Special Publication No. BOF 2009-07

An Overview of the Subsistence Fisheries of the Bristol Bay Management Area

by

James A. Fall,

Theodore M. Krieg

and

Davin Holen

November 2009

Alaska Department of Fish and Game **Division of Subsistence**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the reports by the Division of Subsistence. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

all commonly-accepted abbreviations e.g., Mr., Mrs., AM, PM, etc.	
all commonly-accepted professional titles e.g., Dr., Ph.D., R.N., etc.	
Alaska Administrative Code	AAC
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures):	first three letters (Jan,...,Dec)
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	E
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

SPECIAL PUBLICATION NO. BOF 2009-07

AN OVERVIEW OF THE SUBSISTENCE FISHERIES OF THE BRISTOL BAY MANAGEMENT AREA

by

James A. Fall,
Alaska Department of Fish and Game, Division of Subsistence, Anchorage

Theodore M. Krieg,
Alaska Department of Fish and Game, Division of Subsistence, Dillingham

and

Davin Holen
Alaska Department of Fish and Game, Division of Subsistence, Anchorage

Alaska Department of Fish and Game
Division of Subsistence
333 Raspberry Road
Anchorage, Alaska, 99518

November 2009

The Division of Subsistence Special Publications series was established for the publication of techniques and procedure manuals, informational pamphlets, special subject reports to decision-making bodies, symposia and workshop proceedings, application software documentation, in-house lectures, and other documents that do not fit in another publications series of the Division of Subsistence. Most Special Publications are intended for readers generally interested in fisheries, wildlife, and the social sciences; for natural resource technical professionals and managers; and for readers generally interested the subsistence uses of fish and wildlife resources in Alaska.

Special Publications are available through the Alaska State Library and on the Internet: http://www.subsistence.adfg. state.ak.us. This publication has undergone editorial and professional review.

James A. Fall,
Alaska Department of Fish and Game, Division of Subsistence,
333 Raspberry Rd., Anchorage, AK, 99518, USA

Theodore M. Krieg,
Alaska Department of Fish and Game, Division of Subsistence
P.O. Box 1030, Dillingham, AK, 99576, USA

and
Davin Holen
Alaska Department of Fish and Game, Division of Subsistence,
333 Raspberry Rd., Anchorage, AK, 99518, USA

This document should be cited as:
Fall, J. A., T. M. Krieg, and D. Holen. 2009. Overview of the subsistence fisheries of the Bristol Bay Management Area. Alaska Department of Fish and Game Division of Subsistence Special Publication No. BOF 2009-07, Anchorage.

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

- Bristol Bay subsistence fisheries are an essential component of the local economy and way of life of Bristol Bay communities. About 50% of the subsistence harvest by local community residents, as measured in pounds usable weight, is Pacific salmon *Oncorhynchus* and about 10% is other fishes.
- The Alaska Board of Fisheries (BOF) has found that all finfishes of the Bristol Bay Management Area are customarily taken or used for subsistence purposes. As established by the BOF, the amounts reasonably necessary for subsistence uses (ANS) include 157,000–172,171 salmon (including 55,000–65,000 Kvichak River drainage sockeye salmon *O. nerka*) and 250,000 pounds usable weight of other finfishes.
- The number of Bristol Bay subsistence salmon permits issued has been stable since 1990. The recent 10-year average (1998–2007) is 1,146 permits.
- Most subsistence permit holders are residents of Bristol Bay communities: for the 1998–2007 period, 84% of permit holders were Bristol Bay residents.
- Most subsistence permits are issued for the Nushagak and Naknek/Kvichak districts.
- Sockeye salmon make up the largest portion of the Bristol Bay subsistence salmon harvest, as reported on subsistence permits: 79% of the recent 10-year average (1998–2007), followed by Chinook *O. tshawytscha* (19%), coho *O. kisutch* (5%), chum *O. keta* (5%), and pink salmon *O. gorbuscha* (2%).
- Annual subsistence salmon harvests in the Bristol Bay Management Area declined from the early 1990s to the early 2000s. Since 1975, the average annual harvest was about 152,371 salmon; the recent 5-year average (2003–2007) was 126,717 salmon. Estimated harvests in 2000 (118,824 salmon), 2001 (119,856 salmon), and 2002 (109,587 salmon) are among the lowest on record. Salmon harvests have slightly recovered since 2002.
- The largest decline over the last 15 years has occurred in the Kvichak River watershed subsistence sockeye salmon fishery, historically the largest component of the Bristol Bay subsistence salmon harvest. The long-term (45 years, the time for which permit data are available) average annual harvest for this fishery is 66,614 sockeye salmon. The recent 5-year average annual harvest is 47,480 sockeye salmon. Harvests in 2000 (36,990 sockeye salmon), 2001 (32,808), and 2002 (33,001) were the lowest on record. Declines are due to lower harvests per permit rather than less fishing effort. Local fishers attribute the declines to reduced abundance of fish in traditional harvest areas. Since 1996, harvest per day is down 26% in years of escapements under 2 million fish, compared to the previous 13-year average.
- From 1983 to 2007 (the most recent data year), salmon harvests have shown an overall decline in the Nushagak District from a high of 86,400 fish in 1986 to a low of 40,373 salmon in 2006. The 24-year average harvest (the time for which data are available) is 50,740 fish. However, the number of subsistence salmon permits issued in the Nushagak District has remained relatively stable since 1983. In 2007, 496 permits were issued, compared to the 5-year average of 499 and the 10-year average of 522. Average salmon harvests per subsistence permit in the Nushagak District began to decline in 1995, reaching a low of 82 fish per permit in 1998. For all permit holders, the average harvest per permit was 91 salmon in 2007, which was higher than the 10-year average of 89 fish but lower than the 20-year average of 102 fish.
- Other fishes taken for subsistence purposes in the Bristol Bay Management Area include Pacific herring *Clupea pallasi*, various species of smelt, Dolly Varden *Salvelinus malma*, lake trout *S. namaycush*, rainbow trout *O. mykiss*, Arctic grayling *Thymallus arcticus*, northern pike *Esox lucius*,

various species of whitefishes, burbot *Lota lota*, and Alaska blackfish *Dallia pectoralis*. Although there are no Alaska Department of Fish and Game annual subsistence harvest assessment programs for these species, harvest estimates are available through periodic household surveys. These fishes are taken throughout the year with a variety of harvest methods and are an important part of annual subsistence uses in the general Bristol Bay area.

Key words: subsistence fishing, Kvichak River, Bristol Bay, subsistence permit, sockeye salmon, Board of Fisheries.

INTRODUCTION

In an area that is world-renowned for its commercial fisheries and its recreational opportunities, subsistence uses of wild renewable resources remains the most consistent and the most reliable component of the local economy of Bristol Bay communities (Figure 1). Subsistence fishing, hunting, and gathering provide hundreds of pounds of highly nutritious food for residents of the area. Much of the seasonal round of activities is shaped by the natural cycles of fishes, birds, mammals, and plants. Knowledge that is fundamental to making a living in the region is preserved and communicated through gathering and processing of wild resources, including fishing and hunting activities. Values that support families and communities are expressed, emphasized, and taught during the harvest, preparation, and sharing of wild foods. In the 20th century, much economic, social, cultural, and demographic change took place in Bristol Bay during the evolution of its economy, which is a mixture of cash and subsistence sectors. At the beginning of the 21st century, subsistence activities and values remain a cornerstone of area residents' way of life, a link to the traditions of the past, and one of their bases for survival and prosperity.

This report briefly describes the subsistence fisheries of the Bristol Bay Management Area, with a primary focus on the fisheries for Pacific salmon *Oncorhynchus*. It is based on information gathered from a subsistence salmon permit program administered by the Alaska Department of Fish and Game (ADF&G) Division of Subsistence as well as research conducted by the division.

THE BRISTOL BAY REGION

POPULATION, COMMUNITIES, AND CASH ECONOMY

At the time of the last federal census in 2000, the population of the general Bristol Bay area was 7,520 in 26 communities (Table 1). This was an increase of 14% since 1990, when the federal census estimated the area's population at 6,573. The most recent estimates by the Alaska Department of Labor and Workforce Development (ADLWD 2009) place the 2008 population of the area at 6,984, a decline of 7% since 2000. There are 2 regional centers: Dillingham (population 2,347 in 2008) and the Bristol Bay Borough, which consists of Naknek, South Naknek, and King Salmon (population 1,029 in 2008). In 2000 in the region overall, 72% of the population was Alaska Native. In 22 communities other than the regional centers, 87% of the population was Alaska Native. Native peoples of the area include Central Yup'ik, Dena'ina Athabascan, and Alutiiq.

Commercial fishing and services dominate the cash economy of the area, and thus the economy is highly seasonal. The 2000 federal census estimated a per capita income for the area of $17,864, which was below the state average of $22,660. Median household income was $43,896, also below the Lower 48 average of $51,571 (Appendix Table 1). Studies by the Division of Subsistence have also documented a pattern of seasonal employment, reliance on commercial fishing, and relatively low cash incomes (Krieg

et al. 2009; Fall et al. 2006; see also the Division of Subsistence Community Subsistence Information System[1] and the Community Profile Database.[2])

GENERAL PATTERNS OF SUBSISTENCE USES

Subsistence harvests in the Bristol Bay Management Area are among the largest in the state, and are very diverse. Based on the results of systematic household surveys conducted by the Division of Subsistence, the estimated annual areawide harvest of wild foods in the 1980s and 1990s was 422 pounds usable weight per capita and 1,439 pounds per household. As shown in Figure 2, salmon made up 51% of this harvest, land mammals (mostly moose *Alces americanus* and caribou *Rangifer tarandus*) were 31%, fishes other than salmon (see below) comprised 10%, and other resources, such as marine mammals, birds and eggs, marine invertebrates, and wild plants, provided 8%.

Wild resource harvests are generally higher in the smaller communities of the Bristol Bay Management Area than in the 2 regional centers. The areawide estimate for these smaller communities for the 1980s through 1990s was 587 pounds per person per year, with a household average of 2,284 pounds. For this period, the composition of subsistence harvests in the smaller communities was very similar to that of the area overall: 49% salmon, 31% land mammals, 11% other fishes, and 9% other resources. More current harvest estimates are currently being researched by ADF&G, mainly in response to the proposed Pebble Project. (Fall et al. 2006; Krieg et al. 2009; Holen et al. *In prep.*; Holen et al. *In prep.*)

The importance of subsistence harvests to the economy of the Bristol Bay region is evident when considering potential replacement costs of foods produced by local hunting, fishing, and gathering activities. For a subset of Bristol Bay communities studied in 2005, the estimated cost of replacing wild foods, at $7 per pound, based on the 2008 costs of buying meat at a local store or the cost of importing store-bought meat to small communities, would range from $4,851 in Levelock to $14,973 per household in the Iliamna Lake area (see Table 2). Residents have reported that they spend from 15% to 26% of their income on store-bought foods (Krieg et al. 2009; Holen *In press*). However, this exercise omits the cultural, social, and nutritional costs of replacing subsistence foods with imported substitutes. Indeed, it is unlikely that adequate substitutes for many subsistence foods produced in the region could be purchased.

THE BRISTOL BAY MANAGEMENT AREA SUBSISTENCE SALMON FISHERIES

REGULATIONS

The Alaska Board of Fisheries (BOF) has found that salmon of the Bristol Bay Management Area support customary and traditional (subsistence) uses (5 AAC 01.336). In 1993, the BOF established a range of 157,000–172,171 salmon as the amount necessary to provide a reasonable opportunity for subsistence uses (ANS). The low point of this range was the lowest subsistence harvest in the area over the previous 11 years (1982–1992), while the high point was the average harvest over that period. In 2001, the finding was amended to specify that of the total ANS, 55,000–65,000 Kvichak River drainage sockeye salmon *O. nerka* (excluding Alagnak River stocks) were necessary to provide a reasonable opportunity for subsistence uses.

The following is a synopsis of the key provisions of subsistence salmon fishing regulations for the Bristol Bay Management Area.

- Permits. Required. Limit of one per household. Must be returned with a record of harvest.

[1] ADF&G Community Subsistence Information System: http://www.subsistence.adfg.state.ak.us/CSIS. Hereinafter cited as CSIS.

[2] ADF&G Community Profile Database: http://subsistence.adfg.state.ak.us/geninfo/publctns/cpdb.cfm. Hereinafter cited as CPDB.

- Seasonal limits: With one exception, none established in regulation, although ADF&G may set harvest limits for conservation reasons. The exception is in the Naknek District, where there is an annual possession limit of 200 sockeye salmon taken after August 15.
- Gear: Drift and set gillnets in waters open to commercial fishing. Set gillnets only in other waters with certain exceptions. Spears may be used in the Togiak River. Nets may be up to 25 fathoms in length except in the Naknek, Egegik, and Ugashik rivers, in the Dillingham beach areas, and during emergency openings in the Nushagak District, where they may be no more than 10 fathoms in length. Also, in 1998, the BOF adopted new regulations for the taking of "redfish" (spawned sockeye salmon) in portions of the Naknek District. Gillnets, spears, and dip nets may be used along a 100 yard portion of the west shore of Naknek Lake near its outlet to the Naknek River from August 20 through September 30; at Johnny's Lake from August 15 through September 25; and at the mouth of the Brooks River from October 1 through November 15. In 2006, the BOF adopted regulations to allow the harvest of salmon by spear in Lake Clark (excluding its tributaries) and by beach seines in Iliamna Lake, Sixmile Lake, and Lake Clark. Beach seines may not exceed 25 fathoms in length.
- Seasons. Except as follows, fishing is open at any time.
    - In areas open to commercial fishing, from May 1–31 and October 1–31, from 9:00 a.m. Monday to 9:00 a.m. Friday; from June 1–September 30, during open commercial fishing periods.
    - In the area of the Nushagak District generally called the "Dillingham beaches," from July 2–July 17, three 24-hour periods per week (from 9:00 a.m. Monday to 9:00 a.m. Tuesday, 9:00 a.m. Wednesday to 9:00 a.m. Thursday, and 9:00 a.m. Friday to 9:00 a.m. Saturday). This area is defined as all waters upstream of a line between an ADF&G regulatory marker located 2 statute miles south of Bradford Point and an ADF&G regulatory marker located on Nushagak Point to an ADF&G regulatory marker located at Red Bluff on the west shore of the Wood River, and to an ADF&G regulatory marker located at Lewis Point on the north shore of the Nushagak River.
    - In the Naknek, Egegik, and Ugashik rivers, from June 23–July 17, two 24-hour periods per week (from 9:00 a.m. Tuesday to 9:00 a.m. Wednesday and 9:00 a.m. Saturday to 9:00 a.m. Sunday). (In 2001, 2002, and 2003, ADF&G issued emergency orders to open additional subsistence fishing periods in the Egegik District during commercial fishing closures.)

THE SUBSISTENCE PERMIT PROGRAM

As noted above, subsistence salmon fishers in the Bristol Bay Management Area are required to obtain an annual subsistence permit from ADF&G. These permits are issued free of charge, but are issued only to Alaska residents (minimum of 12 consecutive months' residency in the state). The permit includes a harvest calendar for recording daily harvests by species. These permits are available at ADF&G offices in Dillingham, King Salmon, and Anchorage, and from vendors in most area communities. The Division of Subsistence has the primary responsibility for administering the Bristol Bay subsistence permit program.

Since 1963, subsistence salmon harvest data based on permit returns have been reported in an ADF&G Bristol Bay Annual Management Report series ("AMRs") prepared by the Division of Commercial Fisheries. Since 1983, the Division of Subsistence has performed data entry for the permit program. To ensure high permit return rates, Division of Subsistence staff mail 2 reminder letters to permit holders, visit the area communities, and contact permit recipients by telephone, as time and funding permit. Radio announcements in English and Central Yup'ik are also broadcast. These measures have been very successful, with permit returns averaging better than 85% annually. Thus, most subsistence fishing households in the Bristol Bay Management Area that do obtain permits do return their salmon permits and harvest calendars.

PARTICIPATION

Figure 3 illustrates the number of subsistence permits issued for the Bristol Bay Management Area from 1975 through 2007 (see also Table 3, Appendix Table 2). For this 33-year period, the average number of Bristol Bay subsistence permits issued is 1,035. The recent 10-year average (1998–2007) is 1,146 permits and the recent 5-year average is 1,094 (Table 3). Most of the increase in permits issued in 1990 and 1991 was likely due to the reopening of the area's subsistence salmon fisheries to nonlocal Alaska residents. Since the early 1990s, the number of subsistence permits issued annually for Bristol Bay has been stable. Appendix Table 3 reports participation and harvest levels by district and subdistrict for 2007, the most recent study year for which data are available.

The majority of participants in the Bristol Bay subsistence salmon fishery are year-round residents of Bristol Bay communities. For the 10-year period from 1998–2007, 83.9% of the permits were issued to Bristol Bay residents and 16.1% to other Alaska residents. These percentages have been fairly steady since 1992 (Figure 4).

SUBSISTENCE SALMON HARVESTS

Figure 5 illustrates the estimated subsistence salmon harvests for the Bristol Bay Management Area for 1975–2007 (see also Table 3 and Appendix Table 2), based on permit returns and expanded to nonreturned permits. The 33-year average harvest is 152,371 salmon, the most recent 10-year average is 127,069 salmon, and the most recent 5-year average is 126,717 salmon (Table 3). These data show that after about 2 decades of relative stability in the 1970s and 1980s, a downward trend in total subsistence salmon harvests in Bristol Bay began in the early 1990s, although harvests in 2003–2007 rebounded from near record lows in 2000, 2001, and 2002. The estimated total Bristol Bay subsistence salmon harvest in 2007 is 124,679 fish.

Average harvests per permit in the Bristol Bay Management Area subsistence salmon fishery declined over the 1975–2002 period and especially from 1991 to 2002 (Figure 6, Table 3). Average harvests per permit have increased since 2002. For the 33-year period overall, the average harvest per permit is about 153 salmon; for the most recent 10-year period, this average is 111 salmon; and for the most recent 5-year period, the average is 116 salmon. The average harvest per permit in 2007 is 117 salmon per permit (Table 3).

From 1975 to 2007, sockeye salmon made up about 79% of the total subsistence salmon harvest in the Bristol Bay Management Area (Figure 7, Table 3). Chinook salmon *O. tshawytscha* ranked second at 9%, followed by coho salmon *O. kisutch* (5%), chum salmon *O. keta* (5%), and pink salmon *O. gorbuscha* (2%). For the most recent 10-year period (1998–2007), the contribution of Chinook salmon to the area's subsistence harvest increased to about 12%, with drops in the contributions of chum and pink salmon.

Figure 8 illustrates the recent 10-year (1998–2007) average percentage of the total Bristol Bay Management Area subsistence salmon harvest for each management district. The Naknek-Kvichak District has accounted for the largest portion of the subsistence harvest, at about 56%, the Nushagak District ranked second at 37%, followed by Togiak (4%), Egegik (2%), and Ugashik (1%).

Table 4 reports the most recent 10-year (1998–2007) average subsistence salmon harvests for each of the 5 Bristol Bay districts, based on permit returns and expanded to nonreturned permits. In descending order, these most recent average harvests are 71,385 salmon in the Naknek-Kvichak District, 46,172 salmon in the Nushagak District, 5,060 salmon in the Togiak District, 2,832 salmon in the Egegik District, and 1,625 salmon in the Ugashik District.

The majority of the subsistence salmon harvest in the Bristol Bay Management Area is taken by residents of the area. For the most recent 10-year period (1998–2007), 92% of the total harvest was taken by local permit holders, and 8% by nonlocal Alaska residents (Figure 9).

Within the Bristol Bay Management Area, average subsistence salmon harvests per permit differ by district. As illustrated in Figure 10 (see also Table 4), the largest annual average harvest from 1998 through 2007 occurred in the Naknek-Kvichak District at 142 fish per permit, followed by the Nushagak District (88 salmon), Togiak District (86 salmon), Ugashik District (68 salmon), and the Egegik District (64 salmon).

KVICHAK DISTRICT SOCKEYE SALMON SUBSISTENCE FISHERY

The Division of Subsistence prepared a detailed report on the Kvichak River watershed subsistence salmon fishery for the BOF in January 2001 (Fall et al. 2001). This section updates harvest data for this component of the Bristol Bay subsistence salmon fisheries.

Historically, subsistence salmon harvests in the Kvichak River watershed, including Iliamna Lake and Lake Clark, have been the largest within the general Bristol Bay area. There are 8 year-round communities within the watershed: Igiugig (population 40 in 2008), Iliamna (95), Kokhanok (179), Levelock (70), Newhalen (162), Nondalton (202), Pedro Bay (44), and Port Alsworth (125) (ADLWD 2009). Virtually all of the subsistence salmon harvest in the watershed is sockeye salmon; other salmon species are much less abundant upstream of the confluence of the Alagnak (Branch) River with the Kvichak River.

