

RAINBOW TROUT SPAWNING

STUDIES IN FOXY CREEK

1993

Prepared by

DAVID BUSTARD AND ASSOCIATES

for

HOMESTAKE CANADA INC.

June 1993

1.0 INTRODUCTION

Foxy Creek, tributary to Maxan Creek located 20 km west of Burns Lake in north central British Columbia, has a significant population of juvenile rainbow trout. Juvenile fish populations in lower Foxy Creek have been assessed since 1987 as part of an environmental monitoring program conducted by Equity Silver Mines Ltd. with the most recent results reported in Bustard (1991).

The juvenile fish sampling programs have been conducted during the first week of September after fry emergence and during the low-flow period. A nagging question concerning the fish assessments in Foxy Creek has been whether or not the juvenile rainbow trout are the progeny of resident rainbow trout or of summer steelhead trout moving upstream from the Bulkley River. It is not possible to visually separate juvenile resident rainbow trout from steelhead. The presence of juvenile chinook salmon in Foxy Creek during some years suggests that steelhead may be present in the system. The most reliable method for determining the origin of the juvenile trout in Foxy Creek is to conduct studies during the spawning period.

Prime Resources Group is assessing the feasibility of establishing a mill in the vicinity of the Equity Mine to process ore from the Eskay Creek area. As part of their environmental assessment, David Bustard and Associates was retained to undertake studies in the Foxy and upper Maxan creeks to investigate fish species spawning in Foxy Creek. This report summarizes the results of this study.

2.0 METHODS

The area was examined on five occasions on a weekly basis from early May through early June. Water temperature and visibility were recorded in Foxy Creek at the bridge crossing and in Maxan Creek at the lake outlet and at the bridge crossing located downstream of the Foxy Creek confluence (Figure 1).

Fish sampling relied on a combination of angling and visual observations. Both snorkel observations and seining were attempted in Maxan Creek, but conditions were unsuitable for effective use of these techniques. Angling (usually with float and roe) focussed on the outlet of Maxan Lake downstream to the bridge crossing of Maxan Creek below the Foxy confluence (Figure 1) on May 5, 13th and 21st. Angling was attempted in Foxy Creek on these dates, but the bankfull and turbid water conditions made sampling ineffective. Angling and visual surveys were conducted in the lower 1 km of Foxy Creek down to the Maxan bridge on May 28. The June 3 survey focussed on visual surveys in Foxy Creek in the 1.5 km section upstream of the bridge crossing on Foxy Creek.

Fork lengths were measured on all fish angled. Sex and state of maturity were recorded and scales were removed from angled fish for aging. A numbered floy tag with an information return address was inserted on the left side near the dorsal fin of all fish captured. The objective of the tagging was to determine possible linkages between fish captured in various sections of Maxan and Foxy creeks through recaptures including possible returns from anglers fishing in Maxan or Bulkley lakes later in the summer. During the latter two surveys the numbers and location of spawners observed from the streambank was recorded.

3.0 RESULTS

3.1 WATER TEMPERATURE AND STREAMFLOW CONDITIONS

Water temperature and visibility for the five survey dates are shown in Table 1. Foxy Creek water temperatures ranged from 3.0 to 8.8°C during the survey period. Water temperatures in the outlet

DATE	LOCATION	TEMP (°C)	VISIBILITY (cm)	TIME (hr)
May 5	Maxan Lake Outlet	8.0	75	10:00
	Maxan below Foxy	5.5	15	14:30
	Foxy Creek	3.0	15	12:00
May 13	Maxan Lake Outlet	8.9	100	12:30
	Maxan below Foxy	5.8	15	9:30
	Foxy Creek	3.2	10	9:30
May 21	Maxan Lake Outlet	13.3	75	10:00
	Maxan below Foxy	8.8	20	9:30
	Foxy Creek	5.8	<10	9:30
May 28	Maxan Lake Outlet	22.2	>100	16:15
	Maxan below Foxy	14.9	50	9:00
	Foxy Creek	8.7	50	9:15
June 3	Maxan Lake Outlet	15.6	>100	12:00
	Maxan below Foxy	12.4	50	11:30
	Foxy Creek	8.8	40	11:45

