

# Evaluate Status of Pacific Lamprey in the Clearwater River Drainage, Idaho

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**EVALUATE STATUS OF PACIFIC LAMPREY IN THE CLEARWATER RIVER  
DRAINAGE, IDAHO**

**ANNUAL REPORT 2001**

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## ABSTRACT

Recent decline of Pacific lamprey *Lampetra tridentata* adult migrants to the Snake River drainage has focused attention on the species. Adult Pacific lamprey counted passing Ice Harbor Dam fishway averaged 18,158 during 1962-69 and 361 during 1993-2000. Human resource manipulations in the Snake River and Clearwater River drainages have altered ecosystem habitat in the last 120 years, likely impacting the productive potential of Pacific lamprey habitat. Timber harvest, stream impoundment, road construction, grazing, mining, and community development have dominated habitat alteration in the Clearwater River system and Snake River corridor. Hydroelectric projects in the Snake River corridor impact juvenile/larval Pacific lamprey outmigrants and returning adults. Juvenile and larval lamprey outmigrants potentially pass through turbines, turbine bypass/collection systems, and over spillway structures at the four lower Snake River hydroelectric dams. Clearwater River drainage hydroelectric facilities have impacted Pacific lamprey populations to an unknown degree. The Pacific Power and Light Dam on the Clearwater River in Lewiston, Idaho, restricted chinook salmon *Oncorhynchus tshawytscha* passage in the 1927-1940 period, altering the migration route of outmigrating Pacific lamprey juveniles/larvae and upstream adult migrants (1927-1972). Dworshak Dam, completed in 1972, eliminated Pacific lamprey spawning and rearing in the North Fork Clearwater River drainage. Construction of the Harpster hydroelectric dam on the South Fork of the Clearwater River resulted in obstructed fish passage 1949-1963.

Through Bonneville Power Administration support, the Idaho Department of Fish and Game continued investigation into the status of Pacific lamprey populations in Idaho's Clearwater River drainage in 2001. Trapping, electrofishing, and spawning ground redd surveys were used to determine Pacific lamprey distribution, life history strategies, and habitat requirements in the South Fork Clearwater River drainage. Forty-three sites in Red River, South Fork Clearwater River, and their tributaries were electrofished in 2001. Sampling yielded a total of 442 juvenile/larval Pacific lamprey. Findings indicate Pacific lamprey juveniles/larvae are not numerous or widely distributed. Pacific lamprey distribution in the South Fork of the Clearwater River drainage was confined to lower reaches of Red River (rkm 8.0 to mouth) and the South Fork Clearwater River.

## INTRODUCTION

The Pacific lamprey *Lampetra tridentata* is facing the same migratory hazards and habitat degradation as other anadromous fish species in Idaho. Because this fish is not recognized as a sport or game fish species, little attention has been given to its status. The ecological interaction of Snake River Pacific lamprey and other riverine species is thought to contribute to the Snake River basin overall aquatic productivity. Pacific lamprey ammocoetes provide Snake River basin white sturgeon *Acipenser transmontanus* populations with an important food source (Galbreath 1979), which potentially contributed to Snake River white sturgeon historical productivity. Pacific lamprey, chinook salmon, *Oncorhynchus spp.* and summer steelhead trout, *O. mykiss* rear in Snake River basin stream habitats, however, the ecological relationship of the three species in freshwater is little known. Basic life history, distribution, and remaining population status are urgently needed to fully understand this species and to begin intensive management before populations decline to unrecoverable threshold in Idaho.

The South Fork Clearwater River (SFCR) drainage of north central Idaho is an important study area as both Pacific lamprey ammocoetes and macrothemia have been captured in outmigrant anadromous fish smolt traps since 1992.

Understanding Pacific lamprey larval fish population composition, migrational behavior, and habitat needs will provide basic information to better manage Pacific lamprey. Without this knowledge, the opportunity for preservation of critical habitat may be lost. This project will add to our knowledge of Pacific lamprey and provide critical information to minimize future degradation of habitat.

## PROJECT AREA

The Clearwater River drainage is located in north central Idaho and encompasses approximately 2.5 million hectares. The SFCR, one of the four major tributaries of the Clearwater River, drains 300,440 hectares. The upper SFCR watershed has several large meadow complexes with low stream gradients and fine substrates. The mid and lower SFCR reaches are predominantly canyon confined and boulder substrate dominated. In 1910 Grangeville Electric Light and Power Company constructed a hydroelectric dam on the SFCR at rkm 32.0. In 1937 Avista Utilities, (formerly Washington Water Power), acquired the dam. Steelhead trout migration was possible, although limited, over the dam from 1935 to 1949. High flows destroyed the fishway in 1945 eliminating adult salmonid passage until the dam was removed in 1963. Adult Pacific lamprey passage may have occurred during this entire period as adult Pacific lamprey have the ability to climb above water surface levels (G. Starke, U.S. Army Corps of Engineers, personal communications). Pacific lamprey returns to the main Clearwater River in the period following removal of the SFCR dam could have provided recolonization stock for the SFCR drainage.

The current land ownership of the SFCR watershed is U.S. Forest Service (68%), private (28%), Nez Perce Tribe (0.9%), Bureau of Land Management (2%), and State of Idaho (0.7%). Land use activities range from predominantly forestry related in the upper SFCR to livestock pasture and grazing in middle and lower reaches. Historically, mining was centered in the upper reaches. Extensive mining from the 1860's to the mid-1900's occurred in four SFCR tributaries, Crooked River, Red River, American River, and Newsome Creek. Mining in the watershed has impacted fish production in varying degrees through sedimentation, channel alteration, and riparian habitat degradation. Riparian canopy removal in the meadow complexes of the upper SFCR watershed contributes to elevated summer stream temperatures.

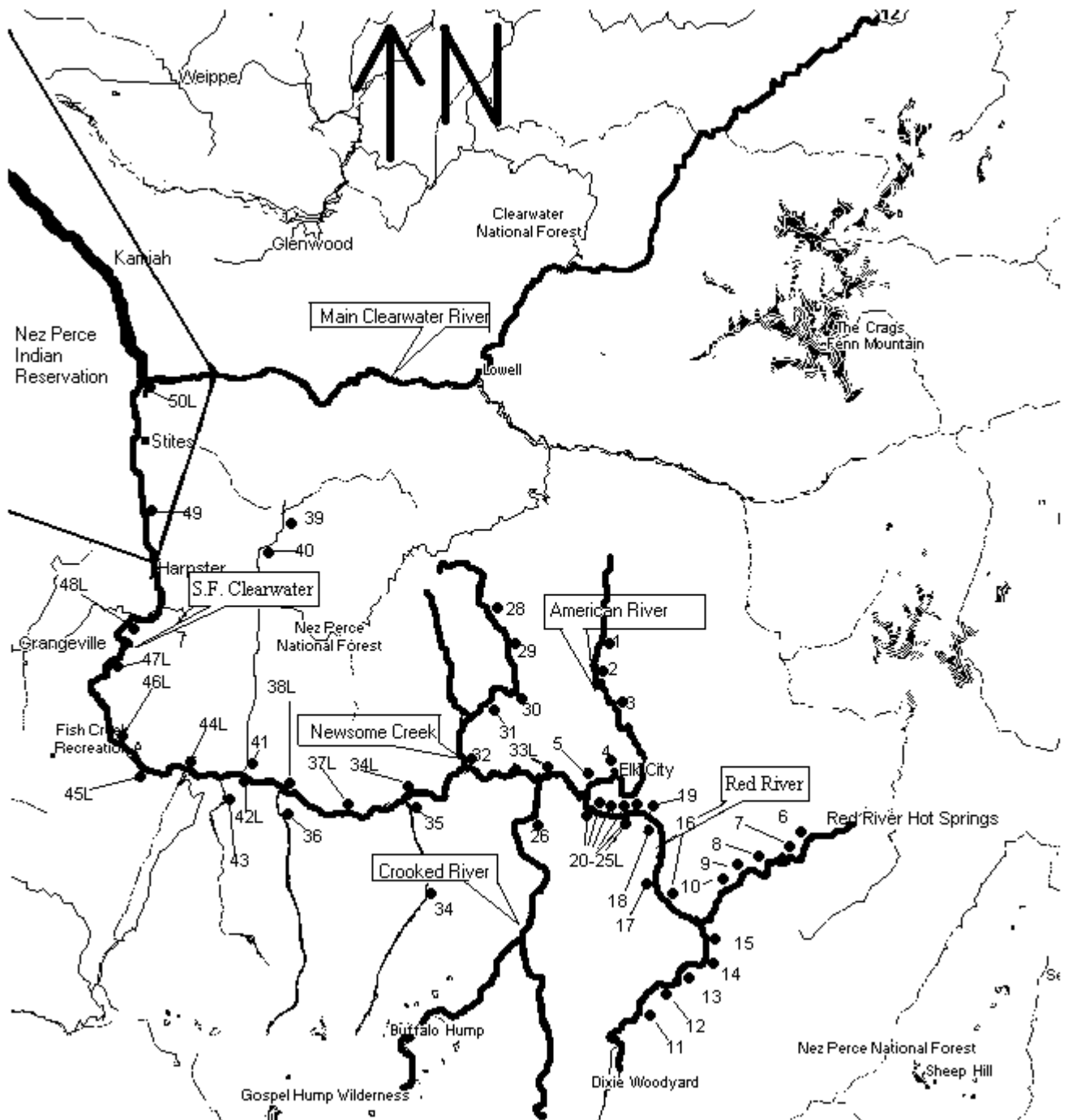


Figure 1. Geographic location of Pacific lamprey investigations in the South Fork Clearwater River drainage, 2000/01, L=lamprey found.



## OBJECTIVES

1. Determine life history characteristics of Pacific lamprey ammocoetes and macrothemia in the Clearwater River drainage.
2. Determine habitat requirements of Pacific lamprey in the Clearwater River drainage.
3. Determine distribution of Pacific lamprey in SFCR drainage.
4. Develop and implement strategies to protect Pacific lamprey adult and juvenile/larval habitat.

## METHODS

Electroshocking with an ABP-2 electrofisher was used to capture fish in the stream channel. Any Pacific lamprey mortalities were to be retained for statolith banding age determination, following procedures described by Beamish and Medland (1988). Determination of habitat usage was focused in the Red River drainage. Presence-absence surveys were completed in the Red River subbasin and the SFCR basin. We segmented Red River into one-kilometer sections from its mouth upstream to the uppermost bridge crossing. We prioritized 41 sampling locations based on random selection of kilometer section and sampled the first 100 meters of each selected section. The habitat in each of the sampled sections was classified as to type (Table 1). The first riffle, pool, glide, etc., was electroshocked from its downstream boundary upstream without repeating sampling in identical habitat types. Water depth, water velocity, and substrate composition were measured and recorded at the site of individual captures.

