

ALASKA DEPARTMENT OF FISH & GAME



**KARLUK RIVER KING SALMON
ACTION PLAN**

January 11, 2011

KARLUK RIVER KING SALMON STOCK STATUS AND ACTION PLAN, 2011

INTRODUCTION

SYNOPSIS

In October of 2010, the Alaska Department of Fish and Game (department) recommended that the Board of Fisheries (board) declare Karluk River king salmon as a stock of management concern at the regulatory board meeting for the Kodiak management Area (KMA) in January of 2011¹. This recommendation was based on guidelines established in the *Policy for Management of Sustainable Salmon Fisheries* (SSFP; 5 AAC 39.222). The SSFP states that “management concern means a concern arising from a chronic inability, despite use of specific management measures, to maintain escapements for a salmon stock within the bounds of the SEG, BEG, OEG, or other specific management objectives for the fishery...”. Chronic inability is further defined in the SSFP as “...the continuing or anticipated inability to meet escapement thresholds over a four to five year period...” based on the generation time of most salmon species. Despite specific management measures taken by the department to reduce harvest in the sport, commercial, and subsistence fisheries since 2001, the Karluk River king salmon stock has continued to decline since 1999, and failed to make the escapement goal from 2007 through 2010.

This action plan summarizes historical assessment of annual run size and describes the existing regulations and emergency order (EO) authority that the department follows to manage Karluk River king salmon. Options are then presented for potential management actions for the commercial, sport, and subsistence fisheries, and research projects for the Karluk River king salmon stock.

STOCK ASSESSMENT AND ESCAPEMENT GOAL HISTORY

The divisions of Commercial Fisheries and Sport Fish have operated a weir to assess salmon escapement to the Karluk River since 1976 (Figure 1). Escapement of Karluk River king salmon since 1976 has ranged from 752 to 13,742 fish (Table 1). During the 10 years from 1997–2006, escapements averaged 7,278 king salmon. After 2006, there appeared to be a substantial decline in productivity, as measured both by total harvest and escapement. From 2007 through 2010, escapements decreased to an average of 1,668 fish. The decline in escapement was not due to increased harvests (sport, subsistence, and commercial combined), which also declined from an average of 2,383 (1997–2006) to 134 (2007–2010).

For each of the last four years (2007 thru 2010), Karluk River king salmon escapement has been below the current biological escapement goal (BEG) of 3,600–7,300 fish (Figure 2). During this period, escapements ranged from 752 fish in 2008 to 2,916 fish in 2010 (Table 1). This BEG has been in place since 2002, when it replaced the original BEG of 4,500–8,000 fish established in 1978. The current goal will change to a BEG of 3,000 to 6,000 fish in 2011, based on the recent review by an interdivisional escapement goal review team (Nemeth et al. 2010).

¹ Unpublished memorandum from J. Hilsinger and C. Swanton, ADF&G, to Board of Fisheries, September 30, 2010.

HABITAT

Karluk drainage is located within land owned by Koniag Inc., Karluk Tribal Council, and other private parcels, and the Kodiak National Wildlife Refuge. The habitat is considered pristine with no habitat-related concerns identified for Karluk River king salmon.

HARVEST MANAGEMENT

Karluk River king salmon are harvested by a commercial fishery in salt water, and by subsistence and sport fisheries in fresh water and in the lagoon at the mouth of the river. Estimated mean annual sport harvest of king salmon from 1997 to 2006 was 1,141 fish. In 2007, 205 king salmon were harvested in the sport fishery. No king salmon were harvested by the sport fishery from 2008 through 2010. The Division of Sport Fish began taking inseason management actions to conserve Karluk River king salmon in 2001, and has used the commissioner's EO authority to implement inseason bag limit restrictions, nonretention regulations, and/or total fishery closures annually (with the exception of 2004) from 2001 through 2010. Preseason actions were implemented beginning in 2007 with a reduction in bag limit from two king salmon per day 20 inches or greater in length to one per day 20 inches or greater in length. In 2008, the king salmon fishery was restricted to nonretention preseason and then closed by EO June 30, and total sport fish closures were implemented preseason in 2009 and 2010 (Figure 3).

The commercial seine fishery located in the Inner Karluk and Outer Karluk sections targets sockeye salmon returning to Karluk Lake, but Karluk River king salmon are also harvested. The annual commercial harvest of king salmon has declined significantly since 2004 (Table 1). From 1997 to 2006, the mean annual commercial harvest was 1,214 fish. From 2007 to 2010, the annual mean harvest decreased to 82 fish. No commercial harvest of king salmon occurred in these sections from 2009 through 2010 because the sockeye salmon fishery was closed during times that king salmon would normally be present (Figure 4).

The dual-managed state/federal subsistence fishery on Karluk River king salmon occurs in Karluk Lagoon and Karluk River. A state permit is required to participate in both the state and federal subsistence fishery. Estimated mean annual subsistence harvest from 1997 to 2006, as reported by permit returns, was 28 fish and ranged from a low of 0 fish in several years to 165 fish in 2002 (Table 1). Restrictions to the state and federal subsistence fisheries to conserve king salmon escapements have included a prohibition on retention of all king salmon caught inriver during 2008, and complete closure of the Karluk River drainage to subsistence harvest of king salmon in 2009 and 2010 (Figure 4).

