Snorkel Observations of Winter Steelhead Trout Escapement to the Englishman River, Vancouver Island, 2004

by:

Scott Silvestri
Fisheries Technician
BC Conservation Foundation
Greater Georgia Basin Steelhead Recovery Plan

prepared for:

Pacific Salmon Endowment Fund Society
#300 - 1682 West 7th Avenue
Vancouver, BC V6J 4S6

and:

Ministry of Water, Land and Air Protection
2080-A Labieux Road
Nanaimo, BC V9T 6J9

GREATER GEORGIA BASIN
STEELHEAD Recovery Plan
www.SteelheadRecoveryPlan.ca

December 2004

ACKNOWLEDGEMENTS

James Craig[1], Mike McCulloch[1], Brad Smith[1], Harlan Wright[1], Craig Wightman[2], Randy Dolighan[3], Ron Ptolemy[4] and the author conducted snorkel surveys of the Englishman and South Englishman rivers. Funding for this project was provided by the Pacific Salmon Endowment Fund Society, through the Englishman River Watershed Recovery Plan, and the Ministry of Water, Land and Air Protection, through the Greater Georgia Basin Steelhead Recovery Plan. Appreciation is extended to James Craig for editing this report. Craig Wightman provided technical support and was the scientific authority. This report follows a format similar to those produced by B. Smith (Smith 2003[1] and Smith 2003[2]). His effort in program design, implementation, and reporting was much appreciated.

[1] Fisheries Technicians, Greater Georgia Basin Steelhead Recovery Plan, BC Conservation Foundation, Nanaimo, BC
[2] Senior Fisheries Biologist, Ministry of Water, Land and Air Protection, Nanaimo, BC
[3] Anadromous Fisheries Biologist, Ministry of Water, Land and Air Protection, Nanaimo, BC
[4] Standard/Guidelines Specialist, Ministry of Water, Land and Air Protection, Victoria, BC

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1.0 INTRODUCTION

The Englishman River is an important salmon and steelhead producing stream on the central east coast of Vancouver Island (Figure 1). The watershed supports anadromous populations of steelhead and cutthroat trout, coho, chinook, chum, sockeye and pink salmon, along with resident cutthroat and rainbow trout (Lough and Morley 2002). Since the mid 1990s, decreased ocean survivals, along with forest harvesting, agricultural land use and urban encroachment impacts have resulted in declines in steelhead abundance in the Englishman River (Wightman et al. 1998, Bocking and Gaboury 2001).

The Englishman River was selected in 2001 by the Pacific Salmon Endowment Fund Society (PSEFS) as the first watershed to receive attention in the Georgia Basin steelhead and salmon recovery planning process (PSEF Technical Committee 2001). Additionally, the Greater Georgia Basin Steelhead Recovery Plan (GGBSRP) selected the Englishman River as a key east coast Vancouver Island (ECVI) steelhead indicator stream. The 2004 winter steelhead season marked the third consecutive year that fisheries staff from the BC Conservation Foundation (BCCF) and Ministry of Water, Land and Air Protection (MWLAP) conducted an intensive snorkel survey program to estimate steelhead escapement to the Englishman River watershed.

Figure 1. Location of the Englishman River watershed.

Between February 4 and May 14, 2004, a series of six snorkel surveys were conducted to estimate steelhead escapement in the Englishman River watershed. Survey timing and swim sections were intended to match surveys conducted in 2002 and 2003, and included 19.5 km of anadromous stream length in the Englishman and South Englishman rivers.

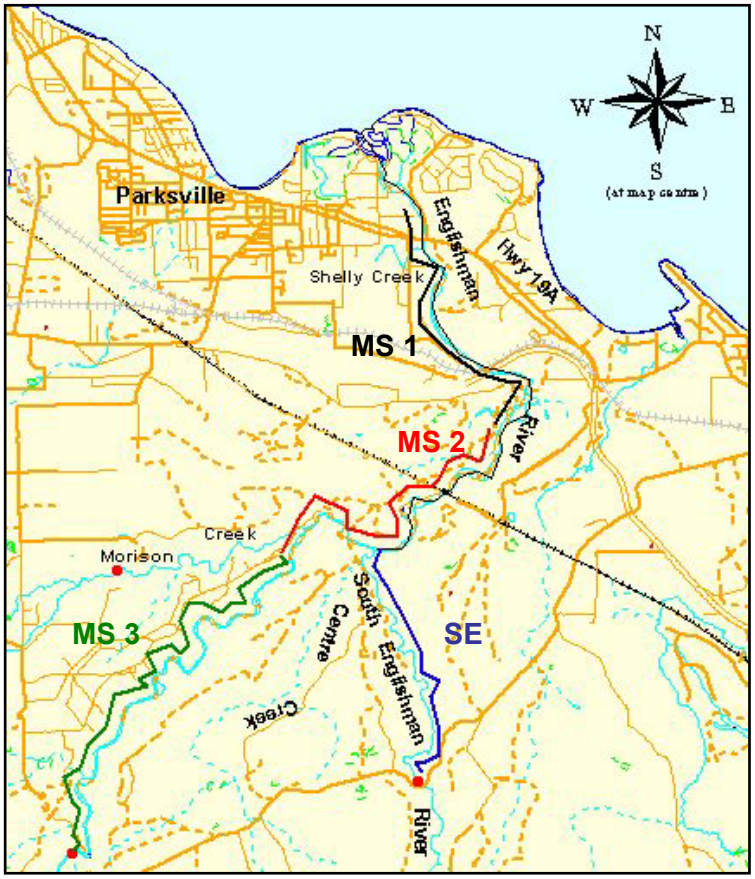
The objectives of the 2004 study remained the same as previous years and included:

- enumerate steelhead and estimate escapement to the Englishman in 2004;
- better determine steelhead run-timing and snorkel observer efficiencies;
- continue to identify steelhead spawning locations and critical holding habitat; and,
- further develop the Englishman as an index stream for steelhead stocks on the east coast of Vancouver Island.

For detailed study area information please refer to *Snorkel Observations of Winter Steelhead Trout Escapement to the Englishman River, Vancouver Island, 2002 and 2003* (Smith 2003[1], Smith 2003[2]).

2.0 METHODS

Snorkel surveys to enumerate steelhead trout were planned for the anadromous portions of the Englishman and South Englishman rivers from early February to mid-May, 2004. In 2004, the survey *schedule* was slightly compressed from the two previous years by incorporating efficiencies identified during those studies and to best use limited project resources. The initial 2002 schedule was based on historic knowledge of steelhead returns to the watershed. Survey *timing* remained similar to the 2002 and 2003 surveys. Survey *sections* were identical to those in the previous studies (Figure 2) and included:



- *Mainstem 1 (MS 1)*: 'Grassy Bank' downstream to the Big Tent Run located 400 m downstream of the Highway 19A bridge crossing (4.2 km);
- *Mainstem 2 (MS 2):* end of Englishman River Road downstream to 'Grassy Bank', 1.0 km upstream of Allsbrook Canyon (4.6 km);
- *Mainstem 3 (MS 3):* Falls located in Englishman River Falls Provincial Park downstream to the end of Englishman River Road (6.2 km); and,
- *South Englishman (SE):* from cascades at Branch 155 Bridge crossing to Englishman River confluence (4.5 km).

Figure 2. Snorkel survey sections on the Englishman River watershed, 2004.

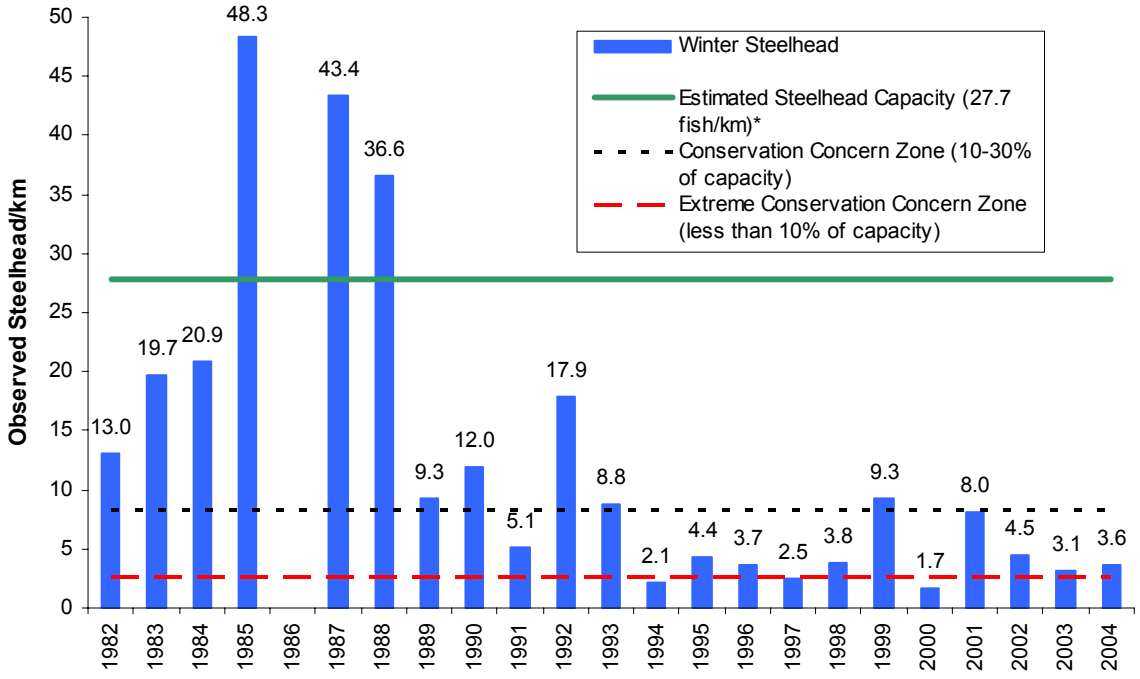
Surveys consisted of two technicians swimming in parallel lanes, each observing half the wetted channel but focusing on the thalweg and likely holding areas. Besides adult counts, data collected included distribution, sex, size, and origin (hatchery or wild). Colour, condition and spawning status of observed steelhead were also recorded and used to infer residence time.