Three downstream migrant traps currently operated by Idaho Department of Fish and Game (IDFG) in the SFCR drainage were used to monitor Pacific lamprey downstream movements. The Crooked River scoop trap (rkm 1.0) was operated from March 23 to October 31. A 1.22m diameter rotary screen trap on American River (rkm 3.0) was operated from April 1 to October 31. Another 1.22m diameter rotary screen trap on Red River (rkm 6.0) was operated from March 29 to October 31.

Captured Pacific lamprey juveniles were anesthetized, and total lengths and body weights measured. Individuals were then recovered in fresh water and released near the site of capture. Red River subbasin Pacific lamprey ammocoetes (greater than 100 mm in length) captured by electroshocking were marked with fluorescent orange elastomer on the right side behind the gill openings. Outmigrant estimates past traps were made using Beamish and Levings (1991) trap-area fished methods.

IDFG Red River trap temperature monitor information was obtained and plotted to determine maximum annual stream temperature at rkm 5.0. Stream and substrate temperatures at 10.0 cm depth were measured at ten Red River sites on August 9, 2001. The substrate temperatures were measured in fine gravel and silt deposits. The stream and substrate temperatures were assessed to determine if temperatures were similar in the two habitats.

Seven kilometers of Red River and its tributaries were surveyed visually for spawning adult Pacific lamprey from May 1 to July 1.

Table 1. Habitat substrate classification for sampling sites in the South Fork Clearwater River drainage.

Habitat Units	I.D.	Substrate Classification
<b>Falls</b>	<b>FLL</b>	<b>Substrate Type (mm)</b>
		Large Boulder 512 +
<b>Cascades</b>	<b>CAS</b>	Small Boulder 256-512
		Cobble 64-256
<b>Rapids</b>		Coarse Gravel 16-64
Typical	<b>RTT</b>	Medium Gravel 8-16
Boulders	<b>RBB</b>	Fine Gravel 2-8
Bedrock	<b>RBD</b>	Course Sand 0.5-2
		Fine Sand 0.062-0.50
<b>Riffles</b>		Silt/Organic 0.004-0.062
Typical	<b>RIF</b>	
Pocket-water	<b>RIP</b>	
<b>Glide</b>	<b>GLD</b>	
<b>Pools</b>		
Lateral Scour Pool	<b>LSP</b>	
Straight Scour Pool	<b>SCP</b>	
Plunge Pool	<b>PPP</b>	
Dammed Pool	<b>DMP</b>	
<b>Alcove</b>	<b>ALC</b>	

Snake River juvenile/larval Pacific lamprey passage information at Lower Granite project was obtained from the Washington Department of Fish and Wildlife sampling personnel in 2001. Mortality samples of macrothemia and ammocoetes were collected to obtain genetic material and assess the general size of juvenile/larvae.

## RESULTS

During 2001, no Pacific lamprey ammocoetes or macrothemia were captured in the Crooked River scoop or the American River rotary screen traps. Forty-five Pacific lamprey ammocoetes and one macrothemia were captured in the Red River rotary screen

trap. The average total length of the ammocoetes was 128mm; no length was obtained for the macrothalmia (Figure 2).

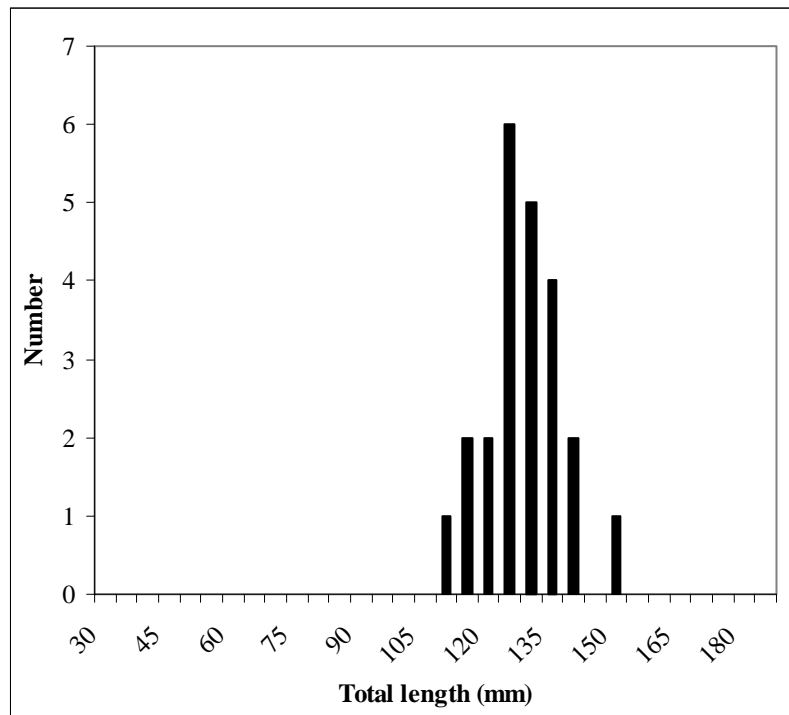


Figure 2. Total length frequency of (N=23) Pacific lamprey ammocoetes captured in the Red River migrant trap, South Fork Clearwater River drainage, ID, 2001.

Because of the low numbers of Pacific lamprey captured at traps, no mark-recapture outmigrant estimates were performed. Based on trap-area fished, a total of 307 ammocoetes and 7 macrothalmia were estimated to have migrated past the Red River trap in 2001, compared to 175 ammocoetes and 14 macrothalmia in 2000.

Because statolith banding examination for age determination requires sacrificing lamprey, no age determinations were attempted for captured fish. Future age determination may include statolith banding examination. Age assessment, based on length frequency (Figures 2-4), indicates there may be five or six age classes in the fish sampled. Plotting of Red River weight frequency distribution suggested potentially was six or seven age classes in the lamprey ammocoetes sampled.

A total of 185 Pacific lamprey ammocoetes and one macrothalmia were captured by electroshocking in Red River. Larval Pacific lamprey were found in seven sections of Red River up to rkm 7.0, however, no lamprey ammocoetes or macrothalmia were captured in river sample sites (rkm 8.0), (9.0), and (10.0). Tributaries of Red River (Siegal Creek, Red Horse Creek, and S. F. Red River) were resampled in 2001, but no

Pacific lamprey were found. The largest Pacific lamprey captured electroshocking in the SFCR drainage in 2001 was 169 mm TL and the smallest ammocoete measured 60 mm TL (Figure 3). Four macrothalmia were captured electroshocking; 3 in the SFCR and 1 in Red River. The largest macrothlmia (158 mm TL) was captured in Red River. The smallest macrothalmia (140 mm TL) was electroshocked in the SFCR (Figure 3). The macrothalmia were captured in August and September. One of the macrothalmia captured in the SFCR was partially transformed.

More Pacific lamprey ammocoetes were captured in lateral scour pool habitat than any other single habitat type, however, no alcove habitat was sampled in 2001 where the maximum Red River lamprey density was found in 2000 (Table 2). Individuals were mostly found inhabiting sand/silt substrate behind boulders and were captured in water depths ranging from 0.1 – 1.0m.

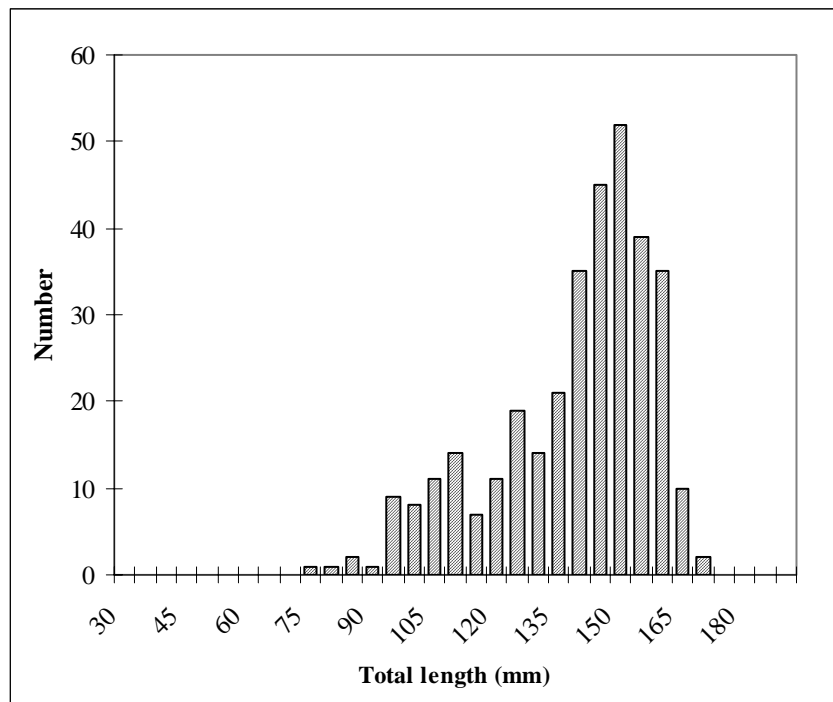


Figure 3. Total length frequency of Pacific lamprey ammocoetes and macrothalmia (N=154, 2000, N= 186, 2001) captured by electroshocking in Red River, ID, 2000/01.

Two Pacific lamprey marked at Red River rkm 3.4 in 2000, were recaptured within 0.00-0.4 m of the original capture location (Table 3).

Although numerous potential spawning sites were identified, no adult Pacific lamprey or redds were observed during 2001 surveys.

Non-random presence-absence surveys were conducted on potential Pacific lamprey habitat sites in the mainstem SFCR, SFCR tributaries, Red River, and the S.F. of Red River. Five sites were sampled in upper Red River upstream of rkm 24.0, six in the S.F. of Red River (rkm1.5) to (rkm8.0), and 23 in the main SFCR (mouth to Red River) and tributaries. No Pacific lamprey were found sampling upper Red River, the S.F. of Red River, or SFCR tributaries. Lamprey distribution in the SFCR drainage was limited to main Red River, lower rkm 7.0, and the SFCR. Two hundred fifty-six lamprey were sampled in the SFCR (Figure 4).

Table 2. Habitat locations of Pacific lamprey larvae in randomly sampled units Red River 2001.

