

STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

Division of Commercial Fisheries
Division of Sport Fish

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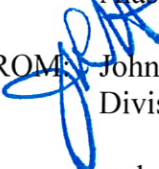
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MEMORANDUM

TO: Members
Alaska Board of Fisheries

DATE: October 1, 2010

FROM:  John Hilsinger, Director
Division of Commercial Fisheries

SUBJECT: Upper Cook Inlet Stock of
Concern
Recommendations

and

Charles Swanton, Director 
Division of Sport Fish

This memorandum summarizes results from the stock of concern evaluation for Upper Cook Inlet (Area H) Region salmon for the 2010–2011 Alaska Board of Fisheries (board) regulatory cycle. The evaluation includes input from regional and area staff from the fishery divisions, as well as input from the Division of Subsistence. The memo discusses the existing Susitna River sockeye salmon stock of yield concern, along with six Chinook salmon recommended stocks of concern in three areas of Upper Cook Inlet: West Cook Inlet, Westside Susitna River, and Eastside Susitna River.

The *Policy for the Management of Sustainable Salmon Fisheries* (SSFP; 5 AAC 39.222) directs the Alaska Department of Fish and Game (department) to report to the board on the status of salmon stocks and identify any stocks that present a concern related to yield, management, or conservation during regular board meetings. Both yield and management stocks of concern are discussed in this memorandum. A yield concern is defined (5 AAC 39.222) as “a concern arising from a chronic inability, despite the use of specific management measures, to maintain expected yields, or harvestable surpluses, above a stock's escapement needs.” A management concern is defined (5 AAC 39.222) as “a concern arising from a chronic inability, despite use of specific management measures, to maintain escapements for a salmon stock within the bounds of the SEG, BEG, OEG, or other specified management objectives for a fishery.” The policy defines “chronic inability” as “the continuing or anticipated inability to meet escapement thresholds over a four to five year period, which is approximately the generation time of most salmon species” (5 AAC 39.222 (f)(5)).

West Cook Inlet Chinook salmon

Chuitna River Chinook salmon

Background

The Chuitna River is the most productive Chinook salmon river flowing into the West Cook Inlet Management Area (WCIMA). This river system is a small- to medium-sized clearwater system initiating in the foothills of the Alaska Range, generally flowing in a southeasterly direction and emptying into WCIMA near the village of Tyonek (Figure 1). This system is pristine with almost no human disturbances or development. Access to the Chuitna River is limited to aircraft and boat since there is no road link to the southcentral Alaska road system.

There is a proposed coal mine development project within the Chuitna River watershed and current plans call for rerouting two of the system's smaller, less productive tributaries. The Chuitna River is the most popular Chinook salmon sport fishery in WCIMA. There are two sport fish lodge operations that target Chuitna River Chinook salmon, as well as several sport fish guide operations.

Stock Status

Chuitna River Chinook salmon are harvested by three user groups: an inriver sport fishery, the Northern District Chinook salmon commercial fishery, and the Tyonek subsistence fishery. The majority of the harvest can likely be attributed to the sport fishery, with the exceptions of 2009 and 2010.

The subsistence fishery occurs in the Tyonek Subdistrict salt waters adjacent to the village of Tyonek on West Cook Inlet; the subdistrict includes the area from one mile south of the mouth of the Chuitna River south to the easternmost part of Granite Point and from the mean point of high tide to the mean point of lower low tide. The season in this subsistence fishery operates in two parts. The first part, which focuses on Chinook salmon, is open Tuesdays, Thursdays, and Fridays from May 15–June 15 or until the Guideline Harvest Level (GHL) of 4,200 Chinook salmon is reached. The second part is open Saturdays from June 16–October 15; however, if the GHL has been reached, the second part does not open until July 1. The board made a positive customary and traditional use finding for salmon in the Tyonek Subdistrict (5 AAC 01.566 (a)(1)(A)), and set an amount necessary for subsistence at 850–3,600 salmon (ADF&G 1995:33).