The number of subsistence salmon permits issued for fishing in the Kvichak River watershed has been relatively stable since the early 1990s, when nonlocal residents were again allowed to obtain permits (Figure 11). The recent 10-year average (1998–2007) is 197 permits. Note that the number of issued permits dropped in 2003 to 175, the lowest number issued since 1991 (Table 5). This reflects, in part, a prohibition by the National Park Service (NPS) against subsistence fishing in Lake Clark National Park and Preserve except by federally qualified local rural residents, a prohibition that took effect in May 2001 (ADF&G 2002:40). The NPS prohibition does not account for drops in subsistence harvests (see below), however, because most subsistence fishers in the Kvichak River watershed live in area communities: for the recent 10-year period (1998–2007), 84% of the subsistence permits were issued to local community residents (see Table 5).

Table 6 reports the estimated subsistence sockeye salmon harvests from the Kvichak River watershed for the period 1963–2007. The long term (45-year) average harvest is 66,614 sockeye salmon. As shown in Figure 12, subsistence sockeye salmon harvests in this drainage declined markedly from the early 1990s to the early 2000s. The average annual harvest for the most recent 10-year period (1998–2007) was 45,158, compared to 67,156 for the previous 10-year period (1988–1997). Estimated total harvests for 2000 (36,990 sockeye salmon), 2001 (32,808 sockeye salmon), and 2002 (33,001 sockeye salmon) were the lowest ever recorded for the fishery. These harvest levels are below the range of 55,000–65,000 sockeye salmon established by the BOF in 2001 as necessary for providing a reasonable opportunity for subsistence uses in the watershed. Estimated subsistence harvests in the drainage have increased in the past 4 years to 53,225 in 2004, 48,263 in 2005, 49,850 in 2006, and 47,538 in 2007, but remained below the minimum value in the ANS range.

As illustrated in Figure 13, average sockeye salmon harvests per subsistence permit in the Kvichak River watershed declined from the late 1980s to a record low in 2001. For all permit holders, the average harvest per permit was 174 sockeye salmon in 2000, 158 in 2001, and 183 in 2002, compared to a recent 20-year average of 303 sockeye salmon per permit. Since 2001, average subsistence harvests per permit have increased to 249 sockeye salmon per permit in 2005, 278 in 2006, and 243 in 2007. Permit holders who live in Kvichak River drainage communities show a similar pattern of declining subsistence harvests per permit from the early 1990s to 2001, when the lowest average harvest per permit (176 sockeye

salmon) was recorded (Figure 14.) Average harvests per permit for local residents have since increased to a high of 314 permits in 2006. These averages remain below those recorded before 2000, however.

In 2000, Division of Subsistence researchers interviewed representatives of about 29 subsistence fishing households in Kvichak watershed communities about their subsistence salmon harvests (Fall et al. 2001). Although systematic interviewing did not occur in subsequent years of record low harvests (2001 and 2002), less formal interaction between local fishers and division staff suggested that similar assessments pertained to those years as well. Generally, subsistence fishers reported that returns of sockeye salmon were late in 2000. Also, once runs began, fish returned in "bunches" or "spurts", unlike the steadier runs of prior years. Consequently, fishers needed to keep their nets in the water longer to achieve their harvest goals. However, some fishers reported in 2000 that even with the increased effort, fishing was so "slow" that they eventually stopped fishing before reaching their harvest goals. They intended to compensate for poor salmon harvests with more fishing over the winter for nonsalmon fishes (although recent warm winters have inhibited these harvests as well), and with more caribou and moose harvests (Fall et al. 2001:47). Interviews conducted in 2000 and in 2003 also found that subsistence fishing families in several Kvichak River watershed communities (including Igiugig, Iliamna, Newhalen, and Pedro Bay) changed the location of their fishing efforts in an attempt reach their harvest goals (Fall et al. 2001:32,34,35,38; Krieg *Unpublished*[3]).

Review of subsistence permit data for 1996, 1997, 2000, 2001, 2002, and 2003, years of unusually low sockeye salmon escapements into the Kvichak River watershed (fewer than 2 million salmon in each year), shows that subsistence harvests per day fished dropped by 28% compared to the previous 13-year average; from about 42.2 sockeye salmon per day for 1983–1995 to 31.3 per day for 1996–1997 and 2000–2003 (Figure 15, Figure 16). Note that in 1999, when escapement topped 6 million sockeye salmon, the reported subsistence harvest per day rebounded to about 40 sockeye salmon. These permit data are consistent with reports from subsistence fishers concerning local scarcities of salmon and the difficulties they have faced in achieving desired harvest levels.

It should also be noted that average harvests per day in years of good salmon returns likely do not reflect the harvest potential of the subsistence fishery. Normally, subsistence harvests are self-limiting, largely depending upon each family's capability of processing the harvest. Thus harvest-per-day averages prior to 1996 likely illustrate how many salmon an average family could *process* in one day, rather than the maximum they could *harvest* in one day. In contrast, the average of about 30 fish per day appears to reflect the harvest potential in recent years of returns under 2 million salmon.

In 2006, the BOF adopted regulations to allow harvest of salmon by beach seine in Iliamna Lake, Sixmile Lake, and Lake Clark (5 AAC 01.320). The Division of Subsistence conducted harvest surveys, including questions about gear type, following the 2007 and 2008 salmon seasons in Iliamna, Newhalen, Nondalton, and Port Alsworth as part of a fish camp ethnographic project (Fall et al. *In prep.*) In 2008, for example, 34% of households in Nondalton harvested salmon by using a beach seine (Table 7). Beach seines were also used by households in Iliamna (12%) and Newhalen (15%), but not by residents of Port Alsworth (Table 7). Beach seines were used to harvest both bright sockeye salmon in mid summer as well as spawning sockeye salmon in fall.

NUSHAGAK SALMON SUBSISTENCE FISHERY

Subsistence salmon harvests in the Nushagak District are similar to those in the Kvichak District in terms of harvest levels. In 2007, for example, based on permit returns, the communities in the Nushagak District harvested 44,944 salmon, compared to 47,538 salmon in the Kvichak River/Iliamna Lake Subdistrict. However, there are differences in the 2 fisheries. Whereas the salmon harvest in the Kvichak River

[3] Krieg, T. L. *Unpublished*. Trip report: Iliamna, Newhalen, Nondalton, Port Alsworth, Pedro Bay, October 6 to 10, 2003. Alaska Department of Fish and Game, Division of Subsistence, Dillingham.

watershed is almost all sockeye salmon (47,473 out of 47,538 in 2007), the salmon harvest in the Nushagak District is more varied, with larger harvests of Chinook, coho, and chum salmon (Figure 17, Appendix Table 3). There are also larger communities in the Nushagak District, including Dillingham (2,347), Manokotak (430), Aleknagik (242), New Stuyahok (491), and Koliganek (174) (ADLWD 2009).

Table 8 reports estimated subsistence sockeye salmon harvests from the Nushagak District watershed for the period 1983–2007, based on permit return data. Since 1983, salmon harvests have shown an overall decline in the Nushagak District, from a high of 86,400 fish in 1986 to a low of 40,373 salmon in 2006. The 20-year average harvest is 50,727 fish. The 2007 harvest of 44,944 salmon was only slightly lower than either the 5- or 10-year averages of 46,278 and 46,172 salmon respectively (Figure 18 and Table 8).

The number of subsistence salmon permits issued in the Nushagak District has remained relatively stable since 1983. In 2007, 496 permits were issued, compared to the 5-year average of 499 and the 10-year average of 522 (Table 9). As illustrated in Figure 19, average salmon harvests per subsistence permit (expanded to nonreturned permits) in the Nushagak District began to decline in 1995, reaching a low of 82 fish per permit in 1998 (see also Table 9). For all permit holders, the average harvest per permit was 91 salmon in 2007, which was higher than the 10-year average of 89 fish but lower than the 20-year average of 102 fish.

As mentioned above, Chinook salmon returns are larger in the Nushagak River than in the Kvichak River watershed. In the upper portion of the Nushagak River, according to interviews, residents attempt to harvest large numbers of Chinook salmon, their traditionally preferred salmon resource, using 10 fathom set gillnets (see Appendix Table 3). A similar number of sockeye salmon are harvested in this area (5,479 Chinook salmon and 5,879 sockeye salmon in 2007). In the Wood River, where 10 fathom nets are also allowed, residents harvest more sockeye salmon than Chinook salmon (6,813 sockeye salmon and 1,793 Chinook salmon in 2007). In Nushagak Bay during the noncommercial opener in 2007, for example, harvests were more varied, with sockeye salmon (9,545 fish) and Chinook salmon (5,138 fish) harvested as well as smaller harvests of coho (1,467 fish), chum (1,009), and pink salmon (163 fish).

OTHER SUBSISTENCE FISHERIES

SUBSISTENCE REGULATIONS

The BOF has determined that all finfishes of the Bristol Bay Management Area support customary and traditional uses (5 AAC 01.336). The BOF determined that approximately 250,000 pounds (in usable weight; about 41 pounds per person) of fishes other than salmon is the amount necessary to provide for these uses. This amount was based upon estimates of nonsalmon fish harvests derived from systematic household surveys conducted by the Division of Subsistence (CSIS; CPDB). The BOF did not establish amounts necessary for specific species or more specific stocks of nonsalmon fishes.

For the most part, subsistence fishing for fishes other than salmon and rainbow trout *O. mykiss* is open year-round in the Bristol Bay Management Area with gear listed in 5 AAC 01.010. There are no seasonal limits established by regulation. The BOF repealed a subsistence permit requirement for trout and char in December 2003. The following regulations apply to subsistence fishing for fishes other than salmon in the area.

- Rainbow trout taken incidentally in other subsistence net fisheries or through the ice are lawfully taken and may be retained for subsistence uses (5 AAC 01.310 (g)).
- Subsistence fishing with a line attached to a rod or pole is prohibited except when fishing through the ice (5 AAC 01.320 (l)).
- Subsistence fishing with nets is prohibited in 18 waters of the Kvichak/Iliamna Lake drainage and within one-fourth mile of the terminus of those waters from September 1 through June 14.

SUBSISTENCE HARVESTS AND USES

A detailed description of subsistence uses of freshwater fishes in the general Bristol Bay area appears in Fall et al. (1996), and specifically for the Kvichak River watershed in Krieg et al. (2005). Wright and Chythlook (1985) describe uses of Pacific herring *Clupea pallasi* spawn on kelp in the Togiak District. Other recent reports documenting subsistence harvest of freshwater fishes in Bristol Bay include Fall et al. (2006) and Krieg et al. (2009). Fishes other than salmon generally rank third behind salmon and land mammals in their contribution to total subsistence harvests in Bristol Bay communities.

Although subsistence harvests of fishes other than salmon are not annually monitored by ADF&G, some findings of Division of Subsistence research regarding nonsalmon fishes are summarized in Table 10. The majority of households in the general Bristol Bay area use fishes other than salmon for subsistence purposes. Most households also participate in the harvest of these fishes. Harvests, as measured in pounds usable weight per person for available study years, vary from community to community, but are generally substantial. As noted above and shown in Figure 2, harvests of fishes other than salmon contribute about 10% of the annual subsistence harvests of wild foods in the general Bristol Bay area, or about 41 pounds (usable weight) per person. In the communities outside the regional centers (Dillingham and the Bristol Bay Borough), the per capita harvest is about 62 pounds per person. Harvests ranged from a low of 12 pounds per person (Port Alsworth in 1983) to 175 pounds per person (Nondalton in 1983). Harvests in 9 communities exceeded 50 pounds per person per year; these harvests exceeded 20 pounds per person per year in an additional 8 communities.

Table 11 presents only those nonsalmon fish species reported as harvested and used by residents of Bristol Bay communities through Division of Subsistence research. Harvests and uses of other species may occur.

Generally, fish taken in the largest quantities in the area as a whole include various species of smelt and whitefishes, as well as Dolly Varden *Salvelinus malma*, Arctic grayling *Thymallus arcticus*, and northern pike *Esox lucius.* [4]

In the general Bristol Bay area, harvests of nonsalmon finfishes occur throughout the year. Harvest effort for these fishes is generally lower among Bristol Bay residents in the summer as their attention is more focused on salmon. Spring is important for herring, herring spawn on kelp, and smelt. Substantial harvests of nonsalmon fishes occur through the ice in winter; effort increases in late winter prior to breakup as temperatures warm and daylight increases. Smelting is a popular activity in October and in late winter when these fish can be caught by jigging through the ice (Wright et al. 1985:34).

Many gear types are used to harvest nonsalmon fishes for home use in the general Bristol Bay area. Rod and reel[5] is used for most fish, and some, such as Dolly Varden/Arctic char *S. malma*, herring, and some marine fishes, are removed from commercial catches. Other methods are used, including (but not necessarily limited to) the following:

- Traps: Alaska blackfish *Dallia pectoralis*, burbot *Lota lota*;
- Set lines: burbot;
- Handline jigging through the ice: Arctic grayling, Dolly Varden/Arctic char, lake trout *S. namaycush*, smelt, rainbow trout, whitefishes, northern pike;

[4] See Fall, et al. (1996) for more a more detailed discussion of harvest quantities, as reported, by species and by community.

[5] Respondents to Division of Subsistence harvest surveys generally do not describe or mention that their subsistence fishing efforts occur under state sport fishing regulations or a federal subsistence regulations. Therefore, effort could occur under state sport fishing regulations or federal subsistence regulations.

- Set gillnets: Arctic grayling, Dolly Varden/Arctic char, lake trout, various species of suckers, rainbow trout, herring, northern pike, burbot, whitefishes;
- Beach seining: Dolly Varden/Arctic char, lake trout, whitefishes, smelt, herring;
- Handline in open water: Pacific halibut *Hippoglossus stenolepis*, rainbow trout;
- Dip nets: smelt, herring.

Herring spawn on kelp is usually picked by hand, although rakes, knives, and *uluaqs* (woman's knife) are also used (Schichnes and Chythlook 1988:127).

Maps of areas used by Bristol Bay communities to harvest nonsalmon fishes appear in the *Alaska Habitat Management Guide Reference Atlas Series* (ADF&G 1985), in Wright et al. (1985), and in Krieg et al. (2005, for Kvichak River drainage communities only). Harvest activities occur throughout the region in most rivers and lakes as well as along shorelines. It is likely that most effort occurs near each community and near seasonal camps, such as at Kulukak[6].

Bristol Bay residents use a wide variety of methods to process and preserve their harvests of fishes other than salmon. These vary by species and community. Some freezing of many species occurs. Some examples of other methods include the following:

- Arctic grayling: dried, half-dried, fresh frozen, aged frozen and eaten with seal oil;
- Dolly Varden: dried, smoked, half dried (*egamaarrluk*);
- Northern pike: dried, half-dried, fresh frozen, aged frozen and eaten with seal oil;
- Rainbow trout: dried, half-dried, smoked;
- Whitefishes: dried, fresh frozen, aged frozen and eaten with seal oil.

Dried fish is usually eaten with seal oil. Some consumption of fat from brown bears *Ursus arctos* with dried fish also occurs. Smelt are fried, boiled, dried, or eaten frozen with seal oil (Fall et al. 1986:100). Herring are salted or split, dried, and smoked (Schichnes and Chythlook 1988:126). The heads and stomachs of northern pike are boiled and eaten (Schichnes and Chythlook 1991:139). Freshwater fishes that are usually eaten frozen with seal oil also form a category called *kumlaneq*. This includes Arctic grayling, whitefishes, lake trout, and northern pike (Fall et al. 1986:102).

Much traditional knowledge is associated with nonsalmon fishes. For example, a Central Yup'ik taxonomic classification system for freshwater fishes has 3 entries, and thus 3 taxons, for the fish that western biologists classify into one taxon as “Dolly Varden”. Distinctions in Central Yup'ik taxonomy depend on the condition of the flesh for aging, drying, or freezing; harvest locations; and harvest methods (Fall et al. 1996).

CONCLUSIONS

This overview has illustrated the continued importance of subsistence fisheries to the economy and way of life of the general Bristol Bay area in Southwest Alaska. Salmon and other fishes provide the largest portion of substantial subsistence harvests of Bristol Bay communities. In addition to their nutritional and economic value, the subsistence fisheries of the region support cultural and social values that are a foundation of life for Bristol Bay residents. Historically, subsistence harvests of salmon and other fishes have been fairly stable and reliable, especially compared to the cash sector of the local economy. Subsistence salmon permit records demonstrate a decline in subsistence salmon harvests in the Bristol

[6] See Wright and Chythlook (1985) and Schichnes and Chythlook (1988) for maps of herring camps at Kulukak Bay. For frequency of use of various areas for freshwater fishing by Nushagak River communities, see Schichnes and Chythlook (1991).

Bay Management Area during the 1990s. This decline occurred primarily in the Nushagak and Naknek-Kvichak districts, and is the result of lower average harvests per permit rather than less participation by local community residents. Substitution of Chinook for sockeye salmon accounts for some, but not all, of the decline in the Nushagak District. Subsistence sockeye salmon harvests in the Kvichak River watershed, including Iliamna Lake and Lake Clark, historically the largest component of the Bristol Bay subsistence salmon fishery, declined by more than one-half during the 1990s and early 2000s. Local subsistence fishers attributed these lowered harvests to poor returns and scarcities of salmon in once reliable and abundant traditional harvest locations. Effort has increased in harvesting salmon in these areas since the low harvest levels seen in early 2000.

REFERENCES CITED

ADF&G (Alaska Department of Fish and Game). 1985. Alaska habitat management guide. Southwest Region. Produced by the State of Alaska Department of Fish and Game Division of Habitat, Juneau.

ADF&G (Alaska Department of Fish and Game). 2000. Review of the Bristol Bay 2000 salmon fishery: annual salmon management report to the Alaska Board of Fisheries. Alaska Department of Fish and Game Division of Commercial Fisheries Regional Information Report No. 2A00-34, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/RIR.2A.2000.34.pdf

ADF&G (Alaska Department of Fish and Game). 2002. Alaska Department of Fish and Game Division of Commercial Fisheries annual management report - 2001 - Bristol Bay area. Alaska Department of Fish and Game Division of Commercial Fisheries Regional Information Report No. 2A02-18, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/RIR.2A.2002.18.pdf

ADLWD (Alaska Department of Labor and Workforce Development). 2009. Alaska population estimates. State of Alaska Department of Labor and Workforce Development., Juneau. http://laborstats.alaska.gov/?PAGEID=67&SUBID=171

Bristol Bay Native Association, and ADF&G (Alaska Department of Fish and Game). 1996. The harvest and use of freshwater fish in Togiak and Manokotak, 1994-95. Prepared by the Natural Resource Department, Bristol Bay Native Association and the Division of Subsistence, Alaska Department of Fish and Game. Bristol Bay Native Assocation Natural Resource Department, Dillingham, Alaska.

Coiley-Kenner, P., T. M. Krieg, M. B. Chythlook, and G. Jennings. 2003. Wild resource harvests and uses by residents of Manokotak, Togiak, and Twin Hills, 1999/2000. Alaska Department of Fish and Game Division of Subsistence Technical Paper No. 275, Juneau. http://www.subsistence.adfg.state.ak.us/techpap/tp275.pdf

Fall, J. A., M. B. Chythlook, T. Krieg, and G. Jennings. 2001. Overview of the subsistence sockeye salmon fishery of the Kvichak River watershed, Bristol Bay, Southwest Alaska. Report to the Alaska Board of Fisheries, January 2001. Alaska Department of Fish and Game, Division of Subsistence, Anchorage. .

Fall, J. A., M. B. Chythlook, J. C. Schichnes, and J. M. Morris. 1996. An overview of the harvest and use of freshwater fish by the communities of the Bristol Bay region, Southwest Alaska. Alaska Department of Fish and Game Division of Subsistence Technical Paper No. 166, Juneau. http://www.subsistence.adfg.state.ak.us/techpap/tp166.pdf

Fall, J. A., D. Holen, T. M. Krieg, R. La Vine, K. Stickman, M. Ravenmoon, J. Hay, and J. Stariwat. *In prep.* The Kvichak watershed subsistence salmon fishery: an ethnographic study. Alaska Department of Fish and Game Division of Subsistence, Anchorage.