Scale - approx. 1 : 16,000

30BCB90062 No. 103

***** - Key Spawning Sections

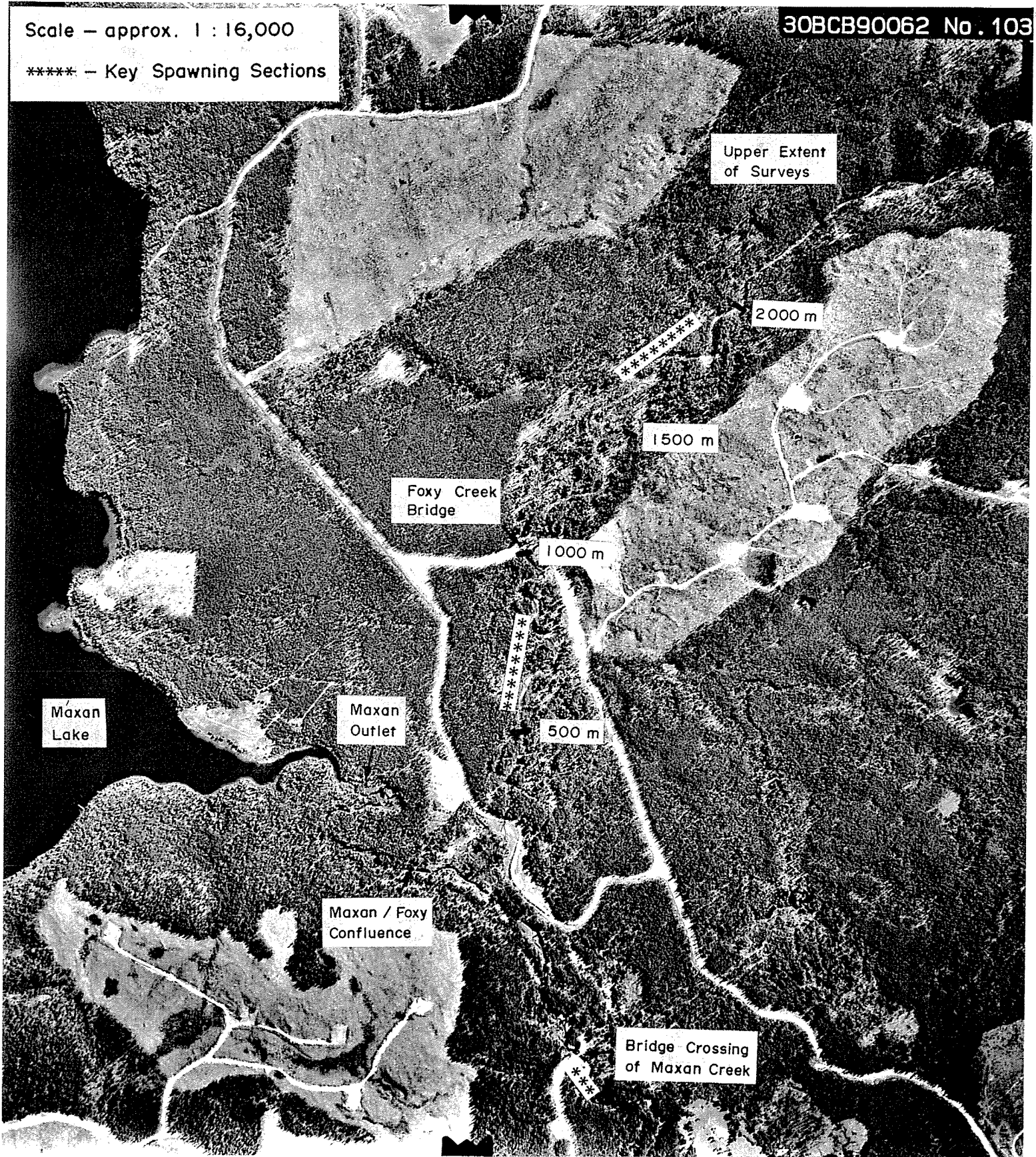


Figure 1. Study Area showing Location of Maxan and Foxy Creeks and some of the Key Spawning Sections.