**Red River**

<b>Habitat Type</b>	<b>Lamprey Captured</b>	<b>Total Area Fished m<sup>2</sup></b>	<b>Total Time Fished (Min)</b>	<b>Density/100m<sup>2</sup></b>	<b>C.P.U.E. (Lmp/Min.)</b>
Lateral Scour Pool	8	289.0	261	2.769	0.031
Riffle	1	318.8	377	0.314	0.003
Riffle w.Pockets	2	395.4	283	0.506	0.007
Rapids w.Boulders	6	182.2	165	3.293	0.036
<b>TOTALS:</b>	17	1185.3	1085.8	na	na
<b>Average</b>				1.720	0.019

Table 3. Presence absence surveys of Pacific lamprey larvae selected sites Red River,

	<b>Lamprey Captured</b>	<b>Total Area Fished m<sup>2</sup></b>	<b>Total Time Fished (Min)</b>	<b>Density/100m<sup>2</sup></b>	<b>C.P.U.E. (Lmp/Min.)</b>
<b>a. Red River</b> (20 sites)	100	22.5	49	444.840	2.053
<b>b. Red River</b> (1 site)	69	na	102	na	0.676
<b>c. SOUTH FORK</b> <b>Clearwater River*</b> (23 sites)	256	106.2	187	240.964	1.368
<b>Totals</b>	425	128.7	338	na	na

\*S. F. Electrofishing time Approximate

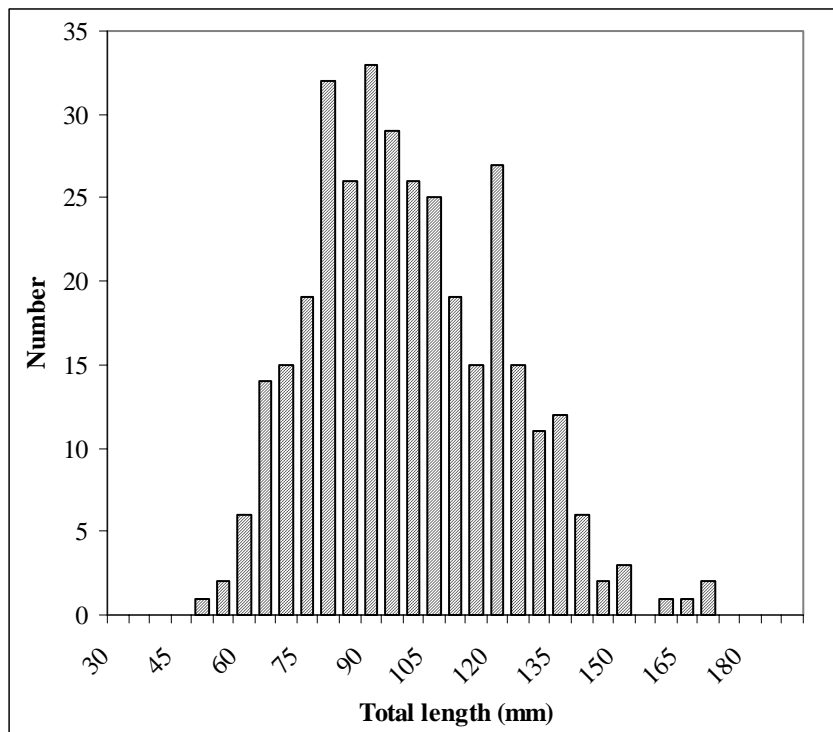


Figure 4. Total length frequency of Pacific lamprey ammocoetes and macrothalmia (N=91, 2000, N=253, 2001) captured by electroshocking in South Fork Clearwater River, ID, 2000-01.

Stream temperatures in Red River subbasin commonly reach 20.0 °C or higher in the summer period (Figure 5). Red River maximum stream temperature obtained from the IDFG Red River trap monitor at rkm 5.0 in 2001 was 26.7°C. Pacific lamprey ammocoetes and macrothalmia are burrowed in the substrate throughout the year including the maximum temperature period in August. Red River stream and substrate temperatures remain cooler in the maximum stream temperature period of the day (Figure 6).

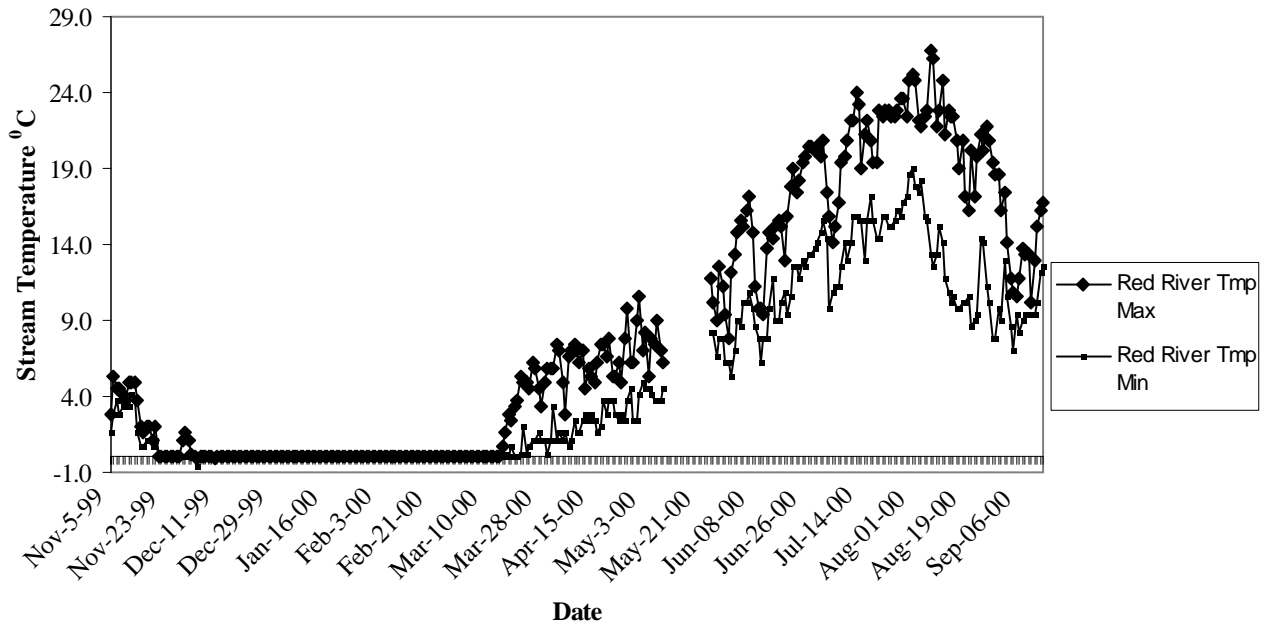


Figure 5. Red River daily maximum/minimum stream temperature (rkm 5.0) November 1999-September 2000, SFCR drainage, ID.

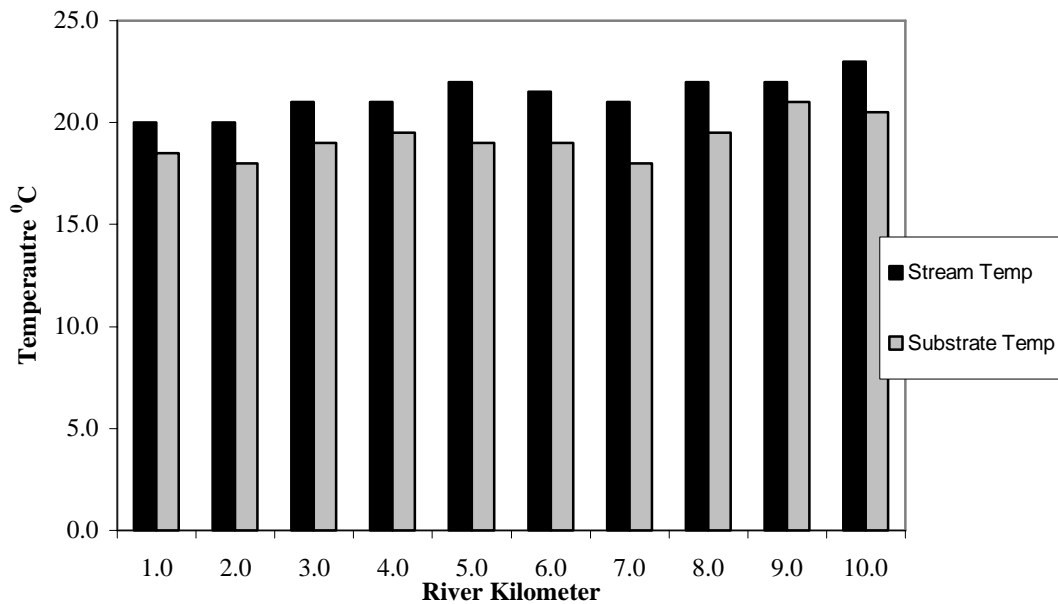


Figure 6. Red River stream surface and substrate (~10.0 cm) temperatures (rkm 1.0) to (rkm 10.0), 1545 to 1800 hrs. August 9, 2001. Substrates, fine silt – fine gravel.

Juvenile/larval Pacific lamprey passage information obtained from Washington Department of Fish and Wildlife at Lower Granite dam in 2001 supports the year 2000 assessment indicating that the majority of juveniles and larvae pass the project between March 1 and July 1. Evaluation of juvenile/larval Pacific lamprey collection/bypass sampling information at Lower Granite in 1998 suggests lamprey migration is possibly correlated to river flow volume (Figure 7).

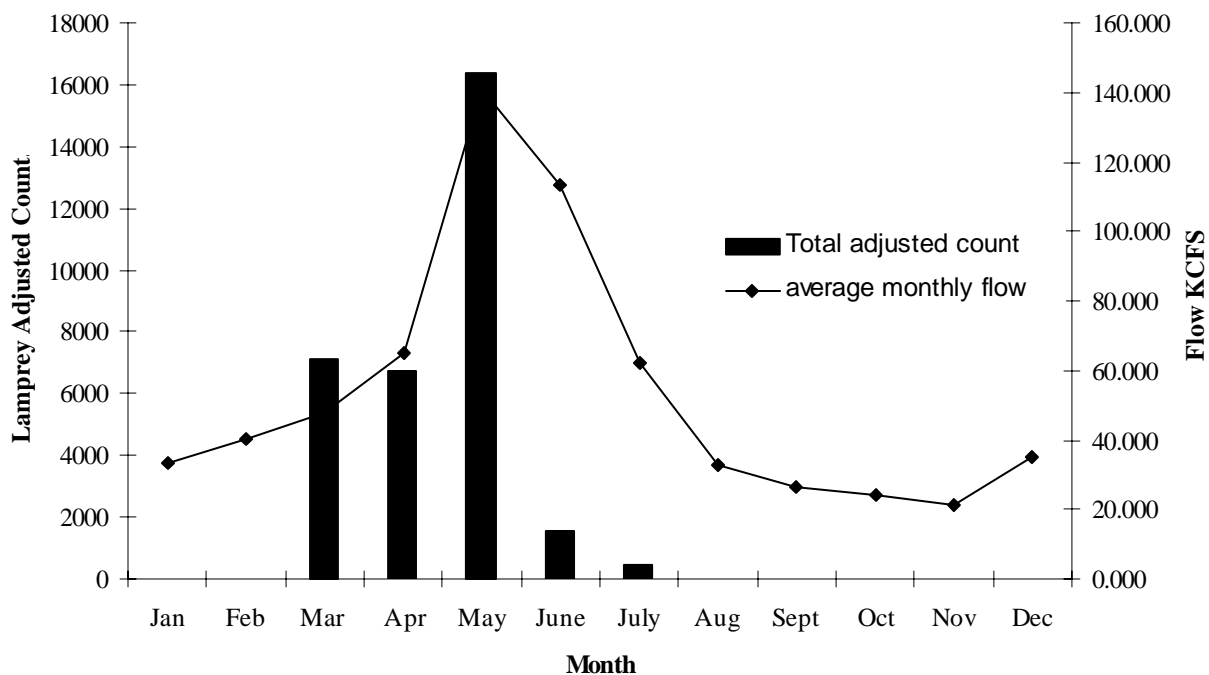


Figure 7. Snake River monthly average flow and juvenile/larval Pacific lamprey collection/bypass estimation, Lower Granite Dam, WA. 1998.

