Fishery Data Series No. 10-96

# Stock Assessment of Late-run Chinook Salmon in the Kenai River, 1999–2006

by

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and

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Alaska Department of Fish and Game Divisions of Sport Fish and Commercial Fisheries

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**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**

| | |
|---|---|
| Alaska Administrative Code | AAC |
| all commonly accepted abbreviations | e.g., Mr., Mrs., AM, PM, etc. |
| all commonly accepted professional titles | e.g., Dr., Ph.D., R.N., etc. |
| 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) |

**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, $\chi^2$, 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 |

# *FISHERY DATA SERIES NO. 10-96*

# STOCK ASSESSMENT OF LATE-RUN CHINOOK SALMON IN THE KENAI RIVER, 1999–2006

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# ABSTRACT

The status of late-run Chinook salmon *Oncorhynchus tshawytscha* in the Kenai River was assessed using information from creel surveys, an inriver sonar project, educational harvests, an inriver gillnetting project, personal use fishery harvests, commercial fishery harvests, and the Alaska Statewide Harvest Survey. This report updates stock assessment statistics with data from 1999-2006.

The estimated total runs of late-run Kenai River Chinook salmon were 60,773 (SE = 778) in 1999, 50,770 (SE = 308) in 2000, 43,446 (SE = 640) in 2001, 54,668 (SE = 1,373) in 2002, 59,759 (SE = 459) in 2003, 84,262 (SE = 1,770) in 2004, 70,664 (SE = 1,397) in 2005, and 52,795 (SE = 891) in 2006. The commercial fishery in Cook Inlet harvested 17% of the run in 1999, 8% in 2000, 15% in 2001, 18% in 2002, 27% in 2003, 28% in 2004, 33% in 2005, and 18% in 2006. The estimated inriver sport fishery harvest was 22% of the run in 1999, 30% in 2000, 38% in 2001, 23% in 2002, 28% in 2003, 21% in 2004, 26% in 2005, and 30% in 2006. Spawning escapement estimates of late-run Chinook salmon were 34,962 (SE = 1,271) in 1999, 29,627 (SE = 1,048) in 2000, 17,947 (SE = 1,254) in 2001, 30,464 (SE = 1,551) in 2002, 23,736 (SE = 1,559) in 2003, 40,198 (SE = 2,055) in 2004, 26,046 (SE = 1,934) in 2005, 24,423 (SE = 1,175) in 2006. Spawning escapement estimates from 1999 through 2006 were all within or above the current biological escapement goal (BEG) of 17,800-35,700 fish.

Hook-and-release mortality estimates for late-run Chinook salmon ranged from 499 (SE = 276; 2000) to 1,803 (SE = 978; 2003). Return-per-spawner estimates for all complete brood years (1986-1999) ranged from 1.00 (replacement; SE = 0.41) to 2.79 (SE = 0.12). Estimated sibling ratios averaged 1.78 (SD = 0.33) for age 5 to age 4, 3.22 (SD = 0.48) for age 6 to age 5, and 0.07 (SD = 0.02) for age 7 to age 6 Chinook salmon. In recent years there is a higher preponderance of age-1.2 fish in the run. The mean age estimates of both the escapement and the return for 1986-1999 (i.e., years with complete brood returns) are similar to the long-term average for this stock. Mean length-at-age estimates have not changed since 1986.

Relative harvest selectivity is generally insignificant for this stock; age composition of the harvest is similar to the age composition of run and the resulting escapement. However, in recent years there is a higher preponderance of age-1.2 fish in the run than the harvest. The ratio of females in the run, harvest, and escapement is stable and generally between 40% and 50%.

An age-structured Ricker spawner-recruit model was fit to the historical data using Markov Chain Monte Carlo methods. Results were consistent with the existing BEG for this stock (17,800-35,700). No change to the goal is recommended, except to re-designate it as a sustainable escapement goal (SEG) because of measurement error introduced by sonar assessment of the inriver run and escapement.


Key words: Kenai River, Chinook salmon, total return, spawning escapement, sibling ratios, brood tables, spawner–recruit analysis, maximum sustained yield, Markov Chain Monte Carlo, *Oncorhynchus tshawytscha*.

# INTRODUCTION

An early and late run of Chinook salmon *Oncorhynchus tshawytscha* return to the Kenai River (Figure 1) to spawn, both of which are highly prized by anglers for their size, relative to other Chinook salmon stocks (Roni and Quinn 1995). The early run enters the river from late April through June, and the late run enters the river from late June through early August (Burger et al. 1985; Bendock and Alexandersdottir 1992). Late-run Kenai River Chinook salmon spawn almost exclusively in mainstem locations (Bendock and Alexandersdottir 1992) and are the focus of this report; early-run fish spawn primarily in tributary streams and are the focus of a companion report (McKinley and Fleischman 2010).

Late-run Chinook salmon of Kenai River origin are harvested in several fisheries. The first known substantial harvest occurs in the recreational marine fishery near Deep Creek. The commercial set gillnet fishery along the eastern shore of Cook Inlet and, to a lesser degree, the commercial drift gillnet fishery, also harvest late-run Chinook salmon while targeting sockeye salmon *O. nerka*. Single-net educational fisheries have been authorized for the Kenaitze Indian tribe since 1989 and for the Village of Ninilchik since 1994. A personal use dip net fishery at the mouth of the Kenai River also harvests late-run Chinook salmon while targeting sockeye salmon. Finally, a major sport fishery occurs in the Kenai River.

Prior to 1970, the sport fishery in the Kenai River was limited to shorebased anglers targeting sockeye salmon in July and coho salmon *O. kisutch* in August and early September. In 1973, anglers began experimenting with a fishing method, used in the Pacific Northwest, of bouncing brightly colored terminal gear along the river bottom from a drifting boat. It proved to be very effective for catching Chinook salmon in the Kenai River, and the fishery expanded rapidly during the late 1970s and 1980s.

As fisheries targeting both the early and late runs of Chinook salmon increased in the early 1980s, the Alaska Department of Fish and Game (ADF&G) and public concerns about overexploitation began to grow. In 1988, the Alaska Board of Fisheries (BOF) adopted management plans for the early and late runs (McBride et al. 1989). These plans, in effect since 1989, define the early run as prior to 1 July and the late run as after 30 June. Optimum spawning escapement for the late run was set at 22,300 fish, with stipulations about how the fishery was to be managed at various levels of projected spawning escapement. In 1999, the inseason management plan was streamlined and the point goal of 22,300 was replaced with an escapement goal range of 17,800-35,700 fish. Regulations for this sport fishery are among the most restrictive in Alaska and include a daily bag and possession limit of 1 Chinook salmon and a seasonal limit of 2, closed areas, and restrictions on boats and guides.

A comprehensive stock assessment program was initiated in the mid-1980s which included creel surveys and estimation of inriver run by sonar to implement the management plan. The objectives of this ongoing program are two-fold: to model inriver run inseason and fishery mortality to effectively manage the fisheries inseason, and to develop brood tables for long-term stock assessment.

This stock assessment of late-run Kenai River Chinook salmon summarizes previously published historical statistics and compiles updated information from 1999 through 2006. Included are estimates of inriver and total run by age, hook-and-release mortality by age, and spawning escapement by age. These are used to produce estimates of return by brood year. An age-structured Ricker spawner-recruit model was fit to the historical data, using Markov Chain Monte Carlo (MCMC) methods. This methodology reduces bias caused by measurement error, and provides a more comprehensive assessment of uncertainty than is possible with other statistical methods. The overall status of late-run Kenai River Chinook salmon stock is also assessed.

# METHODS

Historical assessment begins with the 1986 run, the first year for which age data are available for all components of the run. Fishery and stock parameter estimates were derived from multiple sources; some were estimated directly and some indirectly (Table 1). Formulas for point estimates and variances are detailed in Appendix A.

## DEEP CREEK MARINE SPORT HARVEST

Harvest of late-run Kenai River Chinook salmon in the marine sport fishery near Deep Creek was estimated with an onsite creel survey in 1986, 1994, and 1995 (Hammarstrom et al. 1987;

McKinley 1995, 1996) and in the Alaska Statewide Harvest Survey (SWHS) for 1996–2006 (Howe et al. 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b). Harvest was also estimated in the SWHS for 1987–1993, but for both the early and late runs combined (Mills 1988-1994). Based on the 1994 and 1995 creel surveys, about 25% of the total harvest was taken during the late run (McKinley 1995, 1996), so 25% of the total harvest was apportioned as estimated by the SWHS for 1987–1993 to the late run.

Age and sex data from the marine sport fishery were available only for 1986 (Hammarstrom et al. 1987). For 1986, harvest and proportions at age or by sex were estimated from the total Deep Creek marine harvest using sample sizes by age class provided in Hammarstrom et al. (1987; Appendices A1 and A2).

Sonnichsen and Alexandersdottir (1991) reported for 1983–1986, that the age composition of the sport harvest in the marine fishery was not substantially different from that of the Kenai River sport harvest. Therefore, after 1986, the age composition of the Kenai River sport harvest was used to estimate the age composition of the marine sport harvest (Appendices A1 and A2).

## COMMERCIAL, SUBSISTENCE, EDUCATIONAL, AND PERSONAL USE HARVEST

Estimates of late-run Chinook salmon harvest in commercial fisheries (set and drift gillnet) were obtained annually from reports by ADF&G, Division of Commercial Fisheries (CF). Because commercial harvest comes from sales receipts (fish tickets), it is considered measured without error. Subsistence and educational harvests are compiled annually by the Division of Sport Fish (SF) in Soldotna (Dunker and Lafferty 2007). Participants in the personal use (PU) dip net fishery are required to record their harvest on a permit and return it to the SF. Personal use harvest is reported in SF management reports.

Set gillnet harvests from the east side of Cook Inlet were sampled for age, sex, and size composition by CF. However, other commercial, educational, subsistence, and personal use harvests were not sampled. Therefore, it was assumed that the age compositions of these other harvests were the same as the set gillnet harvest. The set gillnet, drift gillnet, educational, subsistence, and personal use harvests were summed and the estimated proportions by age from the set gillnet harvest were applied to estimate age composition of the total harvest. Hereafter, "commercial" harvest refers to the set gillnet, drift gillnet, educational, subsistence, and personal use harvests combined.

Published estimates of harvest by age class and sex provided in Sonnichsen and Alexandersdottir (1991) were used for 1986–1990, and in CF reports for 1991–1998 (Waltemyer 1994a-b, 1995a-b; Tobias and Waltemyer 1996; Waltemyer and Tobias 1997, 1998; Tobias and Tarbox 1999a-b, 2000; Tobias and Willette 2001, 2002a-b, 2004, 2007, 2008a-c).

The set gillnet harvest was stratified by time period to estimate age composition in stock assessments for 1987–1989, 1992, and 1994–1996 (Sonnichsen and Alexandersdottir 1991; Hammarstrom 1993b, 1995, 1996, 1997; Waltemyer and Tobias 1998; Tobias and Tarbox 1999a). For 1999-2006, estimates in separate reports were used (Reimer et al. 2002; Reimer 2003, 2004a-b, 2007; Eskelin 2007, 2009).

## INRIVER RUN

Inriver runs of Kenai River Chinook salmon have been estimated using two methods: a capture-recapture program from 1985 through 1990 (Hammarstrom and Larson 1986; Conrad and Larson 1987; Conrad 1988; Carlon and Alexandersdottir 1989; Alexandersdottir and Marsh 1990), and a hydroacoustic (sonar) program from 1984 through 2006 (Eggers et al. 1995; Burwen and Bosch 1995a-b, 1996, 1998; Bosch and Burwen 1999-2000; Miller and Burwen 2002; Miller et al. 2003-2005, 2007a-b). The sonar program was exploratory during the first 4 years of the study, and the two programs were conducted simultaneously from 1985 to 1990 to determine the best method for estimating inriver run. Run estimates from the capture-recapture program were not available for 1990 because of closures to the inriver sport fishery (Sonnichsen and Alexandersdottir 1991). The capture-recapture program was terminated after 1990 because estimates from the two methods were similar, the sonar estimates were more precise, and redundancy was cost prohibitive. In addition, the management plan implemented in 1989 required inseason estimates of the run, which could not be provided by the capture-recapture method. Continued evaluation of the sonar project has improved inriver run estimates.

For this stock assessment, capture-recapture estimates of the inriver run were used for 1986 and 1987, and sonar estimates of passage were used for 1988-1995 and 1998-2006. In 1996 and 1997, radiotelemetry projects were conducted to estimate harvest rates in the sport fishery. Combined with creel survey harvest estimates, these provided independent inriver Chinook salmon run estimates for comparison with the sonar (Hammarstrom and Hasbrouck 1998, 1999). For this assessment, the 1996 telemetry-based inriver run estimate was used directly. In 1997, the telemetry-based estimate was for 1–31 July only, and fishing was allowed through 3 August that year. To account for the additional 3 days of harvest, the sonar estimate for 1-3 August was multiplied by the ratio of the Hammarstrom and Hasbrouck (1999) estimate to the sonar estimate for 1–31 July (Burwen and Bosch 1998). The variance was not adjusted for the additional days.

The age/sex composition of the inriver run was sampled in 1986-2006 to estimate inriver run by age (Appendices A1 and A2). Scale samples collected from Chinook salmon captured prior to 1991 were obtained during capture-recapture studies with 7.5-inch mesh gillnets (Sonnichsen and Alexandersdottir 1991). Although the capture-recapture program was discontinued in 1991, age, sex, and length samples were still collected using 7.5-inch gillnets from 1991 through 2001 (Hammarstrom 1992, 1993a, 1994; King 1995-1997; Marsh 1999-2000; Reimer et al. 2002; Reimer 2003). Beginning in 2002, gillnets were constructed of multi-monofilament mesh, increasing the catch rate by approximately 3-fold (Reimer 2004a). Also, a second mesh size (5-inch stretched mesh) was added to reduce size selectivity. Age composition estimates in 2002-2006 reported here are from the pooled catch (both 5- and 7.5-inch mesh).[1]

## TOTAL RUN

Total run was estimated as the sum of the Deep Creek marine sport harvest, the commercial harvest, educational harvest, personal use harvest, the sport harvest downstream of the sonar site, and the inriver run.

---

[1] Technically, these estimates are not exactly comparable to pre-2002 estimates; however, the differences are small and they have a negligible effect on the spawner-recruit analysis.

## SPORT HARVEST

Catch and harvest of Chinook salmon in the Kenai River sport fishery were estimated with an onsite creel survey (Conrad and Hammarstrom 1987; Hammarstrom 1998-1992, 1993a, 1994; King 1995-1997; Marsh 1999-2000; Reimer et al. 2002; Reimer 2003, 2004a-b, 2007; Eskelin 2007, 2009) and in the Statewide Harvest Survey (Mills 1987-1994; Howe et al. 1995, 1996, 2001a-c). The creel survey provided estimates for the entire fishery for 1986–1989, and downstream of Naptowne Rapids to Cook Inlet in 1990. In those years, catch and harvest were estimated for three river sections (two in 1990): Cook Inlet to the Soldotna Bridge, Soldotna Bridge to Naptowne Rapids, and Naptowne Rapids to the outlet of Skilak Lake. In 1991 and 1992, catch and harvest were only estimated for Cook Inlet to Soldotna Bridge because of restrictions and closures to the fishery upstream of the Soldotna Bridge. Beginning in 1993, catch and harvest were only estimated from Cook Inlet to Soldotna Bridge because of logistical problems with conducting an onsite creel survey upstream of the Soldotna Bridge. However, some sport fishing occurred upstream of the Soldotna Bridge.

Estimates of harvest and catch from creel surveys for the Cook Inlet to Soldotna Bridge area were used for all years. Estimates from the SWHS (Howe et al. 1995, 1996, 2001a-d; Mills 1987-1994; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b) were used to account for harvest upstream of the Soldotna Bridge. The SWHS provided estimates of harvest and catch of Chinook salmon from the following sections of the Kenai River: Cook Inlet to the Soldotna Bridge, the Soldotna Bridge to Moose River, Moose River to the outlet of Skilak Lake, and the inlet of Skilak Lake to the outlet of Kenai Lake. However, using these estimates to account for harvest and catch upstream of the Soldotna Bridge was complicated because catch, harvest, and their variances prior to 1996 were estimated for the entire year in the SWHS rather than by run. Beginning in 1996, the SWHS estimates were stratified into an early (before 1 July) and late (after 30 June) run. In addition, catch was not estimated in the SWHS prior to 1990.

Based on creel surveys and the SWHS, the late run accounted for about half the total harvest upstream of the Soldotna Bridge (Conrad and Hammarstrom 1987; Hammarstrom 1988-1991; Howe et al. 2001a-c). Therefore, 50% of the SWHS estimates from upstream of the Soldotna Bridge were used to account for harvest upstream of the Soldotna Bridge for 1986-1995. Catch was accounted for in the same manner for 1990-1995. For 1986-1989 estimates of harvest were used to account for catch upstream of the Soldotna Bridge, assuming that catch equaled harvest. The estimates of hook-and-release mortality are therefore negatively biased for those years because some fish were released alive. For 1996-2006, late-run (after June 30) estimates of harvest and catch upstream of the Soldotna Bridge from the SWHS were used (Howe et al. 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b).

Total sport harvest was estimated as the sum of harvest from Cook Inlet to the Soldotna Bridge and harvest upstream of the Soldotna Bridge. Total harvest by age was estimated by applying age proportions estimated from the creel surveys to the total sport harvest (Appendices A1 and A4).

## HOOK-AND-RELEASE MORTALITY

A small proportion of Chinook salmon that are hooked and released by anglers during the inriver sport fishery die. Hook-and-release mortality rates for Kenai River Chinook salmon were estimated in 1990 and 1991 (Bendock and Alexandersdottir 1991, 1992). The mean of the two annual estimates was used to estimate mortality for the remaining years (Appendices A1 and A5). Hook-and-release mortality by age was estimated by applying age composition estimates from the inriver run to annual estimates for hook-and-release mortality (Appendices A1 and A5).

## SPAWNING ESCAPEMENT

Spawning escapement by age was estimated by subtracting total inriver mortality (sport harvest upstream of the sonar site and hook-and-release mortality) from the inriver run for each age class (Appendices A1 and A6).

## RETURN PER SPAWNER

Within each calendar year, the individual age components of the total run corresponding to the same age were summed (e.g., the total run estimates for ages 0.5, 1.4, and 2.3 were summed for age 6), and then total run by age corresponding to the same brood year were summed across calendar years (Appendices A1 and A7). Returns per spawner were estimated by dividing the total number of fish returning for each brood year by the number of spawners for that brood year.

## SIBLING RATIOS

The distribution of Chinook salmon returning in each age class within a brood year can be a stable, heritable characteristic of a stock (Ricker 1972; Hard et al. 1985; Withler et al. 1987; Hankin et al. 1993). Sibling ratios, which can be used to project future runs, were estimated as the ratio of the total return at one age to the total return at one or more younger ages (Appendix A8).

## SPAWNER RECRUIT ANALYSIS

A Ricker spawner-recruit function [2] (Ricker 1975) was chosen to model the relationship between escapement and recruitment, and to estimate optimal spawning escapement and other reference points. Markov Chain Monte Carlo (MCMC) methods were used in a Bayesian framework, which are especially well-suited for modeling complex population and sampling processes. The Bayesian MCMC analysis considers all the data simultaneously in the context of an age-structured spawner-recruit statistical model, detailed in Appendix B.

# RESULTS

## DEEP CREEK MARINE SPORT HARVESTS

The annual estimated sport harvest of late-run Chinook salmon in the Deep Creek marine fishery during 1999-2006 ranged from 200 to 1,660 fish (Table 2; Howe et al. 2001d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b). Age composition of fish harvested in this fishery was not sampled. Instead, the inriver sport harvest age composition (consisting primarily of age-1.3 and age-1.4 fish) was used as a proxy (Appendix C1).

## COMMERCIAL, PERSONAL USE, AND SUBSISTENCE HARVESTS

The annual commercial set gillnet harvest of late-run Kenai River Chinook salmon during 1999-2006 ranged from 3,684 to 21,625 fish (Table 2). The harvest consisted primarily of age-1.2, -1.3, and -1.4 fish (Tobias and Waltemyer 1996; Waltemyer and Tobias 1997, 1998; Tobias

2 The Ricker spawner-recruit function was chosen because it is capable of modeling overcompensation (a decline in absolute production with increasing escapement).

and Tarbox 1999a-b, 2000; Tobias and Willette 2001, 2002a-b, 2004a-b, 2007, 2008a-c). During this same period, the annual commercial drift gillnet harvest of late-run Kenai River Chinook salmon ranged from 270 to 1,839 fish (Table 2). Age composition of fish harvested in this fishery was not determined. Instead, the commercial set gillnet age composition (consisting primarily of age-1.2, -1.3 and -1.4 fish) was used as a proxy.

The annual estimated personal use dip net harvest of late-run Kenai River Chinook salmon during 1999-2006, ranged from 410 to 1,034 fish and the annual subsistence gillnet harvest ranged from 4 to 11 fish (Table 2). Fish harvested in these fisheries were not sampled for age composition and the commercial set gillnet age composition was used as a proxy (Appendix C1).

## INRIVER AND TOTAL RUNS

The inriver late-run estimates of Kenai River Chinook salmon between 1999 and 2006 ranged from 33,916 to 56,205 fish, and were comprised of 0-2% 3-year-old fish (ages 0.2, 1.1), 4-30% 4-year-old fish (ages 0.3, 1.2, 2.1), 13-31% 5-year-old fish (ages 0.4, 1.3, 2.2), 49–71% 6-year-old-fish (ages 0.5, 1.4, 2.3), and 1-10% 7-year-old-fish (ages 1.5, 2.4) (Table 3).

The total late-run estimates of Kenai River Chinook salmon between 1999 and 2006 ranged from 43,446 to 84,262 fish (Figure 2), and were comprised of 1–4% 3-year-old fish (ages 0.2, 1.1), 5-36% 4-year-old fish (ages 0.3, 1.2, 2.1), 16-32% 5-year-old fish (ages 0.4, 1.3, 2.2), 41-63% 6-year-old-fish (ages 0.5, 1.4, 2.3), and 1–8% 7-year-old-fish (ages 1.5, 2.4) (Table 4; Appendix C1). The proportion of female Chinook salmon in the total run has exhibited no change or trend in the last 20 years, generally varying between 40% and 50% annually (Figure 3).

## SPORT HARVEST

The annual estimated total sport harvest of late-run Kenai River Chinook salmon during 1999-2006 ranged from 12,607 to 18,214 fish, including 823 to 3,322 fish downstream of the sonar site; 9,554 to 13,026 between the sonar site and the Soldotna Bridge; and 1,124 to 3,157 upstream of the bridge (Table 5). Sport harvest downstream of the Chinook salmon sonar site comprised 5-21% of the total sport harvest (Table 5). Sport harvest downstream of the Soldotna Bridge comprised 79-91% of the total sport harvest (Table 5). Estimates of sport harvest do not include harvest on Mondays when boat anglers can only fish from unguided drift boats for Chinook salmon. The sport harvest consisted primarily of age-1.3 and age-1.4 fish (Table 6).

The estimated total sport catch of late-run Kenai River Chinook salmon from 1999 through 2006 ranged from 20,664 to 38,799 fish annually, including 15,135 to 28,769 fish downstream of the Soldotna Bridge and 3,798 to 10,030 fish upstream of the bridge (Table 5).

Harvest selectivity (the proportion of each age class in the harvest divided by the proportion of each age class in the inriver run) has changed substantially in recent years, as age-1.2 fish have become more abundant in the run than in the harvest (Figure 4). A harvest selectivity equal to one indicates neutral selectivity (age class harvested in proportion to its abundance), whereas age classes with harvest selectivity greater than one are selected *for* (harvested disproportionately more) and age classes with harvest selectivity less than one are selected *against* (harvested disproportionately less). The proportion of female Chinook salmon in the sport fishery appears stable, generally representing a little over half of the harvest, and has not changed since 1986 (Figure 3).

Along with a slot limit regulation enacted in 2003, a sealing requirement for harvested Kenai River Chinook salmon that are 55 inches total length (TL) or longer was also enacted. Fish 55 inches TL or longer are required to be examined by ADF&G staff in the Soldotna Office, and a yellow, plastic, individually numbered strap attached to the fish. As part of the sealing process, biological samples, and angler information including location are collected. Through 2006, 28 Kenai River fish 55 inches TL or greater were harvested and sealed and all but one were harvested in July; 15 were age-1.4, 11 were age-1.5, and for 2 fish the age was not determined (Table 7).

## HOOK-AND-RELEASE MORTALITY

During 1999-2006, annual estimates of Chinook salmon released in the inriver sport fishery ranged from 6,052 to 21,856 fish (Table 8). By applying the 1989-1990 average mortality rate of 8.25%, the estimated hook-and-release mortality ranged from 499 to 1,803 fish (Table 9).

## SPAWNING ESCAPEMENT

Spawning escapements have not exhibited an upward or downward trend in the last 21 years (Figure 5). All spawning escapements since 1986 have been above the low end of the biological escapement goal (BEG; 17,800), and in 2 of the last 20 years have been above the upper end of the BEG (35,700; Figure 5).

In 2001, the estimated Chinook salmon spawning escapement was 17,947, the lowest ever recorded for the late run, and just above the low end of the escapement goal of 17,800 (Table 2; Figure 5). In 2004, the estimated spawning escapement was 40,197, the second highest ever recorded for the late run, and over the upper end of the escapement goal of 35,700. The point estimates of spawning escapement were within the goal range of 17,800–35,700 during all other years (Table 2). The majority of the spawners in 1999-2002, 2004, 2005, and 2006 were age-1.4 (Table 3). In 2003 and 2006, age-1.4 fish comprised less than 50% due to exceptionally high numbers of age-1.2 fish (Table 3). The proportion of female Chinook salmon in the spawning escapement has been stable, with no clear trend in the last 20 years (Figure 3).

## SIBLING RELATIONSHIPS AND TRENDS IN AGE

Mean sibling return ratio estimates (1982-2001 brood years) were 1.78 (SD = 0.34) for Chinook salmon age 5 to age 4, 3.22 (SD = 0.49) for age 6 to age 5, and 0.07 (SD = 0.02) for age 7 to age 6 (Table 10). The age 5 to age 4 sibling ratio has been well below average for the last 4 brood years (Table 10; Figure 6).

The mean age of the escapements for years with complete brood returns (1986-1999) and the mean age of the return from those escapements are relatively similar (between 5.2 and 6.1; Figure 7).

Age composition has changed in the last decade, with age-1.2 fish increasing in proportion. The number of age-1.3 and -1.4 fish appears stable, whereas age-1.5-fish have been both well above and well below average in recent years (Figure 8).

Age composition of the run changes over time, with the number of younger (age-1.2) fish entering the river decreasing steadily after the first 2 weeks in July (Figure 9).

## RETURN PER SPAWNER

To enable reconstruction of brood year returns for the spawner-recruit analysis, the numbers of fish by age were estimated by calendar year (Table 4) and by brood year (Table 11). For brood years 1986-1999 (i.e., years with complete return data), returns ranged from 39,288 (SE = 1,555) to 97,397 (SE = 1,924) Chinook salmon (Table 11). Return-per-spawner estimates ranged from 1.00 (SE = 0.41) for brood year 1986 (the highest escapement measured with complete return data) to 2.79 (SE = 0.12) for brood year 1999 (the third highest escapement measured with complete return data; Table 11).

## SPAWNER RECRUIT ANALYSIS

See Appendix B1 for a detailed description of the age-structured Ricker spawner-recruit model that was fit to the stock assessment data.

Estimates of annual spawning escapements were imprecise (Figure 10) because of measurement error in the sonar estimates of inriver run. Brood year return estimates *R* were also imprecise because escapement generally comprised a large fraction of the total run. Measurement error in harvest estimates, and to a smaller extent age composition, also contributed to uncertainty in *R*. Posterior medians of *S* and *R* differed from the original data-based point estimates (Figure 10) because of measurement error and because all of the data were considered simultaneously in the context of the full statistical model. Point estimates of *R* are not available for brood years 1979–1981 or 2001–2003 because documented returns from these brood years were incomplete (i.e., one or more age classes were not estimated). One of the advantages of the Bayesian MCMC analysis is that estimates are still produced for incomplete brood years at the beginning and end of the *R* time series, and the additional uncertainty is reflected in wider intervals.

The effect of measurement error on the Ricker parameter estimates was accounted for by incorporating measurement error into the spawner-recruit model. Thus, the Bayesian MCMC estimates of the Ricker parameters, constructed from the posterior medians of $\ln(\alpha)$ and $\beta$ (Table 12), differ somewhat (slightly higher productivity, slightly more density dependence) from the classical estimates, calculated by simple linear regression (Figure 11). The classical estimates ignore the measurement error in *S* and *R*, resulting in negative bias in estimates of $\ln(\alpha)$ and $\beta$. In addition, classical analysis does not use information from incomplete brood years.

There are a number of Ricker relationships that could have generated the observed escapement and production data (Figure 12). The degree to which these Ricker curves differ from one another reflects the amount of uncertainty about the true Ricker relationship. For this stock, the prospective Ricker relationships are radically different, indicating that both productivity and density dependence are poorly estimated for late-run Kenai River Chinook salmon. The slope at the origin ($\alpha$) varies greatly among the individual curves, and so does the point of maximum recruitment $S_{MAX}$, which is the inverse of the density-dependent parameter $\beta$. In addition, the individual curves pass through the replacement line at widely disparate places, indicating that carrying capacity $S_{EQ}$ is also poorly estimated.

The graphical evidence is confirmed by wide 80% interval estimates for $\ln(\alpha)$ (1.03–2.17), $\beta$ ($1.24–5.34 \times 10^{-5}$), $S_{MAX}$ (18,740–80,580) and $S_{EQ}$ (40,220–90,450; Table 12). Similarly, $S_{MSY}$ is also poorly estimated (80% interval 14,090–37,510; Table 12). In other words, $S_{MSY}$ is equally likely to be above or below 20,270. The width of the 80% interval divided by the posterior median of $S_{MSY}$ is an index of the relative uncertainty (RU) surrounding the estimate of $S_{MSY}$.

For late-run Kenai River Chinook salmon, this ratio was $RU_{80}$ = 1.16, meaning there is more uncertainty about $S_{MSY}$ than for 5 of 7 other similarly analyzed salmon stocks (Table 13).

The sustained yield (SY) probability profile displays the probability of achieving near maximal SY (>90% of MSY) for specified levels of escapement (Figure 13). For this stock, the limbs of the profile are not steep and reach a maximum of only 74%, indicating that there is poor information about the range of escapements that would produce near-maximal yield. For example, there is only 50% certainty that spawning escapements between approximately 13,000 and 27,000 fish would result in expected sustained yield exceeding 90% of MSY.

# DISCUSSION

## ASSESSMENT UNCERTAINTIES

All salmon stock assessments have some level of uncertainty. Uncertainties in the late-run Kenai River Chinook salmon assessment are related to the use of sonar to estimate fish numbers, difficulties in distinguishing early- and late-run fish, incomplete accounting of marine harvest, fisheries for which age composition is estimated via surrogate sampling, and changes in the fishery that may affect the hook-and-release mortality rate estimates.

### Sonar Imprecision

Potential measurement error in sonar estimates contribute substantial uncertainty to estimates of inriver run size and by extension total run size, escapement, and spawner-recruit parameters. Split-beam sonar attempts to distinguish Chinook salmon based on target strength (TS) and range (Eggers et al. 1995; Miller et al. 2007b), and the premise that sockeye salmon are smaller and migrate closer to shore than Chinook salmon, which are larger and tend to migrate more toward the middle of the river. Measurement error can be in either direction, leading to over- or under-estimates of inriver run. Burwen et al. (1998) concluded that sockeye salmon can be erroneously classified as Chinook salmon, inflating Chinook salmon abundance to some degree. Underestimation errors can result when fish enter the river before the sonar program begins in mid-May, when fish migrate behind the sonar, or they migrate too close in front of the sonar where they cannot be detected (McKinley 2002).

Shortcomings associated with the target strength (TS)-based sonar methodology have been recognized since the late 1990s (Burwen et al. 1998), and ADF&G has been actively engaged in the development of improved sonar methodology ever since.[3] These efforts include development of statistical mixture models for analysis of echo-length data measured by the split-beam sonar (Burwen et al. 2003, 2007; Fleischman and Burwen 2003). Ultimately, these efforts will culminate in revised abundance estimates for 2002 and beyond for the early and late runs. Such estimates are not yet finalized, but preliminary quantities can be compared with the published estimates of Chinook salmon abundance.

The most promising methodology involves dual-frequency identification sonar (DIDSON[4]), which has been tested in the Kenai River since 2002 (Burwen et al. 2007). DIDSON uses a lens system that provides high resolution images that approach the quality achieved with conventional optics (Simmonds and MacLennan 2005), with the added advantage that images can be obtained in dark or turbid waters. Fish size is immediately evident from DIDSON images of migrating

[3] See Fleischman et al. *In prep* for a detailed discussion of these efforts.

[4] DIDSON was designed by the University of Washington Applied Physics Laboratory, originally for military applications.

salmon, providing improved discrimination of large Chinook salmon from smaller fish in the Kenai River. ADF&G staff have worked with DIDSON developers to design custom software for manually measuring fish size directly from those images (Burwen et al. 2007), and have engaged other experts to develop software for conducting automatic measurements (Burwen et al. 2010; Mueller et al. 2010). By fall 2010, DIDSON had been successfully deployed on both banks of the Kenai River at mile 8.6 for an entire season, and most major technical, logistical, and analytical hurdles had been cleared. ADF&G is committed to transitioning to new management plans based on DIDSON-based stock assessments. A comprehensive review of Kenai River Chinook salmon stock assessment is currently being conducted.

