreement with the FS.

FS final Section 4(e) condition no. 32(1)A.1.c specifies that PG&E provide matching funding to reconstruct the north and south loops of the Almanor Family Campground, including general improvement of travel ways and spurs, upgrading sanitation facilities, providing utility hook ups, and constructing an amphitheater.

FS final Section 4(e) condition no. 32(3) specifies that within 6 months after the FS has completed all of the recreation improvements at the Almanor Family Campground and Amphitheater, PG&E would (1) apply to the Commission to adjust the project boundary as needed to incorporate this facility into the project boundary, and (2) assume responsibility for the operational maintenance and heavy maintenance of the Almanor Family Campground and Amphitheater. FS final Section 4(e) condition no. 33 defines operational maintenance as maintenance or reconditioning that neither materially adds to the value of the property nor appreciably prolongs its life and serves only to keep the facility in an ordinary, efficient operating condition. Operational maintenance includes work that may be expensed. FS final Section 4(e) condition no. 33 defines heavy maintenance as maintenance or reconditioning that arrests deterioration and appreciably prolongs the life of the property and includes expenditures may be capitalized.

Almanor Group Campground

Within 1 to 13 years after license issuance, PG&E proposes that construction of camping loops, a group gathering area including a pavilion, and a trailer dump station, and rehabilitating, restoring, and revegetating the decommissioned overflow and group camp at the Almanor Group Campground, would be completed.

FS final Section 4(e) condition no. 32(1)A.1.c specifies that PG&E provide matching funding to the FS to construct camping loops, a group gathering area including a pavilion and a trailer dump station, and to rehabilitate, restore and revegetate the decommissioned overflow and group camp at the Almanor Group Campground.

FS final Section 4(e) condition no. 32(3) specifies that, within 6 months after the FS has completed all of the recreation improvements at the Almanor Group Campground, PG&E would (1) apply to the Commission to adjust the project boundary as needed to incorporate this facility into the project boundary, and (2) assume responsibility for the operational maintenance and heavy maintenance of the Almanor Group Campground.

Almanor Picnic Area

Within 1 to 13 years after license issuance, PG&E proposes that defining and upgrading picnic sites, shade structures, and interpretation/orientation facilities at the Almanor picnic area, would be completed.

FS final Section 4(e) condition no. 32(1)A.1.c specifies that PG&E provide matching funding to the FS for redevelopment of the Almanor picnic area by defining and upgrading picnic sites, shade structures, and interpretation/orientation facilities. FS final Section 4(e) condition no. 33 explicitly specifies that PG&E would not be responsible for the operational maintenance and heavy maintenance of the Almanor picnic area.

Almanor Beach

Within 1 to 13 years after license issuance, PG&E proposes to provide matching funding for the FS to expand the sandy beach area and parking area, and construct a swim buoy at the Almanor beach.

FS final Section 4(e) condition no. 32(1)A.1.c specifies that PG&E provide matching funding to expand the sandy beach area, expand the parking area, and construct swim buoy at the Almanor beach.

FS final Section 4(e) condition no. 32(3) specifies that within 6 months after the FS has completed all of the recreation improvements at the Almanor beach, PG&E would (1) apply to the Commission to adjust the project boundary as needed to incorporate this facility into the project boundary, and (2) assume responsibility for the operational maintenance and heavy maintenance of the Almanor beach.

East Shore Group Camp Area

Within 1 to 3 years after license issuance, PG&E proposes to convert the existing East Shore picnic area to a group reservation camp area that would accommodate one group of 16 RVs or two groups of eight RVs; widening the entrance road; improving internal road circulation to accommodate RVs; provide one ADA-accessible parking space near the existing double-vaulted toilet building and an ADA-accessible access route to the nearby trash receptacles; provide bear-proof food lockers at 16 sites; providing a paved, non-accessible trail down to the shoreline with switchbacks and stairs; and institute erosion control measures. PG&E also proposes to apply to the Commission within 1 year of license issuance to adjust the UNFFR Project boundary to include this facility. FS final Section 10(a) condition nos. 32(1)A.1.d and 32(3) recommend the same proposal as PG&E, including the same implementation timeline.

East Shore Day-Use Area

Within 1 to 5 years after license issuance, PG&E proposes to designate a day-use swim area in the existing cove adjacent to the proposed new East Shore campground, which would include up to five picnic tables, non-paved shoreline access trails, a single vaulted toilet building, and parking for 10 to 20 vehicles. PG&E also proposes to apply to the Commission within 1 year of license issuance to adjust the UNFFR Project boundary to include this facility. FS final Section 10(a) condition nos. 32(1)A.1.i and 32(3) recommend the same proposal as PG&E, including the same implementation timeline.

East Shore Family Campground

Over the term of the project license period, contingent on reaching the recreation monitoring standards contained in the RRMP during the new license term, PG&E proposes to provide a new two-loop family campground on PG&E-owned land along the east shore of Lake Almanor. PG&E proposes to construct the campground in two phases with a total of approximately 63 new tent and RV campsites, bear-proof food lockers at each campsite, two user fee, indoor hot shower buildings with flush toilets, approximately 20 boat moorage slips/buoys, and a camp host site. PG&E also proposes to apply to the Commission within 1 year of license issuance to adjust the UNFFR Project boundary to include this facility. FS final Section 10(a) condition nos. 32(1)2.A.2 and 32(3) recommend the same proposal as a potential future recreation enhancement measure.

North Shore Public Boat Launch

Within 3 to 5 years after license issuance, PG&E proposes to provide a new and expanded public boat launching facility at the North Shore campground, including paved parking for 40 single vehicles with trailers and 12 single vehicles, a double vaulted toilet building, and a boarding float. Additionally, PG&E proposes dredging and maintaining along the existing submerged river channel to provide an approximate 1,000 foot long, 50

foot wide, and 6 foot deep boat channel that provides boat access to approximately the 4,480-foot elevation (PG&E datum). PG&E proposes that the boat launch would be open for public use from April 1 to December 1 when the lake's elevation is at or above the 4,480 foot elevation (PG&E datum) and as snow on the ground permits. PG&E proposes to provide public access to the boat launch facility along an abandoned portion of Highway 36 located along the north side of the campground, in order to reduce traffic impacts at the campground, and relocate 22 campsites within the project boundary that would be affected by the expanded boat launch facility.

FS final Section 10(a) condition no. 32(1)A.1.e recommends the same proposal as PG&E, including the same implementation timeline.

In its November 29, 2004, comments on the draft EIS, EPA mentions potential environmental impacts from dredging activities at this site and the need to consider Section 404 of the Clean Water Act.

Stover Ranch Day-Use Area

Within 3 to 5 years after license issuance, PG&E proposes to develop the Stover Ranch day-use area to provide improved Lake Almanor shoreline access for Chester residents including gravel parking for 10 to 20 vehicles, a double-vaulted toilet building, four picnic tables, a non-paved trail to the shoreline, an interpretive sign, and an RV site to accommodate a new Lake Almanor caretaker. PG&E would coordinate these developments with the Chester Public Utility District and the Almanor Recreation and Park District. PG&E also proposes to apply to the Commission within 1 year of license issuance to adjust the UNFFR Project boundary to include this facility. FS final Section 10(a) condition nos. 32(1)A.1.f and 32(3) recommend the same proposal as PG&E's, including the same implementation timeline.

Marvin Alexander Beach

Within 1 to 3 years after license issuance, PG&E proposes to assume management responsibility of the PSEA swim beach and expand and improve the existing sandy beach to a 0.4 acre area above the high water level (4,494-foot elevation, PG&E datum), provide an improved gravel parking area for 30 to 45 single vehicles, replace the site's two single-vault toilet buildings and 10 picnic tables, and provide a swim delineator. PG&E also proposes changing the name of the site to the "Marvin Alexander Beach" to eliminate any public perception that this is a private beach. FS final Section 10(a) condition no. 32(1)A.1.g recommends the same proposal as PG&E, including the same implementation timeline.

Canyon Dam Day-Use Area

Within 1 to 3 years after license issuance, PG&E proposes to provide an approximately 0.3-acre sandy beach above the high water level (4,494-foot elevation, PG&E datum), a swim area delineator, an informational kiosk, improved vehicle

circulation, and eight new ADA-accessible picnic tables; and in accordance with ADA guidelines, modify eight existing picnic tables to make them accessible, provide an accessible parking space, and provide an accessible route to the high water level (4,494 foot elevation, PG&E datum) at the swim beach area in accordance with ADA guidelines. Additionally, PG&E proposes to reserve approximately 1 acre of land adjacent to the Canyon dam day-use area for potential future recreation development during the term of the new license. FS final Section 10(a) condition no. 32(1)A.1.h recommends the same proposal as PG&E, including the same implementation timeline.

Westwood Beach Day-Use Area

Within 1 to 3 years after license issuance, PG&E proposes to provide a gravel parking area for 10 vehicles, six picnic tables, an ADA-accessible single vaulted toilet building, an approximately 0.1 acre sandy beach, a swim delineator, directional signage, and erosion control measures to protect the shoreline from wind-caused wave action at the Westwood beach. PG&E also proposes to apply to the Commission within 1 year of license issuance to adjust the UNFFR Project boundary to include this facility. FS final Section 10(a) condition nos. 32(1)A.1.j and 32(3) recommend the same proposal as PG&E, including the same implementation timeline.

Stumpy Beach Day-Use Area

Within 1 to 3 years after license issuance, PG&E proposes to provide five picnic tables, directional signage, an approximately 0.7 acre sandy beach above the high water level (4,494 foot elevation, PG&E datum), a swim delineator, eight to 10 paved parking spaces parallel to Highway 147 with trails connecting to the northern and southern portions of Stumpy beach (the southern trail would be ADA-accessible where feasible and the northern trail would be non-paved), four benches at the roadside parking area for viewing Lake Almanor and the surrounding mountains, and erosion control measures to protect the shoreline from wind-caused wave action. PG&E also proposes providing a single vaulted toilet building if allowed by Plumas County and the California Department of Transportation set back regulations; otherwise, PG&E proposes providing a seasonal portable toilet building. PG&E also proposes to apply to the Commission within 1 year of license issuance to adjust the UNFFR Project boundary to include this facility. FS final Section 10(a) condition nos. 32(1)A.1.k and 32(3) recommend the same proposal as PG&E, including the same implementation timeline.

Catfish Beach

Within 3 to 5 years after license issuance, PG&E proposes to make a good faith effort to negotiate a reasonable easement across private lands to provide public road access to the Catfish beach area. If PG&E's negotiations are unsuccessful, PG&E would not be required to seek to condemn the easement. PG&E also proposes to provide a single vaulted toilet building at this site and monitor and maintain the toilet building and the site's cleanliness through appropriate means. PG&E proposes to apply to the

Commission within 1 year of license issuance to adjust the UNFFR Project boundary to include this facility. FS final Section 10(a) condition nos. 32(1)A.1.l and 32(3) recommend the same proposal as PG&E, including the same implementation timeline.

Almanor Scenic Overlook

Within 1 to 5 years after license issuance, PG&E proposes to provide an ADA-accessible route connecting the existing accessible double vaulted toilet building at the overlook with a new ADA-accessible parking space, and conduct vegetative brushing and clearing to restore the views of Lake Almanor, Mt. Lassen, and Canyon dam. FS final Section 10(a) condition no. 32(1)A.1.m recommends the same proposal as PG&E, including the same implementation timeline.

Southwest Shoreline Access Zone

Within 1 to 5 years after license issuance, PG&E proposes to provide four shoreline access points at existing informally used areas along Lake Almanor's southwest shoreline between Prattville and Canyon dam in consultation with the FS. These shoreline access areas would provide vehicle access at or above the 4,494 foot elevation (PG&E datum) and serve as pedestrian access areas to the adjacent shoreline. PG&E proposes to provide four gravel parking areas that provide parking for up to four to eight vehicles at two of the areas and 10 to 20 vehicles at the other two areas; vehicle barriers; regulatory, interpretive, and informational signs; gravel access roads; and, if appropriate, single vaulted toilet buildings at these access areas. PG&E proposes to assume responsibility for operational maintenance and heavy maintenance for each facility as it is constructed. PG&E also proposes to apply to the Commission within 1 year of license issuance to adjust the UNFFR Project boundary as needed to incorporate these facilities. PG&E also proposes to close and restore to natural conditions other degraded user-created vehicular access routes along the southwest shoreline in consultation with the FS.

FS final Section 4(e) condition no. 32(1)A.1.n specifies the same proposal as PG&E, including the same implementation timeline. FS final Section 4(e) condition no. 32(3) specifies that PG&E apply to the Commission to adjust the project boundary as needed to incorporate those portions of the southwest shoreline access zone facilities currently outside of the project boundary into the project boundary. FS final Section 4(e) condition no. 33 specifies that PG&E would assume responsibility for the operational maintenance and heavy maintenance of the southwest shoreline access zone facilities as each facility is constructed.

Camp Connery Reservation Group Camp Area

Within 1 to 5 years after license issuance, PG&E proposes to provide an ADA-accessible parking space and a new bunk house cabin with an ADA-accessible toilet and a user fee based hot shower and retrofit the existing telephone position and water faucet features to meet the ADA guidelines. FS final Section 10(a) condition no. 32(1)A.1.o

also recommends the same proposal as PG&E, including the same implementation timeline.

Over the term of the project license period, contingent on reaching the recreation monitoring standards contained in the draft RRMP during the new license term, PG&E proposes to provide a new group reservation camping area adjacent to the existing Camp Connery group camp, which would either provide space for two groups of approximately eight self-contained RVs or one group of approximately 16 self-contained RVs, a centrally located bear-proof food facility, and two user fee, indoor shower buildings with hot water and flush toilets. PG&E also proposes to repair and resurface the existing access road. FS final Section 10(a) condition no. 32(1)2.A.1 also recommends the same proposal as a potential future recreation enhancement measure.

Lake Almanor Recreation Trail Easements

The FS specified, as preliminary Section 4(e) condition no. 44B.2, that within 5 years of issuance of a new license, or no later than January 1, 2009, that PG&E provide easements to the FS and Plumas County for non-motorized recreational trails across PG&E-owned project lands surrounding Lake Almanor. The FS specified that the conditions of the proposed trail easements would be similar to those previously provided to the FS. The FS originally specified extending the LART all the way to the Canyon dam boat launch and day-use area, adding another few miles to the LART. The FS final Section 4(e) conditions did not include any specifications related to the LART.

Our Analysis

Lake Almanor, the largest reservoir at the UNFFR Project, has induced high concentrations of human use around the lake shoreline. Only 11 percent of the perimeter of Lake Almanor is composed of NFS lands, and the remaining shoreline consists of private land owned by either PG&E or private owners. The majority of the non-PG&E private land is occupied by private dwellings so public access at Lake Almanor is limited to NFS lands, PG&E lands, and a limited number of private marinas and other points of access.

The Last Chance family and group camp currently has no ADA-accessible elements. Based on draft ADA guidelines, this facility should have three accessible campsites, but the modification of both two campsites and the two toilet buildings to ADA standards would improve accessibility at the facility. Providing an ADA-accessible access road to the nearby creek would also enhance accessibility.

Loop One of the Rocky Point campground is one of only two facilities in the project that provides the minimum number of accessible campsites as required in the draft ADA guidelines. PG&E's proposal to modify several elements to ADA standards at this facility would greatly improve accessibility. Replacing the older Klamath stoves with campfire rings at all of the campsites would improve safety at the facility. The other

improvements proposed at this facility would make the facility more desirable to recreation users.

Most of the recreation facilities on NFS lands along Lake Almanor are located adjacent to PG&E-operated facilities. Unfortunately, most of these recreation facilities do not meet current FS standards including LRMP standards and guidelines and current ADA accessibility standards. PG&E proposes providing 40 percent of the matching funds up to a maximum of \$5,000,000 to the FS to assist with making major improvements to its Lake Almanor facilities. Many of these facilities have very few, if any, ADA-accessible elements and the elements that are there are in need of modification. PG&E has set a limit on the amount of money it would provide to the FS to assist with reconstruction and modifications of these facilities. Improvement of the FS facilities would bring them up to the current standards of the PG&E facilities.

PG&E's proposed modification of the East Shore picnic area into a group camp area would increase the number of group camping areas available at Lake Almanor. Likewise, PG&E's proposal to modify several elements to ADA standards at this facility would improve accessibility at Lake Almanor. Formalizing the trail down to the shoreline and completion of erosion control measures would improve the recreation experience at this site, as well as protect it and water quality in Lake Almanor.

PG&E's proposal to create a swimming area adjacent to the new East Shore group camp area would increase recreational opportunities for visitors to the East Shore campground, as well as day use visitors.

PG&E proposes to provide a new two-loop family campground on the east shore of Lake Almanor once use levels or other indicators reach a defined capacity threshold level. PG&E proposes monitoring campground utilization at Lake Almanor by calculating the capacity utilization of selected campgrounds during the managed use season (primarily mid-May to mid-September) and during the peak months (July and August at most sites). PG&E would annually assess whether use levels are approaching threshold standards to determine if demand warrants construction of another campground in the area.

PG&E's proposal to provide a new and expanded boat launching facility at North Shore campground on Lake Almanor would increase the number of free public launch facilities available on Lake Almanor and would also provide a launch facility at the northern end of the lake, allowing boat users to disperse themselves around the Lake Almanor shoreline. Currently, parking at this site is limited and increasing opportunities for parking at this facility would make this site more desirable and efficient. Dredging and maintaining the existing submerged river channel within the project waters would be necessary to provide an approximately 1,000 foot long, 50 foot wide, and 6 foot deep boat channel that provides boat access to approximately the 4,480-foot elevation (PG&E datum). Dredging activities can be undertaken with minimal effects on water quality as

long as best management practices are in place to control sedimentation and downstream transport of fine-grained sediment that may be resuspended at the dredging site. We anticipate that dredging activities would occur during the fall, when the lake level is typically lower and much, if not all, of the work could be conducted “in the dry.”

PG&E’s proposed development of the Stover Ranch into a day use area with parking, picnic tables, and a trail to the shoreline would provide easier and improved access to the Lake Almanor shoreline for Chester residents and visitors. Additionally, accommodating a seasonal caretaker at the site would help ensure that the site is maintained in a pleasing manner and should minimize the possibility of vandalism at the site.

PG&E’s proposal to modify the existing PSEA swim beach would increase day-use beach opportunities for the public along the Lake Almanor shoreline. Renaming the site “Marvin Alexander Beach” would allow PG&E to pay tribute to a member of the community with a long-time, unwavering interest in Lake Almanor and should help eliminate any public perception that the facility is a private beach.

PG&E’s modification of eight existing picnic tables and provision of eight new picnic tables to ADA standards would improve accessibility at the Canyon dam day-use area and bring the facility up to ADA standards. Providing an ADA-accessible parking space and an accessible route to the high water level would also enhance accessibility.

Westwood and Stumpy beaches are currently undeveloped dispersed sites along the eastern shoreline of Lake Almanor. PG&E’s proposal to provide facilities at the Westwood and Stumpy beaches would increase day-use beach opportunities for the public along the Lake Almanor shoreline and should attract some of the day use from the western shore. PG&E’s proposals to provide elements at these sites in compliance with ADA standards would improve accessibility at Lake Almanor. Additionally, PG&E’s provision of erosion control measures would protect the shoreline and the newly created beaches at these sites, and should help maintain water quality in Lake Almanor.

PG&E proposes to attempt to acquire an easement across private lands to provide both public road access and a single vaulted toilet building at Catfish beach, which currently is an undeveloped dispersed site. According to studies conducted by PG&E, fly fishermen expressed concern over the current gated access to Catfish beach, which makes it difficult for older fly fisherman to reach the area they traditionally use to go fishing. This proposal would increase day use beach opportunities for the public along the Lake Almanor shoreline, may disperse some of the use from the western shore, and should address sanitation issues at Catfish beach.

PG&E’s proposals for the Almanor scenic overlook would make the site more accessible and also improve the aesthetic appeal of the site for visitors.

PG&E's proposal for the southwest shoreline access zone would formalize some of the existing undeveloped dispersed use in this area. Defining the boundaries of this shoreline vehicular access area would minimize adverse impacts on water quality, cultural resources, and the flora and fauna in the area.

PG&E's proposal to modify several elements to ADA standards at Camp Connery would greatly improve accessibility at this site and allow a broader range of visitors to use the facility. PG&E also proposes to provide a new group camping area adjacent to the existing Camp Connery group camp once use levels or other indicators reach a defined capacity threshold level. PG&E proposes monitoring group campground utilization at Lake Almanor by calculating the capacity utilization of selected campgrounds during the managed use season (primarily mid-May to mid-September) and during the peak months (July and August at most sites). PG&E would annually assess if use levels are approaching threshold standards to determine if demand warrants construction of another group campground in the area.

The FS originally recommended that PG&E provide easements to them for the purpose of extending the LART to the north and to the south. Extending the LART would enhance trail opportunities at Lake Almanor and provide visitors with another means to access sites on the western shore of Lake Almanor without having to drive a vehicle. However, to extend the LART all the way to Canyon dam day-use area and boat launch to the south, the route would pass through sensitive plant and animal habitat and coordination with other resource specialists would be necessary prior to designing a trail in this area. Also, certain use restrictions in this sensitive area may apply. The FS no longer recommends that PG&E grant easements to the FS so that it may extend the LART. We conclude that extension of the LART is not appropriate at this time.

A connection exists between project operations and recreational use of formal and informal recreational sites at Lake Almanor. All of the facilities that PG&E proposes to either construct or provide funding to construct are used as primary access points to Lake Almanor. As such, a clear connection exists between project operations and recreational use of these facilities. Including all of these facilities in the project boundary would provide assurance that improvements would be consistent with project purposes and that PG&E, in cooperation with the FS, would continue to provide recreational access to project lands and waters. We conclude that the facilities proposed for improvement or construction should be included in the project boundary. The FS would own the facilities on NFS land but we consider it appropriate for PG&E to contribute annually to the O&M of project-related recreational facilities.

Butt Valley Reservoir Recreational Facilities and Access

Powerhouse Trails

Within 5 to 10 years after license issuance, PG&E proposes to provide two improved angler access trails to two locations near the Butt Valley powerhouse. One of the trails would be an approximately 200-foot, non-paved trail beginning at the existing gravel parking area next to the powerhouse down the steep slope east of the powerhouse to the levee below, with stairs, if needed. The second trail would be ADA-accessible (compact base rock) originating from an existing pullout along the Prattville-Butt Valley Road near the powerhouse, extending approximately 700 feet to the eastern shoreline of the inlet near the levee. PG&E proposes to develop a new compacted base rock trailhead parking area with barriers for this trail. FS final Section 10(a) condition no. 32(1)A.2.a specifies the same proposal as PG&E, including the same implementation timeline.

Ponderosa Flat Campground

Within 5 to 10 years after license issuance, PG&E proposes to provide a single person, non-heated outdoor shower at Ponderosa Flat campground, and, in accordance with ADA guidelines: modify four campsites and retrofit the existing designated accessible campsites to provide accessibility of the picnic table, fire ring, cooking grill, tent or RV area, and water faucet at each of these campsites; replace the vault toilets in the overflow area with one new accessible single vaulted toilet building and modify all of the other existing designated accessible toilet buildings to meet current ADA standards; provide an ADA-accessible access route to the toilet building near Site 45 and one ADA-accessible paved parking space near the toilet buildings; provide an ADA-accessible swimming area at the campground with an approximately 0.4 acre sandy beach above the high water elevation (4,132 foot elevation, PG&E datum) and a swim delineator; and provide a new ADA-accessible fishing access trail and pier or platform north of the overflow area. FS final Section 10(a) condition no. 32(1)A.2.b specifies the same proposal as PG&E, including the same implementation timeline.

Over the term of the project license period, contingent on reaching the recreation monitoring standards contained in the draft RRMP during the new license term, PG&E proposes to provide approximately 20 new primitive tent campsites, likely to the north of the current overflow area, and a new 100 person capacity group camp area in the existing overflow area. FS final Section 10(a) condition no. 32(1)2.B.1 specifies the same proposal as a potential future recreation enhancement measure.

Cool Springs Campground

Within 5 to 10 years after license issuance, PG&E proposes to provide a two-person, non heated outdoor shower at Cool Springs campground and one new ADA-accessible campsite by modifying the picnic table, the fire ring, the cooking grill, the tent

or RV space, and water faucet. FS final Section 10(a) condition no. 32(1)A.2.c recommends the same proposal as PG&E, including the same implementation timeline.

Alder Creek Boat Launch

Within 5 to 10 years after license issuance, PG&E proposes to expand the existing Alder Creek boat launch parking area to accommodate 10 to 20 additional vehicles with trailers and to improve circulation. PG&E proposes that new parking areas on the east side of the Butt Valley Reservoir Road would be gravel while the parking areas on the west side of this road would be paved. PG&E also proposes to modify the boat launch to be accessible, and provide one ADA-accessible parking space near the existing double vaulted toilet building. PG&E proposes to apply to the Commission within 1 year of license issuance to adjust the UNFFR Project boundary as needed to include all of this facility. FS final Section 10(a) condition nos. 32(1)A.2.d and 32(3) specify the same proposal as PG&E, including the same implementation timeline.

Our Analysis

Butt Valley reservoir is located on the Plumas National Forest. There is no road access to the west side of the reservoir, and all developed facilities are located along the Caribou-Butt Valley Road on the east side of the reservoir. Recreation development at Butt Valley reservoir has focused on a more primitive recreation experience in an attempt to provide a wide spectrum of opportunity from highly developed at Lake Almanor to primitive at Butt Valley reservoir.

PG&E's proposal to provide two angler access trails near the Butt Valley powerhouse would formalize some of the existing user-defined trails in the area. One of the trails is proposed to be ADA-accessible, increasing the diversity of recreation experiences available.

Ponderosa Flat Campground is the second one of only two facilities in the project that provides the minimum number of accessible campsites as required in the draft ADA guidelines. PG&E's proposal to modify several elements to ADA standards at this facility would greatly improve accessibility. The other improvements proposed at this facility would make the facility more desirable to recreation users.

PG&E proposes to provide 20 new primitive tent campsites and a new 100 person capacity group camp area in the existing overflow area at the Ponderosa Flat Campground once use levels or other indicators reach a defined capacity threshold level. PG&E proposes monitoring campground utilization at Butt Valley Reservoir by calculating the capacity utilization of selected campgrounds during the managed use season (primarily mid-May to mid-September) and during the peak months (July and August at most sites). PG&E would annually assess if use levels are approaching threshold standards to determine if demand warrants construction of another campground in the area.

PG&E's proposal to provide a new, fully-accessible campsite at the Cool Springs Campground would bring this facility into compliance with ADA standards.

The new parking areas that PG&E proposes at the Alder Creek boat launch would help accommodate user demand at this facility. PG&E's proposal to modify the boat launch to be ADA-accessible and providing one accessible parking space would improve accessibility at this site. A connection exists between project operations and recreational use of this site and this site is used as a primary access point to Butt Valley reservoir. As such, a clear connection exists between project operations and recreational use of this facility. Including this facility in the project boundary would provide assurance that improvements would be consistent with project purposes and that PG&E, in cooperation with the FS, would continue to provide recreational access to project lands and waters. We conclude that this facility should be included in the project boundary.

Belden Forebay Recreational Facilities and Access

Belden Forebay Access

Within 5 to 10 years after license issuance, PG&E proposes to provide a car-top boat launch, a seasonal portable toilet building, and a gravel parking area for 10 single vehicles at the Belden forebay's existing undeveloped parking area, which also serves as the trailhead for the North Fork fishing trail; provide suitable access for launching small car-top watercraft at the Belden forebay; post signage referring to a Plumas County ordinance (once the ordinance is approved) limiting boat engines to 10 hp, boat speeds to 5 mph on small reservoirs such as the Belden forebay, prohibit swimming or boating within 0.25 mile of Belden dam and prohibit swimming or boating at night. FS final Section 4(e) condition no. 32(1)A.3.a also specifies the same proposal as PG&E, including the same implementation timeline.

North Fork Fishing Trail

Within 1 to 3 years after license issuance, PG&E proposes to improve the North Fork fishing trail from the Belden forebay parking area to the upstream side of Caribou powerhouse 1, including retrofitting the existing metal trail decking and railing at the powerhouse above the turbine outlets providing enhanced access and safety, trail directional signs, and a wider, more even non-paved trail base along the chain-link fencing at the powerhouse yard and along Caribou Road from the parking area. FS final Section 4(e) condition no. 32(1)A.3.b specifies the same proposal as PG&E, including the same implementation timeline.