## SUMMARY AND DISCUSSION

It is not known if Pacific lamprey densities observed in 2000-01 reflect overall low population numbers in the SFCR drainage. The number of spawning adults in the SFCR basin is suspected to have totaled fewer than 50 Pacific lamprey annually 1998-2001. The SFCR estimate of spawning adults is based on Lower Granite passage of less than 320 adults in 1998-2001, and assumed distribution into Grande Ronde River, Imnaha River, Salmon River, and Clearwater River with one-half of Clearwater River spawners returning to the SFCR. Low SFCR basin larval densities would be expected following several years of limited spawning. Relatively high habitat survey effort to catch rates were partially a result of randomly selected Red River units. Potential juvenile/larval habitat sampled in upper Red River, the S.F. of Red River, and SFCR



tributaries did not yield lamprey. Presence-absence sampling in the 13 tributaries contributing the greatest flow volume to the SFCR indicates distribution of Pacific lamprey in the SFCR basin is limited. Sampling to date suggests population numbers are minimal and distribution restricted to remaining preferred habitat in the SFCR basin. Assuming growth rates similar to those noted by Scott and Crossman (1973), length frequency distribution data suggests there are five, possibly six age classes present, in the SFCR drainage. Age determination improved with 2001 lamprey sampled, however, future capture of Pacific lamprey larvae would further increase aging ability. Sampling random units of lateral scour habitat in 2001 yielded the greatest total number of ammocoetes, however, rapids habitat type produced the highest densities per meter squared (random units). Pacific lamprey captured in rapids units were confined to boulder formed calm water pockets.

No Pacific lamprey juvenile/larval mortalities were observed at outmigrant traps, but three mortalities resulted from handling while electroshocking in the SFCR drainage.

Both life stages (ammocoete and macrothemia) were present in Lower Granite Dam bypass samples. Rearing of some ammocoetes in the Snake River pool could account for both life stages being sampled at the project. Pacific lamprey potentially are consumed by northern pike minnow *Ptychocheilus oregonensis* predation (Poe et al. 1991) in the Lower Granite pool

Temperature monitoring in the Red River subbasin infers lamprey juveniles/larvae are capable of surviving stream temperatures in excess of 20.0°C. However, the time period Pacific lamprey ammocoetes are able to survive high water temperatures is unknown. Substrate temperatures were cooler in the maximum temperature period in comparison to water temperatures.

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## **APPENDIX A**

**Table A1. Pacific lamprey length, weight, and mark information from Red River, 2001.**

Date	Km/	Habitat	Area	Time	Lamprey	Lamprey	Length	Weight	Mark <sup>1</sup>	Trans/ Phase <sup>2</sup>
Electrofished	Reach	Type	Fished (m <sup>2</sup> )	Fished (Min.)	Captured	Measured	(mm)	(g)		
7/13/2001	05/00	LSP	15.2	21.6	54	54	109	3.1	NO MARK	U
7/13/2001	05/00	LSP					135	3.9	NO MARK	U
7/13/2001	05/00	LSP					139	4.3	NO MARK	U
7/13/2001	05/00	LSP					135	3.7	NO MARK	U
7/13/2001	05/00	LSP					140	4.3	NO MARK	U
7/13/2001	05/00	LSP					120	2.5	NO MARK	U
7/13/2001	05/00	LSP					107	2.0	NO MARK	U
7/13/2001	05/00	LSP					147	5.1	NO MARK	U
7/13/2001	05/00	LSP					139	4.5	NO MARK	U
7/13/2001	05/00	LSP					144	4.6	NO MARK	U
7/13/2001	05/00	LSP					139	4.0	NO MARK	U
7/13/2001	05/00	LSP					130	3.4	NO MARK	U
7/13/2001	05/00	LSP					122	2.8	NO MARK	U
7/13/2001	05/00	LSP					123	2.8	NO MARK	U
7/13/2001	05/00	LSP					107	2.0	NO MARK	U
7/13/2001	05/00	LSP					141	4.5	NO MARK	U
7/13/2001	05/00	LSP					139	4.3	NO MARK	U
7/13/2001	05/00	LSP					121	2.7	NO MARK	U
7/13/2001	05/00	LSP					101	1.8	NO MARK	U
7/13/2001	05/00	LSP					125	3.5	NO MARK	U
7/13/2001	05/00	LSP					129	3.4	NO MARK	U
7/13/2001	05/00	LSP					125	2.9	NO MARK	U
7/13/2001	05/00	LSP					123	3.6	NO MARK	U
7/13/2001	05/00	LSP					135	3.9	NO MARK	U
7/13/2001	05/00	LSP					95	1.9	NO MARK	U
7/13/2001	05/00	LSP					111	2.4	NO MARK	U
7/13/2001	05/00	LSP					139	*	NO MARK	U
7/13/2001	05/00	LSP					159	6.9	NO MARK	U
7/13/2001	05/00	LSP					148	7.9	NO MARK	U
7/13/2001	05/00	LSP					130	3.6	NO MARK	U
7/13/2001	05/00	LSP					147	4.8	NO MARK	U
7/13/2001	05/00	LSP					134	4.2	NO MARK	U
7/13/2001	05/00	LSP					147	4.6	NO MARK	U
7/13/2001	05/00	LSP					129	4.3	NO MARK	U
7/13/2001	05/00	LSP					121	3.0	NO MARK	U
7/13/2001	05/00	LSP					107	2.6	NO MARK	U
7/13/2001	05/00	LSP					117	2.5	NO MARK	U

1 RCO-Right center orange

2 T-transformed; U-transformed

**Table A1. (con't).**

Date	Km/ Electrofished Reach	Habitat Type	Area Fished (m <sup>2</sup> )	Time Fished (Min.)	Lamprey Captured	Lamprey Measured	Length (mm)	Weight (g)	Mark <sup>1</sup>	Phase <sup>2</sup>
7/13/2001	05/00	LSP					146	5.0	NO MARK	U
7/13/2001	05/00	LSP					149	5.5	NO MARK	U
7/13/2001	05/00	LSP					134	4.0	NO MARK	U
7/13/2001	05/00	LSP					132	4.6	NO MARK	U
7/13/2001	05/00	LSP					117	2.6	NO MARK	U
7/13/2001	05/00	LSP					107	1.9	NO MARK	U
7/13/2001	05/00	LSP					120	2.9	NO MARK	U
7/13/2001	05/00	LSP					127	3.4	NO MARK	U
7/13/2001	05/00	LSP					112	2.4	NO MARK	U
7/13/2001	05/00	LSP					98	1.8	NO MARK	U
7/13/2001	05/00	LSP					124	2.2	NO MARK	U
7/13/2001	05/00	LSP					92	1.5	NO MARK	U
7/13/2001	05/00	LSP					112	2.3	NO MARK	U
7/13/2001	05/00	LSP					103	1.8	NO MARK	U
7/13/2001	05/00	LSP					104	2.1	NO MARK	U
7/13/2001	05/00	LSP					112	2.2	NO MARK	U
7/13/2001	05/00	LSP					101	2.9	NO MARK	U
7/14/2001	06/00	Glide	1.3	1.4	5	5	117	2.7	NO MARK	U
7/14/2001	06/00	Glide					129	3.6	NO MARK	U
7/14/2001	06/00	Glide					140	4.6	NO MARK	U
7/14/2001	06/00	Glide					122	3.0	NO MARK	U
7/14/2001	06/00	Glide					143	4.4	NO MARK	U
7/14/2001	07/00	LSP	6.0	7.3	8	8	112	3.0	NO MARK	U
7/14/2001	07/00	LSP					125	3.2	NO MARK	U
7/14/2001	07/00	LSP					127	2.5	NO MARK	U
7/14/2001	07/00	LSP					124	3.7	NO MARK	U
7/14/2001	07/00	LSP					105	1.9	NO MARK	U
7/14/2001	07/00	LSP					108	2.8	NO MARK	U
7/14/2001	07/00	LSP					117	2.0	NO MARK	U
7/14/2001	07/00	LSP					72	1.0	NO MARK	U
7/27/2001	02/05	LSP	57.6	39	1	1	134	3.9	RCO	U
8/11/2001	02/69	LSP	121.2	109	1	1	142	5.6	RCO	U
8/12/2001	02/57	RIP	164.4	111.8	2	2	146	5.2	RCO	U
8/12/2001	02/57	RIP					156	5.8	RCO	U
8/14/2001	03/04	LSP	na	116.6	69	69	136	3.7	NM/RCO	U
8/14/2001	03/04	LSP					144	5.4	NM/RCO	U
8/14/2001	03/04	LSP					100	1.6	NM/RCO	U
8/14/2001	03/04	LSP					116	2.8	NM/RCO	U
8/14/2001	03/04	LSP					143	4.6	NM/RCO	U
8/14/2001	03/04	LSP					152	5.6	RE/LCO	U
8/14/2001	03/04	LSP					140	4.6	NM/RCO	U
8/14/2001	03/04	LSP					136	4.1	NM/RCO	U
8/14/2001	03/04	LSP					148	5.7	NM/RCO	U

