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# **Southeast Alaska Steelhead and Dolly Varden Management**

by

**Roger D. Harding**

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December 2008

Alaska Department of Fish and Game

Divisions of Sport and Commercial Fisheries



## Symbols and Abbreviations

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<b>Weights and measures (metric)</b>		<b>General</b>		<b>Measures (fisheries)</b>	
centimeter	cm	Alaska Department of		fork length	FL
deciliter	dL	Fish and Game	ADF&G	mideye-to-fork	MEF
gram	g	Alaska Administrative		mideye-to-tail-fork	METF
hectare	ha	Code	AAC	standard length	SL
kilogram	kg	all commonly accepted		total length	TL
kilometer	km	abbreviations	e.g., Mr., Mrs., AM, PM, etc.		
liter	L			<b>Mathematics, statistics</b>	
meter	m	all commonly accepted		<i>all standard mathematical signs, symbols and abbreviations</i>	
milliliter	mL	professional titles	e.g., Dr., Ph.D., R.N., etc.		
millimeter	mm			alternate hypothesis	H <sub>A</sub>
		at	@	base of natural logarithm	<i>e</i>
<b>Weights and measures (English)</b>		compass directions:		catch per unit effort	CPUE
cubic feet per second	ft <sup>3</sup> /s	east	E	coefficient of variation	CV
foot	ft	north	N	common test statistics	(F, t, $\chi^2$ , etc.)
gallon	gal	south	S	confidence interval	CI
inch	in	west	W	correlation coefficient	
mile	mi	copyright	©	(multiple)	R
nautical mile	nmi	corporate suffixes:		correlation coefficient	
ounce	oz	Company	Co.	(simple)	r
pound	lb	Corporation	Corp.	covariance	cov
quart	qt	Incorporated	Inc.	degree (angular )	°
yard	yd	Limited	Ltd.	degrees of freedom	df
		District of Columbia	D.C.	expected value	<i>E</i>
<b>Time and temperature</b>		et alii (and others)	et al.	greater than	>
day	d	et cetera (and so forth)	etc.	greater than or equal to	≥
degrees Celsius	°C	exempli gratia		harvest per unit effort	HPUE
degrees Fahrenheit	°F	(for example)	e.g.	less than	<
degrees kelvin	K	Federal Information		less than or equal to	≤
hour	h	Code	FIC	logarithm (natural)	ln
minute	min	id est (that is)	i.e.	logarithm (base 10)	log
second	s	latitude or longitude	lat. or long.	logarithm (specify base)	log <sub>2</sub> , etc.
		monetary symbols		minute (angular)	'
		(U.S.)	\$, ¢	not significant	NS
<b>Physics and chemistry</b>		months (tables and		null hypothesis	H <sub>0</sub>
all atomic symbols		figures): first three		percent	%
alternating current	AC	letters	Jan, ..., Dec	probability	P
ampere	A	registered trademark	®	probability of a type I error	
calorie	cal	trademark	™	(rejection of the null	
direct current	DC	United States		hypothesis when true)	$\alpha$
hertz	Hz	(adjective)	U.S.	probability of a type II error	
horsepower	hp	United States of		(acceptance of the null	
pH	pH	America (noun)	USA	hypothesis when false)	$\beta$
hydrogen ion activity		U.S.C.	United States	second (angular)	"
(negative log of)			Code	standard deviation	SD
parts per million	ppm	U.S. state	use two-letter	standard error	SE
parts per thousand	ppt,		abbreviations	variance	
	‰		(e.g., AK, WA)	population	Var
volts	V			sample	var
watts	W				

***SPECIAL PUBLICATION NO. 08-21***

**SOUTHEAST ALASKA STEELHEAD AND DOLLY VARDEN  
MANAGEMENT**

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# Report to the Alaska Board of Fisheries

Sitka, Alaska

February 2009

Southeast Alaska Steelhead and Dolly Varden Management

by

Roger D. Harding





## INTRODUCTION

Steelhead, rainbow, and cutthroat trout, along with Dolly Varden char, occur in streams and lakes throughout most of Southeast Alaska (SEAK) and Yakutat and are available to anglers year-round. Trout (including steelhead) and Dolly Varden are harvested incidentally in Southeast Alaska's commercial fisheries and targeted in marine and freshwater sport and state and federal subsistence fisheries.

The Alaska Department of Fish & Game (ADF&G) and members of the public became concerned about the status of trout and steelhead in SEAK during the late 1980s and early 1990s. This concern stemmed largely from trends observed in the sport fishery, stream survey observations, and reduced abundance reported by members of the public and sport fishing guides throughout the region. These factors indicated a SEAK-wide decline in abundance of cutthroat trout and steelhead, presumably due in part to harvest levels that may have been unsustainable. In January 1994, the Alaska Board of Fisheries (Board) adopted new regulations for steelhead, rainbow, and cutthroat trout in SEAK. The regulations were based on results of ADF&G research, published literature on trout, and an extensive public review of angler preferences for trout and steelhead management.

The Board will consider six regulatory proposals at its February 2009 meeting that deal with steelhead and Dolly Varden (Table 1). The purpose of this paper is to explain the regulatory history and stock status of steelhead and Dolly Varden for use at the 2009 meeting. This report briefly describes the distribution and life history of steelhead and Dolly Varden in SEAK and recounts the conservation concerns that led up to adoption of the current steelhead and trout regulations. It also summarizes the effects of the recent regulations on steelhead and trout fisheries and stocks, and presents the results of pertinent ADF&G steelhead and trout research.

### **FEDERAL SUBSISTENCE PROGRAM FOR STEELHEAD, TROUT, AND CHAR**

All harvests of steelhead, trout, and char in SEAK occurred under State of Alaska regulations prior to the federal subsistence expansion. The state-

managed subsistence fishery allowed an annual harvest of up to 300 steelhead in the Situk and Ahrnklin rivers. The federal subsistence management program expanded in 1999 to include subsistence fisheries on waters within and adjacent to federal lands. Subsequent to the 2003 Board meeting, the Federal Subsistence Board significantly expanded federal subsistence harvest opportunities for steelhead, trout and char. These expanded subsistence fisheries have the potential to cause stock declines of steelhead and trout and therefore may affect management of state fisheries. Sport fishery regulations allow a limited harvest of steelhead, trout, and char, but are very conservative compared to federal regulations. Under the expanded federal subsistence regulations all fresh waters in SEAK are open for federally-qualified users to harvest trout, Dolly Varden and steelhead. Federal harvest and size limits are liberal compared to those of the state. The State of Alaska has opposed, without success, almost all the federal increases in subsistence harvest opportunity for trout and steelhead on the basis that they are not sustainable and that the federal board has not defined the subsistence need or developed proven methods with which to monitor the subsistence harvest and stock status.

## STEELHEAD

### **DISTRIBUTION AND LIFE HISTORY**

Steelhead are found in coastal streams of Alaska from Dixon Entrance, north and westward around the Gulf of Alaska to the Cold Bay area on the Alaska Peninsula. SEAK has 309 watersheds known to support annual escapements of steelhead. Most of the known steelhead streams in SEAK are believed to contain 200 or fewer adults. However, some of the larger systems, like Karta River, may have once supported annual escapements >1,000 adult steelhead while the Thorne River watershed is still believed to have an annual escapement >1,000. The largest known steelhead producer in SEAK is the Situk River near Yakutat, which has annual kelt counts (adult emigrants) that vary from 3,000 to just over 15,000 adults.

Steelhead in Alaska generally spend 2 to 5 years in fresh water before migrating to the ocean as smolt; a 3-year freshwater residency is most

Table 1.—Regulatory proposals submitted to the Alaska Board of Fisheries, 2007–2008, dealing with steelhead and Dolly Varden.

Proposal #	Effect
290	Prohibit the retention of steelhead in fresh and salt waters except in 16 streams.
291	Prohibit the retention of steelhead only in high use systems, fall steelhead drainages, Ward Creek, Thorne River and Karta River.
292	Reduce Dolly Varden bag and possession limit to 4 fish, of which only one may exceed 20 inches.
304	Prohibit removing steelhead under 36 inches from the water.
315	Open Ketchikan Creek to sport fishing from September 15 through May 3.
317	Prohibit retention of steelhead in all streams crossed by Juneau road system

common. Adult steelhead typically return to spawn after spending 2 to 3 years at sea. Steelhead are often grouped or classified by the time of year they return to their natal stream, i.e., spring, summer, or fall. Spring-run steelhead return to streams in SEAK between March and early June but are generally concentrated between mid-April through May. The rare summer-run fish may return to freshwater during July. Fall-run steelhead enter the freshwater systems as adults in September, October, and November and possibly throughout the winter. In SEAK, the spring run form is the most common, but fall run steelhead do comprise a significant component of some populations.

