

Fishery Data Series No. 93-29

Situk River Steelhead Trout Counts, 1992

by

**Brian Glynn
and
Steve Elliott**

August 1993

Alaska Department of Fish and Game

Division of Sport Fish



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ABSTRACT

Abundance indices of steelhead trout *Oncorhynchus mykiss* in the Situk River have decreased over 50% since 1984. In 1992, as part of a continuing program to monitor this stock, counts of steelhead were obtained at a weir on the Situk River and from visual counts obtained from float surveys. Counts (incomplete due to washout of the weir) of 1,079 immigrants and 2,976 emigrants were obtained at the weir between the dates of 14 April - 17 July. On 15-16 May, 883 steelhead were counted during float surveys of the upper and lower river. This is the lowest float count ever recorded, which suggests that abundance of steelhead in the Situk River remains low.

KEY WORDS: steelhead trout abundance, Situk River, kelts, abundance indices, migration timing.

INTRODUCTION

The Situk River has the largest run of steelhead trout *Oncorhynchus mykiss* in Southeast Alaska. This population has two components, a fall run, thought to number about 500 fish and a spring run of about 2,000 - 7,000 fish. The migratory timing of the fall immigration is unknown though fish appear to enter the river from August through October. They reside in the upper reaches of the Situk River or in Situk Lake until spring (Johnson 1991). It is thought that these fish spawn early in the spring and are actively emigrating while the immigration of spring fish is occurring. The spring run begins around 15 April and ends about 15 June and the kelt emigration begins on 15 May and usually ends by 15 July.

The high rate of weir wash out in the spring (high flows in the fall preclude the use of weirs) makes it difficult to assess either the fall or spring run spawning abundance. Currently, the best indicator of relative annual abundance are counts of steelhead obtained during float surveys in mid May before a large portion of the fish emigrate but after most of the immigration has occurred.

Indices of steelhead abundance obtained from float surveys have declined 78% from a high of 3,206 in 1987 to 883 in 1992. Emigrating steelhead were also counted at a weir constructed in the lower river from 1988 through 1992. These counts indicate a similar decline despite high water events that may have flushed uncounted kelts from the river.

This project is a continuation of work begun in 1984 to monitor the status of this stock. The following report provides abundance indices for Situk steelhead in 1992.

METHODS

Weir Counts

Immigrant steelhead were counted through an aluminum bipod and metal picket weir equipped with an upstream migrant trap. Emigrants were counted through a section of the weir where pickets had been removed. The weir was built about 1.5 miles upstream of the Lower Landing and was operational on 18 April 1992 (Figure 1). The weir was undermined by spring floods and was inoperative from 4-16 May; it was reinstalled on 17 May and thereafter it was fished continuously until it was removed by Commercial Fisheries Division staff on 17 July 1992.

Immigrants approached the weir at dusk, the time of their natural movement (Johnson 1991), and were allowed to enter the trap between 20:00 and 02:00 hours where they were counted, sampled, and released. After the weir wash out, both immigrants and emigrants were counted through an open section of the weir from which the pickets were removed.

From 18 April - 4 May, every sixth immigrant was sampled. After that date no steelhead were sampled. Each immigrant steelhead was measured to the nearest 1 mm fork length and sexed by examining external characteristics; scales were removed from preferred areas (Anas 1963) of each side of the fish for age analysis. Steelhead scales were aged using the methods in Narver and Withler (1977).

Water depth at the weir was measured to the nearest 1 cm, and water temperature

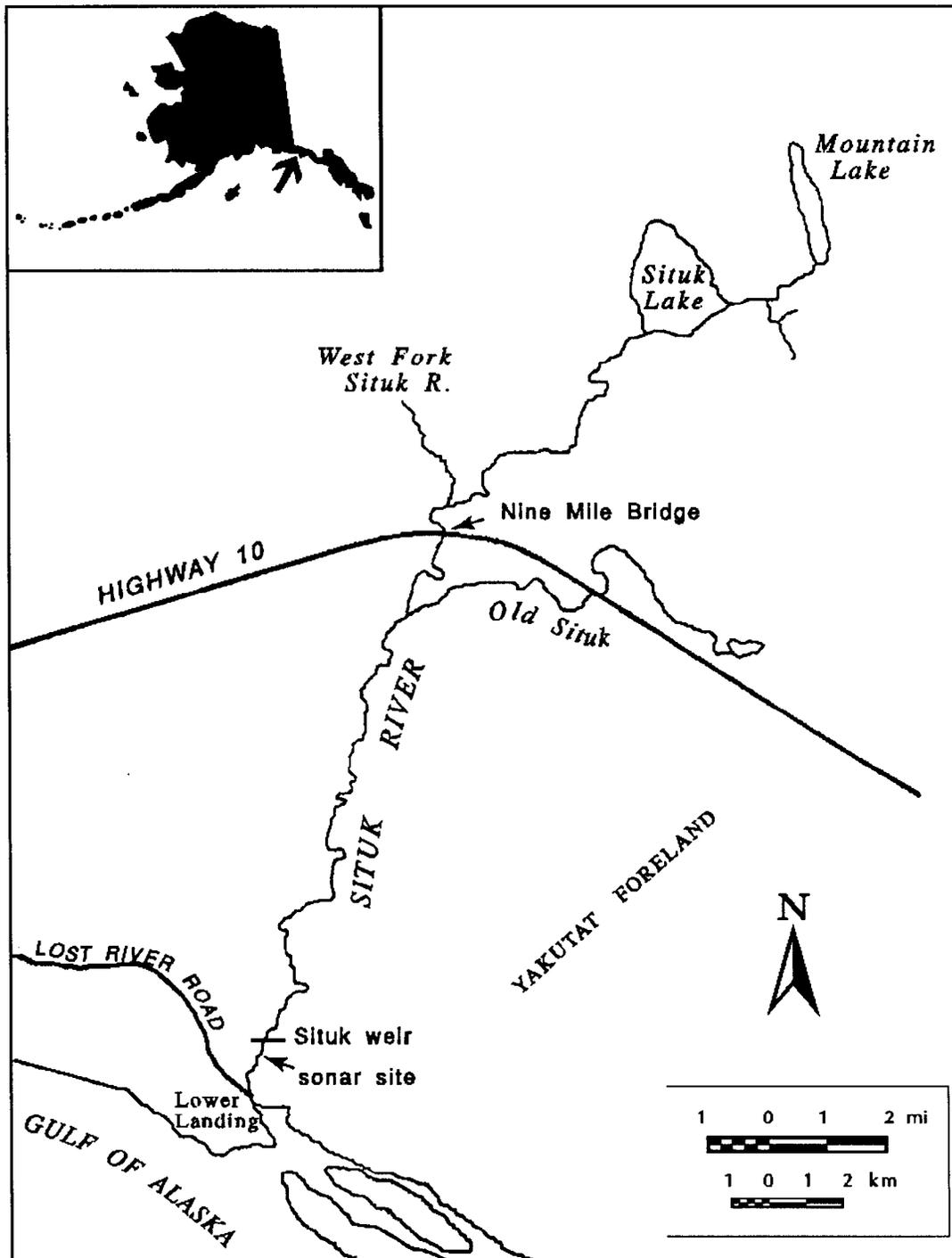


Figure 1. The Situk River, Yakutat, Alaska.

