Summary of Habitat and Fish Monitoring Data From East Fork and Upper Mainstem Lobster Creeks: 1988-2001

Since 1988, the Oregon Department of Fish and Wildlife (ODFW) has been monitoring the smolt production, adult returns, summer abundance of juvenile salmonids, and stream habitat in East Fork and Upper Mainstem Lobster Creeks, in the Alsea watershed (Figure 1). The primary purpose of this monitoring is to study the affects that stream habitat modification has on the freshwater survival and abundance of coho salmon (*Oncorhynchus kisutch*). This work has been partially funded by the Bureau of Land Management's (BLM) Salem District Office since 1996. The purpose of this report is to provide BLM with an update of ODFW's sampling in East Fork and Upper Mainstem Lobster Creek during the 2000-01 sampling season and to put these data in context with past data collected by ODFW.

Habitat

The watershed characteristics of the two study streams are shown in Table 1. In 1991, extensive instream habitat modification was conducted by the BLM in Upper Mainstem Lobster Creek. A detailed description of the effects of this habitat modification on smolt production may be found in Solazzi et al. (2000). During the February 1996 flood, a number of large debris torrents entered Upper Mainstem and significantly impacted the habitat structures resulting in the loss of considerable overwinter habitat for juvenile coho salmon. Similar high streamflows in the winter of 1998-99 caused significant channel changes in East Fork Lobster Creek. In the summer of 1999, the BLM used 65 pieces of large wood with a total volume of 265m^3 to create seven in channel debris jams in East Fork.

Table 1. Watershed characteristics of East Fork and Upper Mainstem Lobster Creek.

Stream	Basin Area (km^2)	Stream Length (km)	Mean summer wetted width (m)	Average gradient (%)
E.F. Lobster Cr.	14.2	3.5	3.5	4.0
U.M. Lobster Cr.	12.4	4.7	3.2	2.6

Since 1988 we have conducted instream habitat surveys using the methods of Hankin and Reeves (1988). Surface area for each habitat unit was visually estimated, and every tenth unit was measured to calibrate the visual estimates. In addition, we classified the substrate in each habitat unit by visually estimating the percentage of each category of substrate present. Substrate composition was separated into the following categories: clay (extremely fine sediment that is tightly packed), silt (fine sediment often containing a large proportion of organic material that when disturbed will become suspended in the water column); sand (<0.2 cm); gravel (particles between 0.2 and 6 cm. in diameter); cobble (6 to 25 cm.); small boulders (26 to 100 cm.); large boulders (>100 cm); and bedrock. We also measured the maximum depth of each pool, and estimated the surface area of undercut bank, the percent of the stream channel shaded by riparian vegetation, and the wood complexity for each habitat unit. Wood complexity was estimated on a scale of 1-5 using the following criteria: 1) no wood present; 2) some wood present, but it provides little refuge from predators or fast water velocity; 3) moderate amount of wood present, providing fair refuge; 4) moderate to large amount of wood present, providing good refuge; and 5) moderate to large amount of wood present, providing excellent refuge.

Summaries of habitat surveys conducted in East Fork Lobster Creek are shown in Table 2. The surface area of glides and all pools were lower in 2001 than the 14- year average for East Fork Lobster Creek. Riffle area was higher than the average. Summaries of habitat surveys conducted in Upper Mainstem Lobster Creek are shown in Table 3. Surface areas of pools were lower in 2001 than the 14- year average. Most of the loss of pool habitat in Upper Mainstem was due to the effects of the 1996 flood that removed many of the instream habitat restoration structures.

Juvenile Salmonid Summer Population Estimates

After completing the habitat surveys, we estimated the number of young-of-the-year coho salmon, young-of-the-year trout (steelhead and cutthroat combined), age 1+ steelhead trout, and age 1+ cutthroat trout rearing in each stream. To estimate the number of fish rearing in the pools, we (1) estimated the mean number of fish per pool by snorkeling every third pool, (2) adjusted the mean fish per pool estimate by a calibration factor derived from electrofishing population estimates in a subset of the snorkeled pools, and then (3) multiplied this adjusted mean by the total number of pools in the stream (Hankin and Reeves 1988). Snorkel estimates were impractical in habitat with shallow depths. Therefore, we estimated the mean density of fish for a subset of glide, riffle, and rapid habitats by electrofishing. For each habitat type, we then multiplied this mean density by the surface area of the habitat type in the entire stream (Hankin 1984).