Return per spawner of Karluk River king salmon is somewhat cyclical, averaging 1.22 for brood years 1976–2002 (Figure 5). For the 13 most recent complete brood years (1990–2002), only three (1992, 1994, and 1998) have replaced themselves (i.e., return per spawner \geq 1.0). For brood years from 1976 through 2002, the age composition of the returns was approximately 2% age-3, 11% age-4, 29 % age-5, 52% age-6, and 6% age-7 fish. It is unlikely brood years 2003 and 2004 will produce returns that replace themselves.

ACTION PLAN FOR ADDRESSING STOCK OF CONCERN**COMMERCIAL FISHERIES MANAGEMENT ACTIONS****Past Management Actions**

Although there are no commercial fisheries management plans for king salmon in the KMA, fisheries managers have responded to the recent declines with inseason management actions designed to reduce harvests when king salmon runs were low. In 2005, the board adopted a commercial fishery regulation that directs the department to mandate nonretention of king salmon over 28 inches in the commercial fishery within the Inner and Outer Karluk sections if king salmon runs were weak (5 AAC 18.395). While the department does not specifically manage the commercial harvest of king salmon, this regulation was put into effect during the 2005 through 2008 seasons. Inner and Outer Karluk sections were then closed to commercial salmon fishing during the king salmon run in 2009 and 2010 (Figure 4) due to low sockeye salmon runs. All of these actions were effective in reducing harvests from pre-2005 levels, both in absolute numbers and relative to escapement (Figure 6).

5 AAC 18.362(e) *Westside Kodiak Salmon Management Plan* describes the management priorities for managing commercial sockeye salmon fisheries in the Inner and Outer Karluk sections.

Potential Management Actions**Action#1**

Status quo. Maintain regulations as currently specified in 5 AAC 18.362. *Westside Kodiak Salmon Management Plan* and 5 AAC 18.395. *Retention of king salmon taken in a commercial fishery*. The westside management plan regulates commercial seine and setnet fisheries on the westside of the KMA (including the Inner and Outer Karluk sections and 5 AAC 18.395 prohibits retention of king salmon over 28 inches in length taken in commercial fisheries by emergency order in the Inner and Outer Karluk sections and the Inner and Outer Ayakulik sections.

Specific Actions:

When king salmon runs to the Karluk system are weak, the department would continue to use emergency order authority to invoke and enforce nonretention of king salmon greater than 28 inches in length in Inner and Outer Karluk sections of the Southwest Kodiak District.

Background:

King salmon harvests in the KMA commercial fisheries are incidental. Currently, there are no management plans directing the department with regard to king salmon management. However, the department does have EO authority to limit the harvest of king salmon by requiring the release of king salmon over 28 inches in length within the Inner and Outer Karluk sections and the Inner and Outer Ayakulik sections. The department has invoked and enforced this provision when it became apparent the king salmon runs were weak (Figure 4).

Benefits:

The current plan allows the department to effectively manage the sockeye salmon run to Karluk Lake while releasing king salmon in years of weak king salmon runs.

Detriments:

While largely unknown, current regulations and management actions may not be sufficient to protect king salmon runs to the Karluk system.

Action#2

Maintain regulations as currently specified in the 5 AAC 18.362. *Westside Kodiak Salmon Management Plan*; and 5 AAC 18.395. *Retention of king salmon taken in a commercial fishery*. In addition require nonretention of king salmon in sections adjacent to the Inner and Outer Karluk sections, including sections of the Northwest Kodiak District and Southwest Kodiak District for seine gear only (Figure 1) by regulation.

Specific Action:

Take board action to expand area referenced in 5 AAC 18.395. When king salmon runs to the Karluk system are weak, the department would enforce nonretention in all sections of the Northwest Kodiak District and Southwest Kodiak District for seine gear only.

Background:

King salmon harvests in the KMA commercial fisheries are incidental. Currently there are no management plans directing the department with regard to king salmon management. However, the department does have EO authority to limit the harvest of king salmon by requiring the release of king salmon over 28 inches in length within the Inner and Outer Karluk sections and the Inner and Outer Ayakulik sections. The department has enforced this provision when it became apparent king salmon runs were weak.

Benefits:

The department does not have a stock separation plan for king salmon on the westside. However, assuming some Karluk River king salmon are caught in the commercial fishery, some released salmon may survive to spawn. This action would maintain the department's flexibility to manage sockeye salmon returns to KMA westside systems.

Detriments:

This action would be considered allocative because it would further reduce commercial harvest of king salmon.

Restrictions on commercial salmon fisheries adjacent to the Inner and Outer Karluk sections will result in an unknown savings to Karluk king salmon stocks because the contribution of these fish to Karluk River is unknown. The potential conservation of Karluk king salmon stock needs to be weighed against the foregone harvest of king salmon of unidentified origin in these commercial seine fisheries.

Action#3

Maintain regulations as currently specified in the 5 AAC 18.362. *Westside Kodiak Salmon Management Plan*; and 5 AAC 18.395. *Retention of king salmon taken in a commercial fishery*. In addition, require nonretention of king salmon for sections adjacent to the Inner and Outer Karluk sections, including sections of the Northwest Kodiak District and Southwest Kodiak District for all gear types (Figure 1).

