

To: Files

Subject: Brush Creek (Mendocino County) Population Sample,  
July 31-August 3, 1984.

**Section 1** - IFIM Transects 1-12 Sample date - July 31, 1984

Section location - 1.13 km (0.7 mile) below Hwy. 1 bridge  
Section length - 81.1 m (266 ft) Section width (ave.) - 5.6 m (18.5 ft)  
Section area (approx.) - 454.3 sq m (4921 sq ft)  
Flow (ave.) - 0.086 cms (3-05 cfs)  
Water temp. - 15.8 C (60.5 F) @1500  
Air Temp. - 16.7 C (62 F) @1500  
Weather - Fog

Sampling crew — G. Smith, B. Smith, A. White, and B. Snider.

Sampling method - Mark/recapture using an SR type VII electrofisher  
w/ block nets.

Fishes present — Steelhead, armored threespined stickleback, sculpin  
(spps.)

Fishes sampled — Steelhead

Instream description - Largely riffle with one deep pool, cover under  
overhanging willow and alder and beneath logs which  
appeared to help form the pool.

Sample results -

Raw data

Run 1 (marking run)  
255 SH caught total  
77 SH marked (68 age 0<sup>1</sup>, 9 age 1)  
Run 2 (recapture run)  
83 SH caught total  
73 SH caught unmarked (70 age 0, 3 age 1)  
10 SH recaptured (9 age 0, 1 age 1)

Data expansion

$N = M(C+1)/(R+1) + \text{dead}$   
Total SH  
 $N = 77(83+1)/(10+1) + 178$   
 $N = 766$   
>100 mm SH  
 $N = 9(4+1)/(1+1) + 2$   
 $N = 25$

<sup>1</sup> Fish  $\geq 100$  mm FL Were considered age 1+.

## Data extrapolation

N/mile

Total 766/266 ft = 15,205/mile

>100 mm 25/266 ft = 496/mile

N/acre

Total 766/4921 sq ft = 6,780/acre

>100 mm 25/4921 sq ft = 221/acre

Confidence limits (95% + 20%)

$$\text{C.L.} = + [N (C-R)] / [(C+1) (R+2)]^{1/2}$$

$$\begin{aligned} \text{C.L. (total)} &= [(766) (83-10)] / [(83+1) (10+2)]^{1/2} \\ &= 206 (+/- 27\%) \end{aligned}$$

$$\begin{aligned} \text{C.L. (>100 mm)} &= [(25) (4-1)] / [(4+1) (1+2)]^{1/2} \\ &= 11 (+/- 44\%) \end{aligned}$$

## Section 2 — West pump

Sample date - August 2, 1984

Section location - 1.5 km (0.95 mile) below Hwy. 1

Section length - 100.6 m (330 ft)

Section width (ave.) - 4.33 m (14.2 ft)

Section area (approx.) - 435.3 sq m (4,686 sq ft)

Flow (approx.) -

Water temp. - 18.3 C (65 F) @ 1530

Air temp. - 20.0 C (68 F) @ 1530

Weather - Fog

Sampling crew - G. Smith, B. Smith, A. White, and B. Snider

Sampling method - Mark/recapture using SR Type VII w/block nets

Fishes present - Steelhead, armored threespined stickleback and sculpin (spps.)

Fishes sampled - steelhead

Instream description - Area has been heavily eroded. Large, sheer exposed banks border the entire north side; the south bank is a broad floodplain of loose gravel. Vegetation is largely replanted willows along the north bank, and several naturally occurring willows near the downstream section end where the stream channel begins to migrate south away from the steep bank. Pools (1 1/2 to 3 ft deep) occur in the vicinity of each willow mass (every 20 ft). Cover is from overhanging willow branches and root structures.

Sampling data -

Run 1 (marking run)

631 SH caught total

609 SH marked (545 age 0, 64 age 1)

Run 2 (recapture)

676 SH caught total

450 SH caught unmarked (423 age 0, 27 age 1)  
226 SH recaptured (185 age 0, 41 age 1)

Data expansion Total SH

$$N = 609 (676+1)/(226+1) + 22$$

$$N = 1,838$$

>100 mm

$$N = 64 (68+1)/(41+1) + 1$$

$$N = 106$$

Data extrapolation

N/mile

$$\text{Total } 1,838/330 \text{ ft} = 29,408/\text{mile}$$

$$>100 \text{ mm } 106/330 \text{ ft} = 1,696/\text{mile}$$

N/acre

$$\text{Total } 1,838/4,686 \text{ sq ft} = 17,085/\text{acre}$$

$$>100 \text{ mm } 106/4,686 \text{ sq ft} = 985/\text{acre}$$

Confidence limits

$$\begin{aligned} \text{C.L. (total)} &= [(1,838)(676-226)/(676+1)(226+2)]^{1/2} \\ &= 99 (\pm 5\%) \end{aligned}$$

$$\begin{aligned} \text{C.L. (>100 mm)} &= [(106)(68-41)/(68+1)(41+2)]^{1/2} \\ &= 10 (\pm 9.4\%) \end{aligned}$$