We estimated the population size for each species and size group of juvenile salmonid in each sample unit by using either a mark-recapture estimate (Chapman 1951) or a removal estimate with two or more passes (Seber and LeCren 1967). Mark-recapture estimates were generally used in pool habitat that was characterized by high levels of wood complexity or presented special

Table 2. Habitat survey results for East Fork Lobster Creek, 1988-2001.

	Year														
Habitat Variable	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Average
Glide (m^2)	1,252	2,108	2,737	1,474	912	1,842	1,144	1,635	1,801	1,259	781	735	804	787	1,377
Cascade (m^2)	32	0	39	0	0	32	30	0	0	28	0	50	0	30	17
Rapid (m^2)	1,965	1,948	4,398	4,723	3,933	6,132	2,678	1,915	1,433	6,187	4,756	5,445	3,350	6,919	3,984
Riffle (m^2)	3,257	2,428	1,847	1,849	1,662	3,046	3,900	5,479	4,392	2,860	4,532	2,707	6,143	2,562	3,333
Lateral Scour Pool (m^2)	2,160	2,075	2,710	3,048	2,753	2,613	1,990	1,397	2,440	2,355	2,440	2,361	2,239	2,148	2,338
Plunge Pool (m^2)	0	344	667	340	238	234	133	214	113	65	52	19	35	15	176
Alcove Pool (m^2)	166	12	0	91	281	270	28	11	10	0	0	0	0	0	62
Dam Pool (m^2)	1,673	1,273	168	170	145	354	211	0	82	25	0	169	115	0	313
Beaver Dam Pool (m^2)	2,885	1,759	687	1,081	1,160	1,622	991	263	273	463	458	369	430	0	889
Trench Pool (m^2)	585	716	62	60	60	30	40	0	0	0	47	15	17	16	118
Straight Scour Pool (m^2)	1,299	1,575	1,661	2,454	1,893	2,690	2,109	1,810	924	2,370	2,692	1,299	937	2,073	1,842
Backwater Pool (m^2)	0	22	231	52	105	318	187	147	0	44	70	23	99	58	97
Isolated Pool (m^2)	0	0	211	204	244	193	91	108	245	241	195	167	134	92	152
% Clay	N/A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0	0.1	0.02
% Silt	N/A	5.1	4.2	5.8	7.4	7.3	7.0	4.4	1.2	7.3	4.9	2.1	1.3	5.6	4.9
% Sand	N/A	2.2	1.1	0.2	0.9	1.4	3.4	2.0	10.0	2.0	1.5	3.0	2.4	2.6	2.5
% Gravel	N/A	37.5	28.2	25.8	20.1	39.9	33.0	38.0	39.8	23.6	30.3	29.1	22.8	26.7	30.4
% Cobble	N/A	32.6	37.1	43.6	40.7	30.7	36.1	32.5	27.1	36.8	32.7	42.5	35.9	36.4	35.7
% Small Boulder	N/A	15.2	23.8	19.0	25.0	15.1	15.2	16.3	14.7	24.2	20.6	14.6	29.3	21.3	19.6
% Large Boulder	N/A	0.6	0.1	0.3	0.2	0.4	0.3	0.4	0.1	0.1	3.2	0.6	0	0.3	0.5
% Bedrock	N/A	6.8	5.5	5.4	5.7	5.2	4.9	6.3	7.1	6.6	6.8	8.0	8.3	7.1	6.4
No. Large Boulders	N/A	0.8	0.6	0.9	0.7	0.5	0.6	0.2	0.7	0.8	0.4	0.8	0.7	0.6	0.6
Wood Complexity	N/A	1.7	1.9	1.8	2.0	1.7	1.6	1.6	1.6	1.6	1.4	1.7	1.6	1.8	1.7
% Shade	N/A	76.4	76.9	87.9	81.8	80.7	82.0	73.8	80.1	80.0	63.0	82.8	83.8	84.4	79.5
Width (m)	N/A	3.3	3.3	3.5	3.2	3.9	3.0	3.2	3.2	3.4	3.5	3.2	3.7	3.2	3.4

Table 3. Habitat survey results for Upper Mainstem Lobster Creek, 1988-2001.