to Maxan Lake were considerably higher on all dates and were up to 22.2°C during a hot sunny period in late May. Foxy Creek has a moderating effect on water temperatures in Maxan Creek downstream of its confluence where temperatures ranged from 5.5 to 14.9°C.

The snowmelt freshet in 1993 tended to be early and intense due to a 2-week period of very hot weather followed by heavy rains in mid-May. As a result, Foxy Creek was high and turbid (visibility was restricted to 10 cm or less) until late May and early June. After this period, visibility improved to 40-50 cm and spawning fish were observed from the shoreline in most but not all sections of the stream. The Maxan Lake outlet downstream to Foxy Creek had a tannic colouration but remained suitable for angling but not snorkelling throughout the study.

3.2 FISH SAMPLING RESULTS

3.2.1 Spawner Length and Age Information

A total of 54 fish were angled and tagged during the study (Table 2 and Appendix 1). All of these fish were resident trout (Photos 1 and 2). Fork lengths of those fish captured ranged from 26 to 35.5 cm with a mean of 30.3 cm for all sites. More than one-half of the fish were angled in the outlet to Maxan Lake since conditions were most suitable at this site during the early portions of the study. Fish sizes were very similar in all of the sites and it is assumed that all of the fish in the study were from the same population. However none of the fish tagged in the outlet of Maxan were recaptured in Foxy Creek. It should be noted that the sample size is small and visibility in Foxy Creek was not adequate to effectively observe tags during the study.

LOCATION	SAMPLE SIZE	MEAN FORK LENGTH (cm)	SIZE RANGE	STD
Maxan Outlet	29	30.2	26.0-35.5	2.19
Foxy/Maxan Confluence	10	32.0	29.5-34.5	1.62
Maxan Below Foxy	2	30.8	30.5-31.0	0.25
Foxy Creek	13	29.2	28.0-30.0	0.61
Total	54	30.3	26.0-35.5	

Scale reading (sample size of 39 fish excluding regenerated scales) indicated that most of the spawners were age 5 (82.1%) with a small proportion of age 6 (12.8%) and age 4 (5.1%) fish (Table 3). The scales suggest that most of these fish had spent two years in a stream environment prior to lake entry. The scales typically indicated a period of rapid growth (presumably upon lake entry) at the beginning of their third summer with more moderate growth during subsequent years. A few scales suggested entry to a lake in their second year.

AGE	SAMPLE SIZE	PERCENTAGE	MEAN FORK LENGTH (cm)
4	2	5.1	28.8
5	32	82.1	29.8
6	5	12.8	33.3

3.2.2 Spawner Distribution and Abundance

Spawning fish were observed throughout the lower 2400 m of Foxy Creek and in the 800 m section of Maxan Creek from the Foxy Creek confluence downstream to the bridge crossing (Appendix Table 2). Surveys were not conducted upstream of 2400 m on Foxy Creek, but it is assumed some scattered spawning occurs in the steeper gradient sections upstream from this point to a series of barriers located approximately 10 km upstream (Bustard 1984). Similarly, it is assumed that spawning also occurs in Maxan Creek downstream of the bridge crossing for some distance below the extent of our surveys.

Approximately 200 resident rainbow were observed in lower Foxy Creek during late May and early June (Appendix 2). This represents only a portion of the fish assumed to be present in this section since visibility was restricted in deeper pool areas. An additional 62 fish were observed in the 800 m section of Maxan Creek downstream of the Foxy confluence. All fish observed appeared to be a similar size to those angled (Table 2) and are assumed to be resident trout.