(to nearest °C) taken with pocket thermometer, every morning around 09:00 hours. Records of daily precipitation at the Yakutat Airport were obtained from the U.S. Weather Service.

Abundance Indices

Indices of steelhead abundance were obtained via float surveys in an upper river survey section (Situk Lake to Nine Mile Bridge) and a lower river survey section (Nine Mile Bridge to Lower Landing) (Figure 1). Surveys of the lower river were done about every ten days; on the upper river they were done three times. When counts were near their peak in the lower river, surveys in the upper river were timed to be nearly coincident with surveys of the lower river so as to obtain an abundance index for the entire river. Surveys of the upper and lower river cannot be done on the same day (by a single crew), as it takes about 10 hours to float the entire river.

The timing and duration of the shorter surveys are intended to take advantage of the brief period of optimum light conditions around mid-day.

Each survey was conducted with two observers drifting downstream in a small boat. During the day, steelhead usually lie in pools, and in most situations, the boat could be positioned so that all of the fish could be seen from one side of the boat and counted by the observer assigned to that side of the boat. In areas where deep water and fish occurred on both sides of the boat, observers counted the fish on their respective sides of the boat, and counts for that area were summed. Visibility was rated as good, fair, or poor, depending on whether observers could consistently see to the bottom of pools.

In the upper river, an inflatable raft was backpacked to the upstream end of the survey section and launched. In the lower river, a sport canoe with a small outboard motor was launched at the Nine Mile bridge. Polarized sunglasses were worn by each observer to improve detection of fish.

RESULTS AND DISCUSSION

Weir Counts

During 1992, 1,079 immigrant steelhead and 2,976 emigrant steelhead were counted at the Situk River weir (Table 1). The rate of emigration peaked around 30 May, when 262 fish were counted (Figure 2). Between 18 April and 3 May, 829 immigrants and 27 emigrants were counted through the weir.

On 4 May, the weir was undermined during a flood and became inoperable until 15 May. During this hiatus, immigrating steelhead passed through the weir uncounted. Steelhead that were seen holding downstream of the weir before the flood were absent when flood waters subsided. The weir was reinstalled on 15 May and operated successfully until its removal by the Commercial Fisheries Division on 17 July.

Low rates of emigration before and after the weir washout suggest that few fish had left Situk River prior to 16 May. Total counts after reinstalling the weir on 15-16 May were 250 immigrants and 2,947 emigrants.

Between 27 April and 3 May 1992, 71 immigrating steelhead were sampled at the

Table 1. Daily counts of immigrant and emigrant steelhead at the Situk River weir, 1992.

	Daily		Cumulative		Water	
	Up-stream	Down-stream	Up-stream	Down-stream	Depth (cm)	Temp. (°C)
04/18	7	0	7	0	1.3	5
04/19	36	0	43	0	1.1	5
04/20	77	0	120	0	1.0	6
04/21	34	0	154	0	0.9	6
04/22	44	0	198	0	0.8	7
04/23	2	0	200	0	0.8	7
04/24	73	0	273	0	0.7	8
04/25	39	0	312	0	0.6	7
04/26	45	1	357	1	0.6	5
04/27	36	0	393	1	0.5	5
04/28	75	4	468	5	1.2	5
04/29	97	0	565	5	0.9	5
04/30	4	0	569	5	0.7	5
05/01	54	7	623	12	0.7	5
05/02	75	10	698	22	0.7	5
05/03	131	5	829	27	0.9	5
05/04	weir out		829	27		4
05/05	weir out		829	27		
05/06	weir out		829	27		
05/07	weir out		829	27		
05/08	weir out		829	27		
05/09	weir out		829	27		
05/10	weir out		829	27		
05/11	weir out		829	27		
05/12	weir out		829	27		
05/13	weir out		829	27		
05/14	weir out		829	27		
05/15	weir out		829	27		
05/16	0	4	829	31		8
05/17	2	6	831	37		6
05/18	25	41	856	78		6
05/19	4	18	860	96	1.0	7
05/20	13	59	873	155		7
05/21	16	53	889	208	0.9	8
05/22	16	82	905	290	0.9	8
05/23	11	37	916	327	0.9	8
05/24	30	133	946	460	0.9	8

-continued-

Table 1. (Page 2 of 3).

	Daily		Cumulative		Water	
	Up- stream	Down- stream	Up- stream	Down- stream	Depth (cm)	Temp. (°C)
05/25	11	37	957	497	0.9	9
05/26	8	240	965	737	1.2	9
05/27	9	97	974	834	1.1	9
05/28	20	79	994	913	1.1	9
05/29	14	174	1,008	1,087	1.1	9
05/30	9	262	1,017	1,349	1.2	9
05/31	7	40	1,024	1,389	1.1	9
06/01	0	155	1,024	1,544		9
06/02	0	106	1,024	1,650		9
06/03	0	104	1,024	1,754	2.4	9
06/04	10	100	1,034	1,854	1.8	9
06/05	5	55	1,039	1,909	1.6	9
06/06	3	56	1,042	1,965	1.5	9
06/07	3	48	1,045	2,013	1.5	9
06/08	0	69	1,045	2,082	1.5	9
06/09	3	73	1,048	2,155	1.1	9
06/10	11	101	1,059	2,256	1.1	12
06/11	10	139	1,069	2,395	1.1	12
06/12	1	104	1,070	2,499	1.0	12
06/13	0	92	1,070	2,591	0.9	12
06/14	1	11	1,071	2,602	0.9	12
06/15	0	5	1,071	2,607	0.9	12
06/16	0	0	1,071	2,607	1.2	10
06/17	5	120	1,076	2,727	1.3	10
06/18	0	43	1,076	2,770	1.2	10
06/19	0	34	1,076	2,804	1.1	10
06/20	0	15	1,076	2,819	1.0	10
06/21	0	3	1,076	2,822	2.6	10
06/22	0	0	1,076	2,822	1.8	10
06/23	0	0	1,076	2,822	1.4	10
06/24	0	0	1,076	2,822	1.6	10
06/25	0	24	1,076	2,846	1.5	11
06/26	0	8	1,076	2,854	1.3	13
06/27	1	7	1,077	2,861	1.2	13
06/28	0	13	1,077	2,874	1.1	12
06/29	0	2	1,077	2,876	1.1	12
06/30	0	3	1,077	2,879	1.0	11
07/01	0	6	1,077	2,885	1.0	12

-continued-

Table 1. (Page 3 of 3).

