Annual Project Performance Report

1. State: California

Grant number: F-122-R

Grant name: California Inland and Anadromous Sport Fish Management and Research

Project number and name: Project 67: Humboldt Bay Juvenile Salmonid Investigations

2. Report Period: July 1, 2007 through June 30, 2008

Report due date: September 15, 2008
Date prepared: August-September 2008

3. Location of work: Humboldt Bay, Humboldt County California, State Congressional District 1

4. Objectives:

1. To describe the use of the tidal portion of Freshwater Creek, Humboldt Bay, by juvenile salmonids.
2. To describe the use of the tidal portion of Elk River, Humboldt Bay, by juvenile salmonids.
3. To describe the use of the tidal portion of Salmon Creek, Humboldt Bay, by juvenile salmonids.
4. To describe the use of the tidal portions of selected smaller Humboldt Bay tributaries by juvenile salmonids.

5. Part of Larger Project: This work is being augmented by California Fisheries Restoration Grant Program to pay for Pacific States Marine Fisheries Commission fishery technicians to conduct the field sampling and a small portion of O&E. Aid in Sport Fish Restoration funds are being used to pay for project biologist, O&E, and a small portion of temporary help for project field work.

This project is also collecting juvenile salmonid emigration timing and relative abundance data to document existing conditions prior to marsh restoration projects already ongoing or planned in the tidal portion of Freshwater Creek Slough, Salmon Creek estuary, Rocky Gulch, Wood Creek, Jacoby Creek, Gannon Slough, and Martin Slough by other government agencies and private and non-profit groups.

6. Describe how the objectives were met:

Introduction

California salmonid populations have declined considerably from historic levels (Brown et al. 1994, Weitkamp et al. 1995; Busby et al. 1996; Myers et al. 1998; CDFG 2002). Humboldt Bay tributary populations of coho salmon, *Oncorhynchus kisutch*, Chinook salmon, *O. tshawytscha*, and steelhead trout, *O. mykiss*, have been listed as threatened by NOAA Fisheries and coho salmon have been listed as threatened by the State of California. The State of California also enacted the Salmon, Steelhead and Anadromous Fisheries Program Act (SB 2261) in 1988 that directed California Department of Fish and Game (CDFG) to develop a statewide plan and

program with the objective of doubling the State's natural anadromous fish production by the end of the 20th century.

Estuaries are important habitat for juvenile salmonids and other popular sport fish species. Numerous studies have documented extended estuarine residence by juvenile Chinook salmon (Reimers 1971; Healey 1982; Kjelson et al.1982; Healey 1991; Wallace 2000), coho salmon (Miller and Sadro 2003; Nielsen 1994; Tschaplinski 1982) and sea-run coastal cutthroat trout (Trotter 1997; Northcote 1997; CDFG 2000; CDFG 2001). Wallace (2006 and 2007) reported that juvenile salmonids, especially young-of-the-year (yoy) coho salmon, rear in Freshwater Creek Slough for significant periods of time making this tidal area important rearing habitat for juvenile salmonids. Prior to this study virtually nothing was known about juvenile salmonid use of Humboldt Bay or the sloughs and tidal portion of its tributaries. Humboldt Bay tributaries support some of the last significant populations of wild coho salmon remaining in California (Brown et al. 1994), as well as Chinook salmon, steelhead trout, and coastal cutthroat trout. An ongoing study by California Department of Fish and Game's (CDFG) Anadromous Fisheries Resource Assessment and Monitoring Program (AFRAMP) made observations that suggest yoy coho salmon and age 1 steelhead may rear downstream of the head of the tide during the spring and summer, then migrate back into Freshwater Creek to over-winter before emigrating to the ocean the following year. Miller and Sadro (2003) documented that yoy coho migrate to the tidal portion of Winchester Creek (a tributary of South Slough, Coos Bay, Oregon) and adjacent tidal freshwater marshes and rear for up to 8 months. CDFG's Natural Stocks Assessment Project (NSA) sampled Freshwater Creek Slough 2003 through 2006 and Elk River 2005 and 2006 and found that some yoy coho salmon reared throughout the summer and into the fall and that yoy Chinook salmon reared for up to 8 weeks in Freshwater Creek Slough in 2003 (Wallace and Allen 2007; CDFG 2007; Wallace 2006; CDFG 2006).

The majority of tidal wetlands around Humboldt Bay have been diked and converted to pasture land during the past 150 years (HBWAC 2005). Currently, historic pieces marshland habitat around Humboldt Bay are being acquired by various public agencies and numerous marsh restoration projects are being planned or implemented near Humboldt Bay tributaries such as Wood Creek and Fay Slough (tributaries to Freshwater Creek Slough), Martin Slough (tributary to Elk River Slough), Salmon Creek, Rocky Gulch, McDaniel Slough, Jacoby Creek, and Gannon Slough. Most if not all Humboldt Bay sloughs are now contained between levees and their adjacent marshes converted to pasture lands. Restoring these marshes will likely benefit coho salmon and steelhead trout as well as juvenile Chinook salmon, coastal cutthroat trout and other estuarine fishes.

During the duration of this contract period (2007-2008) NSA continued to sample the tidal portion of Freshwater Creek Slough, Elk River Slough, and Salmon Creek estuary to document their use by juvenile salmonids. Starting in early 2007 NSA began sampling smaller Humboldt Bay tributaries such as Jacoby Creek/Gannon Slough, Martin Slough, Rocky Gulch, and Wood Creek to determine if juvenile salmonids use these very small estuaries as rearing habitat or if they offer over wintering habitat during high stream flow events. By describing life history traits and habitat needs of juvenile coho salmon, Chinook salmon, steelhead trout, and sea-run coastal cutthroat trout this project hopes to provide important data to the restoration community to help restoration planning projects succeed. This project will provide "snapshots" of juvenile salmonid use of these areas before and after restoration projects.

Methods

NSA conducted weekly sampling for juvenile salmonids in Freshwater Creek Slough and Elk River Slough, in July and August 2007 and March through June 2008 and biweekly sampling September 2007 through March 2008 (Figure 1). In Hookton Slough/Salmon Creek NSA conducted biweekly sampling from July 2007 to June 2008. NSA used a 100 ft X 5 ft seine net to capture fish in lower Freshwater Creek, Elk River, and Hookton Sloughs, and a 30 ft X 4 ft seine net to capture fish in upper Freshwater Creek, Elk River, and Salmon Creek Sloughs. I