Englishman River discharge data was obtained from the Water Survey of Canada (WSC) gauging station (08HB0027-BC), located downstream of the Highway 19A Bridge. Non-corrected river discharge information can be viewed online at http://scitech.pyr.ec.gc.ca/waterweb/fullgraph.asp. In addition, stream temperatures, water clarity (visibility), weather and habitat conditions were recorded on each survey.

3.0 RESULTS

3.1 Historical Snorkel Survey Data

Snorkel surveys to enumerate winter steelhead on the Englishman River have been conducted by BCCF and/or provincial fisheries staff in Nanaimo since 1982. Peak observed winter steelhead densities (steelhead/km) *in mainstem sections 1 and 2* from 1982 to 2004 have declined since the early 1990s and generally remained low (Figure 3). Smith (2003[1], 2003[2]) presents additional information and historical data on the Englishman River steelhead stock.



* Based on 598 adults (Lill 2002) over 21.6 km (mainstem, South Englishman and Morison Creek)

Figure 3. Peak adult steelhead densities (fish/km) observed during snorkel surveys in mainstem sections 1 and 2 of the Englishman River, 1982 – 2004, relative to estimated capacity and provincial conservation limit reference points. The data is not adjusted to reflect varying observer efficiency and water conditions.

3.2 Observed Steelhead Abundance and Distribution

A total of six surveys occurred between February 4 and May 14, 2004 (Appendix A), each survey taking two days to complete. Steelhead were counted on all six surveys with the highest count (45) recorded on April 13/14. Table 1 summarizes observed steelhead abundance and distribution during the study period.

Table 1. Adult steelhead snorkel survey counts and distribution in the Englishman River, February 4 - May 14, 2004.

Date	Steelhead/Section				# of Steelhead Observed	Total Distance (km)	Steelhead Observed / km
	MS 1	MS 2	MS 3	SE			
4,5 Feb 04	2	3	1	n/a	6	15.0	0.40
1,2 Mar 04	1	20	0	n/a	21	15.0	1.40
22,23 Mar 04	6	13	5	n/a	24	15.0	1.60
13,14 Apr 04	15	12	11	7	45	19.5	2.31
28,29 Apr 04	4	28	8	1	41	19.5	2.10
13,14 May 04	4	7	15	n/a	26	15.0	1.73

The peak count of 45 steelhead on April 12/13, 2004, correlates closely with the peak count in 2002 (n=73, April 24-26) and in 2003 (n=50, April 22 and 23), confirming mid to late April is when steelhead abundance peaks in the Englishman River (Figure 4).

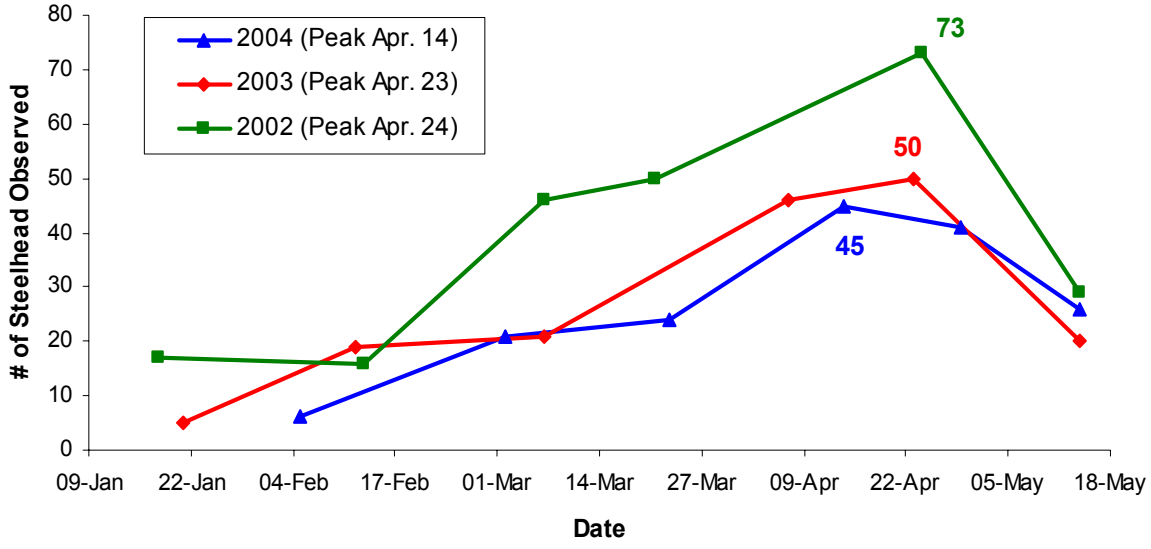


Figure 4. Englishman River winter steelhead snorkel survey counts, 2002 - 2004.

South Englishman River surveys were conducted on April 14 and April 29, based on past results that showed steelhead presence during peak run timing only. Fish bound for the South

Englishman River likely mature in the mainstem, and then enter only for a short period to spawn (Smith 2003[2]).

During snorkel surveys, mainstem discharge ranged from 6 to 12 m^3/s and visibility varied from 3.5 to 8 m (Appendix B).

3.3 Steelhead Body Colouration and Spawning Condition

Steelhead body colouration and condition were noted and used to infer spawning and migration timing (Figure 5; Appendix C).

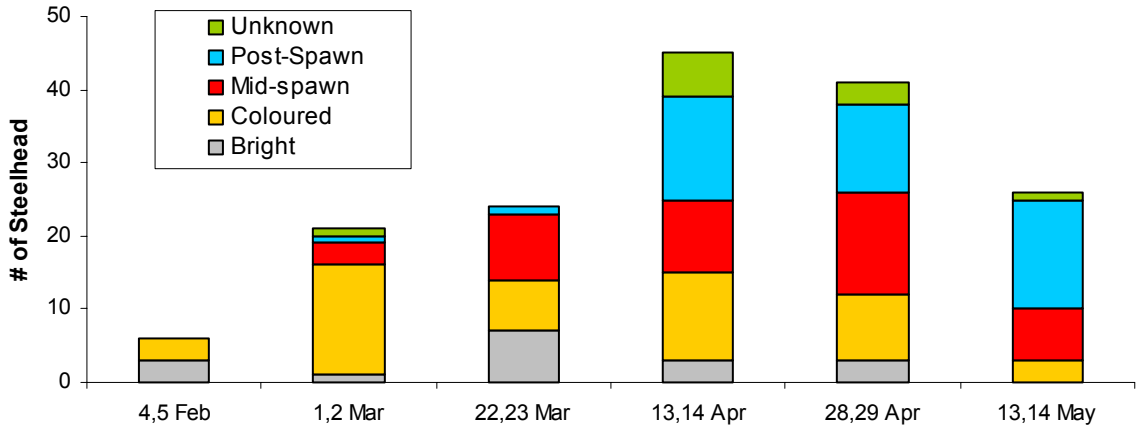


Figure 5. Colour and spawning condition of steelhead observed in the Englishman River, February 4 - May 14, 2004.

3.4 Population Estimate

Snorkel survey count data was plotted and area under the curve (AUC) calculated to determine a range of escapement estimates. The total number of fish observed during each survey was plotted against time (expressed as days from the start of the run) to generate a total of 3056 fish-days for the 2004 winter steelhead run (Figure 6). The first and last days of the run were assumed to be January 1 and May 31, respectively, making the cumulative run-time 151 days. These results clearly indicate a reduction in the peak count of steelhead in 2004 and a diminished number of fish-days compared to the 2002 and 2003 snorkel survey series.

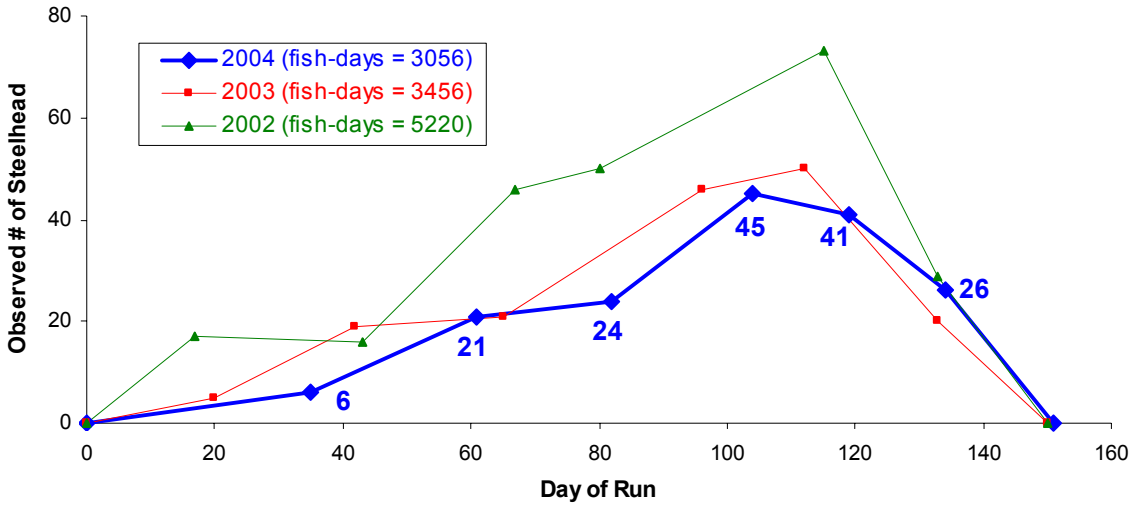


Figure 6. AUC results for snorkel survey series in the Englishman River, February 4 - May 14, 2004.