Our Analysis

There are no developed boating-related facilities at the Belden forebay. PG&E's proposal to provide access for boaters to launch their car-top boats at the Belden forebay would address angler needs and user demand at this site. Providing a parking lot and a toilet building would address any sanitation concerns at the site. The North Fork fishing

trail is the only developed non-motorized trail on the project river reaches and receives regular use by anglers. Improving the trail would prevent site degradation and ensure the safety of trail users.

Bypassed River Reaches

Upper Belden Reach River Access

Prior to the initiation of any recreation release flows, PG&E proposes to provide a river access point at the upstream end of the Belden reach located at the spoil pile area which would include a seasonal portable toilet, a seasonal dumpster located over a concrete pad, and a non-paved parking area to accommodate 15 to 25 single vehicles. PG&E proposes to apply to the Commission within 1 year of license issuance to adjust the UNFFR Project boundary to include this facility. FS final Section 4(e) condition nos. 32(1)A.4.a and 32(3) specify the same proposal as PG&E.

Belden Reach Trails

Within 1 to 3 years after license issuance, PG&E proposes to provide and maintain four trails to the Belden reach shoreline from existing informal parking areas where public access can be provided in a safe manner. PG&E proposes to apply to the Commission within 1 year of license issuance to adjust the UNFFR Project boundary to include these facilities. FS final Section 4(e) condition nos. 32(1)A.4.b and 32(3) specify the same proposal as PG&E, including the same implementation timeline.

Belden Rest Stop (SR 70)

Within 3 to 5 years after license issuance, PG&E proposes to relocate the existing picnic tables down to the rest stop's lower level and disperse them within the area from the Eby Stamp Mill to the gazebo near the creek; replace two of the tables with ADA-accessible tables; develop ADA-accessible routes to the gazebo, the overlook area next to the creek, and to the Eby Stamp Mill historical features; and provide improved I&E elements at the rest stop and erosion control measures on the slope between the parking lot and the upper picnic area. PG&E also proposes to remove the existing cooking grills from the upper level and closing that area. FS final Section 10(a) condition no. 32(1)A.4.c specifies the same proposal as PG&E, including the same implementation timeline.

Lower Belden Reach River Access

If a determination is made to proceed with scheduled river recreation flows, PG&E proposes to provide up to a maximum of \$125,000 (2005 dollars) to the FS for construction of non-Project river access to the lower Belden reach. PG&E expects the FS to make a good faith effort to obtain matching funds to help offset the cost of these improvements.

FS preliminary Section 4(e) condition no. 44H.1 recommended that PG&E prepare a river recreation facilities plan in consultation with the Technical Review Group and approved by FS, if a determination is made to proceed with scheduled river recreation flows. The FS further recommended that PG&E provide up to \$125,000 for construction of essential facilities including access facilities at a site determined by the FS, with paved parking, restroom, picnic table, bear-proof garbage disposal and reasonable access to launch and retrieve kayaks and rafts.

FS final Section 10(a) condition no. 32(1)A.4.d specifies the same proposal as PG&E except that the FS clarifies that the \$125,000 is in constant dollars and not subject to escalation.

Our Analysis

The Seneca and Belden reaches provide many dispersed recreation use opportunities, especially the Belden reach. Formalizing access points at the upper and lower ends of the reach would address environmental concerns related to riparian areas at these locations. Likewise, providing and maintaining trails to the shoreline should discourage the formation of informal trails, thus addressing environmental concerns at this site. Regular maintenance of the trails to the shoreline of the Belden reach should also ensure user safety.

The Belden Rest Stop receives year-round use due to its location on SR 70, which is plowed in the winter. It is primarily used by motorists for short periods of time. PG&E's proposal to provide two ADA-accessible picnic tables would bring the facility into compliance with the draft ADA guidelines. PG&E's proposal to modify other elements at this facility to ADA standards would greatly improve accessibility at this site and allow a broader range of visitors to use the facility. Safety for all users would be enhanced with the closure of the upper picnic area. The other improvements proposed at this facility would make the facility more desirable to visitors and may encourage extended visits at the site. Additionally, PG&E's provision of erosion control measures would protect the environmental quality of the area, and should help maintain a pleasing aesthetic quality at the site.

Whitewater boating flows may be proposed in the Belden reach and there is potential for implementation of scheduled recreational boating releases there in the future. PG&E proposes providing an improved access point at the upper end of the Belden reach for a boater put-in location. This access point would accommodate use issues such as vehicle parking and sanitation issues at this location. Additionally, PG&E proposes providing funding to the FS for construction of a non-project river access point to provide a boater take-out location. Any amenities provided at this site, would be based on an assessment of user needs by the FS and PG&E.

A connection exists between project operations and recreational use of informal recreational sites in the Belden reach. All of the facilities that PG&E proposes to either construct or provide funding to construct are used as primary access points to the Belden reach. As such, a clear connection exists between project operations and recreational use of these facilities. Including all of these facilities in the project boundary would provide assurance that improvements would be consistent with project purposes and that PG&E, in cooperation with the FS, would continue to provide recreational access to project lands and waters. We conclude that the facilities proposed for improvement or construction should be included in the project boundary. The FS would own the facilities on NFS land but we consider it appropriate for PG&E to contribute annually to the O&M of project-related recreational facilities.

Recreation Operations and Maintenance Program

In the draft RRMP, PG&E states that it expects to allocate most of the day-to-day recreation facility management responsibility for its facilities to a PG&E-contracted concessionaire who would be responsible for all necessary personnel, equipment, materials, and management. PG&E also states that it expects that all existing and future recreation facilities owned and operated by entities other than PG&E would be operated and maintained by their current providers. However, as a component of the draft RRMP and identified in the SA, PG&E proposes assuming responsibility for operational maintenance and heavy maintenance of the following FS facilities prior to the start of the first recreation season following license issuance: the Dyer View day-use area, the Canyon dam boat launch and day-use area, and the Almanor boat launch. Additionally, as each recreation facility is individually constructed, PG&E proposes to assume responsibility for operational maintenance and heavy maintenance for the southwest shoreline access zone facilities described in the recreation facilities development program. Further, PG&E proposes that, within 6 months after the FS has completed construction of each of the recreation improvements it had planned for the FS Almanor Family Campground and Amphitheater, the FS Almanor Group Campground, and the FS Almanor beach, it would apply to FERC to incorporate these additional FS facilities within the FERC project boundary and to include these facilities in the O&M program.

PG&E proposes that its operational maintenance and heavy maintenance of FS facilities would be consistent with FS standards, applicable laws, regulations, codes and other legal direction. PG&E proposes that it would not be responsible for any future reconstruction of FS facilities.

PG&E proposes to be responsible for operational maintenance and heavy maintenance at FS facilities. To offset its operational and heavy maintenance costs and reasonable administrative costs, PG&E proposes to collect and retain 100 percent of FS-approved reasonable user fees at all FS recreational facilities that PG&E operates and maintains with the intent that the fees would be sufficient to cover PG&E's costs over the term of the license. These fees may also cover any matching contribution PG&E made

toward initial construction of recreation improvements at FS facilities. Collection of user fees would be done in accordance with FERC, FS, and applicable California Department of Boating and Waterways regulations. PG&E proposes to track costs and revenues in a balancing account and providing the FS with an annual accounting. PG&E proposes that funds derived from user fees may be accumulated from year to year to address larger heavy maintenance projects. At the end of the license term, PG&E proposes that any funds remaining in the balancing account would be used to offset its matching contribution toward initial construction of recreation improvements at FS facilities.

Prior to assuming responsibility for the operational maintenance and heavy maintenance of these FS facilities, PG&E proposes to enter into an FS-approved operation agreement or other appropriate authorization with the FS that addresses PG&E's obligations as defined in the SA. PG&E proposes to meet with the FS and Plumas County every 5 years, or as necessary, to determine whether the fees are sufficient to meet their proposed purposes, and if not, to make necessary adjustments. PG&E further proposes to meet with the FS and Plumas County at least annually to review the operational maintenance and heavy maintenance of FS facilities included in the license and to adjust maintenance levels as necessary.

As part of the O&M program, PG&E proposes to work with the Plumas County Sheriff's Department and its Marine Patrol to provide for adequate public safety on project lands and waters. PG&E proposes to develop a new Memorandum of Understanding with the Plumas County Sheriff's Department that would define activities proposed at the UNFFR Project. PG&E proposes to coordinate with the Plumas County Sheriff's Department to provide for continued seasonal marine patrols of Lake Almanor and land patrol of project lands within the project boundary. PG&E proposes that the Marine Patrol would be responsible for marking and/or removing floating hazards in the lake per the new MOU, enforcing existing county ordinances regarding watercraft speed limits and no-wake zones, and enforcing new vehicular access restrictions below the 4,500-foot elevation at Lake Almanor (once a new county ordinance is approved). The Marine Patrol would be assisted by land-based Sheriff's Department patrols to help enforce existing county campfire restrictions and new county vehicular access restrictions below the 4,500-foot elevation at Lake Almanor.

In its November 4, 2004, filing with the Commission, the FS reflects PG&E's proposal as described in the SA in its final Section 4(e) condition no. 33 and specifies that PG&E assume responsibility for operational maintenance and heavy maintenance of the following FS facilities prior to the start of the first recreation season following license issuance: the Dyer View day-use area, the Canyon dam boat launch and day-use area, and the Almanor boat launch. Additionally, as each recreation facility is individually constructed, the FS specifies that PG&E assume responsibility for operational maintenance and heavy maintenance for the southwest shoreline access zone facilities described in the recreation facilities development program. In its final Section 4(e)

condition no. 32(3), the FS further specifies that, within 6 months after the FS has completed construction of each of the recreation improvements it has planned for the FS Almanor Family Campground and Amphitheater, the FS Almanor Group Campground, and the FS Almanor beach, that PG&E would apply to FERC to incorporate these additional FS facilities within the FERC project boundary and to include these facilities in the O&M program.

FS final Section 4(e) condition no. 33 defines operational maintenance as maintenance or reconditioning that neither materially adds to the value of the property nor appreciably prolongs its life and serves only to keep the facility in an ordinary, efficient operating condition. Operational maintenance includes work that may be expensed. FS final Section 4(e) condition no. 33 defines heavy maintenance as maintenance or reconditioning that arrests deterioration and appreciably prolongs the life of the property and includes expenditures may be capitalized. FS final Section 4(e) condition no. 33 further specifies that PG&E's operational maintenance and heavy maintenance of FS facilities be consistent with FS standards, applicable laws, regulations, codes, and other legal direction. FS final Section 4(e) condition no. 33 specifies that PG&E would not be responsible for any future reconstruction of the FS facilities listed. The FS also specifies that PG&E collect and retain 100 percent of the FS-approved reasonable user fees at all FS recreation facilities that PG&E operates and maintains in accordance with Commission, FS, and applicable California Department of Boating and Waterways regulations. The FS specifies that these user fees be used to offset PG&E's operational maintenance, heavy maintenance, and reasonable administrative costs, with the intent that the fees would be sufficient to cover these costs over the term of the license,

Our Analysis

The O&M program is a component of the draft RRMP and has also been proposed by PG&E in the SA and recommended by the FS. Ongoing and adequate O&M of existing and future recreation facilities is critical to visitor enjoyment and effective recreation resource management. A partnership between PG&E and the FS for O&M of FS recreation facilities would be beneficial for a number of reasons: FS funding is often too low and unpredictable to adequately maintain facilities and meet growing needs; PG&E is able to provide more consistent management over the life of the license than the FS, which is subject to changing budgets based on Congressional appropriations; PG&E would be able to realize all receipts received from the recreational facilities which would provide substantially more revenues to invest in the facilities for maintenance and standard upgrades over the life of the license; adjacent project facilities would be managed more consistently, reducing visitor confusion over management practices; and funding for the facilities would be provided in a more efficient and consistent manner, which should result in improved public service and increased user satisfaction.

Interpretation and Education Program

As a component of the draft RRMP and identified in the SA, PG&E proposes to develop an I&E program for the project in consultation with the FS, Plumas County, and other stakeholders within 2 years after license issuance. PG&E proposes to submit the portion of the I&E program that pertains to FS facilities to the FS for its approval and to implement the program within 1 year of program approval by the Commission. PG&E proposes that the I&E program would provide information to enhance recreation experiences and encourage appropriate resource protection, cooperative and safe behaviors from project visitors. PG&E proposes that the I&E program would include themes, media, media design, prioritized sites, and prioritized services. Potential themes that PG&E proposes include fish and wildlife resources, volcanic history, hydropower, Native American cultures, pioneers, recreation activities and facilities available in the project area, and boating hazards. The program as PG&E proposes it in the SA would include improvements such as interpretive or informational signs, kiosks, reservoir boating safety and hazard information signs and brochures, and informational signs describing recreation facilities and opportunities in the area. PG&E proposes that development of improvements contemplated in the I&E program would be at recreation sites owned by PG&E and the FS that are to be included within the project boundary. PG&E also proposes that the I&E program would identify funding partnership arrangements with the FS and other interested parties, and would include a schedule for implementation. PG&E proposes to review facility naming practices with the FS and re-naming facilities with similar names to reduce visitor confusion. PG&E proposes that wording of entrance signs to facilities operated by PG&E but owned by the FS would be completed in agreement with the FS. PG&E also proposes to prepare a Lake Almanor bathymetric (underwater topographic) map within 1 year of license issuance, which would be available in pamphlet form to area boaters and posted on signs at Lake Almanor public boat ramps.

In its November 4, 2004, filing with the Commission, the FS specifies in final Section 4(e) condition no. 34, that PG&E develop an I&E program with the same elements as PG&E's proposed I&E program, including developing the program within 2 years of license issuance.

Our Analysis

The I&E program is a component of the draft RRMP and has also been proposed by PG&E in the SA. Development of an I&E program would help provide a means to disseminate information regarding project-area resources, facilities, and management issues to members of the public who currently use the project area and to members of the public who may be interested in using the area. This information would provide a means to help educate the public about safety factors to consider within the project area and the potential effects of recreational use on sensitive project-area resources. An I&E program

would also help with coordination of the types of information that should be provided to the public and the best methods for providing it.

The proposed bathymetric map would provide valuable information such as submerged hazards and pool depth to boaters that visit Lake Almanor. The map would be especially useful during times of the year when the water level of Lake Almanor is below full pool. PG&E's proposal to provide copies of the bathymetric map at the public boat ramps on Lake Almanor would ensure that the boaters who launch their watercraft there have been exposed to information included on the map such as underwater boating hazards, and may improve the recreation experiences of these individuals as well as enhancing safety.

Recreation Monitoring Program

As a component of the draft RRMP and identified in the SA, PG&E proposes to complete a recreation monitoring program in consultation with the FS, Plumas County, and other interested parties within 1 year after license issuance. PG&E proposes to submit that portion of the recreation monitoring program pertaining to FS facilities to the FS for its approval. In the recreation monitoring program, PG&E proposes adopting the limits-of-acceptable-change (LAC)-based monitoring approach as described in the October 2002 draft of the RRMP. This approach includes recreation monitoring indicators and standards that would initiate management action to help maintain desired recreation experiences and resource conditions at project recreation areas over the license term. PG&E proposes specifically monitoring the following recreation areas at a minimum: the water surface of project reservoirs, and PG&E and FS recreation facilities and shoreline areas within the project boundary. PG&E proposes including a schedule of information to be collected annually, every 6 years, or every 12 years in the recreation monitoring program. PG&E also proposes more in-depth monitoring, such as visitor questionnaire surveys and general assessment of regional recreation trends at 12-year intervals. PG&E proposes preparing periodic monitoring reports every 6 years in conjunction with FERC Form 80 recreation facility and use monitoring requirements. As part of the monitoring program, PG&E proposes conducting annual recreation planning and coordination meetings with other recreation providers in the project area to discuss recreation resource management decisions for the project area, implementation of project recreation enhancements, recreation monitoring results, potential grant applications, and other pertinent project-related recreation issues that may arise over the term of the new project license. If recreation test river flows are conducted, PG&E proposes to develop a study plan to monitor recreation use during the test flow period and producing a report on monitoring results in consultation with the FS and other interested parties.

In its December 1, 2003, filing with the Commission, the FS recommended, as preliminary Section 4(e) condition no. 42, that PG&E prepare a recreation monitoring and survey plan in consultation with the FS, Plumas County, and other interested parties that would be approved by the FS and filed with the Commission within 12 months of

license issuance. The FS also recommended that PG&E complete FS-approved reports on recreational resources and file them with the Commission. The FS wanted to reserve the right to require changes in the project and its operation, after notice and opportunity for comment and administrative review, through revision of the Section 4(e) conditions that require measures necessary to accomplish protection and utilization of National Forest resources identified in those surveys. The rest of preliminary Section 4(e) condition no. 42 is consistent with the proposal in the SA.

In its November 4, 2004, filing with the Commission, the FS specifies in final Section 4(e) condition no. 35 developing a recreation monitoring program with the same elements as PG&E's proposed recreation monitoring program, including development of the program within 1 year of license issuance.

Our Analysis

The recreation monitoring program is a component of the draft RRMP and has also been proposed by PG&E in the SA. Implementation of a recreation monitoring plan would provide measures to assess the adequacy of the recreational facilities, the effects of recreational use on the project area's resources, recreational-use capacity issues, and the opportunity to adjust recreational facility development and management over the term of a new license.

The proposed stakeholder consultation and annual recreation coordination and planning meetings would ensure that all of the recreation providers and managers are in agreement with regard to the necessary improvements at the project. Implementation of the recommended recreation monitoring plan and associated stakeholder consultation would provide the opportunity for the review of the recreational facilities and maintenance over the term of the license.

A report on the recreation monitoring and coordination would allow the Commission to review the proposed recreation facilities as they are planned or as modifications are required over the course of the license. Such a report would be best suited to a similar time schedule as the FERC Form 80 requirements. This report could include the recreational monitoring results, documentation of consultation, and a summary of planned recreational facility improvement measures or resources protection mitigation measures associated with the recreational facilities within the project boundary, schedule information, the party responsible for funding and implementing the measures, estimated costs for implementation, and the entity responsible for the long-term maintenance and management of the planned recreational facilities and/or mitigation measures.

Resource Integration and Coordination Program

As a component of the draft RRMP and identified in the SA, PG&E proposes to hold annual public meetings to coordinate recreation resource needs with other resource

management needs such as cultural, wildlife, and aquatic resources with appropriate agencies and stakeholders over the term of the new project license.

In its December 1, 2003, filing with the Commission, Interior recommended that PG&E develop a recreational activities monitoring plan, to monitor the potential effects of camping, angling, access, and boating flows (if adopted) on fish and wildlife resources. Interior would like for elements of the plan to include a comparison of data on recreational activities use, distribution, and expansion to fisheries and raptor monitoring data. Interior would also like for the plan to include elements to assess the effects of recreational use and facility development on local vegetation resources.

In its November 4, 2004, filing with the Commission, the FS specifies in final Section 4(e) condition no. 36, developing a resource integration and coordination program with the same elements as PG&E's proposed resource integration and coordination program.

Our Analysis

The resource integration and coordination program is a component of the draft RRMP and has also been proposed by PG&E in the SA. A similar program has been recommended by Interior. Results of the recreation monitoring conducted at the project would provide information on the effects of recreational use on the project area's resources and the opportunity to adjust recreational facility development and management over the term of a new license. Monitoring of recreation at the project should be designed so that effects on a variety of resources are addressed, not just recreation-related interests. This would help ensure that minimal adverse effects on the project area's sensitive resources, such as cultural resources, would occur as a result of project-area recreational use.

A number of parties have oversight for and an interest in various natural resources, commercial interests, and community interests that may be affected either positively or negatively by recreational pursuits. By holding specific coordination meetings, information obtained in previous years, as well as results of current surveys can be reviewed and discussed. Data obtained from ongoing recreation surveys would assist in making any needed changes in management of the area and for future planning.

Recreation Resource Management Plan Review and Revision Program

In the draft RRMP and in the SA, PG&E discusses unforeseen recreation needs, changes in visitor preferences and attitudes, and new recreation technologies that would likely occur over the term of the license. PG&E proposes that the frequency with which the RRMP is revised or updated should be dependent on significant changes to existing conditions, monitoring results, and management responses made over time. Therefore, PG&E proposes that the frequency of RRMP updates should not exceed every 12 years and should be based on consultation with the FS, other parties to the SA, and the

SWRCB, and other interested parties during monitoring and coordination meetings and through other appropriate sources.

In its November 4, 2004, filing with the Commission, the FS specifies in final Section 4(e) condition no. 37 developing a RRMP review and revision program with the same elements as PG&E's proposed RRMP review and revision program.

Our Analysis

The RRMP review and revision program is a component of the draft RRMP. Updating the RRMP at 12-year intervals allows for two FERC Form 80 reporting periods to take place before any changes to the RRMP may occur. Additionally, meeting every 6 years to review the data provided in the FERC Form 80 report would provide PG&E and interested stakeholders the opportunity to identify and assess changes and trends that have occurred or are occurring over time, and to distinguish them from simple annual variability. Therefore, any changes to the RRMP would be appropriate and would address needed change in the direction of the program. As stated above, the proposed stakeholder consultation, monitoring, and reporting would ensure that the needs of the public are met throughout the term of the license.

Final Recreation Resources Plan

In its December 1, 2003, filing with the Commission, Interior recommended, in its Section 10(a) condition no. 2, that PG&E develop a final recreation resources plan that provides for a diverse range of recreational opportunities on Lake Almanor and the river reaches including a comprehensive listing of capital investments, facility enhancements, and programmatic elements and delineate which entity is responsible for paying for such investments and improvements and have a schedule indicating when it would take place.

Our Analysis

PG&E proposes to finalize the draft RRMP in consultation with the FS and Plumas County within 1 year of license issuance. The six programs included in the draft RRMP, described in detail above, would address Interior's recommendation.

Fishery Programs

PG&E proposes to annually provide up to \$50,000 (2004 escalated dollars) to: (1) reimburse CDFG for stocking approximately 5,000 pounds of catchable trout per calendar year in the waters of the NFFR between its confluence with the EBNFFR and the Belden diversion dam; and (2) to augment CDFG's existing Lake Almanor fisheries program. PG&E proposes that its cost for fish stocking in the NFFR should be the actual average hatchery production cost per pound to the CDFG, and any applicable distribution and planting costs. PG&E also proposes that any augmented fisheries program in Lake Almanor may include, but is not limited to, such projects as the expansion of the pen rearing program and the construction of rearing habitat for warmwater fish.

In its final Section 10(a) condition no. 32(4), filed November 4, 2004, the FS recommends the same proposal for funding the fishery programs as PG&E.

Our Analysis

Bank fishing is one of the most popular dispersed uses in the project's bypassed reaches. Also, the CDFG has a long history of developing and maintaining the popular reservoir fishery in Lake Almanor. The fishery in Lake Almanor is primarily for salmonids (trout and related species) and bass (smallmouth and largemouth). Since the salmonid fishery is not self-sustaining, CDFG annually stocks large numbers of hatchery-reared fish in Lake Almanor. According to PG&E's recreation visitor survey results, approximately 71 percent of the visitors to Lake Almanor have fished at Lake Almanor and fishing was the second most common activity enjoyed at Lake Almanor.

According to studies completed by PG&E, demand for fishing is currently high in California. In the UNFFR Project area, 71 percent of visitors participate in fishing either from the shoreline or from a boat. PG&E determined that fishing is increasing in demand in the project area annually at 0.6 percent for both boat angling and bank angling. Demand for each of these types of angling is expected to increase by 23 percent in the project area over the term of the license. However, fishing has been experiencing a decrease in the number of participants in California, based on the number of fishing licenses sold from 1996 to 2000. The sale of both resident and non-resident fishing licenses has decreased nearly 10 percent since 1996, with non-resident 10-day licenses experiencing the largest decrease (approximately 14 percent). PG&E conducted a study of overall fishing needs in the project area, and availability of catchable fish was not considered an issue. However, we believe that maintaining the current stocking program at the project is beneficial at this time. Visitors to the project currently enjoy fishing there and may tailor their fishing trip in anticipation of catching certain species of fish currently stocked in the project area. PG&E proposes monitoring recreational activities on the surface of project reservoirs and along the shoreline areas within the project boundary, as part of its recreation monitoring program included in the draft RRMP. Information on fishing use at the project would be determined through these activities, and the need to continue or modify the fish stocking program over the term of the license should be addressed as part of the monitoring program.

River Ranger Funding

PG&E proposes providing up to \$25,000 (2004 dollars) to the FS by March 1 of each year of the new project license to assist in funding a river ranger position to provide additional light maintenance, visitor information/assistance, user safety, and law enforcement presence in the project's bypassed river reaches. PG&E further proposes that, by January 31 of each year during the term of the new license, the FS would provide it with a written summary of the previous year's expenditures and river ranger activities and the current year's planned expenditures and river ranger activities. FS final Section

4(e) condition no. 38, filed November 4, 2004, also specifies the same proposal as PG&E's.

Our Analysis

The addition of a river ranger along the project river reaches could enhance the recreation experiences of some of the visitors to the project river reaches. The implementation of a seasonal position would likely increase visitor awareness of federal, state, county, and local regulations and laws. This increase in awareness could lead to an increase in compliance with those laws and regulations, and a greater degree of resource protection resulting from increased compliance. In addition, the position would provide opportunities to increase visitor satisfaction by helping to disseminate project information at various recreation facilities throughout the project area.

However, law enforcement at the UNFFR Project is the responsibility of the FS and Plumas County. PG&E pays property taxes to Plumas County that relate to the operation of its UNFFR Project. A portion of the tax payment would be expected to fund law enforcement activities associated with continued project operation. The FS is responsible for enforcing the natural resource protection provisions of the Plumas National Forest LRMP. Neither Plumas County nor the FS has provided any data to indicate the need for PG&E to fund a river ranger position to patrol the UNFFR Project area. Security at the project development is the responsibility of PG&E.

We find no indication that law enforcement within the project area is inadequate, or that additional assistance is needed to complement the current levels of law enforcement. PG&E has proposed, and the FS has specified, that PG&E provide \$25,000 a year to the FS to assist in funding a river ranger position in order to provide additional light maintenance, visitor information/assistance, user safety, and law enforcement presence in the project's bypassed river reaches. However, funding a river ranger position, as specified and proposed, provides no assurance that the river ranger would be used exclusively in the project area, in addition to the current levels of patrols in the project area. As such, there is no indication that the proposed measure would reduce any existing recreational conflicts or further protect project environmental resources for the term of the new license.

Recreation River Flow Management

Recreation River Flow Technical Review Group

PG&E proposes establishing a TRG within 6 months of license issuance for the purpose of consulting with PG&E in the design of recreation and resource river flow management and monitoring plans, reviewing and evaluating recreation and resource data, and in developing possible recreation river flows in the Belden reach. The TRG would include representatives of the FS, CDFG, SWRCB, FWS, NPS, Plumas County, and other parties to the SA. TRG meetings would be open to and accept comments from

the public. PG&E proposes maintaining, and making public, records of TRG meetings, and forwarding those records with any recommendations to the FS, SWRCB, and the Commission. PG&E also proposes establishing communication protocols in consultation with the TRG to facilitate interaction among TRG members, which would allow for open participation, consultation with independent technical experts, and communication among all TRG participants.

FS final Section 4(e) condition no. 28(1) also specifies the same proposal as PG&E's.