	Daily		Cumulative		Water	
	Up-stream	Down-stream	Up-stream	Down-stream	Depth (cm)	Temp. (°C)
07/02	0	0	1,077	2,885	0.8	13
07/03	0	0	1,077	2,885	0.8	13
07/04	0	0	1,077	2,885	0.8	12
07/05	0	0	1,077	2,885	0.8	12
07/06	1	11	1,078	2,896	0.8	12
07/07	0	2	1,078	2,898	0.8	12
07/08	1	4	1,079	2,902	0.8	12
07/09	0	1	1,079	2,903	1.0	12
07/10	0	8	1,079	2,911	1.0	12
07/11	0	0	1,079	2,911	1.0	12
07/12	0	15	1,079	2,926	1.3	12
07/13	0	14	1,079	2,940	1.5	12
07/14	0	16	1,079	2,956	1.4	12
07/15	0	18	1,079	2,974	1.4	12
07/16	0	1	1,079	2,975		
07/17	0	1	1,079	2,976		
Total	1,079	2,976	1,079	2,976		

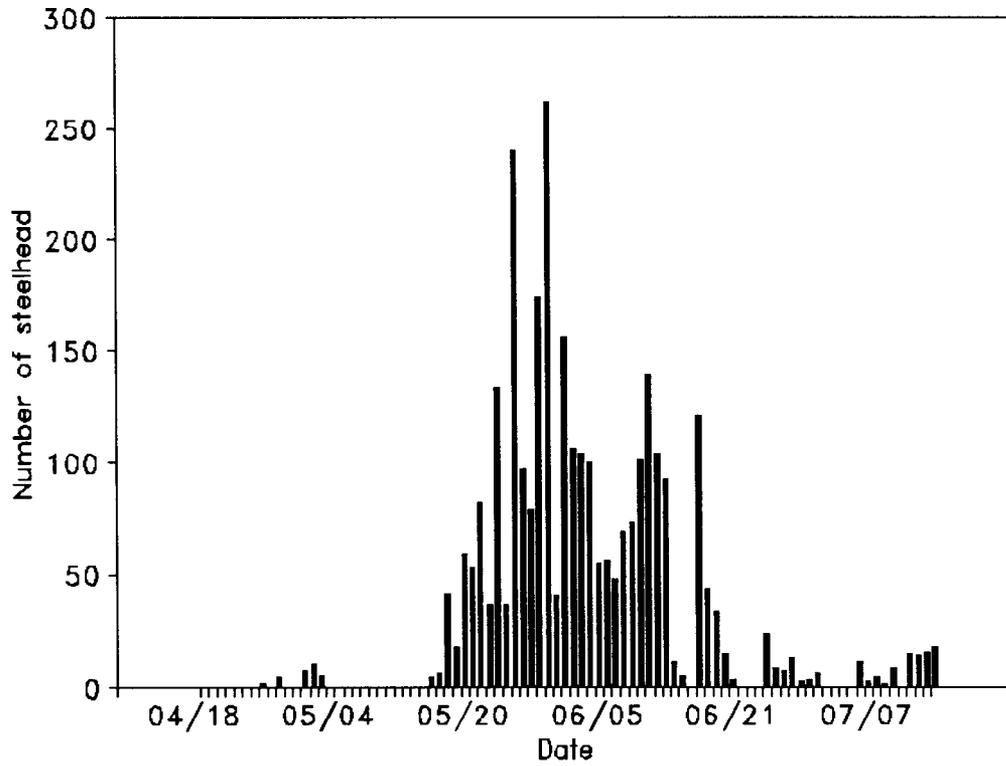


Figure 2. Daily counts of emigrant steelhead at the Situk River weir, 1992.

weir trap. Mean length at age and by sex appears in Appendix A1. Age composition is shown in Appendix A2, and a graph of mean length at ocean age appears in Appendix A3. No fish were sampled after the weir was reinstalled; consequently, these sample results are germane only to the early portion of the run.

Indices of Abundance

The highest total float count was obtained on 15 May and 16 May, when 883 steelhead were observed (Table 2). Peak abundance was observed on 15 May in the upper river and declined thereafter. Counts of steelhead in the lower river increased from 205 on 13 April to 663 on 16 May, then decreased to 379 on 28 May.

Estimates from Past Surveys

For years in which there were float counts but no weir counts of emigrants, the number of emigrants was estimated by expanding the peak float count for those years by the average float/weir count ratio estimated for 1989-1990 (Table 3). This value (≈ 0.42) is different from that reported by Glynn (1992) because calculation of the expansion factor includes only years for which weir counts are complete.

RECOMMENDATIONS

Management

Float counts of emigrant abundance continue to show reduced numbers of steelhead in the Situk River while weir counts indicate a slight increase from 1991 counts (Figure 3). However, because the emigrant counts in both years were interrupted by loss of the weir, it is not possible to make conclusions regarding changes in relative abundance. Indices of abundance therefore provide the best available data on trends in abundance. Based on these considerations it is prudent to support and continue regulations and management actions at a conservative level that will minimize or eliminate mortality of steelhead.

Research

The bipod-picket weir on the Situk River was ineffective as a tool for counting and sampling steelhead. This judgment is based on the following observations:

- (1) The weir is overtopped each spring and has proven to be an unreliable method of counting immigrants and emigrants.
- (2) Because immigrants do not readily migrate through the weir, large numbers of them hold downstream, and, as a result:
 - (a) a delay in migration occurs which has unknown effects on spawning;
 - (b) holding steelhead are subjected to heavy fishing pressure; and;
 - (c) once holding steelhead pass the weir they move rapidly to spawning areas reducing fishing opportunity in several miles of the river.

Table 2. 1992 indices of steelhead trout abundance in the Situk River. Values are cumulative counts summed upstream to downstream.

Date of survey:	13 April	21 April	30 April	12 May	15 May	16 May	23 May	28 May
<u>Upper river survey reaches</u>								
Observers ^a :					BG/RE	BG/JS		BG/EP
Conditions:					Poor	Fair		Good
Rock					2	17		0
Small island					13	21		2
Upper chute					30	36		5
KS hole					81	71		9
Cut log					167	133		18
Hard right					198	152		
West fork					259	195		24
Nine Mile					275	220		30
<u>Lower river survey reaches</u>								
Observers ^a :	BG/BJ	BG/RE	RE/GW	BG/JS		RE/ME	BG/EP	RE/MK
Conditions:	Good	Fair	Good	Good		Fair	Good	Fair
Eagle nest	45	54		65				
Old Situk	64	74	90	146		108	62	16
Mid-cabin	71	88	103	166		131	91	10
Cathedral	77	102	119	216		158	114	45
Fannings	78	122	124	224		168	116	48
Finger	89	148		258			122	
Falls	90	150	164	281		232	136	64
Danny's	111			308			160	
Big jam	122	172	208	331		303	177	99
Milky Creek	128	189		367			200	107
4th July	148							
Road	200	232	291	540		559	354	186
Nymphs	203	248	328	598		627	426	232
Weir	205	254	360	630		653	503	343
Lower Landing	205	254	501	633		663	503	379
Total count						883		409

^a Principal observers: BG = Brian Glynn, RE = Randy Ericksen, GW = Gordan Woods.