1 RCO-Right center orange

2 T-transformed; U-transformed

**Table A1(con't.)**

Date	Km/ Electrofished	Habitat Type	Area Fished (m <sup>2</sup> )	Time Fished (Min.)	Lamprey Captured	Lamprey Measured	Length (mm)	Weight (g)	Mark <sup>1</sup>	Phase <sup>2</sup>
8/14/2001	03/04	LSP					141	4.8	NM/RCO	U
8/14/2001	03/04	LSP					152	5.4	NM/RCO	U
8/14/2001	03/04	LSP					147	5.0	NM/RCO	U
8/14/2001	03/04	LSP					147	4.8	NM/RCO	U
8/14/2001	03/04	LSP					147	4.7	NM/RCO	U
8/14/2001	03/04	LSP					145	4.7	NM/RCO	U
8/14/2001	03/04	LSP					112	2.3	NM/RCO	U
8/14/2001	03/04	LSP					139	4.5	NM/RCO	U
8/14/2001	03/04	LSP					140	*	NM/RCO	U
8/14/2001	03/04	LSP					149	4.7	NM/RCO	U
8/14/2001	03/04	LSP					142	4.4	NM/RCO	U
8/14/2001	03/04	LSP					152	6.2	NM/RCO	U
8/14/2001	03/04	LSP					150	5.7	NM/RCO	U
8/14/2001	03/04	LSP					144	5.2	NM/RCO	U
8/14/2001	03/04	LSP					146	5.2	NM/RCO	U
8/14/2001	03/04	LSP					145	5.3	NM/RCO	U
8/14/2001	03/04	LSP					92	1.7	NM/RCO	U
8/14/2001	03/04	LSP					157	5.4	NM/RCO	U
8/14/2001	03/04	LSP					146	5.6	NM/RCO	U
8/14/2001	03/04	LSP					140	5.1	NM/RCO	U
8/14/2001	03/04	LSP					141	4.7	NM/RCO	U
8/14/2001	03/04	LSP					145	5.4	NM/RCO	U
8/14/2001	03/04	LSP					142	4.9	NM/RCO	U
8/14/2001	03/04	LSP					132	3.7	NM/RCO	U
8/14/2001	03/04	LSP					140	4.6	NM/RCO	U
8/14/2001	03/04	LSP					119	2.7	NM/RCO	U
8/14/2001	03/04	LSP					81	0.9	NM	U
8/14/2001	03/04	LSP					159	6.4	NM/RCO	U
8/14/2001	03/04	LSP					145	4.6	NM/RCO	U
8/14/2001	03/04	LSP					132	4.3	NM/RCO	U
8/14/2001	03/04	LSP					146	5.2	NM/RCO	U
8/14/2001	03/04	LSP					146	5.3	NM/RCO	U
8/14/2001	03/04	LSP					152	5.8	NM/RCO	U
8/14/2001	03/04	LSP					150	5.4	NM/RCO	U
8/14/2001	03/04	LSP					150	5.7	NM/RCO	U
8/14/2001	03/04	LSP					125	3.1	NM/RCO	U
8/14/2001	03/04	LSP					147	5.2	NM/RCO	U
8/14/2001	03/04	LSP					143	4.5	NM/RCO	U
8/14/2001	03/04	LSP					156	6.4	NM/RCO	U
8/14/2001	03/04	LSP					141	4.9	NM/RCO	U
8/14/2001	03/04	LSP					99	1.5	NM/RCO	U
8/14/2001	03/04	LSP					135	4.3	NM/RCO	U
8/14/2001	03/04	LSP					140	5.0	NM/RCO	U
8/14/2001	03/04	LSP					145	5.4	NM/RCO	U

1 RCO-Right center orange

2 T-transformed; U-transformed

**Table A1 (con't).**

Date	Km/ Electrofished	Habitat Type	Area Fished (m <sup>2</sup> )	Time Fished (Min.)	Lamprey Captured	Lamprey Measured	Length (mm)	Weight (g)	Mark1	Phase
8/14/2001	03/04	LSP					142	5.0	NM/RCO	U
8/14/2001	03/04	LSP					110	2.3	NM/RCO	U
8/14/2001	03/04	LSP					156	6.2	NM	U
8/14/2001	03/04	LSP					147	4.7	NM/RCO	U
8/14/2001	03/04	LSP					142	5.0	NM/RCO	U
8/14/2001	03/04	LSP					143	4.9	NM/RCO	U
8/14/2001	03/04	LSP					140	4.9	NM/RCO	U
8/14/2001	03/04	LSP					137	3.8	NM/RCO	U
8/14/2001	03/04	LSP					157	6.3	NM/RCO	U
8/14/2001	03/04	LSP					144	4.7	NM/RCO	U
8/14/2001	03/04	LSP					140	4.7	NM/RCO	U
8/14/2001	03/04	LSP					146	5.3	NM/RCO	U
8/14/2001	03/04	LSP					129	3.8	RE/LCO	U
8/14/2001	03/04	LSP					140	4.6	NM/RCO	U
8/14/2001	03/04	LSP					122	3.4	NM/RCO	U
8/14/2001	03/04	LSP					107	2.1	NM/RCO	U
8/15/2001	04/04	LSP	110.2	112.8	6	6	149	5.6	NM/RCO	U
8/15/2001	04/04	LSP					145	4.6	NM/RCO	U
8/15/2001	04/04	LSP					139	4.4	NM/RCO	U
8/15/2001	04/04	LSP					142	4.7	NM/RCO	U
8/15/2001	04/04	LSP					142	4.7	NM/RCO	U
8/15/2001	04/04	LSP					138	3.8	NM/RCO	U
8/21/2001	04/04	RBB	185.1	165	6	6	132	3.8	NO MARK	U
8/21/2001	04/04	RBB					125	3.0	NM/RCO	U
8/21/2001	04/04	RBB					145	4.4	NM/RCO	U
8/21/2001	04/04	RBB					140	4.5	NM/RCO	U
8/21/2001	04/04	RBB					159	6.2	NM/RCO	U
8/21/2001	04/04	RBB					141	4.7	NM/RCO	U
8/21/2001	04/04	RIF	599.4	377.2	1	1	102	2.0	NM/RCO	U
8/23/2001	00/na	LSP	10.0	18.4	33	33	164	7.3	NO MARK	U
8/23/2001	00/na	LSP					137	5.0	NO MARK	U
8/23/2001	00/na	LSP					141	4.8	NO MARK	U
8/23/2001	00/na	LSP					143	5.1	NO MARK	U
8/23/2001	00/na	LSP					150	5.9	NO MARK	U
8/23/2001	00/na	LSP					147	*	NO MARK	U
8/23/2001	00/na	LSP					142	5.2	NO MARK	U
8/23/2001	00/na	LSP					155	5.8	NO MARK	U
8/23/2001	00/na	LSP					147	*	NO MARK	U
8/23/2001	00/na	LSP					158	7.9	NO MARK	T
8/23/2001	00/na	LSP					156	5.9	NO MARK	U
8/23/2001	00/na	LSP					145	4.5	NO MARK	U
8/23/2001	00/na	LSP					150	5.4	NO MARK	U
8/23/2001	00/na	LSP					142	4.9	NO MARK	U
8/23/2001	00/na	LSP					135	3.9	NO MARK	U
8/23/2001	00/na	LSP					140	4.1	NO MARK	U

1 RCO-Right center orange

2 T-transformed; U-untransformed

**Table A1(con't).**

Date	Km/ Electrofished	Habitat Type	Area Fished (m <sup>2</sup> )	Time Fished (Min.)	Lamprey Captured	Lamprey Measured	Length (mm)	Weight (g)	Mark <sup>1</sup>	Phase <sup>2</sup>
8/23/2001	00/na	LSP					160	6.9	NO MARK	U
8/23/2001	00/na	LSP					155	6.2	NO MARK	U
8/23/2001	00/na	LSP					134	3.4	NO MARK	U
8/23/2001	00/na	LSP					142	5.2	NO MARK	U
8/23/2001	00/na	LSP					139	4.0	NO MARK	U
8/23/2001	00/na	LSP					165	6.8	NO MARK	U
8/23/2001	00/na	LSP					146	5.3	NO MARK	U
8/23/2001	00/na	LSP					156	5.8	NO MARK	U
8/23/2001	00/na	LSP					147	5.3	NO MARK	U
8/23/2001	00/na	LSP					148	5.5	NO MARK	U
8/23/2001	00/na	LSP					152	5.1	NO MARK	U
8/23/2001	00/na	LSP					132	3.9	NO MARK	U
8/23/2001	00/na	LSP					141	4.4	NO MARK	U
8/23/2001	00/na	LSP					147	5.2	NO MARK	U
8/23/2001	00/na	LSP					137	4.3	NO MARK	U
8/23/2001	00/na	LSP					154	5.6	NO MARK	U
8/23/2001	00/na	LSP					127	3.2	NO MARK	U

1 RCO-Right center orange

2 T-transformed; U-untransformed



**Table A2. Pacific lamprey length, weight, and mark information for S.F. Clearwater River 2001.**

Date	Km/ Reach	Habitat Type	Area Time		Lamprey Captured	Lamprey Measured	Length (mm)	Weight (g)	Mark <sup>1</sup>	Phase <sup>2</sup>
			Fished (m <sup>2</sup> )	Fished (Min)						
7/17/2001	47/00	LSP	2.2	3.9	20	20	94	*	NO MARK	U
7/17/2001	47/00	LSP					108	*	NO MARK	U
7/17/2001	47/00	LSP					110	*	NO MARK	U
7/17/2001	47/00	LSP					67	*	NO MARK	U
7/17/2001	47/00	LSP					90	*	NO MARK	U
7/17/2001	47/00	LSP					81	*	NO MARK	U
7/17/2001	47/00	LSP					76	*	NO MARK	U
7/17/2001	47/00	LSP					63	*	NO MARK	U
7/17/2001	47/00	LSP					76	*	NO MARK	U
7/17/2001	47/00	LSP					81	*	NO MARK	U
7/17/2001	47/00	LSP					80	*	NO MARK	U
7/17/2001	47/00	LSP					95	*	NO MARK	U
7/17/2001	47/00	LSP					89	*	NO MARK	U
7/17/2001	47/00	LSP					*	*	*	U
7/17/2001	47/00	LSP					97	*	NO MARK	U
7/17/2001	47/00	LSP					75	*	NO MARK	U
7/17/2001	47/00	LSP					80	*	NO MARK	U
7/17/2001	47/00	LSP					96	*	NO MARK	U
7/17/2001	47/00	LSP					72	*	NO MARK	U
7/17/2001	47/00	LSP					86	*	NO MARK	U
8/25/2001	50/00	LSP	10.0	17	39	39	76	0.7	NO MARK	U
8/25/2001	50/00	LSP					124	3.3	NO MARK	U
8/25/2001	50/00	LSP					93	1.5	NO MARK	U
8/25/2001	50/00	LSP					106	2.1	NO MARK	U
8/25/2001	50/00	LSP					90	1.5	NO MARK	U
8/25/2001	50/00	LSP					126	3.1	NO MARK	U
8/25/2001	50/00	LSP					81	1.6	NO MARK	U
8/25/2001	50/00	LSP					86	0.8	NO MARK	U
8/25/2001	50/00	LSP					111	2.7	NO MARK	U
8/25/2001	50/00	LSP					92	1.5	NO MARK	U
8/25/2001	50/00	LSP					121	3.2	NO MARK	U
8/25/2001	50/00	LSP					122	3.1	NO MARK	U
8/25/2001	50/00	LSP					117	2.9	NO MARK	U
8/25/2001	50/00	LSP					125	3.6	NO MARK	U
8/25/2001	50/00	LSP					94	1.4	NO MARK	U
8/25/2001	50/00	LSP					104	2.0	NO MARK	U
8/25/2001	50/00	LSP					107	2.1	NO MARK	U

