

MEMORANDUM
STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

TO: Distribution

DATE: May 7, 2012

FROM: Tim McKinley
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Division of Sport Fish
Soldotna

TELEPHONE NO: 260-2913
SUBJECT: Projected savings in
Kenai River Chinook salmon
in-river fisheries

The purpose of this memorandum is to provide managers with estimates of the numbers of Kenai River Chinook salmon that might be saved from harvest, depending on the type of management action imposed and the date and area in which the action is taken. In the last 2 years, Kenai River Chinook salmon fisheries have been restricted by emergency order using closures and restrictions on retention and bait (Table 1). This memorandum gives salmon savings estimates for closure of the early and late runs on particular dates for the middle and lower Kenai River fisheries, as well as an estimate of savings given bait restrictions or closure of the personal use fishery on particular dates.

In order to generate salmon savings estimates, a number of assumptions were applied. Trophy fishing was simply treated as a closure to retention, as it results in very little harvest. Similarly, restrictive actions that use the Soldotna Bridge as a downstream boundary to closure were considered the same as restrictive actions that use Slikok Creek as a downstream boundary to closure. The Slikok Creek boundary is a more natural boundary however, because early run fish do enter and spawn within it. Furthermore, it was assumed that closures that affect one fishery do not affect the harvests from another fishery, although there is likely some interaction (e.g. closure of the early run middle river fishery was assumed not to lead to more harvest in the early run lower river fishery). In the middle river fishery, Genetic stock ID (GSI) sampling was conducted only between the Soldotna Bridge and the Moose River. However, very little harvest occurs above the GSI sampling area boundary (Moose River) to Skilak Lake, so the GSI sampling was considered a good surrogate for the harvest between the Soldotna Bridge and Skilak Lake. Also for the middle river fisheries, daily guided angler harvest trends were assumed similar to unguided angler harvest trends. And finally, the Chinook salmon harvest in the personal use dipnet fishery has not been sampled for GSI, but based on sampling of immigrating Chinook salmon in the netting program further upstream at the Chinook salmon sonar site, it is assumed that all of the harvest is of late-run (mainstem-bound) fish.

To estimate the number of salmon saved, harvest timing information was collected from three sources: Freshwater Guide Logbook entries (Soldotna Bridge to Skilak Lake), creel surveys in the lower river (between the Soldotna Bridge and the Warren Ames Bridge), and personal use permit returns from the Kenai River dipnet fishery. GSI data were collected in the early- and late-run fisheries above and below the Soldotna Bridge. The early-run and late-run sport fisheries harvest fish from both the middle and lower river, and these two areas were considered separately for each sport fishery. The personal use fishery only harvests fish in the late run.

To estimate the number of salmon saved in the early-run middle river fishery: (1) harvest by day recorded as logbook entries by freshwater fishing guides in 2008 and 2009 were apportioned as tributary-bound or mainstem-bound fish using roughly biweekly strata estimates from GSI sampling; then, (2) the apportioned daily logbook entries were expanded using the ratio of the Statewide Harvest Survey estimate for all anglers vs. the total reported logbook harvest. Note that other recent years were not used because they had inseason management actions that likely altered harvest timing. Estimates of the number of salmon saved for the late-run middle river fishery were generated using the same method, except the years 2007–2010 were used. The estimated savings of fish by closing the middle river early- and late-run sport fisheries on a particular date and year are given in Tables 2 and 3, as well as the mean percent of

harvest that could have been saved and the mean number of fish that could have been saved by closing the fishery on a particular day, estimated for those years.

In order to estimate the number of fish saved by particular restrictive actions in the early-run lower river sport fishery, we used harvest information from the lower river creel survey. Harvest records from the creel survey by date for 2003, 2004, and 2009 were used. These records were obtained under similar regulations and inseason actions. Also, guided angler and unguided angler information was collected from the creel survey such that separate estimates of harvest could be derived, which improved the accuracy and precision of the overall estimates. Estimates of early-run (tributary-bound) and late-run (mainstem-bound) fish were based on GSI sampling in 2009 only, the only year of these three that was sampled for GSI. The same information that was collected during the early-run lower river sport fishery was also collected for the late-run sport fishery; however, for the late-run fishery, the four most recent years without inseason restrictions were used for harvest timing and GSI estimates (2007–2010). The estimated mean percentages of harvest to date by angler type are given in Tables 4 and 5. An inseason estimate of the number of salmon that could be saved by closing the lower river fishery on a certain date can be calculated as follows: multiply the inseason estimated harvest to date by angler type (from an inseason creel survey) by the ratio of the proportion of remaining harvest to date and the proportion of the harvest to date (see Table 4 or 5). For example, if 500 fish had been harvested from the early run by unguided anglers before 2 June, multiply $500 \times (0.803/0.197) = 2,038$ fish saved.