## Inaccuracies in Accounting for Harvest

For this late-run Kenai River Chinook salmon stock assessment, harvests in the eastside setnet (ESSN), Upper Cook Inlet drift gillnet (UCID), and Deep Creek marine fisheries have been treated as 100% late-run Kenai River Chinook salmon. However, a recent stock assessment on the nearby Kasilof River has shown that there are substantially more late-run Chinook salmon in the Kasilof River than previously thought (Reimer and Fleischman *In prep*). Thus, a substantial fraction of the harvests may be fish of Kasilof River origin. To the extent this is true, total run size of late-run Kenai River Chinook salmon has been overestimated. It has always been understood that some unknown number of these Chinook salmon were Kasilof River origin fish, but these findings suggest that the occurrence of Kasilof River Chinook salmon in Cook Inlet fisheries is likely higher than previously assumed.

The age composition estimates of Chinook salmon in the ESSN fishery harvest are used as a surrogate for the age composition in the UCID fishery harvest. Because of differences in gillnet web material and gillnet deployment between the two fisheries, it is likely that the age composition of the UCID harvest is comprised of younger, smaller fish. However, because of the relatively small harvest in this fishery, it is not worth sampling directly.

Determining the sex of sea-bright Chinook salmon from external characteristics is especially problematic with smaller age-1.1 and -1.2 fish. As a check, future sex determinations of smaller fish in the ESSN fishery will be determined via internal examination.

Because the inriver sport fishery has concentrated more on the lowest reaches of the Kenai River in recent years, occurring predominantly in the tidally influenced section, the true hook-and-release mortality rate is a concern. Salmonids are known to experience high mortality rates from handling as they enter fresh water from the sea (Vincent-Lang et al. 1993). If the actual mortality rate of released fish is 20-40% in the lower Kenai River sport fishery, then the escapement estimates presented here would be somewhat different. Future work could be done on the hook-and-release mortality rate of fish caught in the lowest reach of river.

This assessment accounts for most of the known harvest of late-run Kenai River Chinook salmon. The only known harvest not accounted for is from inriver drift-only Mondays in July. This harvest is assumed to be in the low hundreds and not worth estimating directly with an onsite creel survey for these years. However, as participation increases, it would be prudent to sample Mondays with the existing creel survey. The positive bias in escapement from not accounting for this harvest was deemed negligible.

## CHANGES IN HARVEST PATTERNS

The sport harvest downstream of the sonar site has been substantial since the mid-1990s. This report provides the first stock assessment of late-run Kenai River Chinook salmon that takes that harvest into account when estimating total run and escapement. ADF&G will continue to account for this harvest in future stock assessments.

Annual harvests in the Deep Creek marine sport fishery are generally well below harvests experienced between the late 1980s and late 1990s. Anecdotal evidence suggests that decreases in harvest are due to the inability of anglers to locate and catch fish, which could be related to migratory shifts by late-run fish. Successive years of low success have lead to an apparent decrease in effort, which has further reduced harvest.

Annual harvest in the PU dip net fishery at the mouth of the Kenai River, though still relatively low, has increased substantially in recent years. Increases in harvest are likely because of the increase in popularity and effort in this primarily sockeye salmon fishery, following unresolved access issues with the Copper River PU fishery (Somerville and Taube 2007).

## DISTINGUISHING EARLY- FROM LATE-RUN FISH

Prior to the sonar program, a shift in the daily estimate of catch per unit effort for Chinook salmon as measured in the lower Kenai River creel project was used to estimate the end of the early run and the beginning of the late run (Conrad and Hammarstrom 1987). However, there is typically no obvious pause in passage rate between early and late runs of Chinook salmon in the Kenai River (Figure 14). Therefore, beginning in 1986, 1 July was set as the arbitrary demarcation point between the two runs.

By definition, and for management purposes, the early run ends on 30 June and the late run begins on 1 July. Yet, some fish from the early-run stock enter the river in July and some late-run fish enter in June. Furthermore, some early-run fish are harvested in July, both upstream and downstream of the Soldotna Bridge. The degree to which the two stocks overlap in time and space is unknown. In addition, following the cessation of the onsite creel project upstream of the Soldotna Bridge in 1989, 50% of the harvest estimate from SWHS was used as the harvest and catch estimates upstream of the bridge (Hammarstrom and Timmons 2001). The amount of overlap and lack of detailed harvest and catch estimates by run could have a positive or negative influence on the estimates of escapement. Beginning in 1996, the SWHS generated two estimates: one before 1 July and one after 30 June. The estimates before 1 July have been used as early-run harvest estimates. The degree of overlap between the tail end of the early run and the beginning of the late run in June and July (i.e., what fraction of fish entering the river during June and currently counted as early run are in fact genetically late run fish remains unanswered) is unknown. Conversely, there are probably some early-run fish that enter in July and are counted as late-run fish. To address questions about the entry and harvest timing of Kenai River Chinook salmon by run, an ongoing genetic stock identification program was initiated in 2005. A previous study found genetic differences between the two Kenai River Chinook salmon runs (Adams et al. 1994). To establish a genetic baseline, tissue sampling of Chinook salmon in seven tributaries of the Kenai River and two mainstem locations is being conducted and samples are being analyzed using single nucleotide polymorphisms (SNPs). The genetic baseline will allow for estimates of stock composition, overlap in the early and late runs, and harvest timing. Tissue samples will be collected from (1) Chinook salmon in the lower Kenai River gillnetting project as fish enter the river, (2) the lower river creel survey, and (3) a sport harvest sampling program upstream of the Soldotna Bridge. This information is improving assessment of Kenai River Chinook salmon stock productivity, genetic diversity, escapement estimates, and accuracy in estimating yield and biological escapement goals.

## ESCAPEMENT GOAL RECOMMENDATION

A biological escapement goal (BEG) of 22,300 fish was first established for late-run Kenai River Chinook salmon in 1989. Insufficient data were available for a spawner-recruit analysis at that time, and the proposed escapement goal was based on the following simple formula (McBride et al. 1989):

Escapement Goal = Desired Level of Total Return / Projected Return to Spawner Ratio.

The desired total return was the average measured return of 67,000 as of 1989, and the projected return ratio (3.0) was gleaned from a review of Chinook salmon literature. In addition to the BEG of 22,300, a series of action points were established as guidelines for inseason management (Fried 1994; 5 AAC 21.359).

During the 1998/1999 BOF meetings, the point goal of 22,300 was replaced with a BEG range of 17,800-35,700, based on Eggers (1993) finding that 80% and 160% of $S_{MSY}$ performed well in simulations of Pacific salmon management scenarios. In addition, the inseason management plan was simplified to improve and streamline the inseason decision-making process. The new BEG range and management plan more closely fit ADF&G's management abilities. During 1989-1998, regulation restrictions, liberalizations, or both, occurred every year but one. Since 1999, ADF&G has taken inseason management action only once when the fishery was liberalized in 1999.

The current analysis is the first published spawner-recruit analysis for late-run Kenai River Chinook salmon, and represents a major step forward in the evaluation of stock productivity and fishery sustainability. Nevertheless, there are no recommended changes to the goal range at this time, for the following reasons:

1) The point estimate (posterior median) of $S_{MSY}$ (20,270; Table 12) is between the lower and upper bounds of the existing goal (17,800-35,700), and is close to the old point goal of 22,300. From this standpoint, the current analysis is consistent with the existing goal.

2) There is a large amount of uncertainty in the spawner-recruit analysis. For example, the 95% interval estimate for $S_{MSY}$ is 12,000-77,000 (Table 12). This is primarily because of the limited range in historical escapements, as well as measurement error in the escapement estimates.

3) The current method of assessing the inriver run, based on target-strength measurements by split-beam sonar, is subject to known deficiencies, including potentially large inaccuracies. ADF&G is currently transitioning to updated sonar assessment technology based on DIDSON. This will likely require development of a revised escapement goal, based on DIDSON estimates, in the near future.

Therefore, it is recommended that the current escapement goal of 17,800-35,700 be retained, but it be designated as a sustainable escapement goal (SEG) instead of a BEG, because of concerns about measurement error in the sonar-based inriver run assessment.

## RUN FORECASTS

Predicting runs based on sibling ratios seemed promising at the outset of this program, and predictions were routinely published in previous reports. However, predictions in recent years have been unacceptably different from actual runs, probably due to sonar measurement error and fluctuating sibling ratios. ADF&G is developing new forecasting methods that use a combination of sibling ratios and Ricker production estimates for each age class.

# CONCLUSIONS

The late run of Kenai River Chinook salmon remains a productive and healthy stock. Since estimates of abundance and composition were initiated in the late 1980s, returns have been fairly consistent and escapements have been within or above the current BEG range. Sex and age composition has been relatively consistent, with the caveat about concerns with increasing numbers of ocean-age-2 fish.

There are also concerns about moderately high measurement error in the sonar-based inriver run estimates, and ADF&G is actively engaged in efforts to develop improved sonar methodology.

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# TABLES

Table 1.-Summary of how stock parameter estimates are derived for late-run Kenai River Chinook salmon.

| Stock Parameter | Estimated directly (D) or indirectly (I) | How Estimated |
|---|---|---|
| Late run Deep Creek marine harvest | D | SWHS. Harvest from 25 June to end of season. |
| Age/sex composition late run Deep Creek marine harvest | I | Age composition of sport harvest below Soldotna Bridge used as a surrogate |
| Commercial East side set net (ESSN) harvest | D | CF fish ticket system |
| Age/sex composition of commercial ESSN harvest | D | Collection of age/sex/length samples |
| Commercial Upper Cook Inlet Drift net harvest (UCID) | D | CF fish ticket system |
| Age/sex composition of commercial UCID harvest | I | Age composition of ESSN harvest used as a surrogate |
| Educational and subsistence harvest | D | Reported directly to ADF&G |
| Age/sex composition of educational and subsistence harvest | I | Age/sex composition of inriver run used as a surrogate |
| Personal use dip net harvest in Kenai River | D | Expansion of harvest from harvest reported on returned PU permits |
| Age/sex composition of personal use (PU) dip net harvest | I | Age composition of ESSN harvest used as a surrogate |
| Sport harvest below sonar | D | Onsite creel survey |
| Age/sex composition of sport harvest below sonar | D | Collection of age samples in onsite creel survey |
| Inriver run | D | Sonar at river mile 8.6 |
| Age composition of inriver run | D | Netting project near sonar site at river mile 8.6 |
| Total run | I | Inriver run plus harvests "before" the sonar (see above) |
| Age composition of total run | I | Age composition of inriver run used as a surrogate |
| Sport catch, harvest, and effort below Soldotna Bridge | D | Onsite creel survey |
| Age composition of sport harvest below Soldotna Bridge | D | Collection of age samples in onsite creel survey |
| Age composition of hooked-and-released fish above and below Soldotna Bridge | I | Age composition of inriver run used as a surrogate |
| Sport catch and harvest above Soldotna Bridge | D and I | SWHS. Harvest from July 1-on. |
| Age composition of sport harvest above Soldotna Bridge | I | Age composition of sport harvest below Soldotna Bridge used as a surrogate |
| Age composition of hooked-and-released fish above and below Soldotna Bridge | I | Age composition of inriver run used as a surrogate |
| Hook-and-release mortalities | I | Multiplication of average of direct estimates of mortality rate from 1990 and 1991 (rate not specific to age or size), and the estimated number of released fish above and below the Soldotna Bridge |
| Escapement | I | Subtraction of all known inriver mortalities above the sonar from the inriver run |
| Age composition of the escapement | I | Subtraction of all known inriver mortalities (by age) from the inriver run (by age) |

Table 2.-Abundance, harvest, and escapement estimates of late-run Kenai River Chinook salmon, 1986-2006.

| Year | Deep Creek Marine Harvest | Eastside Set Net Harvest | Drift Gillnet Harvest | Pers. Use | Subsist. | Sport Harvest below sonar | SE | Inriver Run | SE | Total Run | Sport Harvest above sonar | SE | Release Mort. | SE | Escape-ment | SE | Total Harvest Rate | SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1986 | 630 | 19,824 | 1,834 | | | | | 57,563 | 19,457 | 79,851 | 9,872 | 504 | 316 | 178 | 47,375 | 19,464 | 0.41 | 0.19 |
| 1987 | 1,218 | 21,159 | 4,561 | | | | | 48,123 | 1,178 | 75,061 | 13,100 | 825 | 123 | 107 | 34,900 | 1,442 | 0.54 | 0.02 |
| 1988 | 1,487 | 12,859 | 2,237 | | | | | 52,008 | 1,273 | 68,591 | 19,695 | 995 | 176 | 142 | 32,137 | 1,622 | 0.53 | 0.03 |
| 1989 | 1,368 | 10,914 | 0 | | 22 | | | 29,035 | 710 | 41,339 | 9,691 | 548 | 88 | 106 | 19,256 | 903 | 0.53 | 0.03 |
| 1990 | 1,605 | 4,139 | 621 | 91 | 13 | | | 33,474 | 746 | 39,943 | 6,897 | 459 | 69 | 46 | 26,508 | 877 | 0.34 | 0.01 |
| 1991 | 1,705 | 4,893 | 246 | 130 | 288 | | | 34,614 | 901 | 41,876 | 7,903 | 428 | 16 | 46 | 26,695 | 998 | 0.36 | 0.02 |
| 1992 | 2,115 | 10,718 | 615 | 50 | 402 | | | 30,314 | 685 | 44,214 | 7,556 | 471 | 234 | 135 | 22,524 | 842 | 0.49 | 0.02 |
| 1993 | 2,834 | 14,079 | 765 | 129 | 27 | | | 51,991 | 1,338 | 69,825 | 17,775 | 644 | 478 | 263 | 33,738 | 1,508 | 0.52 | 0.03 |
| 1994 | 1,869 | 15,575 | 464 | 13 | 392 | | | 53,474 | 1,374 | 71,787 | 17,837 | 669 | 572 | 311 | 35,065 | 1,560 | 0.51 | 0.02 |
| 1995 | 2,069 | 12,068 | 594 | 36 | 646 | | | 44,336 | 970 | 59,749 | 12,609 | 533 | 472 | 257 | 31,255 | 1,136 | 0.48 | 0.02 |
| 1996 | 2,038 | 11,564 | 389 | 45 | 294 | | | 39,356 | 3,535 | 53,686 | 8,112 | 446 | 337 | 189 | 30,907 | 3,568 | 0.42 | 0.06 |
| 1997 | 2,931 | 11,325 | 627 | 339 | 26 | | | 39,622 | 6,049 | 54,870 | 12,755 | 737 | 570 | 319 | 26,297 | 6,102 | 0.52 | 0.13 |
| 1998 | 1,784 | 5,087 | 335 | 271 | 2 | | | 34,878 | 500 | 42,357 | 7,515 | 430 | 595 | 320 | 26,768 | 733 | 0.37 | 0.01 |
| 1999 | 1,004 | 9,463 | 575 | 488 | 4 | 1,170 | 152 | 48,069 | 723 | 60,773 | 12,425 | 972 | 682 | 383 | 34,962 | 1,271 | 0.42 | 0.02 |
| 2000 | 1,052 | 3,684 | 270 | 410 | 6 | 831 | 108 | 44,517 | 669 | 50,770 | 14,391 | 758 | 499 | 276 | 29,627 | 1,048 | 0.42 | 0.02 |
| 2001 | 920 | 6,009 | 619 | 638 | 8 | 1,336 | 174 | 33,916 | 565 | 43,446 | 15,144 | 1,023 | 825 | 456 | 17,947 | 1,254 | 0.59 | 0.04 |
| 2002 | 427 | 9,478 | 415 | 606 | 6 | 1,929 | 251 | 41,807 | 1,353 | 54,668 | 10,678 | 666 | 665 | 363 | 30,464 | 1,551 | 0.44 | 0.03 |
| 2003 | 200 | 14,810 | 1,240 | 1,016 | 11 | 823 | 134 | 41,659 | 435 | 59,759 | 16,120 | 1,188 | 1,803 | 978 | 23,736 | 1,599 | 0.60 | 0.04 |
| 2004 | 1,660 | 21,625 | 1,095 | 792 | 10 | 2,386 | 268 | 56,205 | 1,735 | 83,773 | 14,988 | 982 | 1,019 | 554 | 40,198 | 2,069 | 0.52 | 0.03 |
| 2005 | 1,040 | 21,472 | 1,839 | 775 | 11 | 2,287 | 210 | 43,240 | 1,370 | 70,664 | 15,927 | 1,176 | 1,267 | 693 | 26,046 | 1,934 | 0.63 | 0.05 |
| 2006 | 938 | 8,691 | 1,051 | 1,034 | 11 | 3,322 | 509 | 37,743 | 718 | 52,790 | 12,490 | 810 | 830 | 455 | 24,423 | 1,175 | 0.54 | 0.03 |

Table 3.-Estimated number of late-run Kenai River Chinook salmon by age class in the spawning escapement.

| | Age Class | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | All |
| 1986 | | | | | | | | | | | | | | | | | |
| Inriver Run | 0 | 0 | 0 | 0 | 0 | 6,990 | 25,199 | 22,822 | 2,551 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57,563 |
| Var Run | 0 | 0 | 0 | 0 | 0 | 5,772,676 | 72,988,471 | 59,936,791 | 819,249 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 378,574,849 |
| SE Run | 0 | 0 | 0 | 0 | 0 | 2,403 | 8,543 | 7,742 | 905 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19,457 |
| Inriver Sport Harvest | 0 | 0 | 0 | 0 | 40 | 1,001 | 3,845 | 4,465 | 521 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9,872 |
| Var Harv | 0 | 0 | 0 | 0 | 802 | 20,619 | 85,530 | 100,950 | 10,577 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 254,186 |
| SE Harvest | 0 | 0 | 0 | 0 | 28 | 144 | 292 | 318 | 103 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 504 |
| H&R Mortality | 0 | 0 | 0 | 0 | 0 | 38 | 138 | 125 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 316 |
| Var H&R | 0 | 0 | 0 | 0 | 0 | 470 | 6,058 | 4,971 | 64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 31,558 |
| SE H&R | 0 | 0 | 0 | 0 | 0 | 22 | 78 | 71 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 178 |
| Escapement | 0 | 0 | 0 | 0 | 0 | 5,950 | 21,216 | 18,232 | 2,017 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 47,375 |
| Var Esc | 0 | 0 | 0 | 0 | 0 | 5,793,765 | 73,080,059 | 60,042,711 | 829,890 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 378,860,592 |
| SE Escapement | 0 | 0 | 0 | 0 | 0 | 2,407 | 8,549 | 7,749 | 911 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19,464 |
| 1987 | | | | | | | | | | | | | | | | | |
| Inriver Run | 0 | 0 | 0 | 0 | 0 | 900 | 13,406 | 33,116 | 500 | 100 | 50 | 0 | 0 | 50 | 0 | 0 | 48,123 |
| Var Run | 0 | 0 | 0 | 0 | 0 | 44,705 | 591,638 | 1,173,459 | 24,925 | 5,003 | 2,502 | 0 | 0 | 2,502 | 0 | 0 | 1,386,601 |
| SE Run | 0 | 0 | 0 | 0 | 0 | 211 | 769 | 1,083 | 158 | 71 | 50 | 0 | 0 | 50 | 0 | 0 | 1,178 |
| Inriver Sport Harvest | 0 | 0 | 0 | 0 | 54 | 136 | 2,983 | 9,520 | 407 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13,100 |
| Var Harv | 0 | 0 | 0 | 0 | 1,474 | 3,706 | 97,703 | 430,191 | 11,328 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 681,231 |
| SE Harvest | 0 | 0 | 0 | 0 | 38 | 61 | 313 | 656 | 106 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 825 |
| H&R Mortality | 0 | 0 | 0 | 0 | 0 | 2 | 34 | 85 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 123 |
| Var H&R | 0 | 0 | 0 | 0 | 0 | 4 | 895 | 5,457 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11,521 |
| SE H&R | 0 | 0 | 0 | 0 | 0 | 2 | 30 | 74 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 107 |
| Escapement | 0 | 0 | 0 | 0 | 0 | 763 | 10,389 | 23,511 | 92 | 100 | 50 | 0 | 0 | 50 | 0 | 0 | 34,900 |
| Var Esc | 0 | 0 | 0 | 0 | 0 | 48,415 | 690,236 | 1,609,106 | 36,254 | 5,003 | 2,502 | 0 | 0 | 2,502 | 0 | 0 | 2,079,353 |
| SE Escapement | 0 | 0 | 0 | 0 | 0 | 220 | 831 | 1,269 | 190 | 71 | 50 | 0 | 0 | 50 | 0 | 0 | 1,442 |
| 1988 | | | | | | | | | | | | | | | | | |
| Inriver Run | 0 | 0 | 0 | 0 | 0 | 666 | 1,998 | 40,407 | 8,936 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 52,008 |
| Var Run | 0 | 0 | 0 | 0 | 0 | 36,779 | 109,088 | 1,478,119 | 458,787 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,619,521 |
| SE Run | 0 | 0 | 0 | 0 | 0 | 192 | 330 | 1,216 | 677 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,273 |
| Inriver Sport Harvest | 0 | 0 | 0 | 0 | 142 | 47 | 663 | 15,481 | 3,361 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19,695 |
| Var Harv | 0 | 0 | 0 | 0 | 6,726 | 2,241 | 31,440 | 768,865 | 160,810 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 990,616 |
| SE Harvest | 0 | 0 | 0 | 0 | 82 | 47 | 177 | 877 | 401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 995 |
| H&R Mortality | 0 | 0 | 0 | 0 | 0 | 2 | 7 | 137 | 30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 176 |
| Var H&R | 0 | 0 | 0 | 0 | 0 | 3 | 30 | 12,127 | 595 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20,085 |
| SE H&R | 0 | 0 | 0 | 0 | 0 | 2 | 5 | 110 | 24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 142 |
| Escapement | 0 | 0 | 0 | 0 | 0 | 616 | 1,329 | 24,789 | 5,545 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32,137 |
| Var Esc | 0 | 0 | 0 | 0 | 0 | 39,023 | 140,558 | 2,259,110 | 620,191 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,630,222 |
| SE Escapement | 0 | 0 | 0 | 0 | 0 | 198 | 375 | 1,503 | 788 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,622 |

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Table 3.-Page 2 of 7.

| | Age Class | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | All |
| 1989 | | | | | | | | | | | | | | | | | |
| Inriver Run | 0 | 0 | 0 | 0 | 47 | 2,989 | 3,558 | 18,835 | 3,511 | 95 | 0 | 0 | 0 | 0 | 0 | 0 | 29,035 |
| Var Run | 0 | 0 | 0 | 0 | 2,251 | 132,685 | 155,858 | 526,652 | 153,953 | 4,497 | 0 | 0 | 0 | 0 | 0 | 0 | 504,766 |
| SE Run | 0 | 0 | 0 | 0 | 47 | 364 | 395 | 726 | 392 | 67 | 0 | 0 | 0 | 0 | 0 | 0 | 710 |
| Inriver Sport Harvest | 0 | 0 | 0 | 0 | 0 | 96 | 1,055 | 6,908 | 1,535 | 0 | 0 | 0 | 0 | 96 | 0 | 0 | 9,691 |
| Var Harv | 0 | 0 | 0 | 0 | 0 | 9,206 | 94,409 | 343,961 | 132,332 | 0 | 0 | 0 | 0 | 9,206 | 0 | 0 | 299,779 |
| SE Harvest | 0 | 0 | 0 | 0 | 0 | 96 | 307 | 586 | 364 | 0 | 0 | 0 | 0 | 96 | 0 | 0 | 548 |
| H&R Mortality | 0 | 0 | 0 | 0 | 0 | 9 | 11 | 57 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 88 |
| Var H&R | 0 | 0 | 0 | 0 | 0 | 118 | 167 | 4,697 | 163 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11,165 |
| SE H&R | 0 | 0 | 0 | 0 | 0 | 11 | 13 | 69 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 106 |
| Escapement | 0 | 0 | 0 | 0 | 47 | 2,884 | 2,492 | 11,869 | 1,965 | 95 | 0 | 0 | 0 | 0 | 0 | 0 | 19,256 |
| Var Esc | 0 | 0 | 0 | 0 | 2,251 | 142,010 | 250,434 | 875,310 | 286,447 | 4,497 | 0 | 0 | 0 | 0 | 0 | 0 | 815,710 |
| SE Escapement | 0 | 0 | 0 | 0 | 47 | 377 | 500 | 936 | 535 | 67 | 0 | 0 | 0 | 0 | 0 | 0 | 903 |
| 1990 | | | | | | | | | | | | | | | | | |
| Inriver Run | 0 | 0 | 0 | 0 | 0 | 4,113 | 4,872 | 22,970 | 1,519 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 33,474 |
| Var Run | 0 | 0 | 0 | 0 | 0 | 237,009 | 275,598 | 718,835 | 93,012 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 556,617 |
| SE Run | 0 | 0 | 0 | 0 | 0 | 487 | 525 | 848 | 305 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 746 |
| Inriver Sport Harvest | 0 | 0 | 0 | 0 | 40 | 667 | 1,092 | 4,288 | 809 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6,897 |
| Var Harv | 0 | 0 | 0 | 0 | 819 | 14,144 | 23,837 | 114,026 | 17,315 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 210,258 |
| SE Harvest | 0 | 0 | 0 | 0 | 29 | 119 | 154 | 338 | 132 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 459 |
| H&R Mortality | 0 | 0 | 0 | 0 | 0 | 8 | 10 | 47 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 69 |
| Var H&R | 0 | 0 | 0 | 0 | 0 | 33 | 46 | 1,015 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,154 |
| SE H&R | 0 | 0 | 0 | 0 | 0 | 6 | 7 | 32 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 46 |
| Escapement | 0 | 0 | 0 | 0 | 0 | 3,437 | 3,770 | 18,635 | 707 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 26,508 |
| Var Esc | 0 | 0 | 0 | 0 | 0 | 251,186 | 299,482 | 833,876 | 110,332 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 769,029 |
| SE Escapement | 0 | 0 | 0 | 0 | 0 | 501 | 547 | 913 | 332 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 877 |
| 1991 | | | | | | | | | | | | | | | | | |
| Inriver Run | 0 | 0 | 0 | 0 | 0 | 2,580 | 5,482 | 24,079 | 2,257 | 0 | 0 | 0 | 215 | 0 | 0 | 0 | 34,614 |
| Var Run | 0 | 0 | 0 | 0 | 0 | 261,797 | 517,561 | 1,182,470 | 230,846 | 0 | 0 | 0 | 23,055 | 0 | 0 | 0 | 811,605 |
| SE Run | 0 | 0 | 0 | 0 | 0 | 512 | 719 | 1,087 | 480 | 0 | 0 | 0 | 152 | 0 | 0 | 0 | 901 |
| Inriver Sport Harvest | 0 | 0 | 0 | 0 | 0 | 390 | 921 | 6,025 | 496 | 0 | 0 | 0 | 71 | 0 | 0 | 0 | 7,903 |
| Var Harv | 0 | 0 | 0 | 0 | 0 | 13,600 | 31,380 | 157,183 | 17,227 | 0 | 0 | 0 | 2,508 | 0 | 0 | 0 | 183,015 |
| SE Harvest | 0 | 0 | 0 | 0 | 0 | 117 | 177 | 396 | 131 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 428 |
| H&R Mortality | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 11 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 |
| Var H&R | 0 | 0 | 0 | 0 | 0 | 11 | 52 | 1,012 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,094 |
| SE H&R | 0 | 0 | 0 | 0 | 0 | 3 | 7 | 32 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 46 |
| Escapement | 0 | 0 | 0 | 0 | 0 | 2,189 | 4,558 | 18,044 | 1,760 | 0 | 0 | 0 | 144 | 0 | 0 | 0 | 26,695 |
| Var Esc | 0 | 0 | 0 | 0 | 0 | 275,408 | 548,993 | 1,340,665 | 248,081 | 0 | 0 | 0 | 25,563 | 0 | 0 | 0 | 996,714 |
| SE Escapement | 0 | 0 | 0 | 0 | 0 | 525 | 741 | 1,158 | 498 | 0 | 0 | 0 | 160 | 0 | 0 | 0 | 998 |

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| | Age Class | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | All |
| 1992 | | | | | | | | | | | | | | | | | |
| Inriver Run | 0 | 0 | 0 | 0 | 0 | 2,045 | 4,800 | 22,758 | 711 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30,314 |
| Var Run | 0 | 0 | 0 | 0 | 0 | 172,050 | 371,812 | 770,044 | 62,147 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 469,352 |
| SE Run | 0 | 0 | 0 | 0 | 0 | 415 | 610 | 878 | 249 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 685 |
| Inriver Sport Harvest | 0 | 0 | 0 | 0 | 38 | 150 | 1,165 | 5,752 | 451 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7,556 |
| Var Harv | 0 | 0 | 0 | 0 | 1,413 | 5,634 | 42,372 | 180,312 | 16,754 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 221,987 |
| SE Harvest | 0 | 0 | 0 | 0 | 38 | 75 | 206 | 425 | 129 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 471 |
| H&R Mortality | 0 | 0 | 0 | 0 | 0 | 16 | 37 | 176 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 234 |
| Var H&R | 0 | 0 | 0 | 0 | 0 | 90 | 471 | 10,274 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18,193 |
| SE H&R | 0 | 0 | 0 | 0 | 0 | 9 | 22 | 101 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 135 |
| Escapement | 0 | 0 | 0 | 0 | 0 | 1,878 | 3,598 | 16,830 | 255 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22,524 |
| Var Esc | 0 | 0 | 0 | 0 | 0 | 177,774 | 414,654 | 960,630 | 78,914 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 709,532 |
| SE Escapement | 0 | 0 | 0 | 0 | 0 | 422 | 644 | 980 | 281 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 842 |
| 1993 | | | | | | | | | | | | | | | | | |
| Inriver Run | 0 | 0 | 0 | 0 | 0 | 4,159 | 7,279 | 37,285 | 2,971 | 0 | 0 | 0 | 297 | 0 | 0 | 0 | 51,991 |
| Var Run | 0 | 0 | 0 | 0 | 0 | 581,127 | 966,996 | 2,490,939 | 422,861 | 0 | 0 | 0 | 44,035 | 0 | 0 | 0 | 1,790,571 |
| SE Run | 0 | 0 | 0 | 0 | 0 | 762 | 983 | 1,578 | 650 | 0 | 0 | 0 | 210 | 0 | 0 | 0 | 1,338 |
| Inriver Sport Harvest | 0 | 0 | 0 | 0 | 0 | 335 | 1,006 | 15,221 | 1,032 | 0 | 0 | 103 | 52 | 26 | 0 | 0 | 17,775 |
| Var Harv | 0 | 0 | 0 | 0 | 0 | 8,637 | 25,817 | 360,302 | 26,475 | 0 | 0 | 2,661 | 1,331 | 666 | 0 | 0 | 414,409 |
| SE Harvest | 0 | 0 | 0 | 0 | 0 | 93 | 161 | 600 | 163 | 0 | 0 | 52 | 36 | 26 | 0 | 0 | 644 |
| H&R Mortality | 0 | 0 | 0 | 0 | 0 | 38 | 67 | 343 | 27 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 478 |
| Var H&R | 0 | 0 | 0 | 0 | 0 | 475 | 1,406 | 35,552 | 250 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 68,948 |
| SE H&R | 0 | 0 | 0 | 0 | 0 | 22 | 38 | 189 | 16 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 263 |
| Escapement | 0 | 0 | 0 | 0 | 0 | 3,786 | 6,206 | 21,722 | 1,912 | 0 | 0 | 0 | 243 | 0 | 0 | 0 | 33,738 |
| Var Esc | 0 | 0 | 0 | 0 | 0 | 590,239 | 994,219 | 2,886,793 | 449,586 | 0 | 0 | 0 | 45,370 | 0 | 0 | 0 | 2,273,928 |
| SE Escapement | 0 | 0 | 0 | 0 | 0 | 768 | 997 | 1,699 | 671 | 0 | 0 | 0 | 213 | 0 | 0 | 0 | 1,508 |
| 1994 | | | | | | | | | | | | | | | | | |
| Inriver Run | 0 | 0 | 0 | 0 | 0 | 2,971 | 6,071 | 41,849 | 2,196 | 0 | 0 | 0 | 0 | 387 | 0 | 0 | 53,474 |
| Var Run | 0 | 0 | 0 | 0 | 0 | 368,865 | 720,656 | 2,333,439 | 275,634 | 0 | 0 | 0 | 0 | 49,874 | 0 | 0 | 1,887,876 |
| SE Run | 0 | 0 | 0 | 0 | 0 | 607 | 849 | 1,528 | 525 | 0 | 0 | 0 | 0 | 223 | 0 | 0 | 1,374 |
| Inriver Sport Harvest | 0 | 0 | 0 | 0 | 41 | 329 | 781 | 16,193 | 452 | 41 | 0 | 0 | 0 | 0 | 0 | 0 | 17,837 |
| Var Harv | 0 | 0 | 0 | 0 | 1,689 | 13,428 | 31,574 | 430,440 | 18,413 | 1,689 | 0 | 0 | 0 | 0 | 0 | 0 | 447,784 |
| SE Harvest | 0 | 0 | 0 | 0 | 41 | 116 | 178 | 656 | 136 | 41 | 0 | 0 | 0 | 0 | 0 | 0 | 669 |
| H&R Mortality | 0 | 0 | 0 | 0 | 0 | 32 | 65 | 448 | 23 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 572 |
| Var H&R | 0 | 0 | 0 | 0 | 0 | 328 | 1,303 | 59,329 | 185 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 96,713 |
| SE H&R | 0 | 0 | 0 | 0 | 0 | 18 | 36 | 244 | 14 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 311 |
| Escapement | 0 | 0 | 0 | 0 | 0 | 2,610 | 5,225 | 25,209 | 1,720 | 0 | 0 | 0 | 0 | 383 | 0 | 0 | 35,065 |
| Var Esc | 0 | 0 | 0 | 0 | 0 | 382,621 | 753,533 | 2,823,208 | 294,232 | 0 | 0 | 0 | 0 | 49,883 | 0 | 0 | 2,432,373 |
| SE Escapement | 0 | 0 | 0 | 0 | 0 | 619 | 868 | 1,680 | 542 | 0 | 0 | 0 | 0 | 223 | 0 | 0 | 1,560 |