Table 3. Indices of abundance of emigrant steelhead in the Situk River obtained from float counts and weir counts, 1984-1992.

Year	Float count	Weir count	Expansion factor	Estimated emigrants ^a
1984	2,200	-- b		5,274
1985	2,048	-- b		4,909
1986	1,367 ^c	-- b		
1987	3,026	-- b		7,675
1988	2,595	1,211 ^d	-- e	6,220
1989	2,251	5,867 ^f	0.38367	5,396
1990	1,640	3,639 ^g	0.45067	3,931
1991	979	2,490 ^h	-- e	2,347
1992	883	2,976	-- e	2,117
Average	1,670	3,237	0.41717	4,735

^a Calculated by dividing float count by average float count/weir count ratio.

^b Weir not operational during steelhead emigration.

^c Lower river only.

^d Weir count incomplete; see Appendix B1.

^e Not calculated.

^f Appendix B2.

^g Appendix B3.

^h Weir count incomplete; see Appendix B4.

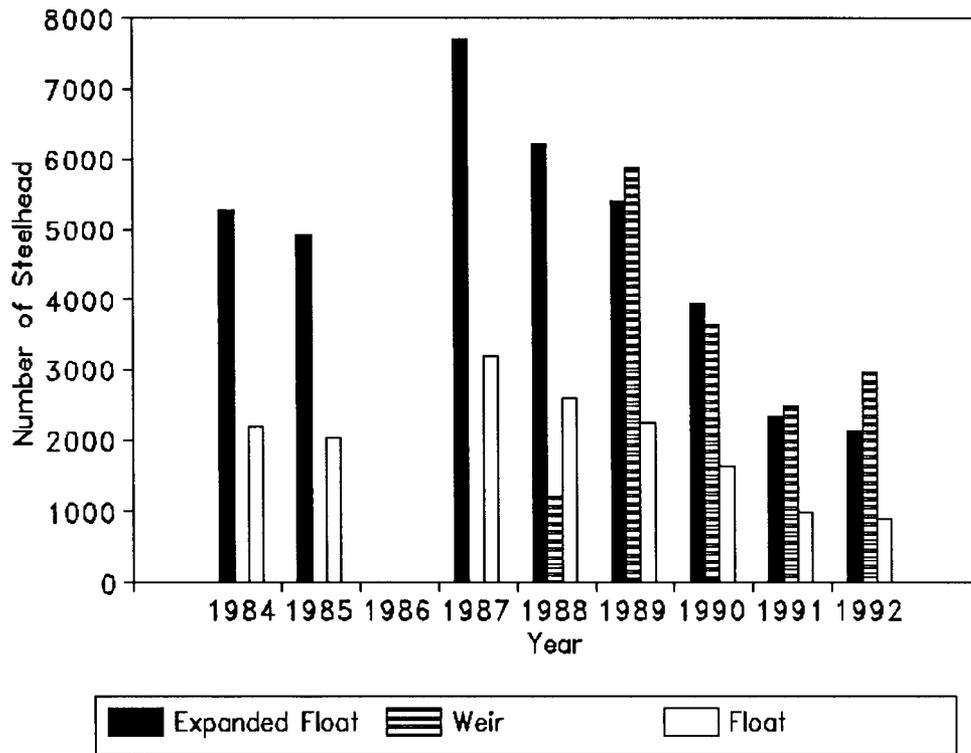


Figure 3. Abundance indices of emigrant steelhead in the Situk River, 1984-1992, obtained from float surveys, weir counts, and by expansion of the float surveys.

- (3) Emigrants can be effectively trapped at the weir only where a trap can be installed in deep water; however, this makes netting the fish difficult and probably stresses the fish. This problem may be overcome by different trap designs in shallow water.

To decrease variability in the index surveys in the future, we recommend the following standards:

- (1) Indices should always be done with two observers.
- (2) The lower river survey should always include the reach from the weir to the lower landing.
- (3) Surveys should be done twice for the same survey event to provide some estimate of measurement error.
- (4) In conducting a survey of the entire river, surveys of the upper and lower river should be done by two different teams of observers on the same day. (If each section is surveyed on a different day, there is the possibility of under-counting or over-counting, depending on which section is surveyed first, because fish may move from one section to the other. If the entire river is surveyed by one team on the same day, 8-10 hours would be required to complete the survey. During this time, observer fatigue and changes in light conditions would reduce counting efficiency.)

To reduce the error and effort associated with the above, an alternative method is to count the number of fall fish in the upper river before immigration begins and thereafter survey only the lower river. The rationale for this method is that every emigrant - both fall and spring run - must pass through the lower river and should have an equal chance of being counted if surveys are done frequent enough.

- (5) The frequency of upper river surveys should be increased prior to onset of immigration to count fall run steelhead.
- (6) Survey conditions should be rated with a standardized rating system during each survey. Suggested ratings are:

Good = can see to the bottom of all large holes;
Fair = cannot see to the bottom of all large holes;
Poor = cannot see to the bottom of medium depth holes
as those found at _____.

- (7) Survey conditions should be quantified. Data to be collected could include water depth and clarity, as well as percent overcast, precipitation during time of survey, and relative wind speed, all of which affect water clarity.
- (8) The river should be mapped and the length and distance between each survey section should be measured.

Research for 1993

A cost-effective method to accurately measure the abundance of adult Situk River steelhead needs to be developed. The Division of Sport Fish has tried or considered several methods of assessing the run. Standard weirs to count immigrants have not been successful. They are expensive to maintain and operate, and they have invariably washed out, yielding only minimum counts. Also, immigrant weirs impede migration of steelhead and disrupt upstream fisheries. Special weirs such as floating weirs are designed to resist flooding, but they are expensive and may not work at this site because of unstable substrates.

Counts based on observation-float counts, foot counts, etc, are subjective and highly influenced by conditions and can be used only to describe trends. The use of sonar to count steelhead has been considered but this method will not provide estimates of fall-run fish. Secondly the expected accuracy and precision of sonar derived estimates of spring-run fish (David Mesiar, Alaska Department of Fish and Game, Anchorage, personal communication) are expected to be no better than a mark-recapture experiment.