Historical snorkel survey and radio-telemetry studies from several southwestern BC rivers (Salmon, Puntledge, Cheakamus, Goldstream rivers), estimate snorkel survey observer efficiency at 40 to 80%. Stream width and typical conditions encountered support a range of 50-70% for the Englishman River. Estimated residence time of winter steelhead in the Englishman River ranges between 45 and 75 days (Smith 2003[2]). To obtain results comparable to previous years, and without better estimates of observer efficiency and residence time, these values were again used in 2004. The range in escapements was 58 to 136, with a most probable estimate of 85 fish, based on an average observer efficiency of 60% and a residence time of 60 days (Table 2).

Table 2. 2004 AUC escapement estimates for winter steelhead in the Englishman River, compared to 2003 and 2002.

Residence Time (days)	Sample Year and Observer Efficiency (%)								
	2004			2003			2002		
	50	60	70	50	60	70	50	60	70
45	136	113	97	154	128	110	232	193	166
60	102	85	73	116	96	83	174	145	124
75	81	68	58	92	77	66	139	116	99

The precision of an AUC estimate depends strongly on observer efficiency and residence time. Without improved accuracy in these variables, the range of escapement estimates will continue to be substantial. Observer efficiency could be better determined if steelhead were tagged (radio or Floy™) and re-observed during subsequent snorkel surveys (mark-recapture component). In addition, radio tags or Floy™ tag colour rotation would allow the residence

time of a sample of the population to be determined. The process of netting or angling fish from such a small stock to apply tags may not be desirable due to the potential for stress and hooking mortality.

3.5 Comparison of Juvenile and Adult Densities

The relationship between peak adult steelhead per kilometer, observed during spring snorkel surveys, and mean depth-velocity adjusted fry per unit[5] (FPU), obtained from closed-site electrofishing at the end of summer, was investigated by Wright (2004). Using data from 1990, and 1998-2003, results showed a strong relationship (R^2=0.85) between the number of spawners and subsequent fry densities. Figure 8 displays these results (updated with 2004 juvenile data) with AUC adult escapement estimates from 2002 to 2004 plotted on a secondary axis. This relationship shows a strong correlation (R^2=0.99) as well, though it is based on just three data points. Depending on future AUC escapement estimates, this relationship may be suitable for predicting fry densities from a given adult return.

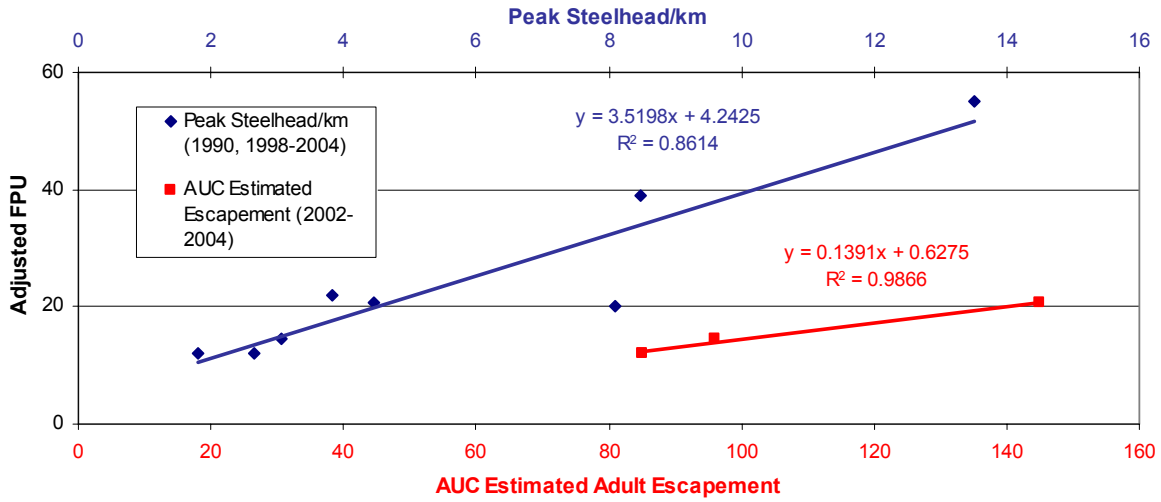


Figure 7. Peak adult steelhead counts (1990, 1998 - 2004) and AUC estimated adult escapement (2002 - 2004) versus mean depth-velocity adjusted FPU in the Englishman River.

3.6 Resident Fish/Juvenile Observations

The number, species, size, origin, and distribution of resident trout was also documented during snorkel surveys. Overall, low to moderate densities of cutthroat and resident rainbow trout were observed during mainstem Englishman and South Englishman surveys (Appendix D). Several trout were counted but not clearly observed to determine species or origin.

[5] Unit = 100 m^2 of suitable steelhead fry habitat.

As in 2002 and 2003, very few steelhead fry and parr were noted during snorkel surveys, particularly from February to April. Low densities of steelhead parr and pre-smolts were noted during the April and May surveys. Coho pre-smolts were observed in low abundance in all mainstem sections on May13/14. High densities of coho fry were observed in margin habitat in the South Englishman River on April 29 and in all sections on May 13/14. Several chinook fry were observed on the last survey in mainstem section 2.

4.0 SUMMARY AND CONCLUSIONS

The 2004 survey marks the third consecutive year of intensive steelhead enumeration by BCCF and MWLAP staff in the Englishman and South Englishman rivers. Estimates of adult escapement using snorkel techniques, smolt emigration using rotary screw traps, and fry standing stocks through closed-site electrofishing further develop the Englishman River as a key steelhead index stream on the east coast of Vancouver Island.

Results from six snorkel surveys between February 4 and May 14 were evaluated using the AUC method to estimate a probable range of steelhead escapements. Observer efficiency and average residence time of Englishman steelhead were established based on radio-telemetry results from previous Vancouver Island studies, historical snorkel survey data from the Englishman watershed, and observations made during the 2002, 2003 and 2004 studies.

The AUC estimate for 2004, assuming an average residence time of 60 days and an average observer efficiency of 60%, was 85 steelhead (most probable range: 58-136). This compares to estimates of 145 and 96 for 2002 and 2003, respectively, using the same observer efficiencies and residence times. Until these assumptions are tightened up if not eliminated, estimate confidence will not improve significantly. However, actions required to address these assumptions (mark-recapture component) may be too invasive given the extreme conservation concern associated with this stock.

Given the importance of Englishman River steelhead, collection of abundance trend data should continue in 2005. Further development of the Englishman River as a key index stream for winter steelhead populations in the Georgia Basin is a high priority outlined in the *Greater Georgia Basin Steelhead Recovery Action Plan* (Lill 2002).

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Appendix A.

2004 Englishman River snorkel survey reports.

Appendix A. Snorkel survey reports of the Englishman River, February 4 - May 14, 2004.

FILE NOTE

Date: February 6, 2004
File: 34560-20/SNORK
xf: 34560-27/*Englishman*

SNORKEL SURVEY REPORT
Englishman River

DATE:	February 4th and 5th, 2004
WEATHER:	February 4th – 30% overcast, cool
	February 5th – 100% overcast, light rain, air temp. ~4°C.
WATER TEMP. (°C):	3 on February 4th; 2 on February 5th
DISCHARGE (m^3/s):	12.25 on February 4th; 11.0 on February 5th (per WSC website)
VISIBILITY (m):	February 4th – 7 m; February 5th – 4.5 m
PERSONNEL:	Mainstem section 1: J. Craig, B. Smith
	Mainstem section 2: H. Wright, S. Silvestri
	Mainstem section 3: J. Craig, S. Silvestri
AREA:	Mainstem 1: Grassy Bank to Big Tent Run (4.2 km)
	Mainstem 2: End of Englishman River Rd. to Grassy Bank (4.6 km)
	Mainstem 3: Falls Pool to end of Englishman River Rd. (6.2 km)

Total distance surveyed = 15.0 km

1. Fish Observed:

Adult Steelhead:

A total of 6 wild steelhead were counted for an observed density of 0.4 fish/km. Distribution was as follows:

- **Section 1:** one female (Grassy Bank) and one male (300 m d/s Allsbrook).
- **Section 2:** two males (one at S/C intake and one d/s "Slough Hole"), and one female (under new LWD structure above powerlines).
- **Section 3:** one female (tailout of canyon pool at the end of Steelhead Pl. off Englishman River Rd.).

Steelhead ranged in weight from 3-6 kg and were bright to moderate in color. See table below for condition rating:

Condition[1]	1	2	3	4	5
#	3	3	0	0	0
%	50	50	0	0	0

[1] 1 (bright), 2 (moderately coloured), 3 (mid spawn), 4 (post spawn), 5 (undetermined)

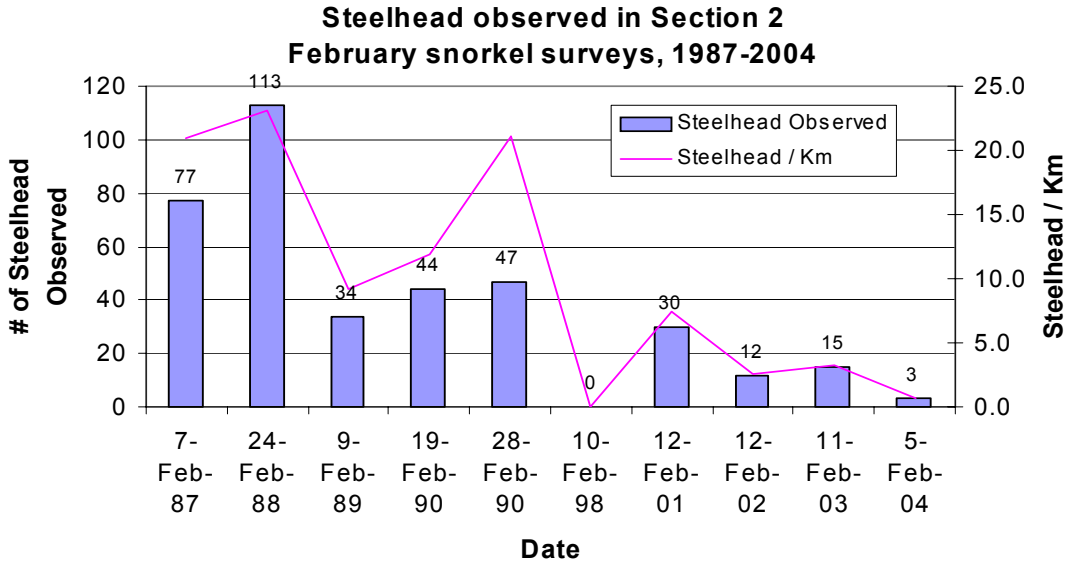
Rainbow/Cutthroat Trout:

- **Section 1:**
  2 rainbow trout (both wild @ 35-45 cm)
- **Section 2:**
  7 rainbow trout (all wild; 1 @ 25-35 cm, 3 @ 35-45 cm, 3 > 45 cm)
  6 cutthroat trout (4 hatchery; 2 @ 25-35 cm, 2 @ 35-45 cm, 1 wild @ 35-45 cm), 1 unidentified origin @ 25-35 cm)
- **Section 3:**
  8 rainbow trout (all wild; 4 @ 25-35 cm, 4 @ 35-45 cm)
  3 cutthroat trout (all hatchery; 2 @ 25-35 cm, 1 35-45 cm)
  1 unidentified trout (unknown origin @ 25-35 cm)

Juveniles:
None observed.