To make a very rough estimate of the impact of bait restrictions, the projected additional fishery harvest in the lower river in July 2011, just prior to bait being restricted (July 24, 2011 was the last day that bait was allowed), was compared to the actual additional harvest (i.e., 2,035 projected vs. 925 actual). Projected final fishery harvests are generated inseason using the information in Tables 4 and 5, and the estimated harvest to date from the lower river creel survey. The difference was an approximate 55% reduction. This estimate is very rough because the magnitude of the decrease may be affected by fish abundance, water clarity, fishery effort, anglers' decisions to retain or not depending on the regulations, the amount of error in the projected harvest (related to how far into the season the projection is made) and interactions between these variables.

To estimate the number of salmon that might be saved by closing the personal use dipnet fishery, reported harvest by day of Chinook salmon was used for 2007–2010 and expanded by the estimated season total for these years. The most recent year, 2011, was closed the last 8 days of the fishery and so was not used. Mean harvest savings by date are in Table 6.

Distribution:

Anchorage: James Hasbrouck, Jack Erickson, Tom Vania

Soldotna: Robert Begich

Table 1. Inseason restrictive actions in the Kenai River Chinook salmon fisheries, 2010 & 2011.

Run	Emergency Order action	Date
Early	Closed below Skilak Lake	June 5, 2010
Early	Catch and Release (C&R) trophy fishing below Skilak Lake	June 12, 2010
Early	No bait C&R trophy fishing above Slikok Creek	June 29, 2011
Late	No bait C&R trophy fishing above Slikok Creek	July 15, 2011
Late	Prohibit retention of Chinook salmon in personal use fishery	July 24, 2011
Late	No bait downstream of Slikok Creek	July 25, 2011

Table 2. Early-run Chinook salmon harvest timing information for the middle Kenai River sport fishery, 2008 and 2009. Estimates were generated from season total estimates from the SWHS for the Soldotna Bridge to Skilak Lake, harvest timing from entries in the Freshwater Guide Logbook program between the Soldotna Bridge and Skilak Lake, and tributary-bound estimates from a roving GSI harvest sampling program between the Soldotna Bridge and the Moose River.

Date	Harvest savings by closing on date			
	Mean % harvest of tributary-bound fish (2008–2009)	Mean harvest of tributary-bound fish (2008–2009)	2008	2009
before				
1-Jun	~100.0%	866	1,114	618
1-Jun	99.2%	861	1,114	608
2-Jun	99.2%	861	1,114	608
3-Jun	98.5%	856	1,114	599
4-Jun	98.5%	856	1,114	599
5-Jun	97.7%	852	1,114	590
6-Jun	97.7%	852	1,114	590
7-Jun	97.7%	852	1,114	590
8-Jun	97.7%	852	1,114	590
9-Jun	97.7%	852	1,114	590
10-Jun	95.4%	837	1,114	561
11-Jun	93.1%	823	1,114	533
12-Jun	89.8%	797	1,091	504
13-Jun	85.3%	767	1,077	457
14-Jun	82.3%	748	1,077	419
15-Jun	80.0%	722	1,026	419
16-Jun	80.0%	722	1,026	419
17-Jun	71.9%	673	1,026	320
18-Jun	66.6%	627	968	286
19-Jun	62.8%	594	927	262
20-Jun	59.4%	569	911	228
21-Jun	55.8%	536	861	212
22-Jun	52.8%	504	795	212
23-Jun	52.8%	504	795	212
24-Jun	46.1%	462	795	129
25-Jun	41.6%	415	709	121
26-Jun	35.0%	351	606	96
27-Jun	31.3%	310	524	96
28-Jun	26.1%	252	408	96
29-Jun	21.5%	201	306	96
30-Jun	21.5%	201	306	96
1-Jul	20.8%	196	306	87
2-Jul	17.2%	163	257	69
3-Jul	14.4%	137	217	58
4-Jul	13.9%	134	217	51
5-Jul	12.8%	122	193	51
6-Jul	12.1%	114	177	51