Beginning in fall 1993, the Division will explore the feasibility of a mark-recapture experiment to estimate steelhead abundance. The experimental method would be to mark fall-run and spring-run immigrants with unique tags and then to inspect emigrating steelhead for marks at the kelt weir in 1994. For these procedures to work, the kelt weir must be fish tight from about 15 June through about 25 July to collect an unbiased sample (Figure 4). Also, since about 40% of the immigrants would pass the weir during this time permitting the opportunity to deploy additional marks.

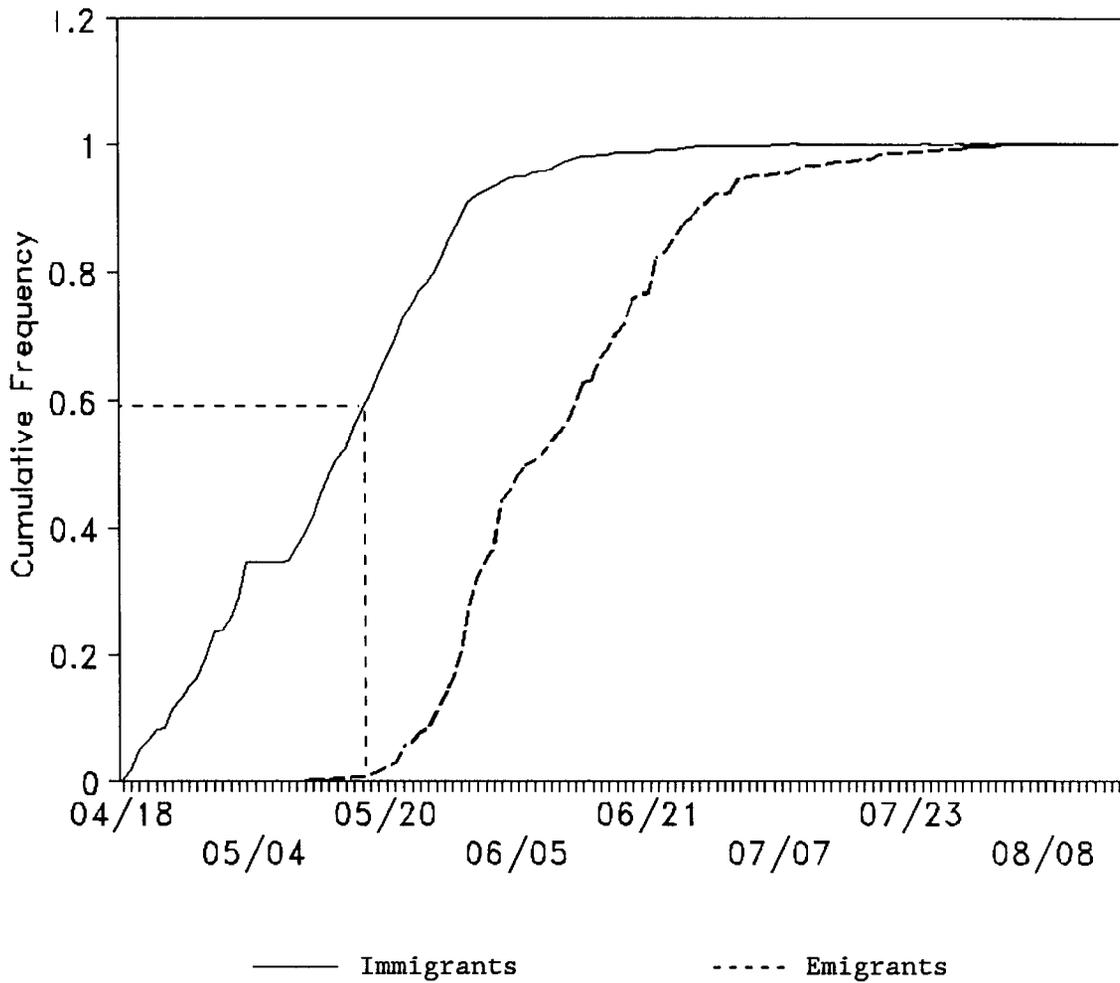


Figure 4. Cumulative counts of steelhead at the Situk River weir. Counts of immigrants are available only for 1992. Emigrant counts are the average of counts from 1988 through 1992. Pointers indicate that about 60% of the spring immigration has passed the weir by the beginning of emigration.

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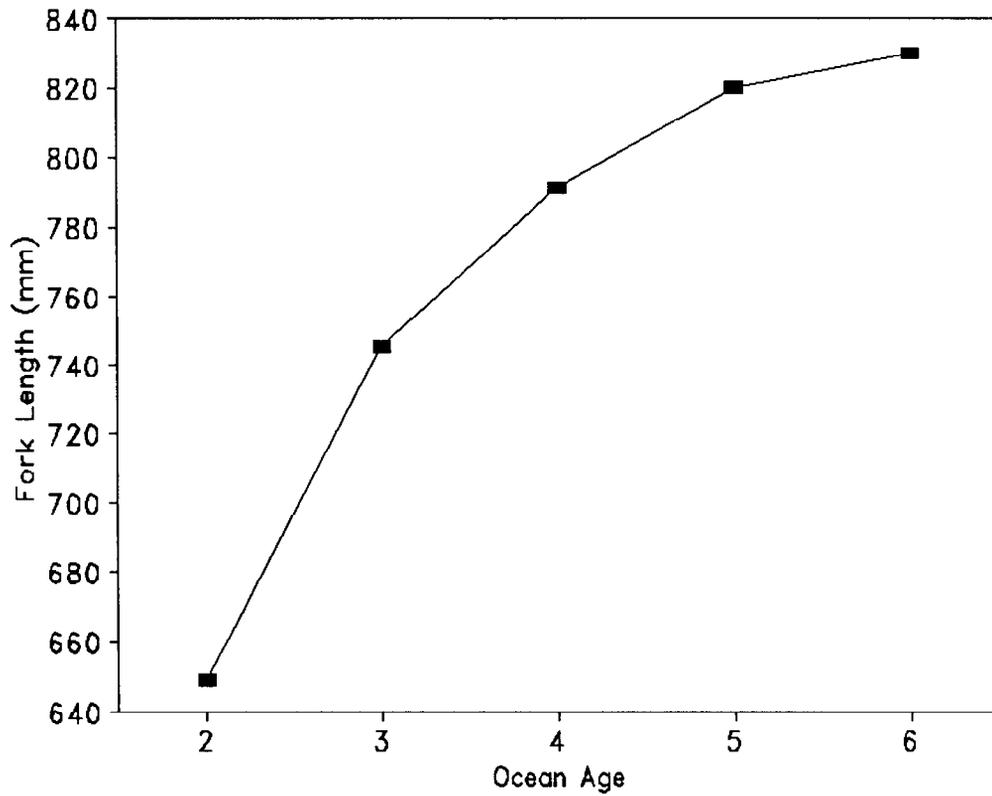
APPENDIX A
AGE AND LENGTH CHARACTERISTICS OF SITUK RIVER STEELHEAD IN 1992

Appendix A1. Age and length of steelhead immigrants sampled at the Situk River weir in 1992.