Prior to 2008, the sport fishery contributed the majority of harvest; although the contribution of this stock to commercial and subsistence fisheries is unknown, it is suspected to be small. The commercial fishery was liberalized from 6 hours per period to 12 hours per period in 2005, and from 3 periods per season to 4 periods per season by the board in 2008. The most productive waters for commercial harvest of Chinook salmon are found from one mile south of the Theodore River to the mouth of the Susitna River; however, this area is open to fishing for the second regular Monday period only. The commercial fishery is limited to a harvest not to exceed 12,500 Chinook salmon, averaging 2,734 over the past five years and about 2,400 since 1993. The department is considering initiating a genetic sampling program to estimate stock-specific harvest in the commercial and subsistence fisheries.

From 1977–2001, this system experienced up to 4,500 angler days of sport fishing effort (Figure 2). In 2009, only 1,350 angler days were expended. Sport angler harvest of Chinook salmon from this system was as high as 1,185 fish (1983); however, in 2009 only 109 fish were harvested (Figure 2) and in 2010, the Chinook salmon fishery was closed preseason by emergency order. Retention of

Chinook salmon in the sport fishery is limited to the area downstream of an old cable crossing. Chinook salmon escapement into the Chuitna River has recently declined. The department has conducted annual single aerial surveys on the Chuitna River since 1979 to index spawning escapement of Chinook salmon. These surveys are conducted from helicopters at slower speeds than traditional fixed-wing aircraft surveys. The average escapement from 1979–2005 was approximately 2,000 fish (Figure 3). A more recent average (2006–2010) is approximately 1,000 fish, nearly one-half the previous 5-year average. The sustainable escapement goal (SEG) for Chinook salmon returning to the Chuitna River is 1,200–2,900 fish. Despite restrictive action since the mid 1990s and closure of the sport fishery in 2010, the lower bound of this goal was not achieved for the past four consecutive years.

Sport Fish Regulatory History

- 1984 Opened to Chinook salmon fishing.
- 1992 Seasonal bag limit of five Chinook salmon was established. Guides could not fish while engaged in guiding activities for Chinook salmon.
- 1993 Chinook salmon fishing in WCIMA reduced from July 13 to June 30. Only unbaited artificial lures could be used in specific sections of the Lewis, Theodore, and Chuitna rivers.
- 1995 Bait prohibited areawide; bag/possession limit of 1 over 16 inches; fishing allowed 6 a.m.–11 p.m.

Stock of Concern Recommendation

Despite the sport fish restrictions already in place and recent commercial fishery restrictions and closures on westside fisheries, the Chuitna River Chinook salmon escapement goal has not been met in four consecutive years. The department recommends that the board consider Chuitna River Chinook salmon for stock of management concern status.

Theodore River Chinook salmon

Background

The Theodore River is a small clearwater system initiating in the foothills of Little Mount Susitna, flowing in a southerly direction and emptying into WCIMA (Figure 1). This system is pristine with almost no human disturbances or development. The Theodore River is remote with access limited to aircraft or boat because there is no road link to the southcentral Alaska road system. Historically, this system was a popular sport fishing destination for Chinook salmon anglers.

Stock Status

Historically, the Theodore River has been the second-most productive Chinook salmon system in WCIMA. Sport fishing effort was relatively high from 1984–1994, with a peak of more than 6,000 angler days of sport fishing effort in 1987 (Figure 2). In recent years estimated effort has been less than 1,000 angler days annually (Figure 2). Sport angler harvest of Chinook salmon from this system was as high as 1,400 fish (1986), and decreased to 183 prior to regulatory changes that closed the sport fishery in 1996 and then restricted sport fishing to catch-and-release in 1999.

Chinook salmon escapement into the Theodore River has recently declined. The department has conducted annual single aerial surveys on the Theodore River via helicopter since 1979 to index spawning escapement of Chinook salmon. The average escapements from 1979–2005 were approximately 1,090 fish (Figure 3). A more recent average (2006–2010) is approximately 470 fish, less than one-half the previous 5-year average. The SEG for Chinook salmon returning to the Theodore River is 500–1,700 fish. The Theodore River has failed to meet the SEG in six of the last 10 years, and for the past four consecutive years despite a catch-and-release sport fishery for Chinook salmon the past 12 years.

Currently, Theodore River Chinook salmon are harvested by two user groups: the Northern District Chinook salmon commercial fishery and the Tyonek subsistence fishery. See “Chuitna River,” above for an explanation of the subsistence and commercial fisheries.