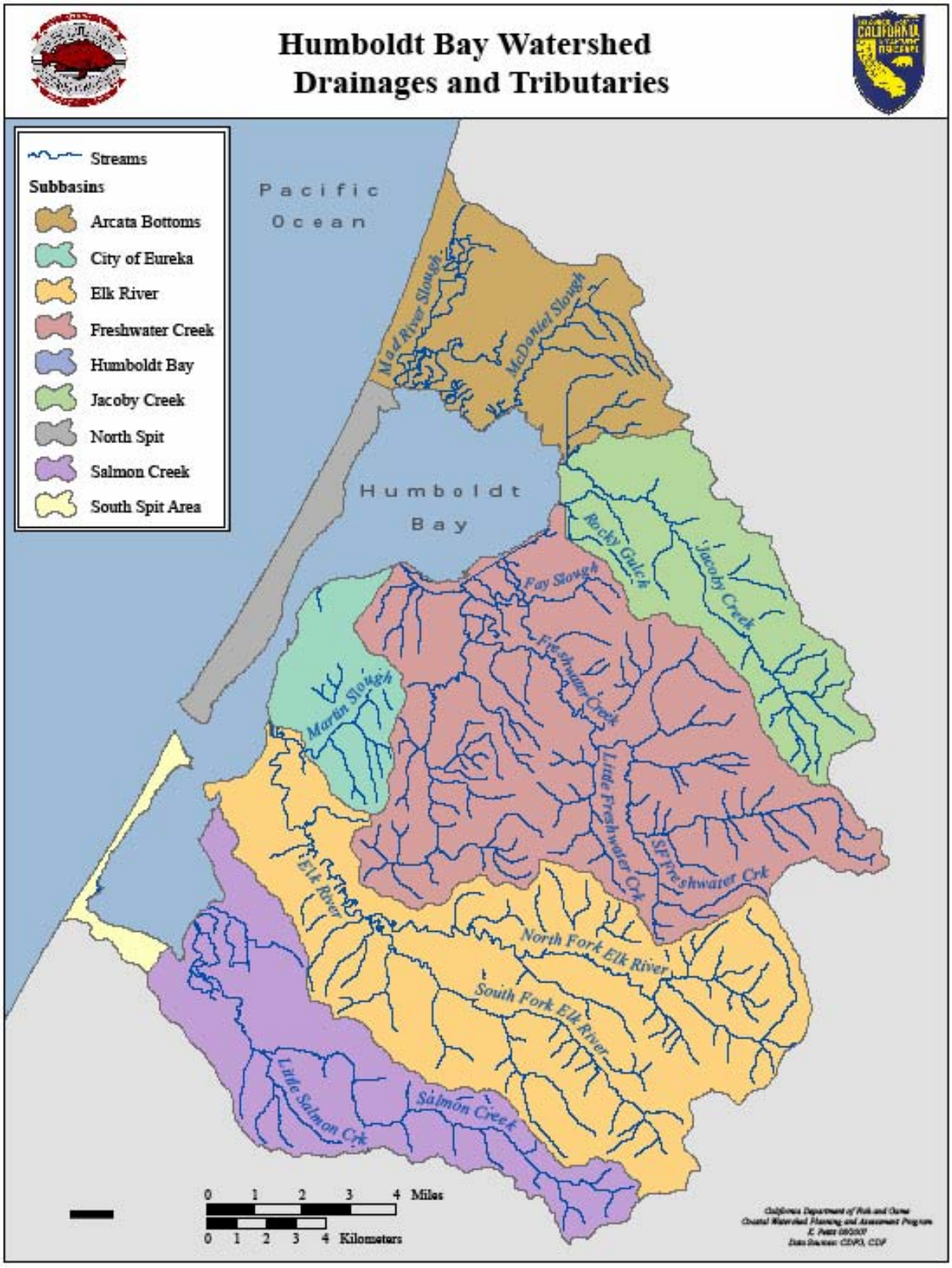

Figure 1. Map of Humboldt Bay tributaries.

stratified sampling between the upper and lower sloughs due to differences in water salinity and the need to use different gear types between the upper and lower sections of the sloughs (Figure 1). NSA also initiated monthly sampling in numerous smaller Humboldt Bay tributaries in 2006 and 2007. We used a 100 ft X 5 ft seine net to capture fish in Martin Slough pond; a 30 ft X 4 ft seine to capture fish in the slough sections of Jacoby Creek/Gannon Slough, Martin Slough and Rocky Gulch; and minnow traps baited with frozen salmon roe in sections of Gannon Slough, Martin Slough, Rocky Gulch, and Wood Creek where we were unable to seine (Figure 1). In the spring of 2008 NSA also assisted AFRAMP with the operation of a juvenile fish weir set up at the Humboldt Fish Action Council (HFAC) weir site in upper Freshwater Creek Slough to capture juvenile salmonid smolts emigrating from Freshwater Creek. The HFAC weir was run in conjunction with another AFRAMP weir located about 3 km upstream in order to generate coho salmon and steelhead smolt production estimates passing each weir. This allowed us to segregate smolt production between the approximate 3 km of estuarine/freshwater ecotone between the weirs from the approximately 23 km of stream habitat above the upstream weir. NSA applied passive integrated transponder (PIT) tags to all healthy juvenile salmonids $\geq$70 mm FL to gather residency, movement, and growth information while they were in the estuary. Beginning in the spring of 2008 due to the recent availability smaller tags we applied PIT tags to juvenile salmonids $\geq$55 mm FL.

Results

Freshwater Creek Slough

July-December 2007. During July-December 2007 young-of-the-year (yoy) coho salmon were the most common salmonid captured in upper Freshwater Creek Slough (Table 1). The peak catch of yoy coho salmon was 1.33 fish/set and it occurred in late July (peak catches for the calendar year occurred in mid June). During the same period last year the peak catch of yoy coho salmon was 3.92 fish/set and it occurred in late July (CDFG 2007). Overall, CPUE of yoy coho was considerably lower than past years. Their weekly mean FL increased from 74 mm in mid July to 90 mm in mid November. Based on marked and recaptured individuals yoy coho salmon resided in the tidal freshwater portion of Freshwater Creek Slough throughout the summer. Most project marked yoy coho salmon were recaptured at the same site where they were originally marked indicating that they moved very little while residing in the slough. We captured a few yoy Chinook salmon in July and August (Table 1). Their peak catch of 0.42 fish/set occurred in mid July. Their weekly mean FL increased from 72 in July to 77 mm in August. We captured one 1+ coho salmon in late July and it was 123 mm FL. We also commonly captured juvenile steelhead trout in the upper slough throughout the sampling season. Their peak catch of 0.75 fish/set occurred in early October. We captured cutthroat trout in the upper slough from late August to late November and their peak catch was 0.25 fish/set in early October.

The only juvenile salmonid we captured in lower Freshwater Creek Slough during July-December 2007 was a steelhead 153 mm FL in early July (Table 2).

PIT Tag Results for 2007. The yoy coho salmon PIT tagged by NSA resided in the tidal freshwater portion of Freshwater Creek Slough throughout the summer. We applied PIT tags to 65 yoy coho in 2007 and recaptured 12 (18.5%) of them (Table 3). Their mean length of residence was 68 days and ranged from 6 to 167 days. In 2006 their mean length of residence was 33 days and ranged from 5 to 106 days (CDFG 2007). Based on the arrival of yoy coho to the slough in April and the little movement they showed it is very likely that yoy coho resided in the slough one to two months before they were large enough to tag. Therefore, the residence times presented in this report should be considered minimum residence times. Nine out of 12 (75.0%) project marked yoy coho salmon were recaptured at the same site where they were originally marked indicating that they moved very little while residing in the slough. The mean growth rate of the 10 recaptured yoy coho salmon at large for at least 13 days was 0.17 mm/day and ranged from 0.12 to 0.45 mm/day (Table 3). In 2006 the mean growth rate of 46 recaptured yoy coho salmon at large for at least two weeks was 0.15 mm/day and ranged from

Table 1. Monthly catch-per-unit-effort (CPUE) and fork length (FL) in millimeters of young-of-the-year (yoy) Chinook salmon, yoy coho salmon, yearling and older coho salmon, juvenile steelhead trout, and cutthroat trout in upper Freshwater Creek Slough, July-December 2007. CPUE is number of fish per seine haul.