Fall, J. A., D. L. Holen, B. Davis, T. Krieg, and D. Koster. 2006. Subsistence harvests and uses of wild resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004. Alaska Department of Fish and Game Division of Subsistence Technical Paper No. 302, Juneau. http://www.subsistence.adfg.state.ak.us/TechPap/tp302.pdf

Fall, J. A., J. C. Schichnes, M. Chythlook, and R. J. Walker. 1986. Patterns of wild resource use in Dillingham: hunting and fishing in an Alaskan regional center. Alaska Department of Fish and Game Division of Subsistence Technical Paper No. 135, Juneau. http://www.subsistence.adfg.state.ak.us/techpap/tp135.pdf

Holen, D. *In press*. Subsistence in Alaska. *In* S. Glomsrod, and I. Aslaksen, editors. The economy of the north. Statistics Norway, Oslo.

Holen, D. L., T. M. Krieg, and T. Lemons. *In prep.* Subsistence harvests and uses of wild resources in King Salmon, Naknek, and South Naknek, Alaska, 2007. Alaska Department of Fish and Game Division of Subsistence, Anchorage.

Krieg, T., M. Chythlook, P. Coiley-Kenner, D. Holen, K. Kamletz, and H. Nicholson. 2005. Freshwater fish harvest and use in communities of the Kvichak watershed, 2003. Alaska Department of Fish and Game Division of Subsistence Technical Paper No. 297, Juneau. http://www.subsistence.adfg.state.ak.us/techpap/tp297.pdf

References Cited, continued

Krieg, T. M., D. L. Holen, and D. Koster. 2009. Subsistence harvests and uses of wild resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005. Alaska Department of Fish and Game Division of Subsistence Technical Paper No. 322, Dillingham. http://www.subsistence.adfg.state.ak.us/TechPap/TP322.pdf

Schichnes, J. and M. Chythlook. 1988. Use of fish and wildlife in Manokotak, Alaska. Alaska Department of Fish and Game Division of Subsistence Technical Paper No. 152, Dillingham. http://www.subsistence.adfg.state.ak.us/techpap/tp152.pdf

Schichnes, J. and M. Chythlook. 1991. Contemporary use of fish and wildlife in Ekwok, Koliganek, and New Stuyahok, Alaska. Alaska Department of Fish and Game Division of Subsistence, Technical Paper No. 185, Juneau. http://www.subsistence.adfg.state.ak.us/techpap/tp185.pdf

Schroeder, R. F., D. B. Andersen, R. Bosworth, J. M. Morris, and J. M. Wright. 1987. Subsistence in Alaska: Arctic, Interior, Southcentral, Southwest, and Western regional summaries. Alaska Department of Fish and Game Division of Subsistence, Technical Paper No. 150, Juneau. http://www.subsistence.adfg.state.ak.us/techpap/tp150.pdf

U. S. Census Bureau. 2001. Profiles of general demographic characteristics, Alaska: 2000. U.S. Department of Commerce, Washington, D. C.

Weiland, K. A., S. Morstad, J. B. Browning, T. Sands, L. Fair, D. Crawford, F. West, and L. McKinley. 2003. Annual management report - 2003 - Bristol Bay area. Alaska Department of Fish and Game Division of Commercial Fisheries Regional Information Report No. 2A03-18, Anchorage.

Wright, J. M. and M. B. Chythlook. 1985. Subsistence harvests of herring spawn-on-kelp in the Togiak district of Bristol Bay. Alaska Department of Fish and Game Division of Subsistence Technical Paper No. 116, Juneau. http://www.subsistence.adfg.state.ak.us/techpap/tp116.pdf

Wright, J. M., J. M. Morris, and R. Schroeder. 1985. Bristol Bay regional subsistence profile. Alaska Department of Fish and Game Division of Subsistence Technical Paper No. 114, Dillingham. http://www.subsistence.adfg.state.ak.us/techpap/tp114.pdf

TABLES AND FIGURES

Table 1.–Population of the general Bristol Bay area, 1980, 1990, 2000, and 2008.

Area	1980 total population	1990			2000			2008 total population
		Total population	Alaska Native		Total population	Alaska Native		
			Number	Percent		Number	Percent	
Dillingham Census Area								
Aleknagik	154	185	154	83.2%	221	187	84.6%	242
Clark's Point	79	60	53	88.3%	75	69	92.0%	54
Dillingham	1,563	2,017	1,125	55.8%	2,466	1,503	60.9%	2,347
Ekuk	7	3	2	66.7%	a.	a.	a.	a.
Ekwok	77	77	67	87.0%	130	122	93.8%	121
Koliganek	117	181	174	96.1%	182	159	87.4%	174
Manokotak	294	385	368	95.6%	399	378	94.7%	430
New Stuyahok	331	391	375	95.9%	471	452	96.0%	491
Portage Creek	48	5	3	60.0%	36	31	86.1%	7
Togiak	470	613	535	87.3%	809	750	92.7%	802
Twin Hills	70	66	61	92.4%	69	65	94.2%	75
Remainder	22	29	8	27.6%	64	37	57.8%	28
Subtotal	3,232	4,012	2,925	72.9%	4,922	3,753	76.2%	4,771
Bristol Bay Borough								
King Salmon	545	696	108	15.5%	442	133	30.1%	409
Naknek	318	575	236	41.0%	678	319	47.1%	552
South Naknek	145	136	108	79.4%	137	115	83.9%	68
Remainder	86	3	3	100.0%	1	0	0.0%	0
Subtotal	1,094	1,410	455	32.3%	1,258	567	45.1%	1,029
Lake and Peninsula Borough[b]								
Egegik	75	122	86	70.5%	116	89	76.7%	62
Igiugig	33	33	26	78.8%	53	44	83.0%	40
Iliamna	94	94	62	66.0%	102	59	57.8%	95
Kokhanok	83	152	137	90.1%	174	158	90.8%	179
Levelock	79	105	87	82.9%	122	116	95.1%	70
Newhalen	87	160	151	94.4%	160	146	91.3%	162
Nondalton	173	178	159	89.3%	221	199	90.0%	202
Pedro Bay	33	42	38	90.5%	50	32	64.0%	44
Pilot Point	66	53	45	84.9%	100	86	86.0%	72
Pope-Vannoy Landing		c.	c.	c.	8	4	50.0%	5
Port Alsworth	22	55	1	1.8%	104	23	22.1%	125
Port Heiden	92	119	86	72.3%	119	93	78.2%	90
Ugashik	13	7	6	85.7%	11	9	81.8%	15
Remainder	19	31	5	16.1%				23
Subtotal	869	1,151	889	77.2%	1,340	1,058	79.0%	1,184

-continued-

Table 1. Page 2 of 2.

Area	1980 total population	1990 Total population	1990 Alaska Native Number	1990 Alaska Native Percent	2000 Total population	2000 Alaska Native Number	2000 Alaska Native Percent	2008 total population
Total	**5,195**	**6,573**	**4,269**	**64.9%**	**7,520**	**5,378**	**71.5%**	**6,984**

a. The community of Ekuk is now counted with neighboring Clark's Point since the only resident is a cannery security guard.

b. Port Heiden is in the Alaska Peninsula Management Area; Chignik, Chignik Lagoon, Chignik Lake, Ivanof Bay, and Perryville of this borough are in the Chignik Management Area and are excluded from this table. The "remainder" may include some population living outside the Bristol Bay Management Area.

c. Pope-Vannoy Landing residents were previously counted with the remainder of the Lake and Peninsula Borough.

Sources U. S. Census Bureau 2001 for 2000, 1990, and 1980; ADLWD 2009 for 2008.

Table 2.–Wild food harvests in select communities: replacement values in 2005.

	Annual wild food harvest per household (pounds)	Estimated wild food replacement value per household, at $7 per pound	Mean household cost of annual food purchases	Annual household income[a]	Resident responses of percentage of annual cash income spent on food
Igiugig	1,584	$11,088	$8,110	$32,755	24.8%
Kokhanok	2,136	$14,952	$7,452	$30,007	24.8%
Koliganek	2,139	$14,973	$7,279	$34,800	20.9%
Levelock	693	$4,851	$4,213	$28,459	14.8%
New Stuyahok	871	$6,097	$7,104	$27,572	25.8%

Sources Krieg et al. 2009:25,27; Holen *In press.*

a. Unpublished data.

Table 3.–Estimated historical subsistence salmon harvests, Bristol Bay Management Area, 1975–2007.

Year	Permits issued	Estimated salmon harvest						Harvest per permit
		Chinook	Sockeye	Coho	Chum	Pink	Total	
1975	686	8,600	175,400	8,500	7,500	1,300	192,700	280.9
1976	716	8,400	120,900	3,500	9,100	4,400	137,900	192.6
1977	738	7,000	127,900	6,600	9,100	300	143,900	195.0
1978	773	8,100	127,600	4,400	16,200	12,700	160,900	208.2
1979	829	10,300	116,500	7,300	7,700	500	132,000	159.2
1980	1,243	14,100	168,600	7,300	13,100	10,000	199,000	160.1
1981	1,112	13,000	132,100	12,200	11,500	2,600	158,400	142.4
1982	806	13,700	110,800	11,500	12,400	8,600	143,300	177.8
1983	829	13,268	143,639	7,477	11,646	1,073	177,104	213.6
1984	882	11,537	168,803	16,035	13,009	8,228	217,612	246.7
1985	1,015	9,737	142,755	8,122	5,776	825	167,215	164.7
1986	930	14,893	129,487	11,005	11,268	7,458	174,112	187.2
1987	996	14,424	135,782	8,854	8,161	673	167,894	168.6
1988	938	11,848	125,556	7,333	9,575	7,341	161,652	172.3
1989	955	9,678	125,243	12,069	7,283	801	155,074	162.4
1990	1,042	13,462	128,343	8,389	9,224	4,455	163,874	157.3
1991	1,194	15,245	137,837	14,024	6,574	572	174,251	145.9
1992	1,203	16,425	133,605	10,722	10,661	5,325	176,739	146.9
1993	1,206	20,527	134,050	8,915	6,539	1,051	171,082	141.9
1994	1,193	18,873	120,782	9,279	6,144	2,708	157,787	132.3
1995	1,119	15,921	107,717	7,423	4,566	691	136,319	121.8
1996	1,110	18,072	107,737	7,519	5,813	2,434	141,575	127.5
1997	1,166	19,074	118,250	6,196	2,962	674	147,156	126.2
1998	1,234	15,621	113,289	8,126	3,869	2,424	143,330	116.2
1999	1,219	13,009	122,281	6,143	3,653	420	145,506	119.4
2000	1,219	11,547	92,050	7,991	4,637	2,599	118,824	97.5
2001	1,226	14,412	92,041	8,406	4,158	839	119,856	97.8
2002	1,093	12,936	81,088	6,565	6,658	2,341	109,587	100.3
2003	1,182	21,231	95,690	7,816	5,868	1,062	131,667	111.4
2004	1,100	18,012	93,819	6,667	5,141	3,225	126,865	115.3
2005	1,076	15,212	98,511	7,889	6,102	1,098	128,812	119.7
2006	1,050	12,617	95,201	5,697	5,321	2,726	121,564	115.8
2007	1,063	15,444	99,549	4,880	3,991	815	124,679	117.3
Average, 2003–2007	1,094	16,503	96,554	6,590	5,285	1,785	126,717	116.0
Average, 1998–2007	1,146	15,004	98,352	7,018	4,940	1,755	127,069	111.0
All years average	1,035	13,825	121,906	8,329	7,733	3,099	152,371	153.0

Source ADF&G Division of Subsistence Alaska Salmon Fisheries Database (ASFDB).

Table 4.–Ten-year average (1998–2007) subsistence salmon harvests, by district.

District	Permits issued	Sockeye	Chinook	Chum	Pink	Coho	Total	Salmon per permit
Naknek–Kvichak District	501	68,098	1,150	567	621	949	71,385	142
Nushagak District	522	24,157	12,495	3,786	958	4,776	46,172	88
Togiak District	59	2,926	1,215	451	128	340	5,060	86
Egegik District	44	2,020	93	100	22	596	2,832	64
Ugashik District	24	1,178	46	29	19	353	1,625	68
Total, Bristol Bay Management Area	**1,146**	**98,379**	**15,000**	**4,932**	**1,747**	**7,015**	**127,073**	**111**

Source ADF&G Division of Subsistence Bristol Bay Subsistence Permit Database.

Table 5.–Number of subsistence permits issued, Kvichak River watershed, 1983–2007.

	Igiugig	Iliamna/ Newhalen	Kokhanok	Levelock	Nondalton	Pedro Bay	Port Alsworth	Other Kvichak residents	Subtotal, local residents	Other Alaska residents	Total
1983	3	63	17	18	38	15	18	0	172	2	174
1984	8	53	19	19	43	15	16	2	175	3	178
1985	4	66	15	17	37	20	23	2	184	74	258
1986	6	58	20	21	29	17	24	5	180	3	183
1987	ND	57	17	19	29	17	21	0	160	1	161
1988	ND	59	22	18	31	14	19	1	164	5	169
1989	4	56	16	17	39	14	18	1	165	5	170
1990	7	49	14	18	37	17	23	1	166	17	183
1991	8	48	17	3	18	26	26	0	146	25	171
1992	4	61	14	16	24	23	27	0	169	33	202
1993	7	57	22	14	49	22	28	0	199	35	234
1994	5	51	21	7	38	17	29	0	168	41	209
1995	7	54	21	15	14	18	28	0	157	44	201
1996	6	60	21	9	28	20	25	0	169	42	211
1997	4	59	16	6	32	14	24	0	155	37	192
1998	4	55	15	6	36	18	29	0	163	42	205
1999	5	45	18	4	26	17	44	0	159	57	216
2000	8	47	22	14	24	10	38	1	164	48	212
2001	8	49	24	9	33	17	30	0	170	37	207
2002	8	53	27	7	20	15	19	0	149	31	180
2003	9	48	26	8	27	11	22	0	151	24	175
2004	6	60	25	3	40	22	25	0	181	25	206
2005	6	48	33	11	33	16	24	0	171	23	194
2006	7	44	28	2	25	21	24	0	151	28	179
2007	6	54	29	1	29	19	30	0	168	28	196

-continued-

Table 5. Page 2 of 2.

	Igiugig	Iliamna/ Newhalen	Kokhanok	Levelock	Nondalton	Pedro Bay	Port Alsworth	Other Kvichak residents	Subtotal, local residents	Other Alaska residents	Total
25-year average (1983–2007)	6.1	54.2	20.8	11.3	31.2	17.4	25.4	0.5	166.2	28.4	195.3
Average, 1988–1997	5.8	55.4	18.4	12.3	31.0	18.5	24.7	0.3	165.8	28.4	194.2
Average, 1998–2007	6.7	50.3	24.7	6.5	29.3	16.6	28.5	0.1	162.7	34.3	197.0
Average, 1998–2002	6.6	49.8	21.2	8.0	27.8	15.4	32.0	0.2	161.0	43.0	204.0
Average, 2003–2007	6.8	50.8	28.2	5.0	30.8	17.8	25.0	0.0	164.4	25.6	190.0

Notes Data for 1983–1986 include a small number of permits issued to local residents for fishing in areas outside the Kvichak watershed. In 1983, 1984, and 1986–1989, only local watershed residents were eligible for permits. Due to updates to the database, these data may differ slightly from those published in ADF&G Division of Commercial Fisheries' Annual Management Reports. ND = no data (missing information).

Source ADF&G Division of Subsistence Bristol Bay Subsistence Permit Database.

Table 6.–Subsistence harvest of sockeye salmon, by community, numbers of fish, Kvichak River drainage, Bristol Bay, 1963–2007.

Year	Levelock	Igiugig	Pedro Bay	Kokhanok	Iliamna-Newhalen	Nondalton	Port Alsworth	All local communities	Other[a]	Total
1963	600	ND	14,000	7,000	10,000	25,000	ND	56,600		56,600
1964	1,000	4,000	12,000	8,000	19,000	35,000	ND	79,000		79,000
1965	1,000	3,300	9,800	10,200	9,700	35,500	ND	69,500		69,500
1966	600	1,200	6,000	10,500	6,600	45,800	ND	70,700		70,700
1967	1,400	3,400	9,900	10,200	9,100	29,600	ND	63,600		63,600
1968	1,400	4,800	9,800	10,200	8,700	33,700	ND	68,600		68,600
1969	1,000	5,100	4,200	15,000	4,900	44,000	ND	74,200		74,200
1970	1,600	11,200	11,200	22,300	16,400	42,900	ND	105,600		105,600
1971	1,600	6,500	10,100	12,800	8,500	22,100	ND	61,600		61,600
1972	1,600	2,200	4,000	8,300	10,000	24,100	ND	50,200		50,200
1973	4,800	2,200	2,900	9,200	10,200	8,500	1,300	39,100		39,100
1974	8,600	6,200	14,400	21,500	16,400	29,500	1,500	98,100		98,100
1975	5,300	6,400	8,300	18,000	26,700	48,700	2,100	115,500		115,500
1976	5,300	6,800	4,400	17,100	16,300	20,500	5,500	75,900		75,900
1977	2,600	6,000	5,600	14,300	11,400	27,200	4,900	72,000		72,000
1978	8,900	8,800	11,200	23,700	11,000	17,300	3,000	83,900		83,900
1979	4,400	6,600	3,500	16,200	15,900	14,700	4,200	65,500		65,500
1980	6,100	8,100	7,400	22,600	11,100	11,300	6,000	72,600		72,600
1981	6,600	5,400	9,700	16,500	15,400	15,200	6,800	75,600	c.	75,600
1982	5,400	1,900	8,200	16,600	13,500	11,200	4,500	61,300	c.	61,300
1983	4,800	3,300	10,400	20,100	23,800	29,400	4,700	96,500	c.	96,500
1984	8,100	6,300	12,100	24,400	15,900	29,100	4,600	100,500	c.	100,500
1985	6,600	3,400	12,900	21,900	22,300	14,900	4,500	86,500	c.	86,500
1986	6,400	1,600	6,700	18,300	17,000	6,600	3,300	59,900	c.	59,900
1987	5,700	b.	7,300	16,500	27,500	11,800	3,200	72,000	c.	72,000
1988	3,500	b.	5,500	14,400	29,800	20,700	3,200	77,100	c.	77,100

-continued-

Table 6. Page 2 of 3.

Year	Levelock	Igiugig	Pedro Bay	Kokhanok	Iliamna-Newhalen	Nondalton	Port Alsworth	All local communities	Other[a]	Total
1989	5,100	1,200	6,700	13,000	24,700	18,500	2,200	71,400	c.	71,400
1990	4,700	2,200	6,600	12,400	18,800	27,300	3,200	75,200	1,400	76,600
1991	1,029	1,712	9,739	17,184	29,094	4,163	2,755	65,676	1,110	66,786
1992	4,374	1,056	6,932	11,477	29,633	13,163	2,954	69,589	2,559	72,148
1993	4,699	1,397	6,226	18,810	19,067	17,890	3,254	71,343	2,780	74,123
1994	1,467	1,201	8,747	15,771	15,553	15,246	3,074	61,059	3,284	64,343
1995	3,756	497	5,359	14,412	20,134	4,188	2,892	51,238	3,441	54,679
1996	1,120	2,309	5,219	14,011	14,787	11,856	3,263	52,565	2,307	54,872
1997	1,062	2,067	5,501	8,722	19,513	17,194	2,348	56,407	3,101	59,508
1998	2,454	1,659	3,511	10,418	16,165	13,136	2,678	50,021	3,635	53,656
1999	1,276	1,608	5,005	10,725	14,129	17,864	4,282	54,889	2,834	57,723
2000	1,467	1,981	1,815	7,175	6,679	11,953	3,200	34,270	2,720	36,990
2001	908	779	2,118	9,447	8,132	7,566	1,958	30,908	1,901	32,808
2002	625	2,138	2,687	9,847	9,417	5,508	1,201	31,423	1,578	33,001
2003	737	1,081	2,135	9,771	13,824	8,016	1,370	36,934	1,591	38,525
2004	1,000	1,026	4,803	11,869	21,652	8,789	2,455	51,594	1,631	53,225
2005	914	1,017	4,162	16,801	12,010	8,824	2,457	46,185	2,078	48,263
2006	0	1,252	4,319	19,028	11,488	8,885	2,418	47,390	2,460	49,850
2007	102	1,803	5,487	15,106	11,453	7,902	3,211	45,064	2,474	47,538

-continued-

Table 6. Page 3 of 3.