Sport Fish Regulatory History

- 1984 Open to Chinook salmon fishing.
- 1992 Seasonal bag limit of five Chinook salmon was established. Guides could not fish while engaged in guiding activities for Chinook salmon.
- 1993 Chinook fishing in WCIMA was reduced from July 13 to June 30; only unbaited artificial lures could be used in specific sections of the Lewis, Theodore, and Chuitna rivers.
- 1995 Bait prohibited areawide; bag/possession 1 over 16 inches; fishing allowed 6 a.m.–11 p.m.
- 1996 Theodore River closed to Chinook salmon fishing.
- 1999 Opened lower Theodore River to catch-and-release for Chinook salmon.
- 2002 Opened entire Theodore River to catch-and-release for Chinook salmon.

Stock of Concern Recommendation

Despite the sport fish restrictions already in place, including over a decade of no sport harvest and recent commercial fishery restrictions and closures on westside fisheries, the Theodore River escapement goal has not been met in four consecutive years. The department recommends that the board consider Theodore River Chinook salmon for stock of management concern status.

Lewis River Chinook salmon

Background

The Lewis River is a small clearwater system initiating in the foothills of Little Mount Susitna and Mount Susitna, flowing into the WCIMA (Figure 1). This system is pristine with almost no human disturbances or development. Access to the Lewis River is limited to aircraft and boat since there is no road link to the southcentral Alaska road system. Historically, this system was a popular sport fishing destination for Chinook salmon anglers.

Stock Status

Although information on the sport fishery is spotty, this system has experienced as many as 1,300 angler days of sport fishing effort (Figure 2). In recent years estimated effort has been fewer than 500 angler days annually. Sport harvest was greater than 150 fish annually from 1987–1990, but the sport fishery was closed by regulation in 1996 and then restricted to catch-and-release by regulation beginning in 1999.

Chinook salmon production in the Lewis River is currently in a state of decline. The department has conducted single annual aerial surveys on the Lewis River via helicopters since 1979 to index spawning escapement of Chinook salmon. The average escapement from 1979–2005 was approximately 560 fish (Figure 3). A more recent average (2006–2010) is 126 fish, approximately one-fourth the previous period's average. The Lewis River SEG for Chinook salmon is 250–800 fish. The Lewis River has failed to meet the SEG for Chinook salmon the past four consecutive years despite a catch-and-release sport fishery.

Currently Lewis River Chinook salmon are harvested by two user groups: the Northern District Chinook salmon commercial fishery and the Tyonek subsistence fishery. See “Chuitna River,” above, for an explanation of the subsistence and commercial fisheries.

Sport Fish Regulatory History

- 1984 Open to Chinook salmon fishing.
- 1992 Seasonal bag limit of five Chinook salmon was established. Guides could not fish while engaged in guiding activities for Chinook salmon.
- 1993 Chinook fishing in WCI was reduced from July 13 to June 30. Only unbaited artificial lures could be used in specific sections of the Lewis, Theodore, and Chuitna rivers.
- 1995 Bait prohibited areawide; bag/possession 1 over 16 inches; fishing allowed 6 a.m.–11 p.m.
- 1996 Lewis River closed to Chinook salmon fishing.
- 2002 Opened entire Lewis River to catch-and-release for Chinook salmon.

Stock of Concern Recommendation

Despite the sport fish restrictions already in place, including over a decade of no sport harvest, and recent commercial fishery restrictions and closures on westside fisheries, the Lewis River escapement goal has not been achieved the past four years. The department recommends that the board consider Lewis River Chinook salmon for stock of management concern status.