		YOY Chinook			YOY Coho			Yearling Coho			Steelhead			Cutthroat		
	No.		Mean			Mean			Mean			Mean			Mean	
Month	Sets	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range
July	48	0.13	72	70-77	0.77	79	69-91	0.02	123	123	0.08	83	70-106	0	-	-
Aug	60	0.02	77	77	0.15	86	80-97	0	-	-	0.17	77	63-122	0.05	182	163-200
Sept	24	0	-	-	0.13	88	85-94	0	-	-	0.33	75	70-79	0.04	226	226
Oct	24	0	-	-	0.83	86	63-105	0	-	-	0.58	99	73-174	0.21	185	152-247
Nov	24	0	-	-	0.13	85	76-101	0	-	-	0.04	192	192	0.13	204	146-248
Dec	12	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-

Table 2. Monthly catch-per-unit-effort (CPUE) and fork length (FL) in millimeters of young-of-the-year (yoy) Chinook salmon, yoy coho salmon, yearling and older coho salmon, juvenile steelhead trout, and cutthroat trout in lower Freshwater Creek Slough, July-December 2007. CPUE is number of fish per seine haul.

		YOY Chinook			YOY Coho			Yearling Coho			Steelhead			Cutthroat		
	No.		Mean			Mean			Mean			Mean			Mean	
Month	Sets	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range
July	27	0	-	-	0	-	-	0	-	-	0.04	153	153	0	-	-
Aug	28	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Sept	7	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Oct	14	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Nov	14	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-

Table 3. Summary of residence times of young-of-the-year (yoy) coho salmon, yearling and older coho salmon, juvenile steelhead trout, and cutthroat trout based on Passive Integrated Transponder (PIT) tag data in Freshwater Creek Slough, January-December 2007. Mean days at liberty (DAL) and mean growth rates were not calculated for recaptured fish with sample sizes of less than 10. Growth rates are millimeters per day and mean growth rates were calculated for fish at large ≥13 days except where noted.

Species	Number Tagged	Number Recaptured	Percent Recaptured	Mean DAL	Range DAL	Percent Recap at Same Site	Number With DAL >12 Days	Mean Growth Rate	Range Growth Rate
Yoy Coho	65	12	18.5	68	6-167	75.0	10	0.17	0.12-0.45
1+ Coho	115	22	19.1	21	5-224	100	15	0.43	0.23-0.60
Steelhead	45	8	17.8	-	14-124	87.5	8	-	0.14-0.34
Cutthroat	14	3	21.4	-	8-295	66.7	2	-	0.13-0.27

0 to 0.29 mm/day (CDFG 2007). We applied PIT tags to 115 yearling coho in 2007 and recaptured 22 (19.1%) of them (Table 3). Their estuarine residence ranged from 5 to 224 days (one recaptured coho was marked in September 2006). All project marked yearling coho were recaptured at the same site where they were marked indicating that they moved very little while residing in the slough. We also captured another 48 yearling coho that were tagged by other projects in the Freshwater Creek basin. The mean growth rate of the 15 recaptured yearling coho salmon at large for at least 13 days was 0.43 mm/day and ranged from 0.23 to 0.60 mm/day (Table 3). The 15 coho includes those marked both by NSA and other projects where we had FL information at least 13 days apart. We applied PIT tags to 45 juvenile steelhead in 2007 and recaptured eight (17.8%) of them (Table 3). They were at large for 14 to 124 days. Seven of eight (87.5%) project marked steelhead were recaptured at the same site where they were marked. We also captured another six juvenile steelhead that were tagged by other projects in the Freshwater Creek basin. The growth rates of the eight recaptured juvenile steelhead at large for at least 13 days ranged from 0.14 to 0.34 mm/day. We applied PIT tags to 14 cutthroat trout in 2007 and recaptured three (21.4%) of them (Table 3). They were at large from 8 to 295 days. Two fish were recaptured at the same site where they were marked. We also captured another eight cutthroat trout that were tagged by other projects in the Freshwater Creek basin. The growth rates were 0.27 mm/day for the fish at large for 70 days (6/13-8/22) and 0.13 mm/day for the fish at large 295 days (6/26/06-4/16/07). It is likely that some of the cutthroat trout captured by our project were resident adult fish.

January-June 2008. We captured very few salmonids in upper Freshwater Creek Slough in 2008 and none prior to April (Table 4). Our catches of yearling coho in 2008 were substantially lower than the same time period last year. In 2008 NSA captured yearling coho salmon from mid April to late June. Their peak catches occurred in May with a high of 0.70 fish/set in mid May. In 2007 their peak catches occurred in April and May with a high of 7.75 fish/set in late April and 3.58 fish/set in mid May (CDFG 2007). Their monthly mean FL's from April to June varied little ranging from 104 to 107 mm which was about 5 mm larger than last year. Our catches of yoy coho were markedly lower than last year. NSA captured yoy coho salmon from mid May to late June and the peak catch of 0.20 fish/set occurred in late May and early June. In 2007 NSA captured yoy coho salmon from mid April to late June and the peak catch of 2.25 fish/set occurred in mid June (CDFG 2007). Their weekly mean FL increased from 39 mm in mid May to 73 mm in late June. NSA captured yoy Chinook salmon from late May to late June with the peak catch of 0.25 fish/set occurring in late June. Their weekly mean FL increased from 60 mm in late May to 69 mm in late June. NSA captured a total of 16 juvenile steelhead from early May to late June with the peak catch of 0.40 fish/set occurring in early June. Their FL's ranged from 58 to 161 mm (Table 4). NSA captured six cutthroat trout from early May to late June with no discernable peak catch. Their FL's ranged from 133 to 167 mm (Table 4).

We captured very few juvenile salmonids in lower Freshwater Creek Slough from January to June 2008 and none prior to April (Table 5). We captured only nine yearling coho from January-June 2008 compared to 11, 19 and 122 during the same time periods in 2007, 2006 and 2005, respectively. Our peak 2008 catches of yearling coho salmon occurred in mid May. Their weekly mean FL increased from 113 mm in late April to 122 mm in late June. NSA captured three yoy Chinook salmon in mid to late June and they were 70 to 73 mm FL. NSA captured a total of three juvenile steelhead, all in mid May. Their FL's ranged from 143 to 160 mm (Table 5). NSA captured a total of three cutthroat trout from mid May to early June. Their FL's ranged from 167 to 214 mm (Table 5). We did not capture any yoy coho salmon in the lower slough.

We are still analyzing PIT tag information for 2008 and these results will be reported in our project's 2008/09 SFRA Annual Report.

Table 4. Monthly catch-per-unit-effort (CPUE) and fork length (FL) in millimeters of young-of-the-year (yoy) Chinook salmon, yoy coho salmon, yearling and older coho salmon, juvenile steelhead trout, and cutthroat trout in upper Freshwater Creek Slough, January-June 2008. CPUE is number of fish per seine haul.