Year	Levelock	Igiugig	Pedro Bay	Kokhanok	Iliamna-Newhalen	Nondalton	Port Alsworth	All local communities	Other[a]	Total
45-year average (1963–2007)	3,149	3,397	7,079	14,484	15,630	19,605	3,271	65,661	2,382	66,614
Average, 1963–1987	4,056	4,987	8,640	15,656	14,292	25,344	4,007	74,980	ND	74,980
Recent 20-year average (1988–2007)	2,015	1,473	5,128	13,019	17,302	12,432	2,719	54,013	2,382	56,157
Average, 1963–1977	2,560	4,950	8,440	12,973	12,260	31,473	3,060	73,347	ND	73,347
Average, 1978–1987	6,300	5,044	8,940	19,680	17,340	16,150	4,480	77,430	ND	77,430
Average, 1988–1997	3,081	1,515	6,652	14,019	22,108	15,020	2,914	65,158	2,498	67,156
Average, 1998–2007	948	1,434	3,604	12,019	12,495	9,844	2,523	42,868	2,290	45,158
Average, 1998–2002	1,346	1,633	3,027	9,522	10,904	11,205	2,664	40,302	2,534	42,836
Average, 2003–2007	551	1,236	4,181	14,515	14,085	8,483	2,382	45,433	2,047	47,480

Notes Harvests are extrapolated for all permits issued, based on those returned. Harvest estimates prior to 1991 are rounded to the nearest 100 fish. This table reports harvest estimates as they have appeared in ADF&G Division of Commercial Fisheries' Annual Management Reports. Harvest estimates prior to 1990 are based on the community where the permit was issued; estimates from 1990 to the present are based on community of residence and include only fish harvested in the Kvichak District. ND = no data (missing information) or unable to calculate.

a. Due to differences in compilation of data, the data prior to 1980 are not comparable to subsequent years. Subsistence harvests by non-Kvichak River watershed residents.

b. No permits issued.

c. No permits issued. Only residents of the Naknek–Kvichak watershed could obtain subsistence permits.

*Source*s Weiland et al. 2003:112 for 2000 to 2002; ADF&G 2000:120 for 1979 to 1999; ADF&G 1985 for 1965 to 1978; Schroeder et al. 1987:365 for 1963 and 1964.

Table 7.–Estimated percentage of households harvesting salmon, by gear type, in the upper Kvichak River watershed, 2008.

Resource	Percentage of households that used the following gear to harvest salmon			
	Gillnet	Seine	Rod and reel	Any method
Iliamna				
Salmon	77%	12%	12%	81%
Chum salmon	4%	0%	0%	4%
Coho salmon	0%	0%	0%	0%
Chinook salmon	8%	0%	0%	8%
Pink salmon	0%	0%	0%	0%
Sockeye salmon	77%	0%	12%	81%
Spawning sockeye salmon	27%	12%	0%	38%
Unknown salmon	0%	0%	0%	0%
Newhalen				
Salmon	65%	15%	24%	71%
Chum salmon	18%	0%	0%	18%
Coho salmon	3%	0%	12%	15%
Chinook salmon	9%	0%	0%	9%
Pink salmon	9%	0%	0%	9%
Sockeye salmon	56%	3%	15%	62%
Spawning sockeye salmon	15%	15%	3%	32%
Unknown salmon	0%	0%	0%	0%
Nondalton				
Salmon	69%	34%	28%	81%
Chum salmon	0%	0%	0%	0%
Coho salmon	0%	0%	3%	3%
Chinook salmon	3%	0%	0%	3%
Pink salmon	0%	0%	0%	0%
Sockeye salmon	66%	34%	28%	81%
Spawning sockeye salmon	25%	0%	0%	25%
Unknown salmon	0%	0%	0%	0%
Port Alsworth				
Salmon	81%	0%	19%	89%
Chum salmon	4%	0%	4%	7%
Coho salmon	0%	0%	11%	11%
Chinook salmon	0%	0%	7%	7%
Pink salmon	0%	0%	4%	4%
Sockeye salmon	78%	0%	11%	81%
Spawning sockeye salmon	7%	0%	0%	7%
Unknown salmon	0%	0%	0%	0%

Table 8.–Harvests of salmon in the Nushagak District, 1983–2007.

Year	Sockeye	Chinook	Chum	Pink	Coho	Total
1983	38,400	11,800	9,200	500	5,200	65,100
1985	38,000	7,900	4,000	600	6,100	56,600
1986	49,000	12,600	10,000	5,400	9,400	86,400
1987	40,900	12,200	6,000	200	6,200	65,500
1988	31,086	10,079	8,234	6,316	5,223	60,938
1989	34,535	8,122	5,704	407	8,679	57,447
1990	33,003	12,407	7,808	3,183	5,919	62,320
1991	33,161	13,627	4,688	292	10,784	62,552
1992	30,640	13,588	7,076	3,519	7,103	61,926
1993	27,114	17,709	3,257	240	5,038	53,358
1994	26,501	15,490	5,055	2,042	5,338	54,426
1995	22,793	13,701	2,786	188	3,905	43,373
1996	22,935	15,941	4,704	1,573	5,217	50,370
1997	25,080	15,318	2,056	218	3,433	46,106
1998	25,217	12,258	2,487	1,076	5,316	46,355
1999	29,387	10,057	2,409	124	3,993	45,969
2000	24,451	9,470	3,463	1,662	5,983	45,029
2001	26,939	11,760	3,011	378	5,993	48,080
2002	22,777	11,281	5,096	1,179	4,565	44,897
2003	25,491	18,686	5,064	403	5,432	55,076
2004	17,491	15,610	3,869	1,944	4,240	43,154
2005	23,916	12,529	5,006	793	5,596	47,841
2006	20,773	9,971	4,448	1,591	3,590	40,373
2007	25,127	13,330	3,006	430	3,050	44,944
Average, 2003–2007	22,560	14,025	4,279	1,032	4,382	46,278
Average, 1998–2007	24,157	12,495	3,786	958	4,776	46,172
Average, 1988–2007	26,421	13,047	4,461	1,378	5,420	50,727
Average, 1988–1997	28,685	13,598	5,137	1,798	6,064	55,282

Table 9.–Subsistence harvest of salmon by community, in numbers of fish, Nushagak District, Bristol Bay, 1983–2007.

Year	Dillingham[a]		Manokotak	Aleknagik	Ekwok	New Stuyahok	Koliganek	Other Alaska residents	Total	Permits issued	Harvest per permit
1983	20,100		5,300	1,900	5,800	18,700	13,300	b.	65,100	389	167
1984	30,500		4,100	2,600	7,200	16,500	17,100	b.	78,000	438	178
1985	22,900		3,600	1,600	7,000	14,500	6,800	b.	56,400	406	139
1986	31,900		5,500	6,900	7,800	26,400	8,200	b.	86,700	424	204
1987	33,500		5,900	3,100	6,400	11,400	4,900	b.	65,200	474	138
1988	29,600	c.	5,500	2,400	6,100	11,700	5,700	d.	61,000	441	138
1989	31,800	c.	5,800	2,000	4,700	9,700	3,800	d.	57,800	432	134
1990	28,860	c.	6,600	2,300	4,900	9,900	8,000	700	61,260	441	139
1991	34,399	c.	5,873	3,043	4,532	8,326	5,438	2,163	63,774	528	121
1992	31,702	c.	4,317	2,184	5,971	11,325	3,708	2,635	61,842	476	130
1993	25,315	c.	3,048	2,593	2,936	12,169	4,180	2,538	52,779	500	106
1994	30,145	c.	3,491	2,289	4,343	8,056	4,513	2,322	55,159	523	105
1995	24,998	c.	2,453	1,468	2,046	6,911	2,983	2,406	43,265	484	89
1996	27,161	c.	3,883	1,733	2,866	8,892	3,319	2,113	49,967	481	104
1997	23,255	c.	3,988	1,989	1,797	6,427	4,179	4,598	46,233	538	86
1998	24,072	c.	4,069	1,112	3,555	5,419	3,166	4,958	46,351	562	82
1999	26,502	c.	3,413	1,532	1,805	4,556	2,772	5,389	45,969	548	84
2000	27,931	c.	3,173	1,111	3,946	3,715	2,792	2,362	45,029	541	83
2001	26,435	c.	3,700	2,129	2,218	7,294	2,209	4,096	48,080	554	87
2002	25,004	c.	3,254	1,517	2,735	6,043	3,098	3,247	44,897	520	86
2003	26,955	c.	4,214	2,044	2,291	10,817	5,721	3,034	55,076	527	105
2004	23,308	c.	2,052	2,206	1,891	6,714	3,619	3,364	43,154	511	84
2005	21,898	c.	1,576	1,795	1,388	9,673	8,422	3,088	47,841	502	95
2006	22,081	c.	1,654	2,047	1,499	6,160	3,885	3,047	40,373	461	88
2007	25,190	c.	2,443	1,382	1,267	8,284	3,054	3,324	44,944	496	91

-continued-

Table 9. Page 2 of 2.

Year	Dillingham[a]	Manokotak	Aleknagik	Ekwok	New Stuyahok	Koliganek	Other Alaska residents	Total	Permits issued	Harvest per permit
Most recent 5-year average	23,886	2,388	1,895	1,667	8,330	4,940	3,171	46,277	499	92
Most recent 10-year average	24,938	2,955	1,687	2,260	6,867	3,874	3,591	46,171	522	89
Most recent 20-year average	26,831	3,725	1,944	3,139	8,104	4,228	3,077	50,740	503	102
Average, 1985–1996	29,357	4,664	2,634	4,966	11,607	5,128	2,125	59,596	468	129
Average, 1997–2006	24,744	3,109	1,748	2,313	6,682	3,986	3,718	46,300	526	104

Notes Harvests are extrapolated for all permits issued, based on those returned. Harvest estimates prior to 1991 are rounded to the nearest 100 fish. Harvest estimates prior to 1990 are based on the community where the permit was issued; estimates from 1990 to the present are based on community of residence and include only fish harvested in the Nushagak District.

a. Includes the villages of Portage Creek and Clark's Point.

b. Due to differences in compilation of data, the data prior to 1988 are not comparable to subsequent years.

c. Includes permits issued in Clark's Point and Ekuk.

d. No permits issued. Only residents of the Nushagak watershed could obtain subsistence permits.

Table 10.–Uses and harvests of fishes other than salmon, Bristol Bay communities.

Community (data year)	Percentage of households					Average pounds harvested	
	Use	Attempt	Harvest	Recd	Give	Per household	Per person
Aleknagik (1989)	94.7	89.5	89.5	73.7	71.1	208.3	61.4
Clark's Point (1989)	94.1	82.4	82.4	82.4	70.6	113.4	34.4
Dillingham (1984)	75.0	56.2	54.9	39.9	19.6	51.6	17.5
Egegik (1984)	64.0	60.0	60.0	24.0	40.0	36.5	15.7
Ekwok (1987)	75.9	72.4	62.1	62.1	37.9	229.4	68.6
Igiugig (1992)	100.0	100.0	100.0	80.0	80.0	392.0	100.5
Iliamna (1991)	87.0	73.9	73.9	65.2	43.5	249.7	76.6
King Salmon (1983)			76.7			48.1	15.9
Kokhanok (1992)	91.7	86.1	86.1	72.2	61.1	469.9	105.7
Koliganek (1987)	92.9	81.0	81.0	69.0	57.1	369.7	95.3
Levelock (1992)	90.0	76.7	73.3	76.7	63.3	186.6	65.9
Manokotak (1999)	86.4	77.8	76.5	76.5	75.3	163.8	37.3
Naknek (1983)			75.0			58.0	18.6
New Stuyahok (1987)	100.0	85.0	82.5	82.5	62.5	171.9	36.0
Newhalen (1991)	100.0	96.2	92.3	73.1	46.2	185.1	37.6
Nondalton (1983)		90.5	90.5	23.8		906.4	174.6
Pedro Bay (1996)	76.9	53.8	53.8	53.8	30.8	85.6	25.9
Pilot Point (1987)	94.1	94.1	94.1	35.3	58.8	55.8	15.5
Port Alsworth (1983)		61.5	61.5	7.7		42.0	11.6
Port Heiden (1987)	91.9	62.2	62.2	70.3	45.9	32.6	11.7
South Naknek (1992)	85.7	77.1	74.3	68.6	48.6	64.4	20.1
Togiak (1999)	89.0	83.5	83.5	56.6	66.4	185.1	44.8
Twin Hills (1999)	91.7	91.7	91.7	75.0	91.7	302.9	101.0
Ugashik (1987)	100.0	100.0	100.0	0.0	40.0	72.2	36.1

Note Information for the most recent year for which data are available. Blank cells indicate question not asked that year.

Sources ADF&G CPDB; Bristol Bay Native Association and ADF&G 1996; Coiley-Kenner et al. 2003.

Table 11.–Nonsalmon finfishes reported to be used for subsistence purposes in the general Bristol Bay area.

Common English name	Scientific name	Yup'ik name(s)	Dena'ina name(s)
Arctic grayling	*Thymallus arcticus*	*Nakrullugpak*	*Ch'dat'an*
		Culugpauk	
Alaska blackfish	*Dallia pectoralis*	*Can'giiq*	*Huzhegh*
Burbot	*Lota lota*	*Manignaq*[a]	*Ch'unya*
		Atgiaq[b]	
Dolly Varden[c]	*Salvelinus malma*	*Yugyaq*[d]	*Qak'elay*
		Anerrluaq	
		Anyuk	
Lake trout	*Salvelinus namaycush*	*Cikignaq*	*Zhuk'udghuzha*
Longnose sucker	*Catostomus catostomus*	*Cungartak*	*Duch'ehdi*
Northern pike	*Esox lucius*	*Cuukvak*	*Ghelguts'i*
Rainbow smelt	*Osmerus mordax*	*Iqalluaq*	
Rainbow trout	*Oncorhynchus mykiss*	*Talaariq*	*Tuni*
Broad whitefish[e]	*Coregonus nasus*	*Akakiik*	*Telay*
Humpback whitefish[e]	*Coregonus pidschian*	*Uraruq*	*Q'untuq'*
Round whitefish[e]	*Prosopium cylindraceum*	*Uraruq*	*Hesten*
Least cisco	*Coregonus sardinella*	*Cavirrutnaq*	*Ghelguts'i k'una*
Pacific herring	*Clupea pallasi*	*Iqalluarpak*	
Herring spawn on kelp		*Melucuaq*	
Starry flounder	*Platichthys stellatus*	*Naternaq*	
Pacific halibut	*Hippoglossus stenolepis*	*Naternarpak*	
Pacific cod	*Gadus macrocephalus*	*Ceturrnaq*	
Sculpin	Various species	*Kayutaq*	
Capelin	*Mallotus villosus*	*Cikaaq*	
Yellowfin sole	*Limanda aspera*	*Sagiq*	

a. Nushagak River villages.

b. Manokotak, Aleknagik, Twin Hills, Togiak.

c. Also includes the closely-related Arctic char, *Salvelinus alpinus*.

d. At Togiak, Manokotak, and Aleknagik, and perhaps elsewhere, there are 3 Yup'ik names for Dolly Varden/Arctic char. *Yugyak* probably refers to resident Dolly Varden/Arctic char. *Anerrluak*, called "Togiak trout" in the local English dialect, probably refers to anadromous fish taken in fresh water. Finally, *anyuk*, or "sea-run Dollies", are Dolly Varden or Arctic char taken in salt waters. See Fall et al. (1996):16–20 for further discussion of these distinctions.

e. Broad whitefish are rare to absent in the Bristol Bay region. *Akakiik* is the word used at Aleknagik and Manokotak to refer to whitefishes they receive from Kuskokwim River communities, where broad whitefish are common. Humpback whitefish are harvested in the Iliamna Lake subregion and are called *uraruq*. *Uraruq* is also used for round whitefish in the Togiak and Nushagak drainages.

Source Fall et al. 1996.

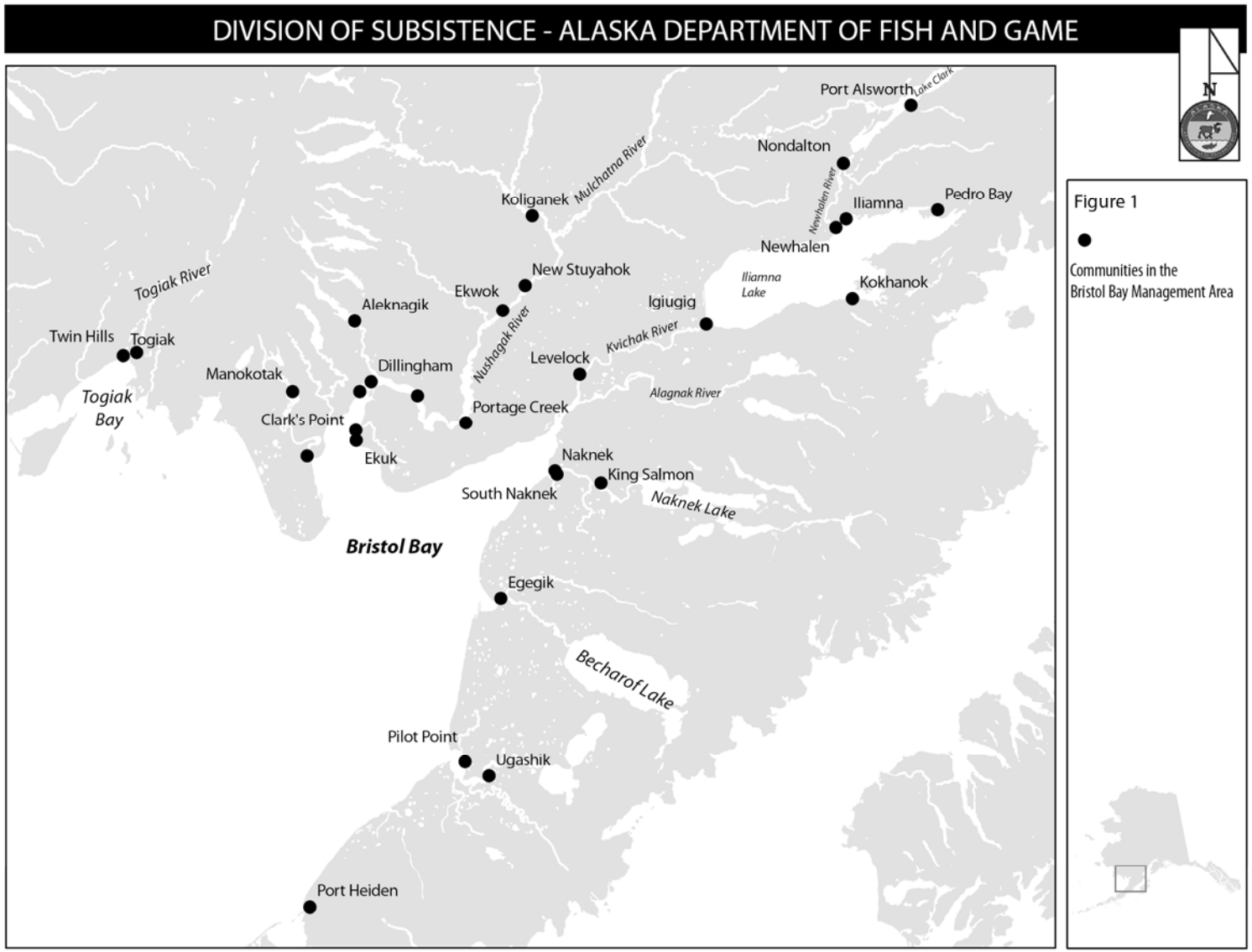

Figure 1.–The Bristol Bay region.