Specific Action:

Take board action to expand area referenced in 5 AAC 18.395. When king salmon runs to the Karluk system are weak, the department would enforce nonretention in all sections of the Northwest Kodiak District and Southwest Kodiak District for all gear types.

Background:

King salmon harvests in the KMA commercial fisheries are incidental. Currently, there are no management plans directing the department with regard to king salmon management. However, the department does have EO authority to limit the harvest of king salmon by requiring the release of king salmon over 28 inches in length within the Inner and Outer Karluk sections and the Inner and Outer Ayakulik sections. The department has enforced this provision when it became apparent the king salmon runs were weak.

Benefits:

The department does not have a stock separation plan for king salmon on the westside. However, assuming some Karluk River king salmon are harvested, some of the released salmon may return to spawn. This action would maintain the department's flexibility to manage sockeye salmon runs to KMA westside systems.

Detriments:

This action would be considered allocative because it would further reduce commercial seine and set gillnet harvest of king salmon.

Restrictions on commercial salmon fisheries adjacent to the Inner and Outer Karluk sections will result in an unknown savings to Karluk king salmon stocks because the contribution of these fish to Karluk River is unknown. The potential conservation of Karluk king salmon stock needs to be weighed against the foregone harvest of king salmon of unidentified origin in these commercial seine and gillnet fisheries.

King salmon caught in gillnet gear are unlikely to survive; therefore, nonretention in the set gillnet fishery would likely not benefit Karluk River king salmon.

SUBSISTENCE FISHERIES MANAGEMENT ACTIONS**Past Management Actions**

The subsistence fishery was closed by emergency order during 2008 inriver above Karluk River weir and within the entire drainage during 2009 and 2010 (Figure 4). These actions reduced harvests from average harvest levels reported on permit returns from 1997–2005 (Table 1).

Potential Management Actions

Action#1

Status quo. The department is tasked with the management of salmon and uses EO authority to manage subsistence fisheries.

Specific Actions:

When king salmon runs to the Karluk system are weak, the department would enforce nonretention of king salmon in the subsistence fishery in the Karluk drainage.

Background:

King salmon subsistence harvests in the Karluk drainage are relatively low compared to sport and commercial harvests. Currently, there are no management plans directing the department with regard to king salmon subsistence management. However, the department does have EO authority to limit the harvest of king salmon, and, in conjunction with the federal subsistence fishery managers, has enforced nonretention of king salmon in the subsistence fishery when it became apparent the king salmon runs were weak (Figure 4). In 2005 the board made a customary and traditional subsistence use finding in the Kodiak area for salmon (5 AAC 01.536).

Benefits:

Currently, the department does have the ability to apply conservation measures to protect Karluk River king salmon in years when runs are weak.

Detriments:

In years of weak runs, restricting area or time in the subsistence fishery may impact reasonable opportunity to harvest the amount necessary for subsistence.

SPORT FISHERY MANAGEMENT ACTIONS

Past Management Actions

The commissioner may, by emergency order, change bag and possession limits and annual limits and alter methods and means in sport fisheries (5 AAC 75.003). These changes may not reduce the allocation of harvest among other user groups. An emergency order may not supersede provisions for increasing or decreasing bag and possession limits or changing methods and means specified in regulatory management plans established by the Board of Fisheries.

The Division of Sport Fish began taking inseason management actions to conserve Karluk River king salmon in 2001, and has used the commissioner's EO authority to implement inseason bag limit restrictions, nonretention regulations, and/or total fishery closures annually (with the exception of 2004) from 2001 through 2010. Preseason actions were implemented beginning in 2007 with a reduction in bag limit from two king salmon per day 20 inches or greater in length to one per day 20 inches or greater in length. In 2008, the king salmon fishery was restricted to nonretention preseason and then closed by EO on June 30, and total sport fish closures were implemented preseason in 2009 and 2010 (Figure 3).

Potential Management Actions

Action#1

Status quo. The preseason sport fishery closures in 2009 and 2010 are the most restrictive management actions that can be implemented by the Division of Sport Fish. The Division of Sport Fish will continue to use its EO authority to manage the Karluk River king salmon stock to achieve the escapement goal and rebuild from the recent period of low productivity.

Specific Action:

Use EO authority to restrict the Karluk River king salmon sport fishery with additional restrictions or closures, as needed, inseason.

Background:

Karluk River is open to fishing for king salmon January 1–July 25. The king salmon bag limit is two per day, two in possession for fish 20 inches or greater in length; 10 per day, 10 in possession for fish less than 20 inches in length; and a five fish annual limit for fish 20 inches or greater in length. The Division of Sport Fish began taking inseason management actions to conserve Karluk River king salmon in 2001, and has used the commissioner's EO authority to implement inseason bag limit restrictions, nonretention regulations, and/or total fishery closures annually (with the exception of 2004) in the Karluk River drainage (Figure 3).