7-Jul	12.0%	114	177	50
8-Jul	11.7%	112	177	46
9-Jul	10.6%	101	159	43
10-Jul	9.1%	85	129	41
11-Jul	6.4%	56	73	38
12-Jul	5.6%	51	73	29
13-Jul	3.6%	28	28	29
14-Jul	3.6%	28	28	29
15-Jul	2.3%	19	22	16
16-Jul	2.0%	17	18	15
17-Jul	1.9%	15	16	14
18-Jul	1.8%	15	16	14
19-Jul	1.7%	14	15	13
20-Jul	1.7%	14	15	13
21-Jul	1.7%	14	15	13
22-Jul	1.5%	13	14	11
23-Jul	1.3%	10	10	10
24-Jul	1.1%	8	7	10
25-Jul	0.9%	7	5	8
26-Jul	0.7%	5	3	7
27-Jul	0.7%	5	3	7
28-Jul	0.7%	5	3	7
29-Jul	0.5%	4	3	5
30-Jul	0.3%	2	1	3
31-Jul	0.1%	1	0	1

Table 3. Late run Chinook salmon harvest timing information for the middle Kenai River sport fishery, 2007-2010. Estimates were generated from season total estimates from the SWHS for the Soldotna Bridge to Skilak Lake, harvest timing from entries in the Freshwater Guide Logbook program between the Soldotna Bridge and Skilak Lake, and mainstem-bound estimates from a roving GSI harvest sampling program between the Soldotna Bridge and the Moose River.

Harvest savings by closing on date						
Date	Mean % harvest of mainstem-bound fish (2007–2010)	Mean harvest of mainstem-bound fish (2007–2010)	2007	2008	2009	2010
before						
1-Jun	~100.0%	1,764	1,986	1,650	1,618	1,805
1-Jun	100.0%	1,764	1,986	1,650	1,618	1,805
2-Jun	100.0%	1,764	1,986	1,650	1,618	1,805
3-Jun	100.0%	1,764	1,986	1,650	1,618	1,805
4-Jun	100.0%	1,764	1,986	1,650	1,618	1,805
5-Jun	100.0%	1,764	1,986	1,650	1,618	1,805
6-Jun	100.0%	1,764	1,986	1,650	1,618	1,805
7-Jun	100.0%	1,764	1,986	1,650	1,618	1,805
8-Jun	100.0%	1,764	1,986	1,650	1,618	1,805
9-Jun	100.0%	1,764	1,986	1,650	1,618	1,805
10-Jun	100.0%	1,764	1,986	1,650	1,618	1,805
11-Jun	100.0%	1,764	1,986	1,650	1,618	1,805
12-Jun	100.0%	1,764	1,986	1,650	1,618	1,805
13-Jun	100.0%	1,764	1,986	1,650	1,618	1,805
14-Jun	100.0%	1,764	1,986	1,650	1,618	1,805
15-Jun	100.0%	1,764	1,986	1,650	1,618	1,805
16-Jun	100.0%	1,764	1,986	1,650	1,618	1,805
17-Jun	99.7%	1,759	1,980	1,650	1,603	1,802
18-Jun	99.4%	1,755	1,979	1,643	1,599	1,799
19-Jun	99.3%	1,752	1,979	1,638	1,595	1,796
20-Jun	98.9%	1,745	1,966	1,636	1,591	1,787
21-Jun	98.6%	1,740	1,957	1,630	1,588	1,787
22-Jun	98.4%	1,737	1,952	1,622	1,588	1,786
23-Jun	98.1%	1,731	1,945	1,622	1,588	1,770
24-Jun	97.8%	1,725	1,942	1,622	1,576	1,760
25-Jun	97.5%	1,721	1,942	1,611	1,575	1,755
26-Jun	97.2%	1,715	1,941	1,598	1,572	1,751
27-Jun	96.9%	1,711	1,936	1,588	1,572	1,747
28-Jun	96.6%	1,705	1,928	1,573	1,572	1,747
29-Jun	96.3%	1,700	1,921	1,560	1,572	1,747
30-Jun	96.2%	1,697	1,917	1,560	1,572	1,739
1-Jul	96.1%	1,696	1,914	1,560	1,571	1,738
2-Jul	93.5%	1,652	1,914	1,473	1,507	1,715
3-Jul	91.4%	1,618	1,908	1,400	1,467	1,697
4-Jul	89.2%	1,576	1,787	1,400	1,444	1,674
5-Jul	87.3%	1,540	1,686	1,357	1,444	1,674
6-Jul	85.7%	1,509	1,592	1,328	1,444	1,674