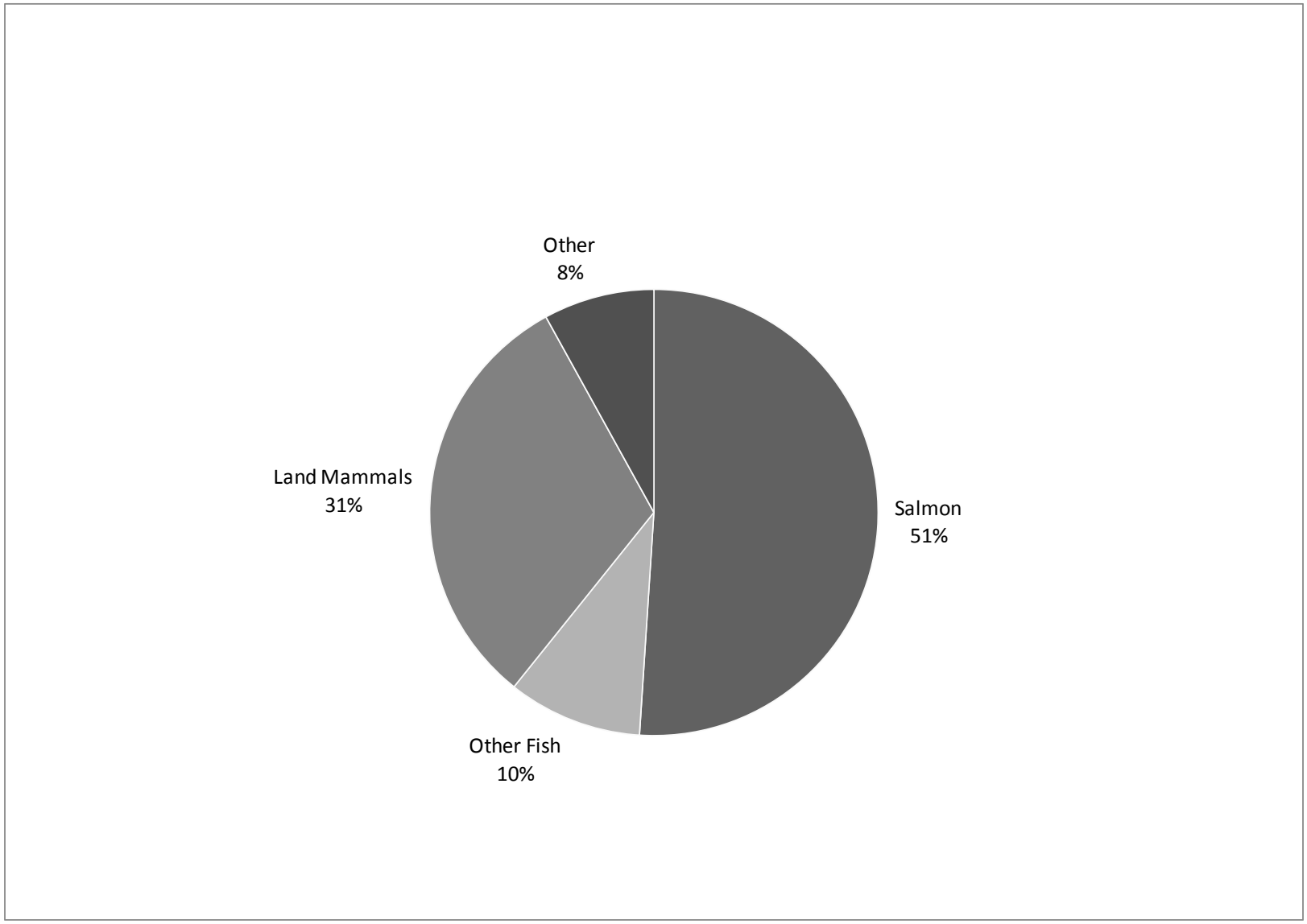

Figure 2.–Composition of Bristol Bay subsistence harvests, 1980s–1990s.

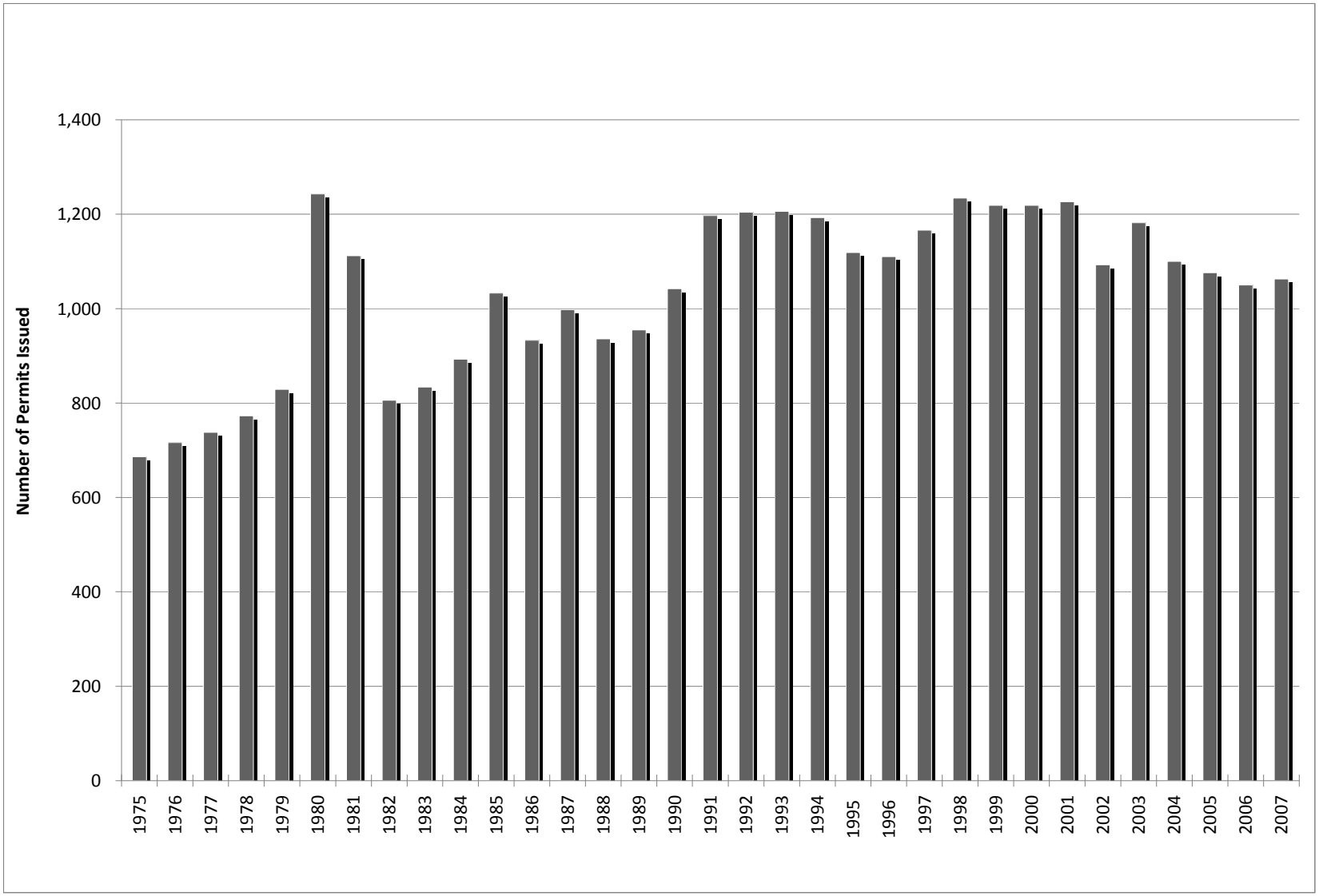

Figure 3.–Number of Bristol Bay subsistence permits issued, 1975–2007.

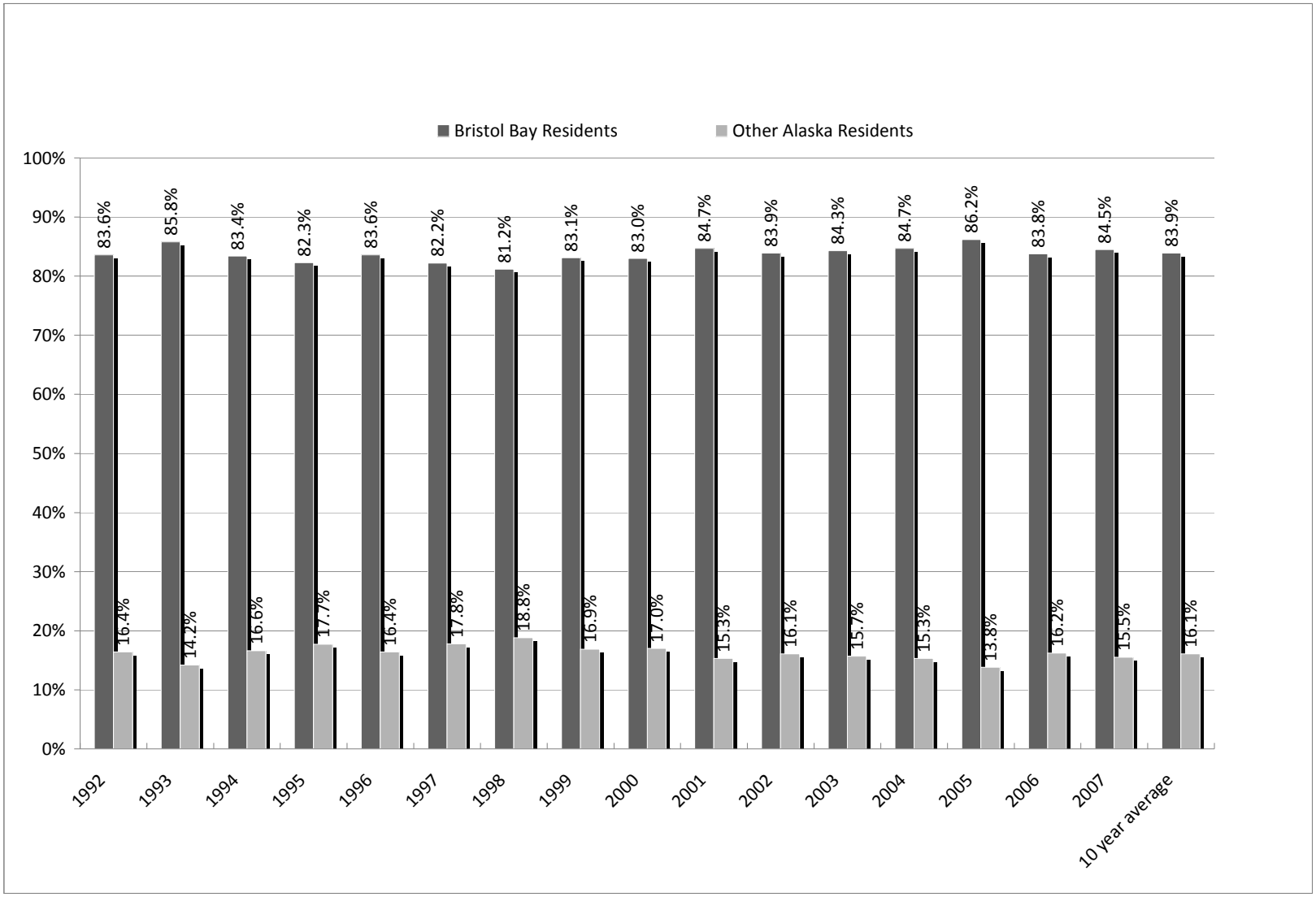

Figure 4.–Percentage of Bristol Bay subsistence salmon permits issued by area of residence of permit holder, 1992–2007.

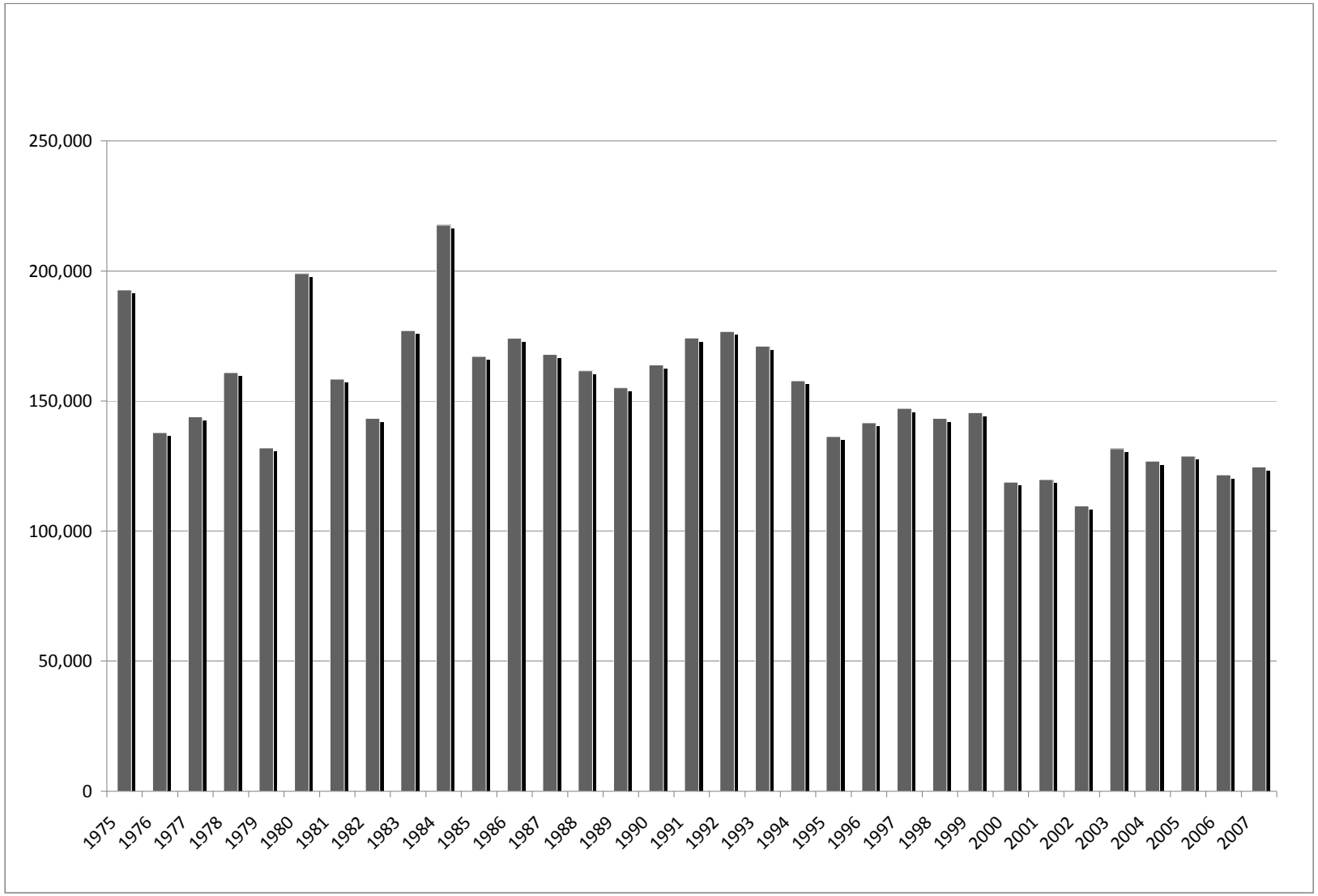

Figure 5.–Estimated subsistence salmon harvests, Bristol Bay Management Area, 1975–2007.

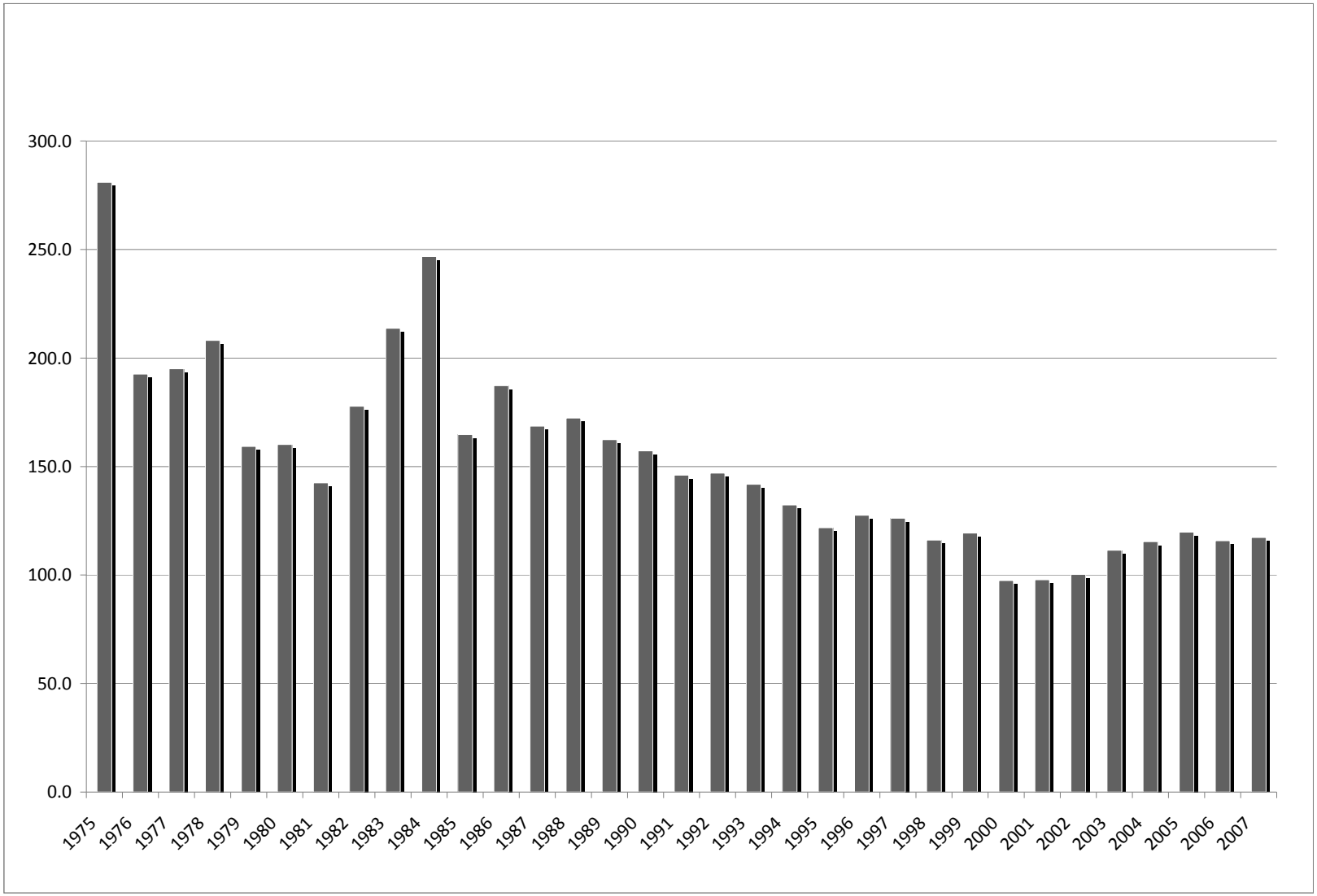

Figure 6.–Average salmon harvest per subsistence permit, Bristol Bay Management Area, 1975–2007.

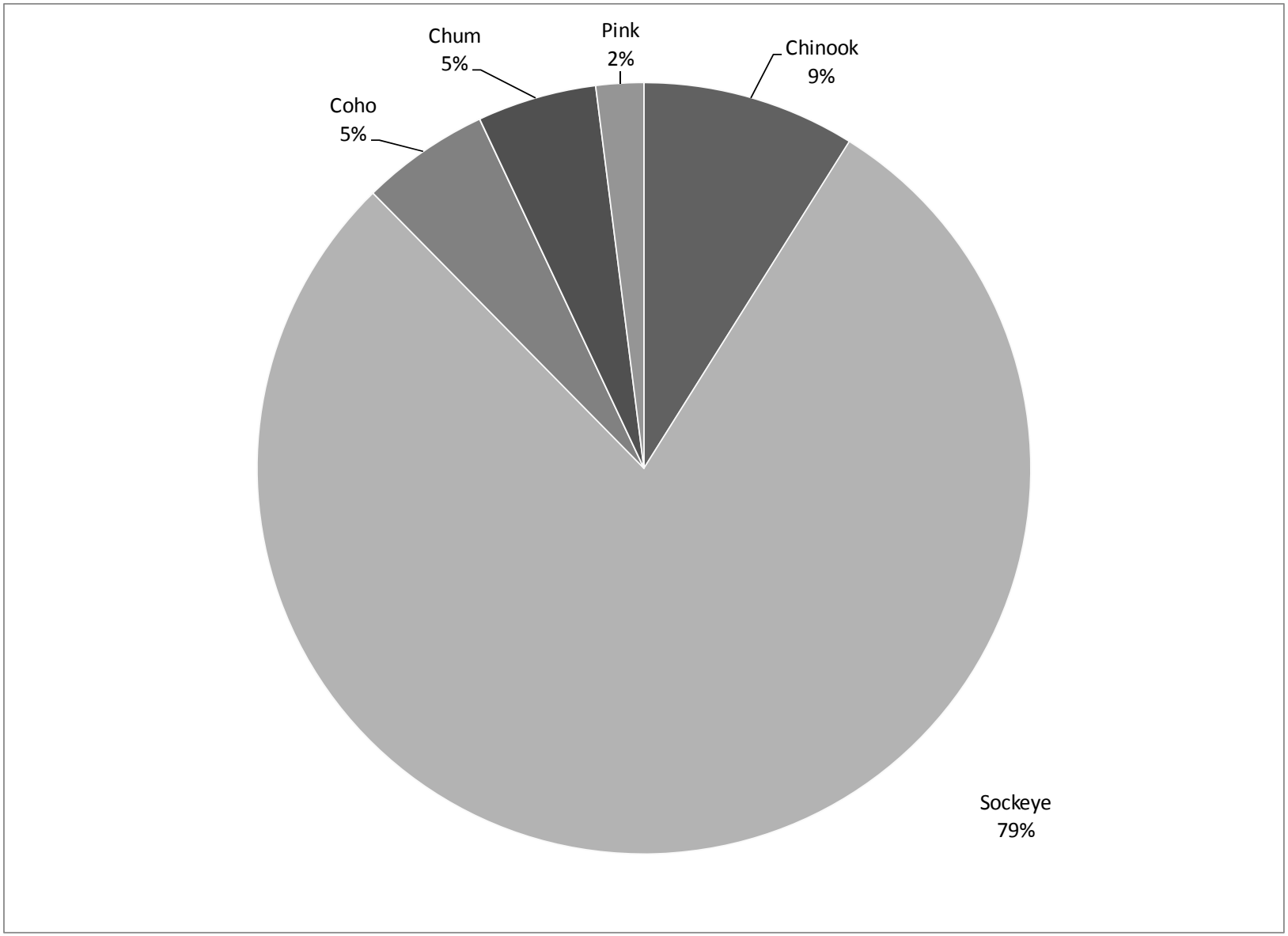

Figure 7.–Composition of Bristol Bay subsistence salmon harvest by species, 1975–2007.