	Year														
Habitat Variable	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Average
Glide (m^2)	1,442	2,522	2,320	2,041	1,590	2,592	3,086	3,209	2,334	N/A	2,339	1,182	1,146	1,467	2,098
Cascade (m^2)	84	65	584	14	71	37	6	0	20	N/A	84	76	0	50	84
Rapid (m^2)	1,168	2,072	4,726	1,552	1,552	1,814	1,213	1,232	2,407	N/A	5,929	7,795	6,643	2,722	3,140
Riffle (m^2)	6,610	4,892	5,134	3,063	3,414	4,498	3,800	5,528	8,574	N/A	4,214	3,744	4,706	7,230	5,031
Lateral Scour Pool (m^2)	3,424	4,020	3,891	3,639	3,609	2,120	2,312	1,154	4,667	N/A	3,920	5,599	5,212	4,009	3,660
Plunge Pool (m^2)	811	891	1,243	1,573	1,228	931	832	1,288	1,141	N/A	512	657	343	281	902
Alcove Pool (m^2)	175	0	0	1,072	847	1,108	731	834	118	N/A	131	245	222	108	430
Dam Pool (m^2)	2,506	384	1,411	6,931	6,784	6,445	5,165	4,410	1,277	N/A	0	0	283	286	2,760
Beaver Dam Pool (m^2)	0	4,946	992	1,564	2,548	1,968	1,928	1,792	558	N/A	243	127	412	947	1,387
Trench Pool (m^2)	113	245	194	0	0	0	0	0	0	N/A	13	99	19	15	54
Straight Scour Pool (m^2)	1,552	1,579	0	1,067	985	4,017	2,553	2,851	3,664	N/A	4,049	2,655	3,950	3,487	2,493
Backwater Pool (m^2)	0	95	645	90	76	127	125	60	30	N/A	70	116	60	63	120
Isolated Pool (m^2)	0	0	72	41	59	58	9	14	22	N/A	112	58	23	38	39
% Clay	N/A	0.0	N/A	0.0	0.0	0.0	0.0	0.0	N/A	N/A	0.0	0.1	0.0	0.0	0.01
% Silt	N/A	20.1	N/A	32.9	29.8	33.8	30.0	24.0	N/A	N/A	8.5	15.6	4.1	10.4	20.9
% Sand	N/A	4.7	N/A	2.1	2.5	5.0	17.9	21.9	N/A	N/A	8.3	14.1	9.8	12.3	9.9
% Gravel	N/A	31.1	N/A	30.6	36.7	32.1	33.2	33.4	N/A	N/A	29.7	25.1	30.0	29.7	31.2
% Cobble	N/A	27.0	N/A	21.6	21.2	17.1	12.9	13.5	N/A	N/A	32.1	28.6	33.5	30.2	23.8
% Small Boulder	N/A	13.8	N/A	11.1	8.0	10.1	3.8	5.3	N/A	N/A	16.5	11.5	16.6	12.6	10.9
% Large Boulder	N/A	1.0	N/A	0.3	0.4	0.2	0.3	0.3	N/A	N/A	1.6	2.2	1.9	1.7	1.0
% Bedrock	N/A	2.2	N/A	1.5	1.5	1.7	2.1	2.3	N/A	N/A	3.3	2.8	4.1	3.2	2.5
No. Large Boulders	N/A	2.2	N/A	1.0	1.0	1.1	0.5	0.9	N/A	N/A	1.5	2.0	1.2	1.1	1.3
Wood Complexity	N/A	1.8	N/A	2.6	2.0	2.0	1.8	1.8	N/A	N/A	1.7	1.8	1.8	1.8	1.9
% Shade	N/A	78.0	N/A	75.3	72.2	88.5	82.3	74.8	N/A	N/A	64.5	59.0	65.3	65.9	72.6
Width (m)	N/A	3.0	N/A	3.3	3.1	3.9	3.1	3.4	N/A	N/A	3.3	3.7	3.8	3.5	3.4