Age class	Females				Males				Total			
	Mean	STD	SE	N	Mean	STD	SE	N	Mean	STD	SE	N
3.2	668	17	9	4	659	35	11	10	661	31	8	14
3.2s1					758	61	27	5	758	61	27	5
3.2s1s1	783	49	28	3	810			1	790	42	21	4
3.2s1s1?					760			1	760			1
3.3	712	44	20	5	785	96	48	4	744	77	26	9
3.?					810			1	810			1
4.1s1					690			1	690			1
4.2	645	7	5	2	626	31	14	5	631	27	10	7
4.2s1	732	52	16	10					732	52	16	10
4.2s1s1	770	-	-	1					770			1
4.2s1s1s1s1					830			1	830			1
4.3	740	-	-	1	790			1	765	35	25	2
5.2					740			1	740			1
R.2	620	14	10	2	625	7	5	2	623	10	5	4
R.2s1	740	28	20	2	750			1	743	21	12	3
R.2s1s1					840			1	840			1
R.2s1s1s1					820			1	820			1
R.3s1					800			1	800			1
U.2					570			1	570			1
U.3					765	78	55	2	765	78	55	2
U.U					790			1	790			1
Total	714	58	11	30	718	85	13	41	716	74	9	71

Appendix A2. Age composition of immigrant steelhead sampled at the Situk River weir, 1992.

Age class	Females			Males			Total		
	N	% Comp.	SE	N	% Comp.	SE	N	% Comp.	SE
3.2	4	5.6%	0.3%	10	14.1%	0.5%	14	19.7%	0.6%
3.2s1				5	7.0%	0.4%	5	7.0%	0.4%
3.2s1s1	3	4.2%	0.3%	1	1.4%	0.2%	4	5.6%	0.3%
3.2s1s1?				1	1.4%	0.2%	1	1.4%	0.2%
3.3	5	7.0%	0.4%	4	5.6%	0.3%	9	12.7%	0.5%
3.?				1	1.4%	0.2%	1	1.4%	0.2%
4.1s1				1	1.4%	0.2%	1	1.4%	0.2%
4.2	2	2.8%	0.2%	5	7.0%	0.4%	7	9.9%	0.4%
4.2s1	10	14.1%	0.5%				10	14.1%	0.5%
4.2s1s1	1	1.4%	0.2%				1	1.4%	0.2%
4.2s1s1s1s1				1	1.4%	0.2%	1	1.4%	0.2%
4.3	1	1.4%	0.2%	1	1.4%	0.2%	2	2.8%	0.2%
5.2				1	1.4%	0.2%	1	1.4%	0.2%
R.2	2	2.8%	0.2%	2	2.8%	0.2%	4	5.6%	0.3%
R.2s1	2	2.8%	0.2%	1	1.4%	0.2%	3	4.2%	0.3%
R.2s1s1				1	1.4%	0.2%	1	1.4%	0.2%
R.2s1s1s1				1	1.4%	0.2%	1	1.4%	0.2%
R.3s1				1	1.4%	0.2%	1	1.4%	0.2%
U.2				1	1.4%	0.2%	1	1.4%	0.2%
U.3				2	2.8%	0.2%	2	2.8%	0.2%
U.U				1	1.4%	0.2%	1	1.4%	0.2%
Total	30	42.3%	0.7%	41	57.7%	0.7%	71	100.0%	



Appendix A3. Length at ocean age of immigrant steelhead sampled at the Situk River weir, 1992.

APPENDIX B
SITUK RIVER WEIR COUNTS, 1988-1991

Appendix B1. Counts of steelhead at the Situk River weir, 1988.

Date	Daily		Cumulative		Water		Morts
	Up	Down	Up	Down	Depth (cm)	Temp. (°C)	
06/06	Weir in 6/7						
06/07	5	6	5	6		9	
06/08	1	13	6	19		10	
06/09	8	3	14	22		10	
06/10	7	79	21	101		10	
06/11	5	8	26	109		10	
06/12	3	58	29	167		9	
06/13	5	56	34	223		10	
06/14	1	24	35	247		10	
06/15	4	185	39	432		11	
06/16	2	130	41	562		10	
06/17	2	42	43	604		10	
06/18	0	84	43	688		10	
06/19	1	281	44	969		9	
06/20	0	0	44	969		10	
06/21	0	7	44	976		9	
06/22	6	1	50	977		11	
06/23	0	0	50	977		10	
06/24	0	19	50	996		9	
06/25	0	21	50	1,017		10	
06/26	0	0	50	1,017		10	
06/27	4	12	54	1,029		9	
06/28	3	0	57	1,029		11	
06/29	1	4	58	1,033		10	
06/30	1	8	59	1,041		9	
07/01	0	11	59	1,052		10	
07/02	1	40	60	1,092		9	
07/03	0	3	60	1,095		11	
07/04	0	0	60	1,095		11	
07/05	0	0	60	1,095		10	
07/06	0	0	60	1,095		10	
07/07	0	3	60	1,098		10	
07/08	0	0	60	1,098		10	
07/09	0	0	60	1,098		10	

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Appendix B1. (Page 2 of 2).

Date	Daily		Cumulative		Water		Morts
	Up	Down	Up	Down	Depth (cm)	Temp. (°C)	
07/10	0	0	60	1,098		10	
07/11	0	0	60	1,098		11	
07/12	0	1	60	1,099		12	
07/13	0	30	60	1,129		10	
07/14	0	0	60	1,129		10	
07/15	0	0	60	1,129		11	
07/16	0	28	60	1,157		11	
07/17	0	0	60	1,157		11	
07/18	0	0	60	1,157		11	
07/19	0	5	60	1,162		12	
07/20	0	8	60	1,170		12	
07/21	0	8	60	1,178		11	
07/22	0	0	60	1,178		11	
07/23	0	3	60	1,181		10	
07/24	0	2	60	1,183		11	
07/25	0	27	60	1,210		11	
07/26	0	0	60	1,210		10	
07/27	0	0	60	1,210		11	
07/28	0	0	60	1,210		10	
07/29	0	0	60	1,210		11	
07/30	0	0	60	1,210			
07/31	0	0	60	1,210			
08/01	0	0	60	1,210			
08/02	0	0	60	1,210			
08/03	0	0	60	1,210			
08/04	0	0	60	1,210			
08/05	0	0	60	1,210			
08/06	0	0	60	1,210			
08/07	0	0	60	1,210			
08/08	0	1	60	1,211			
TOTAL	60	1,211	60	1,211			

Appendix B2. Counts of steelhead at the Situk River weir, 1989.