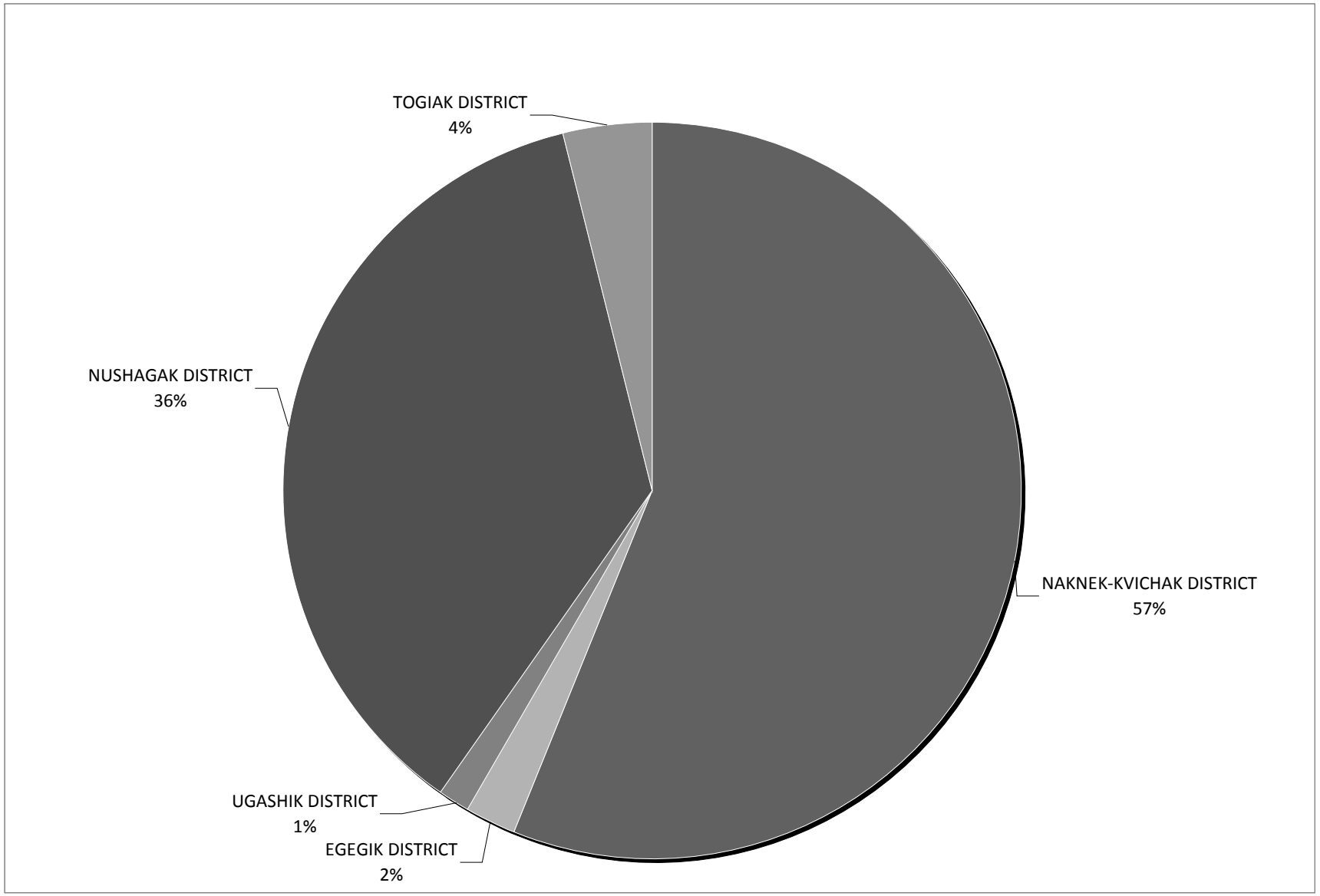

Figure 8.–Composition of Bristol Bay subsistence salmon harvest by district, 1998–2007.

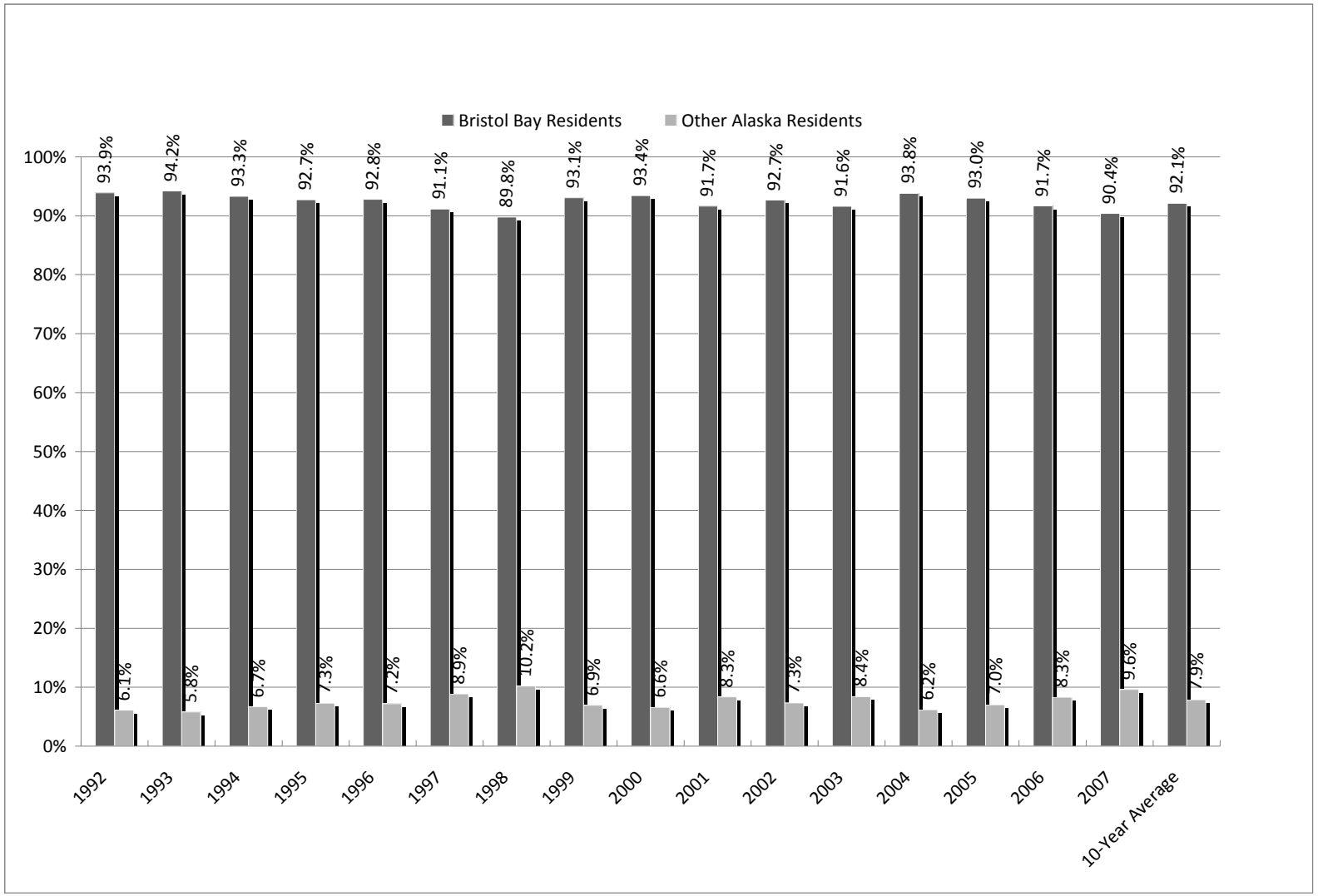

Figure 9.–Percentage of Bristol Bay subsistence salmon harvest by area of residence, 1992–2007.

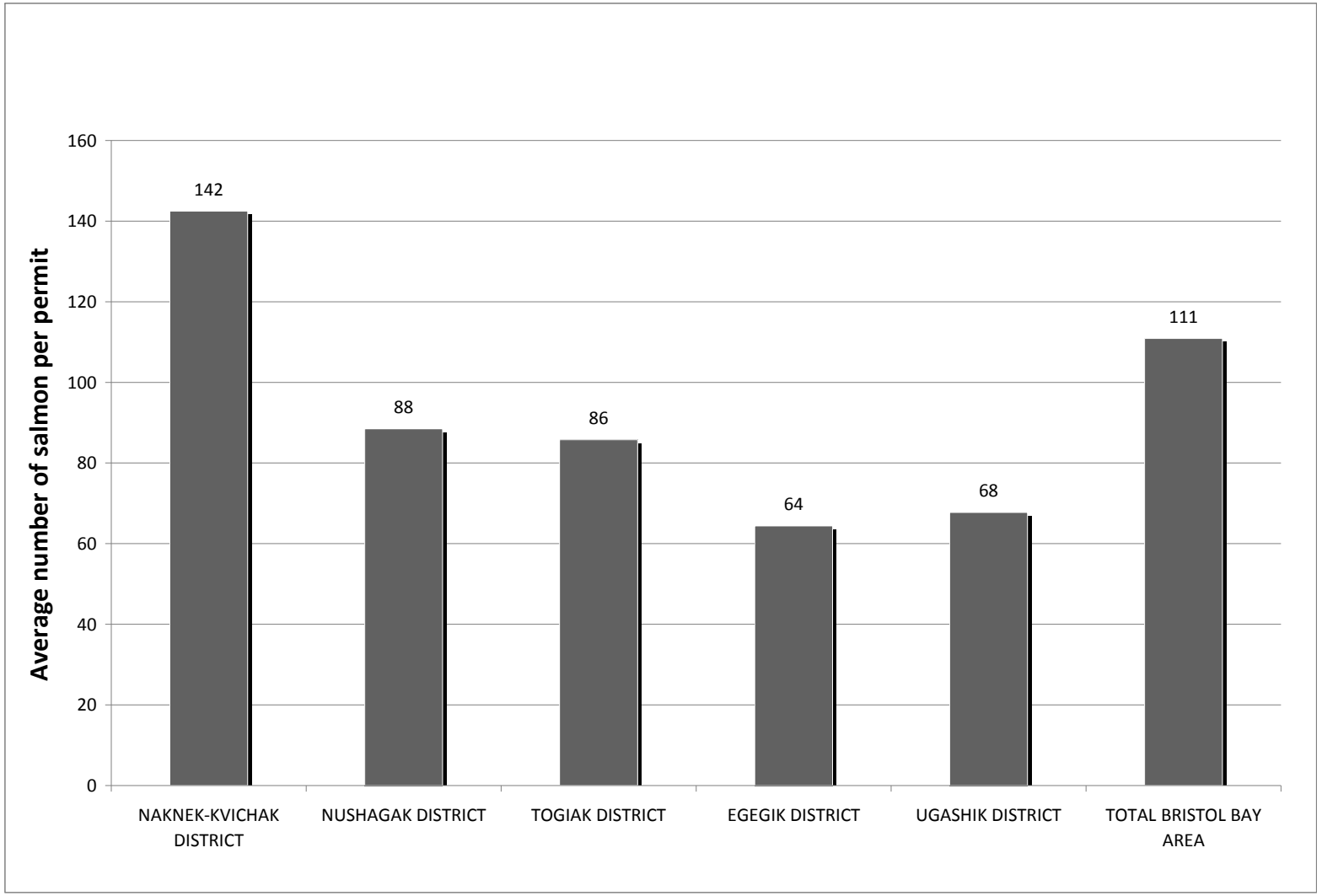

Figure 10.–Average subsistence salmon harvest per permit, 10-year average (1998–2007), Bristol Bay Management Area, by district.

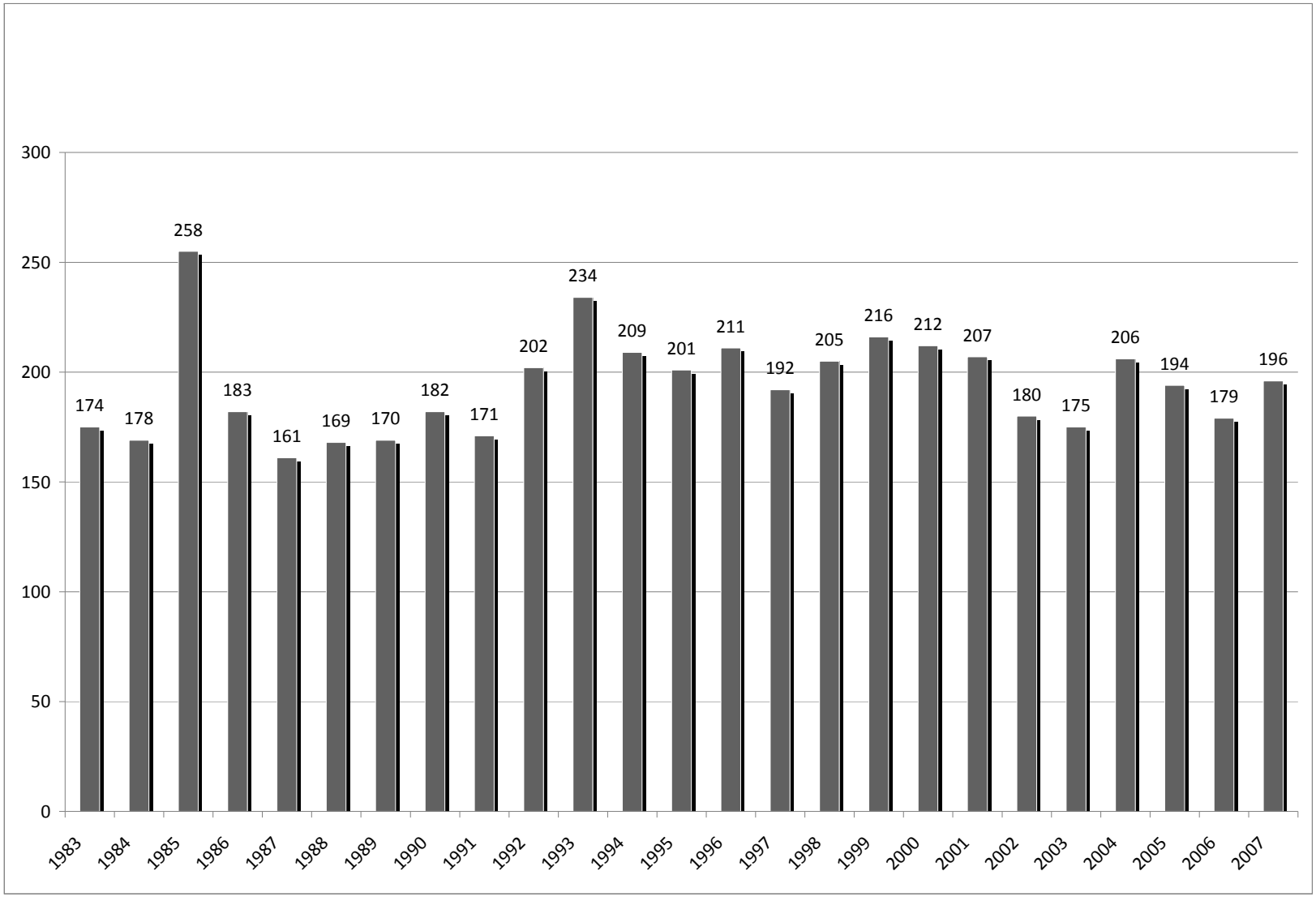

Figure 11.–Number of subsistence permits issued, Kvichak River watershed, Bristol Bay Management Area, 1983–2007.

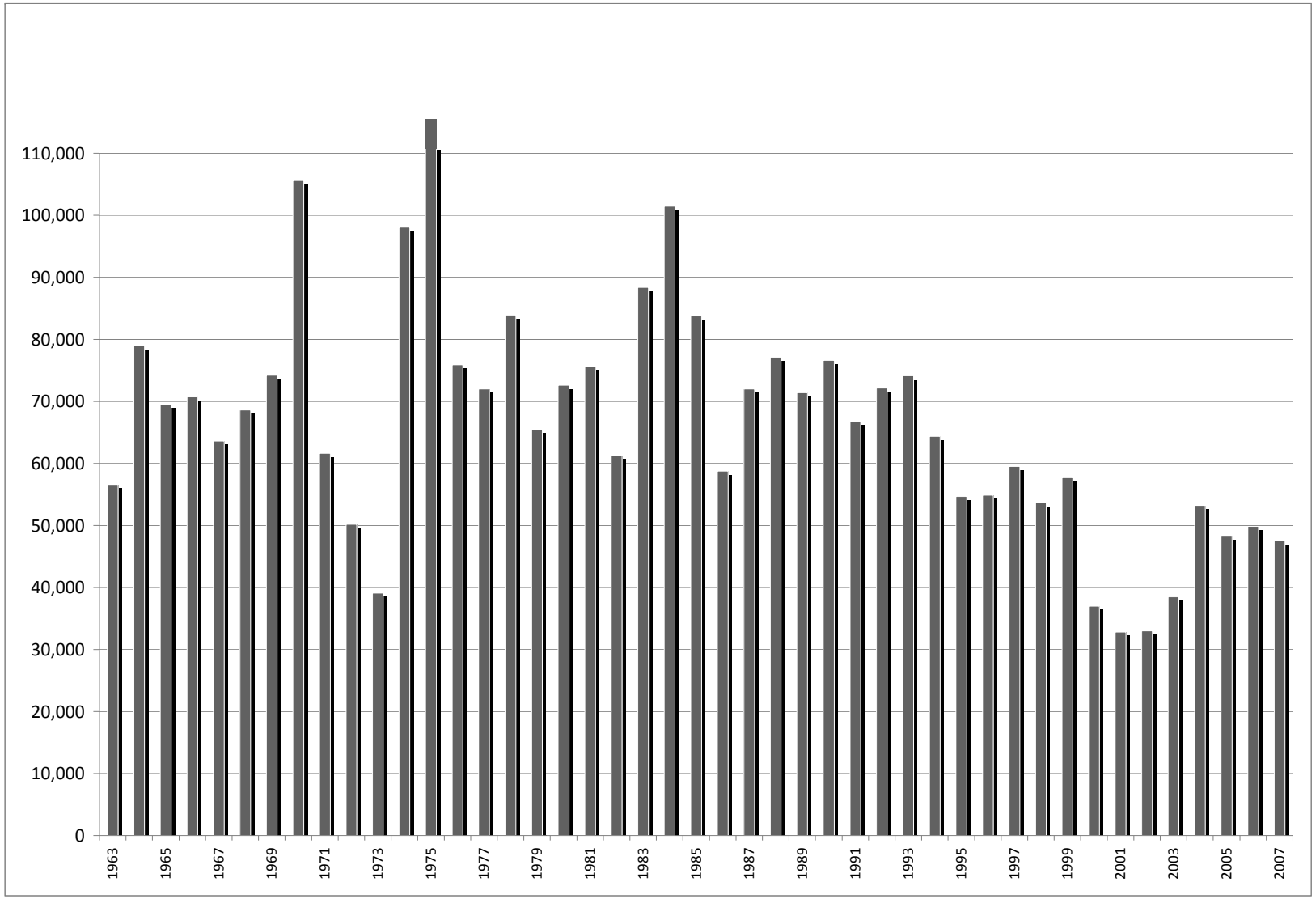

Figure 12.–Estimated subsistence harvests of sockeye salmon, Kvichak River watershed, 1963–2007.