		YOY Chinook			YOY Coho			Yearling Coho			Steelhead			Cutthroat		
	No.		Mean			Mean			Mean			Mean			Mean	
Month	Sets	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range
Jan	10	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Feb	10	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Mar	12	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Apr	34	0	-	-	0	-	-	0.09	104	99-110	0	-	-	0	-	-
May	46	0.02	60	60	0.07	39	39	0.43	105	74-125	0.09	112	94-161	0.11	149	133-167
June	44	0.16	66	59-72	0.09	66	55-73	0.25	107	101-112	0.27	95	58-123	0.02	145	145

Table 5. Monthly catch-per-unit-effort (CPUE) and fork length (FL) in millimeters of young-of-the-year (yoy) Chinook salmon, yoy coho salmon, yearling and older coho salmon, juvenile steelhead trout, and cutthroat trout in lower Freshwater Creek Slough, January-June 2008. CPUE is number of fish per seine haul.

		YOY Chinook			YOY Coho			Yearling Coho			Steelhead			Cutthroat		
	No.		Mean			Mean			Mean			Mean			Mean	
Month	Sets	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range
Jan	13	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Feb	12	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Mar	13	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Apr	19	0	-	-	0	-	-	0.21	113	105-127	0	-	-	0	-	-
May	25	0	-	-	0	-	-	0.16	114	101-124	0.07	154	143-160	0.08	195	167-214
June	21	0.14	71	70-73	0	-	-	0.05	122	122	0	-	-	0.05	206	206

Downstream Migrant Weir. AFRAMP estimated that 38% of the coho salmon smolt production passing the HFAC weir in 2008 originated from the lower 3 km (11.5% of habitat) of the basin (Seth Ricker, CDFG, personal communication). In 2007, AFRAMP estimated 41% of the coho smolt production originated in the lower 3 km of habitat (CDFG 2007). AFRAMP also estimated that 82% of the steelhead smolts originated in the lower 3 km in 2008 compared to 2007 when they estimated >90% of the steelhead smolts originated from this area (Seth Ricker, CDFG, personal communication). These findings illustrate the importance of the estuarine/freshwater ecotone to juvenile salmonids. Freshwater Creek/Slough in this area is confined within a narrow channel bordered by steep banks. It has a low gradient with slow stream velocity and is relatively deep with ample small woody debris cover. The low stream velocity coupled with highly productive habitat found along the lower valley floor of Freshwater Creek and slough probably provides good over-wintering habitat for juvenile salmonids during moderate flows. Low velocity habitats such as off channel ponds, side channels, sloughs, and wetlands often produce high survival and growth of juvenile coho salmon (Sandercock 1991; Jones and Moore 2000; Quinn 2005). However, there is very little off channel habitat in this section of stream so there is little refuge from high flow events in winter.

Elk River Slough

July-December 2007. During July-December 2007 yoy coho salmon were by far the most common salmonid captured in upper Elk River Slough (Table 6). The peak catch of yoy coho salmon was 5.13 fish/set and occurred in mid July. During July-December 2006 the peak catch of yoy coho salmon was 2.50 fish/set and occurred in early August (CDFG 2007). Their weekly mean FL increased from 67 mm in early July to 90 mm in late September and then dropped to 78 mm in December. Based on marked and recaptured individuals yoy coho salmon resided in the tidal freshwater portion of Elk River Slough throughout the summer. Most project marked yoy coho salmon were recaptured at the same site where they were originally marked indicating that they moved very little while residing in the slough. After the first significant rain event of the year in November it appeared that yoy coho redistributed themselves in the basin. We came to this conclusion because the relatively large PIT tagged coho we captured throughout the summer were replaced in our catches by much smaller unmarked yoy coho. We captured three yearling coho in the upper slough from early to mid July (Table 6). Their FL's ranged from 100-114 mm (Table 6). We captured four yoy Chinook salmon in mid July. Their FL's ranged from 72-80 mm FL (Table 6). We captured juvenile steelhead in the upper slough from early July to late October. Their peak catch was 0.63 fish/set in mid July. Their monthly mean FL ranged from 109-159 mm and individuals ranged from 75 to 167 mm (Table 6). We captured 13 cutthroat trout in the upper slough from early July to late October with no discernable peak in abundance. They ranged in size from 148 to 217 mm FL.

During July-December 2007 we captured relatively few juvenile salmonids in lower Elk River Slough (Table 7). Yoy Chinook salmon and yoy coho salmon were the most common salmonids captured in lower Elk River Slough during this time period (Table 7). Field crews captured 23 yoy coho salmon in December with a mean FL of 73 mm. This was the only week we captured yoy coho in the lower slough and it occurred after the first significant rain/flow event of the year. None of these "December" fish contained PIT tags and they were markedly smaller than the coho we captured throughout the summer in the upper slough. Again this suggests a fall redistribution of upstream coho in Humboldt Bay tributaries that has been noted in other river basins (Sandercock 1991; Jones and Moore 2000; Quinn 2005). NSA captured 22 yoy Chinook salmon from early July to early August with a peak catch of 2.40 fish/set in mid July. Their weekly mean FL remained near 80 mm throughout the sampling season. Field crews captured one juvenile steelhead in mid September and it was 169 mm FL. NSA captured one cutthroat trout in early July and it was 270 mm FL. We did not capture any yearling coho in the lower slough during this time period.

PIT Tag Results for 2007. NSA applied PIT tags to 180 yoy coho in 2007 and recaptured 55 (30.6%) of them (Table 8). The PIT tagged yoy coho salmon resided in the tidal freshwater

Table 6. Monthly catch-per-unit-effort (CPUE) and fork length (FL) in millimeters of young-of-the-year (yoy) Chinook salmon, yoy coho salmon, yearling and older coho salmon, juvenile steelhead trout, and cutthroat trout in upper Elk River Slough, July-December 2007. CPUE is number of fish per seine haul.

		YOY Chinook			YOY Coho			Yearling Coho			Steelhead			Cutthroat		
	No.		Mean			Mean			Mean			Mean			Mean	
Month	Sets	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range
July	32	0.13	76	72-80	3.59	73	52-95	0.09	105	100-114	0.25	114	92-126	0.16	169	148-194
Aug	38	0	-	-	3.08	80	65-100	0	-	-	0.24	109	75-157	0.05	191	188-194
Sept	16	0	-	-	1.44	90	84-97	0	-	-	0.25	130	127-132	0	-	-
Oct	16	0	-	-	2.38	86	54-97	0	-	-	0.13	159	151-167	0.13	207	196-217
Nov	16	0	-	-	0.56	78	58-100	0	-	-	0	-	-	0	-	-
Dec	8	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-

Table 7. Monthly catch-per-unit-effort (CPUE) and fork length (FL) in millimeters of young-of-the-year (yoy) Chinook salmon, yoy coho salmon, yearling and older coho salmon, juvenile steelhead trout, and cutthroat trout in lower Elk River Slough July-December 2007. CPUE is number of fish per seine haul.