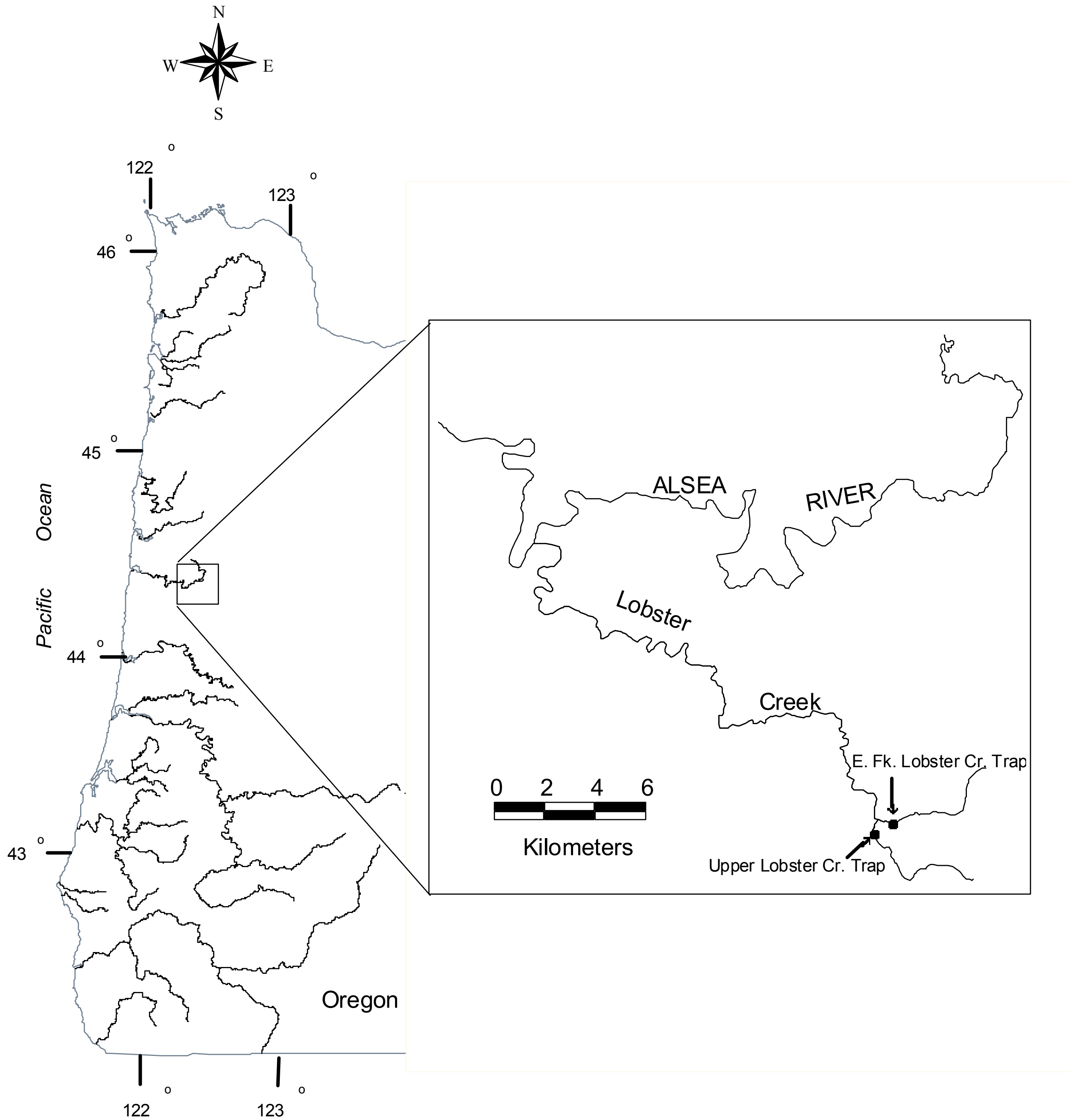

Figure 1. Locations of traps in East Fork and Upper Mainstem Lobster creeks in the Alsea Basin.