Regardless of when they return to freshwater, all steelhead spawn during the spring months when daily water temperatures reach 6–9°C, usually about mid-April through May to early June. Adult steelhead that survive spawning (kelts) migrate back to sea from mid-May through June. Steelhead that have spawned as many as 5 times have been documented in some SEAK systems. Repeat-spawning fish usually compose 25% to 33% (sampled range = 11% to 38%) of the total adult return (VanHulle 1985), and 65% to 80% of repeat spawners are female. In general, first-time spawning fish are evenly comprised of males and females.

## STOCK STATUS AND MANAGEMENT PRIOR TO 1994

The regionwide sport fishing regulations prior to 1994 allowed the harvest of 5 trout (in combination) per day and 10 in possession, of which only 1 per day and 2 in possession could be greater than 16 inches. The use of bait was

allowed year-round, and season restrictions and reduced bag limits were in place at a few specific locations in SEAK.

ADF&G and the fishing public had become concerned that steelhead stocks in SEAK had been declining for several years prior to the regulation changes in 1994. Harvest of steelhead increased after 1977, peaked in 1986, and then began to decline (Figure 1). At the same time, freshwater fishing effort (angler days) was steadily increasing (Figure 2).

Steelhead escapement counts in the early 1990s on the Situk River (the region’s largest steelhead fishery and the only river with long-term kelt counts) were showing a dramatic downturn. In 1991 ADF&G responded by issuing an emergency order (EO) that closed the Situk River to steelhead retention and restricted the use of bait. During the same time period, anglers were also reporting reduced abundance and harvest of steelhead in numerous streams throughout the region. In response, ADF&G issued an EO in the spring of 1992 closing 24 streams to the retention of steelhead and restricting the use of bait. In 1993, ADF&G closed 48 steelhead streams to the retention of steelhead (also with bait restrictions).

Snorkel surveys have been used since 1997 (Table 2) to monitor annual steelhead escapements in a number of index systems dispersed across SEAK (Figure 3). These surveys provide a peak annual escapement count for each system. Snorkel surveys do not estimate total escapement (like a weir count) but provide a relative index of abundance. These snorkel surveys now serve as the primary stock-monitoring tool for steelhead abundance in SEAK.

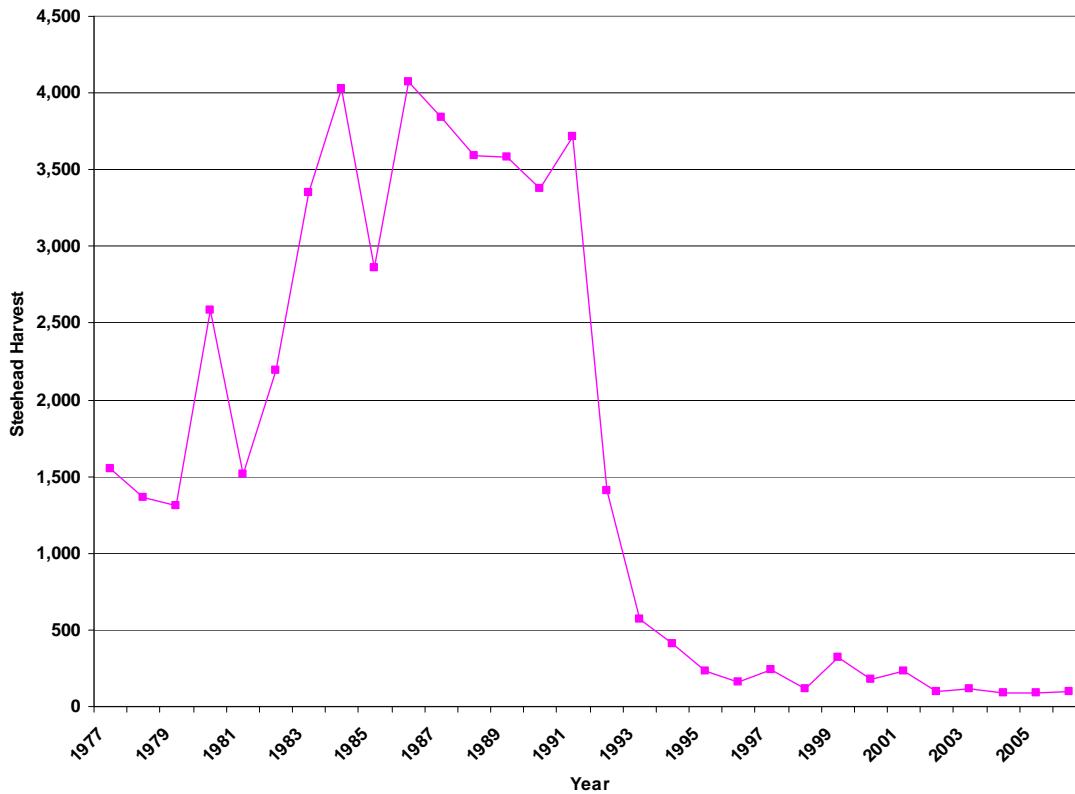


Figure 1.—Steelhead harvests in Southeast Alaska, 1977–2006 from the Alaska Department of Fish and Game, Division of Sport Fish Statewide Harvest Survey.

## MANAGEMENT PLANNING AND BOARD ACTIONS

Based on concerns for sustainability for the steelhead and trout fisheries, the Division of Sport Fish initiated a planning process in 1993 to evaluate trout and steelhead regulations and public attitudes about future management strategies. At the time, the steelhead bag limit was 1 fish with 2 in possession and no minimum size limit. The Commissioner of ADF&G appointed a 9-member citizen committee to make recommendations on how to manage steelhead in SEAK. Committee members included steelhead anglers from Anchorage, Yakutat, Juneau (2 members), Sitka, Petersburg, Ketchikan (2 members), and Prince of Wales Island. This committee developed a survey that was sent to 1,768 steelhead anglers. The list of anglers surveyed included all respondents to the ADF&G Statewide Harvest Survey (SWHS) who had fished on a steelhead system in SEAK in 1992 or 1993.

Returned surveys confirmed that most anglers (81%) felt steelhead in Southeast Alaska were declining and 78% thought that if more restrictive regulations were deemed necessary, then steelhead should be managed more conservatively to rebuild abundance and provide continued fishing opportunity. When asked why anglers fish for steelhead, most answered that they liked to fish (55%) and enjoy the outdoors (35%) as prime reasons, while keeping a trophy or eating a steelhead were minor considerations (<10%). If restrictive regulations were necessary (i.e., steelhead populations continue to decline), most respondents preferred catch-and-release-only management (42% of the residents and 49% of the nonresidents); reducing the total harvest (daily bag limit) was the second most popular option (36% of the residents and 32% of the nonresidents). If there was a harvestable surplus of steelhead, the most preferred management options were: an annual bag limit (38% of the residents and 34% of nonresidents) and gear