		YOY Chinook			YOY Coho			Yearling Coho			Steelhead			Cutthroat		
	No.		Mean			Mean			Mean			Mean			Mean	
Month	Sets	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range
July	25	0.80	82	68-93	0	-	-	0	-	-	0	-	-	0.04	270	270
Aug	19	0.11	68	60-75	0	-	-	0	-	-	0	-	-	0	-	-
Sept	10	0	-	-	0	-	-	0	-	-	0.10	169	169	0	-	-
Oct	10	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Nov	11	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Dec	5	0	-	-	4.60	73	57-98	0	-	-	0	-	-	0	-	-

Table 8. Summary of residence times of young-of-the-year (yoy) coho salmon, yearling and older coho salmon, yoy Chinook salmon, juvenile steelhead trout, and cutthroat trout based on Passive Integrated Transponder (PIT) tag data in Elk River Slough, January-December 2007. Mean days at liberty (DAL) were not calculated for sample sizes less than 10. Growth rates are millimeters per day and mean growth rates were calculated for fish at large at least 13 days except where noted.

Species	Number Tagged	Number Recaptured	Percent Recaptured	Mean DAL	Range DAL	Percent Recap at Same Site	Number With DAL >12 Days	Mean Growth Rate	Range Growth Rate
Yoy Coho	180	55	30.6	44	5-124	98.2	51	0.16	0.00-0.38
1+ Coho	240	14	5.8	-	7-256	87.5	4	-	0.04-0.54
Yoy Chinook	29	0	0	-	-	-	-	-	-
Steelhead	37	5	13.5	-	8-57	100	3	-	0.19-0.27
Cutthroat	16	2	12.5	-	29-347	100	2	-	0.03-0.52

portion of Elk River Slough throughout the summer. Their mean length of residence was 44 days (n=55) and ranged from 5-124 days (Table 8). In 2006 their mean length of residence was 39 days (n=41) and ranged from 6 to 128 days (CDFG 2007). All but one project marked yoy coho salmon were recaptured at the same site where they were originally marked indicating that they moved very little while residing in the slough. The mean growth rate of the 51 recaptured yoy coho at large for greater than twelve days was 0.16 mm/day and ranged from 0 to 0.38 mm/day. In 2006 the mean growth rate of the 30 recaptured yoy coho at large for at least two weeks was 0.19 mm/day and ranged from 0.07 to 0.39 mm/day (CDFG 2007). We applied PIT tags to 240 yearling coho in 2007 and recaptured 14 (5.8%) of them (Table 8). They were at large for 7 to 256 days. Seven of eight (87.5%) fish marked and recaptured by NSA were recaptured at the same site where they were marked. One fish was marked on September 6, 2006 and recaptured on May 22, 2007. We applied PIT tags to 29 yoy Chinook in 2007 but did not recapture any of them (Table 8). We applied PIT tags to 37 juvenile steelhead in 2007 and recaptured five (13.5%) of them (Table 8). They were at large for 8-57 days and had growth rates of 0.19-0.27 mm/day. They were all recaptured at the same site where they were originally marked. We applied PIT tags to 16 cutthroat trout in 2007 and recaptured two (12.5%) of them (Table 8). They were at large for 29 and 347 days and had growth rates of 0.52 and 0.03 mm/day, respectively. They were both recaptured at the same site where they were originally marked. One fish was marked on October 26, 2006 and recaptured on October 8, 2007. It is likely that some of the cutthroat trout captured by our project were resident adult fish.

January-June 2008. Due to high stream flows we conducted little sampling in upper Elk Slough January to March 2008. Yearling and yoy coho salmon were the most common salmonids captured in upper Elk River Slough (Table 9). NSA captured yearling coho salmon from early April to late June and their peak catches of 4.38 and 4.25 fish/set occurred in late April and mid May, respectively. In 2006 NSA captured yearling coho salmon from early May to late June and their peak catch of 4.14 fish/set occurred in mid May (CDFG 2007). Their weekly mean FL's ranged between 99 and 112 mm throughout the sampling period with no apparent pattern. NSA captured yoy coho salmon from late April to late June and their peak catch of 7.13 fish/set occurred in late June. In 2006 NSA captured yoy coho salmon from early May to late June and their peak catch of 5.38 fish/set occurred in late June (CDFG 2007). Their weekly mean FL increased from 39 mm in late April to 68 mm in late June. NSA captured nine juvenile steelhead, all but one was captured after early May. Their FL's ranged from 100-203 mm (Table 9). NSA captured two cutthroat trout, one in late April and the other in mid June. Their FL's were 132 and 137 mm (Table 9). NSA did not capture any yoy Chinook salmon in upper Elk River Slough.

During January-June 2008 yearling coho salmon were the most common salmonid captured in lower Elk River Slough (Table 10). NSA captured yearling coho salmon from early January to late June. Their peak catches occurred in May and June with a high of 8.75 fish/set in late June. The high CPUE in June was mostly due to high catches in the two sites closest to the river mouth. The high catches at these sites likely include coho from other Humboldt Bay tributaries. Two yearling coho salmon marked in Freshwater Creek basin were recaptured by our project in lower Elk River Slough. One of the coho was tagged at the Humboldt Fish Action Council (HFAC) weir on May 8, 2007, recaptured at HFAC on May 10, and then captured in Elk River Slough (about 1/4 to 1/2 mile upstream of the mouth of Elk River) on May 21. It was 107 mm FL when it was tagged and 108 mm FL when captured in Elk River Slough. The other coho was tagged in Cloney Gulch (tributary to Freshwater Creek) on April 8, 2007, recaptured in Cloney Gulch on April 9, and then captured in Elk River Slough (about 1/4 to 1/2 mile upstream of the mouth of Elk River) on May 21. It was 103 mm FL when it was tagged and 126 mm FL when recaptured in Elk River Slough. This is the first confirmation that juvenile salmonids from other Humboldt Bay tributaries move into lower Elk River slough on their way to the ocean. This information suggests that juvenile salmonids will utilize non-natal sloughs and marshes while rearing or migrating through Humboldt Bay. Also, the size of coho captured at the two lower

Table 9. Monthly catch-per-unit-effort (CPUE) and fork length (FL) in millimeters of young-of-the-year (yoy) Chinook salmon, yoy coho salmon, yearling and older coho salmon, juvenile steelhead trout, and cutthroat trout in upper Elk River Slough, January-June 2008. CPUE is number of fish per seine haul.

		YOY Chinook			YOY Coho			Yearling Coho			Steelhead			Cutthroat		
	No.		Mean			Mean			Mean			Mean			Mean	
Month	Sets	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range
Jan	8	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Feb	7	0	-	-	0	-	-	0	-	-	0.14	203	203	0	-	-
Mar	6	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Apr	40	0	-	-	0.03	39	39	1.25	111	80-125	0	-	-	0.03	132	132
May	24	0	-	-	2.67	53	39-63	2.75	107	87-125	0.17	124	100-147	0	-	-
June	32	0	-	-	5.28	63	45-79	0.47	106	94-116	0.13	128	115-148	0.03	137	137

Table 10. Monthly catch-per-unit-effort (CPUE) and fork length (FL) in millimeters of young-of-the-year (yoy) Chinook salmon, yoy coho salmon, yearling and older coho salmon, juvenile steelhead trout, and cutthroat trout in lower Elk River Slough, January-June 2008. CPUE is number of fish per seine haul.