7-Jul	84.4%	1,486	1,552	1,328	1,440	1,623
8-Jul	83.6%	1,471	1,532	1,328	1,426	1,600
9-Jul	82.7%	1,455	1,532	1,294	1,417	1,580
10-Jul	81.6%	1,437	1,532	1,240	1,408	1,570
11-Jul	78.5%	1,382	1,444	1,138	1,399	1,547
12-Jul	77.1%	1,357	1,377	1,138	1,367	1,547
13-Jul	75.5%	1,328	1,344	1,056	1,367	1,547
14-Jul	74.1%	1,303	1,330	1,056	1,367	1,460
15-Jul	70.8%	1,243	1,203	1,046	1,322	1,401
16-Jul	64.3%	1,132	1,203	855	1,242	1,229
17-Jul	59.0%	1,040	1,194	766	1,144	1,057
18-Jul	55.8%	982	1,085	766	1,115	960
19-Jul	53.1%	934	1,022	685	1,069	960
20-Jul	52.6%	926	995	685	1,069	954
21-Jul	49.5%	868	931	685	1,069	785
22-Jul	43.2%	756	832	670	920	604
23-Jul	37.5%	660	832	464	845	500
24-Jul	33.4%	591	823	324	810	407
25-Jul	27.8%	492	696	250	695	325
26-Jul	22.3%	396	570	133	563	319
27-Jul	20.2%	354	407	133	563	313
28-Jul	17.7%	307	289	133	563	244
29-Jul	13.5%	234	235	133	397	172
30-Jul	8.9%	158	235	66	218	113
31-Jul	5.1%	95	208	0	92	78

Table 4. Early run Chinook salmon harvest information from the lower Kenai River creel survey and harvest sampling program conducted between the Warren Ames Bridge and Soldotna Bridge in 2003, 2004, and 2009. Estimates were generated using harvest timing from all these years, and mainstem- or tributary-bound information from only 2009.

Date	Harvest savings by closing on date					
	Guided anglers			Unguided anglers		
	Mean % of harvest	mean % of tributary-bound fish	mean % of mainstem-bound fish	Mean % of harvest	mean % of tributary-bound fish	mean % of mainstem-bound fish
before June	100.0%	88.8%	11.2%	100.0%	88.1%	11.9%
1-Jun	90.2%	79.0%	11.2%	82.5%	70.7%	11.9%
2-Jun	89.7%	78.5%	11.2%	80.3%	68.5%	11.8%
3-Jun	87.8%	76.6%	11.2%	78.0%	66.2%	11.8%
4-Jun	84.8%	73.7%	11.2%	74.0%	62.2%	11.8%
5-Jun	81.9%	70.8%	11.1%	70.0%	58.2%	11.7%
6-Jun	77.7%	66.6%	11.1%	66.1%	54.4%	11.7%
7-Jun	75.7%	64.6%	11.1%	61.8%	50.1%	11.7%
8-Jun	74.4%	63.4%	11.1%	61.5%	49.8%	11.7%
9-Jun	70.9%	59.9%	11.0%	59.6%	47.9%	11.7%
10-Jun	66.1%	55.1%	11.0%	57.7%	46.0%	11.6%
11-Jun	58.8%	47.9%	10.9%	55.7%	44.1%	11.6%
12-Jun	51.6%	40.8%	10.9%	53.8%	42.2%	11.6%
13-Jun	45.9%	35.0%	10.8%	50.5%	38.9%	11.6%
14-Jun	40.0%	29.2%	10.8%	44.8%	33.3%	11.5%
15-Jun	40.0%	29.2%	10.8%	42.7%	31.2%	11.5%
16-Jun	39.3%	28.5%	10.8%	42.0%	30.5%	11.5%
17-Jun	37.0%	26.9%	10.1%	40.7%	29.5%	11.1%
18-Jun	33.6%	24.4%	9.2%	36.8%	26.7%	10.1%
19-Jun	30.1%	21.9%	8.2%	33.0%	23.9%	9.0%
20-Jun	26.9%	19.6%	7.4%	29.9%	21.7%	8.2%
21-Jun	22.4%	16.2%	6.1%	25.4%	18.5%	7.0%
22-Jun	21.5%	15.6%	5.9%	22.0%	16.0%	6.0%
23-Jun	20.9%	15.2%	5.7%	21.7%	15.8%	5.9%
24-Jun	19.5%	14.2%	5.3%	20.1%	14.6%	5.5%
25-Jun	16.0%	11.7%	4.4%	17.2%	12.5%	4.7%
26-Jun	12.6%	9.1%	3.4%	14.3%	10.4%	3.9%
27-Jun	8.6%	6.2%	2.4%	11.7%	8.5%	3.2%
28-Jun	6.1%	4.4%	1.7%	7.8%	5.7%	2.1%
29-Jun	4.7%	3.4%	1.3%	4.3%	3.1%	1.2%
30-Jun	2.7%	2.0%	0.7%	1.9%	1.4%	0.5%

Table 5. Late run Chinook salmon harvest information from the lower Kenai River creel survey and harvest sampling program conducted between the Warren Ames Bridge and Soldotna Bridge, 2007-2010.