1 RCO-Right center orange

2 T-transformed; U-untransformed

**Table A2 (con't).**

Date	Km/ Electrofished Reach	Habitat Type	Area Time		Lamprey Captured	Lamprey Measured	Length (mm)	Weight (g)	Mark <sup>1</sup>	Phase <sup>2</sup>
			Fished (m <sup>2</sup> )	Fished (Min)						
8/25/2001	50/00	LSP					91	1.9	NO MARK	U
8/25/2001	50/00	LSP					104	1.7	NO MARK	U
8/25/2001	50/00	LSP					120	2.7	NO MARK	U
8/25/2001	50/00	LSP					139	2.6	NO MARK	U
8/25/2001	50/00	LSP					135	3.3	NO MARK	U
8/25/2001	50/00	LSP					102	1.8	NO MARK	U
8/25/2001	50/00	LSP					94	1.4	NO MARK	U
8/25/2001	50/00	LSP					86	1.0	NO MARK	U
8/25/2001	50/00	LSP					116	2.8	NO MARK	U
8/25/2001	50/00	LSP					71	0.5	NO MARK	U
8/25/2001	50/00	LSP					126	3.3	NO MARK	U
8/25/2001	50/00	LSP					85	*	NO MARK	U
8/25/2001	50/00	LSP					123	*	NO MARK	U
8/25/2001	50/00	LSP					90	*	NO MARK	U
8/25/2001	50/00	LSP					83	*	NO MARK	U
8/25/2001	50/00	LSP					89	*	NO MARK	U
8/25/2001	50/00	LSP					120	*	NO MARK	U
8/25/2001	50/00	LSP					104	*	NO MARK	U
8/25/2001	50/00	LSP					121	*	NO MARK	U
8/25/2001	50/00	LSP					111	*	NO MARK	U
8/25/2001	50/00	LSP					113	*	NO MARK	U
8/25/2001	50/00	LSP					94	*	NO MARK	U
8/31/2001	83/00	LSP	10.0	13.2	2	0	*	*	NO MARK	U
8/31/2001	83/00	LSP					*	*	*	U
8/31/2001	77/00	LSP	6.0	18.7	26	26	115	*	NO MARK	U
8/31/2001	77/00	LSP					110	1.9	NO MARK	U
8/31/2001	77/00	LSP					135	*	NO MARK	U
8/31/2001	77/00	LSP					120	2.0	NO MARK	U
8/31/2001	77/00	LSP					109	1.4	NO MARK	U
8/31/2001	77/00	LSP					131	*	NO MARK	U
8/31/2001	77/00	LSP					124	2.6	NO MARK	U
8/31/2001	77/00	LSP					120	3.0	NO MARK	U
8/31/2001	77/00	LSP					144	4.6	NO MARK	U
8/31/2001	77/00	LSP					124	2.1	NO MARK	U
8/31/2001	77/00	LSP					115	2.1	NO MARK	U
8/31/2001	77/00	LSP					117	2.3	NO MARK	U
8/31/2001	77/00	LSP					128	*	NO MARK	U
8/31/2001	77/00	LSP					86	1.3	NO MARK	U
8/31/2001	77/00	LSP					130	3.3	NO MARK	U
8/31/2001	77/00	LSP					122	2.5	NO MARK	U
8/31/2001	77/00	LSP					116	2.1	NO MARK	U
8/31/2001	77/00	LSP					117	2.1	NO MARK	U
8/31/2001	77/00	LSP					95	1.8	NO MARK	U
8/31/2001	77/00	LSP					132	3.2	NO MARK	U

1 RCO-Right center orange

2 T-transformed; U-untransformed

**Table A2 (con't).**

Date	Km/ Electrofished	Habitat Reach	Area		Time		Lamprey Captured	Lamprey Measured	Length (mm)	Weight (g)	Mark <sup>1</sup>	Phase <sup>2</sup>
			Fished (m <sup>2</sup> )	Fished (Min)								
8/31/2001	77/00	LSP							103	1.3	NO MARK	U
8/31/2001	77/00	LSP							86	1.5	NO MARK	U
8/31/2001	77/00	LSP							119	2.1	NO MARK	U
8/31/2001	77/00	LSP							*	*	NO MARK	U
8/31/2001	77/00	LSP							116	2.3	NO MARK	U
8/31/2001	77/00	LSP							117	1.9	NO MARK	U
9/1/2001	40/00	LSP	10.0	18		5	5		140	5.4	NO MARK	T
9/1/2001	40/00	LSP							120	2.8	NO MARK	U
9/1/2001	40/00	LSP							105	2.1	NO MARK	U
9/1/2001	40/00	LSP							85	0.9	NO MARK	U
9/1/2001	40/00	LSP							82	0.9	NO MARK	U
9/15/2001	37/00	LSP	5.0	11.5		16	16		100	*	NO MARK	U
9/15/2001	37/00	LSP							113	2.4	NO MARK	U
9/15/2001	37/00	LSP							67	0.6	NO MARK	U
9/15/2001	37/00	LSP							87	2.2	NO MARK	U
9/15/2001	37/00	LSP							97	2.8	NO MARK	U
9/15/2001	37/00	LSP							92	1.3	NO MARK	U
9/15/2001	37/00	LSP							85	1.3	NO MARK	U
9/15/2001	37/00	LSP							85	1.2	NO MARK	U
9/15/2001	37/00	LSP							97	2.6	NO MARK	U
9/15/2001	37/00	LSP							93	1.5	NO MARK	U
9/15/2001	37/00	LSP							65	*	NO MARK	U
9/15/2001	37/00	LSP							95	1.8	NO MARK	U
9/15/2001	37/00	LSP							78	1.0	NO MARK	U
9/15/2001	37/00	LSP							86	1.8	NO MARK	U
9/15/2001	37/00	LSP							100	2.1	NO MARK	U
9/15/2001	37/00	LSP							94	1.4	NO MARK	U
9/29/2001	na		10.0	10.6		4	4		145	*	NO MARK	T
9/29/2001	na								85	*	NO MARK	U
9/29/2001	na								133	*	NO MARK	U
9/29/2001	na								130	*	NO MARK	U
9/29/2001	68/00	LSP	10.0	13		7	7		147	5.2	NO MARK	U
9/29/2001	68/00	LSP							157	6.4	NO MARK	U
9/29/2001	68/00	LSP							169	7.7	NO MARK	U
9/29/2001	68/00	LSP							168	9.0	NO MARK	U
9/29/2001	68/00	LSP							163	7.3	NO MARK	U
9/29/2001	68/00	LSP							100	2.1	NO MARK	U
9/29/2001	68/00	LSP							95	1.6	NO MARK	U
9/29/2001	29/05	LSP	6.0	**		32	32		60	0.4	NO MARK	U
9/29/2001	29/05	LSP							105	1.6	NO MARK	U
9/29/2001	29/05	LSP							105	1.6	NO MARK	U
9/29/2001	29/05	LSP							104	1.6	NO MARK	U
9/29/2001	29/05	LSP							91	1.3	NO MARK	U
9/29/2001	29/05	LSP							129	3.4	NO MARK	U

1 RCO-Right center orange

2 T-transformed; U-untransformed

**Table A2 (con't).**

Date	Km/ Electrofished Reach	Habitat Type	Area		Time		Lamprey Captured	Lamprey Measured	Length (mm)	Weight (g)	Mark <sup>1</sup>	Phase <sup>2</sup>
			Fished (m <sup>2</sup> )	Fished (Min)								
9/29/2001	29/05	LSP							112	2.2	NO MARK	U
9/29/2001	29/05	LSP							121	2.7	NO MARK	U
9/29/2001	29/05	LSP							111	2.2	NO MARK	U
9/29/2001	29/05	LSP							116	2.3	NO MARK	U
9/29/2001	29/05	LSP							109	1.8	NO MARK	U
9/29/2001	29/05	LSP							115	2.6	NO MARK	U
9/29/2001	29/05	LSP							135	3.6	NO MARK	U
9/29/2001	29/05	LSP							131	3.0	NO MARK	U
9/29/2001	29/05	LSP							133	3.6	NO MARK	U
9/29/2001	29/05	LSP							134	3.5	NO MARK	U
9/29/2001	29/05	LSP							105	2.0	NO MARK	U
9/29/2001	29/05	LSP							110	2.0	NO MARK	U
9/29/2001	29/05	LSP							127	3.0	NO MARK	U
9/29/2001	29/05	LSP							97	1.6	NO MARK	U
9/29/2001	29/05	LSP							117	2.4	NO MARK	U
9/29/2001	29/05	LSP							90	1.2	NO MARK	U
9/29/2001	29/05	LSP							99	1.7	NO MARK	U
9/29/2001	29/05	LSP							122	2.7	NO MARK	U
9/29/2001	29/05	LSP							96	1.3	NO MARK	U
9/29/2001	29/05	LSP							118	2.5	NO MARK	U
9/29/2001	29/05	LSP							117	2.2	NO MARK	U
9/29/2001	29/05	LSP							90	1.1	NO MARK	U
9/29/2001	29/05	LSP							121	2.3	NO MARK	U
9/29/2001	29/05	LSP							109	2.2	NO MARK	U
9/29/2001	29/05	LSP							115	2.3	NO MARK	U
9/29/2001	29/05	LSP							138	3.7	NO MARK	U
9/30/2001	31/00	RBB	2.0	8.3	1	0			*	*	NO MARK	U
10/6/2001	01/00	na	10.0	15	13	13			140	4.3	NO MARK	U
10/6/2001	01/00	na							140	4.3	NO MARK	U
10/6/2001	01/00	na							103	1.9	NO MARK	U
10/6/2001	01/00	na							110	2.1	NO MARK	U
10/6/2001	01/00	na							85	1.3	NO MARK	U
10/6/2001	01/00	na							108	2.3	NO MARK	U
10/6/2001	01/00	na							104	1.9	NO MARK	U
10/6/2001	01/00	na							102	1.8	NO MARK	U
10/6/2001	01/00	na							108	2.0	NO MARK	U
10/6/2001	01/00	na							110	2.4	NO MARK	U
10/6/2001	01/00	na							112	2.4	NO MARK	U
10/6/2001	01/00	na							120	2.8	NO MARK	U
10/6/2001	01/00	na							140	5.6	NO MARK	T
10/6/2001	19/00	LSP	5.0	19	31	31			90	1.1	NO MARK	U
10/6/2001	19/00	LSP							130	3.2	NO MARK	U
10/6/2001	19/00	LSP							74	0.6	NO MARK	U
10/6/2001	19/00	LSP							119	2.8	NO MARK	U