sampling problems where removal estimation methods have been shown to be less accurate (Rodgers et al. 1992). Every habitat unit was blocked by seines on both ends and sampled for juvenile salmonids using 1000-volt D.C. backpack electrofishers. Specific criteria for sampling intensity were established to control the size of the confidence interval derived from the population estimate and to prevent exposing the fish to unnecessary repeated electrofishing. When using the removal method, we continued to sample until we achieved a 50% reduction in the number of fish captured on the previous pass, if the catch on the first pass was fewer than 10 fish. If the catch on the first pass was greater than or equal to 10 fish, then a 66% reduction was required before discontinuing the sampling effort. For the mark-recapture estimates, we attempted to retrieve 50% of the marked fish released. We electrofished 9 pools and 17 riffle/rapids in East Fork Lobster Creek and 10 pools and 29 riffle/rapids in Upper Mainstem Lobster Creek during the summer of 2001.

Table 4 shows the yearly results of summer population sampling for juvenile salmonids in East Fork Lobster and Upper Mainstem Lobster Creek. Coho salmon populations in 2001 were higher than the averages for both creeks.

Table 4 Juvenile salmonid population size during summer in East Fork Lobster and Upper Mainstem Lobster Creek, 1988-2001.

		E.F. Lobster Creek				U.M. Lobster Creek			
Brood Year	Sample Year	Coho	Trout <90mm	Steelhead ≥90mm	Cutthroat ≥90mm	Coho	Trout <90mm	Steelhead ≥90mm	Cutthroat ≥90mm
1987	1988	11,462	5,098	530	368	10,667	2,916	437	338
1988	1989	13,694	2,279	792	961	6,406	3,242	248	596
1989	1990	19,278	2,837	474	1,811	18,161	2,288	766	792
1990	1991	9,964	3,490	543	686	7,633	1,776	235	525
1991	1992	7,716	3,096	363	1,255	8819	2951	216	1268
1992	1993	15,842	2,298	672	2,793	23,012	1,327	148	3,337
1993	1994	6,432	2,278	468	998	15,486	2,562	150	729
1994	1995	8,085	2,884	803	583	9,619	3,357	112	1,288
1995	1996	3,767	2,355	412	592	940	2,501	520	893
1996	1997	11,055	4,619	133	444	N/A	N/A	N/A	N/A
1997	1998	4,863	3,516	667	827	6,842	3,153	909	1,018
1998	1999	2,358	5,012	578	917	1,690	10,346	806	2,296
1999	2000	8,001	5,478	800	488	9,385	4,815	1,300	788
2000	2001	10,280	3,288	667	682	17,086	1,772	778	1,165
	Average	9,486	3,466	564	958	10,442	3,308	510	1,156

Downstream Migrant Juvenile Sampling

In the spring we operate a motor driven floating scoop trap in each study stream to estimate the number of juvenile downstream migrants leaving each system. A detailed description of the methods used to operate these traps may be found in Solazzi et al. (2000).

The estimated numbers of juvenile salmonids migrating downstream from East Fork Lobster Creek in the spring of 2001 are shown in Table 5. Age 1+ coho peaked during the week of April 23-29. The number of downstream migrating 1+ coho salmon was approximately twice the average for East Fork Lobster Creek. Coho salmon fry were also about twice the average while the number of trout were well above the average (Table 6).

The estimated numbers of juvenile salmonids migrating downstream from Upper Mainstem Lobster Creek in the spring of 2000 are shown in Table 7. Age 1+ coho salmon peaked during the week of March 26 – April 1. With the exception of trout fry, all species/age group migrant numbers were substantially above the 14-year average for Upper Mainstem (Table 8).

Overwinter Survival

Table 9 shows the overwinter survival of juvenile coho salmon in both study streams. The overwinter survival was well above the average in both streams.