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| | Age Class | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | All |
| 1995 | | | | | | | | | | | | | | | | | |
| Inriver Run | 0 | 0 | 0 | 0 | 0 | 9,900 | 9,470 | 22,383 | 2,367 | 0 | 0 | 0 | 0 | 215 | 0 | 0 | 44,336 |
| Var Run | 0 | 0 | 0 | 0 | 0 | 1,709,160 | 1,652,772 | 2,635,613 | 487,127 | 0 | 0 | 0 | 0 | 46,321 | 0 | 0 | 940,900 |
| SE Run | 0 | 0 | 0 | 0 | 0 | 1,307 | 1,286 | 1,623 | 698 | 0 | 0 | 0 | 0 | 215 | 0 | 0 | 970 |
| Inriver Sport Harvest | 0 | 0 | 0 | 0 | 87 | 957 | 1,246 | 8,986 | 1,333 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12,609 |
| Var Harv | 0 | 0 | 0 | 0 | 2,518 | 27,271 | 35,349 | 219,129 | 37,756 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 284,025 |
| SE Harvest | 0 | 0 | 0 | 0 | 50 | 165 | 188 | 468 | 194 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 533 |
| H&R Mortality | 0 | 0 | 0 | 0 | 0 | 105 | 101 | 238 | 25 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 472 |
| Var H&R | 0 | 0 | 0 | 0 | 0 | 3,419 | 3,135 | 16,987 | 227 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 65,894 |
| SE H&R | 0 | 0 | 0 | 0 | 0 | 58 | 56 | 130 | 15 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 257 |
| Escapement | 0 | 0 | 0 | 0 | 0 | 8,838 | 8,123 | 13,159 | 1,009 | 0 | 0 | 0 | 0 | 213 | 0 | 0 | 31,255 |
| Var Esc | 0 | 0 | 0 | 0 | 0 | 1,739,849 | 1,691,256 | 2,871,729 | 525,110 | 0 | 0 | 0 | 0 | 46,326 | 0 | 0 | 1,290,820 |
| SE Escapement | 0 | 0 | 0 | 0 | 0 | 1,319 | 1,300 | 1,695 | 725 | 0 | 0 | 0 | 0 | 215 | 0 | 0 | 1,136 |
| 1996 | | | | | | | | | | | | | | | | | |
| Inriver Run | 0 | 0 | 0 | 0 | 84 | 3,021 | 13,342 | 22,573 | 336 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 39,356 |
| Var Run | 0 | 0 | 0 | 0 | 7,042 | 306,277 | 2,171,891 | 4,913,869 | 28,669 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12,496,225 |
| SE Run | 0 | 0 | 0 | 0 | 84 | 553 | 1,474 | 2,217 | 169 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3,535 |
| Inriver Sport Harvest | 0 | 0 | 0 | 0 | 0 | 485 | 2,981 | 4,472 | 173 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8,112 |
| Var Harv | 0 | 0 | 0 | 0 | 0 | 16,550 | 92,325 | 130,119 | 5,979 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 198,964 |
| SE Harvest | 0 | 0 | 0 | 0 | 0 | 129 | 304 | 361 | 77 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 446 |
| H&R Mortality | 0 | 0 | 0 | 0 | 1 | 26 | 114 | 193 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 337 |
| Var H&R | 0 | 0 | 0 | 0 | 1 | 223 | 4,156 | 11,828 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35,832 |
| SE H&R | 0 | 0 | 0 | 0 | 1 | 15 | 64 | 109 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 189 |
| Escapement | 0 | 0 | 0 | 0 | 83 | 2,510 | 10,247 | 17,908 | 159 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30,907 |
| Var Esc | 0 | 0 | 0 | 0 | 7,042 | 323,050 | 2,268,372 | 5,055,816 | 34,652 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12,731,021 |
| SE Escapement | 0 | 0 | 0 | 0 | 84 | 568 | 1,506 | 2,249 | 186 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3,568 |
| 1997 | | | | | | | | | | | | | | | | | |
| Inriver Run | 0 | 0 | 0 | 0 | 0 | 1,645 | 8,637 | 28,517 | 686 | 0 | 0 | 137 | 0 | 0 | 0 | 0 | 39,622 |
| Var Run | 0 | 0 | 0 | 0 | 0 | 274,972 | 2,646,335 | 20,026,984 | 101,470 | 0 | 0 | 18,797 | 0 | 0 | 0 | 0 | 36,588,710 |
| SE Run | 0 | 0 | 0 | 0 | 0 | 524 | 1,627 | 4,475 | 319 | 0 | 0 | 137 | 0 | 0 | 0 | 0 | 6,049 |
| Inriver Sport Harvest | 0 | 0 | 0 | 0 | 121 | 322 | 2,978 | 9,174 | 161 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12,755 |
| Var Harv | 0 | 0 | 0 | 0 | 4,859 | 12,969 | 121,456 | 384,945 | 6,480 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 543,830 |
| SE Harvest | 0 | 0 | 0 | 0 | 70 | 114 | 349 | 620 | 80 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 737 |
| H&R Mortality | 0 | 0 | 0 | 0 | 0 | 24 | 124 | 410 | 10 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 570 |
| Var H&R | 0 | 0 | 0 | 0 | 0 | 206 | 4,965 | 52,833 | 44 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 101,692 |
| SE H&R | 0 | 0 | 0 | 0 | 0 | 14 | 70 | 230 | 7 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 319 |
| Escapement | 0 | 0 | 0 | 0 | 0 | 1,300 | 5,536 | 18,933 | 515 | 0 | 0 | 135 | 0 | 0 | 0 | 0 | 26,297 |
| Var Esc | 0 | 0 | 0 | 0 | 0 | 288,147 | 2,772,756 | 20,464,762 | 107,993 | 0 | 0 | 18,801 | 0 | 0 | 0 | 0 | 37,234,232 |
| SE Escapement | 0 | 0 | 0 | 0 | 0 | 537 | 1,665 | 4,524 | 329 | 0 | 0 | 137 | 0 | 0 | 0 | 0 | 6,102 |

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Table 3.-Page 5 of 7.

| | Age Class | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | All |
| 1998 | | | | | | | | | | | | | | | | | |
| Inriver Run | 0 | 0 | 0 | 0 | 0 | 5,201 | 4,895 | 23,660 | 1,122 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 34,878 |
| Var Run | 0 | 0 | 0 | 0 | 0 | 458,118 | 435,253 | 893,336 | 111,286 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 250,212 |
| SE Run | 0 | 0 | 0 | 0 | 0 | 677 | 660 | 945 | 334 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 500 |
| Inriver Sport Harvest | 0 | 0 | 0 | 0 | 114 | 908 | 931 | 5,335 | 227 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7,515 |
| Var Harv | 0 | 0 | 0 | 0 | 2,580 | 20,820 | 21,346 | 128,231 | 5,166 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 184,716 |
| SE Harvest | 0 | 0 | 0 | 0 | 51 | 144 | 146 | 358 | 72 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 430 |
| H&R Mortality | 0 | 0 | 0 | 0 | 0 | 89 | 84 | 404 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 595 |
| Var H&R | 0 | 0 | 0 | 0 | 0 | 2,377 | 2,112 | 47,415 | 129 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 102,686 |
| SE H&R | 0 | 0 | 0 | 0 | 0 | 49 | 46 | 218 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 320 |
| Escapement | 0 | 0 | 0 | 0 | 0 | 4,204 | 3,881 | 17,921 | 876 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 26,768 |
| Var Esc | 0 | 0 | 0 | 0 | 0 | 481,315 | 458,711 | 1,068,982 | 116,581 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 537,614 |
| SE Escapement | 0 | 0 | 0 | 0 | 0 | 694 | 677 | 1,034 | 341 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 733 |
| 1999 | | | | | | | | | | | | | | | | | |
| Inriver Run | 0 | 0 | 0 | 0 | 125 | 5,977 | 10,212 | 29,265 | 2,242 | 0 | 0 | 0 | 249 | 0 | 0 | 0 | 48,069 |
| Var Run | 0 | 0 | 0 | 0 | 15,508 | 661,453 | 1,027,495 | 1,622,941 | 267,895 | 0 | 0 | 0 | 30,942 | 0 | 0 | 0 | 523,168 |
| SE Run | 0 | 0 | 0 | 0 | 125 | 813 | 1,014 | 1,274 | 518 | 0 | 0 | 0 | 176 | 0 | 0 | 0 | 723 |
| Inriver Sport Harvest | 0 | 0 | 0 | 0 | 39 | 1,359 | 3,417 | 7,106 | 505 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12,425 |
| Var Harv | 0 | 0 | 0 | 0 | 1,508 | 58,161 | 167,374 | 426,866 | 20,306 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 945,152 |
| SE Harvest | 0 | 0 | 0 | 0 | 39 | 241 | 409 | 653 | 142 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 972 |
| H&R Mortality | 0 | 0 | 0 | 0 | 2 | 85 | 145 | 415 | 32 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 682 |
| Var H&R | 0 | 0 | 0 | 0 | 3 | 2,353 | 6,743 | 54,444 | 355 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 146,357 |
| SE H&R | 0 | 0 | 0 | 0 | 2 | 49 | 82 | 233 | 19 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 383 |
| Escapement | 0 | 0 | 0 | 0 | 84 | 4,534 | 6,650 | 21,744 | 1,705 | 0 | 0 | 0 | 246 | 0 | 0 | 0 | 34,962 |
| Var Esc | 0 | 0 | 0 | 0 | 17,019 | 721,967 | 1,201,613 | 2,104,251 | 288,557 | 0 | 0 | 0 | 30,951 | 0 | 0 | 0 | 1,614,677 |
| SE Escapement | 0 | 0 | 0 | 0 | 130 | 850 | 1,096 | 1,451 | 537 | 0 | 0 | 0 | 176 | 0 | 0 | 0 | 1,271 |
| 2000 | | | | | | | | | | | | | | | | | |
| Inriver Run | 0 | 0 | 0 | 0 | 0 | 1,743 | 13,948 | 27,663 | 1,162 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 44,517 |
| Var Run | 0 | 0 | 0 | 0 | 0 | 195,865 | 1,159,859 | 1,393,092 | 132,192 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 447,684 |
| SE Run | 0 | 0 | 0 | 0 | 0 | 443 | 1,077 | 1,180 | 364 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 669 |
| Inriver Sport Harvest | 30 | 0 | 30 | 0 | 238 | 417 | 4,469 | 9,028 | 179 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14,391 |
| Var Harv | 829 | 0 | 829 | 0 | 7,593 | 10,603 | 146,534 | 326,240 | 5,252 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 574,987 |
| SE Harvest | 29 | 0 | 29 | 0 | 87 | 103 | 383 | 571 | 72 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 758 |
| H&R Mortality | 0 | 0 | 0 | 0 | 0 | 20 | 156 | 310 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 499 |
| Var H&R | 0 | 0 | 0 | 0 | 0 | 134 | 7,560 | 29,462 | 63 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 76,021 |
| SE H&R | 0 | 0 | 0 | 0 | 0 | 12 | 87 | 172 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 276 |
| Escapement | 0 | 0 | 0 | 0 | 0 | 1,307 | 9,322 | 18,325 | 971 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29,627 |
| Var Esc | 0 | 0 | 0 | 0 | 0 | 206,602 | 1,313,953 | 1,748,794 | 137,507 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,098,692 |
| SE Escapement | 0 | 0 | 0 | 0 | 0 | 455 | 1,146 | 1,322 | 371 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,048 |

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Table 3.-Page 6 of 7.

| | Age Class | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | All |
| 2001 | | | | | | | | | | | | | | | | | |
| Inriver Run | 0 | 0 | 0 | 0 | 0 | 4,076 | 6,466 | 22,451 | 923 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 33,916 |
| Var Run | 0 | 0 | 0 | 0 | 0 | 466,434 | 707,259 | 1,125,496 | 119,568 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 319,169 |
| SE Run | 0 | 0 | 0 | 0 | 0 | 683 | 841 | 1,061 | 346 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 565 |
| Inriver Sport Harvest | 0 | 0 | 0 | 0 | 273 | 1,795 | 2,303 | 10,460 | 273 | 0 | 39 | 0 | 0 | 0 | 0 | 0 | 15,144 |
| Var Harv | 0 | 0 | 0 | 0 | 8,559 | 73,157 | 106,619 | 630,921 | 11,527 | 0 | 2,062 | 0 | 0 | 0 | 0 | 0 | 1,046,798 |
| SE Harvest | 0 | 0 | 0 | 0 | 93 | 270 | 327 | 794 | 107 | 0 | 45 | 0 | 0 | 0 | 0 | 0 | 1,023 |
| H&R Mortality | 0 | 0 | 0 | 0 | 0 | 99 | 157 | 546 | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 825 |
| Var H&R | 0 | 0 | 0 | 0 | 0 | 3,188 | 7,828 | 91,347 | 203 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 207,538 |
| SE H&R | 0 | 0 | 0 | 0 | 0 | 56 | 88 | 302 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 456 |
| Escapement | 0 | 0 | 0 | 0 | 0 | 2,182 | 4,005 | 11,444 | 628 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17,947 |
| Var Esc | 0 | 0 | 0 | 0 | 0 | 542,778 | 821,707 | 1,847,764 | 131,298 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,573,505 |
| SE Escapement | 0 | 0 | 0 | 0 | 0 | 737 | 906 | 1,359 | 362 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,254 |
| 2002 | | | | | | | | | | | | | | | | | |
| Inriver Run | 47 | 180 | 0 | 0 | 615 | 7,382 | 7,750 | 24,445 | 1,387 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 41,807 |
| Var Run | 2,241 | 8,164 | 0 | 0 | 28,647 | 287,704 | 321,353 | 1,415,543 | 61,900 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,829,645 |
| SE Run | 47 | 90 | 0 | 0 | 169 | 536 | 567 | 1,190 | 249 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,353 |
| Inriver Sport Harvest | 0 | 0 | 0 | 0 | 229 | 539 | 2,471 | 7,208 | 192 | 0 | 0 | 0 | 39 | 0 | 0 | 0 | 10,678 |
| Var Harv | 0 | 0 | 0 | 0 | 10,104 | 24,410 | 116,597 | 301,825 | 8,551 | 0 | 0 | 0 | 1,851 | 0 | 0 | 0 | 443,601 |
| SE Harvest | 0 | 0 | 0 | 0 | 101 | 156 | 341 | 549 | 92 | 0 | 0 | 0 | 43 | 0 | 0 | 0 | 666 |
| H&R Mortality | 1 | 3 | 0 | 0 | 10 | 117 | 123 | 389 | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 665 |
| Var H&R | 1 | 4 | 0 | 0 | 34 | 4,146 | 4,567 | 45,012 | 155 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 131,431 |
| SE H&R | 1 | 2 | 0 | 0 | 6 | 64 | 68 | 212 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 363 |
| Escapement | 47 | 177 | 0 | 0 | 377 | 6,726 | 5,155 | 16,848 | 1,173 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30,464 |
| Var Esc | 2,241 | 8,168 | 0 | 0 | 38,784 | 316,260 | 442,517 | 1,762,380 | 70,606 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,404,677 |
| SE Escapement | 47 | 90 | 0 | 0 | 197 | 562 | 665 | 1,328 | 266 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,551 |
| 2003 | | | | | | | | | | | | | | | | | |
| Inriver Run | 0 | 0 | 0 | 0 | 541 | 12,301 | 8,269 | 20,358 | 190 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 41,659 |
| Var Run | 0 | 0 | 0 | 0 | 19,337 | 326,517 | 258,463 | 425,804 | 7,244 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 189,136 |
| SE Run | 0 | 0 | 0 | 0 | 139 | 571 | 508 | 653 | 85 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 435 |
| Inriver Sport Harvest | 0 | 0 | 0 | 0 | 245 | 2,425 | 2,983 | 10,317 | 150 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16,120 |
| Var Harv | 0 | 0 | 0 | 0 | 8,538 | 104,601 | 133,821 | 730,455 | 5,219 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,412,863 |
| SE Harvest | 0 | 0 | 0 | 0 | 92 | 323 | 366 | 855 | 72 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,189 |
| H&R Mortality | 0 | 0 | 0 | 0 | 23 | 532 | 358 | 881 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,803 |
| Var H&R | 0 | 0 | 0 | 0 | 186 | 83,718 | 37,983 | 228,702 | 29 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 955,522 |
| SE H&R | 0 | 0 | 0 | 0 | 14 | 289 | 195 | 478 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 978 |
| Escapement | 0 | 0 | 0 | 0 | 272 | 9,344 | 4,928 | 9,161 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23,736 |
| Var Esc | 0 | 0 | 0 | 0 | 28,062 | 514,835 | 430,267 | 1,384,961 | 12,493 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,557,521 |
| SE Escapement | 0 | 0 | 0 | 0 | 168 | 718 | 656 | 1,177 | 112 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,599 |

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Table 3.-Page 7 of 7.

| | Age Class | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | All |
| 2004 | | | | | | | | | | | | | | | | | |
| Inriver Run | 0 | 0 | 0 | 0 | 579 | 7,877 | 13,847 | 33,116 | 722 | 0 | 0 | 0 | 64 | 0 | 0 | 0 | 56,205 |
| Var Run | 0 | 0 | 0 | 0 | 33,177 | 396,354 | 755,014 | 2,275,988 | 43,516 | 0 | 0 | 0 | 4,143 | 0 | 0 | 0 | 3,011,186 |
| SE Run | 0 | 0 | 0 | 0 | 182 | 630 | 869 | 1,509 | 209 | 0 | 0 | 0 | 64 | 0 | 0 | 0 | 1,735 |
| Inriver Sport Harvest | 0 | 0 | 0 | 0 | 179 | 1,326 | 4,104 | 8,916 | 464 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14,988 |
| Var Harv | 0 | 0 | 0 | 0 | 5,608 | 48,406 | 179,743 | 448,923 | 16,994 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 965,014 |
| SE Harvest | 0 | 0 | 0 | 0 | 75 | 220 | 424 | 670 | 130 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 982 |
| H&R Mortality | 0 | 0 | 0 | 0 | 10 | 143 | 251 | 600 | 13 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1,019 |
| Var H&R | 0 | 0 | 0 | 0 | 40 | 6,114 | 18,767 | 106,701 | 61 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 306,833 |
| SE H&R | 0 | 0 | 0 | 0 | 6 | 78 | 137 | 327 | 8 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 554 |
| Escapement | 0 | 0 | 0 | 0 | 389 | 6,408 | 9,492 | 23,600 | 245 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 40,198 |
| Var Esc | 0 | 0 | 0 | 0 | 38,825 | 450,874 | 953,524 | 2,831,612 | 60,571 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4,283,033 |
| SE Escapement | 0 | 0 | 0 | 0 | 197 | 671 | 976 | 1,683 | 246 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,070 |
| 2005 | | | | | | | | | | | | | | | | | |
| Inriver Run | 0 | 0 | 0 | 0 | 0 | 2,980 | 7,994 | 30,470 | 1,795 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 43,240 |
| Var Run | 0 | 0 | 0 | 0 | 0 | 248,782 | 611,228 | 1,844,963 | 147,857 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,877,017 |
| SE Run | 0 | 0 | 0 | 0 | 0 | 499 | 782 | 1,358 | 385 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,370 |
| Inriver Sport Harvest | 0 | 0 | 0 | 0 | 64 | 406 | 2,912 | 12,119 | 426 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15,927 |
| Var Harv | 0 | 0 | 0 | 0 | 1,465 | 10,218 | 103,933 | 918,190 | 11,261 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,382,914 |
| SE Harvest | 0 | 0 | 0 | 0 | 38 | 101 | 322 | 958 | 106 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,176 |
| H&R Mortality | 0 | 0 | 0 | 0 | 0 | 87 | 234 | 893 | 53 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,267 |
| Var H&R | 0 | 0 | 0 | 0 | 0 | 2,428 | 16,735 | 238,703 | 914 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 479,770 |
| SE H&R | 0 | 0 | 0 | 0 | 0 | 49 | 129 | 489 | 30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 693 |
| Escapement | 0 | 0 | 0 | 0 | 0 | 2,487 | 4,848 | 17,458 | 1,317 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 26,046 |
| Var Esc | 0 | 0 | 0 | 0 | 0 | 261,428 | 731,895 | 3,001,856 | 160,031 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3,739,701 |
| SE Escapement | 0 | 0 | 0 | 0 | 0 | 511 | 856 | 1,733 | 400 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,934 |
| 2006 | | | | | | | | | | | | | | | | | |
| Inriver Run | 0 | 0 | 0 | 0 | 500 | 10,028 | 5,074 | 18,448 | 3,693 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 37,743 |
| Var Run | 0 | 0 | 0 | 0 | 31,018 | 437,204 | 257,832 | 649,640 | 178,547 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 516,689 |
| SE Run | 0 | 0 | 0 | 0 | 176 | 661 | 508 | 806 | 423 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 719 |
| Inriver Sport Harvest | 0 | 0 | 0 | 0 | 66 | 1,395 | 2,571 | 7,759 | 697 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12,490 |
| Var Harv | 0 | 0 | 0 | 0 | 1,501 | 41,632 | 83,152 | 329,973 | 20,242 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 656,663 |
| SE Harvest | 0 | 0 | 0 | 0 | 39 | 204 | 288 | 574 | 142 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 810 |
| H&R Mortality | 0 | 0 | 0 | 0 | 11 | 221 | 112 | 406 | 81 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 830 |
| Var H&R | 0 | 0 | 0 | 0 | 47 | 14,773 | 3,832 | 49,703 | 2,043 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 207,329 |
| SE H&R | 0 | 0 | 0 | 0 | 7 | 122 | 62 | 223 | 45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 455 |
| Escapement | 0 | 0 | 0 | 0 | 423 | 8,412 | 2,391 | 10,283 | 2,914 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24,423 |
| Var Esc | 0 | 0 | 0 | 0 | 32,566 | 493,609 | 344,816 | 1,029,317 | 200,832 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,380,681 |
| SE Escapement | 0 | 0 | 0 | 0 | 180 | 703 | 587 | 1,015 | 448 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,175 |

Table 4.-Total run estimates by year and age class for late-run Kenai River Chinook salmon, 1986-2006.

| Year | (0.2, 1.1) Age 3 | (0.3, 1.2, 2.1) Age 4 | (0.4, 1.3, 2.2) Age 5 | (0.5, 1.4, 2.3) Age 6 | (1.5, 2.4) Age 7 | (1.6, 2.5) Age 8 | Total Run |
|---|---|---|---|---|---|---|---|
| 1986 | 311 | 12,071 | 33,456 | 30,619 | 3,363 | 16 | 79,837 |
| SE | 71 | 2,416 | 8,549 | 7,748 | 912 | 16 | 19,458 |
| Prp | 0.004 | 0.151 | 0.419 | 0.384 | 0.042 | 0.000 | |
| SE | 0.001 | 0.030 | 0.107 | 0.097 | 0.011 | 0.000 | |
| 1987 | 596 | 4,279 | 21,884 | 46,725 | 897 | 100 | 74,480 |
| SE | 122 | 348 | 864 | 1,206 | 189 | 71 | 1,268 |
| Prp | 0.008 | 0.057 | 0.294 | 0.627 | 0.012 | 0.001 | |
| SE | 0.002 | 0.005 | 0.012 | 0.016 | 0.003 | 0.001 | |
| 1988 | 497 | 2,284 | 4,288 | 51,941 | 9,572 | 0 | 68,582 |
| SE | 91 | 249 | 378 | 1,318 | 690 | 0 | 1,396 |
| Prp | 0.007 | 0.033 | 0.063 | 0.757 | 0.140 | 0.000 | |
| SE | 0.001 | 0.004 | 0.006 | 0.019 | 0.010 | | |
| 1989 | 150 | 4,655 | 6,039 | 25,639 | 4,766 | 95 | 41,344 |
| SE | 60 | 388 | 429 | 840 | 419 | 67 | 885 |
| Prp | 0.004 | 0.113 | 0.146 | 0.620 | 0.115 | 0.002 | |
| SE | 0.001 | 0.009 | 0.010 | 0.020 | 0.010 | 0.002 | |
| 1990 | 66 | 5,742 | 6,589 | 25,600 | 1,945 | 0 | 39,943 |
| SE | 26 | 503 | 546 | 938 | 319 | 0 | 969 |
| Prp | 0.002 | 0.144 | 0.165 | 0.641 | 0.049 | 0.000 | |
| SE | 0.001 | 0.013 | 0.014 | 0.023 | 0.008 | | |
| 1991 | 50 | 4,058 | 7,485 | 27,787 | 2,489 | 0 | 41,869 |
| SE | 25 | 526 | 735 | 1,215 | 484 | 0 | 1,115 |
| Prp | 0.001 | 0.097 | 0.179 | 0.664 | 0.059 | 0.000 | |
| SE | 0.001 | 0.013 | 0.018 | 0.029 | 0.012 | | |
| 1992 | 300 | 3,840 | 8,429 | 30,275 | 1,297 | 0 | 44,142 |
| SE | 70 | 445 | 657 | 1,100 | 270 | 0 | 1,065 |
| Prp | 0.007 | 0.087 | 0.191 | 0.686 | 0.029 | 0.000 | |
| SE | 0.002 | 0.010 | 0.015 | 0.025 | 0.006 | | |
| 1993 | 439 | 6,148 | 10,579 | 48,736 | 3,806 | 0 | 69,709 |
| SE | 83 | 780 | 1,006 | 1,863 | 662 | 0 | 1,727 |
| Prp | 0.006 | 0.088 | 0.152 | 0.699 | 0.055 | 0.000 | |
| SE | 0.001 | 0.011 | 0.014 | 0.027 | 0.009 | | |
| 1994 | 718 | 5,224 | 8,617 | 53,638 | 3,880 | 15 | 72,093 |
| SE | 87 | 625 | 863 | 1,547 | 582 | 12 | 1,380 |
| Prp | 0.010 | 0.072 | 0.120 | 0.744 | 0.054 | 0.000 | |
| SE | 0.001 | 0.009 | 0.012 | 0.021 | 0.008 | | |
| 1995 | 436 | 13,296 | 13,835 | 28,431 | 3,635 | 9 | 59,642 |
| SE | 60 | 1,316 | 1,296 | 1,633 | 736 | 9 | 972 |
| Prp | 0.007 | 0.223 | 0.232 | 0.477 | 0.061 | 0.000 | |
| SE | 0.001 | 0.022 | 0.022 | 0.027 | 0.012 | | |
| 1996 | 621 | 5,447 | 18,303 | 28,635 | 614 | 0 | 53,619 |
| SE | 100 | 564 | 1,482 | 2,225 | 174 | 0 | 3,541 |
| Prp | 0.012 | 0.102 | 0.341 | 0.534 | 0.011 | 0.000 | |
| SE | 0.002 | 0.011 | 0.028 | 0.041 | 0.003 | | |

-continued-

Table 4.-Page 2 of 2.

| Year | (0.2, 1.1) Age 3 | (0.3, 1.2, 2.1) Age 4 | (0.4, 1.3, 2.2) Age 5 | (0.5, 1.4, 2.3) Age 6 | (1.5, 2.4) Age 7 | (1.6, 2.5) Age 8 | Total Run |
|---|---|---|---|---|---|---|---|
| 1997 | 1,025 | 3,513 | 13,140 | 36,065 | 945 | 0 | 54,688 |
| SE | 83 | 535 | 1,641 | 4,482 | 322 | 0 | 6,054 |
| Prp | 0.019 | 0.064 | 0.240 | 0.659 | 0.017 | 0.000 | |
| SE | 0.002 | 0.010 | 0.030 | 0.082 | 0.006 | | |
| 1998 | 708 | 6,749 | 6,399 | 27,138 | 1,312 | 0 | 42,306 |
| SE | 62 | 683 | 666 | 960 | 335 | 0 | 534 |
| Prp | 0.017 | 0.160 | 0.151 | 0.641 | 0.031 | 0.000 | |
| SE | 0.001 | 0.016 | 0.016 | 0.023 | 0.008 | | |
| 1999 | 375 | 8,967 | 13,393 | 35,414 | 2,625 | 0 | 60,773 |
| SE | 131 | 827 | 1,030 | 1,305 | 523 | 0 | 1,030 |
| Prp | 0.006 | 0.148 | 0.220 | 0.583 | 0.043 | 0.000 | |
| SE | 0.002 | 0.014 | 0.017 | 0.021 | 0.009 | | |
| 2000 | 435 | 2,373 | 16,240 | 30,500 | 1,223 | 0 | 50,770 |
| SE | 38 | 445 | 1,084 | 1,190 | 365 | 0 | 308 |
| Prp | 0.009 | 0.047 | 0.320 | 0.601 | 0.024 | 0.000 | |
| SE | 0.001 | 0.009 | 0.021 | 0.023 | 0.007 | | |
| 2001 | 901 | 7,262 | 7,868 | 26,363 | 1,052 | 0 | 43,446 |
| SE | 85 | 701 | 855 | 1,087 | 350 | 0 | 640 |
| Prp | 0.021 | 0.167 | 0.181 | 0.607 | 0.024 | 0.000 | |
| SE | 0.002 | 0.016 | 0.020 | 0.025 | 0.008 | | |
| 2002 | 2,092 | 10,862 | 12,037 | 28,171 | 1,505 | 0 | 54,668 |
| SE | 204 | 562 | 590 | 1,207 | 251 | 0 | 1,372 |
| Prp | 0.038 | 0.199 | 0.220 | 0.515 | 0.028 | 0.000 | |
| SE | 0.004 | 0.010 | 0.011 | 0.022 | 0.005 | | |
| 2003 | 1,210 | 21,293 | 12,538 | 24,218 | 501 | 0 | 59,759 |
| SE | 188 | 659 | 582 | 708 | 121 | 0 | 459 |
| Prp | 0.020 | 0.356 | 0.210 | 0.405 | 0.008 | 0.000 | |
| SE | 0.003 | 0.011 | 0.010 | 0.012 | 0.002 | | |
| 2004 | 1,960 | 14,088 | 25,354 | 41,812 | 1,048 | 0 | 84,262 |
| SE | 234 | 688 | 929 | 1,550 | 218 | 0 | 1,770 |
| Prp | 0.023 | 0.167 | 0.301 | 0.496 | 0.012 | 0.000 | |
| SE | 0.003 | 0.008 | 0.011 | 0.018 | 0.003 | | |
| 2005 | 763 | 9,564 | 13,551 | 44,452 | 2,334 | 0 | 70,664 |
| SE | 191 | 698 | 903 | 1,480 | 413 | 0 | 1,397 |
| Prp | 0.011 | 0.135 | 0.192 | 0.629 | 0.033 | 0.000 | |
| SE | 0.003 | 0.010 | 0.013 | 0.021 | 0.006 | | |
| 2006 | 1,906 | 14,296 | 8,346 | 24,041 | 4,206 | 0 | 52,795 |
| SE | 233 | 697 | 546 | 852 | 429 | 0 | 891 |
| Prp | 0.036 | 0.271 | 0.158 | 0.455 | 0.080 | 0.000 | |
| SE | 0.004 | 0.013 | 0.010 | 0.016 | 0.008 | | |

*Note*: Prp = proportion

Table 5.-Harvest and catch in the recreational fishery for Kenai River late-run Chinook salmon, 1986-2006.

| | Harvest | | | | | | | | | | Catch | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CI-SB[a] | | CI-Sonar | | Sonar-SB | | SB-KL[b] | | Total | | Total Above Sonar | | CI-SB[a] | | SB-KL[b] | | Total | |
| Year | Estimate | SE | Estimate | SE | Estimate | SE | Estimate | SE | Estimate | SE | Estimate | SE | Estimate | SE | Estimate | SE | Estimate | SE |
| 1986 | 8,053 | 447 | | | | | 1,819 | 233 | 9,872 | 504 | | | 13,702 | 723 | 1,819 | 233 | 15,521 | 760 |
| 1987 | 10,767 | 740 | | | | | 2,333 | 366 | 13,100 | 825 | | | 14,595 | 896 | 2,333 | 366 | 16,928 | 968 |
| 1988 | 16,435 | 901 | | | | | 3,260 | 423 | 19,695 | 995 | | | 21,833 | 1,156 | 3,260 | 423 | 25,093 | 1,231 |
| 1989 | 8,008 | 522 | | | | | 1,683 | 165 | 9,691 | 548 | | | 10,525 | 852 | 1,683 | 165 | 12,208 | 868 |
| 1990 | 5,813 | 432 | | | | | 1,084 | 154 | 6,897 | 459 | | | 8,059 | 539 | 2,818 | 208 | 10,877 | 578 |
| 1991 | 6,849 | 410 | | | | | 1,054 | 122 | 7,903 | 428 | | | 8,091 | 479 | 2,030 | 150 | 10,121 | 502 |
| 1992 | 6,680 | 462 | | | | | 876 | 92 | 7,556 | 471 | | | 10,394 | 617 | 2,028 | 182 | 12,422 | 643 |
| 1993 | 15,279 | 620 | | | | | 2,496 | 173 | 17,775 | 644 | | | 19,660 | 787 | 3,910 | 272 | 23,570 | 833 |
| 1994 | 14,388 | 637 | | | | | 3,449 | 205 | 17,837 | 669 | | | 18,539 | 770 | 6,230 | 389 | 24,769 | 863 |
| 1995 | 10,125 | 510 | | | | | 2,484 | 155 | 12,609 | 533 | | | 13,899 | 649 | 4,434 | 313 | 18,333 | 721 |
| 1996 | 5,984 | 404 | | | | | 2,128 | 189 | 8,112 | 446 | | | 6,983 | 428 | 5,216 | 694 | 12,199 | 815 |
| 1997 | 10,336 | 710 | | | | | 2,419 | 199 | 12,755 | 737 | | | 12,536 | 828 | 7,130 | 1,041 | 19,666 | 1,330 |
| 1998 | 5,981 | 392 | | | | | 1,534 | 176 | 7,515 | 430 | | | 9,915 | 556 | 4,812 | 622 | 14,727 | 834 |
| 1999 | 12,027 | 963 | 1,170 | 152 | 10,857 | 958 | 1,568 | 163 | 13,595 | 977 | 12,425 | 972 | 17,197 | 1,527 | 4,664 | 451 | 21,861 | 1,592 |
| 2000 | 12,065 | 720 | 831 | 108 | 11,234 | 718 | 3,157 | 245 | 15,222 | 760 | 14,391 | 758 | 15,135 | 734 | 6,139 | 508 | 21,274 | 893 |
| 2001 | 13,736 | 996 | 1,336 | 174 | 12,400 | 989 | 2,744 | 263 | 16,480 | 1,030 | 15,144 | 1,023 | 19,752 | 1,422 | 6,730 | 808 | 26,482 | 1,635 |
| 2002 | 11,483 | 682 | 1,929 | 251 | 9,554 | 649 | 1,124 | 149 | 12,607 | 698 | 10,678 | 666 | 16,866 | 1,028 | 3,798 | 470 | 20,664 | 1,130 |
| 2003 | 13,837 | 1,168 | 823 | 134 | 13,014 | 1,160 | 3,106 | 258 | 16,943 | 1,196 | 16,120 | 1,188 | 28,769 | 1,746 | 10,030 | 2,479 | 38,799 | 3,032 |
| 2004 | 14,493 | 975 | 2,386 | 268 | 12,107 | 937 | 2,881 | 294 | 17,374 | 1,018 | 14,988 | 982 | 22,456 | 1,462 | 7,270 | 745 | 29,726 | 1,641 |
| 2005 | 15,313 | 1,161 | 2,287 | 210 | 13,026 | 1,142 | 2,901 | 281 | 18,214 | 1,194 | 15,927 | 1,176 | 25,663 | 2,214 | 7,910 | 724 | 33,573 | 2,329 |
| 2006 | 13,190 | 905 | 3,322 | 509 | 9,869 | 749 | 2,621 | 310 | 15,811 | 957 | 12,490 | 810 | 19,788 | 1323 | 6,089 | 733 | 25,877 | 1,513 |

Source: Conrad and Hammarstrom 1987; Hammarstrom 1988-1992, 1993a,-1994, King 1995-1997, Marsh 1999, 2000, Reimer et al. 2002, Reimer 2003, 2004a-b, 2007, Eskelin 2007, 2009.