1 RCO-Right center orange

2 T-transformed; U-untransformed

**Table A2 (con't).**

Date	Km/ Electrofished	Habitat Reach	Area		Time		Lamprey Captured	Lamprey Measured	Length (mm)	Weight (g)	Mark <sup>1</sup>	Phase <sup>2</sup>
			Fished (m <sup>2</sup> )	Fished (Min)								
10/6/2001	19/00	LSP							100	1.7	NO MARK	U
10/6/2001	19/00	LSP							90	0.9	NO MARK	U
10/6/2001	19/00	LSP							86	0.9	NO MARK	U
10/6/2001	19/00	LSP							81	0.8	NO MARK	U
10/6/2001	19/00	LSP							88	0.9	NO MARK	U
10/6/2001	19/00	LSP							80	0.8	NO MARK	U
10/6/2001	19/00	LSP							70	0.6	NO MARK	U
10/6/2001	19/00	LSP							110	2.8	NO MARK	U
10/6/2001	19/00	LSP							99	1.4	NO MARK	U
10/6/2001	19/00	LSP							88	1.1	NO MARK	U
10/6/2001	19/00	LSP							77	0.8	NO MARK	U
10/6/2001	19/00	LSP							119	2.5	NO MARK	U
10/6/2001	19/00	LSP							97	1.8	NO MARK	U
10/6/2001	19/00	LSP							124	2.5	NO MARK	U
10/6/2001	19/00	LSP							105	2.1	NO MARK	U
10/6/2001	19/00	LSP							110	1.8	NO MARK	U
10/6/2001	19/00	LSP							120	2.9	NO MARK	U
10/6/2001	19/00	LSP							147	5.1	NO MARK	U
10/6/2001	19/00	LSP							132	3.1	NO MARK	U
10/6/2001	19/00	LSP							100	1.5	NO MARK	U
10/6/2001	19/00	LSP							80	1.1	NO MARK	U
10/6/2001	19/00	LSP							95	1.7	NO MARK	U
10/6/2001	19/00	LSP							80	0.6	NO MARK	U
10/6/2001	19/00	LSP							80	0.8	NO MARK	U
10/6/2001	19/00	LSP							85	0.8	NO MARK	U
10/6/2001	19/00	LSP							80	0.6	NO MARK	U
10/6/2001	19/00	LSP							118	1.8	NO MARK	U
10/7/2001	na	na	10.0	20		35	35		86	1.0	NO MARK	U
10/7/2001	na	na							96	0.8	NO MARK	U
10/7/2001	na	na							96	0.8	NO MARK	U
10/7/2001	na	na							102	1.8	NO MARK	U
10/7/2001	na	na							88	1.3	NO MARK	U
10/7/2001	na	na							86	1.0	NO MARK	U
10/7/2001	na	na							83	1.0	NO MARK	U
10/7/2001	na	na							105	3.3	NO MARK	U
10/7/2001	na	na							68	1.8	NO MARK	U
10/7/2001	na	na							100	2.1	NO MARK	U
10/7/2001	na	na							105	2.1	NO MARK	U
10/7/2001	na	na							100	2.0	NO MARK	U
10/7/2001	na	na							98	1.6	NO MARK	U
10/7/2001	na	na							104	1.5	NO MARK	U
10/7/2001	na	na							86	1.4	NO MARK	U
10/7/2001	na	na							75	1.0	NO MARK	U
10/7/2001	na	na							80	1.2	NO MARK	U

1 RCO-Right center orange

2 T-transformed; U-untransformed

**Table A2 (con't).**

Date	Km/ Electrofished	Habitat Reach	Fished (m <sup>2</sup> )	Area		Lamprey Captured	Lamprey Measured	Length (mm)	Weight (g)	Mark <sup>1</sup>	Phase <sup>2</sup>
				Fished (Min)	Time						
10/7/2001	na	na						93	1.6	NO MARK	U
10/7/2001	na	na						98	1.8	NO MARK	U
10/7/2001	na	na						90	1.1	NO MARK	U
10/7/2001	na	na						107	1.4	NO MARK	U
10/7/2001	na	na						107	1.5	NO MARK	U
10/7/2001	na	na						100	1.8	NO MARK	U
10/7/2001	na	na						96	1.8	NO MARK	U
10/7/2001	na	na						76	1.2	NO MARK	U
10/7/2001	na	na						94	1.2	NO MARK	U
10/7/2001	na	na						83	0.9	NO MARK	U
10/7/2001	na	na						95	1.7	NO MARK	U
10/7/2001	na	na						97	2.3	NO MARK	U
10/7/2001	na	na						85	1.1	NO MARK	U
10/7/2001	na	na						102	2.2	NO MARK	U
10/7/2001	na	na						80	1.1	NO MARK	U
10/7/2001	na	na						88	0.9	NO MARK	U
10/7/2001	na	na						40	0.8	NO MARK	U
10/7/2001	na	na						90	1.1	NO MARK	U
10/7/2001	17/09	LSP	10.0	20		25	25	105	1.6	NO MARK	U
10/7/2001	17/09	LSP						80	0.9	NO MARK	U
10/7/2001	17/09	LSP						95	1.6	NO MARK	U
10/7/2001	17/09	LSP						93	1.1	NO MARK	U
10/7/2001	17/09	LSP						101	1.7	NO MARK	U
10/7/2001	17/09	LSP						90	0.7	NO MARK	U
10/7/2001	17/09	LSP						107	2.0	NO MARK	U
10/7/2001	17/09	LSP						85	1.2	NO MARK	U
10/7/2001	17/09	LSP						112	3.2	NO MARK	U
10/7/2001	17/09	LSP						127	3.6	NO MARK	U
10/7/2001	17/09	LSP						92	1.4	NO MARK	U
10/7/2001	17/09	LSP						70	0.8	NO MARK	U
10/7/2001	17/09	LSP						77	0.7	NO MARK	U
10/7/2001	17/09	LSP						132	3.9	NO MARK	U
10/7/2001	17/09	LSP						146	5.2	NO MARK	U
10/7/2001	17/09	LSP						99	1.8	NO MARK	U
10/7/2001	17/09	LSP						76	0.5	NO MARK	U
10/7/2001	17/09	LSP						104	1.6	NO MARK	U
10/7/2001	17/09	LSP						92	1.1	NO MARK	U
10/7/2001	17/09	LSP						103	2.1	NO MARK	U
10/7/2001	17/09	LSP						130	3.6	NO MARK	U
10/7/2001	17/09	LSP						74	1.6	NO MARK	U
10/7/2001	17/09	LSP						98	1.5	NO MARK	U
10/7/2001	17/09	LSP						85	1.0	NO MARK	U
10/7/2001	17/09	LSP						92	1.6	NO MARK	U

1 RCO-Right center orange

2 T-transformed; U-untransformed

**Table A3. Pacific lamprey presence-absence surveys in Red River drainage, 2001.**

DATE	TIME	STREAM	RKM/DESCRIPT.	AIR TEMP °C	STREAM TMP. °C	TIME (min)	LAMPREY CAPTURED	DEPTH (m)	SHADE (%)
6/30/2001	1000	Red Horse	3.0/na	23.0	12.0	9.5	0	0.38	na
7/13/2001	923	Red River	5.0/na	12.5	15.0	21.6	54	0.34	36.0
7/14/2001	920	Red River	8.0/na	17.5	16.0	8.3	0	0.38	6.8
7/14/2001	930	Red River	6.0/na	16.0	15.0	1.4	5	0.23	9.0
7/14/2001	1015	RedRiver	7.0/na	16.5	16.0	7.3	8	0.30	1.5
7/14/2001	1025	Red River	9.0/na	20.0	17.0	9.6	0	0.33	19.5
7/14/2001	1450	Red River	10.0/na	12.0	13.5	9.2	0	0.40	24.0
8/10/2001	1452	Red River	na/1.5km dwn.RR.hot springs	17.5	14.5	7.4	0	0.40	moderate
8/13/2001	930	Red River	na/100m dwn.rd.172	17.0	13.0	7.3	0	0.25	0-est.
8/13/2001	1022	Red River	na/2.2km dwn.RR Campgrnd.	21.0	15.0	4.6	0	0.56	na
8/13/2001	1105	Red River	na/3.0km dwn. RR Campgrnd	21.5	16.5	6.2	0	0.18	na
8/13/2001	1142	Red River	na/150m up rd.9519	27.0	17.5	4.0	0	0.35	na
8/23/2001	1211	Red River	.8/na	17.0	16.0	18.4	33	0.41	na
7/15/2001	1656	S. F. R. R.	.20/na	18.0	15.0	10.4	0	na	na
8/9/2001	1201	S. F. R. R.	na/1.5km up Trpr. Crk.	15.0	14.0	9.7	0	0.23	na
8/9/2001	1353	S. F. R. R.	na/.75km dwn.Trpr. Crk.	18.0	15.5	5.0	0	0.18	na
8/9/2001	1443	S. F. R. R.	na/2.25km dwn.Trpr. Crk.	23.5	17.0	11.6	0	0.30	na
8/11/2001	1118	S. F. R. R.	na/1.5km dwn. Trpr. Crk.	21.5	14.5	7.1	0	0.25	na
8/11/2001	1213	S. F. R. R.	na/1.7km up frm. mouth	18.0	16.5	12.6	0	0.45	na
8/30/2001	1437	Siegel Crk.	2.0/na	na	15.0	15.5	0	0.25	na