Recreation Flow Implementation Plan

PG&E proposes implementing the following RFIP:

1. **Determination to Proceed with Test Flows**—Within 6 months after license issuance, PG&E proposes convening the TRG to evaluate the existing available ecological information regarding recreation river flows to make a determination whether (a) sufficient information exists to conclude that recreation river flows would result in unacceptable impacts on sociological or ecological resources; or (b) recreation river test flows as prescribed in table 3-32 should be conducted to further evaluate the ecological and social effects of the recreation river flows in the Belden reach. If the TRG determines that recreation test flows should be conducted, it would not recommend any flow schedule that exceeds the frequency, magnitude, or duration of flows prescribed in table 3-32. Within 6 months of convening the TRG, PG&E proposes forwarding the TRG recommendations regarding recreation test river flows to the FS and SWRCB.
2. **Approvals to Proceed with Test Flows**—If the TRG recommends that recreation test river flows in the Belden reach should be conducted, the FS and SWRCB would consult with appropriate state and federal agencies, PG&E, tribal governments, and other interested parties prior to approving, denying, or modifying the TRG's proposal. If the FS and SWRCB approve a proposed schedule for recreation test river flows that does not exceed the frequency, magnitude, or duration of flows prescribed for any given month in table 3-32, then PG&E proposes submitting the proposal to FERC for approval.
3. **Conducting Test Flows**—Upon approval from FERC, PG&E proposes conducting the recreation test river flows as prescribed in table 3-32 for a 3-year period.
4. **Monitoring**—PG&E proposes preparing and submitting to the FS and SWRCB for their review and approval, concurrent with the TRG recommendation, a Belden reach recreation test river flow evaluation plan. Upon FS and SWRCB approval, PG&E proposes submitting the plan to

FERC for approval. The plan would be designed to evaluate the effects of the recreation test river flow releases on ecological and social resources, and the metrics to be used in this determination. Upon approval of the plan by the Commission, PG&E proposes implementing the plan during the 3-year recreation test flow period.

5. **Determination of Continued Flows**—After the 3-year recreation test river flow period, PG&E proposes convening the TRG to evaluate the existing available ecological and social information. The TRG would make a recommendation regarding whether recreation river flows should be continued to meet the river flow management for recreation objective. The TRG would not recommend any flow schedule that exceeds the frequency, magnitude, or duration of flows prescribed for any given month in table 3-32.
6. **Approval of Results of Determination of Continued Flows**—Any recommendation regarding continued recreation river flows made by the TRG would be submitted to the FS and SWRCB. The FS and SWRCB would consult with appropriate state and federal agencies including FWS, PG&E, tribal governments, and other interested parties prior to approving, denying, or modifying the TRG's proposal. If the FS and SWRCB approve a proposed schedule for continued recreation river flows that does not exceed the frequency, magnitude, or duration of the flows prescribed for any given month in table 3-32 below, PG&E proposes submitting the proposal to FERC for approval.

FS final Section 4(e) condition no. 28(2) specifies that PG&E would implement the RFIP as described above.

Recreation River Flows

PG&E proposes implementing the recreation river flow schedule and other provisions presented in table 3-32, subject to the RFIP described above.

Recreational Flow Calendar and Additional Flow Days

PG&E proposes posting an annual recreation flow calendar scheduling the initial recreation flow day per month through a third party or other mechanism. PG&E proposes conducting an annual planning meeting each year in March to discuss expected water year type, results of monitoring efforts, PG&E maintenance needs that may conflict with recreation flow releases, and other relevant issues. PG&E further proposes that the TRG recommend the desired date of the month for any additional recreation river flow release days triggered by the number of boats per day as described below based on evaluation of social and ecological considerations.

Table 3-32. Belden reach recreation river flow schedule.^a (Source: PG&E, 2004a)

Month	Release Amount (cfs)		Release Days Per Month				Boats Per Day Triggers	
	Dry/ Crit. Cry	Norm./ Wet	Crit. Dry Start	Crit. Dry Cap	Dry/ Norm./ Wet Start	Dry/ Norm./ Wet Cap	Wet and Normal/Dry	
							Up	Down
July	650	750	1 day	1 day	1 day	2 days	>100	<100
Aug/Sep/ Oct	650	750	1 day	1 day	1 day	2 days	>100	<100

Notes: Water year types are determined by PG&E based on the predicted, unimpaired inflow to Lake Oroville and the spring snowmelt runoff forecasts provided by PG&E and CDWR each month from January through May. Water year types are defined as follows:

- Wet Water Year Type—greater than or equal to 5,679 thousand acre-feet (TAF) inflow to Oroville is predicted.
- Normal Water Year Type—less than 5,679 TAF, but greater than or equal to 3,228 TAF inflow to Oroville is predicted.
- Dry Water Year Type—less than 3,228 TAF, but greater than or equal to 2,505 TAF inflow to Oroville is predicted.
- Critically Dry Water Year Type—less than 2,505 TAF inflow to Oroville is predicted.

^a Flow releases would occur between the hours of 10 a.m. and 4 p.m. for the first day and between the hours of 10 a.m. and 2 p.m. for the second release day during wet and normal water years, and between the hours of 10 a.m. and 1 p.m. during dry and critically dry years for both release days.

Recreation River Flow Postponement

PG&E proposes postponing any scheduled recreation river flow release in the event of an emergency. PG&E proposes providing as much notice as reasonably practicable under the circumstances.

If practicable, PG&E proposes rescheduling postponed recreation river flow releases as recommended by the TRG.

Triggers for Adjustments

During scheduled recreation river flows, PG&E proposes counting observed boater use in number of boats per day to determine whether recreation flow release days should be added or subtracted. All boats would be counted as one boat except for rafts 12 feet or greater in length, which would be counted as two boats. All boats observed on the

Belden reach for any part of a given day would be counted. If the number of boats per day on the first recreation river flow day for a month exceeds 100 boats per day, one day of recreation river flow would be added to the recreation river flow schedule in that month the next year. If the number of boats per day is less than 100 boats per day for both the recreation river flow releases in one month, one day of recreation river flow would be subtracted from the recreation river flow schedule for the that month in the next year. Recreation river flow releases would not decrease below one day per month and would not exceed the cap defined in table 3-32. Recreation river flow release days would not be added or subtracted during any period of recreation test river flows.

PG&E also proposes developing and implementing a visitor survey for up to 3 years to determine if visitors would choose to return to recreate on the Belden reach based on their experience related to the number of boats encountered on the river. The visitor survey questionnaire and methodology would be statistically valid and approved by the TRG. The TRG would evaluate the survey results and other data to determine if the trigger for adding/deleting days, based on the number of boats per day, should be amended based on this analysis.

Ramping Rates

PG&E proposes applying the basic ramping rates when implementing recreation river flows. The basic ramping rate at Canyon dam is 0.5 foot per hour up and down, in all months, as measured at NF-2. The proposed basic ramping rate at Belden dam is also 0.5 foot/hour up and down, in all months, as measured at NF-70.

Streamflow Information

PG&E proposes creating a calendar that lists the dates of the March pulse flow in the Seneca reach and any scheduled pulse flow or recreation river flow releases in the Belden reach, and making that calendar available on the Internet through a third party or other mechanism. The calendar would state the timing and magnitude of the scheduled flow release. The March pulse flow release in the Seneca reach would be posted by February 15, and the scheduled summer releases in the Belden reach would be posted by May 15. If PG&E anticipates releasing flows of a similar magnitude and duration as a scheduled pulse flow in the Seneca or Belden reaches, it proposes posting an estimate of the release magnitude and duration of the flow.

In its Section 10(a) condition no. 1, filed December 1, 2003, Interior recommends that PG&E implement a flow schedule similar to the one shown in table 3-31, and concurred with the elements for managing the recreation river flow listed in the SA, including the establishment of a TRG and the consideration of river test flows.

CDFG, in its November 26, 2003, letter to the Commission, indicates that it would support the recreation river flow management program as proposed in a previous version of the SA. CDFG states that it supports this proposal since the agreement language states

that the recreational flow proposal would go forward only if the available information suggests that there would be no unacceptable impacts on sociological and ecological resources.

In their December 1, 2003, letter to the Commission, AW, Chico Paddleheads, and Shasta Paddlers concur with the recreation river flow proposal included in a previous version of the SA with the following exceptions: including whitewater releases during the month of June; modifying the number of boaters necessary to trigger modification of whitewater releases to 80 boaters for the up-trigger and 25 boaters for the down-trigger; scheduling dates for the actual releases in coordination with releases on the Rock Creek-Cresta Project; and an adaptive management team limited to parties to the SA with responsibility for providing recommendations to the regulatory agencies and PG&E and no decision-making authority.

In its response to AW, Chico Paddleheads, and Shasta Paddleheads in a letter filed with the Commission on January 15, 2004, PG&E disagrees with the recommended number of boaters necessary to trigger modification of the whitewater flow releases and explained the calculation and rationale used in the license application to determine the boater use trigger.

In its final Section 4(e) condition no. 28(3), filed November 4, 2004, the FS specifies the same flow schedule, triggers for adjustments, ramping rates, and streamflow information provision as are in PG&E's proposal.

Our Analysis

The proposal to provide recreational whitewater flows in the Belden reach would, if implemented, enhance whitewater boating opportunities in the area. The proposed TRG would ensure that whitewater boating provisions would not cause irreversible damage to terrestrial, aquatic, or other recreational values in the Belden reach of the UNFFR, such as habitat for sensitive wildlife species, riparian vegetation, and developed and dispersed camping in the Belden reach. The up and down triggers for increases and decreases of the number of days would ensure that the benefits of the whitewater releases are commensurate with demand. The trigger numbers that were developed for the Rock Creek-Cresta Project may not necessarily be appropriate for this project. Given the features of the Belden reach and relative inaccessibility, up and down triggers specific to the Belden reach developed by the TRG would provide triggers that are more appropriate. As stated in section 3.3.4, *Threatened and Endangered Species*, there is a potential for recreational whitewater flows to negatively affect the federally threatened bald eagle if they occur during prime foraging hours. The TRG should give special consideration to these potential conflicts caused by the provision of whitewater flows during June and July to ensure that such effects are not realized. Certainly, whitewater boaters would benefit from releases during these months; however these benefits should be balanced with effects on other resources.

During 2000, PG&E conducted a flow assessment for recreational use within the UNFFR bypassed reaches. The study assessed recreational opportunities including whitewater boating and angling within the bypassed reaches and the effects of flows on these activities. Whitewater boaters ran the rivers at approximately 350, 600, and 850 cfs. As a result of the study, PG&E determined that flows from about 700 to 850 cfs are would likely provide quality standard trips for both kayaking and rafting. Lower flows, such as approximately 600 cfs, would provide a starting point for quality kayaking opportunities, but that flow would be below optimal levels for rafting. Flows above 850 cfs would provide more powerful hydraulics and smaller recovery areas associated with challenging whitewater boating opportunities. PG&E's proposed release flows of 650 and 750 cfs fall within the range necessary for providing good boating opportunities.

PG&E proposes providing a calendar that lists the dates of the March pulse flow in the Seneca reach and any scheduled pulse flows or recreation river flow releases in the Belden reach for the public (including anglers and boaters) via an Internet site. This information would help inform the public about flow-related recreational opportunities within the river reaches. The calendar would state the timing, magnitude, and duration of any scheduled flow release. This information could deter unqualified boaters from beginning a run that is too dangerous for their skills and alert anglers of difficult stream fishing conditions.

Belden Interagency Recreation River Flow Management Plan

If a determination is made to proceed with scheduled river recreation flows, PG&E proposes to coordinate with the FS, Plumas County, and CalTrans to develop an MOU to produce the Belden interagency recreation river flow management plan. This plan would address management and integration of recreation opportunities provided by the Belden recreation river flow release with other river recreation opportunities in the watershed. The plan would address establishment of visitor capacity thresholds, maintenance of facilities, signage, traffic management, and monitoring. PG&E proposes that the plan and the MOU would not be financially binding, but would document agency roles, responsibilities, and intentions related to river recreation management. PG&E further proposes terminating the plan and the MOU if recreation river flow releases are not continued after an evaluation period. FS final Section 4(e) condition no. 29 also specifies the same proposal as PG&E.

Our Analysis

The proposal to provide recreational whitewater flows would enhance whitewater boating opportunities in the area. The proposed interagency recreation river flow management plan would provide guidance to ensure that whitewater boating provisions would not cause unintended damage to terrestrial, aquatic, or other recreational values in the Belden reach of the UNFFR. Results of the evaluation of any test flows provided in the reach would provide information on the effects of recreation flows on other river recreation opportunities in the watershed. The plan would be designed so that effects on

a variety of resources are addressed, not just recreation-related interests. This would help minimize adverse effects on any sensitive resources in the Belden reach, such as riparian and wetland habitat, from recreational flows. Additionally, the plan would enhance recreation provisions along the river reaches and would provide guidance in regard to roles and responsibilities along the river reaches.

Reservoir Levels and Annual Meeting with Plumas County

In the SA, PG&E proposes to meet annually with a committee appointed by the Plumas County Board of Supervisors between March 15 and May 15 in order to inform the committee about the water elevation levels of Lake Almanor predicted to occur between May 1 and September 30. Additionally, PG&E proposes to schedule an additional meeting with the committee if PG&E forecasts that its obligation to deliver water to the State of California and the Western Canal Water District pursuant to the January 17, 1986, agreement would require it to deviate from the Lake Almanor water elevation levels previously predicted.

FS final Section 4(e) condition no. 30(12) specifies that PG&E participate in an annual meeting with the Plumas County Board of Supervisors as described above.

Our Analysis

In the SA, PG&E proposes to operate Lake Almanor and the other reservoirs at a higher level than is currently practiced. However, lake levels vary depending on the type of water year forecasted. Informing Plumas County of predicted Lake Almanor water surface elevations in the spring would facilitate its understanding of conditions that are likely to occur during the subsequent high-use recreation season.

Potential Measures to Reduce Water Temperature

As detailed in section 3.3.1.2, as part of the SA for the Rock Creek-Cresta Project, PG&E agreed to evaluate the effectiveness of modifying UNFFR Project's Prattville intake as a temperature control measure for the downstream reaches of the NFFR. PG&E has been conducting feasibility studies, including modeling the water temperature effects of potential Prattville intake modifications, re-operation of the Canyon dam outlet gates, and modification of Caribou No. 2 intake for the past few years. Appendix D of this EIS provides an initial evaluation of the advantages and disadvantages of 42 potential measures that could affect water temperatures and identifies the five measures we analyze further in section 3.3.1.2, *Water Resources*, of this EIS.

Two of the measures evaluated by PG&E and described in section 3.3.1.2 include the installation of a thermal curtain in front of the Prattville intake. The Prattville intake is located in a steep-sided trough in a cove of the relatively shallow western lobe of Lake Almanor. Black & Veatch (2004) conducted a feasibility study of alternatives to lower water temperature based on results of the hydraulic model testing conducted by the IIHR, and provided a conceptual design for installing a U-shaped thermal curtain in this

location. Two sides of the thermal curtain described by Black & Veatch would extend approximately 900 feet from two locations on the shore, with an approximately 770-foot-long thermal curtain parallel to the lakeshore connecting them. The curtain would be supported on the lake surface by a floating boom of steel cables connecting floating galvanized steel tanks. Large floating stabilizing buoys, also of galvanized steel, would be attached to the floating boom with chains to assist with holding the curtain in place.

To minimize public safety hazards, warning signs would be installed offshore to inform the boating public of the existence of the thermal curtain. Public warning buoys (standard lighted Coast Guard warning buoys) also would need to be installed beyond the location of the thermal curtain.

Our Analysis

Lake Almanor is formed by two main lobes or branches; the western lobe or the Chester branch, and the eastern lobe or the Hamilton branch. On average, the eastern lobe is considerably deeper than is the western lobe. The two lobes of Lake Almanor are connected at a narrow region locally called the “Narrows.” A peninsula extends into the lake at the Narrows, and acts to partially isolate the eastern and western lobes. The Prattville intake is located just off the southwest shore of the lake’s western lobe, in a small cove just northwest of the Narrows.

Access currently is restricted in the area immediately surrounding the Prattville intake for safety reasons. Just beyond the Prattville intake, orange buoys are suspended across the small cove where the intake is located. The thermal curtain would eliminate boating access near the cove where the intake is located, since it would extend approximately 900 feet into Lake Almanor. According to the California Department of Boating and Waterways regulations, boaters must limit their speed to 5 mph or less when within 100 feet of a bather or within 200 feet of a swimming beach, dock, or marina and, according to a Plumas County ordinance, boaters must limit their speed to 5 mph or less when within 300 feet of any buoy or boom. At this time, the low speed zone in Lake Almanor is 300 feet from the buoy line located just beyond the Prattville intake. If the thermal curtain and its associated public warning buoys are added, a low speed zone over 830 feet wide would extend for more than 1,200 feet from the shore. In this narrow section of the lake, the space available for boaters to travel at speeds greater than 5 mph would be greatly reduced by the presence of the thermal curtain, increasing the likelihood of boating accidents. Additionally, boaters, water skiers, and bathers no longer would have access to approximately 16 acres of Lake Almanor occupied by the thermal curtain and the public warning buoys.

We present the estimated cost of all measures that pertain to recreational resources in chapter 4, *Developmental Analysis*, and make our final recommendations regarding these measures in section 5.1, *Comprehensive Development and Recommended Alternative*.

3.3.5.3 Unavoidable Adverse Effects

None.

3.3.6 Land Use and Aesthetic Resources

3.3.6.1 Affected Environment

The UNFFR Project developments span a 30-mile reach of the UNFFR and 4 miles of the Butt Valley drainage and encompass roughly 31,060 acres of land within the project boundary (see figure 1-1). A total of 1,024 acres of federally owned lands are located within the project boundary. Of this acreage, the FS administers about 986 acres of federally owned land within the project boundary. The Lassen National Forest manages approximately 577 acres, and the Plumas National Forest manages approximately 409 acres. The BLM manages the remaining 38 acres of federal land. Approximately 3 acres of land within the project boundary is privately owned. The entire project is within Plumas County.

The general character of the lands in the region surrounding the project includes residential, transportation, parks and recreation, and open space. Much of the region consists of low-density residential and undeveloped lands. The aesthetic character of the area is generally forested. The highways and trails in the area offer scenic views of the lakes, streams, waterfalls, and surrounding mountains.

Land Use

Project Reservoirs

Lake Almanor—Lake Almanor is a 27,000-acre reservoir formed by the 135-foot-high earth-filled Lake Almanor dam. The shoreline of Lake Almanor consists of extensive recreation and residential development. There are more than 1,000 residential lots adjacent to Lake Almanor, as well as 22 commercial resorts and 13 public recreation sites. Highways run along all sides of Lake Almanor, which provides easy access to the area. The principal highways are State Routes (SR) 36, 89, and 147.

Butt Valley Reservoir—Butt Valley reservoir has a surface area of 1,600 acres and is more rural in character than Lake Almanor. The FS manages the lands that completely surround the PG&E-owned Butt Valley reservoir. This reservoir sits within a fairly narrow wooded valley with no commercial or residential uses.

Belden Forebay—The Belden forebay is the smallest of the project reservoirs with a surface area of approximately 42 acres. The Belden forebay is surrounded by the Plumas National Forest, and the shoreline adjacent to the forebay is undeveloped. The northwest boundary of the reservoir is along Caribou Road.

Stream and River Reaches—The project's stream and river reaches are within a canyon that is a deep and narrow valley. Other than the PG&E town of Caribou, there are no commercial or residential developments in this area.

Land Management Plans

The project area falls within several different land management areas and therefore is subject to the following land management plans.

Sierra Nevada Forest Plan Amendment

The Sierra Nevada Forest Plan Amendment establishes the management direction for five problem areas: old forest ecosystems and associated species; aquatic, riparian, and meadow ecosystems and associated species; fire and fuels management; noxious weeds; and lower westside hardwood forest ecosystems. It amends the LRMPs for nine National Forests within California including the Lassen and Plumas LRMPs. It also amends the regional guides for the Intermountain and Pacific Southwest regions. The Sierra Nevada Forest Plan Amendment serves as an overlay to existing forest plan designations and only replaces standards and guidelines of the LRMPs that conflict with it. Within the project area, this plan applies only to NFS lands managed under the Lassen and Plumas LRMPs, namely the area along the southwestern shoreline of Lake Almanor, the land surrounding Butt Valley reservoir and the Belden forebay, and the land along the Belden and Seneca reaches.

The primary objective of the Sierra Nevada Forest Plan Amendment is to conserve important components of the landscape such as stands of mid-seral and late-seral forests with large trees. Riparian conservation area designations are provided along streams and around water bodies to preserve, enhance, and restore habitat for riparian and aquatic-dependent species as well as ensure that water quality is maintained or restored. There are also important and wide-ranging new land allocations for fire and fuels management. The plan attempts to link potential fuel treatment areas to support one another on the landscape so that wildland fire spread and intensity are reduced.

The majority of the NFS lands along the southwestern shoreline of Lake Almanor, a little more than half of the NFS lands along the Seneca reach, and a small portion of the lands along the Caribou Road are designated general forest under the Sierra Nevada Forest Plan Amendment. General forest refers to lands outside other land prescriptions. The management focus of these lands limits fuel treatments to 75 percent of the stand and works toward increasing the amount of forest with late-successional characteristics such as diverse species composition, multi-layered canopy, and a higher density of large diameter trees. Most of the remaining NFS lands along the southwestern shoreline of Lake Almanor, nearly half of the NFS lands along the Seneca reach, and the majority of the lands along the Belden reach are classified as old forest emphasis. Management of old forest emphasis areas focuses on developing larger aggregations of old forest over time through reducing hazardous fuel conditions and re-introducing fire to reduce fuels

and meet ecological goals. Additionally, most of the NFS lands within the project are in the urban wildland intermix zone, which overlaps the other land designations. This zone, where human habitation is mixed with areas of flammable wildland vegetation, extends 1.5 miles out from areas where the population density indicates at least one structure per 40 acres. Management in the urban wildland intermix zone gives high priority to fuel reduction activities to protect human communities from wildland fires as well as minimizing the spread of fires that might originate in urban areas (FS, 2001).

Lassen National Forest Land and Resource Management Plan

The Lassen National Forest LRMP was finalized in 1992 and prescribes land management measures for NFS lands within or administered by the Lassen National Forest. Within the project vicinity, the Lassen LRMP applies to NFS lands on Lake Almanor's southwestern shoreline between Canyon dam and the Lake Almanor West subdivision. The Lassen National Forest administers 577 acres within the project boundary.

All the project lands and lands influenced by project operations that are managed under the Lassen National Forest LRMP fall within the Prattville management area, one of 48 specific management areas designated by the Lassen LRMP. The Prattville management area covers approximately 6,280 acres along the large southwestern shoreline area above Lake Almanor. Most of this management unit lies southwest of SR 89. The majority of intense public recreation is generally found along lands on the northeastern side of SR 89, although there is a group camp and rest area on the southwestern side of the highway. Approximately 480 acres are dedicated to recreation uses and management emphasis around the Almanor campground and neighboring summer housing area. Another 2,210 acres south of Prattville are now designated old forest emphasis areas under the Sierra Nevada Framework Plan Amendment. The Lassen LRMP specifically recognizes that the Prattville area is a highly used recreation area and identifies the need for a comprehensive recreation development plan for the Almanor campground and vicinity. However, snags, wetlands, and nest site protection are also important to protect waterfowl and raptors in the area, and the plan specifically calls for protection and enhancement of bald eagle nesting habitat at Rocky Point and Prattville.

Plumas National Forest Land and Resource Management Plan

The Plumas National Forest LRMP was finalized in 1988 and directs land management measures for NFS lands within or administered by the Plumas National Forest. Within the project vicinity, the Plumas LRMP applies to NFS lands near Canyon dam at the southern end of Lake Almanor, NFS lands around Butt Valley reservoir and Belden forebay, and the NFS lands along the Seneca and Belden reaches. The Plumas National Forest administers 409 acres within the project boundary.

All the project lands and lands influenced by project operations that are managed under the Plumas National Forest LRMP fall within one of four management areas

designated by the Plumas LRMP: Butt Lake, Rich, and a small portion of the North Fork and Indian Valley Management Areas. The Butt Lake management area includes all of the lands surrounding the Butt Valley reservoir and the area to the southwest of Canyon dam. The primary land allocation for NFS lands near Canyon dam is the protection of bald eagle habitat, which includes limiting human activities between November 1 and March 1 to minimize disturbance. The Rich management area includes the lower portion of the Belden bypassed reach just upstream of the confluence with the EBNFFR, and contains three small NFS campgrounds. The management direction for the Rich management area includes maintaining or improving recreation development in the area, eliminating some grazing uses, and reconstructing and surfacing the Caribou Road from Highway 70 to the old railroad bridge at Queen Lily campground. The Belden rest stop, which includes the trailhead for the Pacific Crest Trail (PCT), is located in the North Fork management area. Management direction for the North Fork management area includes maintaining this PCT trailhead and another one near Belden. The northwestern corner of the Indian Valley management area reaches Canyon dam and the Almanor scenic overlook.

Bureau of Land Management Plans

The BLM administers two parcels of land along the western shores of Lake Almanor. One 34-acre parcel is near the end of the runway at the Chester airport and is slated to be transferred to Plumas County. The area below the 4,500-foot-elevation is used for storing water for project purposes. The other parcel is an isolated 4-acre parcel within the Eagle Lake resource area and includes about 4 acres within the project boundary north of Chester. This parcel is used for grazing above the 4,500 foot elevation contour.

Plumas County General Plan

The Plumas County General Plan, as amended, presents goals and policies for private lands within the county and serves as a basis for all decisions regarding land use within the county. The plan elements most relevant to the project include land use, open space, seismic safety, scenic highways, noise safety, and conservation. The Plumas County General Plan addresses hydroelectric power generation under its constraints policies, and the expressed goal of the county is to encourage the use of water for hydroelectric generation to meet the energy needs of the county.

The Plumas County General Plan includes the Plumas County zoning ordinances, which prescribes regulations governing land use through the establishment of land use zones, parcel sizes, and placement of structures within the county. Much of the private land within and adjacent to the project boundary lies within residential zones, especially along Lake Almanor. Also prevalent along the shoreline of Lake Almanor are prime recreation zones, which allow marinas, resorts, and boat ramps, as well as dwellings. However, there are other private lands in commercial, recreation and timberland production zones (TPZs). TPZs are state-designated zones that are reserved for timber

production and compatible uses. In addition to the basic zoning designations, Lake Almanor and its shoreline are considered a scenic area, and scenic protection designations include additional planning measures.

The Plumas County General Plan also includes standards for scenic highways and roads including the Feather River Highway (SR 70) corridor, Highway 147 and SR 89, except where SR 89 crosses Canyon dam. SR 36 is designated scenic from Chester to the Lassen County line near Clear Creek, California. Almanor Drive West is an important roadway serving the Prattville area and many public recreation areas along the southwestern shoreline of Lake Almanor and is also designated as scenic. For each of these scenic roads, a 100-foot scenic corridor is designated from the outer edges of the road easement. Within these zones there are to be no “off-premise” advertising signs, and transmission and utility lines are to be located where they may be concealed by vegetation or topographical features.

Shoreline Land Management

PG&E maintains a public recreational policy that allows access to the project lands without compromising public safety, environmental resources, or interfering with the operation of the project for hydroelectric power generation. Although vehicular access is limited to developed recreation sites, numerous informal trails provide access to the reservoir shorelines. PG&E's policy also includes providing appropriate recreational facilities for public use, without discrimination, and providing general information about availability of recreational use through brochures, notices, and signs.

All project shorelines are open to the public because they are either PG&E lands or public domain lands administered by the FS. Access to project shorelines is variable, with most areas accessible by foot or boat, and specific areas accessible by bicycle, wheelchair or motorized vehicles. Vehicle access is available at all commercial and public recreation sites, as well as several locations where public road rights-of-way parallel project shorelines.

Lake Almanor

Lake Almanor is a highly developed reservoir with more than 1,000 adjacent residential lots, 22 commercial resorts, and 13 public recreation developments (seven PG&E developments and six FS developments). The shoreline of Lake Almanor spans a distance of more than 52 miles. Most of the private residential lots are developed with single-family residential structures. The project boundary around Lake Almanor is generally defined by the 4,500-foot elevation contour (PG&E datum). In five locations the project boundary extends upland above 4,500 feet elevation to encompass Canyon dam and spillway, the Prattville intake, and PSEA camp, as well as several recreation facilities. A large portion of the southwestern Lake Almanor shoreline is federal land managed by the Lake Almanor Ranger District of the Lassen National Forest and the Mt. Hough Ranger District of the Plumas National Forest. The BLM manages another two

parcels of federal land in the northern half of the western shoreline. PG&E owns the remaining 97 percent of the land along the shoreline within the project boundary.

The shoreline within the project boundary serves as a buffer zone surrounding the reservoir. This buffer zone protects the reservoir from encroachments or other competing uses that might degrade the natural resource conditions important to the region and also protects the recreational and aesthetic values of the reservoir. The public can access most of the shoreline by foot or boat. Most of the western shoreline is accessible by pedestrians since it is near the town of Chester; the topography is relatively flat, and the vegetation is grass and shrub land. In non-developed areas on the southeastern shoreline, the land is steeper, making pedestrian access impractical for most individuals. Access is restricted in the areas immediately surrounding Canyon dam and the Prattville intake for safety reasons.