[a] Cook Inlet–Soldotna Bridge: from creel survey, areas surveyed were (1) entire area open to fishing 1986–1989, (2) mid and lower sections in 1990, (3) lower only 1991–1998.

[b] Soldotna Bridge–Kenai Lake: from SWHS, 50% of published estimate for 1986–1992; catch for 1986–1995 not available, so used 50% of harvest estimate.

Table 6.-Estimates by age class of the total number of late-run Chinook salmon harvested in the recreational fishery of the Kenai River, 1986-2006.

| | Age Class | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Estimate | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | All |
| 1986 Harvest | 0 | 0 | 0 | 0 | 40 | 1,001 | 3,845 | 4,465 | 521 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9,872 |
| 1986 SE | 0 | 0 | 0 | 0 | 28 | 144 | 292 | 318 | 103 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 504 |
| 1987 Harvest | 0 | 0 | 0 | 0 | 54 | 136 | 2,983 | 9,520 | 407 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13,100 |
| 1987 SE | 0 | 0 | 0 | 0 | 38 | 61 | 313 | 656 | 106 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 825 |
| 1988 Harvest | 0 | 0 | 0 | 0 | 142 | 47 | 663 | 15,481 | 3,361 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19,695 |
| 1988 SE | 0 | 0 | 0 | 0 | 82 | 47 | 177 | 877 | 401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 995 |
| 1989 Harvest | 0 | 0 | 0 | 0 | 0 | 96 | 1,055 | 6,908 | 1,535 | 0 | 0 | 0 | 0 | 96 | 0 | 0 | 9,691 |
| 1989 SE | 0 | 0 | 0 | 0 | 0 | 96 | 307 | 586 | 364 | 0 | 0 | 0 | 0 | 96 | 0 | 0 | 548 |
| 1990 Harvest | 0 | 0 | 0 | 0 | 40 | 667 | 1,092 | 4,288 | 809 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6,897 |
| 1990 SE | 0 | 0 | 0 | 0 | 29 | 119 | 154 | 338 | 132 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 459 |
| 1991 Harvest | 0 | 0 | 0 | 0 | 0 | 390 | 921 | 6,025 | 496 | 0 | 0 | 0 | 71 | 0 | 0 | 0 | 7,903 |
| 1991 SE | 0 | 0 | 0 | 0 | 0 | 117 | 177 | 396 | 131 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 428 |
| 1992 Harvest | 0 | 0 | 0 | 0 | 38 | 150 | 1,165 | 5,752 | 451 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7,556 |
| 1992 SE | 0 | 0 | 0 | 0 | 38 | 75 | 206 | 425 | 129 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 471 |
| 1993 Harvest | 0 | 0 | 0 | 0 | 0 | 335 | 1,006 | 15,221 | 1,032 | 0 | 0 | 103 | 52 | 26 | 0 | 0 | 17,775 |
| 1993 SE | 0 | 0 | 0 | 0 | 0 | 93 | 161 | 600 | 163 | 0 | 0 | 52 | 36 | 26 | 0 | 0 | 644 |
| 1994 Harvest | 0 | 0 | 0 | 0 | 41 | 329 | 781 | 16,193 | 452 | 41 | 0 | 0 | 0 | 0 | 0 | 0 | 17,837 |
| 1994 SE | 0 | 0 | 0 | 0 | 41 | 116 | 178 | 656 | 136 | 41 | 0 | 0 | 0 | 0 | 0 | 0 | 669 |
| 1995 Harvest | 0 | 0 | 0 | 0 | 87 | 957 | 1,246 | 8,986 | 1,333 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12,609 |
| 1995 SE | 0 | 0 | 0 | 0 | 50 | 165 | 188 | 468 | 194 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 533 |
| 1996 Harvest | 0 | 0 | 0 | 0 | 0 | 485 | 2,981 | 4,472 | 173 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8,112 |
| 1996 SE | 0 | 0 | 0 | 0 | 0 | 129 | 304 | 361 | 77 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 446 |
| 1997 Harvest | 0 | 0 | 0 | 0 | 121 | 322 | 2,978 | 9,174 | 161 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12,755 |
| 1997 SE | 0 | 0 | 0 | 0 | 70 | 114 | 349 | 620 | 80 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 737 |
| 1998 Harvest | 0 | 0 | 0 | 0 | 114 | 908 | 931 | 5,335 | 227 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7,515 |
| 1998 SE | 0 | 0 | 0 | 0 | 51 | 144 | 146 | 358 | 72 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 430 |
| 1999 Harvest | 0 | 0 | 0 | 0 | 42 | 1,487 | 3,739 | 7,775 | 552 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13,595 |
| 1999 SE | 0 | 0 | 0 | 0 | 42 | 260 | 433 | 673 | 155 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 977 |
| 2000 Harvest | 32 | 0 | 32 | 0 | 252 | 441 | 4,727 | 9,549 | 189 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15,222 |
| 2000 SE | 30 | 0 | 30 | 0 | 92 | 109 | 397 | 583 | 77 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 760 |
| 2001 Harvest | 0 | 0 | 0 | 0 | 297 | 1,954 | 2,506 | 11,383 | 297 | 0 | 42 | 0 | 0 | 0 | 0 | 0 | 16,480 |
| 2001 SE | 0 | 0 | 0 | 0 | 100 | 290 | 350 | 814 | 117 | 0 | 49 | 0 | 0 | 0 | 0 | 0 | 1,030 |
| 2002 Harvest | 0 | 0 | 0 | 0 | 267 | 633 | 2,909 | 8,525 | 225 | 0 | 0 | 0 | 47 | 0 | 0 | 0 | 12,607 |
| 2002 SE | 0 | 0 | 0 | 0 | 101 | 156 | 341 | 549 | 92 | 0 | 0 | 0 | 43 | 0 | 0 | 0 | 698 |
| 2003 Harvest | 0 | 0 | 0 | 0 | 257 | 2,546 | 3,134 | 10,847 | 157 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16,943 |
| 2003 SE | 0 | 0 | 0 | 0 | 97 | 337 | 381 | 869 | 76 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,196 |
| 2004 Harvest | 0 | 0 | 0 | 0 | 210 | 1,545 | 4,777 | 10,308 | 534 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17,374 |
| 2004 SE | 0 | 0 | 0 | 0 | 90 | 257 | 476 | 722 | 153 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,018 |
| 2005 Harvest | 0 | 0 | 0 | 0 | 73 | 464 | 3,329 | 13,861 | 487 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18,214 |
| 2005 SE | 0 | 0 | 0 | 0 | 45 | 117 | 358 | 985 | 123 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,195 |
| 2006 Harvest | 0 | 0 | 0 | 0 | 80 | 1,744 | 3,260 | 9,839 | 888 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15,811 |
| 2006 SE | 0 | 0 | 0 | 0 | 48 | 258 | 370 | 704 | 188 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 957 |

Table 7.-Summary of Kenai River Chinook salmon 55 inches TL or larger sealed by the Alaska Department of Fish and Game, 2003-2006.

| Date | Location | Resident/non resident | Power/Drift Boat | Guided/Non-guided | Fish color | Sex | TL (in) | Length: mid eye to tail fork (mm) | Girth (in) | Weight (lb) | Fish age |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7/12/2003 | Big Eddy | R | P | NG | Blushed | M | 55.5 | 1,215 | 31 | 70.12 | 1.5 |
| 7/23/2003 | Sunken Island | NR | P | G | Blushed | M | 57 | 1,238 | 35 | 85 | 1.4 |
| 7/24/2003 | Poacher's Cove | NR | P | G | Silver | M | 55.25 | 1,225 | 33.25 | 74.5 | 1.4 |
| 7/26/2003 | RM 26 | R | P | NG | Red | M | 55.63 | 1,158 | 33 | 72 | 1.4 |
| 7/26/2003 | Eagle Rock | R | P | NG | Blushed | M | 55 | 1,240 | 32 | 76 | 1.5 |
| 7/30/2003 | Sunken Island | NR | P | G | Blushed | M | 55.5 | 1,219 | 34.5 | 81 | 1.4 |
| 7/31/2003 | Sunken Island | NR | P | G | Red | M | 57 | 1,245 | 33.5 | 76.5 | 1.4 |
| 7/1/2004 | 3 miles below Moose R. | R | P | G | Red | M | 56 | 1,199 | 32.125 | 71.35 | 1.4 |
| 7/3/2004 | Poacher's Cove | NR | P | G | Blushed | M | 55 | 1,205 | 31.75 | 68.7 | 1.4 |
| 7/20/2004 | Beaver Creek | R | P | NG | Blushed | M | 56.25 | 1,240 | 33.875 | 76.8 | 1.4 |
| 7/29/2004 | Rock Pile (Middle River) | NR | P | G | Red | M | 55.5 | 1,215 | 34.875 | 80.2 | 1.5 |
| 6/24/2005 | Sunken Island RM 18.1 | NR | P | G | Blushed | M | 55.38 | 1,223 | 31.875 | 70.4 | 1.4 |
| 7/13/2005 | Beaver Creek | R | P | NG | Blushed | M | 55.38 | 1,160 | 33 | 72.7 | 1.5 |
| 7/14/2005 | Lower Bluffs | R | P | G | Silver | M | 55.75 | 1,225 | 30 | 65.1 | 1.5 |
| 7/15/2005 | Cow Pastures | NR | P | G | Blushed | M | 57.88 | 1,245 | 35 | 86.45 | N/A |
| 7/15/2005 | Slikok Cr. | NR | P | NG | Silver | M | 56.88 | 1,260 | 31.875 | 73.73 | 1.4 |
| 7/15/2005 | Eagle Rock | R | P | NG | Blushed | M | 56.25 | 1,245 | 31.75 | 75.6 | 1.5 |
| 7/30/2005 | Below Cunningham park | NR | P | G | Blushed | M | 58 | 1,272 | 32 | 78.9 | N/A |
| 7/31/2005 | RM 10 Flat below Beaver CR | N/A | P | NG | Silver | M | 56 | 1,215 | 33 | 74.9 | 1.5 |
| 7/31/2005 | Falling in Hole | R | P | NG | Red | M | 55.5 | 1,215 | 33 | 67.8 | 1.5 |
| 7/8/2006 | Across from Pillars RM 12.3 | R | P | NG | Blushed | M | 55.5 | 1,275 | 31.5 | 73.25 | 1.4 |
| 7/16/2006 | Honeymoon Cove | R | P | NG | Blushed | M | 55.5 | 1,275 | N/A | 75.85 | 1.4 |
| 7/16/2006 | Cow Pastures | NR | P | NG | Blushed | M | 55 | 1,240 | 31.25 | 60.35 | 1.4 |
| 7/18/2006 | Cow Pastures | NR | P | G | Blushed | M | 55.25 | 1,223 | 31 | 64.7 | 1.5 |
| 7/26/2006 | Airplane Hole RM 14.5 | NR | P | G | Blushed | M | 57 | 1,280 | 34.75 | 86.55 | 1.4 |
| 7/28/2006 | Mud Island | NR | P | G | Red | M | 56 | 1,240 | 33 | 68.2 | 1.5 |
| 7/29/2006 | UK | NR | P | G | Blushed | M | 56.25 | 1,275 | 31.75 | 74.9 | 1.5 |
| 7/31/2006 | RM. 7.5 Pastures | R | D | NG | Blushed | M | 55 | 1,185 | 29 | 56.84 | 1.4 |

Table 8.- Estimated sport catch, harvest, releases, and hook-and-release fishing mortality of late-run Kenai River Chinook salmon, 1986–2006.

| | Sport Catch | | Sport Harvest | | Released | | Proportion Hook-and-Release Mortality | | Hook-and-Release Mortality | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Estimate | SE | Estimate | SE | Estimate | SE | Estimate | SE | Estimate | SE |
| 1986 | 15,521 | 760 | 9,872 | 504 | 5,649 | 912 | 0.0825 | 0.0435 | 466 | 254 |
| 1987 | 16,928 | 968 | 13,100 | 825 | 3,828 | 1,272 | 0.0825 | 0.0435 | 316 | 189 |
| 1988 | 25,093 | 1,231 | 19,695 | 995 | 5,398 | 1,583 | 0.0825 | 0.0435 | 445 | 260 |
| 1989 | 12,208 | 868 | 9,691 | 548 | 2,517 | 1,026 | 0.1060 | 0.0330 | 267 | 133 |
| 1990 | 10,877 | 578 | 6,897 | 459 | 3,980 | 738 | 0.0590 | 0.0220 | 235 | 96 |
| 1991 | 10,121 | 502 | 7,903 | 428 | 2,218 | 660 | 0.0825 | 0.0435 | 183 | 107 |
| 1992 | 12,422 | 643 | 7,556 | 471 | 4,866 | 797 | 0.0825 | 0.0435 | 401 | 219 |
| 1993 | 23,570 | 833 | 17,775 | 644 | 5,795 | 1,052 | 0.0825 | 0.0435 | 478 | 263 |
| 1994 | 24,769 | 863 | 17,837 | 669 | 6,932 | 1,092 | 0.0825 | 0.0435 | 572 | 311 |
| 1995 | 18,333 | 721 | 12,609 | 533 | 5,724 | 896 | 0.0825 | 0.0435 | 472 | 257 |
| 1996 | 12,199 | 815 | 8,112 | 446 | 4,087 | 929 | 0.0825 | 0.0435 | 337 | 189 |
| 1997 | 19,666 | 1,330 | 12,755 | 737 | 6,911 | 1,521 | 0.0825 | 0.0435 | 570 | 319 |
| 1998 | 14,727 | 834 | 7,515 | 430 | 7,212 | 939 | 0.0825 | 0.0435 | 595 | 320 |
| 1999 | 21,861 | 1,592 | 13,595 | 977 | 8,266 | 1,868 | 0.0825 | 0.0435 | 682 | 383 |
| 2000 | 21,274 | 893 | 15,222 | 760 | 6,052 | 1,173 | 0.0825 | 0.0435 | 499 | 276 |
| 2001 | 26,482 | 1,635 | 16,480 | 1,030 | 10,002 | 1,933 | 0.0825 | 0.0435 | 825 | 456 |
| 2002 | 20,664 | 1,130 | 12,607 | 698 | 8,057 | 1,329 | 0.0825 | 0.0435 | 665 | 363 |
| 2003 | 38,799 | 3,032 | 16,943 | 1,196 | 21,856 | 3,259 | 0.0825 | 0.0435 | 1,803 | 978 |
| 2004 | 29,726 | 1,641 | 17,374 | 1,018 | 12,352 | 1,931 | 0.0825 | 0.0435 | 1,019 | 554 |
| 2005 | 33,573 | 2,329 | 18,214 | 1,194 | 15,359 | 2,618 | 0.0825 | 0.0435 | 1,267 | 693 |
| 2006 | 25,877 | 1,513 | 15,811 | 957 | 10,065 | 1,790 | 0.0825 | 0.0435 | 830 | 455 |

Table 9.-Estimated number of late-run Kenai River Chinook salmon hook-and-release mortalities by age class in the sport fishery.

| | | Age Class | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | All |
| 1986 | Inriver Run % | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 12.14 | 43.78 | 39.65 | 4.43 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 100 |
| | Inriver Run % SE | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.81 | 1.22 | 1.21 | 0.51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| | Hook-and-Release Mortality | 0 | 0 | 0 | 0 | 0 | 57 | 204 | 185 | 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 466 |
| | Hook-and-Release SE | 0 | 0 | 0 | 0 | 0 | 31 | 111 | 101 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 254 |
| 1987 | Inriver Run % | 0 | 0 | 0 | 0 | 0 | 2 | 28 | 69 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| | Inriver Run % SE | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Hook-and-Release Mortality | 0 | 0 | 0 | 0 | 0 | 6 | 88 | 217 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 316 |
| | Hook-and-Release SE | 0 | 0 | 0 | 0 | 0 | 4 | 53 | 130 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 189 |
| 1988 | Inriver Run % | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.28 | 3.84 | 77.69 | 17.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 100 |
| | Inriver Run % SE | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.37 | 0.63 | 1.36 | 1.23 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| | Hook-and-Release Mortality | 0 | 0 | 0 | 0 | 0 | 6 | 17 | 346 | 77 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 445 |
| | Hook-and-Release SE | 0 | 0 | 0 | 0 | 0 | 4 | 10 | 202 | 45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 260 |
| 1989 | Inriver Run % | 0.00 | 0.00 | 0.00 | 0.00 | 0.16 | 10.29 | 12.25 | 64.87 | 12.09 | 0.33 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 100 |
| | Inriver Run % SE | 0.00 | 0.00 | 0.00 | 0.00 | 0.16 | 1.23 | 1.33 | 1.93 | 1.32 | 0.23 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| | Hook-and-Release Mortality | 0 | 0 | 0 | 0 | 0 | 27 | 33 | 173 | 32 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 267 |
| | Hook-and-Release SE | 0 | 0 | 0 | 0 | 0 | 14 | 17 | 86 | 16 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 133 |
| 1990 | Inriver Run % | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 12.29 | 14.56 | 68.62 | 4.54 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 100 |
| | Inriver Run % SE | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.43 | 1.53 | 2.02 | 0.91 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| | Hook-and-Release Mortality | 0 | 0 | 0 | 0 | 0 | 29 | 34 | 161 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 235 |
| | Hook-and-Release SE | 0 | 0 | 0 | 0 | 0 | 12 | 14 | 66 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 96 |
| 1991 | Inriver Run % | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7.45 | 15.84 | 69.57 | 6.52 | 0.00 | 0.00 | 0.00 | 0.62 | 0.00 | 0.00 | 0.00 | 100 |
| | Inriver Run % SE | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.47 | 2.04 | 2.57 | 1.38 | 0.00 | 0.00 | 0.00 | 0.44 | 0.00 | 0.00 | 0.00 | |
| | Hook-and-Release Mortality | 0 | 0 | 0 | 0 | 0 | 14 | 29 | 127 | 12 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 183 |
| | Hook-and-Release SE | 0 | 0 | 0 | 0 | 0 | 8 | 17 | 74 | 7 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 107 |

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Table 9.-Page 2 of 4.

| | | Age Class | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | All |
| 1992 | Inriver Run % | 0 | 0 | 0 | 0 | 0 | 7 | 16 | 75 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| | Inriver Run % SE | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Hook-and-Release Mortality | 0 | 0 | 0 | 0 | 0 | 27 | 64 | 301 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 401 |
| | Hook-and-Release SE | 0 | 0 | 0 | 0 | 0 | 15 | 35 | 164 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 219 |
| 1993 | Inriver Run % | 0 | 0 | 0 | 0 | 0 | 8 | 14 | 72 | 6 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 100 |
| | Inriver Run % SE | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Hook-and-Release Mortality | 0 | 0 | 0 | 0 | 0 | 38 | 67 | 343 | 27 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 478 |
| | Hook-and-Release SE | 0 | 0 | 0 | 0 | 0 | 22 | 38 | 189 | 16 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 263 |
| 1994 | Inriver Run % | 0 | 0 | 0 | 0 | 0 | 6 | 11 | 78 | 4 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 100 |
| | Inriver Run % SE | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Hook-and-Release Mortality | 0 | 0 | 0 | 0 | 0 | 32 | 65 | 448 | 23 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 572 |
| | Hook-and-Release SE | 0 | 0 | 0 | 0 | 0 | 18 | 36 | 244 | 14 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 311 |
| 1995 | Inriver Run % | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 22.33 | 21.36 | 50.49 | 5.34 | 0.00 | 0.00 | 0.00 | 0.00 | 0.49 | 0.00 | 0.00 | 100 |
| | Inriver Run % SE | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.91 | 2.86 | 3.49 | 1.57 | 0.00 | 0.00 | 0.00 | 0.00 | 0.49 | 0.00 | 0.00 | |
| | Hook-and-Release Mortality | 0 | 0 | 0 | 0 | 0 | 105 | 101 | 238 | 25 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 472 |
| | Hook-and-Release SE | 0 | 0 | 0 | 0 | 0 | 58 | 56 | 130 | 15 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 257 |
| 1996 | Inriver Run % | 0.00 | 0.00 | 0.00 | 0.00 | 0.21 | 7.68 | 33.90 | 57.36 | 0.85 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 100 |
| | Inriver Run % SE | 0.00 | 0.00 | 0.00 | 0.00 | 0.21 | 1.23 | 2.19 | 2.29 | 0.43 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| | Hook-and-Release Mortality | 0 | 0 | 0 | 0 | 1 | 26 | 114 | 193 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 337 |
| | Hook-and-Release SE | 0 | 0 | 0 | 0 | 1 | 15 | 64 | 109 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 189 |
| 1997 | Inriver Run % | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.15 | 21.80 | 71.97 | 1.73 | 0.00 | 0.00 | 0.35 | 0.00 | 0.00 | 0.00 | 0.00 | 100 |
| | Inriver Run % SE | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.18 | 2.43 | 2.65 | 0.77 | 0.00 | 0.00 | 0.35 | 0.00 | 0.00 | 0.00 | 0.00 | |
| | Hook-and-Release Mortality | 0 | 0 | 0 | 0 | 0 | 24 | 124 | 410 | 10 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 570 |
| | Hook-and-Release SE | 0 | 0 | 0 | 0 | 0 | 14 | 70 | 230 | 7 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 319 |

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Table 9.-Page 3 of 4.

| | | Age Class | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | All |
| 1998 | Inriver Run % | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 14.91 | 14.04 | 67.84 | 3.22 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 100 |
| | Inriver Run % SE | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.93 | 1.88 | 2.53 | 0.96 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| | Hook-and-Release Mortality | 0 | 0 | 0 | 0 | 0 | 89 | 84 | 404 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 595 |
| | Hook-and-Release SE | 0 | 0 | 0 | 0 | 0 | 49 | 46 | 218 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 320 |
| 1999 | Inriver Run % | 0.00 | 0.00 | 0.00 | 0.00 | 0.26 | 12.44 | 21.24 | 60.88 | 4.66 | 0.00 | 0.00 | 0.00 | 0.52 | 0.00 | 0.00 | 0.00 | 100 |
| | Inriver Run % SE | 0.00 | 0.00 | 0.00 | 0.00 | 0.26 | 1.68 | 2.08 | 2.49 | 1.07 | 0.00 | 0.00 | 0.00 | 0.37 | 0.00 | 0.00 | 0.00 | |
| | Hook-and-Release Mortality | 0 | 0 | 0 | 0 | 2 | 85 | 145 | 415 | 32 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 682 |
| | Hook-and-Release SE | 0 | 0 | 0 | 0 | 2 | 49 | 82 | 233 | 19 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 383 |
| 2000 | Inriver Run % | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.92 | 31.33 | 62.14 | 2.61 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 100 |
| | Inriver Run % SE | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.99 | 2.37 | 2.48 | 0.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| | Hook-and-Release Mortality | 0 | 0 | 0 | 0 | 0 | 20 | 156 | 310 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 499 |
| | Hook-and-Release SE | 0 | 0 | 0 | 0 | 0 | 12 | 87 | 172 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 276 |
| 2001 | Inriver Run % | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 12.02 | 19.06 | 66.20 | 2.72 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| | Inriver Run % SE | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.00 | 2.46 | 2.94 | 1.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Hook-and-Release Mortality | 0 | 0 | 0 | 0 | 0 | 99 | 157 | 546 | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 825 |
| | Hook-and-Release SE | 0 | 0 | 0 | 0 | 0 | 56 | 88 | 302 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 456 |
| 2002 | Inriver Run % | 0.11 | 0.43 | 0.00 | 0.00 | 1.47 | 17.66 | 18.54 | 58.47 | 3.32 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 100 |
| | Inriver Run % SE | 0.11 | 0.22 | 0.00 | 0.00 | 0.40 | 1.25 | 1.28 | 1.58 | 0.58 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| | Hook-and-Release Mortality | 1 | 3 | 0 | 0 | 10 | 117 | 123 | 389 | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 665 |
| | Hook-and-Release SE | 1 | 2 | 0 | 0 | 6 | 64 | 68 | 212 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 363 |
| 2003 | Inriver Run % | 0.00 | 0.00 | 0.00 | 0.00 | 1.30 | 29.53 | 19.85 | 48.87 | 0.46 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| | Inriver Run % SE | 0.00 | 0.00 | 0.00 | 0.00 | 0.33 | 1.33 | 1.20 | 1.48 | 0.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| | Hook-and-Release Mortality | 0 | 0 | 0 | 0 | 23 | 532 | 358 | 881 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,803 |
| | Hook-and-Release SE | 0 | 0 | 0 | 0 | 14 | 289 | 195 | 478 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 978 |

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Table 9.-Page 4 of 4.

| | | Age Class | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | All |
| 2004 | Inriver Run % | 0.00 | 0.00 | 0.00 | 0.00 | 1.03 | 14.01 | 24.64 | 58.92 | 1.28 | 0.00 | 0.00 | 0.00 | 0.11 | 0.00 | 0.00 | 0.00 | 100.00 |
| | Inriver Run % SE | 0.00 | 0.00 | 0.00 | 0.00 | 0.32 | 1.10 | 1.40 | 1.56 | 0.37 | 0.00 | 0.00 | 0.00 | 0.11 | 0.00 | 0.00 | 0.00 | |
| | Hook-and-Release Mortality | 0 | 0 | 0 | 0 | 10 | 143 | 251 | 600 | 13 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1,019 |
| | Hook-and-Release SE | 0 | 0 | 0 | 0 | 6 | 78 | 137 | 327 | 8 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 554 |
| 2005 | Inriver Run % | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.89 | 18.49 | 70.47 | 4.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| | Inriver Run % SE | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.15 | 1.73 | 2.03 | 0.88 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| | Hook-and-Release Mortality | 0 | 0 | 0 | 0 | 0 | 87 | 234 | 893 | 53 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,267 |
| | Hook-and-Release SE | 0 | 0 | 0 | 0 | 0 | 49 | 129 | 489 | 30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 693 |
| 2006 | Inriver Run % | 0.00 | 0.00 | 0.00 | 0.00 | 1.33 | 26.57 | 13.44 | 48.88 | 9.78 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| | Inriver Run % SE | 0.00 | 0.00 | 0.00 | 0.00 | 0.47 | 1.69 | 1.33 | 1.88 | 1.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| | Hook-and-Release Mortality | 0 | 0 | 0 | 0 | 11 | 221 | 112 | 406 | 81 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 830 |
| | Hook-and-Release SE | 0 | 0 | 0 | 0 | 7 | 122 | 62 | 223 | 45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 455 |

Table 10.-Sibling return ratios for late-run Kenai River Chinook salmon for brood years 1980-2001.

| Brood Year | Age 5/ Age 4 | Age 6/ Age 5 | Age 6/ Age 4+5 | Age 7/ Age 6 | Age 7/ Age 5+6 | Age 7/ Age 4+5+6 |
|---|---|---|---|---|---|---|
| 1980 | | | | 0.03 | | |
| 1981 | | 1.40 | | 0.20 | 0.12 | |
| 1982 | 1.81 | 2.37 | 1.53 | 0.09 | 0.06 | 0.06 |
| 1983 | 1.00 | 5.98 | 2.99 | 0.08 | 0.06 | 0.06 |
| 1984 | 2.64 | 4.24 | 3.08 | 0.10 | 0.08 | 0.07 |
| 1985 | 1.42 | 4.22 | 2.47 | 0.05 | 0.04 | 0.03 |
| 1986 | 1.30 | 4.04 | 2.29 | 0.13 | 0.10 | 0.09 |
| 1987 | 2.08 | 5.78 | 3.90 | 0.08 | 0.07 | 0.06 |
| 1988 | 2.75 | 5.07 | 3.72 | 0.07 | 0.06 | 0.05 |
| 1989 | 1.40 | 3.30 | 1.93 | 0.02 | 0.02 | 0.01 |
| 1990 | 2.65 | 2.07 | 1.50 | 0.03 | 0.02 | 0.02 |
| 1991 | 1.38 | 1.97 | 1.14 | 0.04 | 0.02 | 0.02 |
| 1992 | 2.41 | 2.07 | 1.46 | 0.10 | 0.07 | 0.06 |
| 1993 | 1.82 | 5.53 | 3.57 | 0.03 | 0.03 | 0.03 |
| 1994 | 1.98 | 2.28 | 1.51 | 0.03 | 0.02 | 0.02 |
| 1995 | 1.81 | 1.62 | 1.05 | 0.06 | 0.04 | 0.03 |
| 1996 | 3.32 | 3.58 | 2.75 | 0.02 | 0.01 | 0.01 |
| 1997 | 1.66 | 2.01 | 1.25 | 0.04 | 0.03 | 0.02 |
| 1998 | 1.15 | 3.33 | 1.79 | 0.06 | 0.04 | 0.04 |
| 1999 | 1.19 | 1.75 | 0.95 | 0.09 | 0.06 | 0.05 |
| 2000 | 0.96 | 1.77 | 0.87 | | | |
| 2001 | 0.87 | | | | | |
| Mean | 1.78 | 3.22 | 2.09 | 0.07 | 0.05 | 0.04 |
| SD | 0.34 | 0.49 | 0.31 | 0.02 | 0.10 | 0.01 |
| % CV | 19% | 15% | 15% | 23% | 196% | 24% |
| Max | 3.32 | 5.98 | 3.90 | 0.20 | 0.12 | 0.09 |
| Min | 0.87 | 1.40 | 0.87 | 0.02 | 0.01 | 0.01 |

Table 11.-Return estimates by brood year and age for late-run Kenai Chinook salmon, 1978-2006.

| | | Return | | | | | | Total | Return |
|---|---|---|---|---|---|---|---|---|---|
| Brood | Spawning | (0.2, 1.1) | (0.3, 1.2, 2.1) | (0.4, 1.3, 2.2) | (0.5, 1.4, 2.3) | (1.5, 2.4) | (1.6, 2.5) | Return | per |
| Year | Escapement | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | To Date | Spawner |
| | | | | | | | (1986) | | |
| 1978 | Unknown | | | | | | 16 | 16 | |
| SE | | | | | | | 16 | 16 | |
| | | | | | | (1986) | (1987) | | |
| 1979 | Unknown | | | | | 3,363 | 100 | 3,463 | |
| SE | | | | | | 912 | 71 | 915 | |
| | | | | | (1986) | (1987) | (1988) | | |
| 1980 | Unknown | | | | 30,619 | 897 | 0 | 31,516 | |
| SE | | | | | 7,748 | 189 | 0 | 7,751 | |
| | | | | (1986) | (1987) | (1988) | (1989) | | |
| 1981 | Unknown | | | 33,456 | 46,725 | 9,572 | 95 | 89,848 | |
| SE | | | | 8,549 | 1,206 | 690 | 67 | 8,661 | |
| | | | (1986) | (1987) | (1988) | (1989) | (1990) | | |
| 1982 | Unknown | | 12,071 | 21,884 | 51,941 | 4,766 | 0 | 90,662 | |
| SE | | | 2,416 | 864 | 1,318 | 419 | 0 | 2,915 | |
| | | (1986) | (1987) | (1988) | (1989) | (1990) | (1991) | | |
| 1983 | Unknown | 311 | 4,279 | 4,288 | 25,639 | 1,945 | 0 | 36,462 | |
| SE | | 71 | 348 | 378 | 840 | 319 | 0 | 1,038 | |
| | | (1987) | (1988) | (1989) | (1990) | (1991) | (1992) | | |
| 1984 | Unknown | 596 | 2,284 | 6,039 | 25,600 | 2,489 | 0 | 37,009 | |
| SE | | 122 | 249 | 429 | 938 | 484 | 0 | 1,173 | |
| | | (1988) | (1989) | (1990) | (1991) | (1992) | (1993) | | |
| 1985 | Unknown | 497 | 4,655 | 6,589 | 27,787 | 1,297 | 0 | 40,825 | |
| SE | | 91 | 388 | 546 | 1,215 | 270 | 0 | 1,416 | |
| | | (1989) | (1990) | (1991) | (1992) | (1993) | (1994) | | |
| 1986 | 47,375 | 150 | 5,742 | 7,485 | 30,275 | 3,806 | 15 | 47,475 | 1.00 |
| SE | 19,464 | 60 | 503 | 735 | 1,100 | 662 | 12 | 1,564 | 0.41 |
| | | (1990) | (1991) | (1992) | (1993) | (1994) | (1995) | | |
| 1987 | 34,900 | 66 | 4,058 | 8,429 | 48,736 | 3,880 | 9 | 65,177 | 1.87 |
| SE | 1,442 | 26 | 526 | 657 | 1,863 | 582 | 9 | 2,126 | 0.10 |
| | | (1991) | (1992) | (1993) | (1994) | (1995) | (1996) | | |
| 1988 | 32,137 | 50 | 3,840 | 10,579 | 53,638 | 3,635 | 0 | 71,743 | 2.23 |
| SE | 1,622 | 25 | 445 | 1,006 | 1,547 | 736 | 0 | 2,036 | 0.13 |
| | | (1992) | (1993) | (1994) | (1995) | (1996) | (1997) | | |
| 1989 | 19,256 | 300 | 6,148 | 8,617 | 28,431 | 614 | 0 | 44,111 | 2.29 |
| SE | 903 | 70 | 780 | 863 | 1,633 | 174 | 0 | 2,014 | 0.15 |