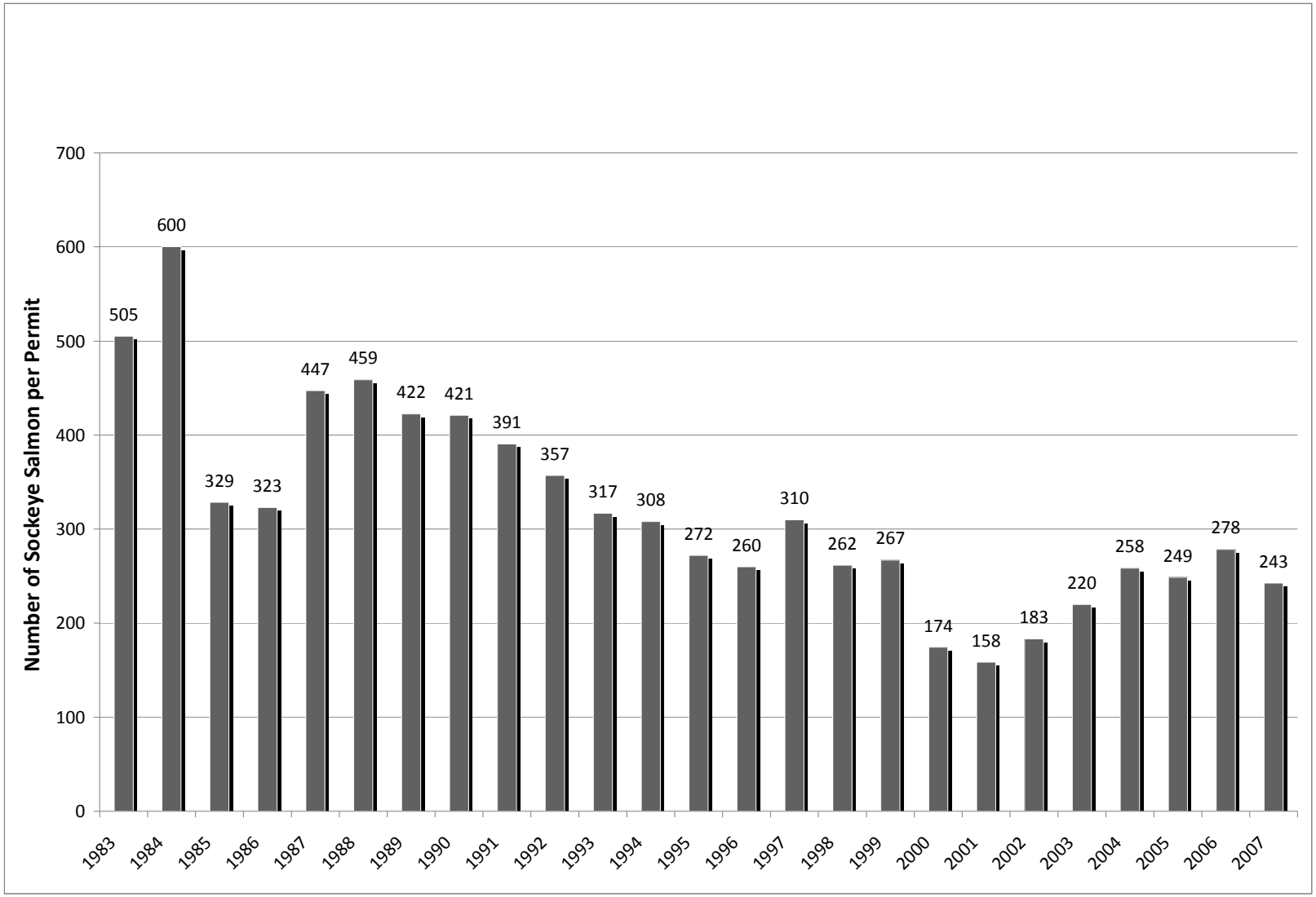

Figure 13.–Average subsistence sockeye salmon harvest per permit, Kvichak River watershed, 1983–2007.

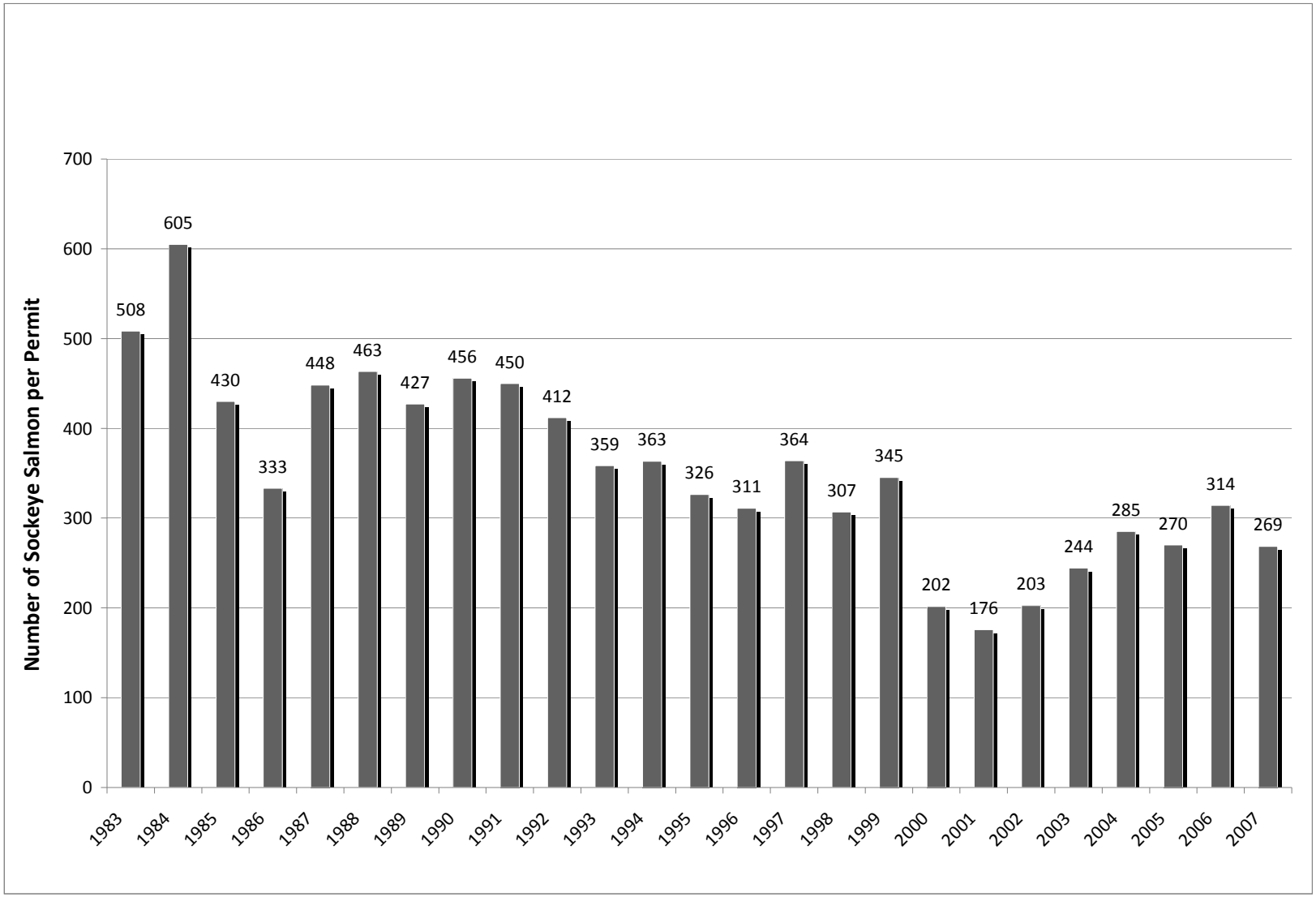

Figure 14.–Average subsistence sockeye salmon harvest per permit, local community residents, Kvichak River watershed, 1983–2007.

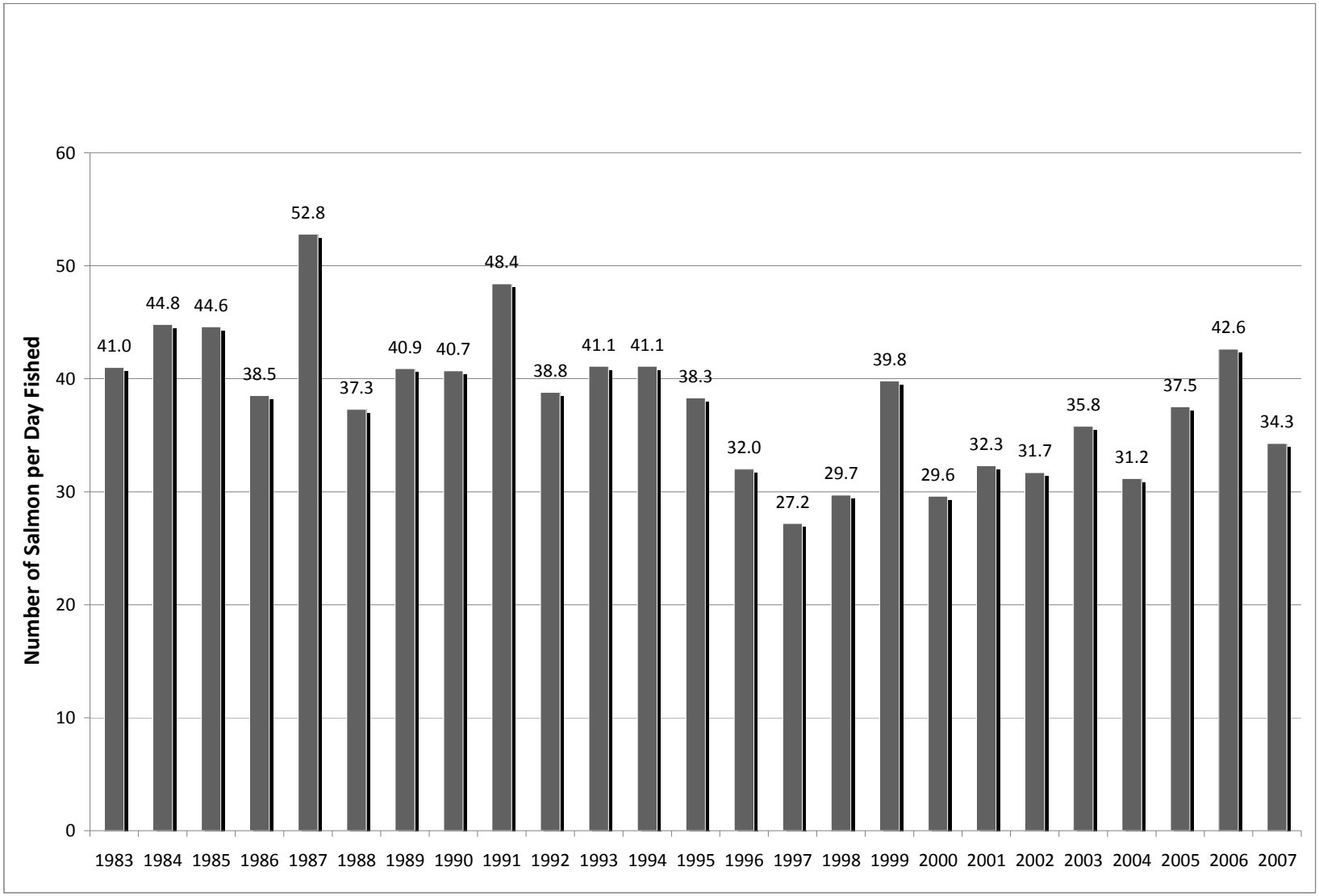

Figure 15.–Kvichak River watershed subsistence fishery: harvest of sockeye salmon per day fished, 1983–2007.

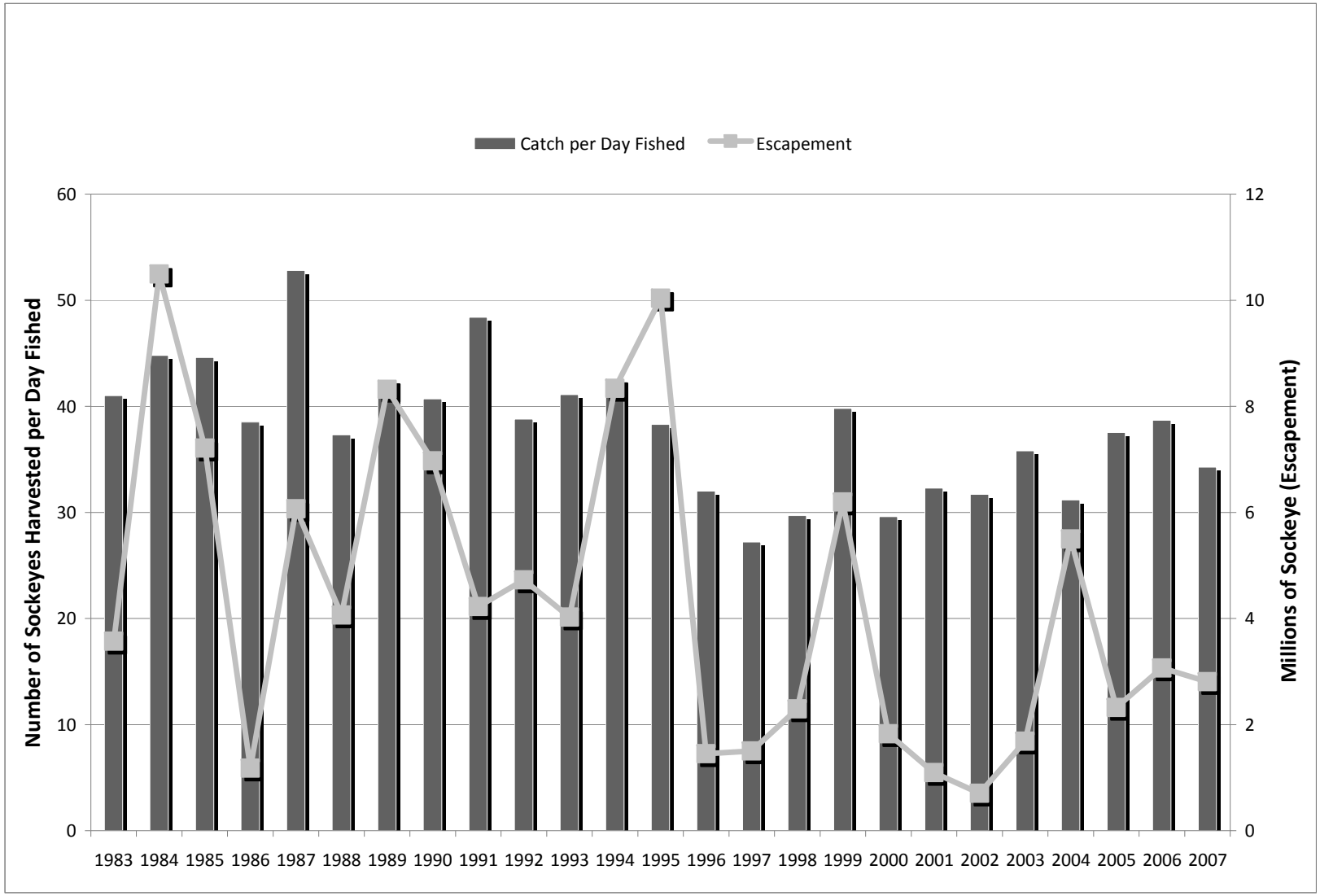

Figure 16.–Escapement of sockeye salmon into the Kvichak River watershed compared to average subsistence harvest per day fished, 1983–2007.

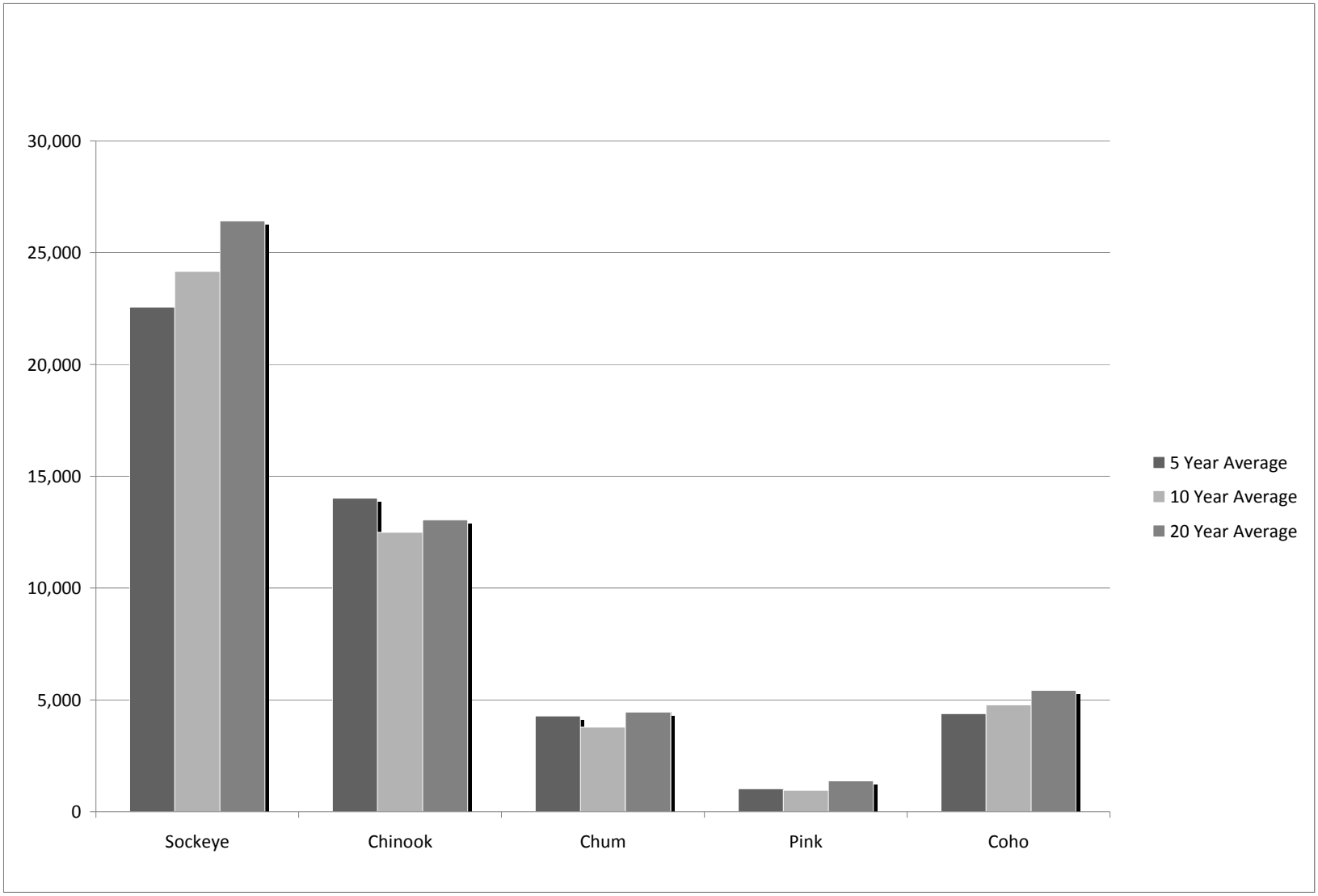

Figure 17.–Average number of salmon harvested in the Nushagak District, 1987–2007.