Spawners were scattered throughout the length of Foxy Creek with no large concentrations at any one location. A stream section from approximately 500 to 700 m upstream and a second area approximately 1800 to 2000 m offered some of the best potential spawning gravels (Figure 1). Water velocities in much of the mainstem of Foxy Creek during the spawning period were high, and the bed material too large for spawning, so fish were often observed near the margins or



Photos 1 and 2. Typical Resident Rainbow Trout Spawners Angled and Tagged in Upper Maxan and Lower Foxy Creeks During Mid-May 1993.

utilizing sidechannel locations where bed material was a more suitable size and water velocities were lower.

The top section of Maxan Creek immediately downstream from the lake has a 100-m section with some suitable gravel for spawning. Maturing rainbow trout were abundant in this section throughout early May when conditions were unsuitable in Foxy Creek for spawning (cold and turbid - Table 1). We suspect that rainbow use this section of stream from Maxan Lake to Foxy Creek mainly as a holding area prior to entering Foxy Creek and lower Maxan after the peak of streamflows as water temperatures increase to the 5-7°C range. Spawning fish were not observed on the riffle sites at the lake outlet and no kelts were captured in the outlet area during the surveys. During the peak of spawning in Foxy and lower Maxan Creek in late May and early June, rainbow trout were not present in the lake outlet. Water temperatures were up to 22°C and only squawfish were angled at this site.

Most of the 500-m section from Maxan Lake to the Foxy Creek confluence is comprised of cobble bed material too large for spawning. The main gravel sections in Maxan occur downstream from Foxy and rely on Foxy Creek for gravel recruitment. It is interesting to note that there are no barriers or beaver dams on Maxan above Foxy Creek and there are no potential points of difficulty for either spawners moving between the lake and Foxy Creek or for juvenile fish to move up into Maxan Lake.

3.2.3 Timing of Spawning

Visual observations and an examination of the condition of fish angled during the study suggests that most fish moved into Foxy Creek after May 21 and that spawning in Foxy Creek peaked during the last few days of May and early June. Although most fish were paired up and holding on spawning areas during the May 28 surveys, some fish appeared to be still moving upstream. No kelts were angled in Foxy Creek on this date. By June 3 it was noted that fish were in spawning locations and redds were present in the vicinity of the holding areas. In a number of locations, only single fish were holding at the redd sites, typical of males remaining in the vicinity of the spawning site for a period after spawning.

The peak of spawning may occur approximately a week earlier in Maxan downstream of Foxy Creek. For example, on May 28, approximately 50 rainbow spawners were observed just downstream of the bridge site. On June 3, nine spawners were observed in this same section. This total included spawning pairs but also some single fish holding on redd sites suggesting spawning was past the peak. A rainbow kelt was angled in this section of Maxan on May 28 (Appendix Table 1).

4.0 CONCLUSIONS

All fish angled and observed in this study were resident rainbow trout. There was no evidence of steelhead use in upper Maxan or Foxy creeks. Scattered rainbow trout spawning occurred throughout the lower reaches of Foxy Creek (2.4 km) and in Maxan Creek downstream of the Foxy Creek confluence.

We suspect that rainbow spawners drop out of Maxan Lake¹ during late April and early May and mainly hold in Maxan Creek until streamflows have peaked and water temperatures begin to rise in Foxy Creek. These fish then move into lower Foxy Creek to spawn in late May and early June. The pattern of spawners moving into a lake outlet and then up a tributary to the outlet stream is similar to that described by Northcote (1969) for Hihium Creek tributary to the Loon Lake outlet stream. There is also the possibility of some rainbow moving up Maxan Creek from Bulkley Lake.

The timing of rainbow trout spawning in Foxy Creek is approximately two weeks later than the timing observed in the Nithi River in 1990 (Lough and Bustard 1990) and similar to that observed for Sutherland River rainbow trout in 1989 (Bustard 1989). The exact timing probably varies annually and is largely dependant upon streamflow and water temperatures for a given year.