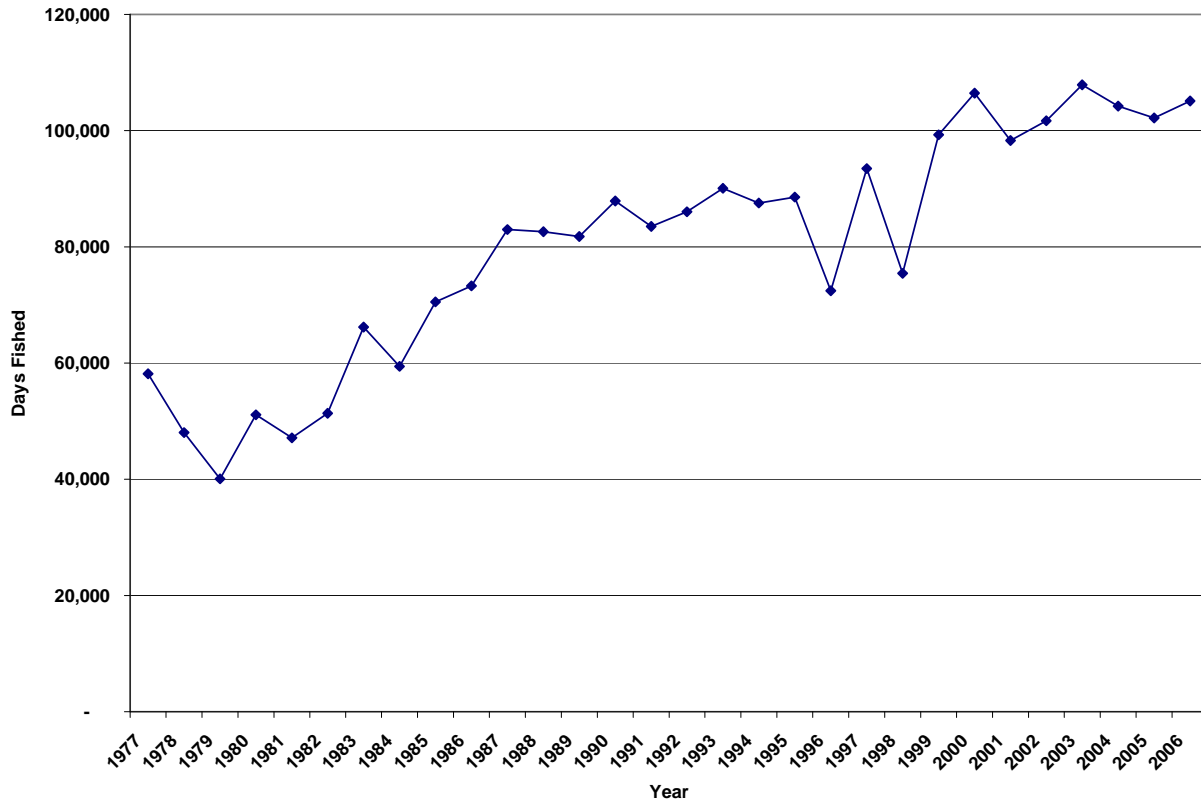


Figure 2.—Southeast Alaska freshwater fishing effort from the Alaska Department of Fish and Game, Division of Sport Fish Statewide Harvest Survey, 1977–2006.

restrictions (34% of the residents and 32% of the nonresidents).

The Board established new regionwide regulations in 1994 to provide additional conservation measures. Sport fishery regulations were crafted based on public responses to the survey and ADF&G assessment of the potential for regulatory options to provide sustainable fisheries. These regulations included a bag limit of 1 steelhead, an annual limit of 2, and a 36-inch minimum size limit. Based on limited sampling in SEAK, the 36-inch size limit was expected to protect approximately 95% of adult steelhead. In concert with size limits established for cutthroat and rainbow trout (12-inch minimum, 22-inch maximum), the 1994 regulations ensured protection for juvenile steelhead prior to smolting and adult steelhead less than 36 inches in length. At the same time, the Board prohibited the use of bait in fresh waters of SEAK from November 16 through September 14 to provide additional

protection from catch-and-release mortality. SEAK commercial regulations were modified to prohibit the sale of commercially-caught steelhead by purse seine and gillnet permit holders.

In subsequent Board meetings very few changes to steelhead regulations have been implemented. In 1997, the Board prohibited the use of bait year-round in 26 streams with fall runs of steelhead, and adopted a proposal making the steelhead regulations at Sitkoh Creek identical to the regionwide regulations.

### **EFFECT OF THE NEW REGULATIONS**

Harvest of steelhead in the sport fishery declined following the 1994 action taken by the Board, and annual harvest from 1994 through 2006 averaged 94% less than harvest in years prior to the regulatory action (1982–1992). Steelhead harvest during 1993 was also significantly reduced as 48 streams were closed to retention through EO

Table 2.—Steelhead snorkel surveys conducted in index stream in Southeast Alaska, 1997–2008. Peak count (bold) is defined as a bracketed count or a count having a lower count before and after the high or “peak” count; high count (italicized) is defined as an unbracketed count and is the highest count for that year/system.

Management Area	Stream Name	Year											
		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Juneau	Peterson Creek	<b>26</b>	<i>29</i>	<i>38</i>	<i>27</i>	<b>41</b>	<b>13</b>	<b>36</b>	<i>39</i>	<b>22</b>	<b>36</b>	<b>26</b>	<b>26</b>
	Pleasant Bay (Seymour)	<i>155</i>	<b>81</b>	<i>132</i>	<b>48</b>	<i>48</i>	<b>36</b>	<b>50</b>	<b>51</b>	<i>47</i>	<i>59</i>	<b>94</b>	<b>53</b>
Ketchikan	McDonald Lake	<b>145</b>	<b>86</b>	<i>100</i>	<b>47</b>	<i>74</i>	<i>14</i>	<b>79</b>	<i>76</i>	<b>134</b>	<b>100</b>	<i>38</i>	<i>45</i>
	White River	<i>84</i>	<b>93</b>	<i>60</i>	<b>38</b>	<b>48</b>	<b>37</b>	<i>77</i>	<i>35</i>	<i>67</i>	<b>41</b>	<b>85</b>	<b>45</b>
Petersburg	Petersburg Creek	<i>123</i>	<b>152</b>	<b>115</b>	<i>68</i>	<i>64</i>	<i>41</i>	<b>146</b>	<b>330</b>	<b>369</b>	<b>241</b>	<b>289</b>	<b>251</b>
	Slippery Creek	NA	NA	NA	NA	<i>41</i>	<i>31</i>	<i>76</i>	<i>92</i>	NA	<i>79</i>	<b>68</b>	<b>46</b>
Prince of Wales	Eagle/Luck Creek	<i>90</i>	<b>56</b>	<i>118</i>	<b>82</b>	NA	<b>36</b>	<i>95</i>	<i>67</i>	<i>102</i>	<i>154</i>	<i>134</i>	<i>8</i>
	Harris River	<i>104</i>	<b>156</b>	<i>192</i>	<b>79</b>	<i>53</i>	<i>200</i>	<i>195</i>	<b>124</b>	<b>122</b>	<i>92</i>	<b>128</b>	<i>122</i>
Sitka	Ford Arm Creek	<i>296</i>	<i>103</i>	<i>89</i>	<b>134</b>	<i>28</i>	<i>122</i>	<b>181</b>	<b>379</b>	<i>364</i>	<b>428</b>	<b>673</b>	<b>266</b>
	Sitkoh Creek	<i>329</i>	<i>154</i>	<i>120</i>	<i>112</i>	<i>115</i>	<i>65</i>	<b>296</b>	<b>354</b>	<b>259</b>	<b>213</b>	<i>70</i>	<b>167</b>