**Table A4. Pacific lamprey presence-absence survey habitat descriptors in Red River drainage, 2001.**

STREAM	RKM/DESCRIPT.	AREA (m <sup>2</sup> )	DOMINANT SUBSTRATE PERCENT						SM. BOULDER	LG. BOULDER	OTHER
			SILT/ORG	SAND	GRAVEL	COBBLE					
Red Horse	3.0/na	25.0	100								
Red River	5.0/na	15.2	40	25						25	10
Red River	8.0/na	10.0	25	30						28	17
Red River	6.0/na	1.3	35	45				20			
Red River	7.0/na	6.0	15		35	15				25	10
Red River	9.0/na	10.0	8	40		41		7			4
Red River	10.0/na	10.0		40				10		45	5
Red River	na/1.5km dwn.RR.hot springs	8.1		70	13	10					7
Red River	na/100m dwn.rd.172	4.6	20	54	11	15					
Red River	na/2.2km dwn.RR Campgrnd.	6.5	7	34	18	16		25			
Red River	na/3.0km dwn. RR Campgrnd	4.8	0.5	25	61	2		6		4	1.5
Red River	na/150m up rd.9519	8.3	61	20	9	0		7		2	1
Red River	.8/na	10.0	60	40							
S. F. R. R.	.20/na	9.2	5	55	20	15					5
S. F. R. R.	na/1.5km up Trpr. Crk.	5.6		50	18	14		11			7
S. F. R. R.	na/.75km dwn.Trpr. Crk.	4.7	17	39	26	8		7		3	
S. F. R. R.	na/2.25km dwn.Trpr. Crk.	9.2		12	12	18		42		14	2
S. F. R. R.	na/1.5km dwn. Trpr. Crk.	6.0	5	11	25	42		9		8	
S. F. R. R.	na/1.7km up frm. Mouth	8.4	45	9	22	5		11		8	
Siegel Crk.	2.0/na	10.0	30	50	20						



**Table A5. Pacific lamprey presence-absence surveys in S.F. Clearwater River drainage, 2001.**

DATE	TIME	STREAM	RKM/DESCRIPT.	E.FISHED					
				AIR TEMP °C	STREAM TMP. °C	TIME (min)	LAMPREY CAPTURED	DEPTH (m)	SHADE (%)
7/17/2001	1005	Mill Creek	.2/na	13.0	12.0	7.7	0	0.65	na
7/17/2001	1125	Johns Crk.	.25/50m blw. gauge	15.5	11.5	4.5	0	0.35	na
7/17/2001	1100	Ten Mile	.10/na	19.0	12.0	11.3	0	0.26	na
8/12/2001	1549	Ten Mile	Na/60m dwn. Sour d. bridge	22.5	16.0	2.2	0	0.45	na
7/28/2001	1100	Mdw. Crk.	Na/1mi. dwn. McComas M.	15.0	12.0	14.9	0	0.23	na
7/28/2001	1251	Mdw. Crk.	.10/na	20.0	16.0	5.8	0	0.21	na
8/1/2001	1350	Mdw. Crk.	Na/rd. 244 crossing	20.0	13.0	9.3	0	0.28	na
7/31/2001	1043	Crooked R.	1.5/na	16.0	12.5	13.0	0	0.57	0.0
7/17/2001	1150	S. F. C. R.	47.0/mth. Johns Crk.	14.5	14.0	3.9	20	0.33	na
8/25/2001	1200	S. F. C. R.	50.0/na	16.5	15.5	17.0	40	0.43	na
8/31/2001	840	S. F. C. R.	83.0/Elk City sign	10.0	13.0	13.2	2	0.28	0.0
8/31/2001	952	S. F. C. R.	77.0/na	20.0	14.5	18.7	26	0.30	34.5
9/1/2001	900	S. F. C. R.	40.0/na	20.0	15.0	18.0	5	0.67	0.0
9/15/2001	1213	S. F. C. R.	37.0/na	21.0	16.0	11.5	15	0.37	na
9/29/2001	900	S. F. C. R.	Na/mile mkr. 38	11.0	11.0	10.6	4	0.65	na
9/29/2001	1030	S. F. C. R.	68.0/na .1 Slvr..Leg.Crk.	14.0	9.0	13.0	7	0.31	na
9/29/2001	1200	S. F. C. R.	44.0/ Mdw. Crk.	17.0	11.0	na	32	0.38	na
9/30/2001	1000	S. F. C. R.	31.0/na.	19.0	11.0	8.3	1	0.35	na
10/6/2001	925	S. F. C. R.	~.9/na	6.0	9.0	15.0	13	0.17	na
10/6/2001	1014	S. F. C. R.	Na/mile mkr. 23	8.0	8.0	8.0	0	0.20	na
10/6/2001	1050	S. F. C. R.	19.0/smith mlbox	14.0	8.0	18.0	31	0.41	na
10/7/2001	1200	S. F. C. R.	17.9/mile mkr.2	23.0	9.0	20.0	25	0.46	na
10/7/2001	1340	S. F. C. R.	Na/na	14.0	5.0	20.0	35	0.27	na

**Table A6. Pacific lamprey presence-absence survey habitat descriptors in S.F. Clearwater River drainage, 2001.**

STREAM	RKM/DESCRIPT.	AREA (m <sup>2</sup> )	DOMINANT SUBSTRATE						
			SILT/ORG	PERCENT					
				SAND	GRAVEL	COBBLE	SM. BOULDER	LG. BOULDER	OTHER
Mill Creek	.2/na	10.8		57		17	18		8
Johns Crk.	.25/50m blw. Gauge	4.4		45	20	25			10
Ten Mile	.10/na	8.0		19	8	35	11	12	15
Ten Mile	na/60m dwn. Sour d. bridge	4.7	0	45	12	15	12	6	10
Mdw. Crk.	na/1mi. dwn. McComas M.	14.5		37	27	4	19	13	
Mdw. Crk.	.10/na	4.6	11	29	41			19	
Mdw. Crk.	na/rd. 244 crossing	9.1	12	20	10	38	16	4	
Crooked R.	1.5/na	15.0	14	78	2	5	1		
S. F. C. R.	47.0/mth. Johns Crk.	2.2	10	82				8	
S. F. C. R.	50.0/na	10.0	50	50					
S. F. C. R.	83.0/Elk City sign	10.0	50	30	20				
S. F. C. R.	77.0/na	6.0	50	50					
S. F. C. R.	40.0/na	10.0	60	40					
S. F. C. R.	37.0/na	5.0	15	14				70	1
S. F. C. R.	Na/mile mkr. 38	10.0	30	30		20	20		
S. F. C. R.	68.0/na .1 dwn. Slvr..Leg.Crk.	10.0	50	40		10			
S. F. C. R.	44.0/ Mdw. Crk.	6.0	30	60		10			
S. F. C. R.	31.0/na.	2.0	70	30					
S. F. C. R.	~9/na	10.0	15	35		50			
S. F. C. R.	na/mile mkr. 23	10.0	30			70			
S. F. C. R.	19.0/smith mlbox	5.0	20	10		70			
S. F. C. R.	17.9/mile mkr.2	10.0	40	50		10			
S. F. C. R.	na/na	10.0	30	70					

**Table A7. Habitat descriptors at locations of Pacific lamprey habitat sampling in Red River, 2001.**

**Sample Personnel:** Claire, Repp

					UNIT MEASUREMENTS					
HABITAT UNIT (Km from Mouth)	DATE	TIME	LAMPREY CAPTURED	Length (m)	Slope %	Max Depth (m)	Channel (m)	Wetted (m)	Area (m <sup>2</sup> )	
LSP	LATERAL SCOUR POOL									
2.500-2.505	27-Jul-01	14:17 PM	1	8.0	0.50	0.90	11.1	8.7	57.6	
2.557-2.569	28-Jul-01	17:13 PM	1	12.0	0.50	0.95	13.4	10.1	121.2	
4.400-4.104	30-Jul-01	7:58 AM	6	10.4	0.50	0.80	12.1	10.6	110.2	
RIF	RIFFLE									
4.4710-4.4916	30-Jul-01	15:03 PM	1	25.5	1.00	0.65	7.0	8.5	318.8	
RIP	RIFFLE WITH POCKETS									
2.505-2.513	27-Jul-01	15:10 PM	0	44.0	1.25	0.7	15.1	13.0	231.0	
2.513-2.557	28-Jul-01	17:13 PM	2	12.0	1.50	0.9	15.8	13.7	164.4	
RBB	RAPIDS WITH BOULDERS									
4.4104-4.4336	30-Jul-01	1:10 PM	6	17.2	2.00	0.6	11.9	10.8	182.2	

**Table A8. Channel descriptions for habitat units surveyed for Pacific lamprey in Red River, 2001.**

HABITAT UNIT (Km from Mouth)	Flow Velocity at Substrate (3, left to right bnk.) (m/sec)			Flow Velocity 60% from substrate (3, left to right bnk.) (m/sec.)			STREAM SHADE				
	25%	50%	75%	25%	50%	75%	LEFT BNK	CNTR UP	CNTR DWN	RIGHT BNK	TOTAL
<b>LSP</b>											
2.500-2.505	0.169	0.537	0.081	0.207	0.873	**	0.0%	4.5%	1.5%	6.0%	12.0%
2.557-2.569	<.100	0.507	0.531	*	0.922	0.489	0.0%	1.5%	1.5%	4.5%	7.5%
4.400-4.104	0.048	0.565	0.136	*	0.840	0.148	0.0%	3.0%	6.0%	9.0%	18.0%
<b>RIF</b>											
4.4710-4.4916	0.495	0.918	0.936	**	**	**	0.0%	1.5%	3.0%	6.0%	10.5%
<b>RIP</b>											
2.505-2.513	0.845	0.054	0.411	*	*	*	0.0%	1.5%	1.5%	4.5%	7.5%
2.513-2.557	<.100	0.111	0.383	0.035	0.30	*	0.0%	1.5%	0.0%	4.5%	6.0%
<b>RBB</b>											
4.4104-4.4336	0.057	0.850	0.101	**	0.932	0.117	0%	3%	3%	6%	12%

**Table A9. Stream substrate descriptions at habitat unit sample sites in Red River, 2001.**

**HABITAT UNIT SUBSTRATE COMPOSITION %**

(Km from Mouth)	LG. BLDR	SM. BLDR	COBBLE	COARSE GRVL.	MED. GRVL	FINE GRVL	COARSE SAND	FINE SAND	SILT/ ORG.	BED ROCK
<b>LSP</b>										
2.500-2.505	20.0%	4.6%	15.0%	2.0%	3.0%	2.0%	9.0%	2.0%	1.0%	
2.557-2.569	18.0%	30.0%	14.0%	4.0%	3.0%	5.0%	6.0%	5.0%	3.0%	12.0%
4.400-4.104	17.0%	22.0%	16.0%	7.0%	5.0%	11.0%	10.0%	9.0%	3.0%	
<b>RIF</b>										
4.4710-4.4916	9.0%	22.0%	33.0%	12.0%	7.0%	5.0%	6.0%	3.0%	3.0%	
<b>RIP</b>										
2.505-2.513	19.0%	29.0%	15.0%	6.0%	6.0%	6.0%	8.0%	5.0%	6.0%	
2.513-2.557	18.0%	35.0%	16.0%	8.0%	5.0%	5.0%	6.0%	5.0%	2.0%	
<b>RBB</b>										
4.4104-4.4336	24%	28%	10%	8%	5%	11%	7%	5%	2%	

**APPENDIX B**