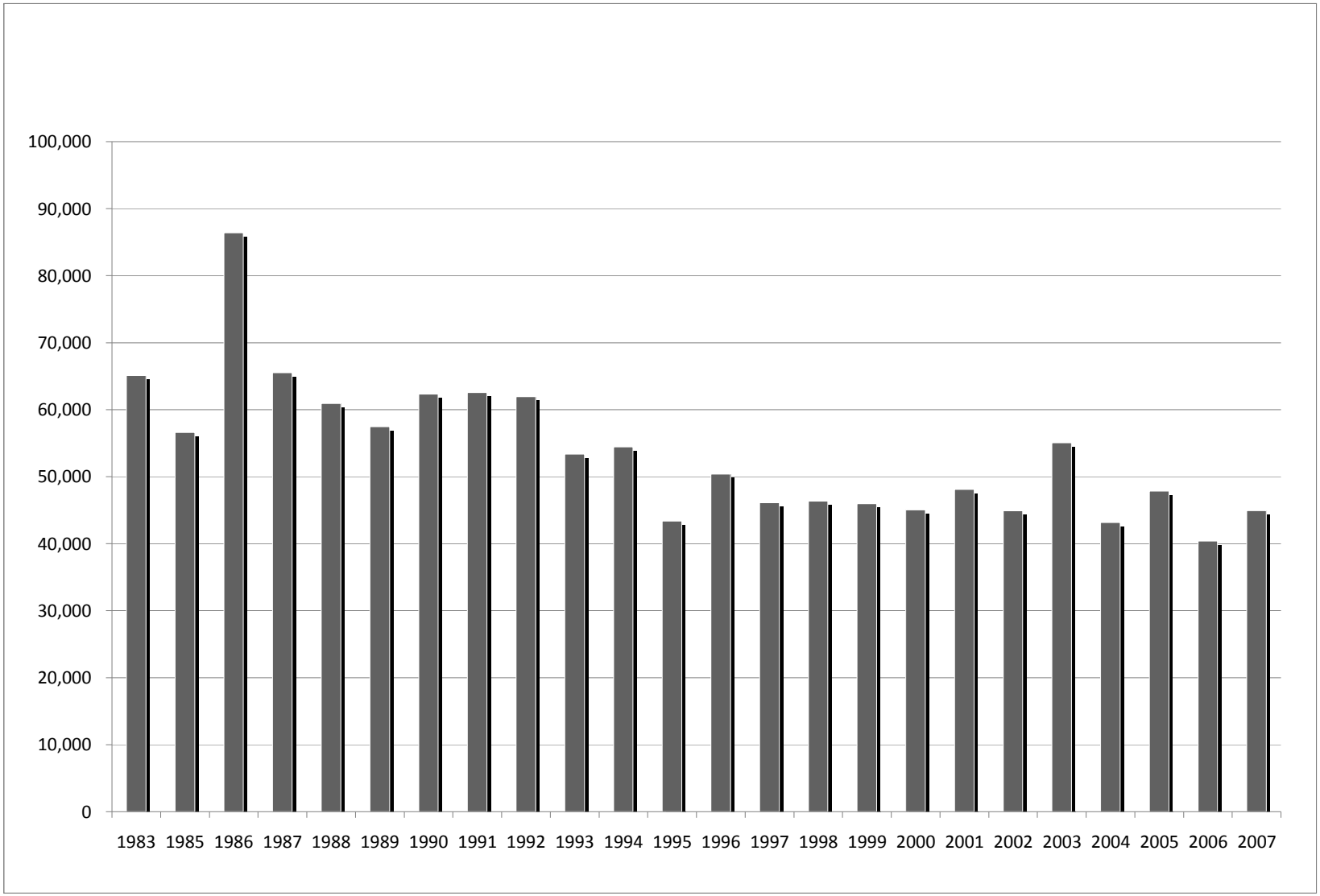

Figure 18.–Estimated subsistence harvests of salmon, Nushagak District, 1983–2007.

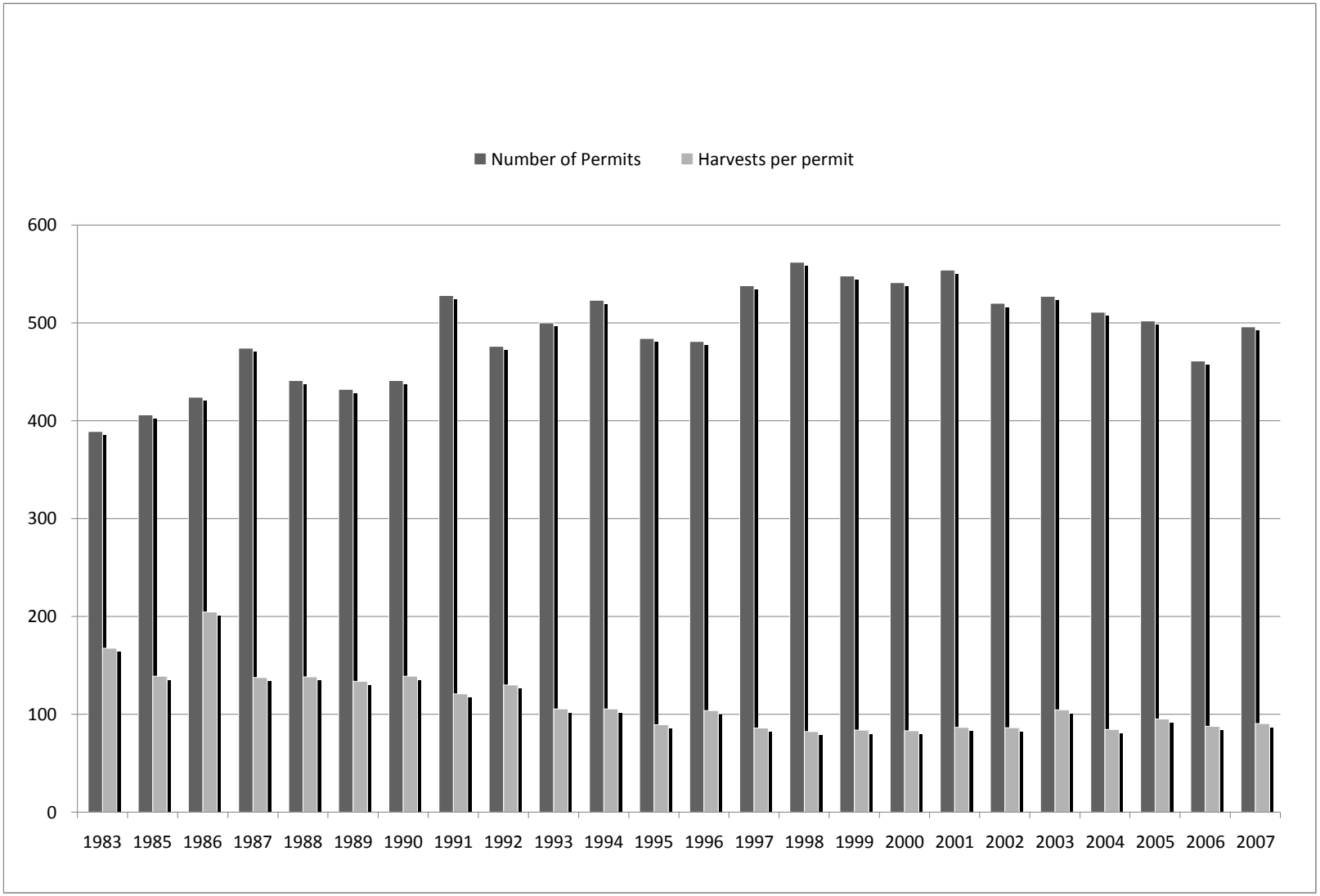

Figure 19.–Number of permits issued in the Nushagak District, 1983–2007.

APPENDIX TABLES

Appendix Table 1.–Per capita income and median household income, 2000.

	Per capita income	Median household income
Bristol Bay Borough	$22,210	$52,167
Dillingham Census Area	$16,021	$43,079
Lake and Peninsula Borough	$15,361	$36,442
Average	$17,864	$43,896

Sources U. S. Census Bureau 2001 for 2000; ADLWD 2009.

Appendix Table 2.–Subsistence salmon harvest by district and species, Bristol Bay, 1985–2005.

Year	Permits issued	Sockeye	Chinook	Chum	Pink	Coho	Total
Naknek–Kvichak District							
1983	385	107,900	1,000	400	300	900	110,500
1985	544	107,543	1,179	540	27	1,103	110,392
1986	412	77,283	1,295	695	2,007	650	81,930
1987	407	86,706	1,289	756	490	1,106	90,347
1988	391	88,145	1,057	588	917	813	91,520
1989	411	87,103	970	693	277	1,927	90,970
1990	466	92,326	985	861	1,032	726	95,930
1991	518	97,101	1,152	1,105	191	1,056	100,605
1992	571	94,304	1,444	2,721	1,601	1,152	101,222
1993	560	101,555	2,080	2,476	762	2,025	108,898
1994	555	87,662	1,843	503	460	1,807	92,275
1995	533	75,644	1,431	1,159	383	1,791	80,407
1996	540	81,305	1,574	816	794	1,482	85,971
1997	533	85,248	2,764	478	422	1,457	90,368
1998	567	83,095	2,433	784	1,063	1,592	88,967
1999	528	85,315	1,567	725	210	856	88,674
2000	562	61,817	894	560	845	937	65,053
2001	506	57,250	869	667	383	740	59,909
2002	471	52,805	837	909	1,137	943	56,632
2003	489	61,443	1,221	259	198	812	63,934
2004	481	71,110	1,075	469	1,080	566	74,300
2005	462	69,211	1,047	546	275	1,224	72,302
2006	468	69,097	881	341	757	720	71,796
2007	480	69,837	672	405	262	1,104	72,280
Average, 1998–2007	501	68,098	1,150	567	621	949	71,385
Average, 1988–2007	505	78,569	1,340	853	652	1,187	82,601
Average, 1987–1996	484	91,973	1,329	1,094	1,203	1,237	96,409
Average, 1997–2006	521	71,503	1,466	683	984	1,118	75,421

-continued-

Appendix Table 2. Page 2 of 5.

Year	Permits issued	Sockeye	Chinook	Chum	Pink	Coho	Total
Egegik District							
1985	23	582	14	21	1	203	821
1986	41	1,052	69	58	21	319	1,519
1987	49	3,350	87	139	2	284	3,862
1988	52	1,405	97	87	54	333	1,976
1989	50	1,636	50	33	1	414	2,134
1990	61	1,105	53	85	39	331	1,613
1991	70	4,549	82	141	32	430	5,234
1992	80	3,322	124	270	51	729	4,496
1993	69	3,633	128	148	15	905	4,829
1994	59	3,208	166	84	153	857	4,468
1995	60	2,818	86	192	100	690	3,886
1996	44	2,321	99	89	85	579	3,173
1997	34	2,438	101	21	5	740	3,304
1998	36	1,795	44	33	52	389	2,314
1999	42	2,434	106	35	2	806	3,384
2000	31	842	16	11	0	262	1,131
2001	57	2,493	111	105	16	928	3,653
2002	53	1,892	65	34	12	356	2,359
2003	62	3,240	84	32	10	297	3,663
2004	46	2,618	169	410	91	1,423	4,711
2005	45	2,267	81	231	2	526	3,106
2006	41	1,641	94	34	7	641	2,418
2007	28	980	165	72	26	334	1,577
Average, 1998–2007	44	2,020	93	100	22	596	2,832
Average, 1988–2007	51	2,332	96	107	38	599	3,171
Average, 1987–1996	55	2,384	87	107	64	481	3,095
Average, 1997–2006	47	2,289	88	96	48	647	3,158
Ugashik District							
1985	9	233	17	7		143	400
1986	27	1,080	83	48	21	335	1,567
1987	22	892	104	51	29	272	1,348
1988	23	1,400	84	55	35	330	1,904
1989	22	1,309	32	35	2	214	1,592
1990	37	1,578	51	143	120	280	2,172
1991	38	1,403	121	168	42	614	2,348
1992	37	2,348	106	79	8	397	2,938
1993	39	1,766	86	107	24	495	2,478
1994	31	1,587	126	42	38	579	2,372

-continued-

Appendix Table 2. Page 3 of 5.

Year	Permits issued	Sockeye	Chinook	Chum	Pink	Coho	Total
1995	20	1,513	56	18	6	290	1,883
1996	26	1,247	50	21	7	298	1,623
1997	28	2,785	169	39	23	311	3,327
1998	27	1,241	59	75	82	485	1,942
1999	25	1,365	35	5	0	271	1,675
2000	31	1,927	51	34	1	467	2,481
2001	24	1,197	61	8	2	357	1,624
2002	23	1,294	51	14	2	460	1,821
2003	23	1,113	31	30	0	392	1,567
2004	21	804	64	9	4	234	1,116
2005	22	818	27	18	2	249	1,114
2006	25	962	41	6	16	339	1,364
2007	17	1,056	43	88	79	281	1,546
Average, 1998–2007	24	1,178	46	29	19	353	1,625
Average, 1988–2007	27	1,436	67	50	25	367	1,944
Average, 1987–1996	29	1,360	81	74	35	366	1,912
Average, 1997–2006	25	1,449	63	25	19	356	1,906
Nushagak District							
1985	406	38,000	7,900	4,000	600	6,100	56,600
1986	424	49,000	12,600	10,000	5,400	9,400	86,400
1987	474	40,900	12,200	6,000	200	6,200	65,500
1988	441	31,086	10,079	8,234	6,316	5,223	60,938
1989	432	34,535	8,122	5,704	407	8,679	57,447
1990	441	33,003	12,407	7,808	3,183	5,919	62,320
1991	528	33,161	13,627	4,688	292	10,784	62,552
1992	476	30,640	13,588	7,076	3,519	7,103	61,926
1993	500	27,114	17,709	3,257	240	5,038	53,358
1994	523	26,501	15,490	5,055	2,042	5,338	54,426
1995	484	22,793	13,701	2,786	188	3,905	43,373
1996	481	22,935	15,941	4,704	1,573	5,217	50,370
1997	538	25,080	15,318	2,056	218	3,433	46,106
1998	562	25,217	12,258	2,487	1,076	5,316	46,355
1999	548	29,387	10,057	2,409	124	3,993	45,969
2000	541	24,451	9,470	3,463	1,662	5,983	45,029
2001	554	26,939	11,760	3,011	378	5,993	48,080
2002	520	22,777	11,281	5,096	1,179	4,565	44,897
2003	527	25,491	18,686	5,064	403	5,432	55,076
2004	511	17,491	15,610	3,869	1,944	4,240	43,154

-continued-

Appendix Table 2. Page 4 of 5.

Year	Permits issued	Sockeye	Chinook	Chum	Pink	Coho	Total
2005	502	23,916	12,529	5,006	793	5,596	47,841
2006	461	20,773	9,971	4,448	1,591	3,590	40,373
2007	496	25,127	13,330	3,006	430	3,050	44,944
Average, 1998–2007	522	24,157	12,495	3,786	958	4,776	46,172
Average, 1988–2007	503	26,421	13,047	4,461	1,378	5,420	50,727
Average, 1987–1996	465	34,394	12,372	6,182	4,092	6,978	62,147
Average, 1997–2006	527	24,256	13,408	3,494	1,487	4,808	46,841
Togiak District							
1985	51	3,400	600	1,000	100	1,500	6,600
1986	29	2,400	700	800	100	500	4,500
1987	46	3,600	700	1,000		1,600	6,900
1988	29	2,413	429	716	45	792	4,395
1989	40	2,825	551	891	112	976	5,355
1990	37	3,689	480	786	60	1,111	6,126
1991	43	3,517	470	553	27	1,238	5,805
1992	40	3,716	1,361	626	135	1,231	7,069
1993	38	2,139	784	571	8	743	4,245
1994	25	1,777	904	398	77	910	4,066
1995	22	1,318	448	425	0	703	2,894
1996	19	662	471	285	59	199	1,676
1997	31	1,440	667	380	0	260	2,747
1998	42	2,211	782	412	76	310	3,791
1999	76	3,780	1,244	479	84	217	5,804
2000	54	3,013	1,116	569	90	342	5,130
2001	92	4,162	1,612	367	61	388	6,590
2002	36	2,319	703	605	10	241	3,878
2003	92	4,403	1,208	483	451	883	7,428
2004	46	1,795	1,094	383	108	204	3,584
2005	45	2,299	1,528	301	26	295	4,448
2006	61	2,728	1,630	492	354	408	5,612
2007	48	2,548	1,234	420	19	110	4,332
Average, 1998–2007	59	2,926	1,215	451	128	340	5,060
Average, 1988–2007	46	2,638	936	507	90	578	4,749
Average, 1987–1996	38	2,948	698	734	83	1,060	5,506
Average, 1997–2006	51	2,510	934	439	69	375	4,352

-continued-

Appendix Table 2. Page 5 of 5.

Year	Permits issued	Sockeye	Chinook	Chum	Pink	Coho	Total
Total, Bristol Bay Management Area							
1985	1,033	149,758	9,710	5,568	728	9,049	174,813
1986	933	130,815	14,747	11,601	7,549	11,204	175,916
1987	998	135,493	14,356	7,895	689	9,453	167,886
1988	936	124,449	11,746	9,680	7,367	7,491	160,733
1989	955	127,408	9,725	7,356	799	12,210	157,498
1990	1,042	131,701	13,976	9,683	4,434	8,367	168,161
1991	1,197	139,731	15,452	6,655	584	14,122	176,544
1992	1,204	134,330	16,623	10,772	5,314	10,612	177,651
1993	1,206	136,207	20,787	6,559	1,049	9,206	173,808
1994	1,193	120,735	18,529	6,082	2,770	9,491	157,607
1995	1,119	104,086	15,722	4,580	677	7,378	132,443
1996	1,110	108,470	18,136	5,915	2,518	7,775	142,813
1997	1,166	116,991	19,159	2,974	668	6,201	145,992
1998	1,234	113,560	15,576	3,792	2,349	8,093	143,368
1999	1,219	122,281	13,009	3,653	420	6,143	145,506
2000	1,219	92,050	11,547	4,637	2,599	7,991	118,824
2001	1,226	92,041	14,412	4,158	839	8,406	119,856
2002	1,093	81,088	12,936	6,658	2,341	6,565	109,587
2003	1,182	95,690	21,231	5,868	1,062	7,816	131,667
2004	1,100	93,819	18,012	5,141	3,225	6,667	126,865
2005	1,076	98,511	15,212	6,102	1,098	7,889	128,811
2006	1,050	95,201	12,617	5,321	2,726	5,697	121,564
2007	1,063	99,549	15,444	3,991	815	4,880	124,679
Average, 1998–2007	1,146	98,379	15,000	4,932	1,747[a]	7,015	127,073
Average, 1988–2007	1,130	111,395	15,493	5,979	2,183[a]	8,150	143,199
Average, 1987–1996	1,070	133,063	14,565	8,185	5,487[a]	10,121	169,062
Average, 1997–2006	1,167	102,008	15,974	4,738	2,606[a]	7,304	131,692

Notes Harvests are extrapolated for all permits issued, based on those returned. Harvests prior to 1985 are rounded to the nearest 100 fish. Permit and harvest estimates prior to 1989 are based on the community where the permit was issued; estimates from 1989 to the present are based on the area fished, as first reported on the permit.

a. Includes even years only.

Appendix Table 3.–Estimated subsistence salmon harvests by district and location fished, Bristol Bay Management Area, 2007.

Area and river system	Number of permits issued[a]	Estimated salmon harvest					
		Chinook	Sockeye	Coho	Chum	Pink	Total
Naknek–Kvichak District	480	672	69,837	1,104	405	262	72,280
Naknek River subdistrict	287	664	22,364	1,078	375	260	24,742
Kvichak River/Iliamna Lake subdistrict:	196	8	47,473	26	30	1	47,538
Chekok	1	0	310	0	0	0	310
Igiugig	4	1	1,419	0	2	0	1,422
Iliamna Lake-general	31	0	5,017	0	0	0	5,017
Kijik	4	0	769	0	0	0	769
Kokhanok	30	6	15,540	26	22	1	15,595
Kvichak River	12	0	1,203	0	0	0	1,203
Lake Clark	34	0	3,604	0	0	0	3,604
Levelock	1	1	102	0	6	0	109
Newhalen River	39	0	8,732	0	0	0	8,732
Pedro Bay	20	0	5,569	0	0	0	5,569
Sixmile Lake	26	0	5,208	0	0	0	5,208
Egegik District	28	165	980	334	72	26	1,577
Ugashik District	17	43	1,056	281	88	79	1,546
Nushagak District	496	13,330	25,127	3,050	3,006	430	44,944
Wood River	135	1,793	6,813	293	249	36	9,184
Nushagak River	117	5,479	5,879	1,127	1,572	213	14,270
Nushagak Bay noncommercial	228	5,138	9,545	1,467	1,009	163	17,322
Nushagak Bay commercial	33	418	887	113	119	12	1,550
Igushik/Snake River	25	500	2,000	36	57	6	2,599
Nushagak, site unspecified	1	1	3	15	0	0	19
Togiak District	48	1,234	2,548	110	420	19	4,332
Total	**1,063**	**15,444**	**99,549**	**4,880**	**3,991**	**815**	**124,679**

Notes Harvests are extrapolated for all permits issued, based on those returned and on the area fished as reported on the permit. Due to rounding, the sum of columns and rows may not equal the estimated total. Of 1,063 permits issued for the management area, 917 were returned (86.3%).

a. Sum of sites may exceed district totals, and sum of districts may exceed area total, because permittees may use more than one site.

Source ADF&G Division of Subsistence ASFDB.