Date	Daily		Cumulative		Water		Morts
	Up	Down	Up	Down	Depth (cm)	Temp. (°C)	
05/25	Fish-tight on 5/26						
05/26	13	17	13	17			0
05/27	14	49	27	66			1
05/28	7	35	34	101			0
05/29	20	275	54	376			0
05/30	22	577	76	953			0
05/31	8	422	84	1,375			0
06/01	4	185	88	1,560			0
06/02	4	40	92	1,600		9	2
06/03	13	1,013	105	2,613	2	9	8
06/04	6	47	111	2,660	2	10	9
06/05	0	113	111	2,773	2	9	3
06/06	1	83	112	2,856	2	9	3
06/07	0	4	112	2,860	2	9	4
06/08	2	80	114	2,940	2	9	5
06/09	0	52	114	2,992	2	8	7
06/10	5	107	119	3,099	2	8	9
06/11	0	113	119	3,212	2	8	13
06/12	1	317	120	3,529	2	10	8
06/13	3	39	123	3,568	2	10	6
06/14	0	6	123	3,574	2	10	4
06/15	0	52	123	3,626	2	9	6
06/16	0	3	123	3,629	1	9	3
06/17	0	218	123	3,847	1	9	2
06/18	0	87	123	3,934	1	10	1
06/19	0	4	123	3,938	1	10	1
06/20	0	0	123	3,938	1	10	2
06/21	0	5	123	3,943	1	10	0
06/22	0	146	123	4,089	1	10	1
06/23	0	104	123	4,193	1	10	1
06/24	0	276	123	4,469	1	10	2
06/25	3	296	126	4,765	2	9	3
06/26	0	0	126	4,765	1	10	2
06/27	2	127	128	4,892	1	10	2

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Appendix B2. (Page 2 of 3).

Date	Daily		Cumulative		Water		Morts
	Up	Down	Up	Down	Depth (cm)	Temp. (°C)	
06/28	0	56	128	4,948	1	11	1
06/29	0	76	128	5,024	1	12	0
06/30	0	2	128	5,026	1	11	1
07/01	0	0	128	5,026	1	12	1
07/02	0	279	128	5,305	1	13	0
07/03	0	16	128	5,321	1	11	2
07/04	0	22	128	5,343	1	12	1
07/05	0	20	128	5,363	1	12	0
07/06	0	2	128	5,365	1	12	0
07/07	0	28	128	5,393	1	11	1
07/08	0	0	128	5,393	1	12	0
07/09	0	41	128	5,434	1	12	0
07/10	0	76	128	5,510	1	12	0
07/11	0	0	128	5,510	1	12	1
07/12	0	1	128	5,511	1	13	0
07/13	0	8	128	5,519	1	13	1
07/14	0	3	128	5,522	1	13	0
07/15	0	0	128	5,522	1	12	0
07/16	0	10	128	5,532	1	12	0
07/17	0	0	128	5,532	1	13	0
07/18	0	4	128	5,536	1	13	0
07/19	0	140	128	5,676	1	13	0
07/20	0	17	128	5,693	1	13	0
07/21	0	1	128	5,694	1	12	0
07/22	0	0	128	5,694	1	12	1
07/23	0	0	128	5,694	1	13	0
07/24	0	0	128	5,694	1	2	2
07/25	0	22	128	5,716	1	11	0
07/26	0	8	128	5,724	1	11	0
07/27	0	6	128	5,730	1	12	0
07/28	0	11	128	5,741	1	13	0
07/29	0	0	128	5,741	1	13	0
07/30	0	113	128	5,854	1	12	0
07/31	0	1	128	5,855	1	12	0

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Appendix B2. (Page 3 of 3).

Date	Daily		Cumulative		Water		Morts
	Up	Down	Up	Down	Depth (cm)	Temp. (°C)	
08/01	0	0	128	5,855	1	12	0
08/02	0	0	128	5,855	1	12	0
08/03	0	6	128	5,861	1	11	0
08/04	0	1	128	5,862	2	11	0
08/05	0	0	128	5,862	1	12	0
08/06	0	1	128	5,863	1	12	0
08/07	0	0	128	5,863	1	12	0
08/08	0	0	128	5,863	1	11	0
08/09	0	0	128	5,863	1	11	3
08/10	0	2	128	5,865	1	11	0
08/11	0	0	128	5,865	1	13	1
08/12	0	0	128	5,865	1	13	0
08/13	0	0	128	5,865	1	13	0
08/14	0	0	128	5,865	1	13	0
08/15	0	0	128	5,865	1	12	0
08/16	0	2	128	5,867	1	12	0
TOTAL	128	5,867	128	5,867			124

Appendix B3. Counts of steelhead at the Situk River weir, 1990. Estimate of immigrants and counts from 7 May - 31 May are from Johnson (1991).

Date	Daily		Cumulative		Water	
	Up	Down	Up	Down	Depth (cm)	Temp. (°C) Morts
05/06	Fish-tight May 8					
05/07	2,264		2,264			
05/08	5	1	2,269	1		
05/09	48	3	2,317	4		
05/10	59	14	2,376	18		
05/11	57	1	2,433	19		
05/12	33	3	2,466	22		
05/13	22	7	2,488	29		
05/14	42	11	2,530	40		
05/15	24	4	2,554	44		1
05/16	52	11	2,606	55		
05/17	27	9	2,633	64		
05/18	16	22	2,649	86		
05/19	45	52	2,694	138		
05/20	39	62	2,733	200		
05/21	16	22	2,749	222		
05/22	15	336	2,764	558		
05/23	19	139	2,783	697		
05/24	18	76	2,801	773		
05/25	13	44	2,814	817		
05/26	15	158	2,829	975		
05/27	38	240	2,867	1,215		1
05/28	39	310	2,906	1,525		
05/29	26	266	2,932	1,791		2
05/30	30	315	2,962	2,106		4
05/31	9	223	2,971	2,329		2
06/01	12	120	2,983	2,449		2
06/02	10	195	2,993	2,644		
06/03	1	113	2,994	2,757		
06/04	4	107	2,998	2,864		
06/05	1	200	2,999	3,064		
06/06	1	119	3,000	3,183		3

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Appendix B3. (Page 2 of 3).

Date	Daily		Cumulative		Water	
	Up	Down	Up	Down	Depth (cm)	Temp. (°C) Morts
06/07	0	31	3,000	3,214		3
06/08	1	54	3,001	3,268		
06/09	0	102	3,001	3,370		
06/10	0	0	3,001	3,370		
06/11	0	0	3,001	3,370		
06/12	0	9	3,001	3,379		
06/13	0	71	3,001	3,450		
06/14	0	24	3,001	3,474		
06/15	0	38	3,001	3,512		
06/16	0	16	3,001	3,528		
06/17	0	24	3,001	3,552		
06/18	2	23	3,003	3,575		
06/19	0	10	3,003	3,585		
06/20	0	6	3,003	3,591		
06/21	0	0	3,003	3,591		
06/22	1	0	3,004	3,591		
06/23	0	26	3,004	3,617		
06/24	1	0	3,005	3,617		
06/25	0	1	3,005	3,618		
06/26	0	2	3,005	3,620		
06/27	0	0	3,005	3,620		
06/28	0	0	3,005	3,620		
06/29	0	0	3,005	3,620		
06/30	0	0	3,005	3,620		
07/01	0	0	3,005	3,620		
07/02	0	0	3,005	3,620		
07/03	0	0	3,005	3,620		
07/04	0	0	3,005	3,620		
07/05	0	0	3,005	3,620		
07/06	0	1	3,005	3,621		
07/07	0	0	3,005	3,621		
07/08	0	0	3,005	3,621		
07/09	0	9	3,005	3,630		

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Appendix B3. (Page 3 of 3).