2. Notes:

- No anglers or evidence of recent angling were observed (this stream is closed below lower Englishman River falls Dec. 1-May 31).
- Following groin construction in the upper half of the Parry's RV corner in 2003, gravel and cobble infilling has virtually eliminated the deep pool habitat that was located at the bottom of the bend. Habitat complexity has significantly decreased throughout the corner (with removal of LWD during groin construction). No fish (steelhead or resident trout) were observed in or near the area. The pool located between the Parry's peninsula of land and the right bank bedrock cliff is still relatively deep. Bedload has aggraded on the left bank cobble/gravel bar immediately downstream of the peninsula.
- The female in section 1 was "two-toner".
- February snorkel surveys on the Englishman River have been conducted regularly by WLAP and BCCF staff. Results of mainstem section 2 surveys from 1987–2004 are presented.



Scott Silvestri
Fisheries Technician
BC Conservation Foundation

cc: All Fisheries staff
Steelhead Crew
Conservation Officer Service, Nanaimo
B. Bocking, LGL Ltd., Sidney
M. Gaboury, LGL Ltd., Nanaimo
M. Sheng, Biologist, DFO, Nanaimo (Departure Bay Road)
K. Simpson, Biologist, DFO, Nanaimo (PBS)
P. Law, Ecosystems Biologist, WLAP, Nanaimo

FILE NOTE

Date: March 2, 2004
File: 34560-20/SNORK
xf: 34560-27/*Englishman*

SNORKEL SURVEY REPORT
Englishman River

DATE:	March 1st and 2nd, 2004.
WEATHER:	March 1st –Mainly sunny, warm, air temp 12°C. March 2nd – Mainly sunny, warm, air temp 13°C.
WATER TEMP. (°C):	3.5 on March 1st; 3.5 on March 2nd.
DISCHARGE (m^3/s):	7.56 on March 1st, 6.60 on March 2nd (per WSC website)
VISIBILITY (m):	March 1st – 3.5 m; March 2nd – 8.0 m (visibility reduced d/s of Morison Cr.)
PERSONNEL:	Mainstem section 1: R. Dolighan, S. Silvestri, H. Wright Mainstem section 2: J. Craig, B. Smith Mainstem section 3: M. McCulloch, S. Silvestri
AREA:	Mainstem 1: Grassy Bank to Big Tent Run (4.2 km) Mainstem 2: End of Englishman River Rd. to Grassy Bank (4.6 km) Mainstem 3: Falls Pool to end of Englishman River Rd. (6.2 km)

Total distance surveyed = 15.0 km

1. Fish Observed:

Adult Steelhead:

A total of 21 steelhead (19 wild, 2 unknown) were counted for an observed density of 1.4 fish/km. Distribution was as follows:

- **Section 1:** one female (holding in fast water @ the Inland Island Hwy Br.).
- **Section 2:** 20 steelhead evenly distributed. 10 fish were observed near the newly created LWD structures.
- **Section 3:** No steelhead observed.

Steelhead ranged in weight from 3-9 kg and were bright to moderate in color. See table below for condition rating:

Condition[1]	1	2	3	4	5
#	1	15	3	1	1
%	4.8	71.4	14.3	4.8	4.8

[1] 1 (bright), 2 (moderately coloured), 3 (mid spawn), 4 (post spawn), 5 (undetermined)

Rainbow/Cutthroat Trout:

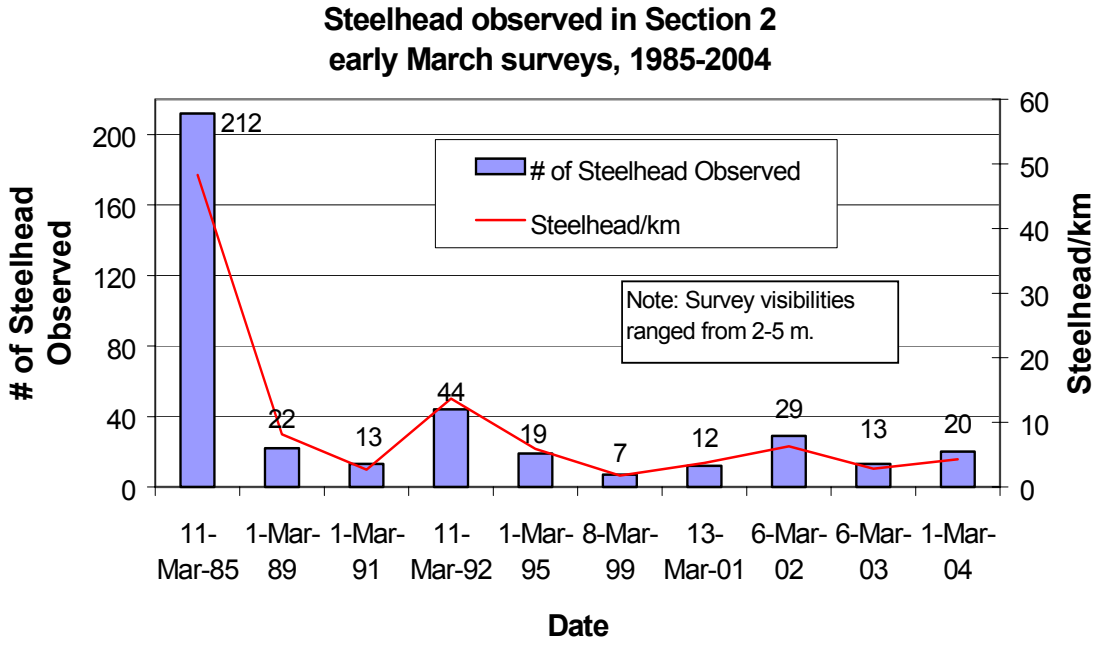
- **Section 1:**
  2 cutthroat trout (1 wild @ 25-35 cm, 1 hatchery @ 25-35 cm)
- **Section 2:**
  4 wild rainbow trout (2 @ 25-35 cm, 1 @ 35-45 cm, 1 > 45 cm)
  11 cutthroat trout (1 hatchery @ 25-35 cm, 3 wild @ 25-35 cm, 1 wild @ 35-45 cm, 6 unknown @ 25-35 cm).
  3 unidentified trout of unknown origin @ 25-35 cm
- **Section 3:**
  2 wild rainbow trout @ 35-45 cm

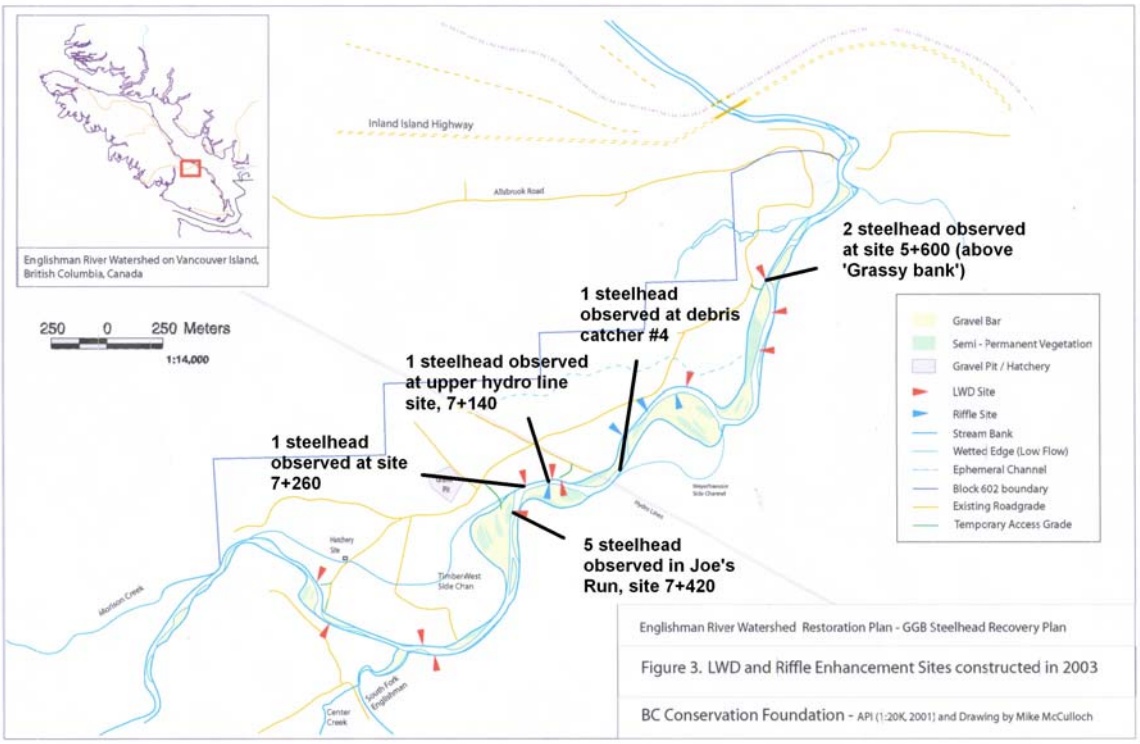
Juveniles:

None observed.