Table 5. Weekly estimates of the number of juvenile salmonids migrating downstream from East Fork Lobster Creek, spring 2001

Week	Coho 1+	Coho Fry	Trout Fry	Chinook Fry	Trout 60-89mm	Steelhead ≥90mm	Cutthroat ≥90mm
FEB 26 - MAR 4	26	0	0		0	0	0
MAR 5-11	208	0	0		5	0	14
MAR 12-18	132	0	0		14	63	46
MAR 19-25	569	0	0		286	175	72
MAR 26 - APR 1	733	0	0		248	184	61
APR 2-8	106	26	0		33	21	18
APR 9-15	220	936	0		42	68	38
APR 16-22	569	12,711	1		92	164	50
APR 23-29	844	7,410	0		143	180	144
APR 30 -MAY 6	328	5,778	0		92	193	68
MAY 7-13	278	4,265	0		95	84	202
MAY 14-20	96	4,495	0		71	218	193
MAY 21-27	10	7,277	1		10	21	58
MAY 28 - JUNE 3	2	1,753	18		0	0	35
Total	4,121	44,651	20	--	1,131	1,371	999

Table 6. The estimated number of juvenile salmonids migrating downstream each spring in East Fork Lobster Creek. 1988-2001.

Brood Year	Trap Start Date	Coho 1+	Coho Fry	Trout Fry	Chinook Fry	Trout 60-89mm	Steelhead ≥90mm	Cutthroat ≥90mm
1986	9-Mar-88	1,178	19,044	3,204	2,130	14[a]	15[a]	15[a]
1987	1-Mar-89	2,691	48,133	3,594	264,733	43	1[a]	268
1988	5-Feb-90	3,549	22,736	4,381	0	99	32	110
1989	4-Feb-91	2,121	8,422	2,984	0	76	45	296
1990	4-Feb-92	2,627	6,992	1,486	0	123	49	251
1991	3-Feb-93	2,055	46,550	1,875	0	202	117	699
1992	1-Feb-94	3,641	4,266	5,529	0	102	26	738
1993	1-Feb-95	892	8,130	5,549	0	55	21	187
1994	12-Feb-96	985	6,302	33[a]	0	116	3[a]	7[a]
1995	3-Mar-97	1,053	42,887	13,609	0	25	14[a]	5[a]
1996	2-Mar-98	1,286	18,416	14,584	0	464	455	523
1997	1-Mar-99	909	3,251	3,413	228	247	169	839
1998	28-Feb 00	1,189	17,108	8,025	0	737	714	691
1999	28-Feb 01	4,121	44,651	20[a]	0	1,131	1,371	999
	Average	2,021	21,206	5,686	19,078[b]	263[b]	300[b]	509[b]

[a]No marked fish recaptured. Number shown is total fish captured and not expanded for trap efficiency.
[b]Average only includes years for which trap efficiency estimates are available.

Table 7. Weekly estimates of the number of juvenile salmonids migrating downstream from Upper Mainstem Lobster Creek, spring 2001.

Week	Coho 1+	Coho Fry	Trout Fry	Chinook Fry	Trout 60-89mm	Steelhead ≥90mm	Cutthroat ≥90mm
FEB 26 - MAR 4	0	0	0		0	0	38
MAR 5-11	6	0	0		0	37	9
MAR 12-18	57	0	0		12	37	19
MAR 19-25	599	0	0		209	57	55
MAR 26 - APR 1	1,103	0	0		128	55	36
APR 2-8	123	0	0		0	20	0
APR 9-15	460	0	0		12	18	121
APR 16-22	290	222	0		83	43	140
APR 23-29	582	5,316	29		151	39	74
APR 30 -MAY 6	199	2,234	0		12	36	162
MAY 7-13	367	2,233	756		12	1	101
MAY 14-20	338	3,703	448		23	1	216
MAY 21-27	39	3,596	329		23	1	103
MAY 28 - JUNE 3	10	934	385		0	2	60
Total	4,173	18,238	1,947		665	347	1,134

Table 8. The estimated number of juvenile salmonids migrating downstream each spring in Upper Mainstem Lobster Creek. 1988-2000.