Date	Daily		Cumulative		Water		
	Up	Down	Up	Down	Depth (cm)	Temp. (°C)	Morts
07/10	0	4	3,005	3,634			
07/11	0	0	3,005	3,634			
07/12	0	0	3,005	3,634			
07/13	0	1	3,005	3,634			
07/14	0	0	3,005	3,635			
07/15	0	0	3,005	3,635			
07/16	0	0	3,005	3,635			
07/17	0	0	3,005	3,635			
07/18	0	0	3,005	3,635			
07/19	0	0	3,005	3,635			
07/20	0	1	3,005	3,636			
07/21	0	0	3,005	3,636			
07/22	0	1	3,005	3,637			
07/23	0	0	3,005	3,637			
07/24	0	0	3,005	3,637			
07/25	0	2	3,005	3,639			
07/26	0	0	3,005	3,639			
07/27	0	0	3,005	3,639			
TOTAL	3,005	3,639	3,005	3,639			36

Appendix B4. Counts of steelhead at the Situk River weir, 1991.

Date	Daily		Cumulative		Water		Morts
	Up	Down	Up	Down	Depth (cm)	Temp. (°C)	
05/08	Fish-tight 5/9-10						
05/09	-	0					0
05/10	0	0	0	0		3.00	0
05/11	0	0	0	0	2.80	3.00	0
05/12	52	1	52	1	2.55	3.00	0
05/13	46	0	98	1	2.40	3.50	0
05/14	24	6	122	7	2.38	4.00	0
05/15	19	4	141	11	2.46	4.50	0
05/16	23	2	164	13	2.90	3.50	0
05/17	44	3	208	16	2.56	4.50	0
05/18	8	0	216	16	2.38	5.00	0
05/19	20	6	236	22	2.32	5.00	0
05/20	24	4	260	26	2.44	4.50	0
05/21	21	1	281	27	2.24	5.50	0
05/22	61	5	342	32	2.12	5.00	1
05/23	15	3	357	35	2.06	6.00	0
05/24	8	15	365	50	2.06	7.00	0
05/25	5	7	370	57	2.00	7.00	0
05/26	13	8	383	65	1.96	5.00	0
05/27	4	6	387	71	1.90	5.50	0
05/28	weir out		387	71	3.80	6.00	0
05/29	weir out		387	71	6.50	5.00	0
05/30	weir out		387	71	0.00		0
05/31	weir out		387	71	3.00		0
06/01	weir out		387	71	0.00		0
06/02	weir out		387	71	0.00		0
06/03	weir out		387	71	2.30	6.80	0
06/04	weir out		387	71	2.10	7.00	0
06/05	weir out		387	71	0.00		0
06/06	weir out		387	71	0.00		0
06/07	weir out		387	71	0.00		0
06/08	weir out		387	71	0.00		0
06/09	weir out		387	71	0.00		0
06/10	0	0	387	71	2.85	7.00	0

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Appendix B4. (Page 2 of 3).

Date	Daily		Cumulative		Water		
	Up	Down	Up	Down	Depth (cm)	Temp.(°C)	Morts
06/11	0	2	387	73	2.65	7.00	1
06/12	1	5	388	78	2.45	8.50	2
06/13	4	231	392	309	2.20	9.00	2
06/14	0	1	392	310	2.10	9.00	0
06/15	1	260	393	570	2.00	9.50	2
06/16	0	83	393	653	1.95	9.00	3
06/17	0	0	393	653	1.85	9.00	3
06/18	0	0	393	653	1.80	9.00	2
06/19	1	582	394	1,235	1.76	9.00	1
06/20	0	59	394	1,294	1.75	11.00	0
06/21	0	35	394	1,329	1.65	12.50	3
06/22	0	533	394	1,862	1.65	14.00	0
06/23	0	2	394	1,864	1.65	13.00	3
06/24	0	3	394	1,867	1.60	11.00	0
06/25	0	21	394	1,888	1.55	11.50	1
06/26	0	137	394	2,025	1.55	12.00	0
06/27	0	130	394	2,155	1.55	11.50	1
06/28	0	68	394	2,223	1.50	12.00	0
06/29	0	149	394	2,372	1.60	11.50	0
06/30	0	8	394	2,380	1.75	11.00	0
07/01	0	10	394	2,390	1.83	10.50	1
07/02	0	4	394	2,394	1.70	12.50	1
07/03	0	26	394	2,420	1.70	11.50	0
07/04	0	7	394	2,427	1.60	12.50	0
07/05	0	0	394	2,427	1.60	11.00	0
07/06	0	13	394	2,440	1.50	10.50	0
07/07	0	6	394	2,446	1.50	11.50	0
07/08	0	1	394	2,447	1.45	12.00	0
07/09	0	18	394	2,465	1.50	11.50	0
07/10	0	13	394	2,478	1.65	11.00	0
07/11	0	3	394	2,481	2.90	11.00	0
07/12	0	1	394	2,482	2.30	12.00	0
07/13	0	0	394	2,482	2.30	12.50	0
07/14	0	0	394	2,482	2.25	12.00	0

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Appendix B4. (Page 3 of 3).

Date	Daily		Cumulative		Water		Morts
	Up	Down	Up	Down	Depth (cm)	Temp. (°C)	
07/15	0	0	394	2,482	2.00	11.00	0
07/16	0	0	394	2,482	1.88	11.00	0
07/17	0	5	394	2,487	1.90	11.50	0
07/18	0	0	394	2,487	2.15	11.00	0
07/19	0	1	394	2,488	2.10	11.00	0
07/20	0	0	394	2,488	1.95	11.00	0
07/21	0	2	394	2,490	1.80	12.50	0
07/22	0	0	394	2,490	1.70	12.00	0
07/23	0	0	394	2,490	1.65	11.00	0
07/24	0	0	394	2,490	2.80	11.50	0
07/25	0	0	394	2,490	1.95	11.50	0
07/26	0	0	394	2,490	1.85	10.00	0
07/27	0	0	394	2,490	1.90	10.00	0
TOTAL	394	2,490	394	2,490			54