2. Notes:

- No anglers or evidence of recent angling were observed (this stream is closed below lower Englishman River falls Dec. 1-May 31).
- The majority of fish observed were 2 ocean (~75%).
- Two large fish (3/4 ocean) were observed in the "Slough Hole". Weights ranged from 7-9 kg.
- One fish observed had obvious predator marks (scratches) on abdomen.
- One redd was observed in the tailout of the S/C intake pool (right bank).
- March snorkel surveys on the Englishman River have been conducted regularly by WLAP and BCCF staff. Results of mainstem section 2 surveys from 1985–2004 are presented below.
- 10 of 21 fish were observed directly under or near the newly created LWD structures. Steelhead locations are presented on map below:





Scott Silvestri
Fisheries Technician
BC Conservation Foundation

cc: All Fisheries staff
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M. Sheng, Biologist, DFO, Nanaimo (Departure Bay Road)
K. Simpson, Biologist, DFO, Nanaimo (PBS)
P. Law, Ecosystems Biologist, WLAP, Nanaimo

FILE NOTE

Date: March 25, 2004
File: 34560-20/SNORK
xf: 34560-27/*Englishman*

SNORKEL SURVEY REPORT
Englishman River

DATE:	March 22nd and 23rd, 2004.
WEATHER:	March 22nd – 50% O.C., mild, air temp. 10°C. March 23rd – 100% O.C., light rain, air temp. 8°C.
WATER TEMP. (°C):	5.4 on March 22nd @ 1300 hrs.
DISCHARGE (m^3/s):	8.10 on March 22nd, 9.10 on March 23rd (per WSC website)
VISIBILITY (m):	March 22nd – 6.0 m; March 23rd – 3.5 m
PERSONNEL:	Mainstem section 1: J. Craig, S. Silvestri Mainstem section 2: M. McCulloch, S. Silvestri Mainstem section 3: R. Ptolemy, H. Wright
AREA:	Mainstem 1: Grassy Bank to Big Tent Run (4.2 km) Mainstem 2: End of Englishman River Rd. to Grassy Bank (4.6 km) Mainstem 3: Falls Pool to end of Englishman River Rd. (6.2 km)

Total distance surveyed = 15.0 km

1. Fish Observed:

Adult Steelhead:

A total of 24 steelhead (19 wild, 2 unknown) were counted for an observed density of 1.6 fish/km. Distribution was as follows:

- **Section 1:** Six steelhead (2 immediately above Parry's, 1 above Hwy 19A Br., 3 in riffle below Hwy 19A).
- **Section 2:** 13 steelhead evenly distributed (3 @ S/C intake, 1 @ South Fork conf., 4 @ Joe's Run, 3 @ lower Hydro LWD site, 2 above Grassy Bank). 7 fish were observed near the newly created LWD structures.
- **Section 3:** Five steelhead evenly distributed (2 @ tailout of falls pool, 1 @ half-way point of survey, 2 in alder run 3/4 of the way through the survey).

Steelhead ranged in weight from 2-6.5 kg and were bright to moderate in color. See table below for condition rating:

Condition[1]	1	2	3	4	5
#	7	7	9	1	0
%	29.2	29.2	37.5	4.1	

[1] 1 (bright), 2 (moderately coloured), 3 (mid spawn), 4 (post spawn), 5 (undetermined)

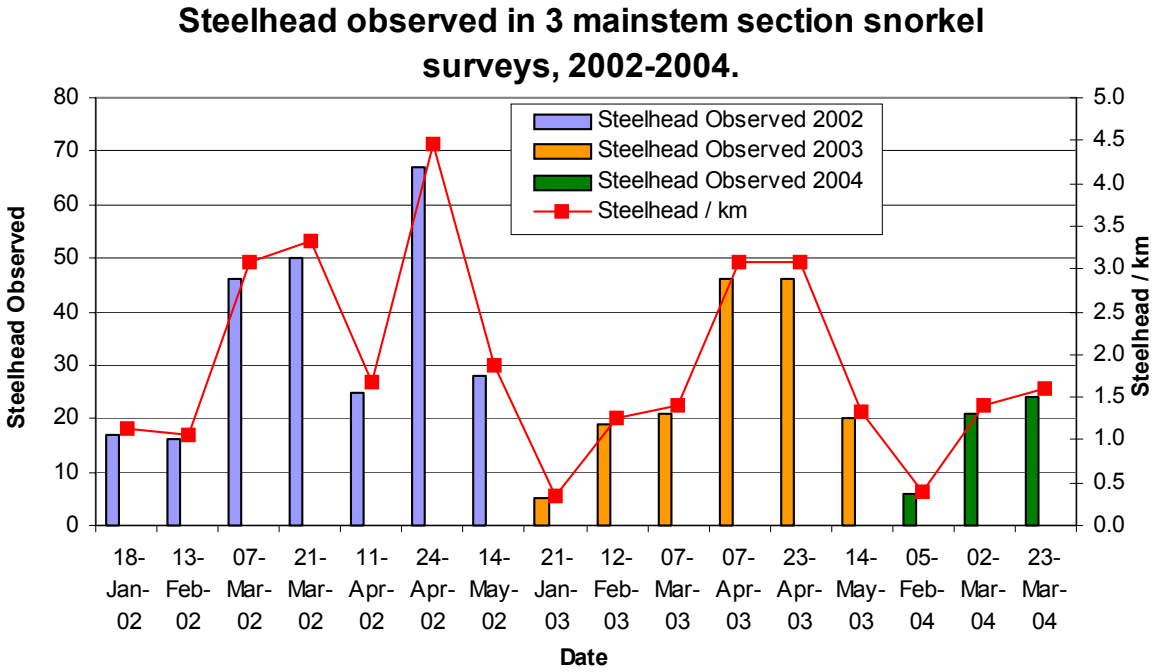
Rainbow/Cutthroat Trout:

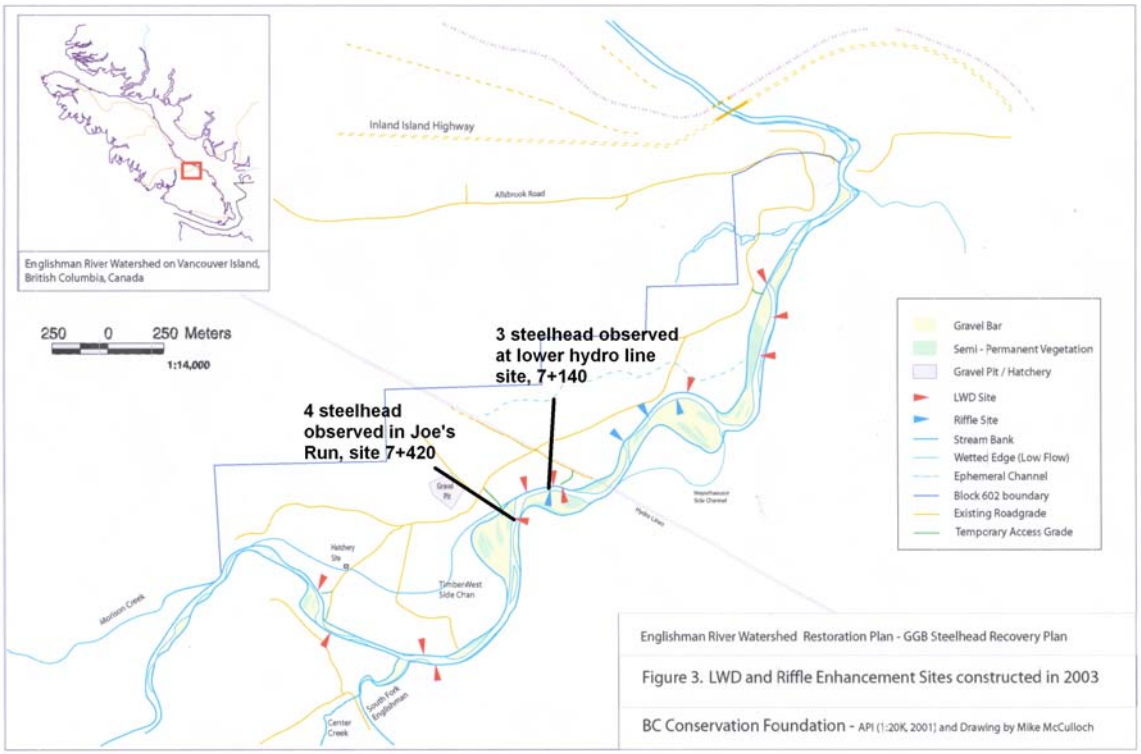
- **Section 1:**
  3 cutthroat trout (1 wild @ 35-45 cm, 2 hatchery @ 25-35 cm)
  1 wild rainbow trout @ 35-45 cm
- **Section 2:**
  2 wild rainbow trout (1 @ 25-35 cm, 1 > 45 cm)
  4 cutthroat trout (1 wild @ 35-45 cm, 1 wild > 45 cm, 1 hatchery @ 35-45 cm, 1 hatchery > 45 cm).
- **Section 3:**
  3 wild rainbow trout (2 @ 35-45 cm, 1 > 45 cm).

Juveniles:
None observed.