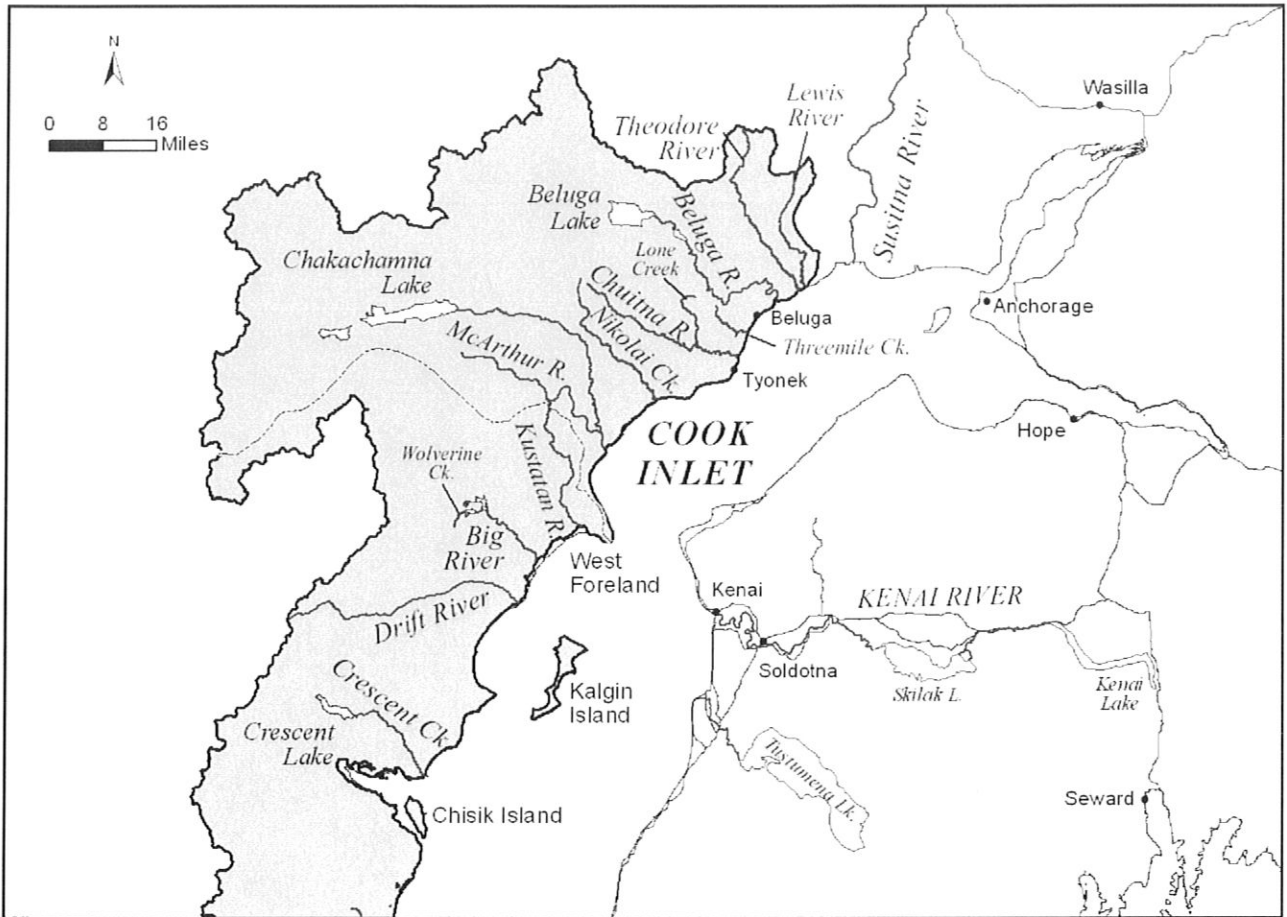


Figure 1. Map depicting West Cook Inlet Chinook salmon streams.