Benefits:

The benefits of providing the department the flexibility to manage Karluk king salmon stocks inseason with EO authority are timely and meaningful management actions based on current run strength. The department has, and has used, EO authority to manage the sport fishery to achieve established escapement goals. As the Karluk king salmon run rebuilds, the department would have the ability to return to more liberal bag limits and provide angler opportunity prior to the next board meeting.

Detriments:

Since inseason actions are based on current data and are implemented in response to the strength or weakness of a run, there is less predictability on when particular management actions may be taken.

Action#2

Restrict the Karluk River sport fisheries by regulation. Board action could create a Karluk River king salmon nonretention fishery, or close other Karluk sport fisheries to reduce incidental harvest or release mortality of Karluk River king salmon.

Specific Action:

Take board action to create new regulations for the Karluk River sport fisheries.

Background:

Karluk River is open to fishing for king salmon January 1–July 25. King salmon bag limit is two per day, two in possession for fish 20 inches or greater in length; 10 per day, 10 in possession for fish less than 20 inches in length; and a five fish annual limit for fish 20 inches or greater in

length. The Division of Sport Fish began taking inseason management actions to conserve Karluk River king salmon in 2001, and has used the commissioner's EO authority to implement inseason bag limit restrictions, nonretention regulations, and/or total fishery closures annually (with the exception of 2004) in the Karluk River drainage (Figure 3).

Benefits:

Fisheries restrictions or closures in regulation may provide the most stable situation for user groups who do not like changes inseason.

Detriments:

Regulations may restrict the department's ability to react to run strength inseason, or create overly restrictive regulations that cannot be addressed until the next scheduled Kodiak board meeting.

Action#3

Restrict the king salmon sport fishery in the salt water outside the Karluk drainage. Restrictions could be bag limit reductions (current bag limit is two per day, two in possession, no size or annual limit), nonretention, or total closure depending on the strength of the Karluk king salmon run.

Specific Action:

Take board action to restrict the king salmon sport fishery in the salt water of Uyak Bay (Figure 1) by regulation.

Background:

Karluk River is open to fishing for king salmon January 1–July 25. King salmon bag limit is two per day, two in possession for fish 20 inches or greater in length; 10 per day, 10 in possession for fish less than 20 inches in length; and a five fish annual limit for fish 20 inches or greater in length. The Division of Sport Fish began taking inseason management actions to conserve Karluk River king salmon in 2001, and has used the commissioner's EO authority to implement inseason bag limit restrictions, nonretention regulations, and/or total fishery closures annually (with the exception of 2004) in the Karluk River drainage (Figure 3).

Restrictions have not been implemented on sport fisheries outside the Karluk drainage. Statewide Harvest Survey data indicates an average (2005–2009) of 340 king salmon is harvested by recreational anglers in the salt water of Uyak Bay. The origin of these king salmon is unknown but, due to the proximity of Uyak Bay to Karluk River, it is likely some are Karluk River stock.

Benefits:

Restricting the saltwater king salmon harvest in Uyak Bay would likely reduce another source of harvest of Karluk king salmon.

Detriments:

Restrictions on king salmon fisheries outside the Karluk drainage will result in an unknown savings to Karluk king salmon stocks because the contribution of these fish to Karluk River is unknown.

Summary of Potential Management Actions:

Fishery/Action number	Summary	Specific Action
CF/#1	Status quo. Maintain current regulations, including nonretention of commercially-caught king salmon.	Continue using current nonretention regulations.
CF/#2	Expand nonretention to sections adjacent to Inner and Outer Karluk (seine gear only).	Board action needed to create regulations.
CF/#3	Expand nonretention to sections adjacent to Inner and Outer Karluk (all gear types).	Board action needed to create regulations.
Sub/#1	Status quo. Maintain current EO management for subsistence harvests.	Continue using EO authority.
SF/#1	Status quo. Use EO to manage sport fishery, with additional closures and restrictions as needed.	Continue using EO authority.
SF/#2	Restrict sport fishery by regulation (king salmon nonretention and/or closures for other species).	Board action needed to create regulations.
SF/#3	Restrict sport fishery in salt water of Uyak Bay.	Board action needed to create regulations.

RESEARCH PLAN

The department currently assesses Karluk River king salmon escapement and harvests annually. The following research projects include current and proposed projects used to gather detailed information about king salmon in the Karluk River.

CURRENT RESEARCH PROJECTS

Salmon returning to the Karluk River are counted at a weir located 1.4 km (0.8 mi) upstream from Karluk Lagoon, operated primarily for sockeye salmon. King salmon return from late May through early September, with the peak of the run usually from June 15 to June 22 (Tiernan and Caldentey 2010). The weir is operated by staff from the Division of Commercial Fisheries from mid May to late September, with assistance from Sport Fish staff from mid May through July 15 specifically to assist with data collection from king salmon. All king salmon are counted and age, sex, and length (ASL) data collected from a sample, then passed upstream of the weir. Data collected are used to monitor escapement size and quality, track productivity, and generate data needed to review and update escapement goals. Weir operation will continue in future years, although collection of ASL data may vary with field staff levels.

POTENTIAL ADDITIONAL RESEARCH PROJECTS

The following research projects are planned or, contingent upon funding, could be implemented to gather further detailed information about king salmon stocks in the Karluk drainage. These projects focus primarily on improving knowledge of freshwater production and assessing genetic diversity among regional king salmon stocks.