2. Notes:

- No anglers or evidence of recent angling were observed (this stream is closed below lower Englishman River falls Dec. 1-May 31).
- The majority of fish observed were 2 ocean (~75%).
- Three possible redds were observed (1 near right bank of S/C intake pool, 1 above Parry's, 1 in the tailout of the HWY 19A Bridge pool).
- This is year three of intense snorkel surveys on the Englishman River during the winter steelhead season by WLAP and BCCF staff. Results of the mainstem surveys from 2002–2004 are presented below.
- 7 of 21 fish were observed directly under or near the newly created LWD structures. Steelhead locations are presented on map below:





Scott Silvestri
Fisheries Technician
BC Conservation Foundation

cc: All Fisheries staff
Steelhead Crew
Conservation Officer Service, Nanaimo
B. Bocking, LGL Ltd., Sidney
M. Gaboury, LGL Ltd., Nanaimo
M. Sheng, Biologist, DFO, Nanaimo (Departure Bay Road)
K. Simpson, Biologist, DFO, Nanaimo (PBS)
P. Law, Ecosystems Biologist, WLAP, Nanaimo

FILE NOTE

Date: April 19, 2004
File: 34560-20/SNORK
xf: 34560-27/*Englishman*

SNORKEL SURVEY REPORT
Englishman River

DATE:	April 13th and 14th, 2004.
WEATHER:	April 13th – Sunny, mild, air temp. 10°C.
	April 14th – 100% O.C., light rain, air temp. 7°C.
WATER TEMP. (°C):	5.5 on April 13th @ 1515 hrs.
DISCHARGE (m^3/s):	11.8 on April 13th, 11.58 on April 14th (per WSC website)
VISIBILITY (m):	Mainstem 1 and 2: 6.0
	Mainstem 3 and South Englishman River: 8.0+
PERSONNEL:	Mainstem section 1: R. Dolighan, H. Wright
	Mainstem section 2: M. McCulloch, S. Silvestri
	Mainstem section 3: J. Craig, B. Smith
	South Englishman River: B. Smith, H. Wright
AREA:	Mainstem 1: Grassy Bank to Big Tent Run (4.2 km)
	Mainstem 2: End of Englishman River Rd. to Grassy Bank (4.6km)
	Mainstem 3: Falls Pool to end of Englishman River Rd. (6.2 km)
	South Englishman River: #155 mainline bridge to mouth (4.5 km)

Total distance surveyed = 19.5 km

1. Fish Observed:

Adult Steelhead:

A total of 45 steelhead (34 wild, 3 hatchery, 8 unknown) were counted for an observed density of 2.3 fish/km. Sex was determined for 39 of the 45 fish observed, with 18 males and 21 females noted. In addition, one dead steelhead was also observed near "Grassy Bank". This fish was a wild male of approximately 2.5 kg and appeared to have died of natural causes as no hooking wounds or predator marks were noticed. Distribution was as follows:

- **Section 1:**15 steelhead observed (5 holding in bedrock pool d/s of Parry's RV Park, 10 evenly distributed over the rest of the section).
- **Section 2:** 12 steelhead evenly distributed.
- **Section 3:** 11 steelhead observed (4 observed in the first 200 m, 7 evenly distributed throughout).
- **South Englishman River:** 7 steelhead all observed in the upper half of the survey section.

Steelhead ranged in weight from 3-9 kg and were bright to dark in color. See table below for condition rating:

Condition[1]	1	2	3	4	5
#	3	12	10	14	6
%	6.7	26.7	22.2	31.1	13.3

Rainbow/Cutthroat Trout:

- **Section 1:**
  1 wild rainbow @ 25-35 cm
  6 cutthroat trout (2 wild @ 35-45 cm, 1 hatchery @ 35-45 c, 1 unknown origin @ 25-35 cm, 2 unknown origin @ 35-45 cm)
- **Section 2:**
  3 rainbow trout (1 hatchery @ 35-45 cm, 2 wild > 45 cm)
  1 wild cutthroat trout @ 35-45 cm
- **Section 3:**
  1 unknown origin cutthroat trout @ 25-35 cm
  8 wild rainbow trout (4 @ 25-35 cm, 3 @ 35-45 cm, 1 > 45 cm
- **South Englishman River:**
  3 wild rainbow trout @ 35-45 cm

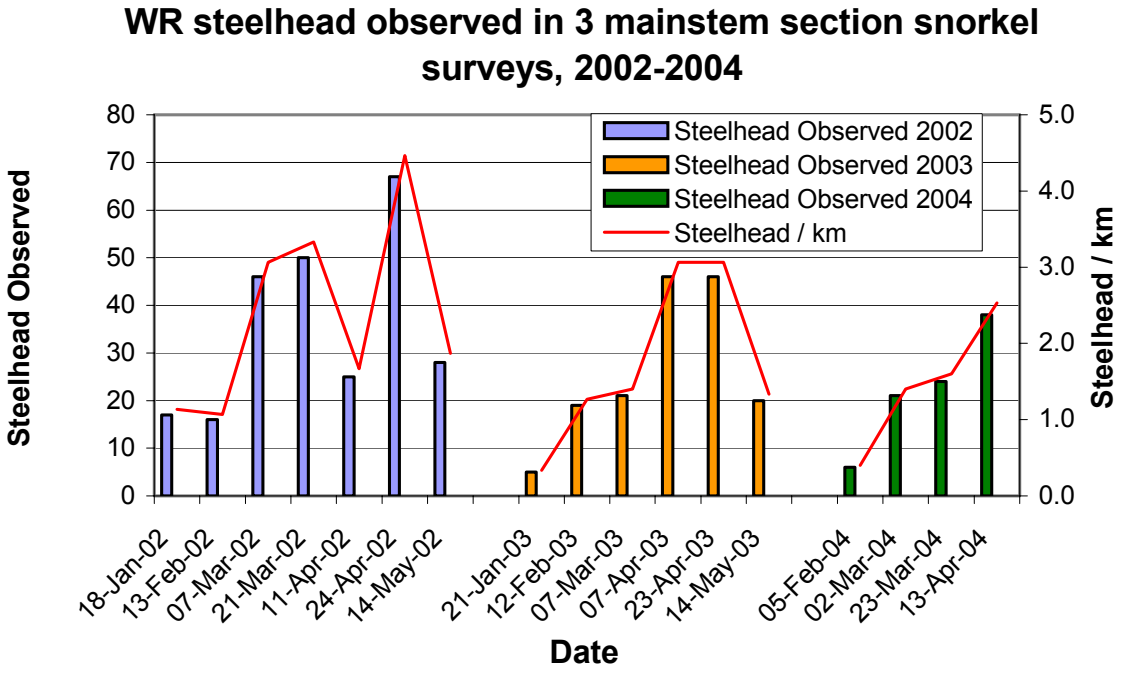
Juveniles:

Low densities of steelhead parr and pre-smolts were observed in all survey sections.

2. Notes:

- One angler was observed fishing the large back-eddie of the "Slough Hole" pool. The angler was approximately 14 years old and was using a small spinning rod, with a two-prong hook and dew worms. The angler was informed of the current fishing closure on the Englishman River. Local Conservation Officers were informed the following day.
- Evidence of recent angling (new fishing line) was observed in a run ~ 500 m upstream of the end of Englishman River Rd. The river is closed to fishing below the lower Englishman River falls (Dec. 1-May 31).
- The majority of fish observed were 2 ocean (~75%).
- Three adipose clipped fish were observed during this survey. One was observed in the upper section of the South Englishman River. A second was observed near "Grassy Bank". A third hatchery fish was observed in the pool downstream of Parry's RV Park.
- Three redds were observed in mainstem section 3 and digging activity was noted in the tail-out of the "Slough Hole" pool (mainstem section 2).
- This is the third consecutive year of intense winter steelhead snorkel surveys on the Englishman River by WLAP and BCCF staff. Results of the three mainstem sections from 2002-2004 are presented below.

[1] 1 (bright), 2 (moderately coloured), 3 (mid spawn), 4 (post spawn), 5 (undetermined)



Scott Silvestri
Fisheries Technician
BC Conservation Foundation

cc: All Fisheries staff
Steelhead Crew
Conservation Officer Service, Nanaimo
B. Bocking, LGL Ltd., Sidney
M. Gaboury, LGL Ltd., Nanaimo
M. Sheng, Biologist, DFO, Nanaimo (Departure Bay Road)
K. Simpson, Biologist, DFO, Nanaimo (PBS)
P. Law, Ecosystems Biologist, WLAP, Nanaimo

FILE NOTE

Date: April 30, 2004
File: 34560-20/SNORK
xf: 34560-27/*Englishman*

SNORKEL SURVEY REPORT
Englishman River

DATE:	April 28th and 29th, 2004.
WEATHER:	April 28th – Sunny, warm, air temp. 20°C.
	April 29th – Sunny, warm, air temp. 20°C.
WATER TEMP. (°C):	7.5 on April 28th @ 1500 hrs (Englishman River Rd.)
	8.0 on April 29 @ 1230 hrs (Big Tent)
DISCHARGE (m^3/s):	10.15 on April 28th, 8.96 on April 29th (per WSC website)
VISIBILITY (m):	Mainstem 1 and 2: 6.0
	Mainstem 3 and South Englishman River: 8.0+
PERSONNEL:	Mainstem section 1: J. Craig, S.Silvestri
	Mainstem section 2: J. Craig, B. Smith
	Mainstem section 3: S. Silvestri, H. Wright
	South Englishman River: B. Smith, H. Wright
AREA:	Mainstem 1: Grassy Bank to Big Tent Run (4.2 km)
	Mainstem 2: End of Englishman River Rd. to Grassy Bank (4.6 km)
	Mainstem 3: Falls Pool to end of Englishman River Rd. (6.2 km)
	South Englishman River: #155 mainline bridge to mouth (4.5 km)

Total distance surveyed = 19.5 km

1. Fish Observed:

Adult Steelhead:

A total of 41 steelhead (32 wild, 6 hatchery, 3 unknown) were counted for an observed density of 2.10 fish/km. Sex was determined for 38 of the 41 fish observed, with 20 males and 18 females noted. Distribution was as follows:

- **Section 1:** 4 steelhead observed (2 holding in bedrock pool d/s of Parry's RV Park, 2 holding in run above Hwy 19A Bridge).
- **Section 2:** 28 steelhead evenly distributed. Several fish were observed near the newly created LWD structures.
- **Section 3:** 8 steelhead observed in the upper third of the survey section, including 3 in the falls pool.
- **South Englishman River:** 1 steelhead observed ~ 100 m above the Englishman River confluence.