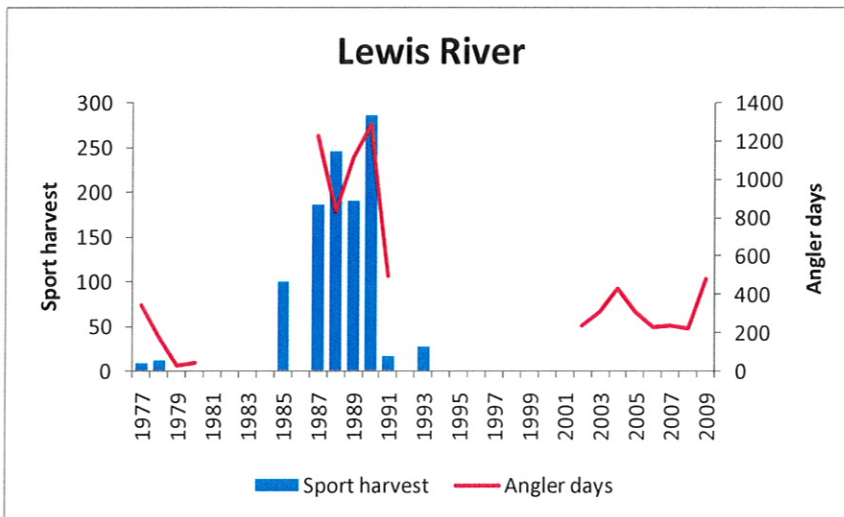
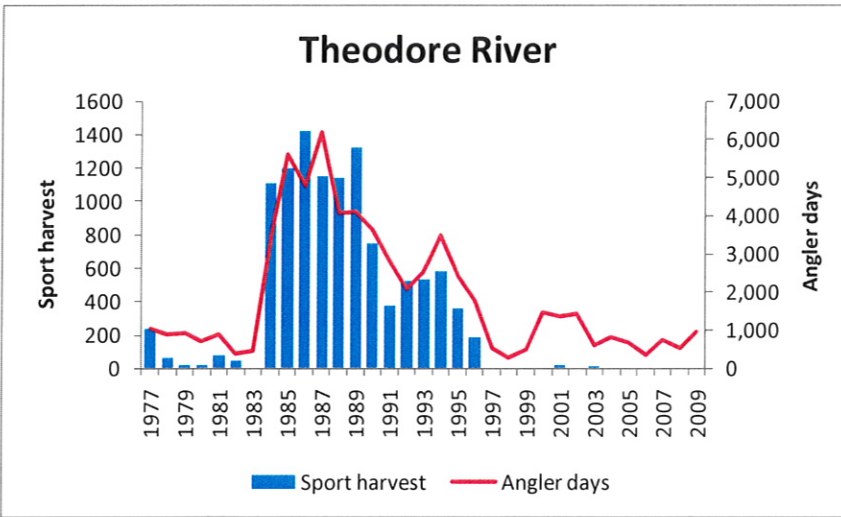
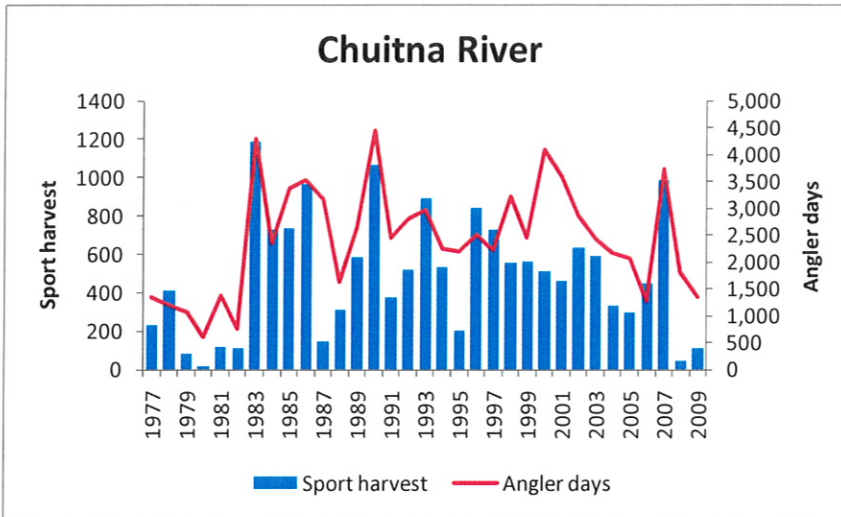


Figure 2. Sport harvest and angler effort estimates for Chuitna, Theodore, and Lewis River Chinook salmon, 1997–2009 (Jennings *et al.* *In prep.*).