1. The Division of Commercial Fisheries will monitor body condition and age of sockeye salmon smolts migrating from the Karluk River from 2011 through 2013 to determine if primary and secondary productivity in Karluk Lake correlate with size and condition of sockeye salmon smolts. As part of this sampling effort, length, weight, and scale samples will be collected opportunistically from king salmon smolts to evaluate body condition and track it over time.

2. Annual abundance of king salmon smolts in the Karluk River is unknown. A project to estimate king salmon smolt abundance, age composition, and average size at age would cost approximately \$70,000 annually. This project idea has been discussed, but not proposed for funding. This type of study would need to be conducted at least three years to provide useful information. The study would provide data on the annual timing and peak of the smolt outmigration, and in conjunction with estimates of total adult run, provide estimates of marine survival and a better understanding of freshwater vs. marine productivity of Karluk River king salmon (i.e., abundance and condition of smolt produced by a given escapement and smolt-to-adult survival in the marine environment).
3. The department has been developing a genetic baseline for king salmon stocks in Alaska. As part of this program, Karluk River king salmon were identified as a stock to be included in the genetic baseline. Samples from 140 Karluk River king salmon were collected in 1993 and 2006. Ideally, a total of 200 adult king salmon from the spawning population in the Karluk River (Chris Habicht, ADF&G Gene Conservation Laboratory, personal communication) should be sampled to complete the baseline. The department plans to collect the remaining 60 samples in 2011. Preliminary results from the department show a high likelihood of being able to identify king salmon of Karluk River origin from other west coast Pacific Coast stocks, including Ayakulik and Chignik river stocks (Chris Habicht, ADF&G, Gene Conservation Laboratory, personal communication).

In addition to the genetic samples from Karluk River king salmon, the department would like to collect additional king salmon tissue samples from the following systems (sample sizes in parentheses). These samples would be used to develop the genetic baseline for the Division of Commercial Fisheries, Westward Region, and could provide a more complete understanding of contributions to the commercial harvest from king salmon from other watersheds.

- Ayakulik River (64)
- Nelson River (105)
- Sandy River (200)
- King Salmon River (69)
- Meshik River (158)
- Chignik River (125)
- Bear River (200)
- Ilnik River (200)

At this time there are no funds identified to collect these additional tissue samples.

4. In 2011, the department will develop a watershed model to estimate the expected carrying capacity of king salmon in the Karluk watershed, and the escapement that may produce maximum sustained yield (Parken et al. 2006, Liermann et al. 2010). A geographic information system (GIS) would be used to quantify the watershed area for this model. The existing habitat-based model estimates of MSY and spawner capacity will be compared to escapement goals and historical escapements.

Literature Cited

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Table 1. –Karluk River king salmon harvest, and escapement, 1976–2010.

Run Year	Commercial Harvest ^a	Subsistence Harvest ^b	Sport Harvest ^c	Total Harvest	Weir Count ^d	Escapement ^e
1976	2	0	461	463	6,897	6,436
1977	0	0	461	461	8,434	7,973
1978	35	0	461	496	9,795	9,334
1979	0	0	461	461	9,555	9,094
1980	0	0	461	461	4,810	4,349
1981	0	0	461	461	7,575	7,114
1982	0	0	796	796	7,489	6,693
1983	0	0	304	304	11,746	11,442
1984	2	0	175	177	7,747	7,572
1985	5	0	472	477	5,362	4,890
1986	542	0	122	664	4,429	4,307
1987	313	0	199	512	7,930	7,731
1988	3	0	819	822	13,337	12,518
1989	0	0	559	559	10,484	9,925
1990	0	0	700	700	14,442	13,742
1991	0	0	1,599	1,599	14,022	12,423
1992	264	0	856	1,120	9,601	8,745
1993	3,082	5	1,634	4,721	13,944	12,310
1994	5,114	13	1,483	6,610	12,049	10,566
1995	1,794	31	1,284	3,109	12,657	11,373
1996	1,662	4	1,695	3,361	10,051	8,356
1997	1,445	17	1,574	3,036	13,443	11,869
1998	252	4	1,173	1,429	10,239	9,066
1999	1,067	7	1,766	2,840	13,063	11,297
2000	693	22	2,581	3,296	10,460	7,879
2001	2,588	24	1,304	3,916	4,453	3,149
2002	1,262	165	716	2,143	7,175	6,944
2003	1,336	6	563	1,905	7,256	6,986
2004	2,249	16	690	2,955	7,525	7,228
2005	349	5	368	722	4,798	4,684
2006	900	17	670	1,587	4,112	3,673
2007	313	1	205	519	1,765	1,697
2008	13	5	0	18	752	752
2009	0	0	0	0	1,306	1,306
2010	0	0 ^f	0	0	2,916	2,916
1997-2006 AVG	1,214	28	1,141	2,383	8,252	7,278
2007-2010 AVG	82	2	51	134	1,685	1,668

^a Source: ADF&G, Division of Commercial Fisheries Statewide Harvest Receipt (fish ticket) database. Commercial harvest is the harvest of king salmon from Inner and Outer Karluk statistical areas (255-10 and 255-20) through July 15.