Foxy Creek and Maxan downstream from Foxy offer suitable spawning gravels and cooler water temperatures than upper Maxan, and this probably provides a more suitable incubation and early fry rearing environment than the upper section of Maxan Creek where water temperatures can become very high during the summer incubation period.

5.0 LITERATURE CITED

- Bustard, D. 1984. Assessment of Benthic Invertebrate and Juvenile Fish Populations in Foxy and Buck Creeks, September 1984. Man. Report prepared for Equity Silver Mines Ltd.
- Bustard, D. 1989. Sutherland River Rainbow Trout Radio Telemetry Studies 1989. Prepared for Ministry of Environment, Smithers.

¹ Rainbow trout were not captured during lake surveys conducted in Maxan Lake (Burns, 1973, on file, B.C. Environment, Smithers) so fish size comparisons cannot be made between fish captured in this study and rainbow trout from Maxan Lake.

Bustard, D. 1991. Fish Population Monitoring in Foxy and Buck Creeks September 1991. Man. Report prepared for Equity Silver Mines Ltd.

Lough, M. and D. Bustard. 1991. Nithi River Rainbow Trout Spawning Studies. Prepared for Ministry of Environment, Smithers.

Northcote, T. 1969. Patterns and Mechanisms in the Lakeward Migratory Behaviour of Juvenile Trout. In: T.G. Northcote (ed.). Symposium on Salmon and Trout in Streams. H.R. MacMillan Lectures in Fisheries. University of British Columbia, Vancouver.

APPENDIX TABLE 1. SUMMARY OF FISH DATA FOR FOXY/MAXAN CREEKS.

FISH #	DATE	LOCATION	TAG #	SEX	FORK LENGTH	MATURITY	SCALE #	AGE	COMMENT
1	50593	1	1901	2	29.1	3	1	5	
2	50593	1	1902	1	30.2	3	2	5	
3	50593	1	1903	1	32.2	3	3	6	
4	50593	1	1904	2	29.8	3	4	5	
5	50593	1	1905	1	28.2	3	5	5	
6	50593	1	1906	1	32.6	3	6	R	
7	50593	1	1907	1	30.3	4	7	5	
8	50593	2	1908	1	30.9	4	8	5	Hooking mort
9	50593	2	1909	1	32.2	3	9	5	
10	50593	2	1910	1	31	3	10	5	
11	51393	2	1911	1	31	4	11	5	
12	51393	2	1912	1	30.5	4	12	5	
13	51393	2	1913	1	34	4	13	6	
14	51393	2	1914	1	32.5	3	14	R	
15	51393	1	1915	1	31.5	3	15	5	
16	51393	1	1916	2	30	2	16	5	
17	51393	1	1917	1	28.5	2	17	5	
18	51393	1	1918	1	29.5	2	18	5	Recaptured on same date
19	51393	1	1919	1	31.5	2	19	5	
20	51393	1	1920	2	29.5	3	20	R	
21	51393	1	1921	2	28	3	21	5	
22	51393	1	1922	2	27	3	22	5	
23	51393	1	1923	2	32	3	23	5	
24	51393	1	1924	1	31.5	3	24	R	
25	51393	1	1926	2	28	2	25	5	
26	51393	1	1927	2	35.5	3	26	R	
27	51393	1	1928	1	33	2	27	5	
28	51393	1	1929	1	33.5	3	28	6	
29	51393	1	1930	1	32.5	3	29	6	
30	52193	3	1931	1	31	3	30	5	
31	52193	2	1932	1	34.5	3	31	6	
32	52193	2	1933	2	34	3			No scale
33	52193	2	1934	2	29.5	3			No scale
34	52193	1	1935	2	31.5	3			No scale
35	52193	1	1936	2	26.5	3	32	5	
36	52193	1	1937	2	26	3			No scale
37	52193	1	1938	2	29.5	3			No scale
38	52193	1	1939	2	28.5	3	33	R	
39	52193	1	1940	2	28.5	3	34	5	
40	52193	1	1949	1	30.5	3	35	5	
41	52893	4	1941	1	29	4	36	5	Partially spent
42	52893	4	1948	1	29.5	4			No scale
43	52893	4	1943	1	29	3	37	5	Left hook in
44	52893	4	1944	1	29.5	3	38	5	
45	52893	4	1945	2	29.5	3			No scale
46	52893	4	1946	2	28	4	39	4	
47	52893	4	1947	2	28.5	4			
48	52893	4	1942	1	30	3			No scale
49	52893	4	1951	2	30	3	40	5	
50	52893	4	1955	1	30	3	41	5	
51	52893	4	1956	2	28.5	3	42	5	
52	52893	4	1957	1	29	4	43	5	Partially spent
53	52893	3	1958	2	30.5	5	44	5	
54	52893	4	1959	1	29.5	4	45	4	