There are several roaded access points at Lake Almanor along SR 147, 36, and 89, including at least two side roads accessing the reservoir off of Almanor Drive West, southeast of Prattville. PG&E seasonally closes some roads along upper Lake Almanor to minimize disturbance to bald eagles, and permanently gates or blocks off lesser used private roads to prevent vehicular damage to archaeological sites.

On June 10, 1935, parts of the Lake Almanor shoreline were acquired by PG&E's predecessor, the Great Western Power Company, from the Red River Lumber Company. These lands include many areas along the Lake Almanor peninsula including much of the Lake Almanor Country Club and parts of the Lake Almanor West subdivision. Some property owners on these lands, including PG&E, possess a special deed reservation that states that the Red River Lumber Company ("second party" in the deed) and its assigns retain:

"the right and privilege, subject to the restrictions and limitations herein specified, of access by second party, its successors, assigns, and/or licensees, to both of said reservoirs, and each of them for all purposes whatsoever that will not materially injure the quality or do not materially reduce the quantity of water therein. Such right and privilege shall be so exercised as to not limit or impair any of the uses for which first parties, their successors or assigns, may make of said reservoirs, or either of them."

The deed goes on to further state "it is understood and agreed that each of the parties hereto, its successors, lessees and assigns, may boat, hunt, fish and take other recreation upon the waters of both said reservoirs and each of them, subject, however to the prior right of first parties to use said reservoirs for irrigation and power purposes." The intent of the deed reservation appears to be to ensure that local residents and users will always have the use of Lake Almanor waters for their enjoyment. The 1935 deed reservation also specifies that the Red River Lumber Company's privileges "shall be

exercised as to not limit or impair any of the uses.” Under the responsibilities of its current FERC license, PG&E is also responsible for ensuring reasonable public access to the reservoir, formulating rules to ensure public safety, and protecting and enhancing the scenic, recreational, and other environmental values of the project. The FERC license provides similar access and use measures as the Red River Lumber Company provided in its deed reservation. These access provisions ensure that the project shorelines are accessible for use and enjoyment by the public without degrading water quality or reducing water quantity.

Under the permitting authority in its current license, PG&E has developed a private residential and commercial development permitting program for Lake Almanor. This permitting program covers routine, non-project uses, including non-commercial boating access facilities (boat docks and buoys), erosion control structures, certain types of recreation development, bulkheading, vegetative removal or trimming, and planting of new vegetation for both private individuals and commercial interests who desire to place structures or undertake other types of development activities on project shorelines. To authorize non-project uses, PG&E must ensure that the proposed uses and occupancies are consistent with the purposes of protecting and enhancing the environmental values of the project. Of the 1,003 residential lots adjacent to Lake Almanor’s shoreline, 419 have docks, and 540 have buoys. Also, some lot owners have installed shoreline protection measures such as riprap.

Butt Valley Reservoir

Butt Valley reservoir, which is just under 5 miles long and almost 1 mile wide with a surface area of 1,600 acres, is surrounded entirely by undeveloped NFS land on the Plumas National Forest. The entire shoreline, except for the area near the Butt Valley powerhouse and the Butt Creek inlet, is open to the public. Several locations provide easy road access to the Butt Valley reservoir shoreline along the Prattville-Butt Valley Road, which closely parallels the eastern edge of the undeveloped reservoir shoreline.

Belden Forebay

Belden reservoir, or forebay, is small with a surface area of 42 acres and a daily water surface elevation that can fluctuate between 5 and 10 feet, depending on power operations. Belden forebay is surrounded by the Plumas National Forest and the entire shoreline, with the exception of the area near the Oak Flat powerhouse, is open to the public. There are several locations providing easy road access to the Belden forebay shoreline along Caribou Road, which closely parallels the western edge of the undeveloped reservoir shoreline.

Traffic Use

Four major state highways pass through the project area: SR 36, 89, 147, and 70. SR 36 provides a major transportation corridor between Red Bluff and Susanville with

connecting access into Mount Lassen Volcanic Park and also provides access via U.S. Highway 395 to the Reno area. SR 89 serves as a well-used transportation corridor between communities in the Lake Almanor basin and Quincy, the Plumas County seat. The route is also used as a north-south corridor to access Reno and commercial centers to the south. SR 147 is a 12-mile road running along the eastern shore of Lake Almanor from Canyon dam to an intersection with SR 36 near Westwood, California, and also connects to SR 36 closer to Chester via the 4.2-mile-long County Road A-13. SR 70 is the Feather River Highway, bisecting the Sierra Nevada Mountains along the NFFR canyon and passing through Quincy and onto a connection with U.S. Highway 395.

The existing road system in the project area has been built and maintained around the major transportation corridors, with secondary roads around project developments. These roads continue to provide essential access to project facilities for PG&E personnel and the general public. The project operates on a continuous basis; therefore, project facility roads must be maintained at all times.

Seventeen project area road segments are used (or historically were used) by project personnel for accessing project lands and waters. Table 3-33 lists these 17 road segments. Of these, five roads are wholly within the project boundary and are essential to O&M of the project, including the Butt Valley Dam Road (two roads), the Butt Valley Powerhouse Road, the Oak Flat Powerhouse Road, the French Creek Road, and the Belden Surge Chamber Road. The project boundary is 60-feet wide along most of the project roads and 40-feet wide along the French Creek Water Supply Road.

Additionally, there are 10 recreation facilities and access roads completely within or partially within the project boundary. These include the Almanor scenic overlook, the Canyon dam day-use area, the East Shore picnic area, the Rocky Point campground (three road loops), Camp Connery group camp, Last Chance campground, Last Chance group camp, Ponderosa Flat campground, Alder Creek day-use area, and Cool Springs campground. Table 3-34 lists these 10 project recreation roads. These roads are all designed as 10-mile-per-hour class roads, with a minimum 12-foot paved top.

New development in Plumas County is expected to be concentrated around Lake Almanor and in the southern portions of the county. Overall traffic projections in the project vicinity for at least the next 10 years have minimal increases, along with some overall decreases, on an average daily traffic usage basis. CalTrans suggests that former summer homes are now occupied as full-time residences by retirees, which reduces peak period travel. CalTrans recently decreased its projections for 2020 traffic in the area by more than 20 percent between 1997 and 2000. Also, although California's population is rapidly growing, a slower growth rate is reflected in Plumas and Lassen counties, and most of the new residents in California would likely be urban-oriented.

Table 3-33. Project-related roads. (Source: PG&E, 2002a)

Road Name	Road		Surface	Jurisdiction	Maintenance	Length	Notes
	Number						
Caribou Road	27N26/ 27N26A		Asphalt	FS	Licensee/FS	7.8	Provides access to Caribou powerhouses
Lower Longville-Belden	26N26/ 26N26A		Aggregate	FS/Licensee	Licensee/FS	5.1	Provides access to Tunnel portals #3 and #4, and Belden surge chamber
Belden surge chamber	None		Native	FS	Licensee	0.7	Spur off Longville-Belden spur
Siphon portal #3	None		Aggregate	Licensee	Licensee	0.2	Spur off Longville-Belden Road
Siphon portal #2	None		Aggregate	Licensee	Licensee	1.2	Spur off Caribou Road
Belden adit	26N26E		Aggregate	FS	Licensee	0.3	Spur off Caribou Road
NF 70 gage station	None		Aggregate	Licensee	Licensee	0.7	Spur off Caribou Road
Oak Flat	None		Aggregate	Licensee	Licensee	0.2	Spur off Caribou Road
Butt Valley dam	27N26/ 27N26D		Aggregate	FS	Licensee/FS	7.1	A 2.2-mile portion is one way north, used only in the non-winter season.
French Creek	27N28C		Aggregate	FS	Licensee	0.3	Access to local potable water supply system
Prattville-Butt reservoir	305		Aggregate /asphalt	Plumas County	Plumas County	10.4	Plowed in winter by licensee

Road Name	Road Number	Surface	Jurisdiction	Maintenance	Length	Notes
Butt Valley powerhouse spur(s)	None	Aggregate /asphalt	Licensee	Licensee	0.4	Two spur roads accessing Butt Valley powerhouse
Butt Valley penstock/surge chamber	None	Aggregate	Licensee	Licensee	2.4	Also provides access to Butt Creek gaging station
Humbug-Humbolt Cross	309	Aggregate	Plumas County	Plumas County	1.0	Plowed in winter by licensee, provides access to Butt Valley penstock/surge chamber access road
Seneca	306	Asphalt/ aggregate/ Native	Plumas County	Plumas County	9.8	Not used frequently for project purposes
Ohio Valley	27N98	Aggregate	FS	FS	7.7	Provides good access between Canyon dam and Butt Valley dam/Caribou
Last Chance campground access	None	Gravel	Licensee	Licensee	4.0	Provides access to adjoining properties. Closed in winter

Table 3-34. Project recreation roads. (Source: PG&E, 2002a)

Road Name	Road Number	Surface	Maintenance	Jurisdiction	Notes
Last Chance campground	None	Asphalt	Licensee	Licensee	Seasonal campground
Last Change group camp	None	Asphalt	Licensee	Licensee	Seasonal campground
Eastshore picnic area	None	Asphalt	Licensee	Licensee	Day-use area
Almanor scenic overlook	None	Asphalt	Licensee	Licensee	Day-use area
Canyon dam day-use area	None	Asphalt	Licensee	Licensee	
Lake Almanor campground loops	None	Asphalt	Licensee	Licensee	Seasonal campground
Camp Connery group camp	None	Asphalt	Licensee	Licensee	Seasonal campground
Ponderosa Flat campground loop	None	Asphalt	Licensee	Licensee	Seasonal campground
Alder Creek day-use area loop	None	Asphalt	Licensee	Licensee	Seasonal campground
Cool Springs campground loop	None	Asphalt	Licensee	Licensee	Seasonal campground

PG&E rated all of the project area roads using the FS's classification system. The majority of the roads were rated as traffic service level C, which means they have interrupted traffic flow, limited passing facilities, and low-design speeds; are unstable in certain traffic or weather conditions; and may not be able to accommodate some vehicles. The first 7.2 miles of the Caribou Road between SR 70 and the town of Caribou; the first 4.3 miles of the Prattville-Butt Reservoir Road from Lake Almanor to Butt Valley reservoir; the first 0.2 mile of the primary access road to the Butt Valley powerhouse coming off of County Road 305; and the first 1.3 miles of the Seneca Road heading southbound from the junction with SR 89 were rated with a traffic service level B, which is congested during periods of heavy traffic, slower speeds, and high dust, but accommodates all legal vehicles. The Belden Surge Chamber Road and a 2-mile segment of the Seneca Road from Seneca to the junction with Dutch Hill Road were rated traffic service level D, which has slow or blocked traffic flow and rough and irregular surface, is difficult for two-way traffic, and accommodates high-clearance vehicles. There were no ratings for the project recreation roads listed in table 3-34.

Fire Events

The California Department of Forestry and Fire Protection recorded more than 350 small fires in the Lake Almanor region from 1981 until 2001. Small fires are considered to be less than 30 acres. Many of the small fire incidents were less than an acre, and most of them occurred close to developed areas. The most recent large fire was the Storrie fire in early September 2000, which burned more than 46,000 acres including some project facilities near the Belden powerhouse.

Mining

There are 206 active mining claims on federal lands situated along the NFFR, mostly along the Seneca bypassed reach. A mining claim is a particular parcel of federal land valuable for a specific mineral deposit or deposits. It is a parcel for which an individual has asserted a right of possession, and that right is restricted to the extraction and development of a mineral deposit. The rights granted by a mining claim are valid against a challenge by the United States and other claimants only after the discovery of a valuable mineral deposit. There are two types of mining claims: lode and placer. Lode claims include rock-in-place bearing veins or lodes of valuable minerals having well-defined boundaries. Placer claims are mineral deposits not subject to lode claims and generally consist of unconsolidated materials such as sand and gravel containing free gold or other materials.

Most of the mining claims in the project area are placer claims, and most are located around the small community of Seneca within the Seneca bypassed reach of the NFFR. The maximum size of a placer claim is 20 acres, and most of the claims in the Feather River area are 20-acre claims. There are also a few lode mines as well as mining activities on the scattered private lands in the Seneca area.

Aesthetic Resources

For its aesthetic resource assessment, PG&E identified four characteristic landscape units (zones of generally similar landscape conditions) the Lake Almanor basin, Butt Creek Valley, NFFR/Caribou Road canyon, and the Belden area. PG&E also identified a set of key viewing points (KVPs) within the project area to provide a basis for systematic evaluation of aesthetic resources at the project. The KVPs represent a sampling of views of each landscape unit within the project area and are based on evaluation of the aesthetic characteristics of each landscape unit; each landscape unit's use patterns; the aesthetic sensitivity of each landscape unit; and the plans, regulations, and policies affecting the alteration of each landscape unit's appearance. Table 3-35 provides a summary, and figure 3-16 shows the location of the KVPs.

Table 3-35. Key viewing points in the UNFFR Project area. (Source: PG&E, 2002a)

KVP	Orientation	Landscape Perspective
(1) SR 36 causeway	West	SR 36 Causeway bridge on Lake Almanor
(2) North Shore campground	South	Shallow areas of upper Lake Almanor
(3) SR 36 rest area	Southwest	Wooded view of upper Lake Almanor, Chester and onto Mt. Lassen
(4) Little Cove	South	Inside cove looking down into Lake Almanor neat Peninsula Village
(5) Eastshore picnic area	West	Typical wooded view from picnic area
(6) Scenic Overlook	Northwest	Canyon dam and spillway area
(7) Canyon dam boat ramp	West	Lower Lake Almanor from developed recreation site.
(8) Plumas Pines Resort	Northwest	Resort view of Lake Almanor and Mt. Lassen
(9) Rocky Point campground beach	East	Swimming beach at campground
(10) Butt Valley reservoir cove	Southwest	Upper Butt Valley reservoir shoreline
(11) Alder Creek campground boat ramp	South	Developed recreation site view along Butt Valley reservoir
(12) Lower Butt Valley reservoir	South	Butt Valley dam and spillway
(13) Seneca Bridge	South	Seneca bypassed reach
(14) Butt Valley Dam Road	South	Project transmission line with Belden forebay in distance
(15) Belden forebay	North	Belden forebay and Oak Flat area
(16) Caribou Road bridge	Northeast	Belden bypassed reach
(17) Belden siphon	North	At road crossing on Caribou Road
(18) Belden bypassed reach	Northeast	Along SR 70
(19) Belden powerhouse	Northwest	Pacific Crest Trail crossing and SR 70 corridor at Belden powerhouse

Lake Almanor Basin

The Lake Almanor basin is a large basin rimmed by densely wooded mountains and rolling topography. Lake Almanor, the dominant feature of the basin is an extensive reservoir of high scenic quality. The basin is somewhat flat and the lake is several miles wide and long, broad sweeping views are generally available along most reservoir shorelines. These include highly scenic views of 10,457-foot-high Mt. Lassen and the rugged terrain within Mt. Lassen Volcanic National Park. Views of Mt. Lassen are possible from the northeast shoreline near SR 36's Johnson Grade, the SR 36 Rest Area, Lake Almanor Country Club, County Highway A13, most of the East Shore area, and much of the shoreline in the Prattville community and Lake Almanor West subdivision.

Lake Almanor is generally a fairly shallow reservoir in a wide basin so a drop of a few feet in elevation can expose wide areas of shoreline. When the lake is above 4,482 feet, the exposed shoreline is somewhat beneficial by serving as a beach area for engaging in or staging recreation activities. However, below about elevation 4,482 feet, the exposed shoreline progressively becomes more undesirable to many users and viewers because of the jagged volcanic-type rocks that occur there. In steeper shoreline areas along the southern portion of the east shore, larger reductions in lake elevation are not noticed because the water line remains fairly close to shore. The western shoreline near Chester and the area north of the SR 36 causeway have large areas of brown flat terrain exposed below elevation 4,482 feet.

Other scenic areas of high quality include the broad meadow landscapes found north of the SR 36 causeway and on the extensive lowlands between Chester and Lake Almanor's western shoreline. These areas offer viewers a distinctive change in scenery from the predominant wooded terrain. These meadows offer a lot of variety and gradually blend into mixed lands with interspersed wooded clumps on relatively flat terrain. Waterfowl and other bird life offer additional aesthetic values to these areas.

Butt Creek Valley

The Butt Creek Valley landscape extends from about halfway between Prattville and the Butt Valley powerhouse to the Caribou powerhouses near the mouth of Butt Creek on the NFFR. This landscape offers a wide variety of dramatic topographic relief that is gentle in the upper elevations and steep and rugged in the lower elevations leading down to the Caribou area. Butt Valley reservoir is of high scenic quality with moderately low banks rimmed by a uniform and densely wooded shoreline. The reservoir is confined inside the valley bottom and is long and narrow allowing good view across its waters to the surrounding undeveloped shorelines. There are few long distance views from within this basin since it is somewhat confined in a narrow valley. There are no residences along the reservoir shoreline but the Butt Valley-Caribou Electric Transmission line, supported by steel lattice towers, dominates the foreground landscape as viewed by travelers on the road. Many users think the power line detracts from the natural landscape qualities that dominate the scenery.

Butt Valley reservoir fluctuates daily and weekly to match daily output to peak needs and typically fluctuates about 1 foot on a daily basis and between 3 and 5 feet on a weekly basis depending on power system operating needs. Butt Valley reservoir has a more attractive sand and rock shoreline than Lake Almanor when exposed. Even with the usual amount of fluctuation, visual quality is generally preserved across the range of normal operating levels.

From the Butt Valley reservoir down to the Caribou powerhouses, the terrain is extremely steep and rugged. A single-lane dirt road, which splits into two one-way separated roadways that wind steeply down the hill, provides most visitors their only access to this landscape. There are several locations along the roads in the upper and lower reaches that offer dramatic views down into the rugged and deep NFFR canyon.

North Fork Feather River/Caribou Road

This landscape unit extends the length of the NFFR from Canyon dam passing through Caribou leading downstream to the confluence of the EBNFFR at the scenic SR 70 highway corridor. The uppermost part of this landscape unit is characterized by rolling wooded terrain bisected by the incised NFFR. The river is hidden from widespread public viewing in most locations because there are few trails or roads in the area. Near Seneca, the river canyon is deeply incised, which is especially noticeable around the Caribou powerhouses. Immediately downstream of the Caribou powerhouses, the river fits inside a small box canyon rimmed by jagged rock ledges. The river valley from this location to Belden is narrow and tucked deep down inside a more open canyon with ridges and mountain tops extending over 3,000 feet above the valley floor on both sides. The valley is highly scenic and has an undeveloped feel with rough mountainous character.

Belden Area

The Belden area landscape spans a distance of less than 2 miles along the deep scenic gorge of the NFFR along the SR 70 highway corridor. The upper end of this distinctive landscape is the confluence of the EBNFFR and the NFFR, where Caribou Road begins. The landscape is fairly uniform in topography but has an impressive variety of geologic and vegetative conditions leading to the Belden powerhouse located at the confluence of Yellow Creek and the NFFR. The canyon gorge is generally U-shaped with both wooded and open rocky slopes bisected by steeply defined stream channels extending up several thousand feet above the valley bottom. Most viewers experience the landscape from well-traveled SR 70. The PCT crosses the canyon at Belden powerhouse.

The PCT is a 2,638-mile-long National Scenic Trail extending from Canada to Mexico. The PCT section crossing the NFFR receives light use, although some horseback use is noted in late summer. Views of the project from the PCT can be seen as northbound users descend the canyon from the south where the Belden powerhouse

penstocks and surge chamber are readily visible on the lower slopes of the canyon. At the SR 70 crossing, the Belden powerhouse becomes visible although viewer sensitivity in this stretch is low because of the variety of developed features present.

LRMP Visual Quality Objectives

The Lassen and Plumas National Forest LRMPs provide guidelines for the preferred VQO of land managed under each designation. VQOs are based on the degree of acceptable alteration permitted within the natural characteristic landscapes and are applied to all project proposals and activities on NFS lands. The Lassen National Forest LRMP assigns two VQOs to the project area or lands influenced by project operations, including Retention and Partial Retention. The VQOs for project lands in the Plumas National Forest are Retention, Partial Retention, and Modification. The three VQOs that apply to the project area are further described in table 3-36.

Table 3-36. VQO classifications and guidelines. (Source: FS, 1992, 1995)

VQO Designation	Definition
Retention	Allows management activities that are not visually evident. Activities may only repeat form, line, color, and texture found frequently in the characteristic landscape. Changes in size, amount, intensity, direction, and pattern should not be evident.
Partial Retention	Allows management activities that remain visually subordinate to the characteristic landscape. Activities may repeat form, line, color, and texture common to the characteristic landscape but changes in their qualities of size, amount, intensity, direction, and pattern remain visually subordinate to the characteristic landscape. Activities may also introduce form, line, color, and texture found infrequently or not at all in the characteristic landscape, but they should remain subordinate to the visual strength of the characteristic landscape.
Modification	Human activities may visually dominate the original characteristic landscape. Vegetation and landform alteration must borrow from naturally established form, line, color, texture, and scale.

On the Lassen National Forest, Retention is prescribed for most of the recreation and lightly developed lands on the southwest shore of Lake Almanor around Prattville. Partial Retention is allocated for the undeveloped lands immediately outside the Lake Almanor West subdivision. On the Plumas National Forest, Retention is prescribed in recreation and scenic areas around Butt Valley reservoir and the lands along the NFFR below the Caribou powerhouses. Partial retention is prescribed to the NFS lands along the Seneca reach. Modification is assigned to the steep canyon lands leading from Butt

Valley dam to Caribou where the project roads, transmission lines and penstocks are visible features of the landscape.

The Lassen and Plumas National Forest LRMPs also provide guidelines for the preferred ROS of land managed under each plan. The ROS provides a framework for classifying the types of outdoor recreational opportunities that the public may desire and identifies the portion of the ROS that any given area may be able to provide. In designating the ROS, factors include qualities provided by the natural setting (i.e., vegetation, topography, scenery), activities associated with recreational use (i.e., type and level of recreational use), and experience opportunities related to management (i.e., development, access, and regulations). Table 3-37 summarizes ROS classifications and guidelines.

Table 3-37. ROS classifications and guidelines. (Source: FS, 1992, 1995)

ROS Classification	Guidelines
Semi-primitive motorized	Provide for minimum evidence of onsite disturbance. Only subtle modifications to an otherwise natural environment. Motorized use of roads and trails is allowed.
Roaded natural	Provide for low-to-moderate interaction between users. Sights and sounds of others are clearly evident.
Rural	Natural environment is substantially modified. Structures are readily evident. Controls and regulations are obvious and law enforcement visible.

The Plumas National Forest LRMP further specifies goals and policies for visual resources. The plan emphasizes the need to allow certain management activities to dominate the visual landscape, especially those activities on lands committed to intensive timber or other commodity production. In areas frequently used by recreationists, the plan emphasizes the need to maintain high visual quality on these lands that are clearly visible from recreational developments, as well as from major travel routes and other high use areas.

In addition to VQOs, there are considerations for visual quality related to the federal designation of the Lassen Scenic Byway and Feather River Scenic Byway. SR 89 has also been designated a California State Scenic Highway by the California State legislature.

3.3.6.2 Environmental Effects

Adding Lands to the Project Boundary

In the license application, PG&E proposes adding approximately 34 acres of the Plumas National Forest into the project at Caribou and Belden dams. The area around the Caribou Nos. 1 and 2 penstocks has required slope stabilization and remediation work over the last 20 years, and PG&E has indicated that it is likely that attention to slope stabilization would continue. Therefore, PG&E proposes to include the area between the two penstocks within the project boundary. Also the project spoil areas located west of the downstream portal of the Caribou No. 2 tunnel and just downstream of the road from the top of Belden forebay dam to Oak Flat powerhouse have each experienced project use and that use is expected to continue. Finally, over the years, the Caribou to Butt Valley Road has experienced minor changes in its alignment, and there are also short access roads in the vicinity of this road that are used by the project. For these reasons, PG&E proposes to include the 34 acres.

In the SA, PG&E proposes to apply to the Commission within 1 year of license issuance to adjust the project boundary to include all recreation improvements covered by the SA at PG&E facilities including the East Shore campground, group camp area, and day-use area, the Stover Ranch day-use area, the Catfish Beach area, the Westwood Beach day-use area, the Stumpy Beach day-use area, the Upper Belden Reach river access site, the Belden Reach trails, and those portions of the southwest shoreline access zone facilities currently outside the project boundary. PG&E also proposes to adjust the UNFFR Project boundary to include the following FS facilities located on the Plumas and Lassen National Forests: Canyon dam boat launch and day-use area, Dyer View day-use area, and Almanor boat launch. PG&E further proposes applying to the Commission to adjust the project boundary as needed to incorporate the Almanor Family Campground and amphitheater, the Almanor Group Campground, and the Almanor beach, 6 months after the FS has completed construction of all of the recreation improvements it has planned for each of these facilities. PG&E also proposes to request a modification of any license article addressing the recreation O&M program included in the draft RRMP to include these facilities.

FS final Section 10(a) condition no. 32(3) specifies the same project boundary adjustments as those listed in PG&E's proposal.

Our Analysis

There are currently 409 acres of lands administered by the Plumas National Forest within the project boundary and 577 acres of lands administered by the Lassen National Forest. PG&E meets with the FS on an annual basis to discuss plans for the upcoming year. The Commission requires licensees for major projects, such as the UNFFR Project, to secure all lands necessary for project purposes either by purchase or acquisition of appropriate easements. Such lands are included within the designated project boundary

and the Commission only has jurisdiction over activities that occur within this project boundary. The Commission has the authority to enforce the terms and conditions of a new license within the project boundary. Adding an additional 34 acres of the Plumas National Forest to the project boundary would not be detrimental to the purposes of the Plumas or Lassen National Forests. The activities that PG&E is responsible for on those lands to be added are addressed in the discussion of vegetation management plans below and in section 3.3.1.2, *Water Resources*.

PG&E has proposed new recreational facilities at the UNFFR Project (see section 3.3.5, *Recreational Resources*) and all of the facilities that PG&E proposes to either construct or provide funding to construct are partially within or adjacent to the existing project boundary, and are used as primary access points to the UNFFR hydroelectric project. As such, a clear connection exists between project operations and recreational use of these facilities. Including all of these facilities in the project boundary would provide assurance that improvements would be consistent with project purposes and that PG&E would continue to provide recreational access to project lands and waters. Additionally, including the FS recreation facilities listed above in the project boundary would have a beneficial effect on recreation since PG&E would be able to apply consistent management to all of the recreation facilities on the Lake Almanor shoreline, reducing visitor confusion over management practices. We conclude that the facilities proposed for improvement or construction should be included in the project boundary.

Traffic Use Surveys and Road Management

In the SA, PG&E proposes to file an FS-approved road traffic survey plan for roads used for project purposes located on NFS lands with the Commission within 1 year of license issuance. PG&E proposes that the plan would include provisions for monitoring traffic every 6 years when PG&E is monitoring recreation use in accordance with FERC Form 80 requirements. PG&E proposes that, at a minimum, the road traffic survey would include the Caribou Road (27N26) and the Caribou-Butt Valley Reservoir roads (27N26 and 27N60) and include the number and types of vehicles per day on these roads and a sampling schedule that includes: the fishing season, including the opening weekend; holiday weekends including Memorial Day, Fourth of July, and Labor Day; non-holiday weekends; the day of and the day after any scheduled Belden reach recreation river flow releases; and weekdays. PG&E further proposes that every 6 years the road traffic reports would be reviewed by the FS and then filed with the Commission.

In its preliminary Section 4(e) condition no. 48, filed December 1, 2003, the FS specified that every 5 years from license issuance, PG&E file a FS-approved road/traffic survey report with the Commission and provide a copy of the survey and the survey results to the FS. The FS wanted to reserve the right to require changes in the project, designated project roads, and operation, after notice and opportunity for comment and administrative review, through revision of the Section 4(e) conditions that require

measures necessary to accomplish protection and utilization of NFS resources and provide for public safety identified as a result of those surveys.