^b Based on subsistence harvest records maintained by the Westward Region of ADF&G's Division of Commercial Fisheries; includes all reported harvest in Karluk Section.

^c Sport harvest is from the Statewide Harvest Survey.

^d Source: ADF&G, Division of Commercial Fisheries Kodiak weir count database.

^e Escapement is the weir count minus the sport harvest. 1976-2001 includes all sport harvest. 2002-2010 only includes sport harvest upstream of the weir.

^f Subsistence fishery closed; no reported harvest to date.

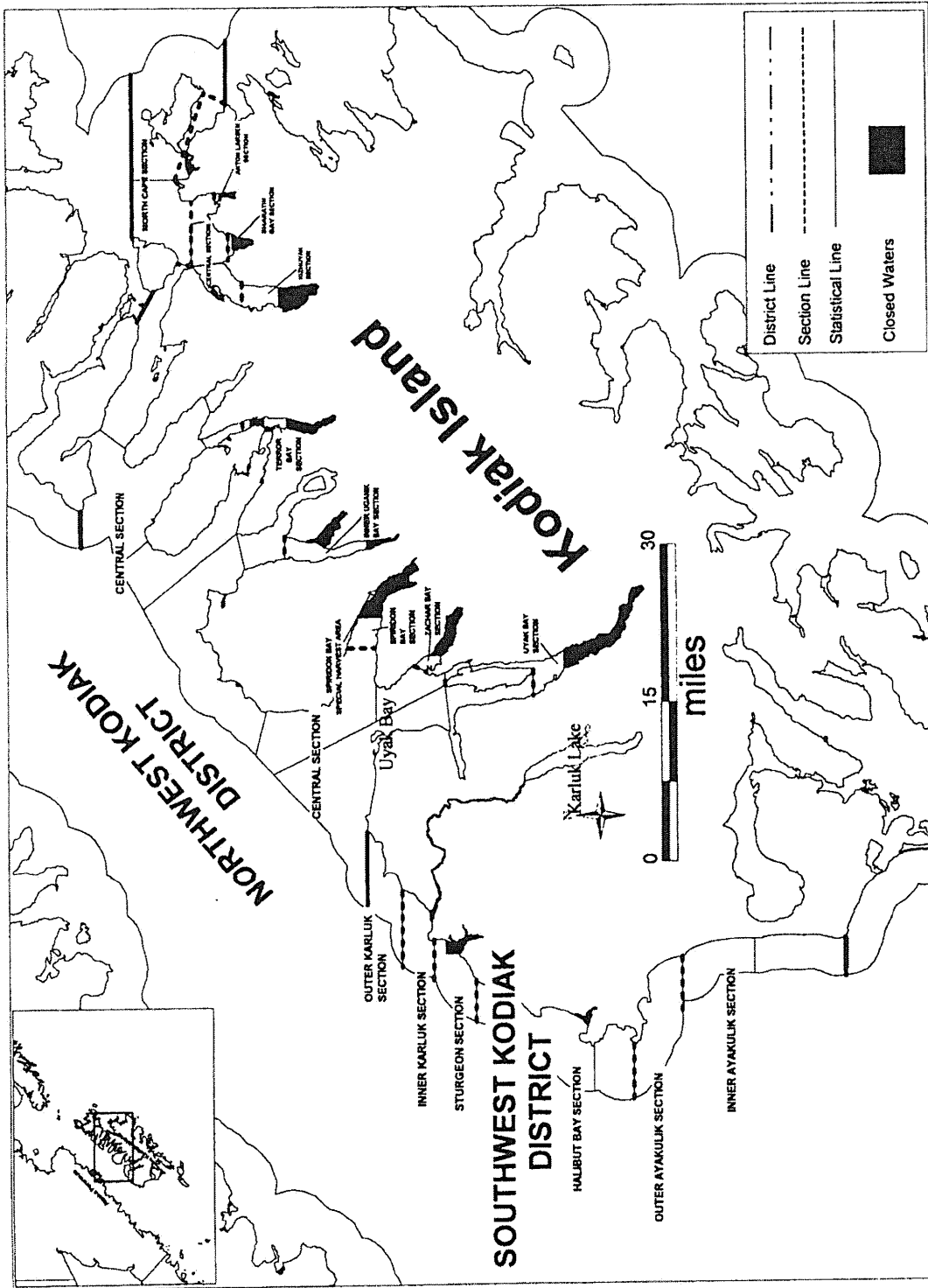


Figure 1.-Map of the Karluk River watershed, location of fish counting weir, and commercial fishery sections.