Steelhead ranged in weight from 3-9 kg and were bright to dark in color. See table below for condition rating:

Condition[1]	1	2	3	4	5
#	3	9	14	12	3
%	7.3	22.0	34.1	29.3	7.3

Rainbow/Cutthroat Trout:

- **Section 1:**
  10 cutthroat trout (3 wild @ 25-35 cm, 2 hatchery @ 25-35 cm, 2 wild @ 35-45 cm, 1 hatchery @ 35-45 cm, 2 wild @ 45+ cm)
- **Section 2:**
  4 wild rainbow trout (1 @ 25-35 cm, 3 @ 35 –45 cm)
  13 cutthroat trout (3 hatchery @ 25-35 cm, 2 hatchery @ 35-45 cm, 1 hatchery @ 45+ cm, 3 wild @ 25-35 cm, 4 unknown origin @ 25-35 cm)
- **Section 3:**
  7 wild rainbow trout (1 @ 18-25 cm, 3 @ 25-35 cm, 3 @ 35-45 cm)
  South Englishman River:
  3 wild rainbow trout (2 @ 25-35 cm, 1 @ 35-45 cm)

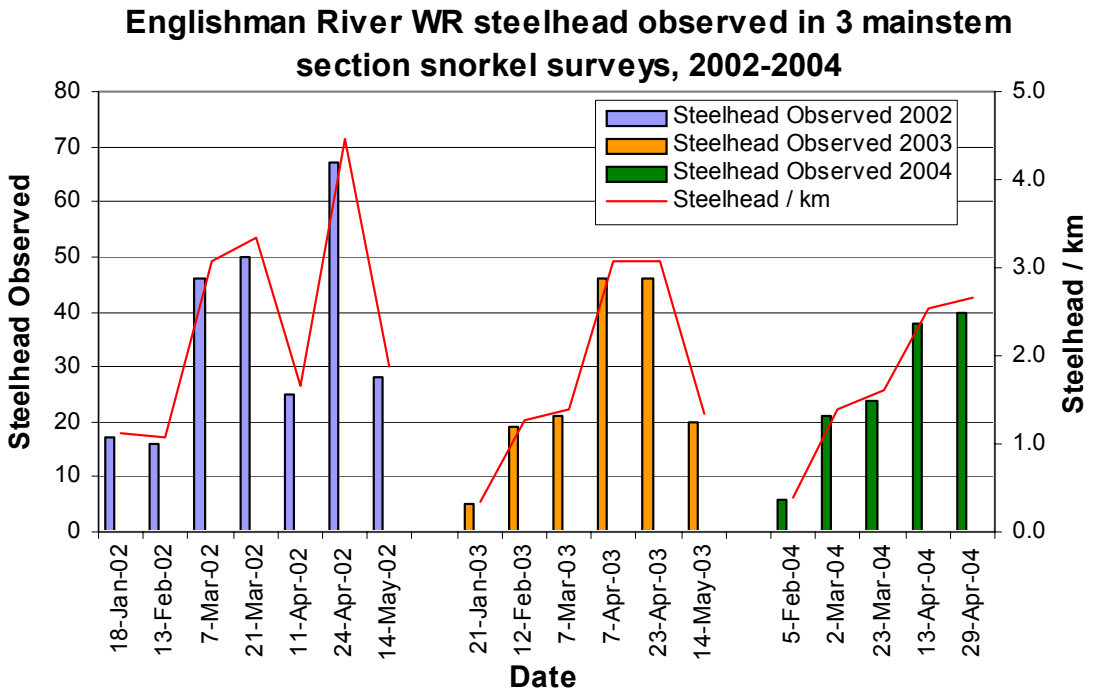
Juveniles:

Low densities of steelhead parr and pre-smolts were observed in all survey sections. A high abundance of coho fry were observed in the margins in the South Englishman River.

2. Notes:

- No anglers were observed. The river is closed to fishing below the lower Englishman River falls (Dec. 1-May 31). A new float was observed in the "Slough Hole", approximately 150 m upstream of "Grassy Bank".
- The majority of fish observed were 2 ocean (~85%).
- Two of the fish observed were two-toners.
- Six adipose clipped fish were observed during this survey. One was observed in section 1, four were observed in section 2 and one was observed in the South Englishman River.
- A total of 22 steelhead redds or test redds were observed during the survey. Distribution was as follows:
  Section 1: 3 redds
  Section 2: 4 redds and 2 other possible test redds
  Section 3: 9 redds
  South Englishman River: 4 small steelhead test redds
- This is the third consecutive year of intense winter steelhead snorkel surveys on the Englishman River by WLAP and BCCF staff. Results of the three mainstem sections from 2002-2004 are presented below.

[1] 1 (bright), 2 (moderately coloured), 3 (mid spawn), 4 (post spawn), 5 (undetermined)



Scott Silvestri
Fisheries Technician
BC Conservation Foundation

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B. Bocking, LGL Ltd., Sidney
M. Gaboury, LGL Ltd., Nanaimo
M. Sheng, Biologist, DFO, Nanaimo (Departure Bay Road)
K. Simpson, Biologist, DFO, Nanaimo (PBS)
P. Law, Ecosystems Biologist, WLAP, Nanaimo

FILE NOTE

Date: May 21, 2004
File: 34560-20/SNORK
xf: 34560-27/*Englishman*

SNORKEL SURVEY REPORT
Englishman River

DATE:	May 13th and 14th, 2004.
WEATHER:	May 13th – Sunny, warm, air temp. 20°C
	May 14th – Sunny, warm, air temp. 20°C
WATER TEMP. (°C):	9.5 on May 13th @ 1345 hrs (Englishman River Rd.)
	10.2 on May 14th @ 1245 hrs (Grassy Bank)
DISCHARGE (m^3/s):	5.86 on May 13th, 5.93 on May 14th (per WSC website)
VISIBILITY (m):	Mainstem 1 and 2: 6.0
	Mainstem 3: 8.0+
PERSONNEL:	Mainstem section 1: J. Craig, B. Smith
	Mainstem section 2: S. Silvestri, C. Wightman
	Mainstem section 3: S. Silvestri, H. Wright
AREA:	Mainstem 1: Grassy Bank to Big Tent Run (4.2 km)
	Mainstem 2: End of Englishman River Rd. to Grassy Bank (4.6 km)
	Mainstem 3: Falls Pool to end of Englishman River Rd. (6.2 km)

Total distance surveyed = 15.0 km

1. Fish Observed:

Adult Steelhead:
A total of 26 steelhead (25 wild, 1 hatchery) were observed for a density of 1.73 fish/km. Sex was determined for 25 of the 26 fish observed, with 16 males and nine females noted. Distribution was as follows:

- **Section 1:** 4 steelhead observed (two holding in bedrock pool d/s of Parry's RV Park, 2 holding in run above Hwy 19A Bridge).
- **Section 2:** 7 steelhead evenly distributed. Several fish were observed near the newly created LWD structures.
- **Section 3:** 15 steelhead. A group of seven was observed in the tail-out of the falls pool, with the rest evenly distributed downstream.

Steelhead ranged in weight from 3-6 kg and were moderate to dark in color. See table below for condition rating:

Condition[1]	1	2	3	4	5
#	0	3	7	15	1
%	0	11.5	26.9	57.7	3.9

[1] 1 (bright), 2 (moderately coloured), 3 (mid spawn), 4 (post spawn), 5 (undetermined)

Rainbow/Cutthroat Trout:

- **Section 1:**
  26 cutthroat trout:
  4 wild (1 @ 25-35 cm, 1 @ 35-45 cm, 2 @ 45+ cm)
  18 hatchery (11 @ 25-35 cm, 7 @ 35-45 cm)
  4 unknown origin @ 25-35 cm
  1 unidentified trout (unknown origin) @ 45 + cm

- **Section 2:**
  9 resident rainbow trout:
  8 wild (7 @ 25-35 cm, 1 @ 35-45 cm)
  1 hatchery @ 35-45 cm
  10 cutthroat trout:
  5 wild (4 @ 25-35 cm, 1 @ 35-45 cm)
  5 hatchery (2 @ 25-35 cm, 3 @ 35-45 cm)

- **Section 3:**
  6 wild rainbow trout (5 @ 25-35 cm, 1 @ 35-45 cm)
  1 wild cutthroat trout @ 25-35 cm
  1 unidentified trout @ 25-35 cm

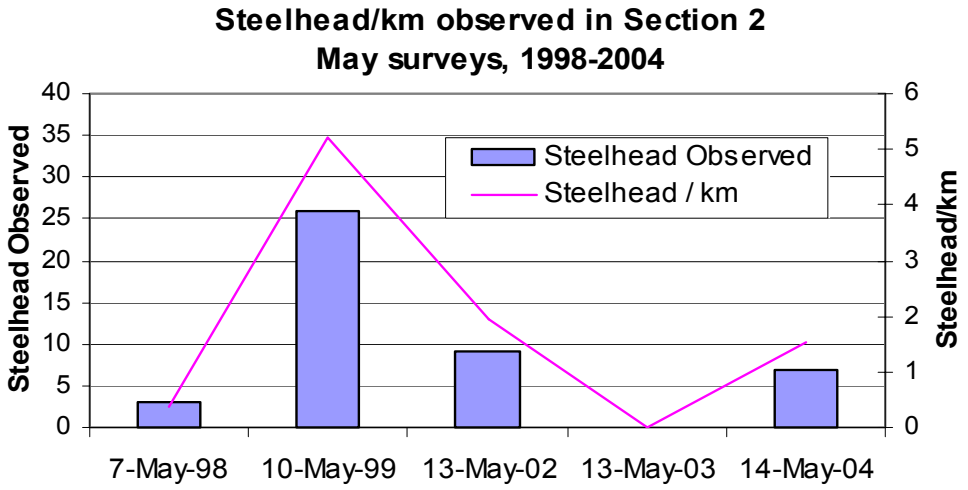
Juveniles:

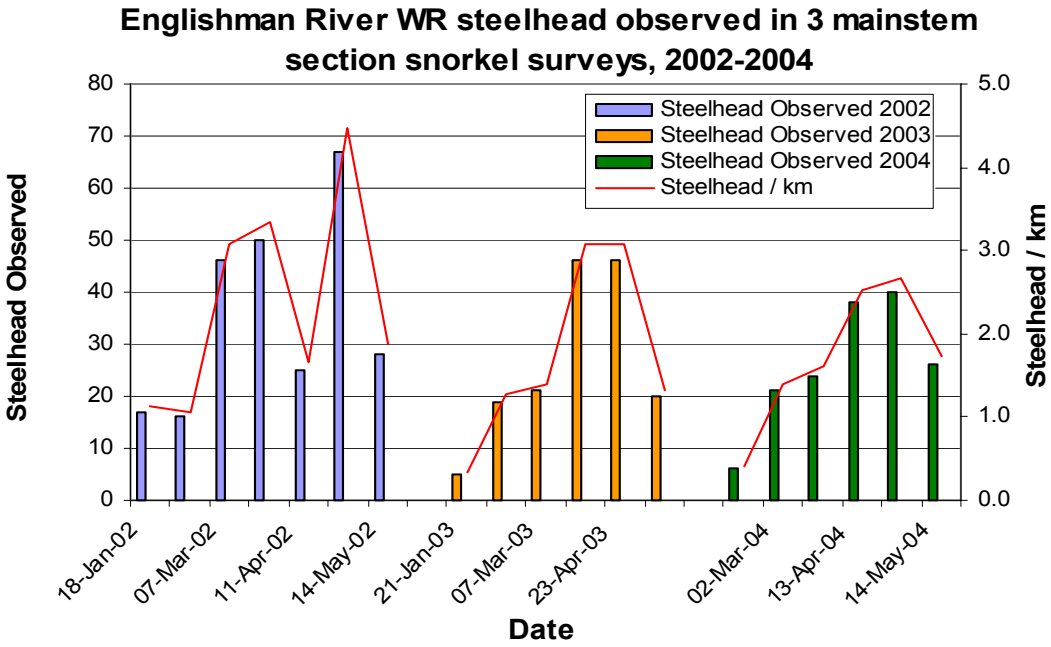
Low densities of steelhead parr and pre-smolts, as well as coho pre-smolts were observed in all survey sections. Several small groups of steelhead and coho smolts were observed in the newly created LWD structures above the hydroline crossing. A moderate to high abundance of coho fry were observed in the margins. Several chinook fry were noted in section 2.

3. Notes:

- No anglers or evidence of recent angling were observed. The river is closed to fishing below the lower Englishman River falls (Dec. 1-May 31).
- The majority of fish observed were 2 ocean (~85%).
- The majority of fish (steelhead and trout) observed in section 2 were noted near the newly created LWD structures.
- One of the fish observed was a two-toner.
- Only one adipose clipped fish was observed during this survey.
- A substantial increase in the amount of *Didymosphenia geminata* ('carpet-like' algae) was noted during this survey compared to the previous survey on April 23 and 24. Areas with little to no cover (exposed to the sun) showed the highest density *of Didymosphenia geminata*.
- A total of 10 steelhead redds were observed during this survey.
- Observed densities of steelhead/km in section 2 surveys in May from 1998-2004 are presented below:
- This is the third consecutive year of intense winter steelhead snorkel surveys on the Englishman River by WLAP and BCCF staff. Results of the three mainstem sections

from 2002-2004 are also presented below:





Scott Silvestri
Fisheries Technician
BC Conservation Foundation

cc: All Fisheries staff
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Conservation Officer Service, Nanaimo

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K. Simpson, Biologist, DFO, Nanaimo (PBS)
P. Law, Ecosystems Biologist, WLAP, Nanaimo
J. Deniseger, Biologist, Environmental Protection Program, Nanaimo

Appendix B.

Summary of environmental conditions during snorkel surveys in the Englishman River, 2004.

Appendix B. Summary of environmental conditions during snorkel surveys in the Englishman River, 2004.

Date	Section	Weather	Water Temp (^{o}C)	Mainstem Discharge (m^3/s)	Visibility (m)
04-Feb-04	MS 1	30% o/c, cool	3	12.25	4.5
	MS 2				7/4.5*
05-Feb-04	MS 3	100% o/c, light rain	2	11.0	7
01-Mar-04	MS 1	Mainly sunny, warm	3.5	7.56	3.5
	MS 2				8/3.5*
02-Mar-04	MS 3	Mainly sunny, warm	3.5	6.6	8
22-Mar-04	MS 2	50% o/c, mild	5.4	8.1	6/3.5*
	MS 3				6
23-Mar-04	MS 1	100% o/c, light rain	n/a	9.1	3.5
13-Apr-04	MS 1	Sunny, mild	5.5	11.8	6
	MS 2				6/8*
	MS 3				8
14-Apr-04	SE	100% o/c, light rain	n/a	11.58	8
28-Apr-04	MS 2	Sunny, warm	7.5	10.15	8/6*
	MS 3				8
29-Apr-04	MS 1	Sunny, warm	8.0	8.96	6
	SE				8
13-May-04	MS 1	Sunny, warm	9.5	5.86	6
	MS 2				8/6*
14-May-04	MS 3	Sunny, warm	10.2	5.93	8

* Visibility reduced below Morison Creek

Appendix C.

Summary of steelhead colour/condition by date and survey section, Englishman River, 2004.

Appendix C. Summary of steelhead colour/condition by date and survey section, Englishman River, 2004.

Date	Condition					Total	Survey Section*			
	Bright	Coloured	Mid-Spawn	Post-Spawn	Undetermined		MS1	MS2	MS3	SE
4/5-Feb-04	3	3				6	2	3	1	n/a
1/2-Mar-04	1	15	3	1	1	21	1	20		n/a
22/23-Mar-04	7	7	9	1		24	6	13	5	n/a
13/14-Apr-04	3	12	10	14	6	45	15	12	11	7
28/29-Apr-04	3	9	14	12	3	41	4	28	8	1
13/14-May-04		3	7	15	1	26	4	7	15	n/a

* MS1 - mainstem section 1 (Grassy Bank to Big Tent Run),
MS2 - mainstem section 2 (end of Englishman River Rd to Grassy Bank)
MS3 - mainstem section 3 (Englishman River Falls Provincial Park to end of Englishman River Rd)
SE - South Englishman River (branch #155 bridge crossing to Englishman River confluence).

Appendix D

Incidental trout observations during steelhead snorkel surveys in the Englishman River, 2004.

Appendix D. Incidental trout observations during steelhead snorkel surveys in the Englishman River, 2004.

Date	Section	Species, Origin and Size																	
		Rainbow Trout						Cutthroat Trout									Unidentified Trout		
		Wild			Hatchery			Wild			Hatchery			Unknown					
		S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L
04-Feb-04	MS1		2																
	MS2	1	3	3					1		2	2		1					
05-Feb-04	MS3	4	4								2	1					1		
01-Mar-04	MS1							1			1								
	MS2	2	1	1				3	1		1			6			3		
02-Mar-04	MS3		2																
22-Mar-04	MS2	1		1					1	1		1	1						
	MS3		2	1															
23-Mar-04	MS1		1						1		2								
13-Apr-04	MS1	1							2			1		1	2				
	MS2			2		1			1										
	MS3	4	3	1										1					
14-Apr-04	SE		3																
28-Apr-04	MS2	1	3					3			3	2	1	4					
	MS3	4	3																
29-Apr-04	MS1							3	2	2	2	1							
	SE	2	1																
13-May-04	MS1							1	1	2	11	7		4					1
	MS2	7	1			1		4	1		2	3							
14-May-04	MS3	5	1					1									1		

S = Small (25-35 cm), M = Medium (35-45 cm), L = Large (45+ cm)

Appendix E

2004 project budget summary (PSEF funding only).

Appendix E. 2004 project budget summary (PSEF funding only).

British Columbia Conservation Foundation
Project Summary Statement of Expenditures

Today's Date : 02-Dec-04
Regional Coordinator: Pat Stephenson

CLIENT NAME :	Rich Chappel	PROJECT NAME	Adult Steelhead Snorkel Program - PSEF - ER7-2004
CLIENT AGENCY:	Pacific Salmon Foundation	BCCF PROJECT #	132519
ADDRESS :	300 - 1682 West 7th Avenue	CLIENT CONTRACT #	ER7-2004
CITY, PROVINCE :	Vancouver, B.C.	TOTAL CONTRACT	$ 7,535.00
POSTAL CODE :	V6J 4S6	FEES	866.86
TEL. NUMBER :	604-664-7664	CARRY-OVER OR SUBSIDY	0
FAX NUMBER :	604-664-7665		6668.14

GL ACC'T.	EXPENDITURE	AMOUNT
3050	Fees Earned	$866.86
4050	Equipment Rental	$0.00
4051	Other charges	$0.00
4055	Project Coordinator Wages	$0.00
4056..5030	Contract wages	$3,302.56
5110	Sub Contracts	$2,933.32
5210	Equipment > 100	$0.00
5220	Equipment < 100	$0.00
5230	Equipment Repairs	$0.00
5235	Rentals	$100.00
5240	Communications	$0.00
5245	Computer costs	$0.00
5300	Materials/Supplies/Courier	$1.56
5400	Project Publications	$0.00
5500	Vehicle Operating Costs	$4.00
5520	Transportation	$0.00
5530	Vehicle Rental	$227.25
5540	Mileage (only)	$0.00
5545	Travel Costs/fuel	$93.09
5550	Accommodation	$0.00
5560	Per Diem/ Food	$0.00
5600	Miscellaneous :	$0.00
5700	Training/Safety	$0.00
5800	GST	$6.36
	Total Project Costs	**$7,535.00**