Brood Year	Trap Start Date	Coho 1+	Coho Fry	Trout Fry	Chinook Fry	Trout 60-89mm	Steelhead >90mm	Cutthroat >90mm
1986	9-Mar-88	1,337	4,311	4,100	1[a]	3[a]	2[a]	21[a]
1987	1-Mar-89	832	1,570	1,370	1[a]	1	0	22
1988	5-Feb-90	974	5,419	1,218	0	5[a]	14	55
1989	4-Feb-91	3,455	6,702	449	0	14	36	319
1990	4-Feb-92	4,171	2,430	9[a]	0	76	284	762
1991	3-Feb-93	2,666	21,077	1,138	0	87	209	382
1992	1-Feb-94	8,909	8,628	21[a]	0	61	101	579
1993	1-Feb-95	5,797	1,759	12[a]	0	0	10[a]	606
1994	12-Feb-96	428	0	0	0	1[a]	2[a]	73
1995	3-Mar-97	214	1,266	6,561	0	0	6[a]	7[a]
1996	2-Mar-98	2,913	3,915	1,406	0	584	484	1,391
1997	1-Mar-99	1,481	353	9,135	0	196	147	398
1998	28-Feb-00	377	5,811	20,006	0	801	494	645
1999	28-Feb 01	4,173	18,238	1,947	0	665	347	1,134
	Average	2,695	5,820	4,303[b]	0[b]	226[b]	212[b]	531[b]

[a]No marked fish recaptured. Number shown is total fish captured and not expanded for trap efficiency.
[b]Average only includes years for which trap efficiency estimates are available.

Table 9. The overwinter survival of juvenile coho salmon in East Fork Lobster and Upper Mainstem Lobster Creek. Survival was calculated by dividing the number of downstream migrating 1+ coho salmon captured in brood year + 2 by the summer population of juvenile coho in brood year +1.

Brood Year	E.F. Lobster Cr.	U.M. Lobster Cr.
1987	23.5%	7.8%
1988	25.9%	15.2%
1989	11.0%	19.0%
1990	26.4%	54.6%
1991	26.6%	30.2%
1992	23.0%	38.7%
1993	13.9%	37.4%
1994	12.2%	4.4%
1995	28.0%	22.8%
1996	11.6%	N/A
1997	18.7%	21.6%
1998	50.4%	22.3%
1999	51.4%	44.5%
Average	24.82%	26.54%

Spawning Adult Surveys

From October 25, 2000 through February 22, 2001, we conducted periodic spawning ground surveys in each of the two study streams. A single observer walking the entire salmon-bearing length of each study stream counted the number of redds, live, and dead adult salmon and/or steelhead observed. Area-under-the-curve extrapolation techniques (Biedler and Nickelson 1980; Neilson and Geen 1981; Solazzi 1984) were used to estimate the total number of spawning coho salmon from the survey data.

Counts of live adult coho spawners during the 2000-01 spawning season are shown in Table 10. Based on area-under-the-curve adjusted estimates, a total of 81 and 107 adult coho salmon were estimated to have spawned in East Fork and Upper Mainstem Lobster Creek, respectively. East Fork was close to the average while Upper Mainstem was well above average for the number of spawners observed (Table11).

Table 10. Spawning ground counts for live adult coho salmon in East Fork Lobster and Upper Mainstem Lobster Creek November, 2000 – January, 2001.

Date*	E.F. Lobster Cr.	U.M Lobster Cr.
25-Oct	0	0
1-Nov	0	0
8-Nov	0	0
15-Nov	0	0
22-Nov	0	0
29-Nov	0	0
6-Dec	0	0
13-Dec	0	0
19-Dec	49	18
29-Dec	40	47
3-Jan	23	49
11-Jan	7	9
19-Jan	3	5
26-Jan	0	5
1-Feb	2	4
9-Feb	8	0
16-Feb	1	0
22-Feb	0	--

Table 11. Estimated number of adult coho salmon spawning in East Fork Lobster and Upper Mainstem Lobster Creek, 1986-2000 brood years.

Brood Year	E.F. Lobster Cr.	U.M. Lobster Cr.
1986	159	31
1987	90	32
1988	302	22
1989	154	40
1990	32	9
1991	21	11
1992	272	284
1993	20	47
1994	30	25
1995	36	34
1996	25	23
1997	45	25
1998	6	1
1999	22	39
2000	81	107
Average	86	49

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