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Table 11.-Page 2 of 2.

| Brood Year | Spawning Escapement | Return (0.2, 1.1) Age 3 | (0.3, 1.2, 2.1) Age 4 | (0.4, 1.3, 2.2) Age 5 | (0.5, 1.4, 2.3) Age 6 | (1.5, 2.4) Age 7 | (1.6, 2.5) Age 8 | Total Return To Date | Return per Spawner |
|---|---|---|---|---|---|---|---|---|---|
| | | (1993) | (1994) | (1995) | (1996) | (1997) | (1998) | | |
| 1990 | 26,508 | 439 | 5,224 | 13,835 | 28,635 | 945 | 0 | 49,078 | 1.85 |
| SE | 877 | 83 | 625 | 1,296 | 2,225 | 322 | 0 | 2,670 | 0.12 |
| | | (1994) | (1995) | (1996) | (1997) | (1998) | (1999) | | |
| 1991 | 26,695 | 718 | 13,296 | 18,303 | 36,065 | 1,312 | | 69,694 | 2.61 |
| SE | 998 | 87 | 1,316 | 1,482 | 4,482 | 335 | 0 | 4,913 | 0.21 |
| | | (1995) | (1996) | (1997) | (1998) | (1999) | (2000) | | |
| 1992 | 22,524 | 436 | 5,447 | 13,140 | 27,138 | 2,625 | | 48,786 | 2.17 |
| SE | 842 | 60 | 564 | 1,641 | 960 | 51 | 0 | 1,984 | 0.12 |
| | | (1996) | (1997) | (1998) | (1999) | (2000) | (2001) | | |
| 1993 | 33,738 | 621 | 3,513 | 6,399 | 35,414 | 1,223 | | 47,169 | 1.40 |
| SE | 1,508 | 100 | 535 | 666 | 188 | 365 | 0 | 953 | 0.07 |
| | | (1997) | (1998) | (1999) | (2000) | (2001) | (2002) | | |
| 1994 | 35,065 | 1,025 | 6,749 | 13,393 | 30,500 | 1,052 | | 52,719 | 1.50 |
| SE | 1,560 | 83 | 683 | 1,030 | 1,190 | 350 | 0 | 1,753 | 0.08 |
| | | (1998) | (1999) | (2000) | (2001) | (2002) | (2003) | | |
| 1995 | 31,255 | 708 | 8,967 | 16,240 | 26,363 | 1,505 | | 53,783 | 1.72 |
| SE | 1,136 | 62 | 827 | 1,084 | 1,087 | 251 | 0 | 1,763 | 0.08 |
| | | (1999) | (2000) | (2001) | (2002) | (2003) | (2004) | | |
| 1996 | 30,907 | 375 | 2,373 | 7,868 | 28,171 | 501 | | 39,288 | 1.27 |
| SE | 3,568 | 131 | 445 | 855 | 1,207 | 121 | | 1,555 | 0.16 |
| | | (2000) | (2001) | (2002) | (2003) | (2004) | (2005) | | |
| 1997 | 26,297 | 435 | 7,262 | 12,037 | 24,218 | 1,048 | 0 | 44,999 | 1.71 |
| SE | 6,102 | 38 | 701 | 590 | 708 | 218 | | 1,179 | 0.40 |
| | | (2001) | (2002) | (2003) | (2004) | (2005) | (2006) | | |
| 1998 | 26,768 | 901 | 10,862 | 12,538 | 41,812 | 2,334 | 0 | 68,448 | 2.56 |
| SE | 733 | 85 | 562 | 582 | 1,550 | 413 | | 1,799 | 0.10 |
| | | (2002) | (2003) | (2004) | (2005) | (2006) | | | |
| 1999 | 34,962 | 2,092 | 21,293 | 25,354 | 44,452 | 4,206 | | 97,397 | 2.79 |
| SE | 1,271 | 204 | 659 | 929 | 1,480 | 413 | | 1,924 | 0.12 |
| | | (2003) | (2004) | (2005) | (2006) | | | | |
| 2000 | 29,627 | 1,210 | 14,088 | 13,551 | 24,041 | | | 52,890 | |
| SE | 1,048 | 188 | 687 | 903 | 852 | | | 1,431 | |
| | | (2004) | (2005) | (2006) | | | | | |
| 2001 | 17,947 | 1,960 | 9,564 | 8,346 | | | | 19,869 | |
| SE | 1,254 | 234 | 698 | 546 | | | | 916 | |
| | | (2005) | (2006) | | | | | | |
| 2002 | 30,464 | 763 | 14,315 | | | | | 15,078 | |
| SE | 1,551 | 191 | 697 | | | | | 723 | |
| | | (2006) | | | | | | | |
| 2003 | 23,736 | 1,906 | | | | | | 1,906 | |
| SE | 1,599 | 233 | | | | | | 233 | |

Table 12.–Posterior percentiles from a Bayesian Ricker spawner-recruit analysis of late-run Kenai River Chinook salmon, brood years 1979–2003.

| | Percentiles | | | | |
|---|---|---|---|---|---|
| Parameters | 2.5% | 10% | Median | 90% | 97.5% |
| *ln(a)* | 0.80 | 1.03 | 1.56 | 2.17 | 2.54 |
| *a* | 2.2 | 2.8 | 4.8 | 8.7 | 12.7 |
| $b \times 10^5$ | 4.98E-06 | 1.24E-05 | 3.06E-05 | 5.34E-05 | 6.78E-05 |
| $s_{SR}$ | 0.13 | 0.17 | 0.24 | 0.34 | 0.40 |
| *f* | -0.50 | -0.25 | 0.22 | 0.69 | 0.89 |
| $s_{SR / (1-f^2)}$ | 0.14 | 0.18 | 0.26 | 0.41 | 0.62 |
| $S_{MSY}^c$ | 11,940 | 14,090 | 20,270 | 37,510 | 77,370 |
| $S_{MAX}$ | 14,750 | 18,740 | 32,650 | 80,580 | 200,700 |
| $S_{EQ}$ | 36,370 | 40,220 | 52,430 | 90,450 | 183,200 |
| *1990 and before* | | | | | |
| *D* | 29 | 41 | 69 | 108 | 134 |
| $p_1$ | 0.070 | 0.079 | 0.096 | 0.115 | 0.128 |
| $p_2$ | 0.145 | 0.157 | 0.179 | 0.202 | 0.216 |
| $p_3$ | 0.613 | 0.632 | 0.662 | 0.689 | 0.704 |
| $p_4$ | 0.044 | 0.050 | 0.062 | 0.076 | 0.085 |
| *1991 and after* | | | | | |
| *D* | 29 | 36 | 58 | 91 | 116 |
| $p_1$ | 0.129 | 0.138 | 0.155 | 0.174 | 0.185 |
| $p_2$ | 0.204 | 0.215 | 0.236 | 0.258 | 0.271 |
| $p_3$ | 0.531 | 0.547 | 0.575 | 0.599 | 0.612 |
| $p_4$ | 0.022 | 0.026 | 0.034 | 0.044 | 0.050 |

*Note:* parameters are defined in Appendix B.

Table 13.–Relative uncertainty (RU80) of Ricker spawner-recruit parameter estimates for Pacific salmon populations analyzed with Bayesian age-structured spawner-recruit methods.

| | | | | | | | $RU_{80}$ [a] | | |
|---|---|---|---|---|---|---|---|---|---|
| Salmon species | River | Years [b] | *S* uncertainty | Harvest rate | $\hat{\phi}$ | $\hat{\sigma}_{SR}$ | $\ln(\alpha)$ | $\beta$ | $S_{MSY}$ |
| Coho | Chilkat | 7/9 | high | low | 0.69 | 0.31 | 0.67 | 0.60 | 0.51 |
| Chinook | Anchor | 5/31 | high | low | 0.23 | 0.17 | 0.85 | 0.98 | 0.42 |
| Chinook | Karluk | 12/29 | low | low | 0.16 | 0.49 | 1.46 | 1.63 | 1.39 |
| Chinook | Ayakulik | 12/28 | low | low | -0.17 | 0.51 | 1.44 | 0.59 | 0.38 |
| Chinook | Kenai, early run | 21/21 | mod-high | mixed | 0.24 | 0.16 | 0.35 | 0.48 | 0.32 |
| Chinook | Kenai, late run | 21/21 | mod-high | moderate | *0.22* | *0.24* | *0.73* | *1.34* | *1.16* |
| Chinook | Deshka | 10/31 | low | mixed | 0.67 | 0.44 | 0.77 | 0.69 | 0.57 |
| Sockeye | Buskin | 8/8 | low | high | 0.43 | 0.57 | 1.21 | 1.63 | 2.11 |

[a] RU80 is defined as the width of 80% credibility intervals (90th posterior percentile – 10th posterior percentile) divided by the posterior median.

[b] Numbers before slash represent years of complete data; numbers after dash represent years with partial data.

# FIGURES

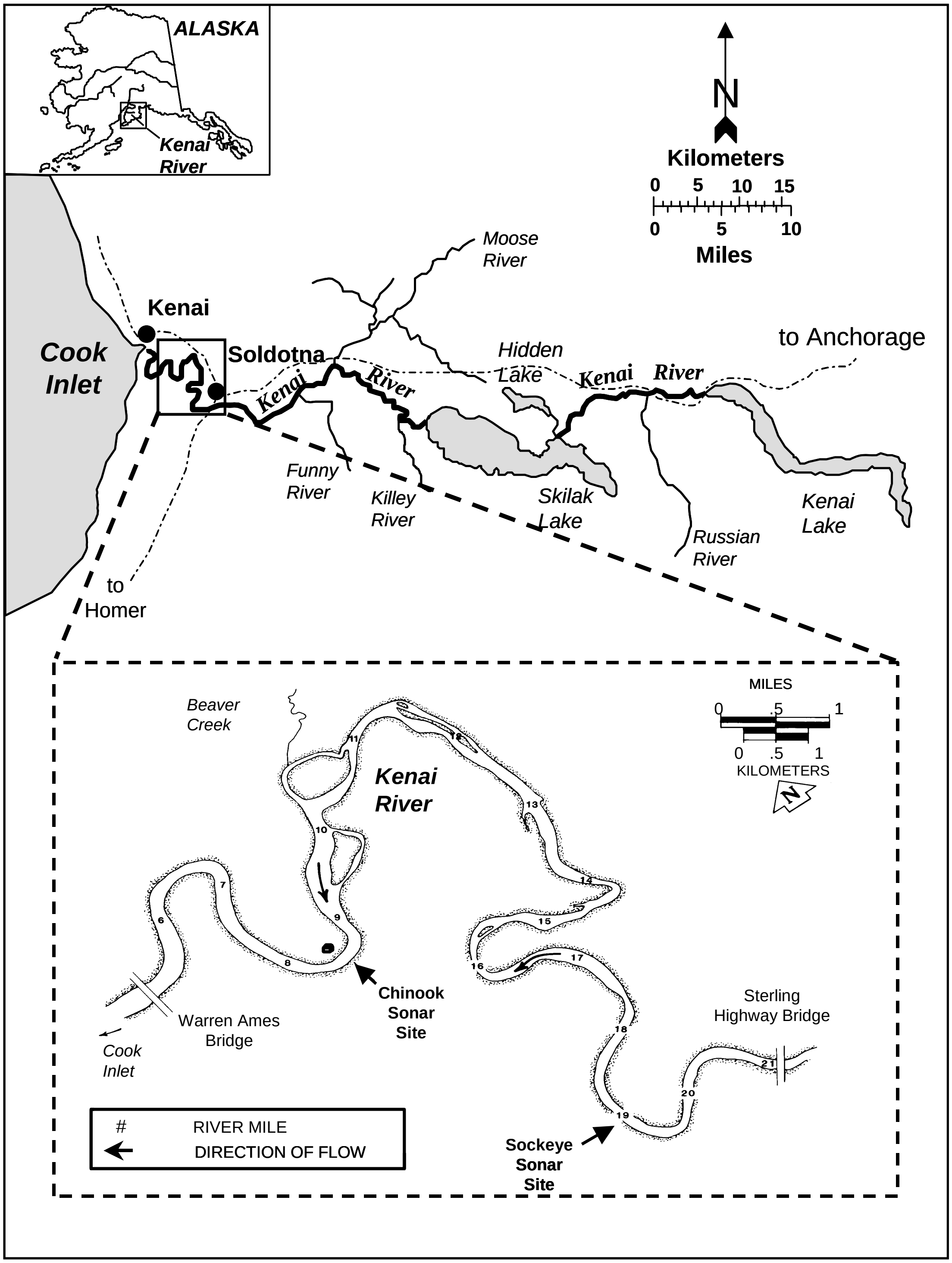
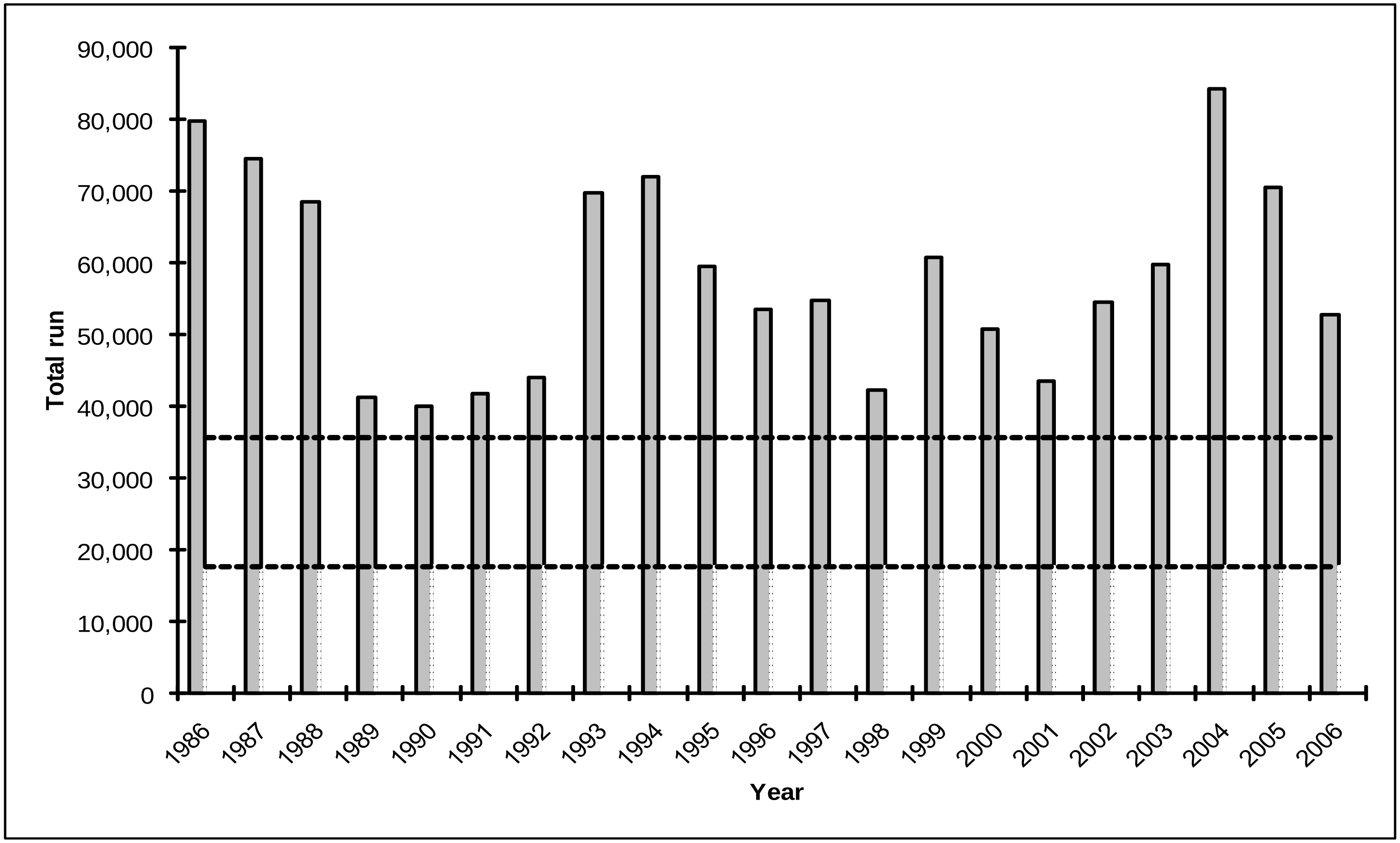
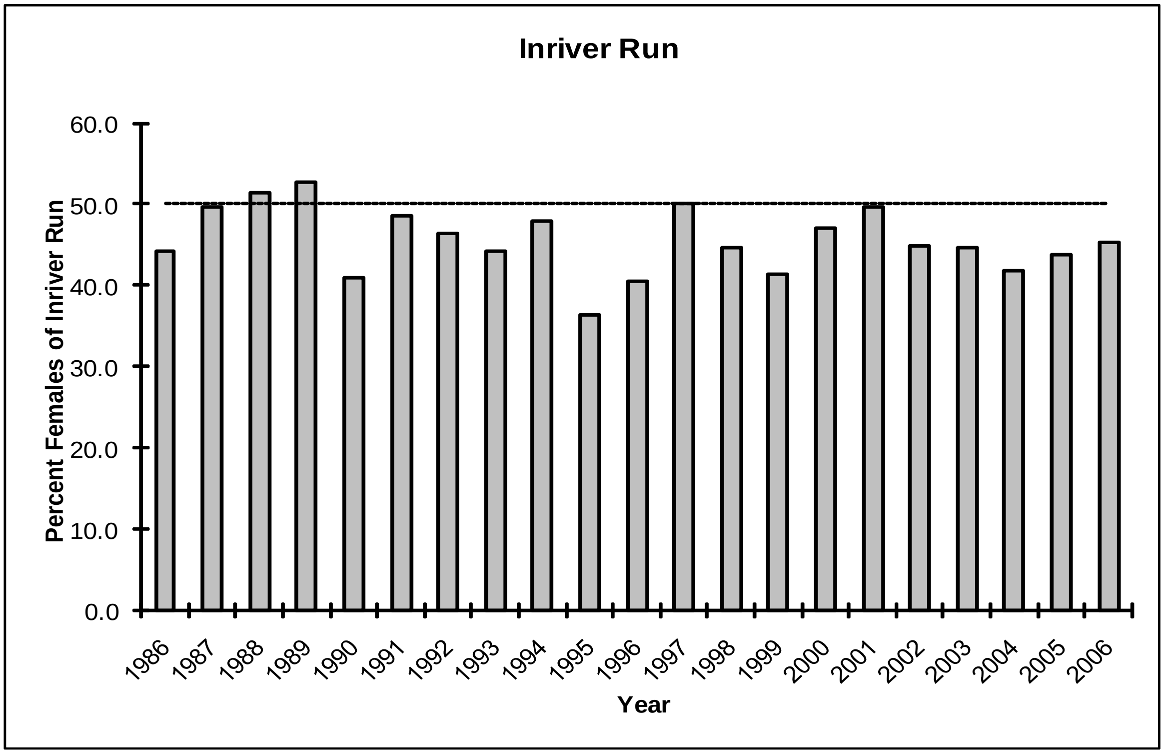



Figure 1.-Kenai River drainage and location of the mile-8.6 Chinook sonar site, the Soldotna Bridge, and tributaries.




*Note*:  Dashed lines indicate lower and upper values of the BEG range in effect since 1999.

Figure 2.-Total run of late-run Kenai River Chinook salmon, 1986-2006.



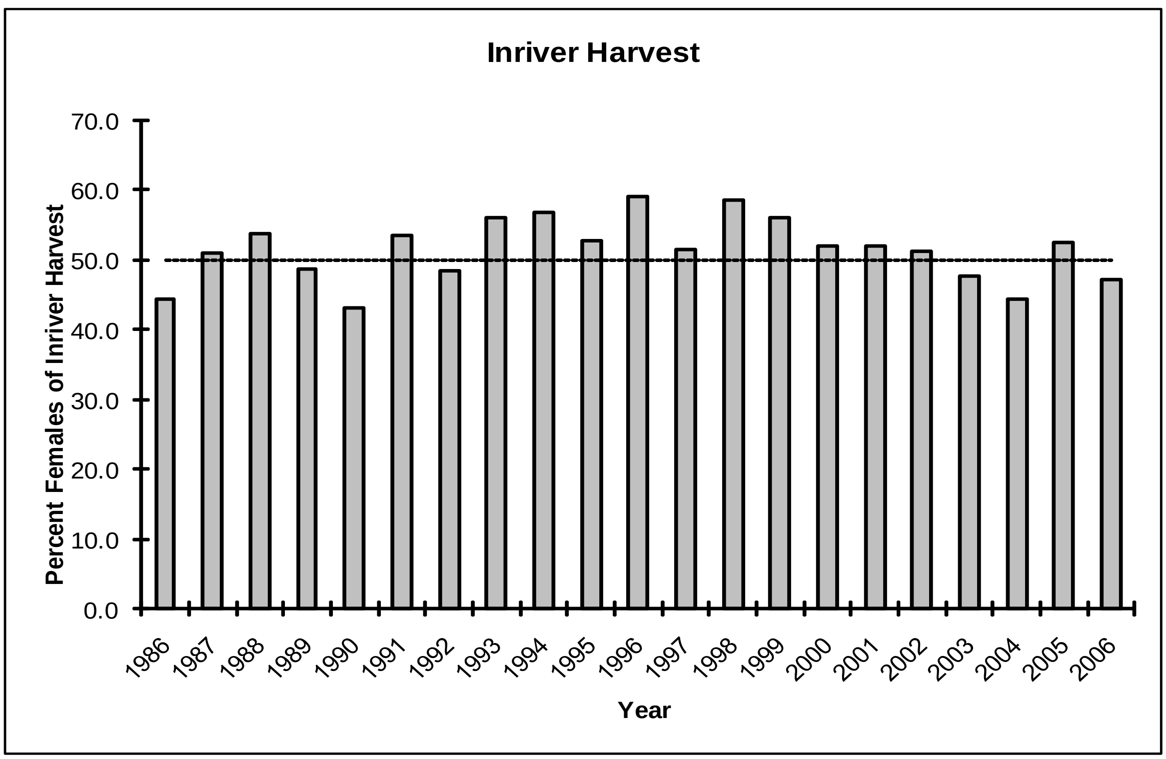




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Figure 3.-Percent of females in the inriver run, inriver harvest, and escapement of late-run Kenai River Chinook salmon, 1986-2006.

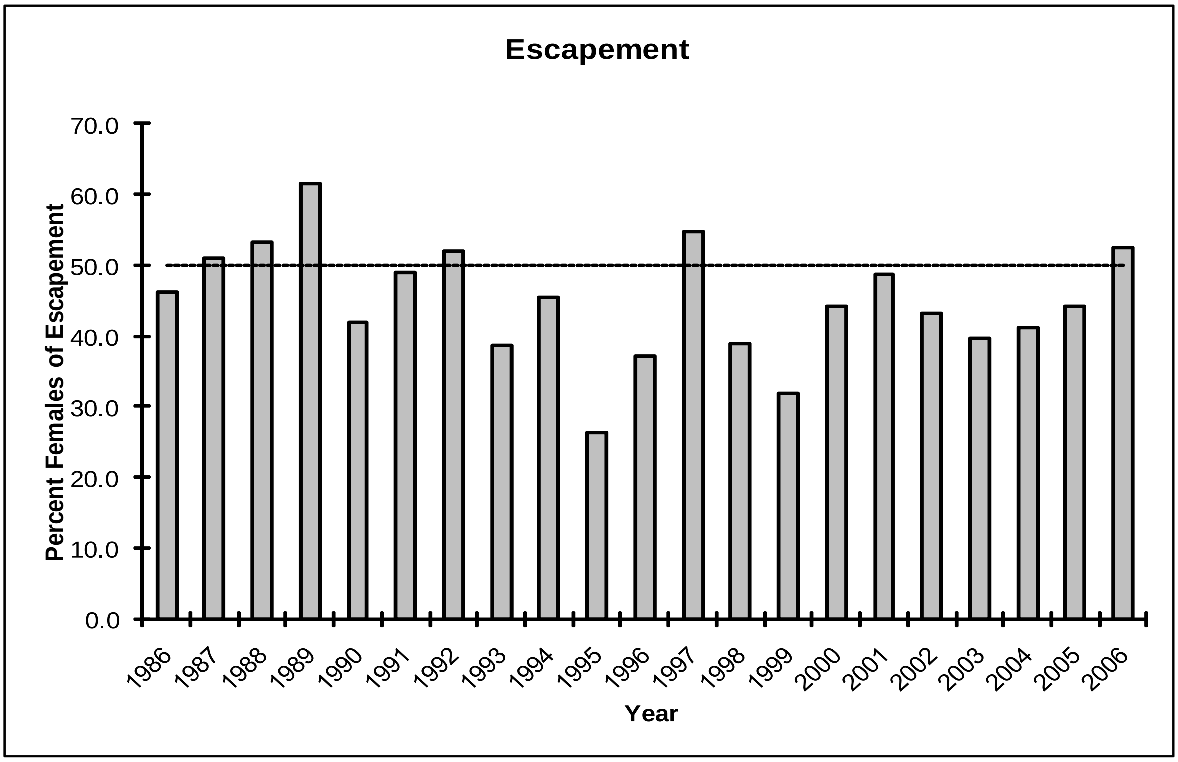
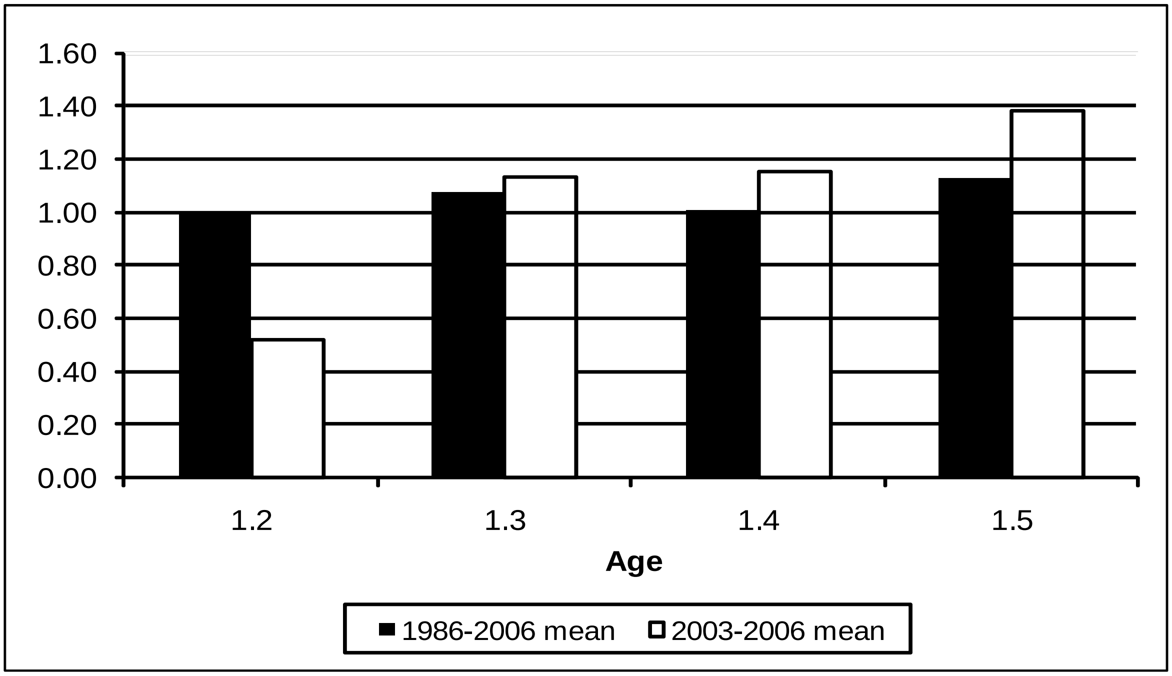
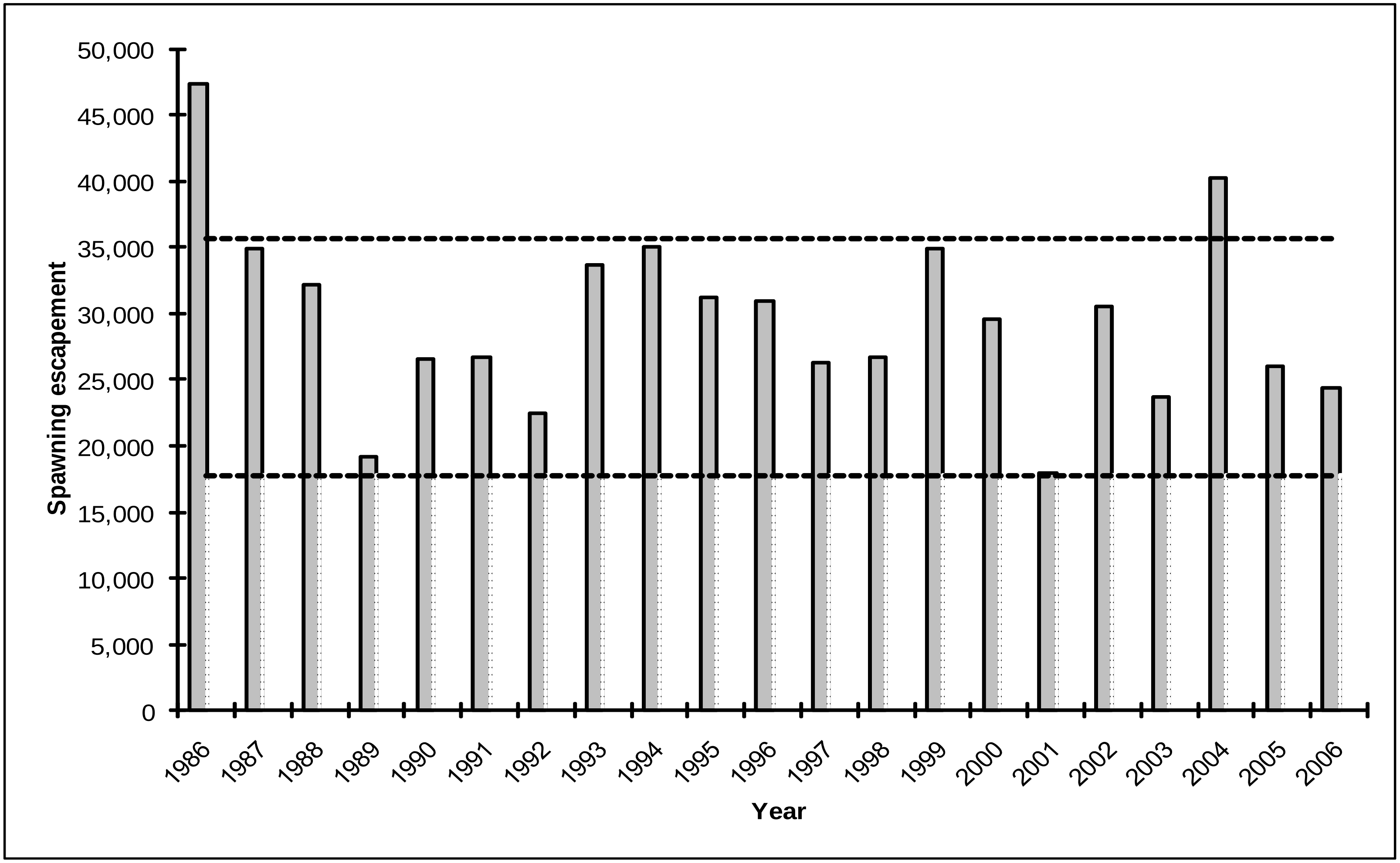



Figure 3.-Page 2 of 2.




*Note*: Selectivity estimates less than 1 equate to no selectivity for that age class; values of 1 equate to no selectivity or neutral; values greater than 1 equate to selectivity for that age class.

Figure 4.-Relative harvest selectivity estimates by age for all late-run Kenai River Chinook salmon, 1986-2006, and for the 4 most recent years (2003-2006).




*Note*: Dashed lines indicate lower and upper values of the BEG range in effect since 1999.