		YOY Chinook			YOY Coho			Yearling Coho			Steelhead			Cutthroat		
	No.		Mean			Mean			Mean			Mean			Mean	
Month	Sets	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range
Jan	8	0	-	-	0	-	-	0.25	72	55-89	0	-	-	0	-	-
Feb	10	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Mar	10	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Apr	20	0	-	-	0	-	-	1.19	119	94-143	0.05	236	236	0	-	-
May	20	0	-	-	0	-	-	1.90	109	90-133	0	-	-	0	-	-
June	23	0.17	82	79-86	0	-	-	1.83	120	101-143	0	-	-	0.04	163	163

sites (especially in June) were substantially larger than outmigrating coho captured upstream or in other Humboldt Bay tributaries suggesting they have been rearing in Humboldt Bay. USFWS found that in 2007 coho salmon smolts resided for an average of two weeks and as long as four weeks in Humboldt Bay (Bill Pinnix, USFWS, presentation at the 2008 Humboldt Bay Symposium). In 2006 yearling coho peak catches occurred in May with a high of 26.80 fish/set in mid May with most of the coho captured at our most downstream sites (CDFG 2007). Their weekly mean FL increased from 72 mm in early January to 123 mm in late June. NSA captured four yoy Chinook salmon in early to mid June and their FL's ranged from 79-86 mm FL (Table 10). NSA captured one juvenile steelhead in late April and it was 236 mm FL. NSA captured one cutthroat trout in late June and it was 163 mm FL.

We are still analyzing PIT tag information for 2008 and these results will be reported in our project's 2008/09 SFRA Annual Report.

Martin Slough

July-December 2007. Juvenile coho salmon were the most abundant salmonids captured in Martin Slough (Table 11). Based on their size and appearance they were probably yoy fish but we did not examine scales to confirm this. On average the coho we captured in Martin Slough were larger than those captured in any other Humboldt Bay tributary. Their monthly mean FL increased August through October but dropped in November. Smaller sized coho appeared in Martin Slough, and many of our other sample sites around Humboldt Bay, after storms increased stream flows. This provides more evidence that juvenile coho salmon residing upstream redistribute themselves in the fall to the stream-estuary ecotone seeking low velocity over-winter habitat. We also captured two juvenile steelhead in September and October. They were 223 and 177 mm FL, respectively (Table 11). We caught two cutthroat trout in September and December. They were 208 and 192 mm FL, respectively (Table 11).

January-June 2008. Juvenile coho salmon were by far the most abundant salmonids captured in Martin Slough (Table 11). Based on their size and appearance they were probably yearling and older fish but we did not examine scales to confirm this. On average the coho we captured in Martin Slough were larger than those captured in any other Humboldt Bay tributary. Our juvenile coho catches remained high throughout the winter and into spring indicating coho were using Martin Slough as over-winter habitat. Their monthly mean FL's increased from 81 mm in January to 111 mm in May (0.24 mm/day). In 2007 recaptured PIT tagged coho grew 0.27-0.33 mm/day (see below). We also captured five cutthroat trout, all in June. Their mean FL was 224 mm and ranged from 181-264 mm.

During the entire year we also captured adult cutthroat trout, threespine stickleback, prickly sculpin, Pacific staghorn sculpin, red legged frog, and rough skin newt.

PIT Tag Results for 2007. We applied PIT tags to 36 yoy and 71 yearling and older coho salmon and recaptured four (11.1%) yoy and one (1.4%) yearling PIT tagged coho. The yearling coho was at large from May 10 to June 18 (39 days) and grew 40 mm (1.03 mm/day). Three of the recaptured yoy coho were at large from September 18 to October 18 (30 days) and grew 8-11 mm (0.27-0.33 mm/day). The other recaptured yoy coho was at large from September 18 to November 15 (58 days) and grew 17 mm (0.29 mm/day). All fish were marked and recaptured in the 17th hole pond where we originally tagged them.

Rocky Gulch

July-December 2007. Cutthroat trout were the most abundant salmonids captured in Rocky Gulch with their highest catches occurring in September (Table 11). Their FL's ranged from 98 to 158 mm. We captured one yoy coho salmon in October.

Table 11. Summary of the number and fork length (FL) information of juvenile salmonids captured in Martin Slough, Rocky Gulch, Wood Creek, and numbers only for Gannon Slough, and Jacoby Creek, July 2007 through June 2008. (MT=minnow trap)

Martin Slough

Date	Coho Salmon			Steelhead/RT			Cutthroat Trout		
	No.	FL	Range	No.	FL	Range	No.	FL	Range
8-16-07	3	100	99-102	0	-	-	0	-	-
9-18-07	14	106	97-111	1	223	223	1	208	208
10-18-07	14	115	95-127	1	177	177	0	-	-
11-15-07	8	91	64-123	0	-	-	0	-	-
12-11-07	0	-	-	0	-	-	1	192	192
1-10-08	28	81	61-113	0	-	-	0	-	-
2-05-08	37	89	66-118	0	-	-	0	-	-
3-04-08	58	95	68-124	0	-	-	0	-	-
4-08-08	65	107	89-136	0	-	-	0	-	-
5-13-08	11	111	94-121	0	-	-	0	-	-
6-12-08	0	-	-	0	-	-	5	224	181-264

Rocky Gulch

Date	Coho Salmon			Steelhead/RT			Cutthroat Trout		
	No.	FL	Range	No.	FL	Range	No.	FL	Range
7-31-07	0	-	-	0	-	-	4	121	112-132
9-17-07	0	-	-	0	-	-	10	126	98-158
10-17-07	1	85	85	0	-	-	1	128	128
11-16-07	0	-	-	0	-	-	2	116	112-120
1-16-08	0	-	-	0	-	-	0	-	-
2-14-08	0	-	-	0	-	-	0	-	-
3-19-08	20	96	87-106	1	129	129	0	-	-
4-18-08	16	100	82-112	0	-	-	2	124	100-148
6-25-08	0	-	-	0	-	-	1	138	138

Wood Creek

Date	Coho Salmon			Steelhead/RT			Cutthroat Trout		
	No.	FL	Range	No.	FL	Range	No.	FL	Range
7-10-07	12*	70	56-89	0	-	-	2	128	120-135
8-12-07	4	93	83-105	0	-	-	2	117	113-120
9-17-07	1	98	98	0	-	-	0	-	-
10-16-07	3	96	82-110	1	135	135	2	139	137-140
11-16-07	9	95	68-109	0	-	-	0	-	-
12-12-07	5	87	65-102	0	-	-	0	-	-
1-09-08	31	74	58-112	0	-	-	0	-	-
2-06-08	47	84	55-112	0	-	-	2	125	110-140
3-06-08	47	95	73-116	0	-	-	0	-	-
4-04-08	39	95	65-115	1	125	125	2	96	92-100
5-02-08	11	98	83-117	0	-	-	2	123	121-125
6-03-08	0	-	-	0	-	-	1	130	130

* includes one yearling coho not included in size information

	Gannon Slough					Jacoby Creek				
Date	Effort		Coho	SH	Cutt	Effort	Coho	SH	Cutt	Yoy Trout
	MT	Seine				Seine				
9-28-07	4	0	0	0	0	-	-	-	-	-
10-31-07	3	5	0	0	0	2	0	0	0	3
12-4-07	4	6	0	0	0	-	-	-	-	-
1-15-08	5	6	0	0	0	2	0	0	0	0
2-14-08	5	6	0	0	0	2	0	0	0	0
3-13-08	5	6	0	0	0	0	-	-	-	-
4-14-08	5	6	2	0	0	2	0	0	0	0
5-13-08	7	2	0	0	0	2	0	0	0	0
6-12-08	6	4	0	0	0	2	2	0	0	5

January-June 2008. Juvenile coho salmon were the most abundant salmonids captured in Rocky Gulch with all of them being in captured in March and April (Table 11). Based on their size and appearance the coho captured were probably yearling fish, but we did not examine scales to confirm this. It appeared that all yearling coho salmon had emigrated from Rocky Gulch by late June since our catches dropped from over 20 coho in February, March, and April to 0 fish in June.