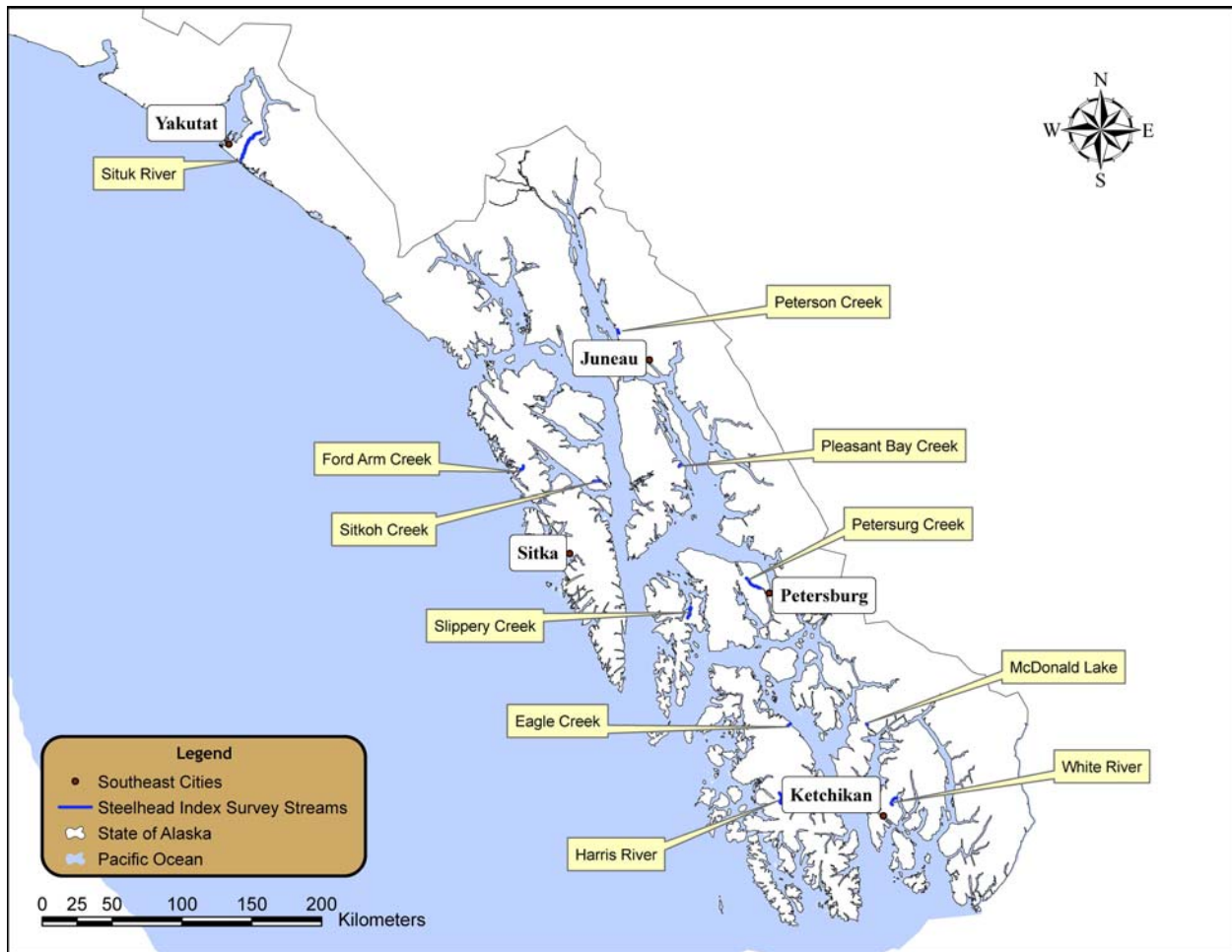


Figure 3.–Location of the 10 current index streams in Southeast Alaska and the Situk River.

action. Since 1994, annual harvests have remained low (Figure 1). An average of 127 steelhead were harvested annually in the SEAK sport fishery between 2000 and 2006 while an average of 17,000 steelhead were caught each year.

Over 14 years (approximately 2 steelhead life cycles) have elapsed since the implementation of the 1994 regulations, but no consistent trend in steelhead abundance has been observed. Snorkel survey counts generally dropped for several years after the initial survey year in 1997. Between 2003 and 2006, snorkel index counts were, on average, similar or higher than those during 2000 to 2002 and 6 of the 10 index streams had record snorkel counts between 2004 and 2007 (Table 2). Collectively these counts suggest that the steelhead stocks surveyed are stable and generally have higher escapements than in the late 1990s.

The 2008 counts show a slight decrease in numbers from the recent high years but the index counts are still generally higher than the late 1990s counts (Table 3).

The emigrant count of steelhead through the Situk River weir between 2004 and 2007 exceeded 12,000 and was roughly twice the emigrant counts recorded between 2000 and 2002 (Table 3). The 2008 Situk emigrant count of 7,320 was about 5,000 less than the 2007 count, but similar to the counts observed between 2000 and 2003.

Sitkoh Creek, located on Chichagof Island, supports one of the largest steelhead runs in northern SEAK. Adult steelhead returning to Sitkoh Creek have been counted through a weir 12 times (1936–1937, 1982, 1990, 1993, 1996, and 2003–2008; Table 3). Escapement counts for Sitkoh have ranged from 395 to 1,108, and

averaged approximately 660 fish; weir counts below this average have occurred during the last 4 years (2005–2008).

Total freshwater fishing effort throughout SEAK has continued to increase (Figure 2). Since implementation of the more restrictive steelhead regulations, steelhead harvest has stabilized at a much lower level (Figure 1) and has averaged <100 fish since 2002. Steelhead catch, which includes harvested and released fish, reached a peak of nearly 25,000 in 2000, and declined steadily for 4 years before rebounding to nearly 19,000 in 2005 (Figure 4).

In summary, steelhead abundance was relatively stable between 2003 and 2007, and the 2008 counts showed a slight decrease in numbers from the recent high years. There are systems where steelhead escapement still remains below historic levels. ADF&G does believe that the current conservative regulations provide for sustainability of steelhead stocks while allowing for a limited harvest opportunity.

## **DOLLY VARDEN**

### **DISTRIBUTION AND LIFE HISTORY**

Dolly Varden are found throughout SEAK and range from the Arctic coast of Alaska south to southern British Columbia (Blackett 1968; Morrow 1980). Both anadromous and non-anadromous populations can be found within streams and lakes throughout their range. Whenever Dolly Varden are present in freshwater they are usually abundant, but because of their migration patterns the abundance may fluctuate tremendously throughout the year (Morrow 1980).

The majority of Dolly Varden growth takes place between May and September each year, and anadromous fish may double their weight in this time. Most Dolly Varden in SEAK reach maturity at age 5 or 6, and at this age they may be 12–16 inches long and may weigh from 0.5 to 1 pound. Dolly Varden in SEAK are believed to spawn annually once they reach maturity.

Dolly Varden return to spawn in their natal stream at maturity and spawning may occur from mid-August to the end of November, but most spawning occurs in September and October.

Young Dolly Varden rear in freshwater for several years. When they are about 5 inches long, they make their first seaward migration, usually in April through June. Anadromous Dolly Varden typically overwinter in lakes, but may also overwinter in rivers and typically spend the rest of their lives wintering in and migrating to and from freshwater.

Migration patterns of the Dolly Varden can be complex. In SEAK, a migration of smolts and adults out of the lakes where they overwintered begins in the early spring and continues into July. After a period of as little as a couple of weeks or as long as 7 months, the fish return to spawn in the streams and overwinter in lakes. Uniquely tagged Dolly Varden in SEAK have been recaptured in saltwater 153 km (95 mi) from their natal system (Armstrong 1965) and in freshwater systems 146 km (91 mi) from their natal systems (Ericksen et al. 1990).

Some Dolly Varden may enter streams to spawn, then leave and enter a lake-stream system to overwinter. Immature fish often enter several streams after their migration to the sea. About 40% to 50% of the fish overwintering in a lake are fish that originated there; the remaining overwintering fish are of unknown origin. Homing of adult spawners to their natal stream is very high (Morrow 1980).

### **STOCK STATUS AND MANAGEMENT**

From 1921 through 1939, efforts were undertaken to reduce the abundance of Dolly Varden because it was believed that this species preyed heavily on young salmon. A bounty ranging from 2 to 5 cents was paid for each Dolly Varden tail turned into officials. It was thought that by controlling Dolly Varden, the survival of juvenile salmon populations would greatly increase. It is now known that Dolly Varden were not responsible for declines in salmon populations. However, 6 million tails were turned in for payment before the program ended in 1939. In 1962, the Division of Sport Fish initiated several studies to investigate the life history of Dolly Varden (i.e., Armstrong 1965; Heiser 1966; and Blackett 1968). The impetus for these studies was lack of life history information about this species and concern regarding the impact the bounty may have had on SEAK Dolly Varden populations.

Table 3.—Assessment of steelhead escapement utilizing weirs in Southeast Alaska (all numbers are immigrant weir counts unless otherwise noted).

Year	Situk River <sup>a</sup>	Sitkoh Creek	Karta River	Harris River	Ratz Creek	Eagle Creek	Twelve Mile Creek	Ward Creek	Cable Creek	Natzuhin Creek	Petersburg Creek <sup>b</sup>	Peterson Creek	Sashin Creek	Lake Eva	Windfall Creek
1936		760													
1937		1,108													
1952	25,000–30,000 <sup>c</sup>														
1971											806				
1972											536				
1973											401				
1974											369				
1975			872 <sup>d</sup>								326				
1982		690													
1989			1,220									222			
1990		661										179			
1991												215			
1992			347 <sup>e</sup>												
1993		520						337 (51) <sup>f</sup>							
1994	7,854							412 (12) <sup>f</sup>							
1995														35	
1996	8,510	926											32		
1997	7,328												63		53
1998	5,786												27		
1999	9,204												24		
2000	6,709												29		
2001	6,400												26		
2002	6,113												36		
2003	7,964	679					97(2) <sup>f</sup>						12		
2004	12,462	764					87						47		
2005	12,265	543	481 <sup>d</sup>	171 <sup>d</sup>	399 <sup>d</sup>								34		
2006	15,003	395				299 <sup>d</sup>			134 <sup>d</sup>				75		
2007	12,438	426(8) <sup>f</sup>			267 <sup>d</sup>					83 <sup>d</sup>			21		
2008	7,320	424	186 <sup>g</sup>										15		

<sup>a</sup> Situk River are emigrant or downstream weir counts only.