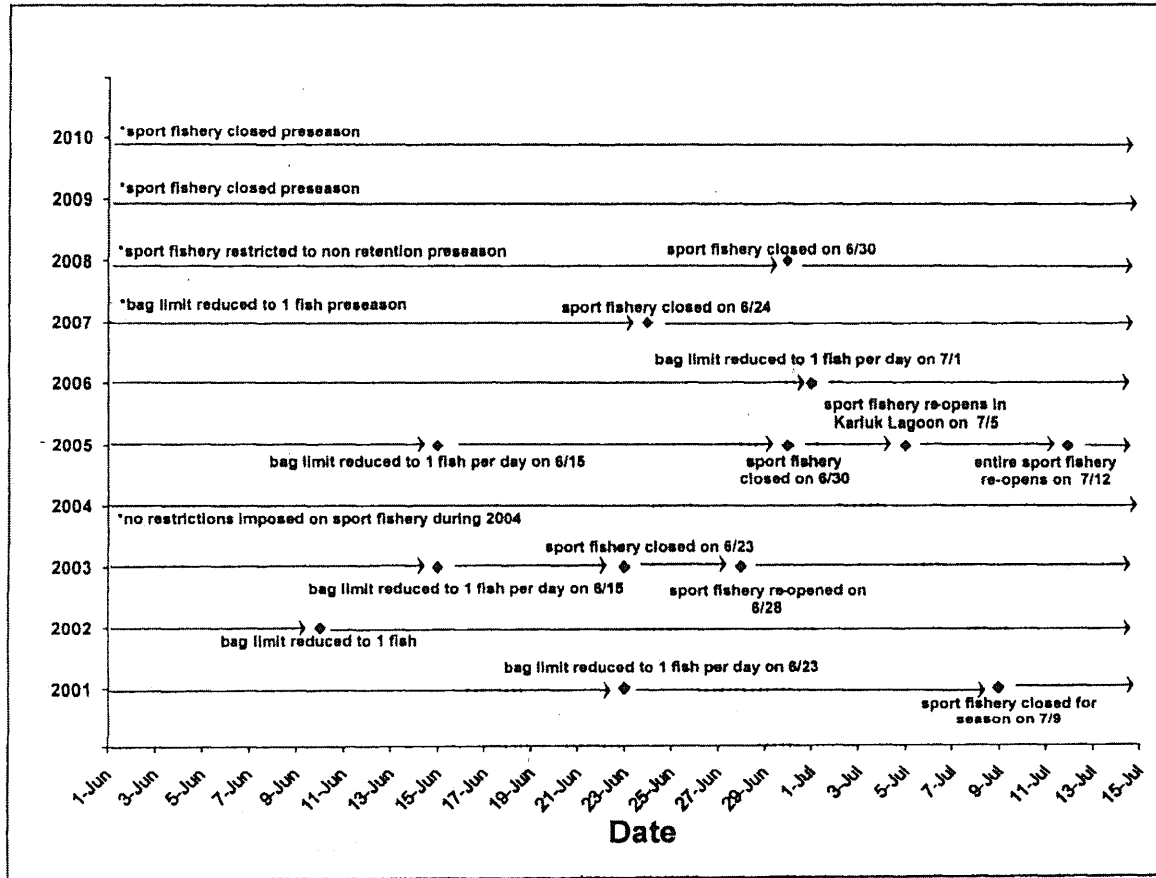


Figure 3. –Karluk River king salmon sport fishery management actions, 2001–2010.