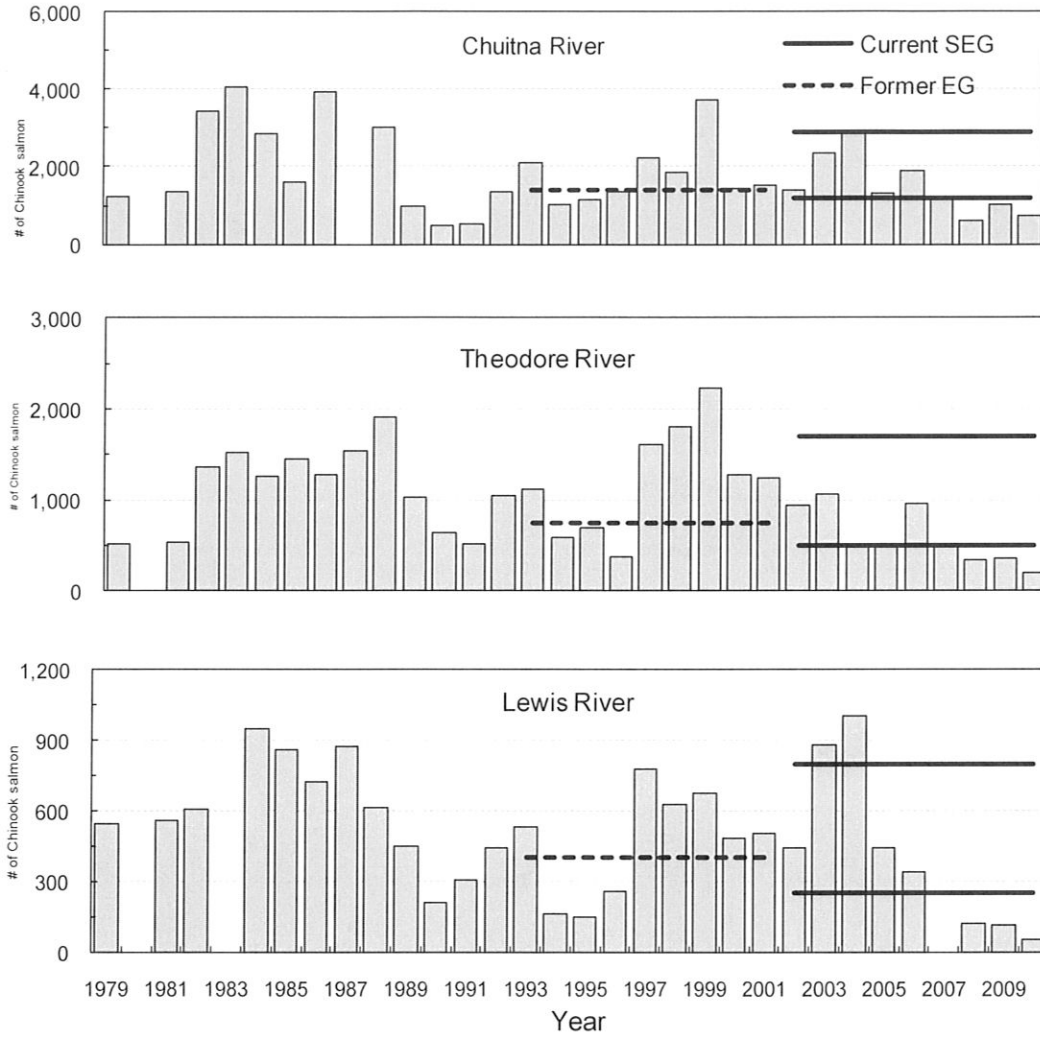


Figure 3. West Cook Inlet Chinook salmon escapement index counts, 1979–2010.

Westside Susitna River Chinook salmon

Alexander Creek Chinook salmon

Background

Alexander Creek (Figure 4) is a remote river accessible via float plane or boat. The creek is a low velocity, winding, clearwater system flowing into the west side of the Susitna River approximately eight river miles upstream from where the Susitna River empties into Cook Inlet. Alexander Creek, once one of the most productive Chinook salmon sport fisheries in the Northern Cook Inlet (NCI) area, was closed to Chinook salmon fishing in 2008 by the board, primarily to address a decade of declining Chinook salmon escapements (see regulatory history below).

Sport fisheries, primarily the Chinook salmon fishery in the Alexander Creek system, once supported nine full time lodges. In addition to the lodge operations, this system also supported several float plane charter operations based at Anchorage's Lake Hood, numerous boat charter/guide operations, and a cabin and boat rental business. Today, few if any, of these operations are still in business.

Northern pike were illegally introduced to at least one lake in the Susitna River drainage during the 1950s and have since spread throughout the drainage. Northern pike were first observed in Alexander Lake in the late 1960s and since then, have colonized the lake and 40 miles of creek. The system contains numerous backwater side-sloughs and oxbow channels, several tributaries, many interconnecting shallow lakes and ponds, and vast expanses of wetlands and marshes, all of which provide for optimum spawning and rearing habitat for northern pike. Unfortunately, juvenile Chinook salmon habitat overlaps with northern pike habitat throughout this river system.