Date	Harvest savings by closing on date					
	Guided anglers			Unguided anglers		
	Mean % of harvest	mean % of tributary-bound fish	mean % of mainstem-bound fish	Mean % of harvest	mean % of tributary-bound fish	mean % of mainstem-bound fish
1-Jul	100.0%	2.3%	97.7%	100.0%	2.1%	97.9%
2-Jul	97.9%	2.2%	95.7%	97.9%	1.9%	96.0%
3-Jul	95.7%	2.1%	93.7%	96.4%	1.8%	94.5%
4-Jul	94.0%	2.0%	92.0%	94.7%	1.7%	92.9%
5-Jul	92.5%	1.9%	90.6%	93.3%	1.7%	91.6%
6-Jul	91.9%	1.8%	90.0%	91.6%	1.6%	90.0%
7-Jul	91.1%	1.8%	89.3%	90.4%	1.5%	88.9%
8-Jul	89.4%	1.7%	87.7%	88.6%	1.4%	87.2%
9-Jul	87.2%	1.6%	85.6%	86.7%	1.3%	85.4%
10-Jul	85.1%	1.5%	83.6%	86.0%	1.2%	84.7%
11-Jul	82.1%	1.3%	80.8%	85.1%	1.2%	83.9%
12-Jul	79.8%	1.1%	78.6%	83.8%	1.1%	82.7%
13-Jul	77.5%	1.0%	76.5%	81.7%	1.0%	80.7%
14-Jul	75.9%	0.9%	74.9%	79.2%	0.9%	78.4%
15-Jul	72.9%	0.8%	72.2%	76.3%	0.7%	75.7%
16-Jul	68.1%	0.5%	67.7%	73.3%	0.5%	72.8%
17-Jul	63.9%	0.4%	63.5%	71.4%	0.5%	70.9%
18-Jul	55.1%	0.4%	54.7%	67.9%	0.5%	67.4%
19-Jul	50.6%	0.4%	50.3%	63.3%	0.4%	62.9%
20-Jul	47.7%	0.3%	47.4%	57.6%	0.4%	57.2%
21-Jul	43.7%	0.3%	43.4%	52.9%	0.4%	52.5%
22-Jul	39.9%	0.3%	39.7%	49.2%	0.3%	48.8%
23-Jul	34.8%	0.2%	34.6%	44.0%	0.3%	43.6%
24-Jul	30.3%	0.2%	30.1%	41.4%	0.3%	41.1%
25-Jul	24.6%	0.2%	24.4%	36.7%	0.3%	36.5%
26-Jul	20.7%	0.1%	20.5%	31.4%	0.2%	31.1%
27-Jul	17.2%	0.1%	17.1%	26.5%	0.2%	26.3%
28-Jul	14.4%	0.1%	14.3%	20.9%	0.1%	20.7%
29-Jul	11.9%	0.1%	11.9%	16.5%	0.1%	16.3%
30-Jul	8.0%	0.1%	8.0%	10.1%	0.1%	10.1%
31-Jul	4.6%	0.0%	4.5%	5.7%	0.0%	5.6%

Table 6. Chinook salmon harvest information for the Kenai River personal use dipnet fishery, 2007–2010.

Date	mean % harvest	mean	Harvest savings by closing on date			
			2007	2008	2009	2010
10-Jul	100.0%	1,231	1,509	1,362	1,189	865
11-Jul	97.2%	1,204	1,488	1,353	1,155	831
12-Jul	94.3%	1,178	1,472	1,343	1,111	804
13-Jul	92.0%	1,142	1,452	1,326	1,060	764
14-Jul	89.1%	1,105	1,414	1,314	1,023	715
15-Jul	86.0%	1,067	1,348	1,302	992	676
16-Jul	83.0%	1,001	1,283	1,272	916	603
17-Jul	77.8%	932	1,252	1,195	866	511
18-Jul	73.4%	840	1,183	1,115	761	422
19-Jul	69.5%	719	1,042	956	601	380
20-Jul	62.6%	630	914	816	540	336
21-Jul	56.3%	538	746	716	485	277
22-Jul	48.8%	460	615	628	425	233
23-Jul	41.6%	376	495	529	342	187
24-Jul	31.7%	327	448	465	301	148
25-Jul	24.3%	273	404	411	250	93
26-Jul	18.7%	210	313	319	189	69
27-Jul	13.4%	172	259	246	159	63
28-Jul	10.3%	134	201	196	121	48
29-Jul	7.2%	99	124	168	93	32
30-Jul	4.3%	70	76	123	66	26
31-Jul	2.2%	35	31	64	33	15