FILE = MAXFISH

LOC: 1 = MAXAN OUTLET
 2 = MAXAN AT FOXY CONFLUENCE
 3 = MAXAN BELOW FOXY
 4 = FOXY CREEK

SEX: 1 = MALE
 2 = FEMALE

MAT: 1 = IMMATURE
 2 = MATURING
 3 = MATURE
 4 = RIPE
 5 = SPENT

APPENDIX TABLE 2. SPAWNER OBSERVATIONS IN FOXY CREEK

file = SPAWNERS

DATE	LOCATION*	NUMBER	COMMENT
May 28/93	50 m	2	Good gravel in this section
	100 m	9	Paired up and digging
	150 m	3	Lower road crossing
	200 m		Lower sample site - lower spawner abundance
	300-500 m		Fast water and coarse material
	500 m	40	Pool below debris jam.
	550 m	5	Most of this section coarse material and fast.
	600 m	7	Pool area along mainstem
	600-700		Limited spawning potential in this section.
			Fish are paired up in this section.
	700 m	20	This is in vicinity of old juvenile sample site.
	710 m	25	Split channel - good spawning at the lower end.
	750 m	6	Fish paired up and evidence of digging.
	760 m	10	Some fish moving upstream
			Cobbles in riffles - low fish numbers
	800 m		Good gravel sections associated with pools.
			Fish present but no estimate of numbers.
880 m		Good gravel in this section	
900 m	10	Redds at tail of pool	
920 m	1	Ripe male tagged in pool	
1000 m	2	Pair just below bridge. Mostly large material in here.	
	TOTAL	140	Lower 1 km of Foxy Creek Many sections are not visible.
	50 m below Foxy in Max	2	
	200 m below Foxy	10	Good gravel - spawning along edge.
	800 m	50	Just below bridge - spawning Visibility limited in most of this section.
June 3/93	1040 m	1	Just above bridge.
	1070 m	1	
	1125 m	4	
		2	Two larger channels rejoin at this location.
	1150 m	2	Gravel in pockets through this section.
	1400 m	4	Paired-up. Gravels start again.
			Mainly silts and sands with lots of debris and multiple channels.
	1400-1800 m		Flows spread everywhere through bushes.
	1850 m	2	Sidechannel spreads through brush in this section.
			Lots of debris jams and channel spreading out.
	1900 m	10	Best gravel in Foxy Creek in this section
	1950 m	9	Deposition and fan really spreads out.
	2080 m	2	Mainstem edge
	2150 m	4	Paired up
			Several good pools in this section.
2175 m	8	Edge of mainstem	
2180 m		Gradient starting to drop D50 = 8 D90 = 30 cm	
2200 m	10	The best gravel in this section is in sidechannel.	
2250 m	2	Small sidechannel	
		2.5% slope D50 = 25 cm D90 = 60 cm	
		Limited pockets of gravel - confined channel	
2400 m		Channel mainly boulders and cobbles	
	TOTAL	61	1400 m above bridge down to bridge on Foxy Creek.

* Approximate distance from the confluence of Foxy Creek with Maxan upstream.