Figure 5.-Spawning escapements of late-run Kenai River Chinook salmon by year, 1986-2006

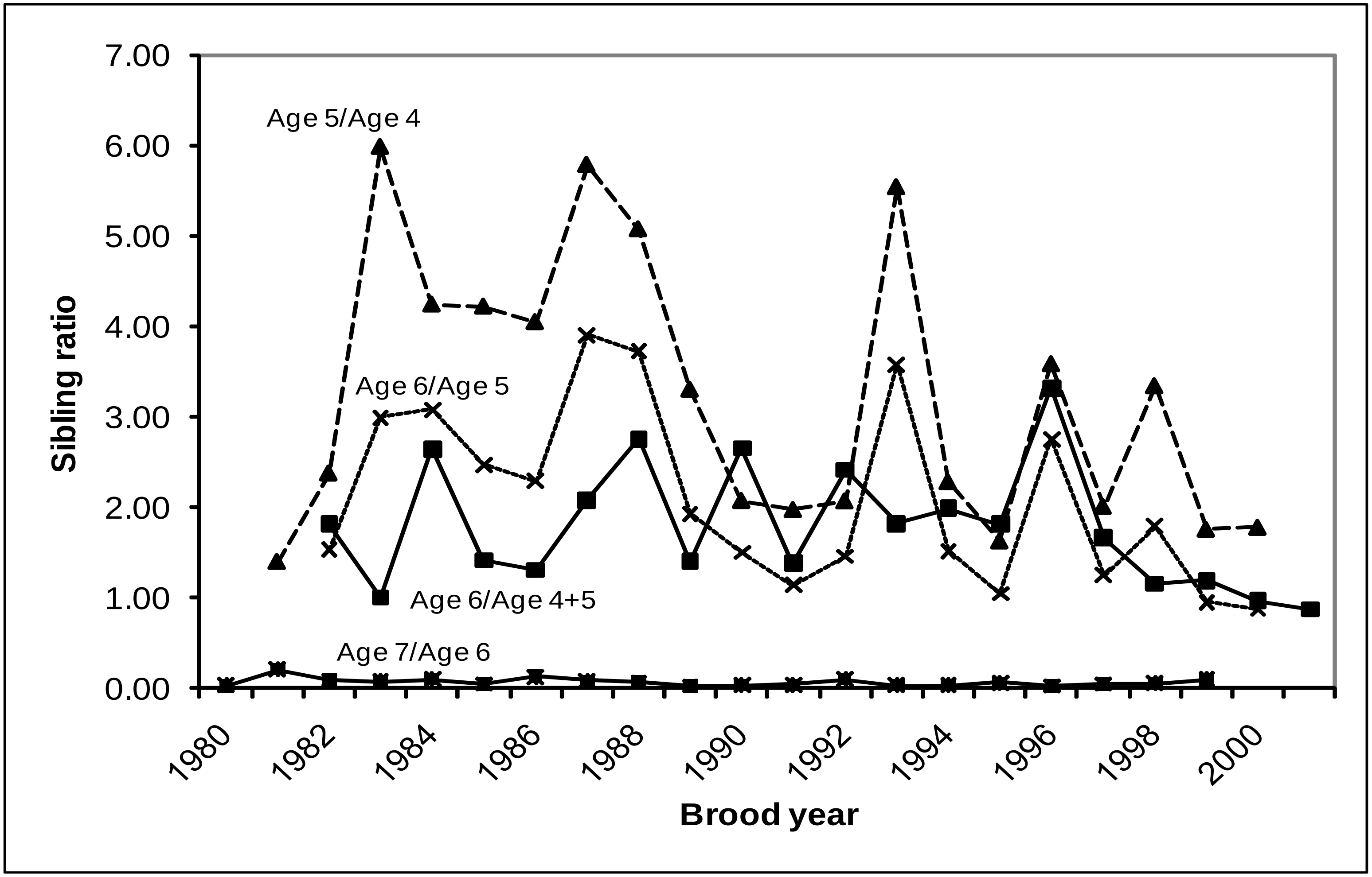



Figure 6.-Sibling ratio estimates by brood year for late-run Kenai River Chinook salmon, 1980-2000.

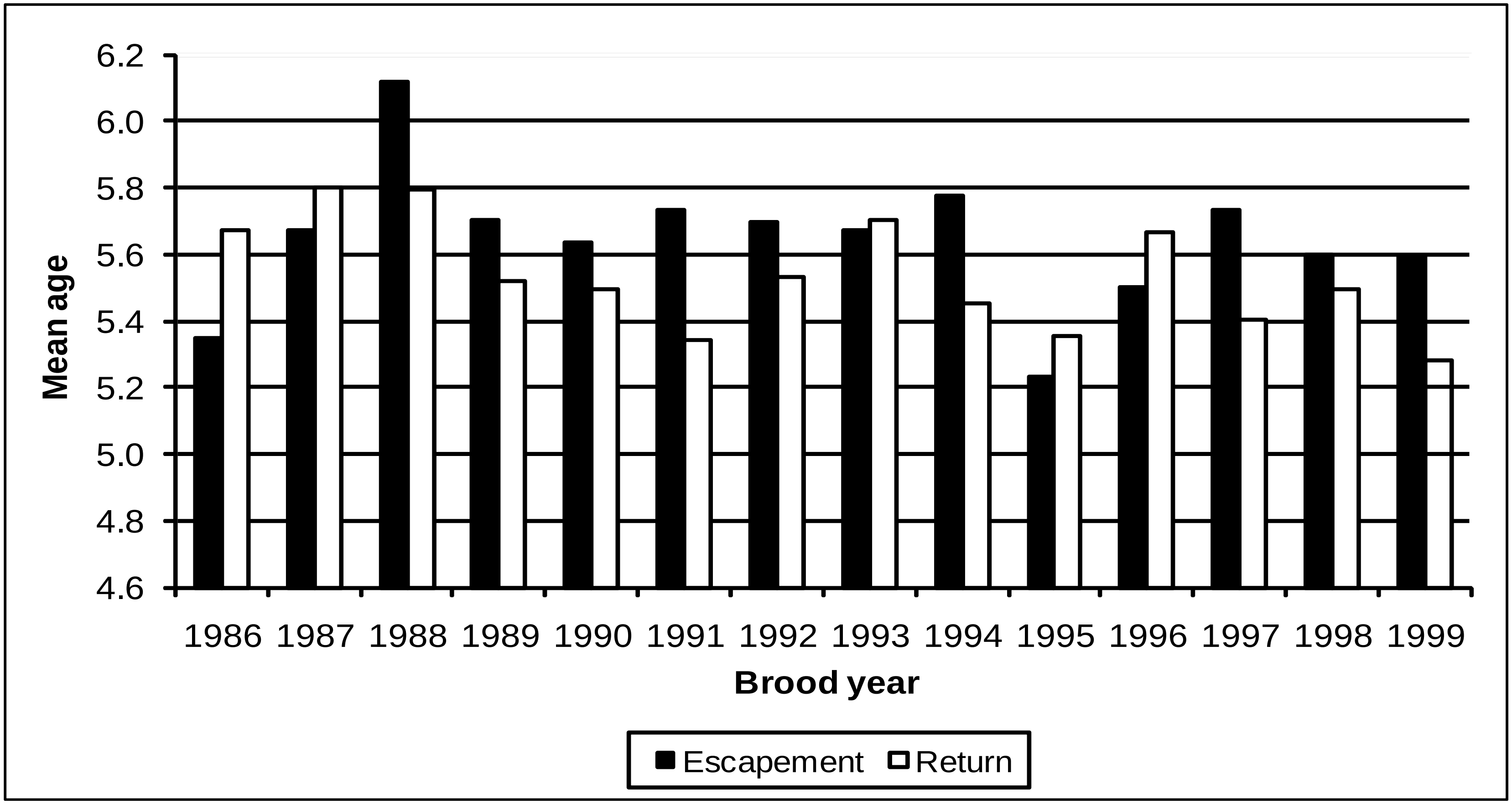



Figure 7.-Mean age of escapement and return estimates by brood year for late-run Kenai River Chinook salmon.

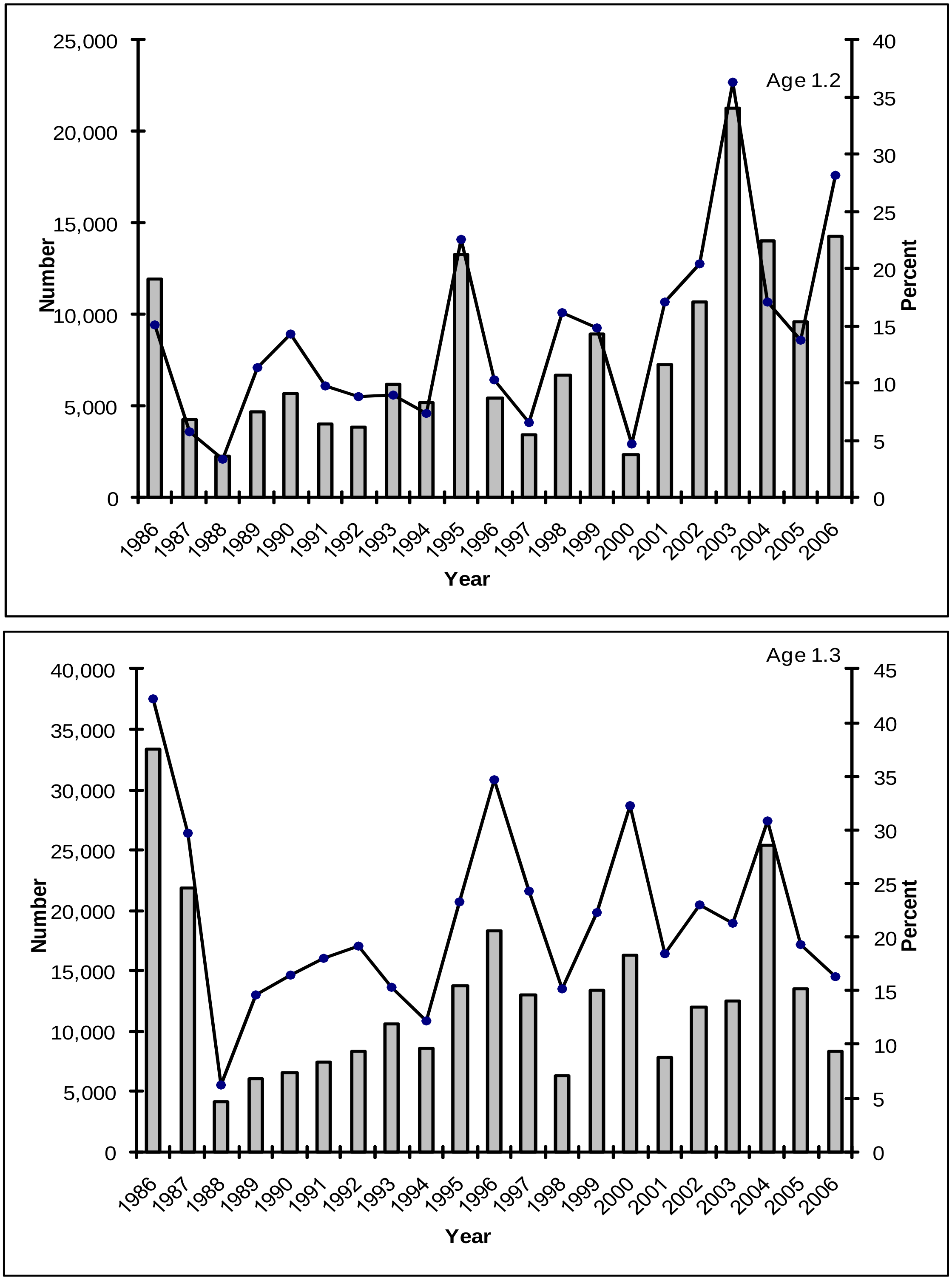



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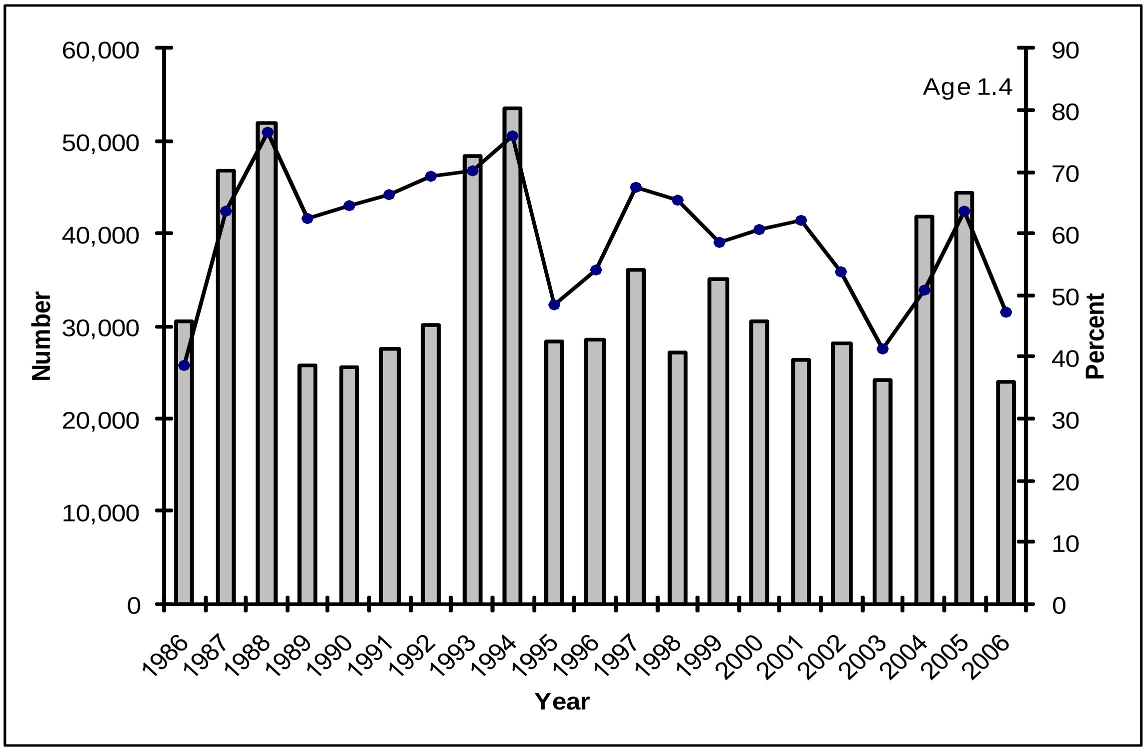
Figure 8.-Number (gray bars) and percent (lines) of age-1.2, -1.3, -1.4, and -1.5 late-run Kenai River Chinook salmon in the total run, 1986-2006.



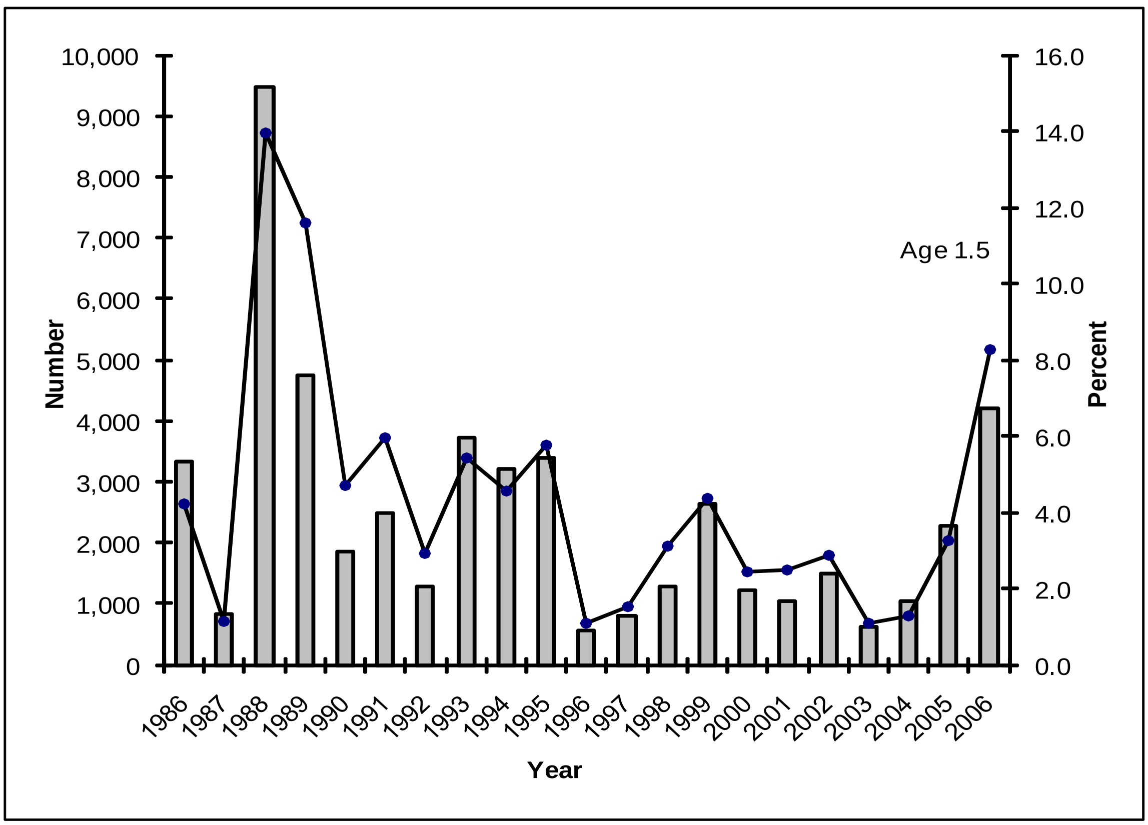




Figure 8.-Page 2 of 2.

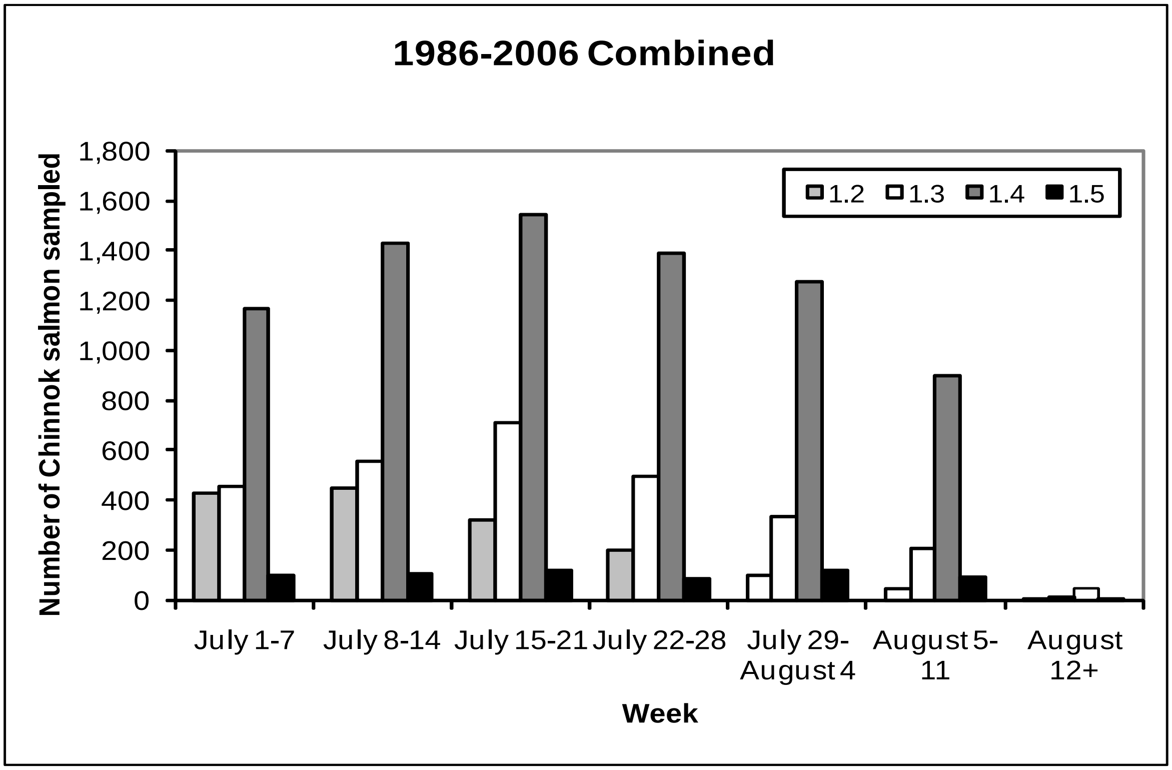



Figure 9.-Age composition (ages 1.2, 1.3, 1.4, and 1.5 only) estimates of inriver late-run Kenai River Chinook salmon by date and year, 1986-2006.

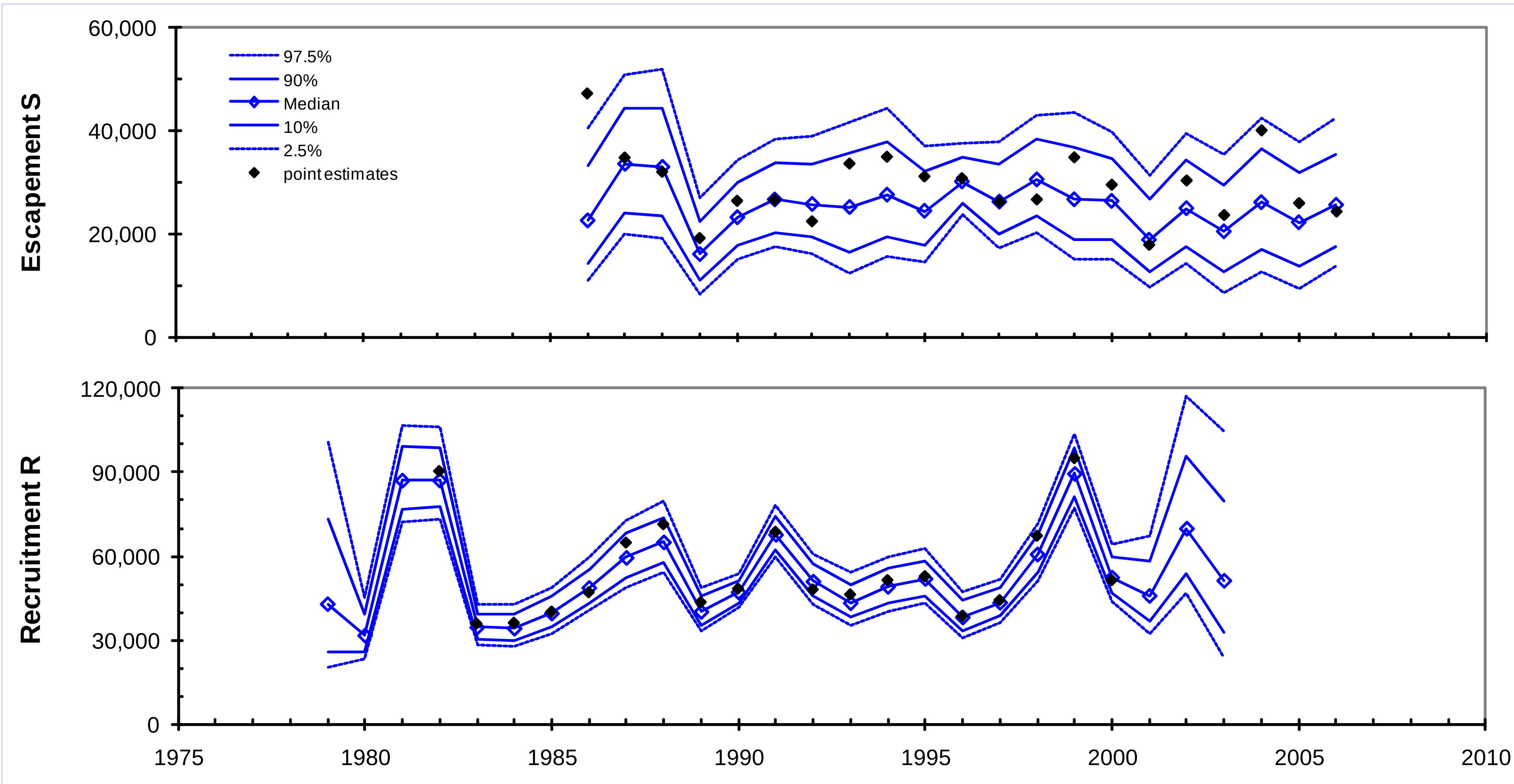
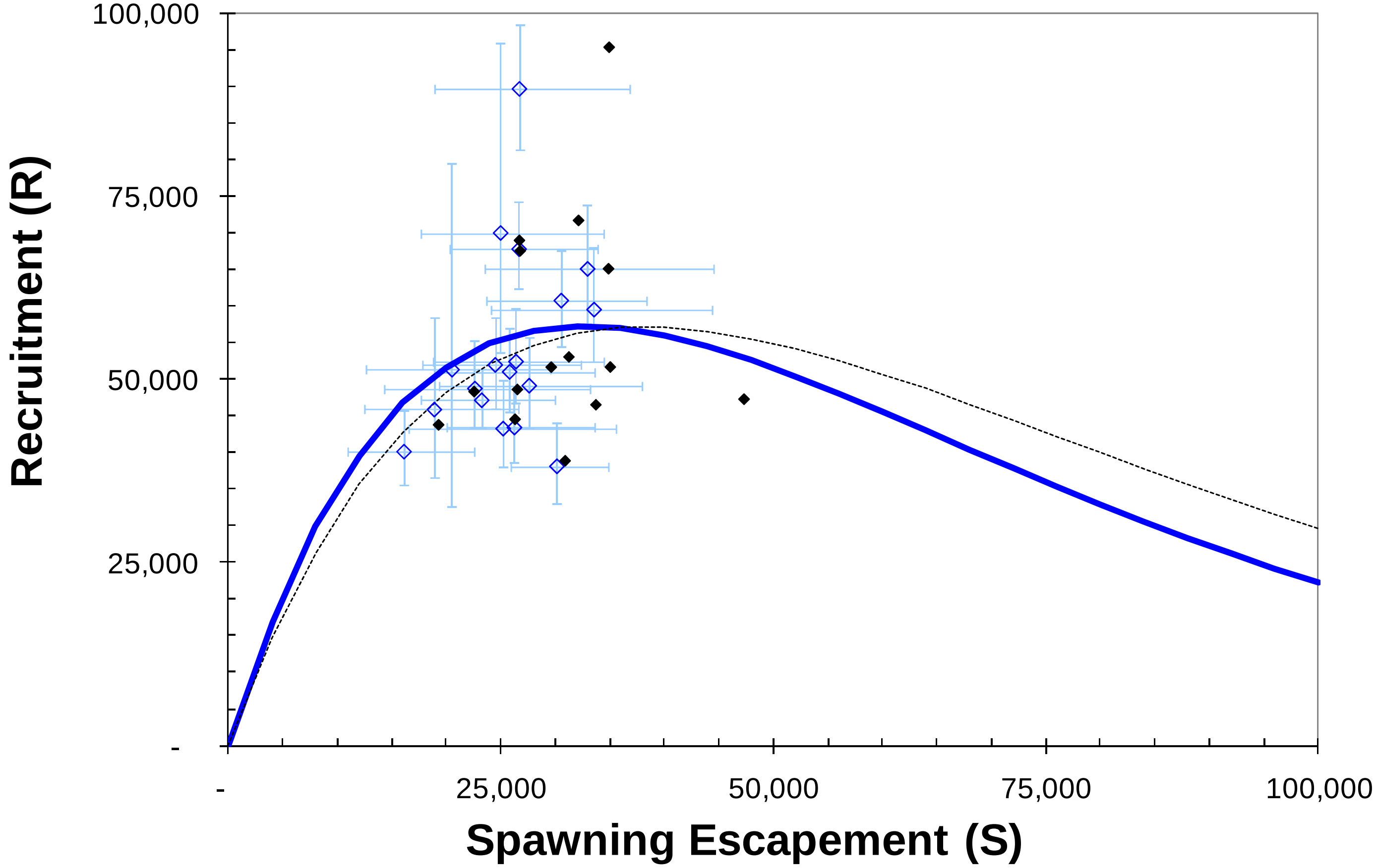
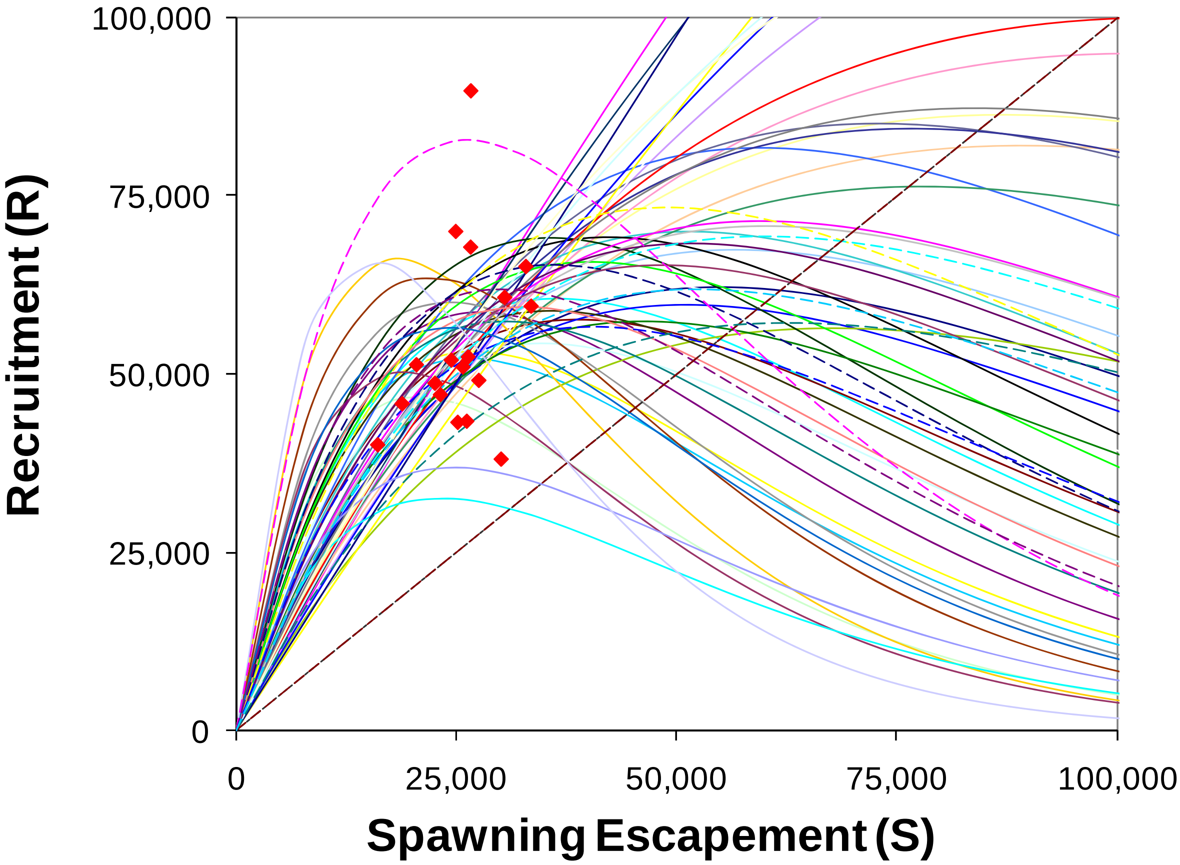



Figure 10.–Data-based point estimates (*solid symbols*) and Bayesian posterior percentiles (*open symbols and lines*) of spawning escapement and recruitment for late-run Kenai River Chinook salmon brood years, 1979–2006.



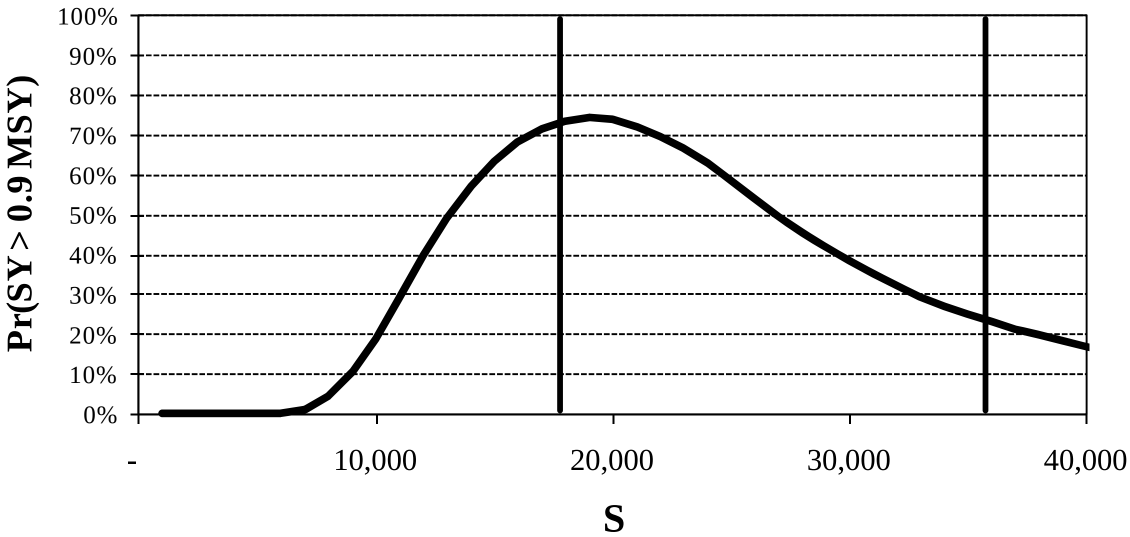

*Note:* Posterior medians are plotted as *open symbols*, 10th and 90th posterior percentiles are *bracketed by error bars*. Original data-based estimates of *S* and *R* are plotted as *solid symbols*. Ricker relationships are Bayesian posterior median (*solid thick line*) and classical estimate (*dashed line*).

Figure 11.–Scatter plot of recruitment versus escapement estimates for late-run Kenai River Chinook salmon brood years, 1979–2003.




Note: Symbols are posterior medians of *R* and *S*. Curves can be interpreted as a sampling of Ricker relationships that could have resulted in the observed data.