<sup>b</sup> All numbers reported in Jones (1976) as “estimated number of adult Steelhead,” but mark–recapture details unavailable.

<sup>c</sup> Situk River 1952, “estimate” by observation of weir crew for steelhead emigrants; 6,000 were counted down in a single night.

<sup>d</sup> Minimum spawning escapement (MSE); weir immigrant count incomplete (i.e. MSE = # of immigrants plus # unmarked emigrants).

<sup>e</sup> Emigrant count.

<sup>f</sup> Estimate of escapement using mark–recapture techniques; standard error is in parentheses.

<sup>g</sup> Incomplete immigrant and emigrant count.



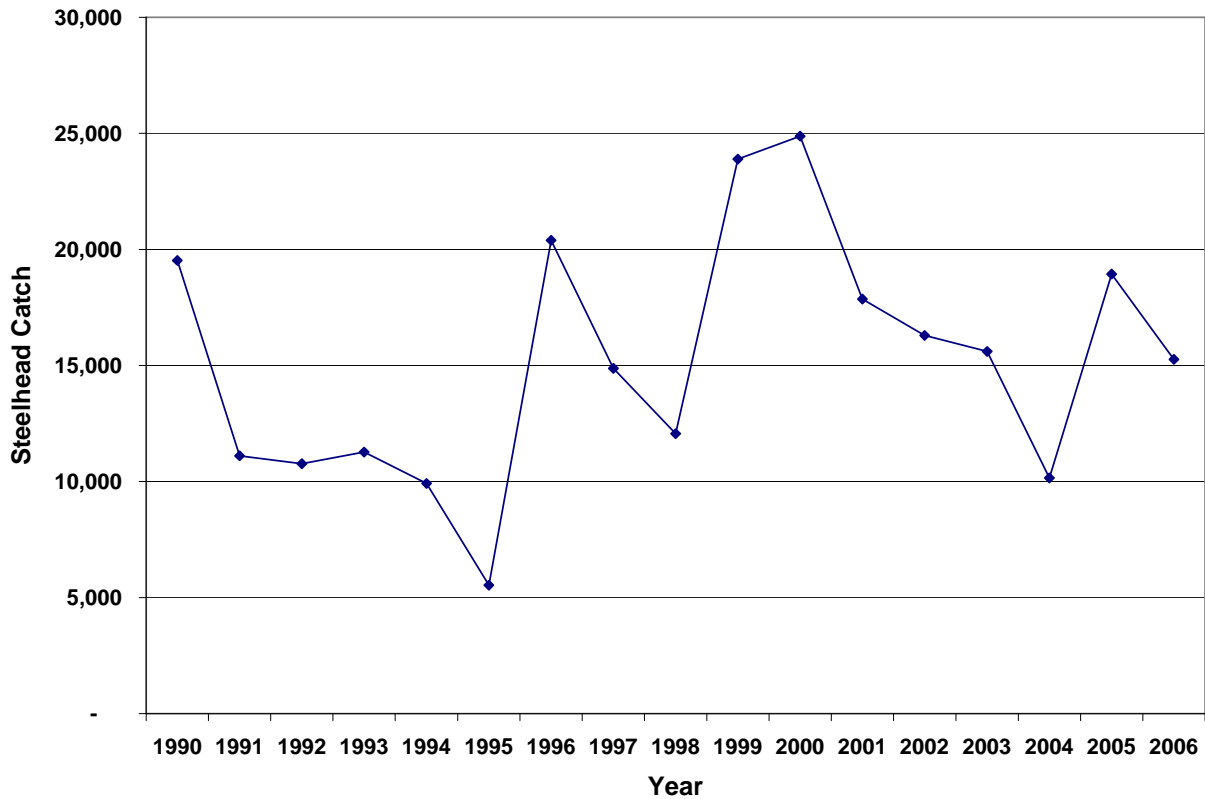


Figure 4.–Steelhead catch (harvested plus released) in Southeast Alaska, 1990–2006 from the Alaska Department of Fish and Game, Division of Sport Fish Statewide Harvest Survey.

Estimates of the annual harvest of Dolly Varden in SEAK have declined since it peaked at over 42,500 in 1986 (Figure 5). Even though Dolly Varden regulations were not modified with the more conservative trout regulations in 1994, the annual harvest of Dolly Varden has a similar pattern as cutthroat trout, i.e., harvest since 1994 has remained low (between 6,000 and 14,000; Figure 5). Estimates of annual catches of Dolly Varden declined by nearly half in the last 3 years (2003–2006) from nearly 90,000 fish in 2003 to 46,000 in 2006 (Figure 6). Dolly Varden emigrants have been enumerated with a weir in 6 systems since statehood (Table 4). Emigrant weir counts vary between years by as much as 50% but are generally stable over multiple years. Estimates of abundance for Dolly Varden in lakes have been generated by two ADF&G projects: Chilkat Lake at 46,700 (SE = 17,300) (Ericksen et al. 1990); and in Chilkoot Lake at 109,152 (SE = 21,065) (Ericksen 2000).

Length composition for anadromous Dolly Varden populations in SEAK have been collected during spring emigrations at several Department weir sites; Auke Creek (1970, 1980–1985, 1987–2005), Sitkoh Creek (1996, 2003–2005), Lake Eva (1963, 1995), and Windfall Lake (1997). Less than 1% of the Dolly Varden sampled in these populations were greater than 20 inches in length.

#### **MANAGEMENT PLANNING AND BOARD ACTIONS**

The current SEAK sport fishing regulations allow a bag and possession limit of 10 Dolly Varden and no size limit; the use of bait is allowed between September 15 and November 15. Between 1971 and 1979 regulations were implemented to limit the harvest of Dolly Varden >20 inches (Table 5).

Regulations for Dolly Varden conservation have been adopted in the Juneau area and in the

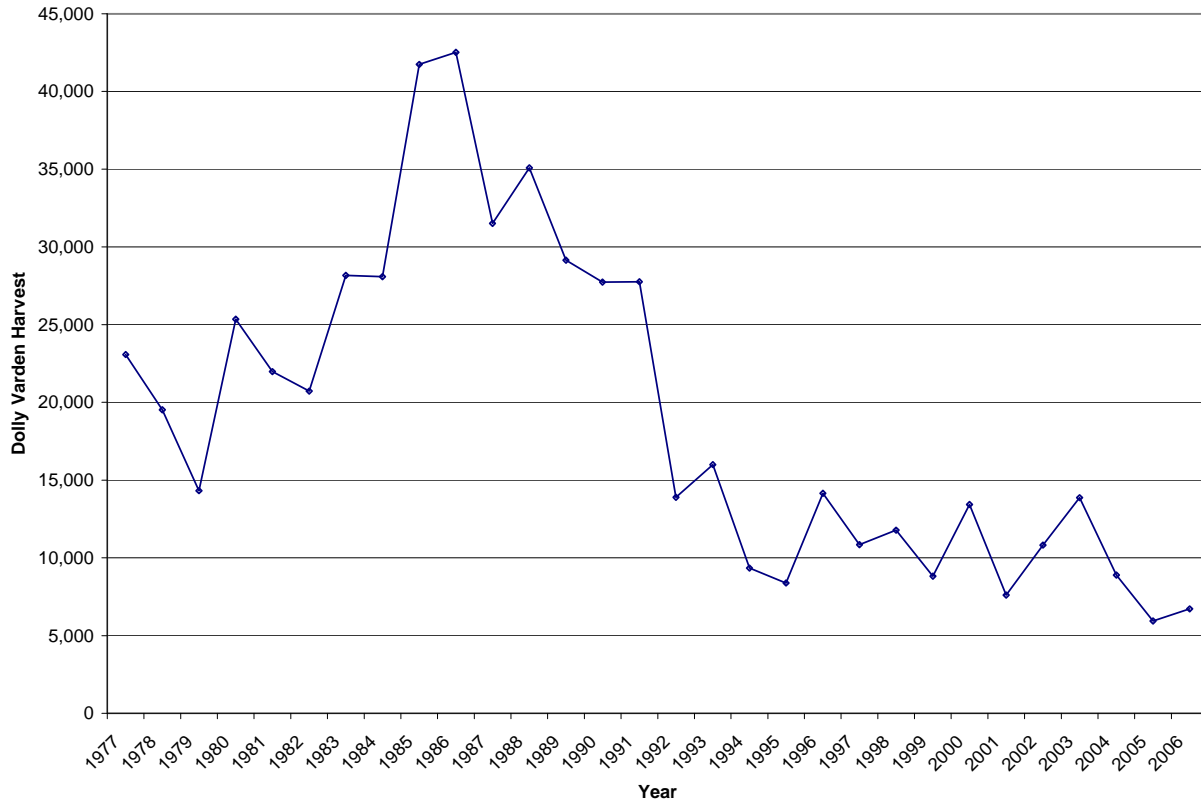


Figure 5.—Dolly Varden harvests in Southeast Alaska, 1977–2006 from the Alaska Department of Fish and Game, Division of Sport Fish Statewide Harvest Survey.