In its response to the FS, filed with the Commission on January 15, 2004, PG&E did not oppose this recommendation, but suggested that it be modified to incorporate the cost sharing responsibilities reflected in the 1998 road maintenance agreement between PG&E and the Plumas National Forest. Additionally, PG&E proposed that the traffic sampling approach not be currently defined but be developed by PG&E in consultation with the FS.

In its preliminary Section 4(e) condition no. 19, filed December 1, 2003, the FS also specified that PG&E furnish, install, and maintain temporary traffic controls when construction is in progress adjacent to or on FS controlled roads open to public travel, to provide the public with adequate warning and protection from hazardous or potentially hazardous conditions associated with PG&E's operations. The FS also specified that any flaggers or devices be as described in the Manual on Uniform Traffic Control Devices for Streets and Highways.

Interior, in its Section 10(j) condition no. 19, filed December 1, 2003, recommends that PG&E develop an erosion control plan for all project facilities including roads, reservoirs, and bypassed reaches.

In its response to Interior filed with the Commission on January 15, 2004, PG&E disagrees with the necessity of the proposed condition for several reasons. One of the reasons PG&E disagrees with the need for a separate erosion control plan is that PG&E and the Plumas National Forest have already entered into a road maintenance agreement for roads on NFS lands. PG&E points out that the agreement addresses such items as slide repair, ditch cleaning, surface repair, shoulder maintenance, dust abatement, drainage structures, and roadside vegetation. PG&E also states that it would be meeting with the FS, Plumas County, and other interested parties at least annually to discuss any project-related issues, including erosion.

FS final Section 10(a) condition no. 39 specifies the same road traffic use survey plan as the one described in PG&E's proposal. In its final Section 4(e) condition no. 42, filed November 4, 2004, the FS specifies that, within 1 year of license issuance, PG&E file a FS-approved road management plan addressing all FS and unclassified roads required by PG&E to access the project area. FS final Section 4(e) condition no. 5 specifies that PG&E would provide the FS with a minimum of 60 days to review and approve the plan before filing it with the Commission. The FS specifies that the road management plan for the UNFFR Project include (1) identification of all FS roads and unclassified roads on NFS lands needed for project access, including road numbers; (2) a map showing all FS roads and unclassified roads on NFS lands used for project access, including digital spatial data accurate to within 40 feet, identifying each road by FS road number; (3) a description of each FS road segment and unclassified road on NFS lands

needed for project access including termini, length, purpose and use, party responsible for maintenance, level of maintenance, structures accessed, location and status of gates and barricades, if any, ownership of road segment and underlying property, instrument of authorization for road use, assessment of road conditions; and (4) provisions requiring PG&E to consult with the FS in advance of performing any road construction, realignment, or closure involving FS roads or lands. The FS specifies that PG&E cooperate with the FS on the preparation of a condition survey and a proposed maintenance plan subject to annual FS approval, beginning the first full year after the road management plan has been approved.

The FS further specifies that PG&E obtain appropriate authorization (e.g., special-use permit, road-use permit, or maintenance agreement) in accordance with the road management plan for all project access roads under FS jurisdiction that are located outside the project boundary, including unclassified roads and FS system roads needed for project access; the term of the authorization would be the same as the term of the license. The FS specifies that PG&E enter into the appropriate authorization mechanism with the FS that supersedes the existing authorization with the FS. The road management plan would identify PG&E's responsibilities for road maintenance and repair costs commensurate with PG&E's use and project-induced use. The FS specifies that the road management plan specify road maintenance and management standards that provide for traffic safety; minimize erosion and damage to natural resources and that are acceptable to the FS.

The FS further specifies that PG&E would be responsible for any new construction, realignment, closure, or other road management actions PG&E proposes in the future, subject to FS standards in effect at the time, including related studies, analyses or reviews required by FS. The FS specifies that snow removal on roads nos. 27N26 and 27N60 and other project roads would be performed to minimize erosion during runoff periods. PG&E would be responsible for maintenance and replacement of aggregate that is damaged or lost due to snow plowing on the aggregate surfaced portion of road nos. 27N26 and 27N60 and other roads from which snow is plowed. The FS specifies that PG&E would be responsible for a share of the cost of needed maintenance and repairs of roads nos. 27N26 and 27N60 commensurate with PG&E's use and project-induced use.

Our Analysis

During its review of PG&E's first stage consultation package, the FS recommended an access management and traffic study for project roads to provide information on the current condition of the project roads as well as current traffic levels, to determine if the roads and trails can provide safe and adequate access to meet existing and future demands. In summer 2001, PG&E conducted a traffic study of the project roads, investigating the traffic safety and road system operations. Also in 2001, PG&E conducted comprehensive traffic monitoring of roads throughout the project area.

The traffic study and road management report concluded that the project road system was suitable for the traffic expected during the life of the license and also provided some specific recommendations for several roads.

PG&E responded to the FS's request for a study of the project roads during initial consultation and in 1998 entered into a road maintenance agreement with the FS that includes a list of roads covered by the agreement (FS System roads jointly used by PG&E and the FS), levels of road maintenance, road maintenance specifications, and methods to fulfill maintenance obligations. The intent of the agreement is to ensure maintenance of the roads in a condition that provides for their intended use, prevent and correct erosion to the roads and adjacent lands, and ensure safe and efficient use of the roads. Additionally, PG&E projects an increase in recreation use at the project over the year 2001 levels. An increase in users as well as the passage of time would likely warrant additional road rehabilitation to help ensure that the capacity of the roads is not exceeded and to maintain the roadways to current traffic service levels and maintenance levels. The traffic use surveys that PG&E and the FS have proposed would help identify when and where roads have reached or exceeded their capacity or fallen below an acceptable level of service. If roads have exceeded their anticipated capacity, PG&E and the FS may need to assess the need to reclassify the road maintenance level or the traffic service level of the road. According to the road maintenance agreement, PG&E and the FS meet annually to develop an annual maintenance plan that addresses all anticipated road maintenance work needed on the roads covered by the road maintenance agreement.

The road management plan specified by the FS differs slightly from the road maintenance agreement PG&E has developed with the FS. Development of a road management plan would require minimal changes to the existing road maintenance agreement as well as development of digital spatial data accurate to within 40 feet, identifying each road by FS road number.

Specific Land Management and Visual Resource Protection Measures

In the SA, PG&E proposes to implement a number of land management and visual resource protection measures at existing facilities within 2 years after initial license issuance.

In its final Section 4(e) condition no. 40, the FS specifies that PG&E implement specific mitigation measures. PG&E's specific visual management proposals and the FS's 4(e) specifications related to visual management are described in the following list.

- Within 2 years of license issuance, PG&E proposes to paint the metal siding and roof of the hoist house on the Prattville intake structure a dark green color similar to the current color. The FS recommends the same measure as an element of its final Section 10(a) condition no. 40(A).

- Within 2 years of license issuance, PG&E proposes to plant sufficient evergreen trees within the UNFFR Project boundary between the existing Prattville maintenance buildings and the shoreline to reduce visual domination of the buildings on the shoreline area. PG&E further proposes to monitor and oversee survival of these trees through the first three summers to ensure their successful establishment. The FS recommends the same proposal as PG&E in its final Section 10(a) condition no. 40(B).
- Within 2 years of license issuance, PG&E proposes to re-grade the Oak Flat road debris spoil piles located on PG&E land outside of the UNFFR Project boundary along Caribou Road to create a more natural rolling topography along the roadside and, where possible, to move spoil materials farther from the road. PG&E also proposes to establish native plantings where possible between the road and the spoil piles to help screen the active use areas from passing motorists. FS final Section 4(e) condition no. 40(C) specifies the same proposal as PG&E.
- Within 2 years of license issuance, PG&E proposes to prepare a plan, in consultation with the FS, to annually apply dust palliatives or other measures, including regular grading, to help minimize dust emissions and improve the lower coupled segment of the Butt Valley-Caribou Road, which is located within the UNFFR Project boundary. FS final Section 4(e) condition no. 40(D) specifies the same proposal as PG&E.
- Within 2 years of license issuance, PG&E proposes to consult with the FS on color selection when maintenance or repair work is scheduled on the Belden powerhouse penstocks, surge chamber, or other powerhouse facilities to reduce visual contrast as seen from SR 70. FS final Section 10(a) condition no. 40(E) specifies the same proposal as PG&E.
- Within 2 years of license issuance, PG&E proposes to maintain the exterior and landscaping of the old clubhouse facility and grounds at Caribou Village to preserve the historic features and character of this facility, which is located within the UNFFR Project boundary. PG&E also proposes to consult with the FS when maintenance or repair activities that affect exterior appearance are to take place to help preserve, as practical, the historic and visual appeal of the village landscaping and structures. FS final Section 4(e) condition no. 40(F) specifies the same proposal as PG&E.

PG&E proposes to file an FS-approved visual management plan with FERC within 60 days prior to any ground-disturbing activities on NFS lands. PG&E proposes that these this plan would, at a minimum, address clearings, spoil piles, and project facilities such as diversion structures, penstocks, pipes, ditches, powerhouses, other buildings, transmission lines, corridors and access roads; facility configurations,

alignments, building materials, colors, landscaping, and screening; a proposed mitigation and implementation schedule necessary to bring project facilities into compliance with the National Forest LRMP direction; locating road spoil piles either in approved areas on NFS lands or in a location off of NFS lands; monitoring and eradicating invasive weeds as specified in any invasive weed management plan for the project; removing all visible non-native materials, including construction debris from the surfaces of piles located on NFS lands; and stabilizing and revegetating all native material that is allowed to be left on NFS lands, including complying with visual quality objectives.

The FS specified, as a part of preliminary Section 4(e) condition no. 49, that within 1 year of issuance of a new license, or 60 days prior to any ground-disturbing activity, that PG&E file a FS-approved visual management plan with the Commission. Additionally, FS preliminary Section 4(e) condition no. 50 specified that PG&E file an FS-approved spoil disposal plan with the Commission within 2 years of license issuance and at least 60 days prior to any ground-disturbing or soil-producing or piling activity. The FS-specified elements are reflective of the elements that PG&E has proposed for inclusion in any visual management plan it prepares.

In its response to the FS, contained in a letter filed with the Commission on January 15, 2004, PG&E expresses its belief that the existing project-related visual quality issues on NFS lands have been adequately addressed through the relicensing studies and consultation and would continue to be adequately addressed through implementation of the proposals included in both the license application and the SA. PG&E has discussed the need for a comprehensive visual management plan with the FS and the FS has concurred with PG&E's recommendation that the visual management plan would only be needed to address future ground-disturbing activities, and should be developed at least 60 days prior to any such activity. FS final Section 4(e) condition no. 40(G) specifies the same proposal as PG&E.

Our Analysis

The Lassen and Plumas National Forest LRMPs define the VQOs for National Forest System lands in the project area. VQOs for the project area are intended to provide various degrees of a natural-appearing landscape. Existing project facilities and operations are clearly visible on the landscape, with buildings, dams, and penstocks contrasting sharply with the surrounding forested setting. Project roads, campgrounds, and appurtenant facilities are also obvious to the casual observer. Although it may not be practical to devise methods to blend the dams in with the natural environment, there may be ways to reduce the contrast of other structures through paint colors or vegetative screening during regular maintenance or upgrading of existing facilities. A coordinated approach to address visual effects of the existing facilities and proposed new facilities would help to protect aesthetic resources within the project area and help ensure that project facilities would be consistent with the applicable LRMP direction.

Periodic painting and maintenance of project facilities is necessary to meet current standards and maintain aesthetic appeal. Consulting with the FS on color selection when any maintenance or repair work is scheduled at the Belden Powerhouse facilities would assure that the LRMP standards are addressed.

The existing PG&E-operated maintenance buildings located at the Prattville intake visually dominate the Lake Almanor shoreline area. Planting evergreen trees between these buildings and the shoreline would reduce the visual domination of the buildings.

The spoil piles located on the Caribou Road at Oak Flat are clearly visible from the road and detract from the scenic quality of the area. Removal of this project-related debris to the extent that such removal is practical along with establishing native plantings where possible, would provide a visual benefit on this road.

The historic structures at the Caribou Village are in need of maintenance to prevent deterioration of the buildings and loss of historic character and value. It would be advantageous for PG&E to consult with the FS on preserving the historic and visual appeal of the village landscaping and structures.

The Butt Valley-Caribou Road (27N60 and 27N26) is quite dusty during the summer, and the dust creates a potential driving hazard. It would be beneficial for PG&E and the FS to work together to address this concern.

A spoil disposal plan was originally recommended by the FS, and the FS final Section 4(e) conditions address spoil pile disposal in the proposed visual management plan. Implementation of this plan would limit the potential for existing and new spoil piles to erode and would improve the aesthetics of the spoil piles. See section 3.3.1.2 for more discussion on the visual management plan.

Shoreline Management Plan

In the SA, PG&E proposes to implement the Lake Almanor SMP included in the final license application within 30 days after license issuance. PG&E further proposes to meet with the FS and Plumas County and other interested parties a minimum of every 10 years to discuss the need to update the SMP. The SMP included in PG&E's final license application describes current conditions and management of the Lake Almanor shoreline and presents the proposed shoreline management program including shoreline authorizations and management policies, including permitting. The proposed shoreline management program designates five shoreline management zones on Lake Almanor including commercial, industrial, residential, recreation, and conservation and also describes the shoreline management policies that apply across all shoreline zones.

In its October 29, 2004, comments on the draft EIS, Plumas County recommends that PG&E meet with local citizens and the 2105 Committee prior to finalizing the SMP and filing it with the Commission.

In its final Section 4(e) condition no. 40(H), filed November 4, 2004, the FS specifies that PG&E consult with the FS and other interested relicensing SA signatories within 30 days of license issuance to finalize the SMP, which the FS specifies that PG&E implement within 1 year of license issuance. The FS states that it would approve those portions of the plan that are within its jurisdiction. The FS further specifies that PG&E meet with the FS, Plumas County, and other interested relicensing SA signatories a minimum of every 10 years to discuss the need to update the SMP; the need to update the SMP sooner may also be raised and discussed during the annual land use meetings with the FS, Plumas County, and other interested relicensing SA signatories.

Our Analysis

The shoreline of Lake Almanor is highly developed and along certain areas of the shoreline, convenient access is limited. PG&E faces a growing need to provide more shoreline access points and shoreline recreation facilities to meet future demand and growth. Also, PG&E currently has more than one program for permitting various features along the reservoir shoreline, addressing both private and commercial uses. The draft SMP that PG&E presented in its license application integrates existing shoreline management policy and permitting documents into one comprehensive plan. The SMP was developed as a guide to future management of the Lake Almanor shoreline in the face of increasing development pressures, as well as frequent requests from adjacent property owners to either make shoreline improvements or place private docks and facilities for public or group use inside the project boundary around Lake Almanor. The plan examines all shoreline areas of the reservoir to identify the appropriate developmental uses, as well as to protect areas deemed necessary for preservation to protect and enhance environmental values. Under the terms and conditions of the project license, PG&E must retain all rights to lands and waters within the project boundary needed for project purposes. PG&E may permit others to use the project's lands and waters but before permitting such a use, PG&E must ensure that the use does not endanger health, create a nuisance, or otherwise be incompatible with overall project recreational use and that a permittee takes all reasonable measures to protect the scenic, recreational, and environmental values of the project. Additionally, PG&E is responsible for ensuring that permitted facilities are constructed and operated in a safe manner that do not adversely affect project operations and purposes. See section 3.3.1, *Water Resources*, for more discussion on the SMP.

Annual Meeting

In the SA, PG&E proposes to conduct an annual meeting with the FS, CDFG, and Plumas County to coordinate ongoing project-related land management activities including recreation management and use; fire suppression and related forest health activities; and the planning for commercial, residential and industrial developments. FS final Section 4(e) condition no. 40(I) specifies the same proposal as PG&E.

Our Analysis

An annual meeting of the FS, CDFG, Plumas County, and PG&E would allow these agencies to share current and future plans for land management activities, including any planned development or timber removal. Such a meeting should decrease conflicts with the established land use policies in place for the project area, such as FS LRMP direction and Plumas County zoning ordinances.

Fire Prevention and Response Plan

In its final Section 4(e) condition no. 41, filed November 4, 2004, the FS specifies that, within 1 year of license issuance, PG&E file an FS-approved vegetation management plan, developed for the purpose of identifying hazardous vegetative conditions surrounding project facilities that may accelerate the spread of a wildfire onto NFS lands as a result of project activities or might place project facilities in jeopardy from an approaching fire. The FS specifies that the plan include the following minimum provisions: (1) analysis of live and dead fuel loading and potential fire behavior within 300 feet of project features; (2) treatments to be employed to reduce ignition hazard; (3) an implementation schedule; and (4) provisions for the reassessment of hazardous conditions at 5- to 8-year intervals depending on regrowth of vegetation. The FS further specifies that any treatments extending onto adjacent NFS lands be approved by the FS and accomplishment of any hazard reduction activities be coordinated with the FS when practicable.

The FS also specifies in final Section 4(e) condition no. 9(A) that PG&E file an FS-approved fire prevention and response plan with the Commission, developed in consultation with the appropriate state and local fire agencies. The fire prevention and response plan would set forth in detail the plan for preventing, reporting, controlling, and extinguishing fires in the vicinity of the UNFFR Project, within 1 year of license issuance. The FS specifies that the plan address the following categories at a minimum: (1) fuels treatment and vegetation management; (2) prevention; (3) emergency response preparedness; (4) reporting; and (5) extinguishing and controlling fires. The FS further specifies that the plan include appropriate measures from the vegetation management plan and that any fire prevention measures conform to the water quality protection practices as enumerated in the USDA, FS, Pacific Southwest Region, Water Quality Management for NFS Lands in California-BMPS.

In final Section 4(e) condition no. 9(B), the FS specifies that PG&E agree to fully cooperate with the FS in all fire investigations and produce for the FS upon request all materials and witnesses over which PG&E has control that are related to the fire and its investigation, including all investigation reports, all witness statements, all photographs, all drawings, all analysis of cause and origin, and all other, similar materials and documents regardless of how collected or maintained. The FS further specifies that

PG&E preserve all physical evidence and give the FS custody of all physical evidence requested.

Our Analysis

PG&E has documented only one large fire, but a relatively high number of small fires. The large number of small fires indicates the presence of ignition sources, though favorable conditions such as weather and people to extinguish the fires have helped to keep the number of large fires down. However, the continued hydroelectric operations along with the presence of project facilities such as generators, construction equipment, and transmission lines contribute to fire danger in the project area. We expect that, over the term of a new license, the number of recreational users would increase at most developed project sites, and dispersed recreational areas with user-created fire rings add to the threat of fires in the area. Additional fires within the project area would most likely result in property damage, destruction to the scenic beauty of the project area, increased particulate matter and decreased air quality due to smoke, and possibly loss of life.

Having a fire management and response plan in place with fire prevention and response strategies would help minimize damage to natural resources and increase preparedness of fire personnel to provide for public safety when future fires occur. Currently, CDF, Plumas County, private timber companies, the FS, and PG&E are working together to reduce fire danger in the project area in the future. A fire management and response plan would enable compilation of information from the various consulting agencies to facilitate fire prevention needs and procedures throughout the project area. Formalizing any existing agreements would improve the efficiency and effectiveness of fire management of the project area.

Reservoir Levels

The Lake Almanor water levels proposed by PG&E in the SA provide for water surface elevations from June 1 through August 31 that are 10 feet higher than the current required levels in wet and normal water year types and 5 feet higher in dry and critically dry water year types. In its Section 10(j) recommendation, Interior recommends that PG&E implement project operations to maintain the same water surface elevations as those proposed in the SA. The water levels proposed by PG&E in the SA maintain existing water level management regimes for the Butt Valley reservoir. Typically, Butt Valley reservoir fluctuates about 1 foot on a daily basis and between 3 and 5 feet on a weekly basis depending on power system operating needs.

Our Analysis

Currently, PG&E operates the project with the level of Lake Almanor between a normal maximum elevation of 4,494 feet and a normal minimum pool elevation of 4,469 feet. The reservoir usually reaches its highest elevation in May or June and is slowly

drawn down to its lowest level by December or January. Lake Almanor's average high level occurs in June when the lake averages about 4,487 feet. The average September lake level is about 4,482 feet.

PG&E's proposal to operate the project to maintain the surface water elevation level of Lake Almanor at 4,485 feet until August 31 in wet and normal water years would improve the aesthetic values of the Lake Almanor area.

Potential Measures to Reduce Water Temperature

As detailed in section 3.3.1.2, as part of the SA for the Rock Creek-Cresta Project, PG&E agreed to evaluate the effectiveness of modifying the UNFFR Project's Prattville intake as a temperature control measure for the downstream reaches of the NFFR. PG&E has been conducting feasibility studies, including modeling the water temperature effects of potential Prattville intake modifications, re-operation of the Canyon dam outlet gates, and modification of Caribou No. 2 intake for the past few years. Appendix D of this EIS provides an initial evaluation of the advantages and disadvantages of 42 potential measures that could affect water temperatures and identifies the 5 measures we analyze further in section 3.3.1.2, *Water Resources*, of this EIS.

Two of the measures evaluated by PG&E and described in section 3.3.1.2 include the installation of a thermal curtain in front of the Prattville intake. The Prattville intake is located in a steep-sided trough in a cove of the relatively shallow western lobe of Lake Almanor. Black & Veatch conducted a feasibility study of alternatives to lower water temperature based on results of the hydraulic model testing conducted by the IIHR, and provided a conceptual design for installing a U-shaped thermal curtain in this location. Two sides of the thermal curtain described by Black & Veatch would extend approximately 900 feet from 2 locations on the shore, with an approximately 770-foot long thermal curtain parallel to the lakeshore connecting them. The curtain would be constructed of a geotechnical fabric (Hypalon), supported on the lake surface by a floating boom made of a string of floating tanks, with the bottom edge held at a constant elevation (4,445 ft) by buoyant tanks anchored to the bottom of the lake. Each of the tanks in the floating boom would be 15 feet long with hard rubber bumpers attached to each end to absorb impacts from the tanks bumping each other and to reduce the noise level during those impacts. Large floating stabilizing buoys would be attached to the floating boom with chains to assist with holding the curtain in place. Both the tanks and the stabilizing buoys would be constructed of galvanized steel. The main floats supporting the upper curtain's top edge would be anchored by cables to the stabilizing buoys, which in turn would be anchored by cables to the large main anchors on the bottom of the lake. With this two-cable system, a vertical force would not pull down on the main floats.

The curtain would be attached to the shore by cables attached to "trolley" beams extending from two walls, such as bin-type galvanized steel walls, extending from the

high water line (elevation 4,495 feet) on the shore to a point offshore where the bottom of the lake is at elevation 4,463 feet. The “trolley” beams would be used to accommodate the changing levels of the water level of the lake. The two walls would be backfilled with aggregate to form a top surface which could be used to drive small equipment to the lake end of the walls.

To minimize public safety hazards, warning signs would be installed offshore to inform the boating public of the existence of the thermal curtain. Public warning buoys (standard lighted Coast Guard warning buoys) would also need to be installed beyond the location of the thermal curtain. Additionally, cable break warning buoys would be installed at about the mid-span of the main cables so that in the event of a break in the cable the marker buoy would surface to indicate where there is a problem. These buoys would be spherical buoys approximately 2 feet, 6 inches in diameter, constructed of encapsulated rigid closed-cell foam and brightly painted with an identifier for the cable which has broken below the surface.

As described in section 3.3.1.2, in the 1920s, a channel was constructed to link the Prattville intake with the Big Springs area in the eastern lobe of Lake Almanor. When the channel was constructed, excavated sediments were placed along it, creating underwater levees. Based on the results of the IIHR Report, Black & Veatch also evaluated removal of these levees, in addition to installing a thermal curtain around the Prattville intake. Black & Veatch estimated that a disposal site consisting of a minimum of 2 acres of land would be required to contain the estimated 23,000 cubic yards of dredged spoils that would be generated by the floating curtain and dredging-only alternative. Dredging operations would likely occur during the seasonal low water period when the Prattville intake is shut down, likely mid to late October through the end of November. With approximately a 2-acre “footprint” 23,000 cubic yards of dredged spoils could be placed to a height of 10 to 12 feet on the site, which is a fairly typical depth for spoils placement on a disposal site.

Prior to the placement of spoil material, the disposal site would require some preparatory development work, including developing a low containment berm (at least around the downhill side of the site), installing silt fencing or other erosion and sediment control measures, clearing of brush and trees, creating a temporary landing and berth for moorage of transfer barges during the unloading operation, creating a working platform for the unloading crane, and developing appropriate temporary site access improvements. Upon completion of the project, the site would be finish graded to natural contours and planted with appropriate native plants and grasses.

Black & Veatch evaluated two potential disposal sites for the dredged material. The first site was the quarry site near the spillway for Canyon dam, which was last used a few years ago to provide rock for reinforcement of the dam. This site has been extensively regraded and planted and is now covered by a crop of pine seedlings. The second disposal site considered was immediately adjacent to the Prattville intake area.

This disposal site would occupy an unused portion of a parcel of PG&E property where PG&E's cloud seeding facility, including a garage and machine shop, is located. The site near the Prattville intake is an upland site and is also convenient to the area where dredging would occur.

Our Analysis

Lake Almanor is formed by two main lobes or branches; the western lobe or the Chester branch, and the eastern lobe or the Hamilton branch. On average, the eastern lobe is considerably deeper than is the western lobe. The two lobes of Lake Almanor are connected at a narrow region locally called the "Narrows." A peninsula extends into the lake at the Narrows, and acts to partially isolate the eastern and western lobes.

The Prattville intake is located just off the southwest shore of the lake's western lobe, in a small cove just northwest of the Narrows. Construction activities related to the thermal curtain, though temporary, would detract from the visual experience when visiting Lake Almanor. If constructed as designed, the thermal curtain would extend approximately 900 feet from the shoreline, well beyond the location of the Prattville intake. The floats holding the top of the thermal curtain and the stabilizing buoys would be constructed of galvanized steel, and would be connected with steel cables. The galvanized steel floats and buoys and the steel cables would contrast with the darker tones of Lake Almanor and be highly visible, particularly to boaters in this narrow section of the lake. Several homes and resorts are located on the peninsula that extends into the lake at the Narrows across from the Prattville intake. It is likely that the view of Lake Almanor from the peninsula would also be affected by the reflection of the steel tanks and buoys. We conclude that locating a thermal curtain in this location in Lake Almanor would negatively affect the aesthetic quality of the lake, particularly since the area where the curtain would be located is one of the narrowest sections of the lake.

Access currently is restricted in the area immediately surrounding the Prattville intake for safety reasons. However, a day-use area is proposed just north of the Prattville intake. The visual experience of the visitors to this day-use area would also be affected by the presence of a thermal curtain in the lake just south of this area.

Dredging may also occur in conjunction with the placement of a thermal curtain. The timing of the dredging would be from mid to late October through the end of November, when there are fewer visitors to Lake Almanor. However, prior to dredging, vegetation removal and other site disturbing activities would occur in the 2 acres proposed for the spoil disposal area, negatively affecting aesthetics for visitors to Lake Almanor. It is possible that the spoil pile created with the material dredged from the bottom of Lake Almanor would be 10 to 12 feet high. Even with contouring and planting, the spoil pile would contrast with the surrounding area along the southwest shoreline of Lake Almanor, creating negative visual effects for boaters and visitors to the day use area.

We present the estimated cost of all measures that pertain to land use and aesthetic resources in chapter 4, *Developmental Analysis*, and make our final recommendations regarding these measures in section 5.1, *Comprehensive Development and Recommended Alternative*.

3.3.6.3 Unavoidable Adverse Effects

None.

3.3.7 Cultural Resources

3.3.7.1 Affected Environment

Identification of the Area of Potential Effects and Consultations

PG&E advocated that the area of potential effects (APE) for the project (PG&E, 2002a, report 4E) should be defined as follows: all of the lands within FERC project boundaries, including the shorelines of Lake Almanor, Butt Valley reservoir, and Belden forebay; roads between Butt Valley reservoir and Caribou powerhouse; the adit access road leading up from Caribou Road to the Belden tunnel; the access road leading up from Highway 70 to the Belden tunnel siphon; and about 15 acres north of the rest stop along Highway 70 near Belden. Project access road corridors extend 25 feet on either side of centerline and include turnouts. Maps of the APE are included in appendix E4-D of PG&E's application.