Figure 12.–Ricker relationships represented by ~50 paired values of ln(α) and β sampled from the posterior probability distribution of stock-recruitment statistics, late-run Kenai River Chinook salmon.




*Note*: Vertical lines are the lower and upper bounds of the existing escapement goal.

Figure 13.–Probability that a specified spawning abundance will result in sustained yield exceeding 90% of maximum sustained yield, late-run Kenai River Chinook salmon.

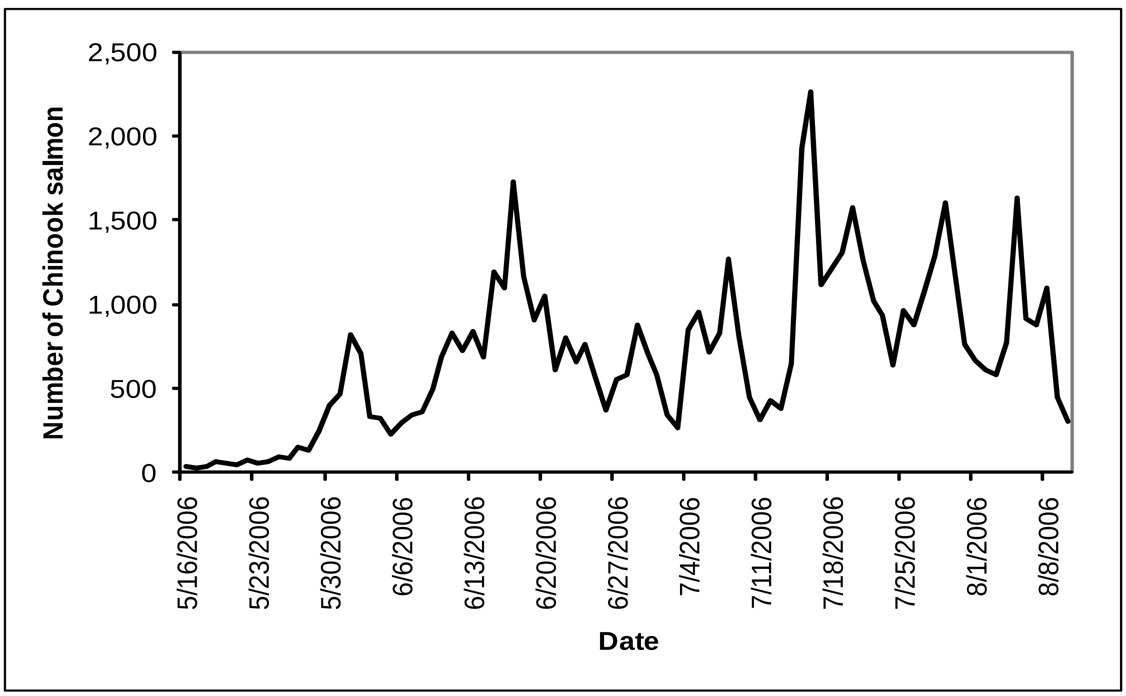



Figure 14.-Daily estimates of Chinook salmon passage (early and late runs) in the Kenai River, 2006.

# APPENDIX A.  STATISTICAL METHODS

Appendix A1.-Notation used in Appendices A2–A8.

| Notation | Definition |
|---|---|
| $a$ | Age or sex |
| $f$ | Temporal stratum |
| $y$ | Brood year |
| $\hat{p}$ | Estimated proportion |
| $n$ | Sample size for estimating proportions |
| $\hat{I}$ | Estimated inriver run |
| $\hat{H}$ | Estimated inriver sport harvest |
| $\hat{C}$ | Estimated inriver sport catch |
| $S$ | Subsistence, personal use and educational fishery harvests |
| $\hat{T}$ | Estimated total run |
| $\hat{M}$ | Estimated hook-and-release mortality |
| $\hat{p}_m$ | Estimated hook-and-release mortality rate |
| $\hat{E}$ | Estimated spawning escapement |
| $\hat{R}_y$ | Estimated total return in brood year *y* |
| $RPS_y$ | Estimated return per spawner in brood year *y* |
| $\hat{r}_{ya}$ | Estimated sibling ratio for age *a* fish in brood year *y* |

Appendix A2.-Estimation of age and sex composition of inriver run.

The proportion at age or by sex ($\hat{p}_a$) was estimated directly from age or sex composition data as:

$$\hat{p}_a = \frac{n_a}{n}, \quad \text{(A2.1)}$$

with variance (Cochran 1977):

$$\hat{V}(\hat{p}_a) = \frac{\hat{p}_a(1-\hat{p}_a)}{(n-1)}, \quad \text{(A2.2)}$$

where *n* is the number of scales for which age was determined.

Inriver run at age or by sex was estimated from inriver run and estimated age or sex proportions:

$$\hat{I}_a = \hat{p}_a \hat{I}, \quad \text{(A2.3)}$$

with variance (Goodman 1960):

$$\hat{V}(\hat{I}_a) = \hat{V}(\hat{I})\hat{p}_a^2 + \hat{V}(\hat{p}_a)\hat{I}^2 - \hat{V}(\hat{I})\hat{V}(\hat{p}_a). \quad \text{(A2.4)}$$

Appendix A3.-Estimation of total run and total run at age or by sex.

Total run was estimated from inriver run and subsistence, personal use, and educational fishery harvests:

$$\hat{T} = \hat{I} + S\ , \tag{A3.1}$$

with variance:

$$\hat{V}\left(\hat{T}\right) = \hat{V}\left(\hat{I}\right), \tag{A3.2}$$

because subsistence, personal use, and educational harvests were considered measured without error.

Total run at age or by sex was estimated from the age and sex compositions of the inriver run applied to the total run:

$$\hat{T}_a = \hat{p}_a \hat{T}\ , \tag{A3.3}$$

with variance (Goodman 1960):

$$\hat{V}\left(\hat{T}_a\right) = \hat{T}^2 \hat{V}\left(\hat{p}_a\right) + \hat{p}_a^2 \hat{V}\left(\hat{T}\right) - \hat{V}\left(\hat{p}_a\right)\hat{V}\left(\hat{T}\right). \tag{A3.4}$$

Appendix A4.-Estimation of age and sex composition of inriver sport harvest.

Inriver sport harvest at age or by sex was estimated by substituting the inriver sport harvest downstream of the Soldotna Bridge for the inriver run ($\hat{I}$) and substituting the age or sex composition of the inriver sport harvest for the age or sex composition of the inriver run in equations A2.1 through A2.4.

Total harvest ($\hat{H}$) was the sum of harvest downstream of the Soldotna Bridge and harvest upstream of the Soldotna Bridge. Total harvest at age or by sex was estimated from the age and sex compositions of the harvest downstream of the bridge applied to the total harvest, using equations A3.3 and A3.4, where $\hat{H}$ is substituted for $\hat{T}$ .

Appendix A5.-Estimation of hook-and-release mortality.

Hook-and-release mortality was estimated by:

$$\hat{M} = \hat{p}_m\left(\hat{C} - \hat{H}\right), \tag{A5.1}$$

with variance:

$$\hat{V}\left(\hat{M}\right) = \hat{p}_m^2\left[\hat{V}\left(\hat{C}\right) + \hat{V}\left(\hat{H}\right)\right] + \left[\hat{C} - \hat{H}\right]^2 \hat{V}(\hat{p}_m) - \left[\hat{V}\left(\hat{C}\right) + \hat{V}\left(\hat{H}\right)\right]\hat{V}(\hat{p}_m). \tag{A5.2}$$

where $\hat{p}_m$ = 0.088 and $\hat{V}(\hat{p}_m)$ = 0.000625 for 1990 (Bendock and Alexandersdottir 1991), and $\hat{p}_m$ = 0.040 and $\hat{V}(\hat{p}_m)$ = 0.000400 for 1991 (Bendock and Alexandersdottir 1992). Because hook-and-release mortality was not measured in other years, the 1990 and 1991 estimates were averaged, so that $\hat{p}_m$ = 0.064 and $\hat{V}(\hat{p}_m)$ = 0.001665 for all other years. Mortality differed by sex and size in 1991 (Bendock and Alexandersdottir 1992), but size and sex composition of releases were not measured in other years. Thus, hook-and-release estimates are probably negatively biased because of the higher mortality for small males and the tendency of anglers to release smaller fish.

Mortalities at age or by sex were estimated from the age or sex compositions of the inriver run:

$$\hat{M}_a = \hat{p}_a\hat{M}, \tag{A5.3}$$

with variance:

$$\hat{V}\left(\hat{M}_a\right) = \hat{M}^2\hat{V}(\hat{p}_a) + \hat{p}_a^2\hat{V}\left(\hat{M}\right) - \hat{V}(\hat{p}_a)\hat{V}\left(\hat{M}\right). \tag{A5.4}$$

Appendix A6.-Estimation of spawning escapement and escapement at age or by sex.

Spawning escapement was estimated by subtracting sport harvest and hook-and-release mortality from the inriver run:

$$\hat{E} = \hat{I} - \hat{H} - \hat{M}, \tag{A6.1}$$

with variance:

$$\hat{V}\left(\hat{E}\right) = \hat{V}\left(\hat{I}\right) + \hat{V}\left(\hat{H}\right) + V\left(\hat{M}\right). \tag{A6.2}$$

Escapement at age or by sex was also estimated by subtraction:

$$\hat{E}_a = \hat{I}_a - \hat{H}_a - \hat{M}_a, \tag{A6.3}$$

with variance:

$$\hat{V}\left(\hat{E}_a\right) = \hat{V}\left(\hat{I}_a\right) + \hat{V}\left(\hat{H}_a\right) + V\left(\hat{M}_a\right). \tag{A6.4}$$

If estimated harvest in the sport fishery was greater than the estimated inriver run, spawning escapement for that age class was set to zero, and spawning escapement by age class did not sum to total escapement.

Appendix A7.-Estimation of return by brood year and return per spawner.

Brood year returns were estimated by summing total return at age for those ages comprising the same brood year *y*:

$$\hat{R}_y = \sum_{a=1}^{j} \hat{T}_{ya} , \tag{A7.1}$$

with variance:

$$\hat{V}\left(\hat{R}_y\right) = \sum_{a=1}^{j} \hat{V}\left(\hat{T}_{ya}\right). \tag{A7.2}$$

Return per spawner was then estimated for brood year *y* as:

$$RPS_y = \frac{\hat{R}_y}{\hat{E}_y} , \tag{A7.3}$$

with variance (Lindgren 1976):

$$\hat{V}\left(RPS_y\right) = RPS_y^2 \left\{ \frac{\hat{V}\left(\hat{R}_y\right)}{\hat{R}_y^2} + \frac{\hat{V}\left(\hat{E}_y\right)}{\hat{E}_y^2} \right\}. \tag{A7.4}$$

Appendix A8.-Estimation of sibling ratios.

Sibling ratios were estimated by:

$$\hat{r}_{ya} = \frac{\hat{T}_{ya}}{\hat{T}_{y(a-1)}} \; or \; \frac{\hat{T}_{ya}}{\sum_{j=4}^{a-1} \hat{T}_{yj}} , \tag{A8.1}$$

with variance (Lindgren 1976):

$$\hat{V}\left(\hat{r}_{ya}\right) = \hat{r}_{ya}^2 \left\{ \frac{\hat{V}\left(\hat{T}_{ya}\right)}{\hat{T}_{ya}^2} + \frac{\hat{V}\left(\hat{T}_{y(a-1)}\right)}{\hat{T}_{y(a-1)}^2} \right\} \text{ or } \hat{r}_{ya}^2 \left\{ \frac{\hat{V}\left(\hat{T}_{ya}\right)}{\hat{T}_{ya}^2} + \frac{\sum_{j=4}^{a-1} \hat{V}\left(\hat{T}_{yj}\right)}{\left[\sum_{j=4}^{a-1} \hat{T}_{yj}\right]^2} \right\}. \tag{A8.2}$$

For example, the sibling ratio of 6-year-old fish in the 1993 brood year could be expressed in terms of the abundance of 6-year-old fish relative to 5-year-old fish in the same brood year or in terms of the abundance of 6-year-old fish relative to 4- <u>and</u> 5-year-old fish in the same brood year:

$$\hat{r}_{1993,6} = \frac{\hat{T}_{93,6}}{\hat{T}_{93,5}} \; or \; \frac{\hat{T}_{93,6}}{\hat{T}_{93,4} + \hat{T}_{93,5}} .$$

# APPENDIX B.  BAYESIAN STATISTICAL METHODS

A Ricker spawner-recruit function (Ricker 1975) was chosen to model the relationship between escapement and recruitment. Under the Ricker model, the total recruitment *R* from brood year *y* is:

$$R = S\,\alpha\,e^{-\beta S}\,e^{\varepsilon} \tag{B1.1}$$

where *S* is the number of spawners, $\alpha$ and $\beta$ are parameters, and the $\{\varepsilon_y\}$ are normally distributed process errors with variance $\sigma^2_{SR}$. Parameter $\alpha$ is the number of recruits per spawner in the absence of density dependence and is a measure of the productivity of a stock. Parameter $\beta$ is a measure of density dependence; the inverse of $\beta$ is the number of spawners that produces the theoretical maximum return ($S_{MAX}$).

Equilibrium spawning abundance, in which the expected return *R* = *S*, is:

$$S_{EQ} = \frac{\ln(\alpha')}{\beta} \tag{B1.2}$$

where ln($\alpha$) is corrected for asymmetric lognormal process error (Hilborn and Walters 1992) as follows:

$$\ln(\alpha') = \ln(\alpha) + \frac{\sigma^2_{SR}}{2} \tag{B1.3}$$

Number of spawners leading to maximum sustained yield $S_{MSY}$ is approximately (Hilborn 1985):

$$S_{MSY} \approx S_{EQ}\left(0.5 - 0.07\ln(\alpha')\right). \tag{B1.4}$$

The classical way to estimate the Ricker parameters is to linearize the Ricker relationship by dividing both sides of equation 1 by *S* and taking the natural logarithm, yielding:

$$\ln\frac{R}{S} = \ln(\alpha) - \beta S + \varepsilon \tag{B1.5}$$

This streamlines parameter estimation, because the relationship can now be viewed as a simple linear regression (SLR) of ln(R/S) on *S*, in which the intercept is an estimate of ln($\alpha$), the negative slope an estimate of $\beta$, and the mean squared error an estimate of the process error variance $\sigma^2_{SR}$.

The SLR approach requires that the usual assumptions of linear regression analysis be met, including that the independent variable (S) be measured without error. Small amounts of measurement error in *S* have little effect; however, measurement error with coefficients of variation exceeding 20% can cause substantial bias in SLR estimates of $S_{MSY}$, as well as increased uncertainty which is not reflected in the classical estimates. The estimated measurement error (expressed as CV) associated with annual Kenai River Chinook salmon sonar estimates range from 22% to 52% (Appendix B2). Other shortcomings of the SLR approach are that it cannot account for serially correlated process error or incomplete brood years.

For these reasons Markov Chain Monte Carlo (MCMC) methods were employed, which are especially well-suited for modeling complex population and sampling processes. This methodology enabled us to analyze the escapement and return data in the context of an age-structured Ricker spawner-recruit model in which measurement error, serially correlated process errors, and incomplete brood years are explicitly considered. The MCMC algorithms in WinBUGS (Gilks et al. 1994) were implemented, which is a Bayesian software program. This methodology provides a more realistic assessment of uncertainty than is possible with classical statistical methods.

Bayesian statistical methods employ probability as a language to quantify uncertainty about model parameters. Knowledge existing about the parameters outside the framework of the experimental design is the "prior" probability distribution. The output of the Bayesian analysis is called the "posterior" probability distribution, which is a synthesis of the prior information and the information in the data. For similar analyses see Szarzi et al. (2007).

The Bayesian MCMC analysis considers all the data simultaneously in the context of the following "full-probability" statistical model. Returns of Chinook salmon originating from spawning escapement in brood years $y$ = 1986–2002 are modeled as a Ricker stock-recruit function with autoregressive lognormal errors:

$$\ln(R_y) = \ln(S_y) + \ln(\alpha) - \beta S_y + \phi\nu_{y-1} + \varepsilon_y \qquad \text{(B1.6)}$$

where $\alpha$ and $\beta$ are Ricker parameters, $\phi$ is the autoregressive coefficient, $\{\nu_y\}$ are the model residuals:

$$\nu_y = \ln(R_y) - \ln(S_y) - \ln(\alpha) + \beta S_y, \qquad \text{(B1.7)}$$

and the $\{\varepsilon_y\}$ are independently and normally distributed process errors with variance $\sigma^2_{SR}$.

Age proportion vectors $\underline{\mathbf{p}}_y = (p_{y4}, p_{y5}, p_{y6}, p_{y7})$ from brood year $y$ returning at ages 4-7 are drawn from a common Dirichlet distribution (multivariate analogue of the beta). The Dirichlet is re-parameterized such that the usual parameters:

$$D_a = \pi_a D \qquad \text{(B1.8)}$$

are written in terms of location (overall age proportions $\pi_a$) and inverse scale ($D$, which governs the inverse dispersion of the $\underline{\mathbf{p}}_y$ age proportion vectors among brood years). The maturity schedule was allowed to change once, between the 1990 and 1991 brood years.

The abundance $N$ of age-$a$ Chinook salmon in calendar year $t$ ($t$ = 1977–2006) is the product of the age proportion scalar $p$ and the total return $R$ from brood year $y = t\text{-}a$:

$$N_{ta} = R_{t-a}\ p_{t-a,a} \qquad \text{(B1.9)}$$

Total run during calendar year $t$ is the sum of abundance at age across ages:

$$N_{t\cdot} = \sum_a N_{ta} \qquad \text{(B1.10)}$$

Inriver run at the sonar site is total abundance minus harvest below the sonar,

$$N_{It} = N_{t\cdot} - H_{Bt} \qquad \text{(B1.11)}$$

where $H_{Bt}$ is very small and considered known without error.

Spawning abundance during year $t$ is:

$$S_t = N_{It} - H_{At} \tag{B1.12}$$

where $H_{At}$ is the sport harvest above the sonar, which in turn is the product of the annual exploitation rate and inriver return:

$$H_{At} = \mu_{At} N_{It}\,. \tag{B1.13}$$

Spawning abundance yielding peak return $S_{MAX}$ is calculated as the inverse of the Ricker $\beta$ parameter. Equilibrium spawning abundance $S_{EQ}$ and spawning abundance leading to maximum sustained yield $S_{MSY}$ are obtained using equations B1.2–B1.4, except that ln(α) is corrected for autoregression lag-1 (AR1) serial correlation as well as lognormal process error:

$$\ln(\alpha') = \ln(\alpha) + \frac{\sigma^2_{SR}}{2(1-\phi^2)}\,. \tag{B1.14}$$

Expected sustained yield at a specified escapement $S$ is calculated by subtracting spawning escapement from the expected return, again incorporating corrections for lognormal process error and AR1 serial correlation:

$$SY = E[R] - S = Se^{\ln(\alpha') - \beta S} - S\,. \tag{B1.15}$$

Probability that a given level of escapement would produce average yields exceeding 90% of MSY was obtained by calculating the expected sustained yield (SY; Equation B1.15) at multiple incremental values of $S$ (0 to 10,000) for each Monte Carlo sample, then comparing SY with 90% of the value of MSY for that sample. The proportion of samples, in which SY exceeded 0.9 MSY, is the desired probability.

Observed data include estimates of inriver abundance, estimates of harvest, and scale age counts. Likelihood functions for the data follow.

Estimated inriver abundance is modeled as:

$$N_{It} = N_{It} e^{\varepsilon_{Nt}} \tag{B1.16}$$

where the $\{\varepsilon_{Nt}\}$ are normal $(0,\sigma^2_{Nt})$ with measurement error variance $\sigma^2_{Nt}$[1]. Estimates were obtained from mark-recapture methods in 1986 and 1987, and sonar thereafter.

Estimated sport harvest (1986–2006) is modeled as:

$$\hat{H}_t = H_t e^{\varepsilon_{Ht}} \tag{B1.17}$$

where $\varepsilon_{Ht}$ are normal $(0,\sigma^2_{Ht})$ with individual variances $\sigma^2_{Ht}$ assumed known from creel survey and SWHS coefficients of variation.

Numbers of fish sampled for scales ($n$) that were classified as age-$a$ in calendar year $t$ ($x_{ta}$) are multinomially ($r_{ta}$,$n$) distributed, with proportion parameters as follows:

1 Annual estimates of variance were available for 1986 and 1987 mark–recapture estimates. Sonar measurement errors in 1988–2006 were drawn from a common variance.

$$r_{ta} = \frac{N_{ta}}{N_{t\cdot}} \qquad \text{(B1.18)}$$

Bayesian analyses require that prior probability distributions be specified for all unknowns in the model. Non-informative priors (chosen to have a minimal effect on the posterior) were used almost exclusively. Initial returns $R_{1979}$-$R_{1985}$ (those with no linked spawner abundance) were modeled as drawn from a common lognormal distribution with median $\mu_{LOGR}$ and variance $\sigma^2_{LOGR}$. Normal priors with mean zero, very large variances, and constrained to be positive, were used for ln$(\alpha)$ and $\beta$ (Millar 2002), as well as for $\mu_{LOGR}$. The initial model residual $\nu_0$ was given a normal prior with mean zero and variance $\sigma^2_{SR}/(1-\phi^2)$. Diffuse conjugate inverse gamma priors were used for $\sigma^2_{SR}$, and $\sigma^2_{LOGR}$. The common measurement error variance for sonar estimates of inriver abundance ($\sigma^2_N$ for 1988-2006) was given an informative inverse gamma (10.5,0.5) prior distribution, based on fitting a linear relationship between 12 published annual sonar estimates and experimental mixture model estimates based on echo-length measurements (Appendix B2, Fleischman and Burwen 2003). Sport fishery exploitation rates $\{\mu_{At}\}$ were given a beta (1,1) prior distribution.

Markov-chain Monte Carlo samples were drawn from the joint posterior probability distribution of all unknowns in the model. For each of two Markov chains initialized, a 4,000-sample burn-in period was discarded, thinning by a factor of 10 was initiated, and 25,000 additional updates were generated. The resulting total of 50,000 samples was used to estimate the marginal posterior means, standard deviations, and percentiles. The diagnostic tools of WinBUGS assessed mixing and convergence, and no major problems were encountered. Interval estimates were obtained from the percentiles of the posterior distribution.

ADF&G is actively engaged in development of improved sonar methodology for estimating the inriver return of Kenai River Chinook salmon. These efforts include development of statistical mixture models for analysis of echo-length data measured by the split-beam sonar (Burwen et al. 2003; Fleischman and Burwen 2003). Ultimately, these efforts will culminate in revised historical (after 2001) abundance estimates for the early and late runs. Such estimates are not finalized, but we have preliminary versions of these quantities that we can compare with the published estimates of Chinook salmon abundance.

These preliminary mixture-model estimates of historical abundance are likely to change, perhaps substantially, upon further analysis[2]. However, these quantities, having come from a consistent and superior methodology, are useful for modeling the degree to which the published estimates may have deviated from true abundance. Published estimates for the early and late run from 2002 to 2007 are plotted versus preliminary mixture model estimates in Appendix Figure B2.1.

The mixture-model estimates were modeled as being equal to true abundance $N$ but corrupted by known multiplicative lognormal error with standard deviation equal to the estimated coefficient of variation of the estimates (standard error divided by the point estimate).

The published estimates were modeled as a multiple of the true abundance ($qN$), where $q$ is equal to the slope of the relationship between Y and X in Appendix Figure B2.1. Published estimates are also subject to multiplicative lognormal error, but with a common standard deviation $\sigma$.

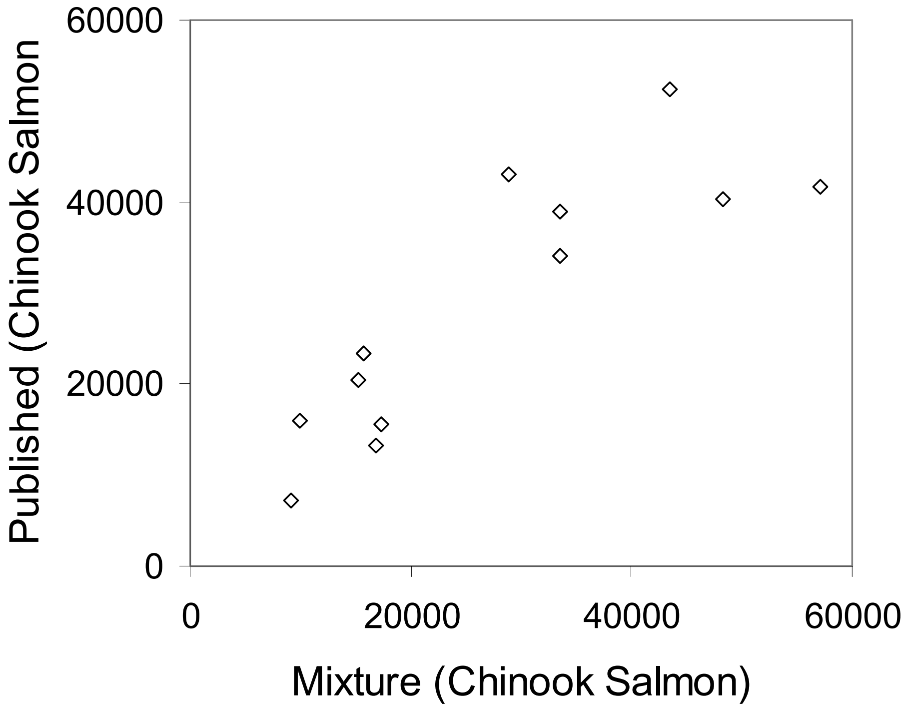
A Bayesian MCMC approach was used to quantify uncertainty about the model parameters. Non-informative priors were specified. WinBUGS code, as well as selected percentiles of the posterior distribution for $q$ and $\sigma$ (Appendix Table B2.1), are shown below.

```
model {
 log.q ~ dnorm(0,1.0E-4)
 tau ~ dgamma(0.1,0.1)
 sigma <- sqrt(1/tau)
 q <- exp(log.q)
 for(y in 1:12) {
  N[y] ~ dnorm(0,1.0E-12)I(0,)
  Mixture.Model[y] ~ dlnorm(log.N[y],tau.MM[y])
  Published.Sonar[y] ~ dlnorm(log.qN[y],tau)
  log.qN[y] <- log.q + log.N[y]
  log.N[y] <- log(N[y])
  tau.MM[y] <- 1 / MM.cv[y] / MM.cv[y]
 }
}
```

[2] For this reason we do not reproduce the actual numbers here.

Appendix Table B2.1.–Posterior means, standard deviations, and percentiles from Bayesian model of sonar measurement error.

| | Mean | Standard deviation | 2.5 percentile | Median | 97.5 percentile |
|---|---|---|---|---|---|
| q (ratio of published to mixture estimates) | 1.08 | 0.11 | 0.88 | 1.07 | 1.31 |
| sigma (measurement error coefficient of variation for published estimates) | 0.332 | 0.079 | 0.217 | 0.318 | 0.523 |




Appendix Figure B2.1.–Published estimates of early and late inriver runs of Kenai River Chinook salmon plotted against preliminary echo-length mixture model estimates, 2002-2007.

Appendix B3.–WinBUGS code for Bayesian age-structured spawner-recruit analysis. Prior distributions are italicized; sampling distributions of the data are underlined.

```
model {
# RICKER STOCK-RECRUIT RELATIONSHIP WITH AR1 ERRORS;
# R[y] IS THE TOTAL RETURN FROM BROOD YEAR y
# THERE ARE A TOTAL OF Y+A-1 = 22 + 4 - 1 = 25 BROOD YRS REPRESENTED IN
DATA+FORECAST
# THE FIRST A+a.min-1 = 7 DO NOT HAVE CORRESPONDING SPAWNING ABUNDANCES
# THE REMAINING Y-a.min = 18 DO (BROOD YEARS A+a.min=8 - 25)

 for (y in A+a.min:Y+A-1) {
  log.R[y] ~ dt(log.R.mean2[y],tau.white,500)
  R[y] <- exp(log.R[y])
  log.R.mean1[y] <- log(S[y-a.max]) + lnalpha - beta * S[y-a.max]
  log.resid[y] <- log(R[y]) - log.R.mean1[y]
  }
 log.R.mean2[A+a.min] <- log.R.mean1[A+a.min] + phi * log.resid.0
 for (y in A+a.min+1:Y+A-1) {
  log.R.mean2[y] <- log.R.mean1[y] + phi * log.resid[y-1]
  }
 lnalpha ~ dnorm(0,1.0E-6)I(0,)
 beta ~ dnorm(0,1.0E-1)I(0,)
 phi ~ dnorm(0,1.0E-4)I(-1,1)
 tau.white ~ dgamma(0.01,0.01)
 log.resid.0 ~ dnorm(0,tau.red)I(-3,3)
 alpha <- exp(lnalpha)
 tau.red <- tau.white * (1-phi*phi)
 sigma.white <- 1 / sqrt(tau.white)
 sigma.red <- 1 / sqrt(tau.red)
 lnalpha.c <- lnalpha + (sigma.white * sigma.white / 2 / (1-phi*phi) )
 S.max <- 1 / beta
 S.eq <- lnalpha.c * S.max
 S.msy <- S.eq * (0.5 - 0.07*lnalpha.c)

# BROOD YEAR RETURNS W/O SR LINK DRAWN FROM COMMON LOGNORMAL DISTN
 mean.log.R ~ dnorm(0,1.0E-4)I(0,)
 tau.R ~ dgamma(0.1,0.1)
 for (y in 1:a.max) {
  log.R.lag[y] ~ dt(mean.log.R,tau.R,500)
  R.lag[y] <- exp(log.R.lag[y])
  }

# DIRICHLET GENERATION OF RETURNS AT AGE CHANGING BETWEEN BY 12 AND 13
# GENERATE ALL Y+A-1 = 25 MATURITY SCHEDULES, USE ONLY THOSE NECESSARY
 D1.scale ~ dunif(0,1)
 D2.scale ~ dunif(0,1)
 D1.sum <- 1 / (D1.scale * D1.scale)
 D2.sum <- 1 / (D2.scale * D2.scale)
 pi[1,1] ~ dbeta(1,1)
 pi[2,1] ~ dbeta(1,1)
 pi1.2p ~ dbeta(1,1)
 pi2.2p ~ dbeta(1,1)
 pi1.3p ~ dbeta(1,1)
 pi2.3p ~ dbeta(1,1)
 pi[1,2] <- pi1.2p * (1 - pi[1,1])
```

```
  pi[2,2] <- pi2.2p * (1 - pi[2,1])
  pi[1,3] <- pi1.3p * (1 - pi[1,1] - pi[1,2])
  pi[2,3] <- pi2.3p * (1 - pi[2,1] - pi[2,2])
  pi[1,4] <- 1 - pi[1,1] - pi[1,2] - pi[1,3]
  pi[2,4] <- 1 - pi[2,1] - pi[2,2] - pi[2,3]
for (a in 1:A) {
  gamma1[a] <- D1.sum * pi[1,a]
  gamma2[a] <- D2.sum * pi[2,a]
  for (y in 1:12) {
      g1[y,a] ~ dgamma(gamma1[a],1)
      p[y,a] <- g1[y,a]/sum(g1[y,])
    }
  for (y in 13:Y+A-1) {
      g2[y,a] ~ dgamma(gamma2[a],1)
      p[y,a] <- g2[y,a]/sum(g2[y,])
    }
  }
for (a in 2:A) {
  sibratio[1,a] <- pi[1,a] / pi[1,a-1]
  sibratio[2,a] <- pi[2,a] / pi[2,a-1]
  }

# ASSIGN PRODUCT OF P AND R TO ALL CELLS IN N MATRIX
# y SUBSCRIPT INDEXES BROOD YEAR
# y=1 IS THE BROOD YEAR OF THE OLDEST FISH IN YEAR 1 (upper right cell)
# y=25 IS THE BROOD YEAR OF THE YOUNGEST FISH IN YEAR Y (lower left cell)
# FIRST DO INITIAL CELLS WITHOUT SR LINK (x's IN MATRIX ABOVE)
# THEN DO CELLS DESCENDING WITH SR LINK (y's IN MATRIX)

for (y in 4:a.max)  {  N.ta[y-3,1] <- p[y,1] * R.lag[y]  }    # COLUMN 1
for (y in 3:a.max)  {  N.ta[y-2,2] <- p[y,2] * R.lag[y]  }    # COLUMN 2
for (y in 2:a.max)  {  N.ta[y-1,3] <- p[y,3] * R.lag[y]  }    # COLUMN 3
for (y in 1:a.max)  {  N.ta[y   ,4] <- p[y,4] * R.lag[y]  }    # COLUMN A=4

for (y in a.max+1:Y+3)   {  N.ta[y-3,1] <- p[y,1] * R[y]  }
for (y in a.max+1:Y+2)   {  N.ta[y-2,2] <- p[y,2] * R[y]  }
for (y in a.max+1:Y+1)   {  N.ta[y-1,3] <- p[y,3] * R[y]  }
for (y in a.max+1:Y)       {  N.ta[y  ,4] <- p[y,4] * R[y]  }

# MULTINOMIAL SCALE SAMPLING ON TOTAL ANNUAL RETURN N
# INDEX t IS CALENDAR YEAR
for (t in 1:Y) {
  N[t] <- sum(N.ta[t,1:A])
  for (a in 1:A) {
    q[t,a] <- N.ta[t,a] / N[t]
    }
  n[t] <- sum(x[t,1:A])
  x[t,1:A] ~ dmulti(q[t,],n[t])
  }

# APPLY (SMALL, KNOWN) HARVEST BELOW SONAR TO GET INRIVER RETURN
# HARVEST ABOVE SONAR IS ESTIMATED, AND CAN BE LARGE
for (y in 1:Y) {
  Inriver.Return[y] <- max(N[y] - Hhat.below[y],1)
  log.IR[y] <- log(Inriver.Return[y])
  IR.hat[y] ~ dlnorm(log.IR[y],tau.log.IR[y])
```

```
 S[y] <- max(Inriver.Return[y] - H.above[y],1)
 mu.Habove[y] ~ dbeta(1,1)
 H.above[y] <- mu.Habove[y] * Inriver.Return[y]
 log.Ha[y] <- log(H.above[y])
 tau.log.Ha[y] <- 1 / Harvest.cv[y] / Harvest.cv[y]
 Hhat.above[y] ~ dlnorm(log.Ha[y],tau.log.Ha[y])
 }

# 1986-1987: ESTIMATE INRIVER RETURN WITH MARK RECAP
# 1988-PRESENT:  ESTIMATE INRIVER RETURN WITH SONAR
# CV OF SONAR-ESTIMATED INRIVER RETURN HAS PRIOR BASED ON ELSD
# MIXTURE ESTIMATES (Measurement Error in IR thru 2007.ODC)
for (y in 1:2) { tau.log.IR[y] <- 1 / MarkRecap.cv[y] / MarkRecap.cv[y]  }
for (y in 3:Y) { tau.log.IR[y] ~ dgamma(10.5,0.5)}

# GENERATE FITTED VALUES OF R EVERY 1000 SPAWNING FISH FOR GRAPHICS;
for (i in 1:25) {
 S.star.1[i] <- 1000*i
 R.fit[i] <- S.star.1[i] * exp(lnalpha - beta * S.star.1[i])
 }
# CALCULATE SUSTAINED YIELD AT REGULAR INTERVALS OF S;
# FIND THE PROBABILITY THAT EACH VALUE OF S WILL RESULT IN YIELDS WITHIN 10% OF
MSC;
R.msy <- S.msy * exp(lnalpha - beta * S.msy)*exp(sigma.red*sigma.red/2)
MSY <- R.msy - S.msy
for (i in 1:100) {
 S.star.2[i] <- 200*i
 R.fit2[i] <- S.star.2[i] * exp(lnalpha - beta * S.star.2[i])*exp(sigma.red*sigma.red/2)
 SY[i] <- R.fit2[i] - S.star.2[i]
 I90[i] <- step(SY[i] - 0.9 * MSY)
 }
 SY.5300 <- 5300 * exp(lnalpha - beta * 5300)*exp(sigma.red*sigma.red/2) - 5300
 SY.4579 <- 4579 * exp(lnalpha - beta * 4579)*exp(sigma.red*sigma.red/2) - 4579
 SY.gain <- SY.4579 - SY.5300
}
```