Chilkoot River drainage following sharp declines in sport harvests. For the Chilkoot River, the Board reduced the bag and possession limit from 10 to 2 fish in 1994 but increased the limit to 4 fish in 2003 based on subsequent research and analysis (Ericksen 2000). In the Juneau area, bag limits for both fresh and saltwater areas were reduced to 5 fish per day in 1978, and then further reduced to 2 per day in 1980 along with closures in all freshwaters during September–May and in salt waters within ¼ mile of the shoreline during April–May. In 1983, the seasonal closures for most areas were lifted (the April–May saltwater shoreline closures were left in place along Eagle Beach and the head of Auke Bay) but year-round non-retention regulations for Auke and Mendenhall lakes were established. Sportfishing regulations for special management of Dolly Varden have not been established in SEAK.

## U.S. FOREST SERVICE RECREATIONAL CABIN SURVEY

ADF&G conducts regular postal surveys of U.S. Forest Service (USFS) recreational cabin users in an effort to monitor and assess fishing impacts on trout, Dolly Varden, and steelhead systems throughout SEAK. The objective of the USFS recreational cabin survey is to estimate angler effort, catch, and harvest of steelhead, trout (cutthroat and rainbow combined) and Dolly Varden by stream or lake for parties who register to use USFS cabins. The long-term goal of ADF&G has been to conduct this survey prior to the SEAK Board meeting and to provide the Board with angler trends for 79 important trout and steelhead systems.

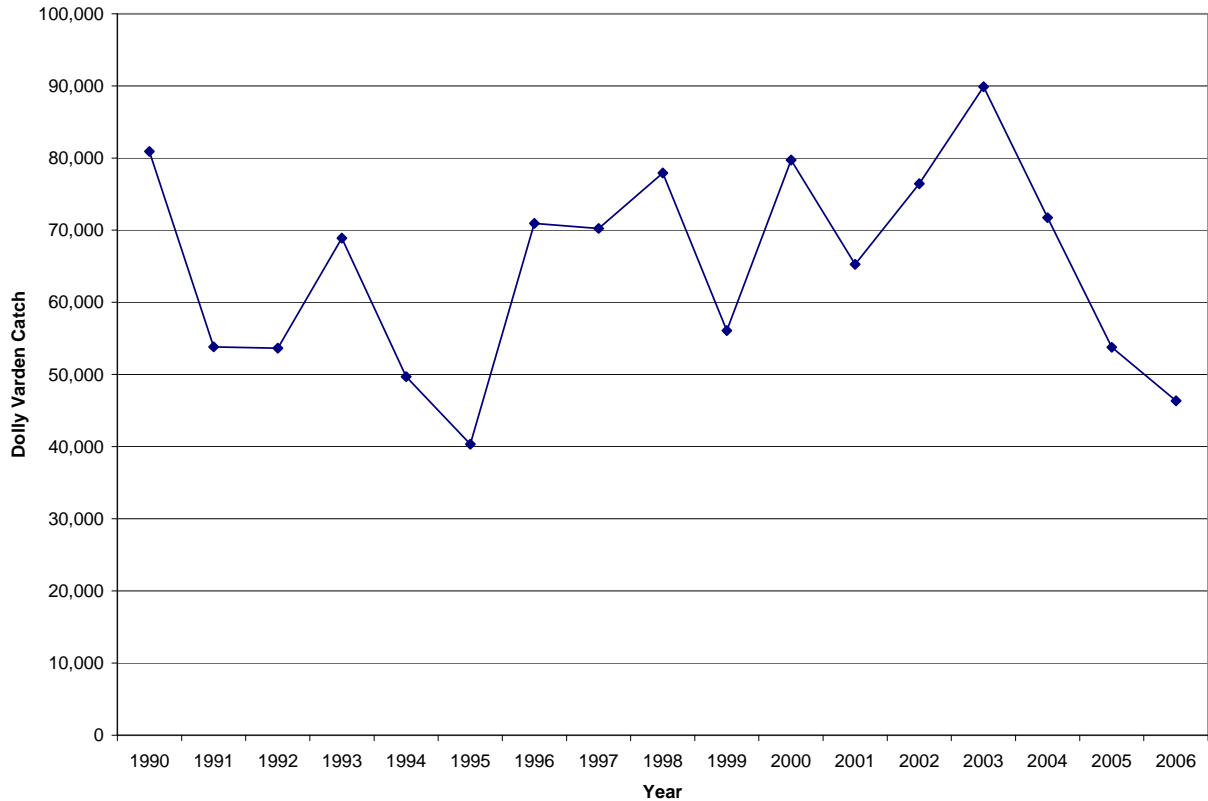


Figure 6.—Dolly Varden total catch (harvest plus released) in Southeast Alaska, 1990–2006 from the Alaska Department of Fish and Game, Division of Sport Fish Statewide Harvest Survey.

The overall response rate during the most recent (2006) cabin survey was 78% (1,064 of 1,359 parties that reserved USFS cabins in SEAK). Approximately 85% (907) of the 1,064 parties that responded to the survey reported they used their cabin reservation during 2006. The average size of responding parties that used their cabin reservation was 3.6 (SE = 0.05) members. The number of nights the cabins were reserved by parties who used their reservation ranged from 1 to 10 nights (maximum allowed) and averaged 2.8 (SE = 0.06). Approximately 60% (547) of the 907 respondents using their reservation reported they had fished during their stay.

Users from 45 different US states and 4 foreign countries reserved the USFS recreational cabins in SEAK included in our survey. Approximately 68% gave an Alaska address when the reservation was made and are assumed to be Alaska residents. Other parties reserving cabins in SEAK during

2006 were from Japan, Australia, Canada, and New Zealand.

Anglers fished an estimated total of 18,914 hours (SE = *in prep*) during 6,102 days (SE = *in prep*) at the USFS recreational cabins and harvested 1,317 trout (SE = *in prep*), 44 steelhead (SE = *in prep*), and 504 Dolly Varden (SE = *in prep*) (Table 6). Anglers also released another 22,107 trout (SE = *in prep*) for an overall retention rate of 6% and released 1,105 steelhead (SE = *in prep*) for an overall retention rate of 4%.

Estimates of effort and catch of trout and steelhead were highly variable throughout SEAK, with some sites being more popular than others (Table 6). The 2 systems with the highest number of reservations, Peterson and Windfall lake cabins (both on the Juneau road system), produced modest catches (<1.5%), but combined accounted

Table 4.—Emigrant Dolly Varden weir counts by system and year for Southeast Alaska.