During the entire year we also captured tidewater goby, threespine stickleback, prickly sculpin, and Pacific staghorn sculpin.

PIT Tag Results for 2007. We applied PIT tags to 62 yearling and one yoy coho salmon and recaptured six (9.7%) PIT tagged yearling coho. The yearling coho were at large 10 to 37 days (mean=31 days), all between March 13 and April 19, and grew 2-11 mm. The mean growth rate for the five fish at large at least two weeks was 0.31 mm/day and ranged from 0.27 to 0.41 mm/day. Two of the fish moved one sampling site downstream and the rest were marked and recaptured in the site where we originally tagged them. We also applied PIT tags to 25 cutthroat trout and recaptured five (20.0%) of them. The cutthroat trout were at large for 60 to 178 days (mean=100 days). Their mean growth rate was 0.26 mm/day and ranged from 0.10 to 0.38 mm/day. All of the fish were recaptured at the same site where we originally tagged them. We also applied a PIT tag to one juvenile steelhead and did not recapture it.

Wood Creek

July-December 2007. Juvenile coho salmon were the most abundant salmonids captured in Wood Creek (Table 11). Based on their size and appearance they were probably yoy fish but we did not examine scales to confirm this. Their monthly mean FL was markedly smaller in July compared to August through October, and then dropped in December. Smaller sized coho appeared in Wood Creek, and many of our other sample sites around Humboldt Bay, after storms increased stream flows starting in November (Table 11). This provides more evidence that juvenile coho salmon residing upstream redistribute themselves in the fall to the stream-estuary ecotone seeking low velocity over-winter habitat. We also captured one juvenile steelhead in October that was 135 mm FL (Table 11). We captured six cutthroat trout in July, August, and October that ranged in size from 113-140 mm FL (Table 11).

January-June 2008. Juvenile coho salmon were by far the most abundant salmonids captured in Wood Creek with large catches occurring January through April (Table 11). Based on their size and appearance they were probably yearling and older fish but we did not examine scales to confirm this. Our juvenile coho catches remained high throughout the winter and into spring indicating coho were using Wood Creek as over-winter habitat. Their monthly mean FL's increased from 74 mm in January to 98 mm in May (0.21 mm/day). In 2007 recaptured PIT tagged coho grew 0.12-0.34 mm/day (see below). We also captured one juvenile steelhead in April that was 125 mm FL (Table 11). We also captured seven cutthroat trout between February and June. Their mean FL was 117 mm and ranged from 92-140 mm (Table 11).

During the entire year we also captured threespine stickleback and prickly sculpin.

PIT Tag Results for 2007. We applied PIT tags to 92 yearling and 19 yoy coho salmon and recaptured five (5.4%) PIT tagged yearling coho and four (21.1%) yoy coho salmon. We also captured two yearling coho tagged by our project in July 2006 in Freshwater Slough at our most upstream site over a mile upstream of Wood Creek. One was at large from July 27, 2006 to February 26, 2007 (213 days) and grew 0.12 mm/day. The other fish was at large from July 19, 2006 to March 27, 2007 (251 days) and also grew 0.12 mm/day. The yearling coho marked and recaptured in Wood Creek were at large 35 to 70 days (mean=49 days) and grew 6-15 mm (0.13-0.43 mm/day). All the yearling coho were marked and recaptured in the site where we originally tagged them. The yoy coho were at large 26-129 days (mean=86 days) and grew 2-28 mm (0.03-0.22 mm/day). All the yoy coho were marked and recaptured in the same site

where we originally tagged them. We also applied PIT tags to six cutthroat trout and recaptured three (50.0%) of them. The cutthroat trout were at large for 60 to 98 days (mean=73 days). Their mean growth rate was 0.04 mm/day and ranged from 0.02 to 0.05 mm/day. All of the fish were recaptured at the same site where we originally tagged them. We also applied a PIT tag to two juvenile steelhead and did not recapture either one.

Gannon Slough/Jacoby Creek

July-December 2007. Yoy trout were the only salmonids captured in this time period and all were captured in November in Jacoby Creek (Table 11). Their mean FL was 52 mm (range 45-56).

January-June 2008. Two juvenile coho captured in April were the only salmonids captured in Gannon Slough. The coho were 129 and 130 mm FL and based on their size and appearance they were probably yearling and older fish, but we did not examine scales to confirm this. In Jacoby Creek we captured two juvenile coho salmon and five yoy trout, all captured in June (Table 11). One coho was 120 mm FL and probably a yearling or older fish while the other was 64 mm FL and probably a yoy fish. The yoy trout were all < 50 mm FL.

During the entire year we also captured tidewater goby, starry flounder, Pacific staghorn sculpin, threespine stickleback, prickly sculpin, larval smelt, and juvenile Dungeness crab upstream of the tidegate on Gannon Slough; starry flounder, Pacific staghorn sculpin, threespine stickleback, shiner surfperch, northern anchovy, Pacific herring, surfsmelt, bay pipefish, saddleback gunnel, and juvenile Dungeness crab downstream of the tidegate on Gannon Slough; and tidewater goby, starry flounder, Pacific staghorn sculpin, threespine stickleback, and unidentified juvenile sculpin in Jacoby Creek.

Hookton Slough/Salmon Creek

July-December 2007. Young-of-the-year trout were the most common salmonid captured by NSA during this time period (Table 12). We captured yoy trout from July to November with their peak catch of 3.50 fish/set occurring in mid July. Their mean monthly FL hovered around 60 mm throughout the year, but this was likely due to field crews being able to identify them as steelhead or cutthroat trout as they reached about 70 mm FL and were no longer classified as yoy trout. NSA captured seven juvenile steelhead in July and August with their peak catch occurring in mid July (0.67 fish/set). Their FL's ranged from 72-98 mm. No salmonids were captured in Hookton Slough (Table 13).

January-June 2008. Unidentified juvenile trout and juvenile steelhead were the most common salmonid captured during this time period (Tables 14 & 15) NSA captured 18 juvenile steelhead with their peak catches occurring in late April (1.17 fish/set). Their FL's ranged from 68-191 mm. We also captured 26 unidentified trout, all between mid January and late March. Their FL's ranged from 49-67 mm. It is likely that as they grew field crews were able to identify them to species, thereby reducing the numbers of captured trout and increasing the numbers of captured steelhead.

Because of the success we had last year we conducted some qualitative sampling using minnow traps baited with frozen salmon roe again in 2008. We fished these traps in deeper water or more heavily vegetated habitat near our normal seining sites. We captured 22 juvenile steelhead, and one unidentified trout (Table 14). The peak catches for steelhead occurred in June and individual FL's ranged from 70-127 mm.