Appendix B4.–Data for Bayesian age-structured spawner-recruit analysis.

```
list( Y=22, A=4, a.min=4, a.max=7,
x = structure(.Data =c(
208    ,    565    ,    464    ,    107    ,
15     ,    376    ,    561    ,    26     ,
14     ,    124    ,    561    ,    84     ,
29     ,    108    ,    496    ,    66     ,
34     ,    125    ,    281    ,    30     ,
17     ,    52     ,    151    ,    12     ,
20     ,    70     ,    143    ,    13     ,
13     ,    93     ,    211    ,    12     ,
16     ,    92     ,    324    ,    22     ,
11     ,    46     ,    157    ,    11     ,
26     ,    95     ,    203    ,    7      ,
16     ,    132    ,    227    ,    4      ,
54     ,    105    ,    117    ,    9      ,
26     ,    174    ,    123    ,    1      ,
21     ,    99     ,    106    ,    1      ,
34     ,    55     ,    105    ,    4      ,
50     ,    118    ,    127    ,    11     ,
230    ,    144    ,    342    ,    7      ,
52     ,    118    ,    165    ,    15     ,
45     ,    111    ,    193    ,    13     ,
77     ,    49     ,    115    ,    9      ,
0,0,0,0
),.Dim = c(22, 4)),
IR.hat=c(27080,25643,20880,17992,10768,10939,10087,19669,18403,21884,
23505,14963,13103,25666,12479,16676,7162,13325,15498,20450,23326,NA),
MarkRecap.cv=c(0.36,0.23),
Hhat.below=c(0,0,0,73,40,2,73,118,56,37,14,141,122,114,124,198,64,46,89,76,75,0),
Hhat.above=c(
8398,13863,15549,8543,2185,2097,2477,9628,8456,10574,
6910,6778,1424,8390,2003,2603,977,3228,3643,4063,4898,1),
Harvest.cv=c(
0.06,0.07,0.05,0.06,0.12,0.11,0.09,0.05,0.05,0.05,
0.06,0.10,0.14,0.06,0.12,0.09,0.15,0.09,0.11,0.10,0.03,0.08)
)
```

# APPENDIX C.  TOTAL RUN BY AGE CLASS

Appendix C1.-Estimated number of late-run Kenai River Chinook salmon by age class in the marine sport and commercial harvests, and the inriver run and total run, 1986-2006.

| | Age Class | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | All |
| **1986** | | | | | | | | | | | | | | | | | |
| **Deep Creek Marine Sport Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 0 | 30 | 165 | 375 | 60 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 630 |
| SE | 0 | 0 | 0 | 0 | 0 | 22 | 72 | 144 | 35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 230 |
| **Commercial Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 49 | 49 | 16 | 16 | 262 | 4,953 | 8,027 | 7,258 | 719 | 16 | 49 | 49 | 147 | 33 | 0 | 0 | 21,644 |
| SE | 28 | 28 | 16 | 16 | 65 | 250 | 287 | 281 | 107 | 16 | 28 | 28 | 49 | 23 | 0 | 0 | 0 |
| **Inriver Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 0 | 6,990 | 25,199 | 22,822 | 2,551 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57,563 |
| SE | 0 | 0 | 0 | 0 | 0 | 2,403 | 8,543 | 7,742 | 905 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19,457 |
| **Total Run** | | | | | | | | | | | | | | | | | |
| Estimate | 49 | 49 | 16 | 16 | 262 | 11,973 | 33,391 | 30,456 | 3,331 | 16 | 49 | 49 | 147 | 33 | 0 | 0 | 79,837 |
| SE | 28 | 28 | 16 | 16 | 65 | 2,416 | 8,548 | 7,748 | 912 | 16 | 28 | 28 | 49 | 23 | 0 | 0 | 19,458 |
| **1987** | | | | | | | | | | | | | | | | | |
| **Deep Creek Marine Sport Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 5 | 13 | 277 | 885 | 38 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,218 |
| SE | 0 | 0 | 0 | 0 | 4 | 7 | 109 | 342 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 469 |
| **Commercial Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 591 | 3,316 | 8,123 | 12,672 | 283 | 0 | 0 | 77 | 51 | 26 | 0 | 0 | 25,139 |
| SE | 0 | 0 | 0 | 0 | 122 | 272 | 376 | 402 | 85 | 0 | 0 | 44 | 36 | 26 | 0 | 0 | 0 |
| **Inriver Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 0 | 900 | 13,406 | 33,116 | 500 | 100 | 50 | 0 | 0 | 50 | 0 | 0 | 48,123 |
| SE | 0 | 0 | 0 | 0 | 0 | 211 | 769 | 1,083 | 158 | 71 | 50 | 0 | 0 | 50 | 0 | 0 | 1,178 |
| **Total Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 596 | 4,229 | 21,806 | 46,673 | 821 | 100 | 50 | 77 | 51 | 76 | 0 | 0 | 74,480 |
| SE | 0 | 0 | 0 | 0 | 122 | 345 | 863 | 1,205 | 180 | 71 | 50 | 44 | 36 | 56 | 0 | 0 | 1,268 |
| **1988** | | | | | | | | | | | | | | | | | |
| **Deep Creek Marine Sport Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 11 | 4 | 50 | 1,168 | 254 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,487 |
| SE | 0 | 0 | 0 | 0 | 7 | 4 | 23 | 451 | 101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 573 |
| **Commercial Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 35 | 0 | 486 | 1,615 | 2,153 | 10,347 | 278 | 0 | 0 | 52 | 17 | 104 | 0 | 0 | 15,087 |
| SE | 0 | 0 | 25 | 0 | 90 | 158 | 179 | 238 | 69 | 0 | 0 | 30 | 17 | 42 | 0 | 0 | 0 |
| **Inriver Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 0 | 666 | 1,998 | 40,407 | 8,936 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 52,008 |
| SE | 0 | 0 | 0 | 0 | 0 | 192 | 330 | 1,216 | 677 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,273 |
| **Total Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 35 | 0 | 497 | 2,284 | 4,201 | 51,923 | 9,468 | 0 | 0 | 52 | 17 | 104 | 0 | 0 | 68,582 |
| SE | 0 | 0 | 25 | 0 | 91 | 249 | 376 | 1,318 | 688 | 0 | 0 | 30 | 17 | 42 | 0 | 0 | 1,396 |

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| | Age Class | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | All |
| **1989** | | | | | | | | | | | | | | | | | |
| **Deep Creek Marine Sport Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 0 | 14 | 149 | 975 | 217 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 1,368 |
| SE | 0 | 0 | 0 | 0 | 0 | 14 | 70 | 380 | 95 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 527 |
| **Commercial Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 102 | 1,653 | 2,306 | 5,829 | 1,025 | 0 | 0 | 26 | 0 | 0 | 0 | 0 | 10,941 |
| SE | 0 | 0 | 0 | 0 | 36 | 134 | 153 | 187 | 109 | 0 | 0 | 18 | 0 | 0 | 0 | 0 | 0 |
| **Inriver Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 47 | 2,989 | 3,558 | 18,835 | 3,511 | 95 | 0 | 0 | 0 | 0 | 0 | 0 | 29,035 |
| SE | 0 | 0 | 0 | 0 | 47 | 364 | 395 | 726 | 392 | 67 | 0 | 0 | 0 | 0 | 0 | 0 | 710 |
| **Total Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 150 | 4,655 | 6,013 | 25,639 | 4,752 | 95 | 0 | 26 | 0 | 14 | 0 | 0 | 41,344 |
| SE | 0 | 0 | 0 | 0 | 60 | 388 | 429 | 840 | 418 | 67 | 0 | 18 | 0 | 14 | 0 | 0 | 885 |
| **1990** | | | | | | | | | | | | | | | | | |
| **Deep Creek Marine Sport Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 9 | 155 | 254 | 998 | 188 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,605 |
| SE | 0 | 0 | 0 | 0 | 7 | 64 | 102 | 386 | 77 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 618 |
| **Commercial Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 11 | 11 | 0 | 57 | 1,417 | 1,429 | 1,610 | 159 | 0 | 45 | 23 | 23 | 79 | 0 | 0 | 4,864 |
| SE | 0 | 11 | 11 | 0 | 25 | 107 | 107 | 111 | 42 | 0 | 23 | 16 | 16 | 30 | 0 | 0 | 0 |
| **Inriver Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 0 | 4,113 | 4,872 | 22,970 | 1,519 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 33,474 |
| SE | 0 | 0 | 0 | 0 | 0 | 487 | 525 | 848 | 305 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 746 |
| **Total Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 11 | 11 | 0 | 66 | 5,686 | 6,555 | 25,578 | 1,866 | 0 | 45 | 23 | 23 | 79 | 0 | 0 | 39,943 |
| SE | 0 | 11 | 11 | 0 | 26 | 503 | 545 | 938 | 317 | 0 | 23 | 16 | 16 | 30 | 0 | 0 | 969 |
| **1991** | | | | | | | | | | | | | | | | | |
| **Deep Creek Marine Sport Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 0 | 84 | 199 | 1,300 | 107 | 0 | 0 | 0 | 15 | 0 | 0 | 0 | 1,705 |
| SE | 0 | 0 | 0 | 0 | 0 | 40 | 84 | 503 | 49 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 657 |
| **Commercial Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 12 | 0 | 25 | 0 | 37 | 1,381 | 1,779 | 2,140 | 112 | 0 | 12 | 0 | 37 | 12 | 0 | 0 | 5,550 |
| SE | 12 | 0 | 18 | 0 | 22 | 114 | 123 | 128 | 37 | 0 | 12 | 0 | 22 | 12 | 0 | 0 | 0 |
| **Inriver Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 0 | 2,580 | 5,482 | 24,079 | 2,257 | 0 | 0 | 0 | 215 | 0 | 0 | 0 | 34,614 |
| SE | 0 | 0 | 0 | 0 | 0 | 512 | 719 | 1,087 | 480 | 0 | 0 | 0 | 152 | 0 | 0 | 0 | 901 |
| **Total Run** | | | | | | | | | | | | | | | | | |
| Estimate | 12 | 0 | 25 | 0 | 37 | 4,045 | 7,461 | 27,519 | 2,476 | 0 | 12 | 0 | 268 | 12 | 0 | 0 | 41,869 |
| SE | 12 | 0 | 18 | 0 | 22 | 526 | 735 | 1,205 | 484 | 0 | 12 | 0 | 154 | 12 | 0 | 0 | 1,115 |

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| | Age Class | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | All |
| **1992** | | | | | | | | | | | | | | | | | |
| **Deep Creek Marine Sport Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 11 | 42 | 326 | 1,610 | 126 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,115 |
| SE | 0 | 0 | 0 | 0 | 11 | 25 | 135 | 623 | 59 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 815 |
| **Commercial Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 289 | 1,754 | 3,235 | 5,805 | 443 | 0 | 0 | 68 | 102 | 17 | 0 | 0 | 11,713 |
| SE | 0 | 0 | 0 | 0 | 69 | 159 | 200 | 223 | 85 | 0 | 0 | 34 | 42 | 17 | 0 | 0 | 0 |
| **Inriver Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 0 | 2,045 | 4,800 | 22,758 | 711 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30,314 |
| SE | 0 | 0 | 0 | 0 | 0 | 415 | 610 | 878 | 249 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 685 |
| **Total Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 300 | 3,840 | 8,361 | 30,173 | 1,280 | 0 | 0 | 68 | 102 | 17 | 0 | 0 | 44,142 |
| SE | 0 | 0 | 0 | 0 | 70 | 445 | 656 | 1,099 | 270 | 0 | 0 | 34 | 42 | 17 | 0 | 0 | 1,065 |
| **1993** | | | | | | | | | | | | | | | | | |
| **Deep Creek Marine Sport Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 0 | 53 | 160 | 2,427 | 165 | 0 | 0 | 16 | 8 | 4 | 0 | 0 | 2,834 |
| SE | 0 | 0 | 0 | 0 | 0 | 25 | 66 | 936 | 68 | 0 | 0 | 10 | 6 | 4 | 0 | 0 | 1,092 |
| **Commercial Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 439 | 1,936 | 3,107 | 8,621 | 602 | 0 | 0 | 16 | 98 | 65 | 0 | 0 | 14,884 |
| SE | 0 | 0 | 0 | 0 | 83 | 166 | 200 | 243 | 97 | 0 | 0 | 16 | 40 | 32 | 0 | 0 | 0 |
| **Inriver Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 0 | 4,159 | 7,279 | 37,285 | 2,971 | 0 | 0 | 0 | 297 | 0 | 0 | 0 | 51,991 |
| SE | 0 | 0 | 0 | 0 | 0 | 762 | 983 | 1,578 | 650 | 0 | 0 | 0 | 210 | 0 | 0 | 0 | 1,338 |
| **Total Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 439 | 6,148 | 10,546 | 48,333 | 3,737 | 0 | 0 | 33 | 403 | 69 | 0 | 0 | 69,709 |
| SE | 0 | 0 | 0 | 0 | 83 | 780 | 1,006 | 1,851 | 661 | 0 | 0 | 19 | 214 | 33 | 0 | 0 | 1,727 |
| **1994** | | | | | | | | | | | | | | | | | |
| **Deep Creek Marine Sport Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 4 | 34 | 82 | 1,697 | 47 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 1,869 |
| SE | 0 | 0 | 0 | 0 | 4 | 12 | 19 | 116 | 14 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 124 |
| **Commercial Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 714 | 2,208 | 2,420 | 10,014 | 959 | 11 | 11 | 45 | 78 | 290 | 0 | 0 | 16,750 |
| SE | 0 | 0 | 0 | 0 | 87 | 146 | 152 | 212 | 100 | 11 | 11 | 22 | 29 | 56 | 0 | 0 | 0 |
| **Inriver Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 0 | 2,971 | 6,071 | 41,849 | 2,196 | 0 | 0 | 0 | 0 | 387 | 0 | 0 | 53,474 |
| SE | 0 | 0 | 0 | 0 | 0 | 607 | 849 | 1,528 | 525 | 0 | 0 | 0 | 0 | 223 | 0 | 0 | 1,374 |
| **Total Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 718 | 5,213 | 8,572 | 53,560 | 3,202 | 15 | 11 | 45 | 78 | 677 | 0 | 0 | 72,093 |
| SE | 0 | 0 | 0 | 0 | 87 | 625 | 863 | 1,547 | 535 | 12 | 11 | 22 | 29 | 230 | 0 | 0 | 1,380 |

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| | Age Class | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | All |
| **1995** | | | | | | | | | | | | | | | | | |
| **Deep Creek Marine Sport Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 14 | 157 | 205 | 1,474 | 219 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,069 |
| SE | 0 | 0 | 0 | 0 | 8 | 27 | 30 | 65 | 31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 65 |
| **Commercial Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 421 | 3,230 | 4,064 | 4,556 | 799 | 0 | 9 | 97 | 18 | 35 | 9 | 0 | 13,237 |
| SE | 0 | 0 | 0 | 0 | 60 | 146 | 157 | 162 | 81 | 0 | 9 | 29 | 12 | 18 | 9 | 0 | 0 |
| **Inriver Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 0 | 9,900 | 9,470 | 22,383 | 2,367 | 0 | 0 | 0 | 0 | 215 | 0 | 0 | 44,336 |
| SE | 0 | 0 | 0 | 0 | 0 | 1,307 | 1,286 | 1,623 | 698 | 0 | 0 | 0 | 0 | 215 | 0 | 0 | 970 |
| **Total Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 436 | 13,287 | 13,738 | 28,413 | 3,385 | 0 | 9 | 97 | 18 | 250 | 9 | 0 | 59,642 |
| SE | 0 | 0 | 0 | 0 | 60 | 1,316 | 1,296 | 1,633 | 703 | 0 | 9 | 29 | 12 | 216 | 9 | 0 | 972 |
| **1996** | | | | | | | | | | | | | | | | | |
| **Deep Creek Marine Sport Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 0 | 122 | 749 | 1,124 | 44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,038 |
| SE | 0 | 0 | 0 | 0 | 0 | 34 | 101 | 134 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 211 |
| **Commercial Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 537 | 2,293 | 4,189 | 4,776 | 185 | 0 | 11 | 22 | 162 | 50 | 0 | 0 | 12,225 |
| SE | 0 | 0 | 0 | 0 | 54 | 102 | 124 | 128 | 32 | 0 | 8 | 11 | 30 | 17 | 0 | 0 | 0 |
| **Inriver Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 84 | 3,021 | 13,342 | 22,573 | 336 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 39,356 |
| SE | 0 | 0 | 0 | 0 | 84 | 553 | 1,474 | 2,217 | 169 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3,535 |
| **Total Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 621 | 5,436 | 18,280 | 28,472 | 564 | 0 | 11 | 22 | 162 | 50 | 0 | 0 | 53,619 |
| SE | 0 | 0 | 0 | 0 | 100 | 564 | 1,482 | 2,224 | 173 | 0 | 8 | 11 | 30 | 17 | 0 | 0 | 3,541 |
| **1997** | | | | | | | | | | | | | | | | | |
| **Deep Creek Marine Sport Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 28 | 74 | 684 | 2,108 | 37 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,931 |
| SE | 0 | 0 | 0 | 0 | 16 | 26 | 90 | 190 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 243 |
| **Commercial Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 997 | 1,751 | 3,646 | 5,353 | 79 | 0 | 43 | 36 | 86 | 144 | 0 | 0 | 12,135 |
| SE | 0 | 0 | 0 | 0 | 81 | 104 | 135 | 147 | 24 | 0 | 18 | 16 | 25 | 32 | 0 | 0 | 0 |
| **Inriver Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 0 | 1,645 | 8,637 | 28,517 | 686 | 0 | 0 | 137 | 0 | 0 | 0 | 0 | 39,622 |
| SE | 0 | 0 | 0 | 0 | 0 | 524 | 1,627 | 4,475 | 319 | 0 | 0 | 137 | 0 | 0 | 0 | 0 | 6,049 |
| **Total Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 1,025 | 3,470 | 12,967 | 35,979 | 801 | 0 | 43 | 173 | 86 | 144 | 0 | 0 | 54,688 |
| SE | 0 | 0 | 0 | 0 | 83 | 535 | 1,635 | 4,482 | 320 | 0 | 18 | 138 | 25 | 32 | 0 | 0 | 6,054 |

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| | Age Class | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | All |
| **1998** | | | | | | | | | | | | | | | | | |
| **Deep Creek Marine Sport Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 27 | 216 | 221 | 1,267 | 54 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,784 |
| SE | 0 | 0 | 0 | 0 | 12 | 39 | 40 | 140 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 187 |
| **Commercial Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 25 | 12 | 6 | 0 | 657 | 1,301 | 1,190 | 2,181 | 105 | 0 | 19 | 87 | 31 | 31 | 0 | 0 | 5,644 |
| SE | 12 | 9 | 6 | 0 | 60 | 79 | 76 | 91 | 25 | 0 | 11 | 23 | 14 | 14 | 0 | 0 | 0 |
| **Inriver Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 0 | 5,201 | 4,895 | 23,660 | 1,122 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 34,878 |
| SE | 0 | 0 | 0 | 0 | 0 | 677 | 660 | 945 | 334 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 500 |
| **Total Run** | | | | | | | | | | | | | | | | | |
| Estimate | 25 | 12 | 6 | 0 | 684 | 6,718 | 6,306 | 27,107 | 1,281 | 0 | 19 | 87 | 31 | 31 | 0 | 0 | 42,306 |
| SE | 12 | 9 | 6 | 0 | 61 | 683 | 665 | 960 | 335 | 0 | 11 | 23 | 14 | 14 | 0 | 0 | 534 |
| **1999** | | | | | | | | | | | | | | | | | |
| **Deep Creek Marine Sport Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 3 | 110 | 276 | 574 | 41 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,004 |
| SE | 0 | 0 | 0 | 0 | 3 | 24 | 48 | 90 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 149 |
| **Commercial Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 6 | 0 | 0 | 0 | 237 | 2,734 | 2,583 | 4,616 | 295 | 0 | 17 | 0 | 41 | 0 | 0 | 0 | 10,530 |
| SE | 6 | 0 | 0 | 0 | 37 | 108 | 106 | 123 | 41 | 0 | 10 | 0 | 15 | 0 | 0 | 0 | 0 |
| **Sport Harvest Below Sonar** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 4 | 128 | 322 | 669 | 48 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,170 |
| SE | 0 | 0 | 0 | 0 | 17 | 97 | 140 | 162 | 61 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 244 |
| **Inriver Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 125 | 5,977 | 10,212 | 29,265 | 2,242 | 0 | 0 | 0 | 249 | 0 | 0 | 0 | 48,069 |
| SE | 0 | 0 | 0 | 0 | 125 | 813 | 1,014 | 1,274 | 518 | 0 | 0 | 0 | 176 | 0 | 0 | 0 | 723 |
| **Total Run** | | | | | | | | | | | | | | | | | |
| Estimate | 6 | 0 | 0 | 0 | 369 | 8,949 | 13,393 | 35,124 | 2,625 | 0 | 17 | 0 | 290 | 0 | 0 | 0 | 60,773 |
| SE | 6 | 0 | 0 | 0 | 131 | 827 | 1,030 | 1,293 | 523 | 0 | 10 | 0 | 177 | 0 | 0 | 0 | 778 |
| **2000** | | | | | | | | | | | | | | | | | |
| **Deep Creek Marine Sport Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 2 | 0 | 2 | 0 | 17 | 30 | 327 | 660 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,052 |
| SE | 2 | 0 | 2 | 0 | 7 | 9 | 52 | 98 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 152 |
| **Commercial Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 4 | 0 | 0 | 400 | 533 | 1,689 | 1,643 | 34 | 0 | 38 | 14 | 12 | 4 | 0 | 0 | 4,370 |
| SE | 0 | 2 | 0 | 0 | 21 | 24 | 35 | 35 | 6 | 0 | 7 | 4 | 4 | 2 | 0 | 0 | 0 |
| **Sport Harvest Below Sonar** | | | | | | | | | | | | | | | | | |
| Estimate | 2 | 0 | 2 | 0 | 14 | 24 | 258 | 521 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 831 |
| SE | 10 | 0 | 10 | 0 | 30 | 35 | 106 | 115 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 165 |
| **Inriver Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 0 | 1,743 | 13,948 | 27,663 | 1,162 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 44,517 |
| SE | 0 | 0 | 0 | 0 | 0 | 443 | 1,077 | 1,180 | 364 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 211 |
| **Total Run** | | | | | | | | | | | | | | | | | |
| Estimate | 4 | 4 | 4 | 0 | 431 | 2,331 | 16,222 | 30,488 | 1,219 | 0 | 38 | 14 | 12 | 4 | 0 | 0 | 50,770 |
| SE | 10 | 2 | 10 | 0 | 37 | 445 | 1,084 | 1,190 | 365 | 0 | 7 | 4 | 4 | 2 | 0 | 0 | 308 |

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| | Age Class | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | All |
| **2001** | | | | | | | | | | | | | | | | | |
| **Deep Creek Marine Sport Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 17 | 109 | 140 | 635 | 17 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 920 |
| SE | 0 | 0 | 0 | 0 | 6 | 25 | 31 | 119 | 7 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 170 |
| **Commercial Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 861 | 2,913 | 1,059 | 2,354 | 88 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7,274 |
| SE | 0 | 0 | 0 | 0 | 75 | 113 | 82 | 108 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Sport Harvest Below Sonar** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 24 | 158 | 203 | 923 | 24 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 1,336 |
| SE | 0 | 0 | 0 | 0 | 39 | 105 | 125 | 176 | 46 | 0 | 19 | 0 | 0 | 0 | 0 | 0 | 248 |
| **Inriver Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 0 | 4,076 | 6,466 | 22,451 | 923 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 33,916 |
| SE | 0 | 0 | 0 | 0 | 0 | 683 | 841 | 1,061 | 346 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 565 |
| **Total Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 901 | 7,256 | 7,868 | 26,363 | 1,052 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 43,446 |
| SE | 0 | 0 | 0 | 0 | 85 | 701 | 855 | 1,087 | 350 | 0 | 20 | 0 | 0 | 0 | 0 | 0 | 640 |
| **2002** | | | | | | | | | | | | | | | | | |
| **Deep Creek Marine Sport Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 9 | 21 | 99 | 289 | 8 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 427 |
| SE | 0 | 0 | 0 | 0 | 2 | 5 | 23 | 67 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 99 |
| **Commercial Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 9 | 0 | 0 | 1,382 | 3,176 | 3,751 | 2,111 | 69 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 10,505 |
| SE | 0 | 9 | 0 | 0 | 102 | 138 | 144 | 120 | 24 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 |
| **Sport Harvest Below Sonar** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 38 | 94 | 438 | 1,317 | 33 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 1,929 |
| SE | 0 | 0 | 0 | 0 | 17 | 27 | 71 | 149 | 15 | 0 | 0 | 0 | 15 | 0 | 0 | 0 | 210 |
| **Inriver Run** | | | | | | | | | | | | | | | | | |
| Estimate | 47 | 180 | 0 | 0 | 615 | 7,382 | 7,750 | 24,445 | 1,387 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 41,807 |
| SE | 47 | 90 | 0 | 0 | 169 | 536 | 567 | 1,190 | 249 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,353 |
| **Total Run** | | | | | | | | | | | | | | | | | |
| Estimate | 47 | 189 | 0 | 0 | 2,045 | 10,674 | 12,037 | 28,162 | 1,497 | 0 | 0 | 0 | 9 | 9 | 0 | 0 | 54,668 |
| SE | 47 | 91 | 0 | 0 | 198 | 555 | 590 | 1,207 | 250 | 0 | 0 | 0 | 15 | 9 | 0 | 0 | 1,372 |
| **2003** | | | | | | | | | | | | | | | | | |
| **Deep Creek Marine Sport Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 3 | 30 | 37 | 128 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 200 |
| SE | 0 | 0 | 0 | 0 | 1 | 9 | 11 | 37 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 58 |
| **Commercial Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 655 | 8,841 | 4,030 | 3,199 | 302 | 0 | 0 | 50 | 0 | 0 | 0 | 0 | 17,077 |
| SE | 0 | 0 | 0 | 0 | 126 | 328 | 279 | 256 | 87 | 0 | 0 | 36 | 0 | 0 | 0 | 0 | 0 |
| **Sport Harvest Below Sonar** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 12 | 121 | 151 | 531 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 823 |
| SE | 0 | 0 | 0 | 0 | 6 | 25 | 30 | 94 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 134 |
| **Inriver Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 541 | 12,301 | 8,269 | 20,358 | 190 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 41,659 |
| SE | 0 | 0 | 0 | 0 | 139 | 571 | 508 | 653 | 85 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 435 |
| **Total Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 1,210 | 21,293 | 12,488 | 24,216 | 501 | 0 | 0 | 50 | 2 | 0 | 0 | 0 | 59,759 |
| SE | 0 | 0 | 0 | 0 | 188 | 659 | 581 | 708 | 121 | 0 | 0 | 36 | 1 | 0 | 0 | 0 | 459 |

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| | Age Class | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | 0.3 | 0.4 | 0.5 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | All |
| **2004** | | | | | | | | | | | | | | | | | |
| **Deep Creek Marine Sport Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 20 | 148 | 456 | 985 | 51 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,660 |
| SE | 0 | 0 | 0 | 0 | 3 | 20 | 60 | 130 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 219 |
| **Commercial Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 1,329 | 5,811 | 10,378 | 6,237 | 204 | 0 | 34 | 0 | 17 | 0 | 0 | 0 | 24,011 |
| SE | 0 | 0 | 0 | 0 | 146 | 274 | 317 | 281 | 59 | 0 | 24 | 0 | 17 | 0 | 0 | 0 | 0 |
| **Sport Harvest Below Sonar** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 31 | 219 | 673 | 1,393 | 70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,386 |
| SE | 0 | 0 | 0 | 0 | 6 | 18 | 57 | 167 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 268 |
| **Inriver Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 579 | 7,877 | 13,847 | 33,116 | 722 | 0 | 0 | 0 | 64 | 0 | 0 | 0 | 56,205 |
| SE | 0 | 0 | 0 | 0 | 182 | 630 | 869 | 1,509 | 209 | 0 | 0 | 0 | 64 | 0 | 0 | 0 | 1,735 |
| **Total Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 1,960 | 14,054 | 25,354 | 41,731 | 1,048 | 0 | 34 | 0 | 81 | 0 | 0 | 0 | 84,262 |
| SE | 0 | 0 | 0 | 0 | 234 | 687 | 929 | 1,549 | 218 | 0 | 24 | 0 | 67 | 0 | 0 | 0 | 1,770 |
| **2005** | | | | | | | | | | | | | | | | | |
| **Deep Creek Marine Sport Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 4 | 26 | 190 | 791 | 28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,040 |
| SE | 0 | 0 | 0 | 0 | 1 | 4 | 32 | 132 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 173 |
| **Commercial Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 50 | 0 | 0 | 0 | 700 | 6,499 | 4,849 | 11,449 | 400 | 0 | 0 | 100 | 0 | 50 | 0 | 0 | 24,097 |
| SE | 50 | 0 | 0 | 0 | 185 | 488 | 441 | 549 | 140 | 0 | 0 | 71 | 0 | 50 | 0 | 0 | 0 |
| **Sport Harvest Below Sonar** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 9 | 58 | 417 | 1,742 | 61 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,287 |
| SE | 0 | 0 | 0 | 0 | 6 | 18 | 57 | 167 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 210 |
| **Inriver Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 0 | 2,980 | 7,994 | 30,470 | 1,795 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 43,240 |
| SE | 0 | 0 | 0 | 0 | 0 | 499 | 782 | 1,358 | 385 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,370 |
| **Total Run** | | | | | | | | | | | | | | | | | |
| Estimate | 50 | 0 | 0 | 0 | 713 | 9,564 | 13,451 | 44,452 | 2,284 | 0 | 0 | 100 | 0 | 50 | 0 | 0 | 70,664 |
| SE | 50 | 0 | 0 | 0 | 185 | 698 | 900 | 1,480 | 410 | 0 | 0 | 71 | 0 | 50 | 0 | 0 | 1,397 |
| **2006** | | | | | | | | | | | | | | | | | |
| **Deep Creek Marine Sport Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 5 | 103 | 193 | 584 | 53 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 938 |
| SE | 0 | 0 | 0 | 0 | 1 | 15 | 28 | 86 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 138 |
| **Commercial Harvest** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 1,388 | 3,816 | 2,370 | 2,929 | 270 | 0 | 0 | 19 | 0 | 0 | 0 | 0 | 10,792 |
| SE | 0 | 0 | 0 | 0 | 153 | 218 | 189 | 203 | 71 | 0 | 0 | 19 | 0 | 0 | 0 | 0 | 0 |
| **Sport Harvest Below Sonar** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 14 | 349 | 689 | 2,080 | 191 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3,322 |
| SE | 0 | 0 | 0 | 0 | 6 | 18 | 57 | 167 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 509 |
| **Inriver Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 500 | 10,028 | 5,074 | 18,448 | 3,693 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 37,743 |
| SE | 0 | 0 | 0 | 0 | 176 | 661 | 508 | 806 | 423 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 719 |
| **Total Run** | | | | | | | | | | | | | | | | | |
| Estimate | 0 | 0 | 0 | 0 | 1,906 | 14,296 | 8,327 | 24,041 | 4,206 | 0 | 0 | 19 | 0 | 0 | 0 | 0 | 52,795 |
| SE | 0 | 0 | 0 | 0 | 233 | 697 | 546 | 852 | 429 | 0 | 0 | 19 | 0 | 0 | 0 | 0 | 891 |