This definition of the APE was included in PG&E's First Stage Consultation Package for the UNFFR Project, and circulated for discussion among the project's Cultural Resources Working Group. The Cultural Resources Working Group includes representatives of the Greenville Rancheria, Susanville Indian Rancheria, Mountain Maidu, Maidu Cultural and Development Group, United Maidu Nation, Honey Lake Maidu Tribe, Roundhouse Council, Tasmam Koyom Foundation, Mountain Meadows Conservancy, Plumas County 2105 Committee, Lassen National Forest, and Plumas National Forest. FERC cultural resources staff met with the Cultural Resources Working Group twice (July 23 and September 4, 2002), and discussed the definition of the APE.

In a letter dated April 10, 2002, conveying cultural resources reports to the California State Historic Preservation Office (SHPO), PG&E requested that SHPO concur with its definition of the APE. SHPO responded in a letter dated July 29, 2002, accepting the reports submitted by PG&E. We also agree with PG&E's definition of the APE with the understanding that it can be modified in the future based on the discovery of project-related impacts elsewhere.

Staff consulted with federally recognized Indian tribes with an interest in this proceeding; these tribes were sent Commission notices and issuances. The Greenville Rancheria and the Susanville Indian Rancheria were the only federally recognized tribes

to request to be consulting parties in this proceeding. On two occasions prior to the filing of PG&E's final application, staff met directly with the tribal council of the Greenville Rancheria. PG&E documented its consultations with Native American organizations and individuals in appendix E4-C of its application.

Archaeological Research

The earliest professional archaeological field work in the project area was initiated in the late 1940s and 1950s by Francis Riddell of the University of California at Berkeley. Riddell had previously excavated Tommy Tucker cave in the Honey Lake Valley of Lassen County in the late 1930s and 1940s, while a student at Sacramento Junior College (Fenenga and Riddell, 1949; Riddell and Fenenga, 1951). He also was the first to investigate Rainbow Point at Buck's Lake in Plumas County (Riddell and Pritchard, 1971). Riddell recorded sites around Lake Almanor that include CA-PLU-1, 30, 32, and 33.

Chester Rich, a school teacher from Chester, recorded site CA-PLU-87 on Lake Almanor in 1956. His students produced a manuscript (Johnson and Newman, 1956) about the Indians of Big Meadow (where Lake Almanor is now located), which reported projectile points found near the Durbin Motel on the east side of the lake.

In 1974, Makoto Kowta of California State University at Chico led a survey of the Lake Almanor shoreline between the 4,490 and 4,500 foot elevation contours on behalf of PG&E (Kowta, 1974). Kowta relocated four previously recorded sites and recorded four new archaeological sites (CA-PLU-333, 334, 335, 336). In 1975, Kowta salvaged prehistoric burial remains found eroding into the reservoir at site CA-PLU-33 (Kowta, 1980). Those remains were recently reinterred in the Lake Almanor vicinity.

Trudy Vaughn, of Coyote and Fox, led surveys on the eastern and southern end of Butt Valley reservoir for a powerline tree removal project for the FS and PG&E in 1994. Vaughn recorded 15 new archaeological sites (CA-PLU-1185 to 1197 and 1206 and 1207). PAR Environmental Services, Inc. (PAR) conducted additional archaeological surveys at the Butt Valley reservoir in 1996 for PG&E's seismic remediation project at the Butt Valley dam (Macdougall and Maniery, 1996).

In 2000, PG&E had PAR inventory all accessible lands within the relicensing APE. After the level of Lake Almanor was lowered in 2001, PAR conducted additional surveys (Compas, 2001, 2002). Combined, these surveys covered 7,567 acres, which PG&E claims represents 75 percent of the APE, the remaining 25 percent of the APE being inaccessible due to steep terrain. In 2003, PAR surveyed an additional 140 acres for various proposed recreational areas around Lake Almanor, Butt Valley reservoir, and Belden forebay (Compas, 2003). The 2000 PAR survey relocated 21 previously recorded sites within the APE and identified 35 newly recorded sites and 119 isolated finds. The 2001 PAR survey relocated 11 previously recorded sites and identified 36 new

archaeological sites and 60 new isolated finds. The 2003 PAR survey recorded two new archaeological sites. Among the previously recorded sites relocated by PAR around Lake Almanor were Riddell's CA-PLU-1, 30, and 33; Rich's CA-PLU-87; and Kowta's CA-PLU-334 and 336. PAR indicated that Riddell's sites CA-PLU-31 and 32 could not be relocated because they are inundated beneath the waters of Lake Almanor. The same is the case for Kowta's sites CA-PLU-333 and 335. PAR also relocated seven sites previously recorded by Vaughn around Butt Valley reservoir (CA-PLU-1186, 1188, 1190, 1192, 1195, 11196, and 1206).

The cultural chronology of the Sierra Nevada was shaped by the work of the University of California Archaeological Survey beginning in 1948 (Morato, 1984). The oldest occupations in the project area can be placed within the Upper Archaic period, dating back to about 2500 BC, and include projectile points typed as Elko or Martis series (corner-notched, contracting stem and expanding stem) and Mesilla complex (large leaf-shaped and wide-stemmed). Martis or Elko type points were found at site CA-PLU-113 at Rainbow Point and CA-PLU-115 at Boathouse Point on Buck's Lake (Crew, 1981). Along Lake Almanor, sites CA-PLU-30, 33, 284, 1718, 1719, 1720, 1732, 2019, 2061, 2072, 2073, and 2077 produced Martis or Elko type points. Wide stemmed, or leaf-shaped Mesilla style points were recovered at sites CA-PLU-33, 1717, 1709, 1721, 2063, 2067, 2068, and 2090 around Lake Almanor. No evidence of the Bidwell complex was uncovered in the project area.

The Emergent period, after AD 1000, distinguished by the introduction of the bow and arrow, is represented by the Sweetwater and Oroville complexes in the Sierra Nevada. The Sweetwater complex includes Rose Spring and Gunther points. Some archaeologists believe that Gunther points mark the arrival of the Maidu in the northern Sierra. Gunther points were found at Rainbow Point on Buck's Lake, and at sites CA-PLU-284, 2071, and 2072 along Lake Almanor. The Oroville complex is denoted by Cottonwood triangular and Desert side-notched points. At Boathouse Point on Buck's Lake, Gunther, Eastgate, Rose Spring, Cottonwood, and Desert side-notched points were found within the same cultural horizon (Crew, 1981). Likewise, at site CA-PLU-33 at Lake Almanor, Kowta (1980) recovered Gunther, Rose Spring, Desert side-notched points, and Cottonwood points from a cultural horizon estimated to date between AD 1100 and 1750, together with ground stone artifacts, a steatite pipe, tubular bone beads, pine nut beads, Olivella shell beads, abalone shell objects, and carbonized coiled basketry, associated with 14 burials. Rose Spring, Eastgate, and Desert side-notched points were also noted at sites CA-PLU-2063, 2072, and 2090 and P-32-2076 at Lake Almanor, and site CA-PLU-1186 at the Butt Valley reservoir.

Table 3-38 lists all of the prehistoric or aboriginal archaeological sites identified in the APE. Many of these sites also have historic materials associated with them.

Table 3-38. Prehistoric or multicomponent sites identified within the APE. (Source: PG&E, 2002a)

Site No./Name	Description	Effects	Management
CA-PLU-1/CA-PLU-1731 (NF-15)	Prehistoric lithic scatter, originally recorded by Riddell in 1949, and relocated by Kowta in 1974 and by PAR in 2000.	Riddell noted that wave action was destroying site. Partly inundated. Local residents cited artifact collection. Private home construction.	Signage, education, and limit permit. Monitor and additional recording and testing, as necessary.
CA-PLU-30 may be related to ethnohistoric Maidu village of Manimbaldiki	Prehistoric lithic scatter, with Elko/Martis type point. Originally recorded by Riddell in 1958. Relocated by Kowta in 1974 and PAR in 2001.	Usually inundated, wave action, changing lake levels, recreation, casual visitation and potential vandalism.	Signage. Monitor and additional recording and testing, as necessary.
CA-PLU-33 may be related to ethnohistoric Maidu village of Nakango Koyo	Originally recorded by Riddell in 1958 as prehistoric village and historic stage station, with 8 burials reported. Kowta (1980) salvaged 14 burials eroding from site in 1975. PAR relocated site in 2000, and found bedrock mortars (BRM), ground stone artifacts, Martis expanding stem, Martis corner- notched, Mesilla large leaf shaped, and Gunther points.	Periodically inundated, wave action, recreation and potential vandalism, ORV use.	Proceed to Stage 3. Consult with FERC, SHPO, Greenville Rancheria, SIR, and other interested parties regarding treatment measures to be developed.
CA-PLU-87 may be related to ethnohistoric Maidu village of Yotim	Originally recorded by Rich in 1956 as prehistoric camp with BRMs, points, beads, and ground stone below high water mark. Relocated by PAR in 2000, noted lithics, BRM, and ground stone.	Periodically inundated, wave action, recreation (near old boat ramp and resort), vandalism.	Signage. Monitor and additional recording and testing, as necessary.

Site No./Name	Description	Effects	Management
CA-PLU-284 and CA-PLU-674 may be related to ethnohistoric Maidu village of Oidoing-Koyo	Originally recorded in 1977 for timber sale as prehistoric base camp with Martis corner-notched point and ground stone. Historic component of tin cans originally recorded in 1985 by Chico State. Relocated in 2000 by PAR with Gunther point noted.	Recreation (near camp ground), casual visitation, logging.	Within Lassen National Forest, so treatment should be determined by the FS.
CA-PLU-334	Originally recorded during Kowta's 1974 survey, as BRM. Relocated in 2001 by PAR, with BRMs and lithic scatter, together with historic artifacts and remains of logging railroad grade.	Partial inundation, changing lake levels, wave action, ORV use, casual visitation.	Block ORV access, signage. Monitor and additional recording and testing, as necessary.
CA-PLU-336	Prehistoric lithic scatter, originally recorded during Kowta's 1974 survey, and relocated by PAR in 2000.	Casual visitation, grazing.	Prohibit grazing.
CA-PLU-1185	Prehistoric lithic scatter, including ground stone artifacts, originally recorded during 1994 Coyote and Fox survey.	Recreation (near a camp ground), casual visitation, logging.	Restrict road grading, signage, monitor.
CA-PLU-1186	Prehistoric lithic scatter, with Desert side-notched point. Originally recorded during 1994 Coyote and Fox survey. In 2001, PAR relocated site and found historic artifacts.	Recreation (near camp ground), casual visitation, logging.	Signage, monitor.
CA-PLU-1709 (NF-3)	Recorded by PAR in 2000 as prehistoric lithic scatter in a meadow, with large leaf-shaped Mesilla type point.	Casual visitation.	Signage, monitor.
CA-PLU-1710 (NF-4)	Recorded by PAR in 2000 as prehistoric lithic scatter in a forested meadow, with large leaf-shaped Mesilla type point, and ground stone (metate).	Casual visitation.	Signage, monitor.

Site No./Name	Description	Effects	Management
CA-PLU-1712 (NF-5)	Recorded by PAR in 2000 as prehistoric lithic scatter in a forested meadow. Also has a historic component with depression and artifacts.	Casual visitation (near a dirt road).	Signage, monitor.
CA-PLU-1717 (NF-24)	Recorded by PAR in 2000 as a prehistoric lithic scatter, including large leaf-shaped point (Mesilla complex?).	Often inundated, changing lake levels, wave action.	Signage. Monitor and additional recording and testing, as necessary.
CA-PLU-1718 (NF-26)	Recorded by PAR in 2000 as a prehistoric lithic scatter, including 2 Martis-type points and ground stone artifacts.	Often inundated, changing lake levels, wave action.	PG&E did not propose any treatment measures.
CA-PLU-1719 (NF-27)	Recorded by PAR in 2000 as a prehistoric lithic scatter in marshy alluvial flat, including Martis contracting stem point and ground stone.	Often inundated, changing lake levels, wave action.	Signage. Monitor and additional recording and testing, as necessary.
CA-PLU-1720 (NF-28)	Recorded by PAR in 2000 as a prehistoric lithic scatter in alluvial flat, including Martis point, ground stone, and hearth feature.	Often inundated, changing lake levels, wave action, recreation (near camp ground), and casual visitation.	Signage. Monitor and additional recording and testing, as necessary.
CA-PLU-1721 (NF-29)	Recorded by PAR in 2000 as a prehistoric lithic scatter in marshy alluvial flat, including broad stemmed point similar to Mesilla type.	Often inundated, changing lake levels, wave action, recreation (near picnic area), and casual visitation.	Signage. Monitor and additional recording and testing, as necessary.
CA-PLU-1725 (NF-13) may be associated with ethnohistoric Maidu village of Manimbaldiki	Recorded by PAR in 2000 and 2001 as a prehistoric lithic scatter, with ground stone, and midden soils. Historic component related to RRLC Camp 28.	Often inundated, changing lake levels, wave action.	Monitor and additional recording and testing, as necessary.
CA-PLU-1728 (NF-28)	Sparse prehistoric lithic scatter recorded by PAR in 2000.	Partly inundated, changing lake levels, wave action.	Signage. Monitor and additional recording and testing, as necessary.

Site No./Name	Description	Effects	Management
CA-PLU-1729 (NF-30)	Prehistoric lithic scatter, with ground stone, and midden soils, recorded by PAR in 2000.	Partly inundated, changing lake levels, wave action.	Signage. Monitor and additional recording and testing, as necessary.
CA-PLU-1730 (NF-14)	Prehistoric lithic scatter, with midden soils, recorded by PAR in 2000 on a forested flat.	Partly inundated, changing lake levels, wave action, casual visitation.	Signage. Monitor and additional recording and testing, as necessary.
CA-PLU-1732 (NF-23)	Prehistoric lithic scatter, with leaf-shaped point, recorded by PAR in 2000 and 2001.	Partly inundated, changing lake levels, wave action.	Signage. Monitor and additional recording and testing, as necessary.
CA-PLU-1733 (NF-22)	Prehistoric lithic scatter, with ground stone, recorded by PAR in 2000 and 2001 on muddy alluvial flat meadow.	Partly inundated, changing lake levels, wave action, borrow area for golf course.	Signage. Monitor and additional recording and testing, as necessary.
CA-PLU-1735 (NF-1)	Prehistoric lithic scatter, with BRMs, recorded by PAR in 2000.	Partly inundated, changing lake levels, wave action.	PG&E did not propose any treatment.
CA-PLU-1737 (NF-7)	Prehistoric lithic scatter, with ground stone artifacts, recorded by PAR in 2000.	Partly inundated, changing lake levels, wave action. Recreation, casual visitation, and vandalism.	Signage. Monitor and additional recording and testing, as necessary.
CA-PLU-1738 (NF-8)	Sparse prehistoric lithic scatter, recorded by PAR in 2000. Historic component of tin cans mostly outside project boundary.	Logging, casual visitation.	PG&E did not propose any treatment.
CA-PLU-2019 (LA-5)	Prehistoric lithic scatter, including 4 Elko/Martis points, and ground stone artifacts, recorded by PAR in 2001.	Usually inundated.	PG&E did not propose any treatment.

Site No./Name	Description	Effects	Management
CA-PLU-2061 (LA-6)	Prehistoric lithic scatter, including Elko point, recorded by PAR in 2001.	Usually inundated.	PG&E did not propose any treatment.
CA-PLU-2063 (LA-8)	Prehistoric lithic scatter, including 2 leaf-shaped Mesilla type points and a Desert side-notched point, recorded by PAR in 2001.	Usually inundated.	PG&E did not propose any treatment.
CA-PLU-2065 (LA-10) may be associated with ethnohistoric villages of Oidoing-Koyo or Nakang-Koyo	Prehistoric lithic scatter, recorded by PAR in 2001.	Usually inundated.	PG&E did not propose any treatment.
CA-PLU-2066 (LA-11)	Prehistoric lithic scatter, recorded by PAR in 2001.	Usually inundated.	PG&E did not propose any treatment.
CA-PLU-2068 (LA-18)	Prehistoric lithic scatter, including wide-stemmed Mesilla type point, recorded by PAR in 2001. Historic component related to logging activities.	Usually inundated.	PG&E did not propose any treatment.
CA-PLU-2069 (LA-20)	Prehistoric lithic scatter, with 4 point fragments, and hearth feature, recorded by PAR in 2001.	Usually inundated.	PG&E did not propose any treatment.
CA-PLU-2071 (LA-22)	Prehistoric lithic scatter, including Gunther point and ground stone, recorded by PAR in 2001.	Usually inundated.	PG&E did not propose any treatment.
CA-PLU-2072 (LA-24)	Prehistoric lithic scatter, including Martis, Gunther, and Rose Spring points and ground stone, recorded by PAR in 2001.	Usually inundated.	PG&E did not propose any treatment.

Site No./Name	Description	Effects	Management
CA-PLU-2073 (LA-29)	Prehistoric lithic scatter, including corner-notched Martis and Sierra Contracting Stem points, recorded by PAR in 2001.	Usually inundated.	PG&E did not propose any treatment.
CA-PLU-2074 (LA-30)	Prehistoric lithic scatter, with 2 point fragments, recorded by PAR in 2001. Site contains an historic component also.	Usually inundated.	PG&E did not propose any treatment.
CA-PLU-2077 (LA-34)	Prehistoric lithic scatter, including Northern side-notched and Martis type points, and ground stone, recorded by PAR in 2001.	Usually inundated.	PG&E did not propose any treatment.
CA-PLU-2089 (LA-26) may be associated with ethnohistoric villages of Manimbalkiki	Prehistoric BRM, recorded by PAR in 2001, near sites CA-PLU-30 and 333.	Usually inundated.	PG&E did not propose any treatment.
CA-PLU-2090 (LA-27)	Prehistoric lithic scatter, including leaf-shaped, Eastgate, and Desert side-notched points, and ground stone, recorded by PAR in 2001.	Usually inundated.	PG&E did not propose any treatment.
CA-PLU-2094 (LA-28)	Prehistoric BRM, recorded by PAR in 2001.	Usually inundated.	PG&E did not propose any treatment.
P-32-1714 (NF-16) may be associated with ethnohistoric village of Chambukunyim	Prehistoric lithic scatter, mounds, and midden soil, in grassy meadow, recorded by PAR in 2000.	Casual visitation, grazing.	Signage. Monitor and additional recording and testing, as necessary.
P-32-2064 (LA-9)	Prehistoric lithic scatter, recorded by PAR in 2001.	Usually inundated.	PG&E did not propose any treatment.

Site No./Name	Description	Effects	Management
P-32-2075 (LA-32)	Prehistoric lithic scatter, recorded by PAR in 2001.	Usually inundated.	PG&E did not propose any treatment.
P-32-2076 (LA-33)	Prehistoric lithic scatter, with 2 points, including a side-notched, recorded by PAR in 2001.	Usually inundated.	PG&E did not propose any treatment.
P-32-2079 (LA-36)	Prehistoric lithic scatter, with a steatite pipe bowl, recorded by PAR in 2001. Site includes an historic artifact also.	Usually inundated.	PG&E did not propose any treatment.
P-32-2080 (LA-39)	Prehistoric lithic scatter, recorded by PAR in 2001. May be related to site LA-40.	Usually inundated.	PG&E did not propose any treatment.
P-32-2081 (LA-40)	Prehistoric lithic scatter, including ground stone artifacts, recorded by PAR in 2001. May be related to site LA-43.	Usually inundated.	PG&E did not propose any treatment.
P-32-2082 (LA-42)	Prehistoric lithic scatter, recorded by PAR in 2001. May be related to site CA-PLU-1717.	Usually inundated.	PG&E did not propose any treatment.
P-32-2083 (LA-43)	Prehistoric lithic scatter, recorded by PAR in 2001. May be related to site LA-40.	Usually inundated.	PG&E did not propose any treatment.
P-32-2084 (LA-44)	Prehistoric lithic scatter, recorded by PAR in 2001.	Usually inundated.	PG&E did not propose any treatment.
P-32-2085 (LA-45)	Prehistoric lithic scatter, including 3 points, recorded by PAR in 2001.	Usually inundated.	PG&E did not propose any treatment.
P-32-2086 (LA-46)	Prehistoric lithic scatter, recorded by PAR in 2001. May be related to site LA-47.	Usually inundated.	PG&E did not propose any treatment.

Site No./Name	Description	Effects	Management
P-32-2087 (LA-47)	Prehistoric lithic scatter, with ground stone, and hearth feature. May be related to site LA-46.	Usually inundated.	PG&E did not propose any treatment.
P-32-2092 (LA-2)	Prehistoric lithic scatter and ground stone artifacts, recorded by PAR in 2001. Site also contains an historic component.	Usually inundated.	PG&E did not propose any treatment.
P-32-2093 (LA-37)	Prehistoric lithic scatter, including corner-notched point, and BRM, recorded by PAR in 2001.	Usually inundated.	PG&E did not propose any treatment.
P-32-2122 (LA-38)	Prehistoric lithic scatter, recorded by PAR in 2001.	Usually inundated.	PG&E did not propose any treatment.

Ethnographic Research

The project area is the native homeland of the Maidu Indian tribe. The Mountain Maidu, also known as the Northern or Northeastern Maidu, occupied valleys in the Sierra Nevada along the Feather River and its tributaries, including Big Meadow and Butt Valley. Their territory extended from Mount Lassen south to Sierra Butte, and from Honey Lake west to Rich Bar. The Northwestern Maidu, or Konkow, occupied the area from Rich Bar west to the Sacramento River, while the Southern Maidu, or Nisenan, occupied the Yuba and American River drainages east from Sacramento. The Maidu, Konkow, and Nisenan are all subgroups of the California Penutain linguistic family.

Ethnographic studies of the Maidu date back to Stephan Powers' articles in the early 1870s. As part of the Huntington Expedition, between 1899 and 1903, Roland Dixon (1905) was the first trained anthropologist to conduct field work with the Maidu. Physician and biologist C. Hart Merriam did anthropological field work with the Maidu in Big Meadow and the American Valley between 1903 and 1930, supported by an endowment from E.H. Harriman. In 1924, Edward Curtis published photographs of Maidu people, together with some ethnographic notes, in volume 14 of his North American Indian series. A.L. Kroeber, of the University of California, devoted several chapters to the Maidu in his Handbook of the Indians of California, published in 1925. University of California linguist William Shipley started working on the Maidu language in 1954. Francis Riddell (1978), the former State Archaeologist for California, had a long career of research among the Maidu, dating from the 1940s through the 1970s. Dorothy Hill studied the Maidu both as a student at the California State University at

Chico and as a teacher at Butte College. In 1977, Marie Potts, a Maidu from Big Meadow, published her book about the tribe. Leigh Ann Hunt's 1992 California State University at Sacramento master's thesis on the Bear Dance also contained ethnographic information about the Mountain Maidu.

As part of its relicensing efforts, in 2001, PG&E commissioned an ethnographic study of the project area to identify traditional cultural properties (TCPs). The research was conducted by Albion Environmental, Inc. (Albion), according to an MOU signed by Albion, PG&E, and the Greenville Rancheria. Albion reviewed the ethnographic literature, and interviewed nine Maidu informants. The study mentions 14 potential TCPs in the APE (Brickley and Blount, 2002; see table 3-39).

Table 3-39. Potential TCPs identified by PG&E's ethnographic study in the APE.
(Source: PG&E, 2002a)

Field No. and Name	Description	Archaeological Correlate	Evaluation	Effects/Management
1 – Big Meadow	Site of numerous ethnohistoric Maidu villages, and historic Maidu allotments; plays role in Maidu Creation Story and other myths, place for fishing, hunting, and gathering activities.	Maidu called valley Naga Koiyo or Nakankoyo or Nah-Kahn-ko. Valley contains numerous aboriginal sites.	Does not retain qualities of a TCP.	Inundated by Lake Almanor. PG&E to develop a public education program.
2 – Eastern Shore Burials	Maidu burials associated with former village location.	Maidu village called Manimbaldiki. Sites CA-PLU-30, 1725, and 2090.	Retains qualities of a TCP.	Inundated by Lake Almanor. If reservoir is drawn down PG&E would try to relocate and assess burial site.
3 – Frog Rock	Place connected to Maidu mythology and stories about Earthmaker.	CA-PLU-1729.	Retains qualities of a TCP.	Partly inundated by Lake Almanor. PG&E would protect site from future impacts by prohibiting construction in area.

Field No. and Name	Description	Archaeological Correlate	Evaluation	Effects/Management
4 – Prattville	Botanical gathering area; possible burial location; and location of Maidu Big Times ceremony.	CA-PLU-1734, and P-32-2093.	Does not retain qualities of a TCP.	Partly inundated by Lake Almanor, and partly developed as PG&E construction camp, and recreational area. PG&E would develop an agreement with Maidu regarding future gathering and protection of specific plant species.
5 – Big Spring	Maidu village location; named in Maidu myths and associated with Earthmaker; site of Big Times and Bear Dance ceremonies; and important location for Maidu shamans.	Maidu village called Wisotpinim. Site CA-PLU-32.	Retains qualities of a TCP.	Inundated by Lake Almanor. PG&E to develop a public education program.
6 – Canyon dam spillway	Place associated with Earthmaker in Maidu Creation Story and myths.	CA-PLU-1264, 1265, 1726, and 1727.	Retains qualities of a TCP.	Site developed as dam and spillway, and impacted by associated construction camp, and historic logging activities. No treatment proposed.
7 – Willow gathering area	Maidu botanical gathering area. “Gray” willow used for basketmaking.	None.	Retains qualities of a TCP.	Partly inundated by Lake Almanor. PG&E would develop an agreement with Maidu regarding future gathering and protection of specific plant species.
8 – Fishing hole along Butt Creek	Maidu family fishing location	None	Does not qualify as a TCP	Project may have affected fishery. No treatment proposed.

Field No. and Name	Description	Archaeological Correlate	Evaluation	Effects/Management
9 – Roundhouse in Butt Valley	Location of a Maidu roundhouse, probably associated with a village.	CA-PLU-1245.	Does not retain qualities of a TCP.	Inundated by Butt Valley reservoir. If reservoir is drawn down PG&E would try to relocate and assess site.
10 – Maidu Trail	Trail historically used by Maidu to travel between Butt Valley and Humbug Valley.	None.	Does not retain qualities of a TCP.	Partly inundated by Butt Valley reservoir. No treatment proposed.
11 – Gould's Swamp	Historic Maidu hunting grounds and botanical gathering area.	CA-PLU-1709, 1710, 1712, 1719.	Does not retain qualities of a TCP.	Partly inundated by Lake Almanor. No treatment proposed.
12 – Maidu Church	Location of a former church attended by members of the Maidu community; also a plant gathering area.	CA-PLU-1714, and 1717.	Does not retain qualities of a TCP.	Church building no longer standing. No effect from the project. No treatment proposed.
13 – Gravel pit gathering area	Location of a Maidu family botanical gathering area.	CA-PLU-1713 and 1715.	Does not retain qualities of a TCP.	No effect from the project. PG&E would develop an agreement with Maidu regarding future gathering and protection of specific plant species.
14 – Butt Valley	Location of ethnohistoric Maidu villages; botanical gathering, and hunting area.	Maidu called valley Kobati or Yakuning Koiyo or Kawati. Five prehistoric sites recorded in the vicinity.	Does not retain qualities of a TCP.	Inundated by Butt Valley reservoir. PG&E to develop a public education program.

Based on research conducted by Riddell and Kowta, PAR (Compas, 2001) identified nine ethnohistoric Maidu villages in the Lake Almanor area. Brickley and

Blount's (2002) TCP study also mentions Maidu village place names in the project area (see table 3-40).