System	Year	Weir Count
Lake Eva Creek	1962	38,957
Lake Eva Creek	1963	93,303
Lake Eva Creek	1995	117,821
Sitkoh Creek	1996	48,252
Sitkoh Creek	2003	52,884
Sitkoh Creek	2004	62,409
Sitkoh Creek	2005	38,422
Sitkoh Creek	2006	29,820
Sitkoh Creek	2007	27,534 <sup>a</sup>
Sitkoh Creek	2008	19,790 <sup>a</sup>
Windfall Creek	1997	34,109
Auke Creek	1970	6,249
Auke Creek	1980	3,132
Auke Creek	1981	6,461
Auke Creek	1982	4,172
Auke Creek	1983	3,718
Auke Creek	1984	4,512
Auke Creek	1985	3,052
Auke Creek	1986	4,358
Auke Creek	1987	6,444
Auke Creek	1988	6,770
Auke Creek	1989	7,230
Auke Creek	1990	6,426
Auke Creek	1991	5,559
Auke Creek	1992	6,839
Auke Creek	1993	5,075
Auke Creek	1994	7,604
Auke Creek	1995	11,728
Auke Creek	1996	11,323
Auke Creek	1997	10,506
Auke Creek	1998	7,532
Auke Creek	1999	6,393
Auke Creek	2000	5,254
Auke Creek	2001	7,356
Auke Creek	2002	4,858
Auke Creek	2003	5,067
Auke Creek	2004	3,955
Auke Creek	2005	6,544
Auke Creek	2006	4,975
Auke Creek	2007	4,300
Auke Creek	2008	5,363
Duck Creek	2003	118
Duck Creek	2004	219
Jordan Creek	2003	151
Jordan Creek	2005	77

<sup>a</sup> Weir was inoperable during part of the Dolly Varden emigration.

for 21% of the reservations and 4% of the trout-days fished. The system with the most effort for trout was the Karta River system (three cabins) on Prince of Wales Island, where 2,147 angler-hours were spent to catch a total of 1,582 trout (1,456 released and 106 harvested) and 468 steelhead (444 released and 24 harvested). Other systems with estimates of over 75 steelhead caught include Kadake Creek (158), Petersburg Lake (110), McDonald Lake (98), Jordan Lake (83), and Hasselborg Lake (80). These six systems account for approximately 88% of steelhead caught and 57% of the steelhead harvested. Two systems had higher estimated steelhead harvests than catch: De Boer Lake (3 harvested vs. 0 released) and Sweetwater Lake (7 harvested vs. 3 released.)

Parties who fished for trout were asked to rank their fishing experience. We received 498 replies to that question from party heads (Table 7). The 2 lakes rated highest by 10 or more respondents were Wilson and Hasselborg lakes with 67% and 62% rating them as excellent, respectively. Other lakes that were rated excellent by 4 or more respondents included Sitkoh Lake (7 responses), Swan Lake (5 responses), and Lake Eva (4 responses).

The lowest-rated systems were Sarkar Lake with 11 of 16 responds rating it as poor, and Peterson Lake near Juneau where 11 of 18 rated the fishing as poor. For many systems, responses were distributed among all 4 categories (Table 6). Southeast-wide, 41% of responses reported trout fishing as good or excellent fishing, and 59% ranked the trout fishing fair or poor.

There was a wide diversity of comments from responses to our question about evaluating our current trout regulations in specific watersheds. We received a total of 489 comments from 444 unique respondents and nearly 90% of these comments were general and did not pertain to any particular system or specific fishery. These comments were summarized into three categories: 1) Keep Same and/or Non-Specific Comments; 2) More Conservative; and 3) Less Conservative. Nearly half (49%) of the comments recommended keeping the trout regulations the same while 32% thought they should be more conservative; 20% thought the regulations should be liberalized.

Table 5.—Dolly Varden regulations in Southeast Alaska.

Years	Saltwater Bag Limit	Additional Restrictions	Possession Limit
1971–1974	15	Only 3 over 20 inches	2 daily bag limits
1975–1977	10 <sup>a</sup>	Only 2 over 20 inches	2 daily bag limits
1978–1979	10 <sup>b</sup>	Only 2 over 20 inches	2 daily bag limits
1980–1982	10 <sup>c</sup>	No size limit	1 daily bag limit
1983–1984	10 <sup>d</sup>	No size limit	1 daily bag limit
1985–1993	10 <sup>e</sup>	No size limit	1 daily bag limit
1994–2005	10 <sup>f</sup>	No size limit	1 daily bag limit

<sup>a</sup> In the Juneau area—Auke Creek closed to fishing from Auke Bay boundary markers upstream to Glacier Hwy.

<sup>b</sup> In the Juneau area—Auke Creek closed to fishing from Auke Bay boundary markers upstream to Glacier Hwy. All lakes and streams from Pt. Bishop north to Sawmill Creek (3 miles north of Echo Cove), including all of Douglas Island: the bag and possession limit is 5 Dolly Varden, only 2 over 12 inches. All saltwater areas ¼ mile offshore between Pt. Bishop and Sawmill Creek, including ¼ mile around Douglas Island: the bag and possession limit is 5 Dolly Varden, only 2 over 12 inches.

<sup>c</sup> In the Juneau area—Auke Creek closed to fishing from Auke Bay boundary markers upstream to Glacier Hwy. All lakes and streams from the tip of Pt. Bishop north to Sawmill Creek, including all of Douglas Island, are closed to the taking of Dolly Varden September 1–May 30. Freshwater bag and possession limit is 2 Dolly Varden of any size. Montana Creek, including McGinnis Creek, closed to the taking of Dolly Varden. Saltwater, ¼ mile offshore between the tip of Pt. Bishop and Sawmill Creek, including ¼ mile saltwater zone around Douglas Island, closed to the taking of Dolly Varden April 1–May 31. Daily bag and possession limit is 2 Dolly Varden of any size remainder of year.

<sup>d</sup> In the Juneau area—Juneau roadside fresh waters restricted to 2 Dolly Varden per day and in possession. Auke Bay, east of line from mouth of Waydelich Creek to a department marker located ¼ mile south of the mouth of Auke Creek, closed to Dolly Varden fishing April 1–May 31; 2 per day and in possession the remainder of the year. Auke Creek, below Glacier Highway is closed to all fishing. Auke Lake, its tributaries, and the outlet downstream from Glacier Highway closed to Dolly Varden fishing. Eagle River beach from the Boy Scout Camp north to a department marker at the latitude of Sentinel Island light, to a distance ¼ mile offshore, closed to Dolly Varden fishing April 1–May 31; 2 per day and in possession the remainder of the year. Mendenhall Lake, Montana Creek and McGinnis Creek closed to Dolly Varden fishing.

<sup>e</sup> In the Juneau area—Juneau roadside fresh waters restricted to 2 Dolly Varden per day and in possession. Auke Bay, east of line from mouth of Waydelich Creek to a marker ¼ mile south of the mouth of Auke Creek, closed to Dolly Varden fishing April 1–May 31; 2 per day in and possession the remainder of the year. Auke Creek, below Glacier Highway, closed to all fishing. Auke Lake and Mendenhall Lake closed to Dolly Varden fishing. Eagle River beach from the Boy Scout Camp north to a department marker at the latitude of Sentinel Island light, to a distance ¼ mile offshore, closed to Dolly Varden fishing April 1–May 31; 2 per day and in possession the remainder of the year. Montana Creek, including McGinnis Creek, 2 per day and in possession, opened to fishing with artificial unbaited lures only.

<sup>f</sup> In the Juneau area—Juneau roadside fresh waters restricted to 2 Dolly Varden per day and in possession. Auke Bay, east of line from mouth of Waydelich Creek to a marker ¼ mile south of the mouth of Auke Creek, closed to Dolly Varden fishing April 1–May 31; 2 Dolly Varden per day and in possession the remainder of the year. Auke Creek, below Glacier Highway, closed to all fishing. Auke Lake and Mendenhall Lake closed to Dolly Varden fishing. Montana Creek, including McGinnis Creek, 2 per day and in possession, opened to fishing with artificial unbaited lures only. All salt waters adjacent to CBJ road system to ¼ mile offshore, 2 Dolly Varden per day and in possession.

The estimated total freshwater catch of trout (cutthroat and rainbow trout, combined) from the 2006 SWHS for SEAK totaled 41,820 (i.e., harvest = 3,143 (SE = 513) + catch = 38,677 (SE = 5,036)). Estimated total trout catch from the 2006 USFS cabin survey was 23,424 or 56% of the SWHS estimate. This suggests that the USFS recreational cabins provide access to over half of the fishing opportunities targeting trout in SEAK. The estimated total trout catch from the USFS cabin survey in 1999 was 58% of the SWHS estimate, while in 2002 it was

only 39% (Harding et al. 2005). These USFS cabins continue to provide significant access to the trout resources in SEAK.

Comparison of the 2006 cabin survey trout catch estimates with estimates prior to the major revision of the regional trout regulations in 1994 reveal that the total trout catch is about 58% of the 1993 estimate. Estimates of trout catch from the 1999 and 2002 surveys also vary between 72% and 55%, respectively, of the 1993 estimate.