PIT Tag Results for 2007. We applied PIT tags to 68 juvenile steelhead and recaptured seven (10.3%) of them. This includes fish collected by seining and in minnow traps. The steelhead were at large 9 to 51 days (mean=28 days) and grew 0-12 mm (0-0.29 mm/day). All the steelhead were marked and recaptured in the site where we originally tagged them. We also applied a PIT tag to one yearling coho and did not recapture it.

Table 12. Monthly catch-per-unit-effort (CPUE) and fork length (FL) in millimeters of young-of-the-year (yoy) Chinook salmon, yoy coho salmon, yearling and older coho salmon, juvenile steelhead trout, and cutthroat trout in Salmon Creek estuary, July-December 2007. CPUE is number of fish per seine haul.

		YOY Trout			YOY Coho			Yearling Coho			Steelhead			Cutthroat		
	No.		Mean			Mean			Mean			Mean			Mean	
Month	Sets	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range
July	12	2.92	56	51-65	0	-	-	0	-	-	0.42	90	82-98	0	-	-
Aug	12	1.00	60	54-69	0	-	-	0	-	-	0.17	75	72-78	0	-	-
Sept	6	0.17	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Oct	12	1.00	59	48-67	0	-	-	0	-	-	0	-	-	0	-	-
Nov	12	0.75	58	49-64	0	-	-	0	-	-	0	-	-	0	-	-
Dec	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 13. Monthly catch-per-unit-effort (CPUE) and fork length (FL) in millimeters of young-of-the-year (yoy) Chinook salmon, yoy coho salmon, yearling and older coho salmon, juvenile steelhead trout, and cutthroat trout in Hookton Slough, July-December 2007. CPUE is number of fish per seine haul.

		YOY Trout			YOY Coho			Yearling Coho			Steelhead			Cutthroat		
	No.		Mean			Mean			Mean			Mean			Mean	
Month	Sets	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range
July	3	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Aug	6	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Sept	3	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Oct	6	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Nov	3	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Dec	0	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-

Table 14. Monthly catch-per-unit-effort (CPUE) and fork length (FL) in millimeters of young-of-the-year (yoy) Chinook salmon, yoy coho salmon, yearling and older coho salmon, juvenile steelhead trout, and cutthroat trout in Salmon Creek estuary, January-June 2008. CPUE is number of fish per seine haul.

Seining

		Trout			YOY Coho			Yearling Coho			Steelhead			Cutthroat		
	No.		Mean			Mean			Mean			Mean			Mean	
Month	Sets	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range
Jan	6	2.00	60	51-66	0	-	-	0	-	-	0.17	71	71	0	-	-
Feb	12	0.42	59	49-65	0	-	-	0	-	-	0.08	191	191	0	-	-
Mar	12	0.75	63	59-67	0	-	-	0	-	-	0.50	96	72-96	0	-	-
Apr	12	0	-	-	-	-	-	-	-	-	0.75	92	68-161	0	-	-
May	12	0	-	-	0	-	-	0	-	-	0.17	116	83-148	0	-	-
June	12	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-

Minnow Traps

		Trout			YOY Coho			Yearling Coho			Steelhead			Cutthroat		
	No.	No.	Mean		No.	Mean		No.	Mean		No.	Mean		No.	Mean	
Month	Traps	Caught	FL	Range	Caught	FL	Range	Caught	FL	Range	Caught	FL	Range	Caught	FL	Range
Jan	2	0	-	-	0	-	-	0	-	-	2	90	70-110	0	-	-
Feb	2	1	65	65	0	-	-	0	-	-	0	-	-	0	-	-
Mar	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Apr	2	0	-	-	0	-	-	0	-	-	1	113	113	0	-	-
May	4	0	-	-	0	-	-	0	-	-	7	89	82-102	0	-	-
June	4	0	-	-	0	-	-	0	-	-	12	104	76-127	0	-	-

Table 15. Monthly catch-per-unit-effort (CPUE) and fork length (FL) in millimeters of young-of-the-year (yoy) Chinook salmon, yoy coho salmon, yearling and older coho salmon, juvenile steelhead trout, and cutthroat trout in Hookton Slough, January-June 2008. CPUE is number of fish per seine haul.

		YOY Chinook			YOY Coho			Yearling Coho			Steelhead			Cutthroat		
	No.		Mean			Mean			Mean			Mean			Mean	
Month	Sets	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range	CPUE	FL	Range
Jan	3	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Feb	6	0	-	-	0	-	-	0*	-	-	0	-	-	0	-	-
Mar	3	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Apr	3	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
May	3	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
June	6	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-

*One adult coho captured

Summary of Project Results:

Project objectives were met.

Project documented that yoy coho salmon rear in the tidal freshwater portion of Humboldt Bay tributaries throughout the summer. Some coho continue to rear in the estuary/freshwater ecotone over the winter bringing their total rearing time up to 8 months.

Project also captured individual juvenile steelhead and cutthroat trout that reared for nearly a year in the freshwater/estuary ecotone.

Project documented that juvenile coho moved to low velocity or off channel habitat such as Martin Slough pond and Wood Creek during winter presumably to escape high velocity flows in the main channel.

Project documented that juvenile coho salmon will utilize appropriate habitat adjacent to mainstem channels and collected basic habitat information about these areas. This includes tidal meanders, dead end sloughs, salt marshes, non-natal streams, and even pond habitat on an active golf course. Therefore this Project can provide information to the marsh restoration community to help design projects to create these types of habitat to increase rearing habitat for juvenile coho salmon.

Project results show that yoy coho salmon that rear in the estuary grow larger than their cohorts rearing in stream habitat farther upstream in the basin. Based on other studies larger size at ocean entry usually results in higher ocean survival. In conjunction with AFRAMP, Project documented that the estuarine/freshwater ecotone located between the estuary and canyon stream habitat is extremely important to coho and especially steelhead smolt production. Roughly 40% of the coho salmon smolts and about 80-90% of the steelhead smolts originated from the estuarine/freshwater ecotone of Freshwater Creek.

Project cooperated with USFWS which found that the mean length of residence of coho salmon smolts in lower Freshwater Creek Slough was about two weeks and as long as four weeks. They also found that coho smolts residence time in Humboldt Bay was about two weeks and ranged about four weeks.

Project documented that some coho salmon smolts from Freshwater Creek basin would move into lower Elk River Slough while rearing in Humboldt Bay.

Questions generated by Project:

The average size of yearling coho smolts leaving Freshwater Slough is smaller than reported from other Pacific coast estuaries. So do these smaller smolts rear in Humboldt Bay for significant periods of time before entering the ocean? (See answer from USFWS above)

The project has captured juvenile salmonids in areas containing eel grass beds. What role does eel grass play in life history of salmonids?

One study in Oregon (Miller and Sadro 2003), showed that after rearing in the estuary for the summer yoy coho salmon migrate back upstream to over-winter. Another study in British Columbia (Tschaplinski 1982), showed that after rearing in the estuary for the summer yoy coho salmon migrated to the ocean. This project made some observations suggesting that

both of the above scenarios may be occurring in Humboldt Bay tributaries. What is the dominate life history strategy of yoy coho salmon in Humboldt Bay tributaries?

Will creation of low water velocity habitat i.e. side channels, freshwater or saltwater marshes, ponds increase over-wintering and spring/summer rearing habitat?

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7. Discuss differences:

No significant difference in work or cost between grant proposal and grant agreement.

8. List any publications or in-house reports resulting from this work:

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