Table 3-40. Ethnohistoric Maidu villages in the UNFFR Project vicinity. (Source: PG&E, 2002a)

Village Name	Place/Source	Archaeological Correlates	Effects/Management
Chaldino	Village in the Lake Almanor area (Brickley and Blount 2002)	Not located	Assumed inundated under Lake Almanor. No treatment proposed.
Chambukunyim	Village near Chester and Stover Ranch (Riddell 1978; Compass, 2001)	P-32-1714	Affected by historic use, grazing, casual visits; and partly inundated by Lake Almanor. Treatment would include signage, elimination of grazing, monitoring, and possibly testing.
Humodum	Winter village site in Big Meadow (Brickley and Blount, 2002)	Not located	Assumed inundated under Lake Almanor. No treatment proposed.
Kobati or Yakuning koiyo or Kawati	Maidu name for Butt Valley, means "fan the dirt." (Brickley and Blount, 2002)	Too general, not located	Inundated under Butt Valley reservoir. Proposed treatment would include developing a public education and interpretation program.
Kolyem	Village near a spring west of Big Spring (Riddell, 1978; Compass 2001; Brickley and Blount, 2002)	CA-PLU-31, not relocated	Assumed inundated under Lake Almanor. No treatment proposed.
Kom-hum	Village with a roundhouse in Big Meadow (Brickley and Blount, 2002)	Not located	Assumed inundated under Lake Almanor. No treatment proposed.
Manimbaldiki	Village at edge of Big Meadow, near Canyon dam, including dance house and associated cemetery (Riddell, 1978, Compass, 2001; Brickley and Blount, 2002)	CA-PLU-30, 333, 1725, and 2089	Affected by recreation, casual visitation; and partly inundated under Lake Almanor. Treatment would include signage, monitoring, and possibly testing.

Village Name	Place/Source	Archaeological Correlates	Effects/Management
Naga koiyo, Nakankoyo, or Kahn-ko	Maidu name for Big Meadow (Brickley and Blount, 2002)	Too general, not located	Inundated under Lake Almanor. Proposed treatment would include developing a public education and interpretation program.
Nakan Koyo	Village near Big Spring. Also Maidu name for people of the entire Big Meadow valley (Dixon, 1905; Compass, 2001; Brickley and Blount, 2002))	Compass (2001) associates this village with CA-PLU-33, but the locations do not match	Assumed inundated under Lake Almanor. Treatment proposed for CA-PLU-33 could include data recovery.
Oi-dim koiyum, or Oidim koiyo, or Oiding Koiyo	Maidu name for “upper valley” or “upper end of the meadows,” and village north of Chester (Brickley and Blount, 2002). Compas (2001) thought this village was near Big Spring.	CA-PLU-284 and 2065	Affected by recreation, casual visitation, logging, and inundation. Treatment of site 284 should be determined by the FS.
Potadi	Village west of Canyon dam (Riddell, 1978; Compas, 2001; Brickley and Blount, 2002)	Not located	Assumed inundated under Lake Almanor. No treatment proposed.
Taldinom	Village near new Prattville (Riddell, 1978; Compass, 2001; Brickley and Blount, 2002)	Not located	Assumed inundated under Lake Almanor. No treatment proposed.
Wisotpinim	Village near Big Spring (Riddell, 1978; Compas, 2001; Brickley and Blount, 2002)	CA-PLU-32, not relocated	Assumed inundated under Lake Almanor. No treatment proposed.
Yoatim,	Village near Hamilton Branch (Riddell, 1978; Compass, 2001; Brickley and Blount, 2002)	CA-PLU-87	Affected by vandalism; partly inundated by Lake Almanor. Treatment would include signage, monitoring, and possibly testing.

Although representatives of the U.S. government negotiated a treaty with various Maidu bands in 1851, it was never ratified. While some Maidu people were forced to relocate to reservations, many Mountain Maidu remained in their ancestral homeland, co-existing with miners, ranchers, loggers, and tourists. Marie Potts (1977) recalled that it was common for the Maidu to work as laborers on the ranches in Big Meadow and adjacent valleys. A census in 1864 counted 262 Maidu in Seneca Township, including Big Meadow and Butt Valley, out of a total population of 800 (Brickley and Blount, 2002). The federal census of 1880 enumerated 137 Indians out of a total population of 535 people in Seneca Township (Maniery, 1999). In the 1890s, the government established boarding schools for Maidu children in Greenville, Taylorville, and Indian Valley. After the passage of the Dawes Act in 1887, some Maidu people were able to acquire allotments near their traditional villages in the mountain valleys. Kelsey's census of non-reservation California Indians in 1905-1906 enumerated 29 Maidu families owning land in Big Meadow, and an additional 23 Maidu families living in Big Meadow but not owning land (Compass, 2001). The Great Western Power Company had to acquire some allotments from Maidu landowners when it bought up property for its UNFFR hydroelectric project, shortly after the turn-of-the-century.

Historical Research

The Maidu first came into contact with Euro-Americans during the period of Spanish colonization of California. In 1820, Luis Arguello led a Spanish expedition through the San Joaquin Valley and named the Feather River. American and Canadian fur traders explored the Sierra Nevada between 1828 and 1836, making contact with native tribes, but only passing through the region temporarily during their travels. The first Euro-Americans to reside in Maidu territory included John Sutter at modern day Sacramento in 1839, and John Bidwell at Chico in 1847, at a time when California was still part of Mexico.

It was the gold rush which led to the permanent Euro-American settlement of the project area. In 1848, Peter Lassen blazed the trail, named after him, through the project area. Miners followed this trail to the upper Feather River drainage. Big Meadow, Prattville, Butt Valley, and Caribou are on Gudde's (1975) list of California gold camps. In the 1850s, the town of Caribou sprung up to support activities at the Caribou Mining District. The community of Buttville (site CA-PLU-1245), centered on William and Lena Miller's hotel and store, and Drake's saloon, including a Chinatown, served the North Fork and Seneca Mining Districts.

Some miners turned to agriculture. Although the Lee, Bunnell, and Miller families, who eventually intermarried with each other, were drawn to the upper Feather River drainage in search of gold in the 1850s, they ended up running dairy ranches in Butt Valley (Maniery, 1999). In 1859, the Stover brothers were the first to establish a ranch in Big Meadow (site P-32-1716). Dr. Willard Pratt founded his ranch and hotel in Big Meadow in 1867, and the town of Prattville grew around it. In 1869, Wells Bunnell

married Julia Lee, Lena Miller's sister, and they moved from Butt Valley to near Prattville to operate a ranch and hotel. By the 1870s, a road (site P-32-1742) led from Miller's ranch up Butt Valley to Prattville, and then on to Johnson's ranch near modern Chester.

The timber industry also was associated with mining activities. In the 1890s the Sierra Lumber Company was a major landowner in Big Meadow. Around the turn-of-the-century, the Red River Lumber Company, from Minnesota, began operations in the project area, and established the town of Westwood at its mill in 1913 (Maniery and Compas, 2002). Timber-related historic archaeological sites in the APE include the remains of logging railroad grades (like site CA-PLU-1211) and camps (like site CA-PLU-1736).

The UNFFR Project was the brainchild of engineer Julius Howells, who first visited the region during a geological expedition in 1882 and recognized its potential for hydropower development. In 1902, he helped organize what later became the Great Western Power Company, with the backing of Edwin and Guy Earl. This company had representatives gather together the water rights and easements necessary for the project, and began construction of Canyon dam in 1912, as a multiple arch design by John Eastwood. However, company politics changed this into a hydraulic-fill dam, designed by Howells, which was completed in 1914, creating Lake Almanor. In 1925, the size of Lake Almanor was increased when a new, larger hydraulic-filled dam was put up by the Foundation Company. In Butt Valley, a rock-filled dam was erected by Stone and Webster in 1921. It was replaced by larger hydraulic-filled dam begun in 1923 by the Schultz Construction Company (Jackson Research Projects, 1986). Water from Lake Almanor and Butt Valley was conveyed by tunnels and penstock to the Caribou No. 1 powerhouse, which became operational in 1921. PG&E acquired Great Western Power in 1930, and expanded the UNFFR Project. The Belden dam and forebay were built in 1956; in 1958 the Butt Valley powerhouse came on line and a second powerhouse was put in at Caribou; the Belden powerhouse was built in 1969; and the Oak Flat powerhouse was built in 1984 (Baker and Bakic, 2001).

The earliest history of Plumas County was published in 1882, and mentioned the Miller ranch in Butt Valley and the Stover ranch in Big Meadow (both ranches are within the APE). The first published summary of the creation of the UNFFR hydroelectric system was Coleman's (1952) corporate history of PG&E. In 1986, PG&E commissioned Jackson Research Projects to write a more detailed history of the Great Western Power Company and the UNFFR hydroelectric system. Also for PG&E, Shoup and Cornford (1987) produced a National Register of Historic Places (National Register) evaluation of the Caribou No. 1 powerhouse. Michael Landon, a student at California State University at Sacramento, wrote his 1988 masters thesis about the creation of Lake Almanor. This was also the subject of an article by Teisch (1999). In 1996, PG&E conducted seismic remediation work at both the Butt Valley dam and Canyon dam. This

resulted in a National Register evaluation of Canyon dam (Maniery and Baker, 1996). When water behind the Butt Valley dam was drawn down, the historic dam construction camp (Camp 5, recorded as archaeological site CA-PLU-1245) was revealed, so PG&E mitigated impact through data recovery excavations (Maniery, 1999, 2002). Also because of the seismic remediation, PAR documented the Butt Valley dam, Gate Tender's House and outbuildings for the Historic American Engineering Record. As part of its current relicensing effort, PG&E had PAR produce a National Register evaluation of the entire UNFFR hydroelectric system (Baker and Bakic, 2001), and evaluations of historical archaeological sites within the APE (Maniery and Compass, 2002).

Table 3-41 lists the historic archaeological sites and standing structures identified within the APE. During PG&E's seismic remediation program in 1996, FERC, in consultation with SHPO, determined that Canyondam; Camp 5 (CA-PLU-1245); the Butt Valley Railroad (CA-PLU-1743); and the Gate Tender's House, barn, and shed at the Butt Valley dam were eligible for the National Register. For the current relicensing, SHPO commented on PAR's recommendations for historic sites and structures, in a letter dated July 29, 2003. While SHPO states the UNFFR hydroelectric system as a whole does not qualify for the National Register as a historic district, it does find individual elements of the system to be eligible (Lake Almanor and the Canyondam Outlet Tower). SHPO also indicates that one structure at Camp Almanor (Gate Tender's House), two structures at Canyondam Camp (Patrolman's House and Cottage), and all structures within PG&E's Camp Caribou are eligible for inclusion on the National Register.

Table 3-41. Historic archaeological sites and structures identified in the APE. (Source: PG&E, 2002a)

Site No./Name	Description	SHPO Opinion	Effects	Management
CA-PLU-334	Red River Lumber Company (RRLC) railroad grade (includes prehistoric component, bedrock mortar).	Eligible for nomination to the National Register.	Partly inundated, wave action, recreation, ORV use.	Signage, block access, monitor, and possibly test.
CA-PLU-713 Caribou No. 1 Powerhouse	Powerhouse building and penstocks, originally built with 2 generating units by Stone and Webster between 1919 and 1921, with a third unit added in 1923-1924.	Eligible for the National Register.	Operation and maintenance.	No treatment proposed.

Site No./Name	Description	SHPO Opinion	Effects	Management
CA-PLU-1028 Belden Cemetery	Cemetery contains at least 14 graves, some of whom are Maidu.	Not eligible for nomination to the National Register.	Not considered.	No further work.
CA-PLU-1188	Can scatter, probably related to recreational activities after ca. 1935.	Not eligible for the National Register.	Not considered.	No further work.
CA-PLU-1190	Historic artifact scatter, including cans, ceramics, and glass bottles, probably related to post-1930 recreation.	Not eligible for the National Register.	Not considered.	No further work.
CA-PLU-1192	Historic artifact scatter, probably associated with the Butt Valley dam caretaker's residence, dating to ca. 1930s.	Not eligible for the National Register.	Not considered.	No further work.
CA-PLU-1195	Historic artifact scatter, dating between about 1910 and 1920, related to the occupation of the construction camp for the first Butt Valley dam (Camp 5).	Not eligible for the National Register.	Not considered.	No further work.
CA-PLU-1196	Historic artifact scatter related to the occupation of Camp 5, ca. 1915 to 1930.	Not eligible for the National Register.	Not considered.	No further work.
CA-PLU-1211 RRLC Railroad	RRLC logging railroad system, 1922 to 1924, consists of 17 recorded segments.	Not eligible for the National Register.	Not considered.	No further work.
CA-PLU-1236	Can dump probably related to logging activities, ca. 1920s.	Not eligible for the National Register.	Not considered.	No further work.

Site No./Name	Description	SHPO Opinion	Effects	Management
CA-PLU-1245 Buttville/Camp 5	William Miller ranch, founded in 1859, later a hotel, store, and townsite, acquired by Great Western Power in 1902 and used as a workers camp during the construction of the first Butt Valley powerhouse in 1911, and the Butt Valley dams built in 1919 and 1923.	Eligible for the National Register.	Inundated under reservoir.	Signage. In the event of a draw down, record, test, and conduct data recovery as necessary.
CA-PLU-1265	Historic artifact scatter (cans and ceramics) probably related to logging activities, ca. 1920s.	Not eligible for the National Register.	Not considered.	No further work.
CA-PLU-1496	Can dump probably related to logging activities, ca. 1920s.	Not eligible for the National Register.	Not considered.	No further work.
CA-PLU-1711 (NF-6)	Historic artifact scatter, perhaps related to recreational activities, 1930s to 1960s.	Not eligible for the National Register.	Not considered.	No further work.
CA-PLU-1713 (NF-12)	Historic artifact scatter, probably representing post-1926 recreation.	Not eligible for the National Register.	Not considered.	No further work.
CA-PLU-1715 (NF-17)	Historic artifact scatter, dated from the 1930s to the 1960s, probably related to the community of Chester. Includes sparse prehistoric component.	Not eligible for the National Register.	Not considered.	No further work.

Site No./Name	Description	SHPO Opinion	Effects	Management
CA-PLU-1726 (NF-19)	Historic artifact scatter related to the second Canyon Dam construction camp, occupied in the mid-1920s by the Foundation Company workers.	Not eligible for the National Register.	Not considered.	No further work.
CA-PLU-1727 (NF-20) Foundation Company camp at Nevis, also called Canyon Dam Camp	Foundation remains of the administrative building for the second Canyon Dam construction camp, occupied between about 1925 and 1930.	Not eligible for the National Register.	Not considered.	No further work.
CA-PLU-1734 (NF-21)	Historic artifact scatter related to Camp 1 (also known as Camp Almanor at New Prattville) the construction camp opened in 1919 for the Prattville intake towers and tunnel, later reused by PG&E as a recreational camp.	Not eligible for the National Register.	Not considered.	No further work.
CA-PLU-1736 (NF-2) RRLC Camp 34	Historic artifact scatter related to the RRLC Camp 34 logging camp, occupied in the early 1920s.	Not eligible for the National Register.	Not considered.	No further work.
CA-PLU-1739 (NF-9)	Historic mining remains and later artifact scatter related to the construction of the Butt Valley dam, ca. 1920.	Not eligible for the National Register.	Not considered.	No further work.

Site No./Name	Description	SHPO Opinion	Effects	Management
CA-PLU-1743 Butt Valley Railroad	In 1919 Stone and Webster built a railroad for the construction of the Caribou power plant and Butt Valley dam. The railroad was reused by Schultz during construction of second Butt Valley dam in 1923.	Eligible for the National Register.	Inundated under Butt Valley reservoir.	Signage. In the event of a draw down, record, test, and conduct data recovery as necessary.
P-32-1206	Concrete cap over air vent for the Prattville Tunnel 1. Use of this tunnel began in 1919 and it was abandoned in place in 1957.	Not eligible for the National Register.	Not considered.	No further work.
P-32-1638 Canyon dam	Originally begun in 1912 as multiple arch designed by John Eastwood, but finished in 1914 as hydraulic-fill designed by Julius Howells. Replaced in 1925-1927 by larger hydraulic fill dam built by the Foundation Company. Second dam height raised in 1962, and seismically retrofitted in 1996.	Eligible for the National Register.	Operation and maintenance (O&M) activities	No treatment measures proposed by PG&E.
P-32-1639 Canyon dam Outlet Tower	Lower section of the tower built in 1912, and height raised in 1926. Slight modifications made between 1936 and 1965.	Eligible for the National Register.	O&M activities. (PG&E repairing outlet tower gates in Fall 2005.)	No treatment measures proposed by PG&E.
P-32-1640 Prattville Intake Towers	First intake tower begun in 1919 to supply water for Prattville Tunnel 1. It was abandoned and replaced by second Prattville Intake Tower in 1957, which connects to Butt Valley Tunnel 1A.	Not eligible for the National Register.	Not considered.	No further work.

Site No./Name	Description	SHPO Opinion	Effects	Management
P-32-1641 Patrolman's House at Canyon Dam Camp	One of the few remaining buildings left from the construction camp used by the crew which built the second Canyon dam. This house was constructed in 1922 and moved to this location in 1926.	Eligible for the National Register.	Operation and maintenance.	No treatment proposed.
P-32-1642 Cottage at Canyon Dam Camp	This cabin was constructed in 1922 and moved to this location in 1926. The Canyon Dam Camp was occupied by the crew which built the second Canyon dam.	Eligible for the National Register.	Operation and maintenance.	No treatment proposed.
P-32-1643 to - 1652 Camp Caribou district (also known as Camp 9)	Originally a construction camp for the crew which built the Caribou powerhouse, ca. 1919-1921. Later became a PG&E recreational camp. Consists of 22 structures, including 10 houses, clubhouse, dormitory, schoolhouse, and 2 garages.	Eligible for the National Register.	Operation and maintenance. PG&E considering removing pool and tennis court.	SA requires PG&E to maintain exterior and landscaping of old clubhouse and grounds to preserve historic features and character, and consult with the FS before conducting maintenance and repair activities.
P-32-1716 (NF-18) Stover Ranch	Stover family ranch founded in 1859, operated until 1960s. Ten standing structures remain.	Eligible for National Register.	Recreation, casual visits, vandalism.	Signage, monitoring, possibly testing.
P-32-1722 (NF-31)	Portion of a wagon road grade, dating to the 1870s, connecting Big Meadow ranches with the road to Red Bluff.	Not eligible for the National Register.	Not considered.	No further work.

Site No./Name	Description	SHPO Opinion	Effects	Management
P-32-1723 (NF-32)	Fence.	Not eligible for the National Register.	Not considered.	No further work.
P-32-1724 (NF-33)	Portion of a local wagon road grade, connecting ranches in Big Meadow, utilized from the 1890s to the 1920s.	Not eligible for the National Register.	Not considered.	No further work.
P-32-1740 (NF-10)	Mine adit. Claim not recorded. May date to the 1930s.	Not eligible for the National Register.	Not considered.	No further work.
P-32-1741 (NF-11)	Mine adit. Claim not recorded. May date to the 1930s.	Not eligible for the National Register.	Not considered.	No further work.
P-32-1742 (NF-35)	Portion of the wagon road grade between Prattville and Johnson's Ranch, dated to the 1860s	Not eligible for the National Register.	Not considered.	No further work.
P-32-1744 (NF-36)	Wood fence.	Not eligible for the National Register.	Not considered.	No further work.
P-32-1766 Camp 4	Construction camp, including sawmill, utilized by Stone and Webster from 1919 to 1921 for the first Butt Valley dam. It was reoccupied by Schultz between 1923 and 1924 during construction of second dam.	Eligible for National Register.	Partly inundated, wave action, casual visitation.	Signage. In the event of a draw down of reservoir level, site should be more fully recorded, possibly tested, and data recovery done if necessary.
P-32-2062 (LA-7)	Fence line.	Not eligible for the National Register.	Not considered.	No further work.

Site No./Name	Description	SHPO Opinion	Effects	Management
P-32-2067 (LA-17) RRLC Camp 38	Multi-component: prehistoric isolated find and historic artifact scatter related to RRLC railroad and logging camp occupied in the 1920s.	Not eligible for the National Register.	Not considered.	No further work.
P-32-2070 (LA-21)	Fence line.	Not eligible for the National Register.	Not considered.	No further work.
P-32-2078 (LA-35)	Gravel quarry, perhaps used by RRLC railroad in the 1920s.	Not eligible for the National Register.	Not considered.	No further work.
P-32-2088 (LA-48)	Remains of a segment of old State Highway 36, abandoned in 1928 when the new causeway was built.	Not eligible for the National Register.	Not considered.	No further work.
P-32-2091 (LA-1)	Multi-component: prehistoric isolated find and historic artifact scatter dated to about the turn-of-the-century.	Not eligible for the National Register.	Not considered.	No further work.
UNFFR-1H	Remains of hydraulic mining, including cut features, equipment pads, rock walls, test pits, and rock piles. Not a claimed mine, may date to 1920s– 1930s.	Unevaluated.	Use of recreational campground and logging.	No treatment proposed.
UNFFR-2H	Historic artifact scatter, mostly tin cans. Related to sites CA-PLU-1726 and 1727, part of the Canyondam construction camp, occupied in the late 1920s.	Unevaluated.	Use of recreational campground.	No treatment proposed.

Site No./Name	Description	SHPO Opinion	Effects	Management
Camp Almanor (also called New Prattville or Camp 1)	Construction camp established in 1919 for crews working on the Prattville Intake Tower and Prattville Tunnel 1. Moved when level of Lake Almanor was raised in 1925. Most extant structures erected ca. 1926. Non-eligible elements include the old mess hall, office, 2 bunkhouses, warehouse, meathouse, 2 garages, 2 sheds, and boathouse moved here in 1957. Since the 1930s, it has been used as PG&E recreational camp.	Not eligible for the National Register.	Not considered.	No further work.
Gate Tender's House at Camp Almanor	Built in 1926 as part of Camp Almanor, the interior retains many original elements.	Eligible under criterion 36 CFR 60.4c.	Operation and maintenance.	No treatment proposed.
UNFFR Hydroelectric System	Non-eligible elements include Prattville Tunnels 1 (1919) and 1A (1957), Butt Valley powerhouse (1958), Butt Valley dam and reservoir (1924), Butt Valley Tunnel 1 (1920) and 2 (1956), Caribou Penstock 2 (1958), Caribou powerhouse 2 (1958), Belden dam and forebay (1956), Oak Flat powerhouse, (1984), Belden Penstock (1969), Belden powerhouse (1969).	Not eligible for the National Register.	Not considered.	No further work.

Site No./Name	Description	SHPO Opinion	Effects	Management
Lake Almanor	When created behind the first Canyon dam in 1914 it was the largest man-made reservoir in the world. Reservoir size increased in 1927 and 1963.	Eligible for the National Register.	Operation and maintenance.	No treatment proposed.

3.3.7.2 Environmental Effects

Effects on cultural resources within the APE can include, but are not limited to, inundation under the waters of project reservoirs, wave action along the edges of the reservoirs, recreational use of the reservoirs and other project lands, other uses of project lands such as livestock grazing, natural wind and water erosion, use and maintenance of roads, vandalism, and modifications or repairs to project facilities. The type and level of effects on cultural resources can vary widely, depending upon site location and setting, features and attributes, visibility of the resource, and public knowledge and access to a resource. Effects can be direct, resulting from operation of the project, or indirect, such as public use of project roads to access lands not used for project purposes.

Section 106 of the NHPA, and its implementing regulations at 36 CFR Part 800, guide our consideration of project-related effects on cultural resources. The law and regulations only require FERC to consider potential effects of undertakings we license on historic properties, which are cultural resources that are listed or eligible for listing on the National Register. PG&E has agreed to treat all cultural resources that have not been officially evaluated for eligibility to the National Register as potentially eligible.

We agree with SHPO that 35 historic archaeological sites and standing structures in the APE are not eligible for the National Register. The project would have no effect on non-eligible sites, and those resources require no further work. FERC, in consultation with SHPO, has determined that 13 historic archaeological sites and standing structures in the APE qualify for nomination to the National Register. PG&E proposes measures for the future management or treatment of most of the eligible historic archaeological sites and standing structures (see table 3-40). In addition, there are 57 prehistoric archaeological or multi-component sites that have been identified in the APE (see table 3-38), but have not been officially evaluated for the National Register by the Commission or SHPO. We agree with PG&E that these sites should be managed as if they are eligible. PG&E and its cultural resources consultants also identified TCPs and ethnohistoric Maidu village locations in the APE (see tables 3-39 and 3-40). None of the TCPs and ethnohistoric Maidu village sites has been officially evaluated for the National Register by the Commission or SHPO. To the extent that the ethnographic resources can

be tied to specific on-the-ground locations, we agree with PG&E's philosophy to treat them as if they are eligible for the National Register.

Applicant-Proposed Treatment Measures

PG&E's application included, as Report E4, an HPMP. This plan, which we consider a draft, outlines the measures PG&E proposes to use to avoid, reduce, or mitigate effects on cultural resources within the APE listed, eligible, or potentially eligible for listing on the National Register. Site-specific management or treatment measures are detailed in tables 3-37 through 3-39.

The draft HPMP presents a general three-stage strategy for managing eligible and potentially eligible properties. Stage 1 would use signs and dissemination of information to the public and PG&E employees to deter or redirect activities away from sensitive areas. PG&E would assess the effectiveness of Stage 1 measures by monitoring sites. If Stage 1 measures are not effective, PG&E would implement Stage 2 measures, including more restrictions on access and recreational activities, and additional monitoring. If Stage 2 measures fail to protect sites adequately, PG&E would move to Stage 3, and consult with FERC, the FS, Greenville and Susanville Indian rancherias, and other Maidu organizations as appropriate to develop better management or treatment alternatives. The draft HPMP also presents site-specific treatment measures for threatened eligible properties, as discussed above (see tables 3-37 through 3-39).

With one exception, PG&E has not identified plans for major changes, repairs, or modifications at National Register-eligible historic project structures. At Camp Caribou (site P-32-1643 to 1652), PG&E would like to remove the tennis court and swimming pool for safety reasons. However, PG&E has not proposed any site-specific measures to mitigate the impacts of that proposal. PG&E would need to prepare a treatment plan for review by FERC and SHPO prior to receiving approval for actions that may have adverse effects on National Register-eligible properties. The SA and FS Section 4(e) condition no. 40 requires PG&E to maintain the exterior and landscaping of the clubhouse, houses, and grounds at Camp Caribou to preserve the historic features and character of the facility, and to notify the FS when maintenance or repair activities are to take place. The draft HPMP states that any major repairs or modification to National Register-eligible historic project structures done during the course of the new license would be performed in accordance with the Secretary of the Interior's Standards for Rehabilitation, and in consultation with SHPO. In addition, table E4-16 identified routine maintenance activities that PG&E believes would have no adverse effects on National Register-eligible historic project structures, and should be exempt from SHPO review.

Recommended Measures from Other Parties

NPS and the FS have raised concerns about PG&E's proposed public education and interpretive program. NPS would like PG&E to develop a plan that addresses the area's unique cultural history and the history of the hydroelectric system. The FS would

like the HPMP to include more details about the public education and interpretive program, including informational kiosks and brochures. In the opinion of the Maidu Cultural and Development Group (MCDG), PG&E's proposed use of signage and public education would not be adequate to protect or mitigate effects on cultural resources, and its three-stage approach would not be practical. The Plumas County Board of Supervisors (Plumas County), the FS, Greenville Rancheria, MCDG, and Tasmam Koyom Indian Sanctuary Foundation requested that PG&E provide land and funds for a curation and interpretive center for the Maidu community.

The FS, Honey Lake Maidu, Greenville Rancheria, and MCDG are concerned about impacts on cultural resources from wave action, changing lake levels, erosion, and inundation under the water of project reservoirs. The Susanville Indian Rancheria, Tasmam Koyom Indian Sanctuary Foundation, Maidu Summit Group, Greenville Rancheria, and Plumas County raised concerns about potential effects on cultural resources if PG&E were to conduct dredging activities at either Lake Almanor or the Butt Valley reservoir related to the possible proposed installation of thermal curtains. In comments on the draft EIS, the Greenville Rancheria and MCDG questioned PG&E's proposed measures to mitigate effects on cultural resources. The Greenville Rancheria wants PG&E to monitor the project more often, and execute an MOU with the Plumas County Sheriff for patrols and prosecution of vandals. Both the Greenville Rancheria and the Susanville Indian Rancheria offered the services of their members for monitoring and other cultural resources investigations. The Greenville Rancheria indicated that the HPMP needs more specific details about control of grazing and ORV traffic.

The FS listed some site locations that it would like recorded and evaluated by PG&E. In its comments on the draft EIS, dated October 29, 2004, Plumas County indicated concerns for the historic buildings at Camp Caribou (also known as Camp 9 or site P-32-1643 to 1652). The FS would like the APE extended for 1 mile outside the current FERC boundary on FS lands to account for effects on cultural resources due to dispersed recreational activities. The Greenville Rancheria would like the APE expanded for 2 miles outside the current FERC boundaries.