### Section 3 - Scotts Crossing

Sample date - August 2 and 3, 1984

Sample location - 1.69 km (1.05 mile) below Hwy. 1

Section length - 100.5 m (330 ft)

Section width (ave.) - 4.97 m (16.3 ft)

Section area (approx.) - 499.7 sq m (5,379 sq ft)

Flow (ave.) - 0.23 cms (2.5 cfs)

Water temp. - 17.5 C (63.5 F) @1130

Air temp. - 18.3 C (65 F) @1130

Weather - Fog

Sampling crew - G. Smith, B. Smith, A. White, and B. Snider

Sampling method - Mark/recapture using SR Type VII w/block nets.

Fishes present - Steelhead, armored threespined stickleback and sculpin (spps.).

Instream description - Primarily riffle (<8 inches deep) with cobble bottom.

Tail end of section consists of one, large pool formed by a submerged log (30 ft long). A silt layer covered loose gravel in the pool. Cover mainly provided by log in the pool. No vegetation along section.

## Sample results -

### Raw data

Run 1 (marking)

663 SH caught total

443 SH marked (405 age 0, 38 age 1)

Run 2 (recapture)

920 SH caught total

754 SH caught unmarked (727 age 0, 27 age 1)

166 SH recaptured (137 age 0, 29 age 1)

### Calculations

#### Data expansion

Total SH

$$N = 443 (920+1)/(66+1) + 220$$

$$N = 663$$

>100 mm

$$N = 38(44+1)/(28+1) + 3$$

$$N = 57$$

#### Data extrapolation

N/mile

$$\text{Total } 2,663/330 \text{ ft} = 42,608/\text{mile}$$

$$>100 \text{ mm } 57/330 \text{ ft} = 912/\text{mile}$$

N/acre

$$\text{Total } 2,663/5,379 \text{ sq ft} = 21,565/\text{acre}$$

$$>100 \text{ mm } 57/5,379 \text{ sq ft} = 462/\text{acre}$$

#### Confidence limits

$$\begin{aligned} \text{C.L. (Total)} &= [(2,663) (920-166)/(920+1)(166+2)]^{1/2} \\ &= 186 (+/- 1\%) \end{aligned}$$

$$\begin{aligned} \text{C.L. (>100mm)} &= [(57) (44-29)/(44+1)(29+2)]^{1/2} \\ &= 6 (+/- 10.3\%) \end{aligned}$$

Migration - Evidence of migration was inadvertently observed during the survey; 28 fish collected in Sections 2 and 3 were marked in Section 1 in early June.

## Discussion

The production of large, smolt-sized steelhead is significant to the production of sea-run adult steelhead. The lower reach of Brush Creek is a critical component of the Brush Creek fishery because it provides a significant amount of large, smolt-sized fish habitat ( i.e., pools with adequate overhead cover). Even in its degraded condition, the lower reach (typified by Section 2 and 3) appears to be a reservoir for fish produced in the upper reaches (e.g., Section 1 and above) holding large fish wherever pools occur.

The water temperatures in the lower creek are in the high portion of the amenable range for steelhead even during cold, foggy days. If flow were decreased, temperatures would likely increase water temperatures.

The absence of coho in the two samples (over 2,000 fish handled) is of significant concern. Coho were found in the creek as late as 1976 and spawned-out "blackfish" were reportedly found in the lagoon area in more recent years. Coho may occur in the upper drainage, as occurs in Ten-Mile River, but increased siltation from road construction and logging may have affected coho more than steelhead. Coho spawn earlier than steelhead, before the larger winter flows have purged the gravel of silt. The degradation of the lower river (i.e. increased riffle areas decreased pools with the adequate cover) may also be responsible for the apparent disappearance of coho.

Table 1. Summary of SH population sample (Total)

Section	M	C	R	dead <sup>1</sup>	C.L.	N/section	N/mile
1 IFIM	77	83	10	178	+/- 26.9%	766	15,205
2 West pump	609	676	226	22	+/- 5.4*	1,838	29,408
3 Scotts Crossing	443	920	166	220	+/- 7.0%	2,663	42,608

<sup>1</sup> First run

Table 2. Summary of SH population sample (>100 mm)

Section	M	C	R	dead <sup>1</sup>	C.L.	N/section	N/mile
1 IFIM	9	4	1	2	+/- 44.0%	25	496
2 West pump	64	68	41	1	+/- 9.4%	106	1,696
3 Scotts Crossing	38	44	29	3	+/- 10.3%	57	912

<sup>1</sup> First run