Table 6.--Number of registered parties, responding parties, and total estimated effort (angler-days and angler-hours) by target species, fish kept and released at USFS recreational cabins in Southeast Alaska during 2006.

System <sup>a</sup>	Number Registered	Number Responded	Total Days Fished	Trout (cutthroat and rainbow)				Steelhead		Dolly Varden	
				Days Fished	Hours Fished	Harvest	Released	Harvest	Released	Harvest	Released
Admiralty Cove	51	44	61	42	93	4	30	0	1	7	130
Anan Bay	24	20	36	36	83	0	13	0	9	0	7
Avoss Lake	5	5	16	16	50	2	25	0	0	0	0
Bakewell Lake	6	4	48	46	204	15	96	0	0	0	0
Baranof Lake	11	7	27	25	48	10	67	0	0	0	3
Black Bear Lake	11	5	12	12	73	8	8	0	0	0	0
Castle River (2)	32	25	217	118	502	73	549	0	10	8	170
Checats Lake	2	1	12	12	32	12	36	0	0	0	0
Control Lake	33	19	114	50	253	5	101	0	0	0	0
Davidof Lake	3	3	7	7	35	5	26	0	0	0	0
De Boer Lake	2	2	14	14	84	3	0	0	0	0	0
Distin Lake (2)	5	5	27	22	138	1	143	0	0	2	11
Duncan Salt Chuck	21	16	88	65	152	10	60	0	0	0	0
Eagle Lake	1	0	0	0	0	0	0	0	0	0	0
Ella Lake	6	5	36	34	187	25	265	0	0	3	4
Essowah Lake	2	2	17	4	12	0	19	0	0	0	8
Fish Creek	54	33	185	149	628	27	244	1	9	5	49
Florence Lake	10	8	11	11	35	9	97	0	0	15	1
Gouldling Lake	7	5	9	9	35	2	46	0	0	0	0
Harding River	9	6	53	37	191	0	2	0	0	0	22
Harvey Lake	9	9	8	8	27	0	16	0	0	0	0
Hasselborg Lake (3)	27	22	246	228	1,353	7	3,085	0	80	0	84
Heckman Lake	35	26	258	170	688	44	529	0	5	4	73
Helm Bay	0	0	0	0	0	0	0	0	0	0	0
Honker Lake	6	5	46	29	99	11	228	0	0	2	20
Hugh Smith Lake	6	6	47	47	260	15	143	0	0	6	36
Humpback Lake	9	7	106	103	578	94	1,924	0	0	3	7
Jim's Lake	4	4	9	9	12	2	43	0	0	0	0
Jordan Lake	31	24	151	115	549	10	275	0	83	0	14
Kadake Creek	7	7	57	44	300	0	38	0	158	3	55
Kah Sheets Creek	24	20	114	24	84	7	44	2	9	6	54
Kah Sheets Lake	23	18	148	80	417	29	80	2	21	14	35

-continued-

Table 6.--page 2 of 2.

System <sup>a</sup>	Number Registered	Number Responded	Total Days Fished	Trout (cutthroat and rainbow)				Steelhead		Dolly Varden	
				Days Fished	Hours Fished	Harvest	Released	Harvest	Released	Harvest	Released
Karta (3)	75	58	699	463	2147	106	1456	24	444	34	328
Kathleen Lake	9	6	0	0	0	0	0	0	0	0	0
Kegan Creek (2)	31	22	223	37	153	14	64	0	3	1	4
Kook Lake	3	3	3	0	0	0	0	0	0	0	0
Lake Alexander	4	4	0	0	0	0	0	0	0	0	0
Lake Eva	17	10	150	113	505	41	374	0	8	29	1,214
Manzanita Lake (2)	20	15	108	97	477	66	583	2	14	28	27
Marten Lake	2	2	24	24	103	11	232	0	0	0	1
McDonald Lake	23	14	343	291	902	56	496	0	98	18	249
Orchard Lake	10	10	109	97	357	114	446	0	0	1	1
Patching Lake	9	5	97	97	589	4	625	0	0	0	38
Petersburg Lake	27	21	135	100	534	23	294	1	110	32	48
Peterson Lake	106	83	60	48	201	0	49	0	0	6	54
Plotnikof Lake	7	3	50	12	62	22	48	0	0	0	0
Rainbow Lake	0	0	0	0	0	0	0	0	0	0	0
Red Bay Lake	35	26	95	83	275	12	186	0	8	3	9
Reflection Lake	17	11	151	131	578	56	1076	2	10	19	72
Salmon Bay Lake	10	8	99	42	188	9	64	0	0	55	221
Salmon Lake	48	43	123	96	369	11	172	0	12	78	375
Sarkar Lake	30	27	138	97	339	17	235	0	0	0	7
Shiple Bay	4	3	5	0	0	0	0	0	0	0	17
Sitkoh Lake (2)	29	26	144	110	446	95	595	0	1	27	287
Staney Creek	53	39	124	52	203	6	77	3	3	6	110
Suloia Lake	7	5	22	22	48	3	43	0	0	4	1
Swan Lake	17	13	69	67	180	45	285	0	0	0	0
Sweetwater Lake	5	5	14	12	54	7	3	7	3	1	1
Turner Lake (2)	50	36	263	214	677	9	651	0	3	53	188
Twin Lakes	15	8	17	11	26	0	29	0	0	0	7
Virginia Lake	22	19	159	122	421	52	470	0	0	3	35
Wilson Lake (2)	22	13	160	148	731	13	3543	0	0	5	253
Windfall Lake	186	138	130	108	476	21	253	0	1	11	292
Winstanley Lake	3	2	47	17	66	27	56	0	0	12	26
Young Lake (2)	38	23	161	140	605	47	1470	0	2	0	3
Totals	1,410	1,064	6,102	4,417	18,914	1,317	22,107	44	1,105	504	4,651

<sup>a</sup> If more than 1 cabin occurs at a given system, the number is listed in parentheses.

Table 7.—Summary of how parties rated trout fishing from the cabins they visited during 2006.

System	Ratings by fishing parties				System	Ratings by fishing parties			
	Excellent	Good	Fair	Poor		Excellent	Good	Fair	Poor
Admiralty Cove	1		3	6	Kegan Creek		3	1	6
Anan Bay		2		1	Kook Lake				
Avoss Lake		1		2	Lake Alexander				
Bakewell Lake		2	2		Lake Eva	4	1	2	1
Baranof Lake		3	1		Manzanita Lake	2	4	6	
Black Bear Lake			2		Marten Lake	1			1
Castle River	2		8	6	McDonald Lake		1	4	5
Checats Lake			1		Orchard Lake	3		7	
Control Lake		3	1	3	Patching Lake	1		3	1
Davidof lake		1			Petersburg Lake	2	6	4	1
De Boer Lake				1	Peterson Lake		6	1	11
Distin Lake		1	1		Plotnikof Lake			1	1
Duncan Salt Chuck		2	1	4	Red Bay Lake	3	4	1	5
Eagle Lake					Reflection Lake	3	3	5	
Ella Lake	3	1			Salmon Bay Lake	1	2	1	
Essowah Lake		1		1	Salmon Lake	3	5	4	6
Fish Creek		4	6	10	Sarkar Lake	2	2	1	11
Florence Lake	2		1		Shiple Bay				1
Gouldling Lake		1			Sitkoh Lake	7	3	5	1
Harding River		1		1	Staney Creek		2		4
Harvey Lake			1	1	Suloia Lake	1			
Hasselborg Lake	8	1	4		Swan Lake	5		2	
Heckman Lake	1	4	4	6	Sweetwater Lake			1	1
Honker Lake	1		1	2	Turner Lake	3	5	9	9
Hugh Smith Lake		2	3		Twin Lakes		2		
Humpback Lake	2	2	2		Virginia Lake	3	3	5	4
Jim's Lake			2		Wilson Lake	8		3	1
Jordan Lake	2	3	1	5	Windfall Lake	1	10	4	13
Kadake Creek		2	2	2	Winstanley Lake	2			
Kah Sheets Creek		2	2	2	Young Lake	4	3	3	4
Kah Sheets Lake		7	2	1	Total	86	122	143	147
Karta	5	11	19	6	Percent of total	17%	24%	29%	30%
Kathleen Lake									

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