The FS and Honey Lake Maidu have suggested that unevaluated cultural resources should be archaeologically tested, and FERC should make formal determinations of National Register eligibility for all sites identified in the APE, in consultation with SHPO. The Greenville and Susanville Indian rancherias object to disturbing prehistoric archaeological sites through archaeological excavations, and would like those sites to be treated as if they were eligible for the National Register, with preservation, education, monitoring being preferable management practices. The Honey Lake Maidu, Greenville Rancheria, Susanville Indian Rancheria, and Mountain Maidu raised concerns about the treatment of Native American human remains.

NPS, the FS, Plumas County, Honey Lake Maidu, Greenville Rancheria, Susanville Indian Rancheria, and MCDG have all requested to be parties to be consulted

during the process of complying with Section 106 of the NHPA. The FS, Greenville Rancheria, and Susanville Indian Rancheria requested to be signatories to the PA for this project. The FS, NPS, and Plumas County want to be included in the UNFFR Cultural Resources Working Group, and the FS questioned the status of future working group meetings. The U.S. Bureau of Indian Affairs (BIA) encouraged FERC to consult on a government-to-government basis with federally recognized Indian tribes with an interest in the cultural resources of the project area, including the Enterprise, Mooretown, and Berry Creek rancherias. EPA, in comments on the draft EIS, requested that FERC provide additional information on the process and outcome of government-to-government consultations with Indian tribes. Both the Susanville Indian Rancheria and the Greenville Rancheria questioned FERC's consultation process with Indian tribes. Plumas County and the FS have requested copies of cultural resources reports, including PG&E's ethnographic study. MCDG requested that the ethnographic study MOU be revised to include them. In addition, MCDG questioned the recommendations in the ethnographic report.

The Greenville Rancheria, Susanville Indian Rancheria, and MCDG requested that PG&E allow Maidu people access to project lands for gathering activities and set aside project lands for traditional cultural practices. The Tasmam Koyom Indian Sanctuary Foundation believes that donations of land and funds could bridge the gap between Native Americans in the project area and agencies associated with the relicensing proposal. MCDG indicated that it considers the donation of land to be mitigation of effects on Maidu lifeways and cultural resources resulting from the construction and continued operation of the UNFFR Project. In addition, the Greenville Rancheria and MCDG would like PG&E to provide them with information about historic Indian allotments that were acquired when Great Western Power initiated the Project.

Our Analysis

The original FERC license for the project was issued in 1955, prior to the passage of the NHPA. Therefore, no article in the original license dealt with the management of cultural resources. However, over time the license has been amended, and articles 37 and 44 were inserted to address cultural resources. These articles require that construction be halted, SHPO and the FS consulted, and a mitigation plan developed if previously unidentified cultural resources are discovered during construction activities. An Order in 1997 amended the license to attach the Memorandum of Agreement executed for the seismic remediation program at the Butt Valley dam, outlining the measures implemented to mitigate impacts on Camp 5, the Butt Valley Railroad, and the Butt Valley dam Gate Tender's House and outbuildings.

The license application filed by PG&E on October 23, 2002, included a draft PA and provided the first opportunity for FERC to address project-wide compliance with Section 106 of the NHPA, through the execution of it. FERC produced its own PA, and on November 23, 2004, provided copies of our draft to the ACHP, SHPO, the FS,

Greenville Rancheria, Susanville Indian Rancheria, MCDG, and Honey Lake Maidu Tribe. In a letter dated December 22, 2004, PG&E concurred with the draft PA. The Greenville Rancheria, Susanville Indian Rancheria, and the FS indicated they want to be signatories to the PA, rather than concurring parties as listed in the draft.

It has been FERC's practice in hydropower relicensing cases to restrict signatories to a PA to the Commission, SHPO, and ACHP to ensure that the Commission remains in control of its ability to issue a license in a timely manner. The FS, as a federal land-managing agency, would retain its ability to manage historic properties on NFS lands through its Section 4(e) conditions and various other federal laws and regulations, including, but not limited to, the Native American Graves Protection and Repatriation Act (NGPRA) and the Archaeological Resources Protection Act. The responsibilities of the FS arise out of these statutes, and not as a result of the PA. With respect to the tribes, no tribal lands (as defined in 36 CFR Part 800.16(x)) are within the project boundaries. We believe that the FS and tribes should remain as concurring parties as outlined in the PA. As concurring parties, the FS and the tribes would have the ability to review and comment on the draft HPMP and would be consulted about the treatment of historic properties under the terms of the PA. By letter dated May 10, 2005, the ACHP declined to participate further in this consultation. As a result, the PA, would be executed as a "two party" PA between FERC and SHPO. The final PA was provided to the consulting parties for signature on August 11, 2005.

FERC's PA would require that cultural resources be managed over the term of the new license in accordance with a final HPMP. The final HPMP would be based on PG&E's draft HPMP, after it has been revised to address comments from interested parties. FS final Section 4(e) condition no. 43 specifies that PG&E file an FS-approved HPMP within 1 year after license issuance. Implementation of the measures outlined in the PA and the final HPMP would ensure that cultural resources are afforded adequate protection.

PG&E has expressed a willingness to formulate an I&E program relating to the region's cultural history as proposed mitigation for effects on potential TCPs such as Big Meadow and Butt Valley. The SA includes an I&E program that PG&E would develop within 2 years after issuance of a new license, which addresses themes including Native American culture, pioneers, and the development of hydropower. This program is also specified in FS final Section 4(e) condition no. 34. Such a program would likely include an explanation of how information would be conveyed through interpretive signs and kiosks and at recreational sites within the project. The details of PG&E's I&E program relating to employee education, and public interpretation, protection, and treatment of cultural resources would likely be outlined in the final HPMP. While the MCDG questions whether signage and public education would be adequate mitigation of effects on cultural resources, it could assist PG&E in formulating more practical mitigation measures during consultations prior to the production of the final HPMP.

Because the FS, Plumas County, and the Maidu community have requested a curation facility or interpretive center, PG&E needs to consult with those parties and more fully investigate the possibility of providing land or seed funds for such a facility. PG&E (in its comments on the draft EIS) pointed out that it currently holds no cultural materials from the project area requiring curation. If, during the term of the new license, archaeological excavations are conducted in the future, in accordance with the procedures outlined in the HPMP, PG&E indicated it would consult with the Maidu community regarding the appropriate curation of recovered cultural materials. Before it would consider any funding for a new Maidu curation or interpretive center, PG&E would request additional information from the Maidu community about details for such a facility, and the source of other funds to be used for the creation and/or operation of the curation/interpretive center. PG&E also pointed out that there are several museums in the vicinity of the project that house Maidu cultural materials and that there is an existing Maidu Interpretive Center in Roseville, California. PG&E agreed to consult with the Maidu community, the FS, SHPO, and the Commission regarding additional interpretive opportunities and a public education program. The results of those consultations need to be documented in the final HPMP.

The draft HPMP identified effects on cultural resources resulting from wave action, changing lake levels, erosion, and inundation from project reservoirs. It did not address potential effects from measures that may be recommended to provide cool water to the North Fork Feather River downstream of the project. In a December 17, 2004, additional information request, we asked PG&E to provide the results of studies of various alternatives to lower water temperatures in the Feather River for the Rock Creek-Cresta Project. On January 13, 2005, PG&E filed studies of 23 alternatives, including the installation of thermal curtains at either or both Lake Almanor and Butt Valley reservoir. Some of these alternatives, including dredging of the Prattville intake area, would have the potential to affect cultural resources. However, PG&E did not recommend any alternative; although it indicated it was unlikely to recommend the use of thermal curtains because of local opposition and their high cost with limited benefits. In section 3.3.1, *Water Resources*, of this EIS, we address the alternatives for cooling water in the Feather River. The final HPMP needs to provide more detailed site-specific treatment measures, based on further consultations with interested parties.

Additional consultations with interested parties are needed so that the final HPMP could address site-specific mitigation measures for the historic archaeological sites and standing structures that FERC, in consultation with SHPO, has determined are eligible for the National Register and may be affected by future project-related activities. This would include the future management and treatment of sites P-32-1638 (Canyon dam), 1639 (Canyon dam outlet tower), 1641 (patrolman's house at Canyon dam Camp), 1642 (cottage at Canyon dam Camp), 1643 through 1652 (Camp Caribou), Gate Tender's House at Camp Almanor, and Caribou No. 1 powerhouse. The SA proposes and FS Section 4(e) condition no. 40.F specifies that PG&E maintain the exterior and

landscaping of the clubhouse, houses, and grounds at Camp Caribou, and to consult with the FS when planning maintenance and repair activities.

PG&E indicated that it no longer allows grazing on project lands. In addition, the draft HPMP provides for barriers to limit ORV access. We agree with PG&E that monitoring during the months when recreational activities are at the highest levels (April to October) would be most effective. If Stage 1 monitoring shows continued impacts on sites from tourists or recreational users of project lands, PG&E would increase monitoring in Stage 2. Stage 2 also would include working with local law enforcement agencies to undertake periodic patrols. Appendix B of the SA includes measures agreed to among the parties that are not intended for inclusion in the project license and includes a provision that, if Plumas County passes an ordinance limiting vehicle traffic below the 4,500-foot elevation contour, PG&E would partially fund a seasonal Plumas County Sheriff's Department position to enforce rules restricting visitor access below the 4,500-foot elevation contour. As discussed in section 3.3.6, *Land Use and Aesthetics*, law enforcement at the UNFFR Project is the responsibility of the FS and Plumas County so we agree that this provision should not be included in the project license. Both the Greenville Rancheria and the Susanville Indian Rancheria offered the services of their members for monitoring and other cultural resources investigations. Continued consultation among PG&E, Plumas County, the Greenville Rancheria, Susanville Indian Rancheria, and other interested Maidu groups during preparation of the final HPMP should allow these issues to be properly addressed.

PG&E indicated that the sites that the FS wants it to record (construction railroad grade and historic trail) are outside of the currently defined APE, but that PG&E would consult with the FS about this request. The FS indicated that it is willing to discuss the modification of the APE with PG&E. SHPO and FERC have previously agreed with PG&E's definition of the APE. If the APE needs to be modified or expanded to meet future project needs or modifications during the course of the new license, the HPMP would need to include provisions for amending the APE if new information indicates a need to do so. We support the recordation, evaluation, and treatment of all cultural resources within the APE as it currently exists, and as it may be modified in the future.

While the FS and Honey Lake Maidu have suggested that unevaluated prehistoric sites should be tested, the Greenville Rancheria and Susanville Indian Rancheria object to archaeological excavations. The FS can require archaeological testing of sites on National Forest lands, but this only applies to one unevaluated prehistoric site (CA-PLU-284) within the APE. PG&E's management strategy of treating all unevaluated prehistoric sites as if they are potentially eligible for the National Register, once incorporated into the HPMP, would offer all potentially eligible sites the same protection as historic properties, those resources listed or officially determined eligible for listing on the National Register.

PG&E stated it would comply with all applicable state laws and regulations (including Section 7050.5 of the California Health and Safety Code and Section 5097.98 of the California Public Resources Code) regarding the treatment of new discoveries of human remains on non-federal project lands should they occur. The FS would be responsible for following the NAGPRA if human remains and funerary objects are discovered on federal lands within the project boundaries. The final HPMP needs to outline procedures and establish protocols for consultation in the event of future discoveries of human remains within the APE. All human remains and funerary objects previously salvaged from the Lake Almanor shoreline were repatriated to members of the Maidu community and reburied in October 2002. That action was done under the current license and is not part of the undertaking considered in PG&E's new license application.

Before filing its license application, PG&E created a Cultural Resources Working Group to facilitate communication about the project. PG&E invited the federally recognized Greenville Rancheria, Susanville Indian Rancheria, Berry Creek Rancheria, Enterprise Rancheria, and Mooretown Rancheria to participate in the working group and included those tribes on its project mailing list. PG&E also had its ethnographic consultant contact the Greenville, Susanville, Berry Creek, Enterprise, and Mooretown rancherias when it conducted its traditional cultural property study. PG&E needs to continue to consult with Indian tribes about this project, and the results of these communications need to be outlined in the final HPMP.

We also acknowledge that other Maidu groups, which have not been granted federal recognition, have a demonstrated interest in the project because their ancestors historically used or resided in the project area. We consider the Honey Lake Maidu and the MCDG to be consulting parties in the process of complying with Section 106 of the NHPA, according to 36 CFR 800.2(c)(5). PG&E invited the Honey Lake Maidu and MCDG to attend its Cultural Resources Working Group meetings, and included them on its cultural resources mailing list. Albion contacted both the Honey Lake Maidu and the MCDG during its ethnographic study. We have included the Honey Lake Maidu and MCDG as concurring parties to the PA for this project.

Additionally, Plumas County, the FS, and NPS could qualify as consulting parties in the Section 106 compliance process according to the 36 CFR 800.2(c)(3) and (5). PG&E indicated it would like the Maidu community to concur with the involvement of Plumas County and the NPS. We encourage the participation of all consulting parties in future Cultural Resources Working Group meetings. PG&E stated that on January 22, 2003, it provided copies of its traditional cultural properties study for this project, conducted by Albion, to the staff archaeologists for the Plumas and Lassen National Forests. However, the MOU between PG&E and the Greenville Rancheria restricts the distribution of this report and requests for additional information must be made through the Greenville Rancheria. While we encourage PG&E to provide copies of cultural resources investigation reports to all consulting parties, the parties must agree not to make these reports available to the public because they contain confidential information protected

under Section 304 of the NHPA. The final HPMP needs to outline procedures for inclusion of consulting parties in the Section 106 process, the organization of future working group meetings, and the distribution of cultural resources investigation reports.

PG&E's ethnographic study listed plants historically important to the Maidu. To mitigate impacts on some gathering locations identified in the TCP study, PG&E recommended protecting certain species, and conferring with the Maidu community to reach an agreement on how and where future gathering could be done. The SA includes a condition that would require PG&E to produce and implement a habitat enhancement plan that would protect rare plants, wetlands, riparian communities, and cultural resources. The final HPMP should address species protection and results of discussions with Maidu groups concerning access to project lands for traditional cultural use.

A condition of the settlement of its bankruptcy case requires PG&E to protect watershed lands in its service territory through conservation easements or the donation of property to public entities or non-profit organizations. PG&E describes how the Pacific Forest and Watershed Land Stewardship Council was created out of the bankruptcy settlement and is charged with developing a Land Conservation Plan. PG&E will submit any land transactions recommended by the Stewardship Council to the appropriate regulatory agencies. We expect that conservation easements or donations of project lands by PG&E should be discussed in the final HPMP, if applicable.

It is a historical fact that some Indian allotments were acquired by Great Western Power when it obtained rights and easements for the original UNFFR hydroelectric project. PG&E owns 30,032 acres out of the 31,060 acres within the FERC project boundary. There are 1,024 acres of federal land within the FERC project boundary; 986 acres managed by the FS and 38 acres managed by the BLM. Land title is a legal issue to be resolved in the courts and not an environmental issue to be reviewed under NEPA or Section 106 of the NHPA.

3.3.7.3 Unavoidable Adverse Effects

None.

3.3.8 Socioeconomic Resources

3.3.8.1 Affected Environment

The UNFFR Project is located in northeastern California in Plumas County, which has an area of 2,554 square miles. The population of the county in 2000 was 20,824 (Bureau of Census, 2003b). This rural county, with a population density of just 8.2 persons per square mile, has more than 100 lakes, 1,000 miles of rivers, and more than 1 million acres of national forest (Plumas County, undated). This abundance of natural resources supports not only employment in wood products and forest management, but also in recreation-related industries such as hotels and motels, food services, real estate, and retail trade.

Between 1990 and 2000, the population of Plumas County grew by 1,085 people, or approximately 5.5 percent. During the same period, the population of California grew by approximately 13.6 percent (Bureau of Census, 2003b). The town closest to the UNFFR Project is Chester, which is located on the shores of Lake Almanor and has a population of 2,316. Other nearby towns include Taylorsville, with a population of 154, and Westwood, in Lassen County, with a population of 1,998 (ePodunk, undated, www.epodunk.com, accessed January 22, 2004).

According to the 2000 Census (Bureau of Census, 2003a), Plumas County ranked 48th out of 58 counties in the State of California in terms of total personal income. Total personal income in the county equaled \$543,953, which was less than 1 percent of total personal income in the state. The average annual growth rate in total personal income in Plumas County was 4.8 percent between 1990 and 2000, which was lower than both the statewide rate (5.3 percent) and the national rate (5.6 percent) over the same period. On a per capita basis, personal income in Plumas County was \$26,173 in 2000. This per capita income ranked 23rd in the state and equaled 81 percent of the state average (\$32,363) and 88 percent of the national average (\$29,760). The average annual growth rate in per capita income in Plumas County was 4.3 percent between 1990 and 2000, which was above the state average (4.0 percent) and equal to the national average (4.3 percent).

Employment in all industries in 2000 equaled 7,200 people, an increase of 740 (11.5 percent) compared to the 1990 employment of 6,460. By 2002, employment equaled 7,370 people. During the same period, the unemployment rate was reduced from 9.8 to 8.4 percent of the labor force. The single largest employment sector in the county is the local government sector, accounting for 28 percent of employment in 2000. Other important sectors include leisure and hospitality services (14 percent), retail trade (11 percent), and manufacturing (9 percent) (InfoUSA, 2002). Within the leisure and hospitality sector, employment in accommodation and food/drink services predominates. Among the 10 major employers in the county are the county government, the FS, several hospitals, Feather River College, the Plumas Pines Golf Resort, and two sawmills and planing mills.

Similar to statewide and national economic trends, the county has seen a continuing shift away from goods-producing (that is, manufacturing, construction, and natural resource-based employment) to service-providing. Between 1990 and 2000, employment in goods-producing sectors was reduced from 21 percent to 17 percent of employment, while service-providing employment grew from 78 percent to 81 percent of the economy (InfoUSA, 2002). This shift is exemplified in Plumas County by the loss of 130 jobs in the natural resources and mining sector between 1990 and 2000, with a simultaneous gain of 110 jobs in the arts, entertainment, and recreation sector (part of the leisure and hospitality sector noted above).

Recreation and tourism, which are becoming increasingly important to the local economy, are one focus of local development efforts. The Plumas Corporation, which is

the county's non-profit economic development entity, is engaged in general economic and business development, visitor attraction (through the Plumas County Visitor's Bureau), and natural resource development. The organization has cited the area's scenic beauty, the quality of life, and the recreational opportunities as some of the strengths that can be drawn on in developing the local economy (Plumas Corporation, 2002).

According to one source, more than \$117 million was spent on tourism in the county in 1992, including a payroll of \$18.1 million, employment of 1,800 people, and tax receipts of \$1.47 million (Plumas Corporation, 1996, cited in Pacific Health Consulting Group LLC, 2000). A later study indicates that the total spent on tourism increased in 1993 to more than \$123 million, including a payroll of \$19.2 million and employment of 1,927 people (Sheffield and Warren, undated, cited in Pacific Health Consulting Group LLC, 2000). According to Sheffield and Warren, vacation home residents had the greatest influence on the economy, accounting for one-third of the jobs resulting from tourism. Vacation home residents were found to spend more locally than those who stay in hotels, motels, and other accommodations.

Table 3-42 presents the racial mix of the Plumas County population. The county population is predominantly white, with whites (91.8 percent) and American Indians/Alaska Natives (2.6 percent) representing a greater percentage of the population than they do in the state of California as a whole. Hispanics or Latinos may be of any race; they represent a much lower percentage of the county population (5.7 percent) than of the state population (32.4 percent).

Table 3-42. Race and poverty in UNFFR Project area.

	Plumas County	California
Race as Percentage of Total Population^a		
Total population (2000)	100	100
Population of one race	97.4	95.3
White alone	91.8	59.5
Black or African American alone	0.6	6.7
American Indian and Alaska Native alone	2.5	1.0
Asian alone	0.5	10.9
Native Hawaiian and Other Pacific Islander alone	0.1	0.3
Some other race alone	1.8	16.8
Population of two or more races	2.6	4.7
Hispanic or Latino as Percentage of Total Population^a		
Hispanic or Latino (of any race)	5.7	32.4
Persons Below Poverty Level as Percentage of Total Population^b		
Persons below poverty level (1999)	13.1	14.2

^a Bureau of Census, 2000a.

^b Bureau of Census, 2000b.

As table 3-42 shows, a slightly lower percentage of the county population lives below the poverty level than in the state as a whole.

3.3.8.2 Environmental Effects

Relicensing of the UNFFR Project could affect the socioeconomic resources of the communities near the project. Possible effects include direct changes in employment, tax revenue, and local expenditures, as well as indirect influences on the local economy.

Under the no-action alternative, there would be no project-related changes in the socioeconomic conditions of the local communities. Any changes in population growth, employment, property tax payments, and recreation expenditures would be unrelated to relicensing the project, and there would be no change in government revenue related to the project. The recreation services industry associated with rafting, boating, camping, fishing, and other recreational activities would likely continue to make up a substantial portion of the local economy.

PG&E's proposal, including finalizing and implementing the RRMP; making improvements in ADA accessibility; providing campground facilities, day use facilities, boat launches, and trails; providing a new bathymetric map of Lake Almanor; implementing river recreation flows; maintaining the surface of Lake Almanor at a higher level through the summer recreation season; and improving the aesthetics of some project features, would have a beneficial economic effect on the area. These measures would help meet future recreation demand and could encourage additional tourism to the area, thereby increasing expenditures in the region.

Growth-inducing Impacts

Growth-inducing impacts are another form of impact that may be attributed to some projects. A project may be growth inducing if it fosters economic, population, or housing growth or removes obstacles to growth, which could indirectly lead to additional economic and environmental impacts. Evaluation of potential growth-inducing impacts of the UNNFR Project was based on a qualitative analysis of the indirect effects that could result from the use of power within PG&E's service area and from the additional tourism that could occur as a result of improvements in recreation resources.

At its proposed generating capacity, the project represents approximately seven-tenths of a percent of the current (2003) generating capacity in the CA/MX (see table 1-1) and six-tenths of a percent of the generating capacity forecast for 2012. Neither PG&E's proposed action nor the proposed action with staff-recommended measures would change the generating capacity, while the cost of generation at the project would increase by about 13 and 15 percent, respectively (see table 4-2). Therefore, with respect to the use of power within PG&E's service area, any changes in the project would not be expected to foster growth, remove obstacles to growth, or have any growth-inducing impacts.

As noted above, PG&E's proposed recreational resource improvements could encourage additional tourism and increase tourism-related expenditures in the area. Those changes would likely be experienced as small incremental changes in existing activities rather than as large changes. Any growth-inducing impacts would be very small, if they occur.

Demographics

PG&E's proposed project is not expected to have adverse socioeconomic effects on the local population. Insofar as the proposed project would protect or enhance fish and terrestrial resources, improve public use of recreational facilities and resources, and maintain and protect historic and archaeological resources within the area affected by project operations, it can be reasonably expected to have a beneficial effect on any population that relies on those resources.

Potential Measures to Reduce Water Temperature

As detailed in section 3.3.1.2, as part of the SA for the Rock Creek-Cresta Project, PG&E agreed to evaluate the effectiveness of modifying the UNFFR Project's Prattville intake as a temperature control measure for the downstream reaches of the NFFR. PG&E has been conducting feasibility studies, including modeling the water temperature effects of potential Prattville intake modifications, re-operation of the Canyon dam outlet gates, and modification of Caribou No. 2 intake for the past few years. Appendix D of this EIS provides an initial evaluation of the advantages and disadvantages of 42 potential measures that could affect water temperatures and identifies the 5 measures we analyze further in section 3.3.1.2, *Water Resources*, of this EIS.

Two of the measures evaluated by PG&E and described in section 3.3.1.2 include the installation of a thermal curtain in front of the Prattville intake, in a steep-sided trough in a cove of the relatively shallow western lobe of Lake Almanor. PG&E did not provide any information on the estimated effects of the thermal curtain on the economy of the Lake Almanor area. However, the Commission received many comments from individuals concerned that the effects of the thermal curtain on the water quality, fisheries, recreation, and aesthetics in the Lake Almanor area would ultimately have a negative effect on the local economy. In its letter filed with the Commission on October 29, 2004, the Plumas County Board of Supervisors pointed out that Plumas County has moved from a goods-producing to a service-providing economy, and that recreation and tourism are increasingly important to the local economy. At the October 19, 2004, public meeting in Chester, John DeJong stated that the recreation industry has replaced the timber industry in the Lake Almanor area. Mr. DeJong emphasized that seasonal recreational activities in the Lake Almanor area occur for about 12 weeks in the summer, but that fishing in Lake Almanor usually begins 2 months before the summer recreation season and continues for 2 months after the end of the summer recreation season. In its letter filed with the Commission on November 3, 2004, the Butt Lake Anglers Association points out that Lake Almanor and Butt Valley reservoir are invaluable

recreation resources because of both their fisheries and water contact sports, and any adverse effects on these resources will adversely affect Plumas County, due to loss of recreational dollars.

Mr. DeJong and Plumas County both stated that Lake Almanor attracts land buyers to northern Plumas County. Both Plumas County and the Plumas Association of Realtors (letter filed with the Commission on December 6, 2004) express concern with the effect of the thermal curtain on property values.

At the October 19, 2004, public meeting in Chester, Russ Lesko discussed a 1999 cost benefit analysis commissioned by PG&E that stated that the temperature modification proposal did not come close to justifying its cost, as calculated by FERC methods. At that time, PG&E's estimated capital costs for the Prattville intake modification were \$5 million. Mr. Lesko pointed out that PG&E now estimates the cost to be \$53 million (this cost includes dredging and installation of two curtains in Butt Valley reservoir). In his letter filed with the Commission on September 27, 2004, Dale Knutsen points out that in addition to the initial cost of approximately \$53 million, PG&E estimates annual maintenance costs of more than \$100,000 per year. Mr. Knutsen believes that this cost is unreasonable with so little benefit to the temperature of the water in the system. Both Mr. Knutsen and Plumas County Several individuals expressed their concern that the cost of installing and maintaining the thermal curtain would be borne by PG&E's customers in the form of higher utility bills.

3.3.8.3 Unavoidable Adverse Effects

None.

3.4 NO-ACTION ALTERNATIVE

Under the no-action alternative, PG&E would continue to operate the project under the terms and conditions of the current license. The environmental measures proposed by PG&E and/or recommended by staff would not be implemented.

3.5 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Continued operation of the existing project would continue to commit the lands and waters previously developed for energy production. This commitment of resources would not necessarily be irreversible or irretrievable because removal of the project dams and restoration of disturbed areas could return the project area to near pre-project conditions. However, given the substantial costs and loss of energy, recreational, and socioeconomic benefits, removal of the dams is unlikely.

Under PG&E's proposed project, or with the staff, agency, and NGO recommended measures, maintaining the new minimum flow regime would commit water for aquatic and riparian habitat enhancements instead of energy production. While

over the short term such commitment of water may be considered irretrievable, any changes in flow requirements would not be irreversible over the longer term, since stream flows are a renewable resource and flow requirements could be changed in a license amendment proceeding or in any future license that may be issued for the project.

In addition, implementation of the staff-recommended alternative, or certain measures recommended by others, would require the commitment of lands that would be developed for recreational enhancements (e.g., trails, reservoir and river public access sites, and development of current informal campgrounds and trails). However, our measures would not change the existing, informal usage of such land and, therefore, there would be no incremental irreversible or irretrievable commitment of resources.

3.6 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

Our recommended operating alternative for the project is expected to provide an average of at least about 1,074,298,000 kilowatt-hours (kWh) of energy each year to the region. This long-term energy productivity would extend for at least as long as the duration of the new license. Our recommendations are designed to minimize or avoid in certain cases, long-term decreases in biological productivity of the system, as well as enhance aquatic habitat and local and regional recreational opportunities.

If the project was to operate solely to maximize hydroelectric generation, there could be a loss of long-term productivity of the river fisheries and perhaps sensitive invertebrates and amphibians (i.e., foothill yellow-legged frog), due to decreases in habitat availability. Moreover, many efforts to enhance recreational opportunities at the project would be foregone.

With the proposed operating mode, as well as with proposed and recommended enhancement or protection measures, the project would continue to provide a low-cost, environmentally sound source of power. Moreover, the project, with our recommended measures, would further the many goals and objectives identified by the agencies and other interested parties for managing the resources of the UNFFR, Butt Valley reservoir, and Lake Almanor.