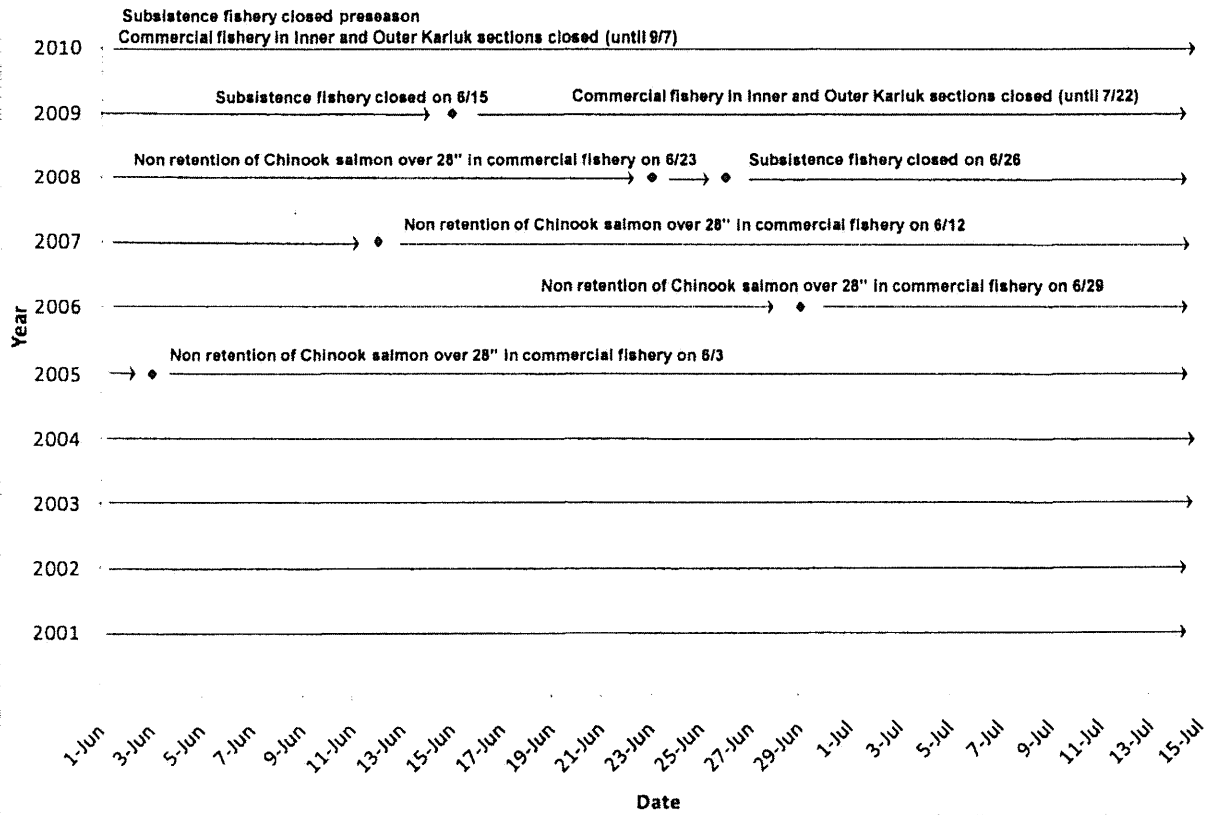


Figure 4.-Karluk River king salmon commercial and subsistence fishery management actions, 2001–2010.

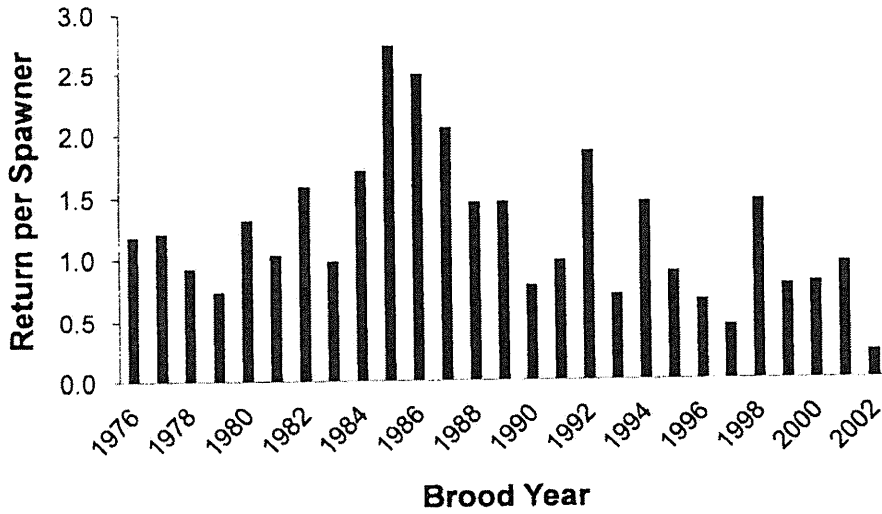


Figure 5.—Karluk River king salmon annual return per spawner, brood years 1976-2002.

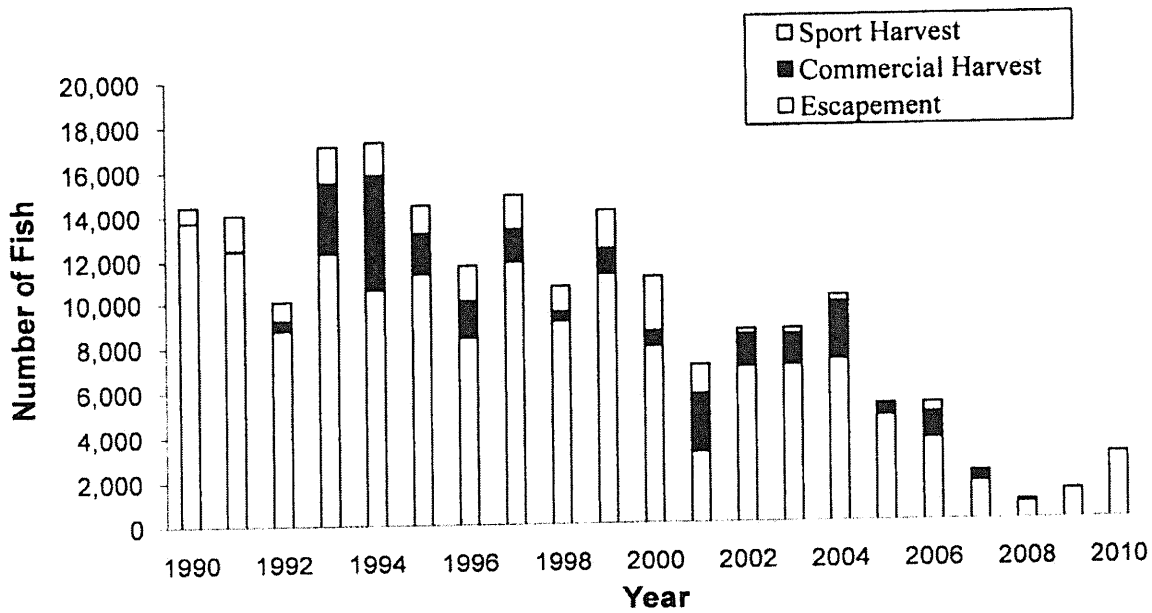


Figure 6. —Sport and commercial harvest, and escapement of Karluk River king salmon, 1990 – 2010.