Northern pike are voracious, opportunistic feeders that prey on and prefer salmonids over other available prey. In the absence of refuge areas for juvenile salmon, predation by northern pike can lead to severe reductions in salmonid populations, such as Chinook salmon. This is likely the cause for the decrease of Chinook salmon escapement in the Alexander Creek drainage. Northern pike have colonized nearly all of the drainage (with the exception of lower Sucker and Wolverine creeks), while Chinook salmon escapement has declined significantly. Because of the tremendous overlap of northern pike and juvenile Chinook salmon habitat throughout most of this system, there is little refuge for juvenile Chinook salmon to escape northern pike predation. Therefore, it is unlikely that Alexander Creek Chinook salmon will rebound in this system without significant changes to the northern pike infestation. Other salmon species and resident fish populations have declined in this system as well, the extent of which is currently unknown since the department monitors only Chinook salmon.

Stock Status

Until 2008, Alexander Creek Chinook salmon were harvested by three users groups: a sport fishery, the Northern District Chinook salmon commercial fishery, and the Tyonek subsistence fishery. Prior to 2008, the sport fishery occurred on the lower 12 miles of Alexander Creek and sport fishing was allowed from 6 a.m.–11 p.m., through June 30. The sport fishery was closed in 2008 by the board. See "Chuitna River," above, for an explanation of the subsistence and commercial fisheries.

Prior to 2000, Alexander Creek was one of the most productive Chinook salmon systems in the entire westside Susitna River. From 1986–1994 this system experienced more than 20,000 angler days of sport fishing effort (Figure 5). In 2007, prior to its closure, there was an estimated 2,666 angler days of effort. Historically, sport angler harvest of Chinook salmon from this system was as high as 6,548 fish (1991). In 2007, only 412 fish were harvested (Figure 5).

The department has conducted annual single aerial surveys on Alexander Creek since 1979 to index spawning escapement of Chinook salmon. The average escapements from 1979–1999 were approximately 3,500 fish (Figure 6). The most recent 10-year average (2001 through 2010) was approximately 1,600 fish, less than one-half the previous 10-year average. An SEG of 2,100–6,000 Chinook salmon was established in 2001. Chinook salmon escapements to this system in the past five years have been far below the SEG, averaging 393 fish annually. In seven of the last 10 years the goal was not achieved. At a time (1999–2006) when other Susitna drainage systems were experiencing strong Chinook salmon runs, the Alexander Creek run was either not making or barely meeting the escapement goal.

A change in spawning distribution has also paralleled the decline of Chinook salmon in this drainage. Past escapement surveys on Alexander Creek documented fish spawning throughout the drainage, with a large percentage of fish spawning in tributaries upstream of Alexander Lake. More recent observations indicate no fish spawning in the mainstem between Sucker Creek and the lake, in tributaries upstream of the lake, and few below Sucker Creek (Figure 4). Most of the Chinook salmon escapement to Alexander Creek is now isolated to less productive northern pike habitat in Lower Sucker Creek and the Wolverine Creek fork of Sucker Creek.

Regulatory History for Sport Fish

- 1977 All NCI harvest > 20 inches closed
- 1979 Chinook fishing open; seasonal limit of 5 over 20 inches.
- 1980 Bag changed from 1 to 2 over 20 inches; only 1 over 28 inches
- 1981 Bag/possession returned to 1 daily/2 possession over 20 inches.
Bag/possession changed to 2 per day/4 possession over 16 inches; only 1 daily/2 possession over 28 inches.
- 1986
- 1987 Season extended from July 6 to July 13
- 1990 No seasonal limit.
Seasonal limit of 5 over 16 inches; bag/possession changed to 1 daily/2 possession over 16 inches.
- 1992
- 1995 Bait prohibited; bag/possession 1 over 16 inches; fishing allowed 6 a.m.–11 p.m.; closed upstream of Trail Creek.
- 1996 Season ends June 30; harvest allowed downstream of Granite Creek only.
- 1999 Harvest area extended upstream of Granite Creek to Trail Creek.
- 2008 Fishery closed.

Stock of Concern Recommendations

Chinook salmon escapement has declined both in run size and spatial distribution of adult spawners. Runs to Alexander Creek have declined drastically over the past five years despite closure of the sport fishery in 2008. It is assumed that recent downturns in Chinook salmon runs throughout UCI have added to this decline. Because escapements to this system have been chronically below the escapement goal despite management action taken to eliminate the sport fishery, the department recommends the board consider Alexander Creek Chinook salmon for stock of management concern status.

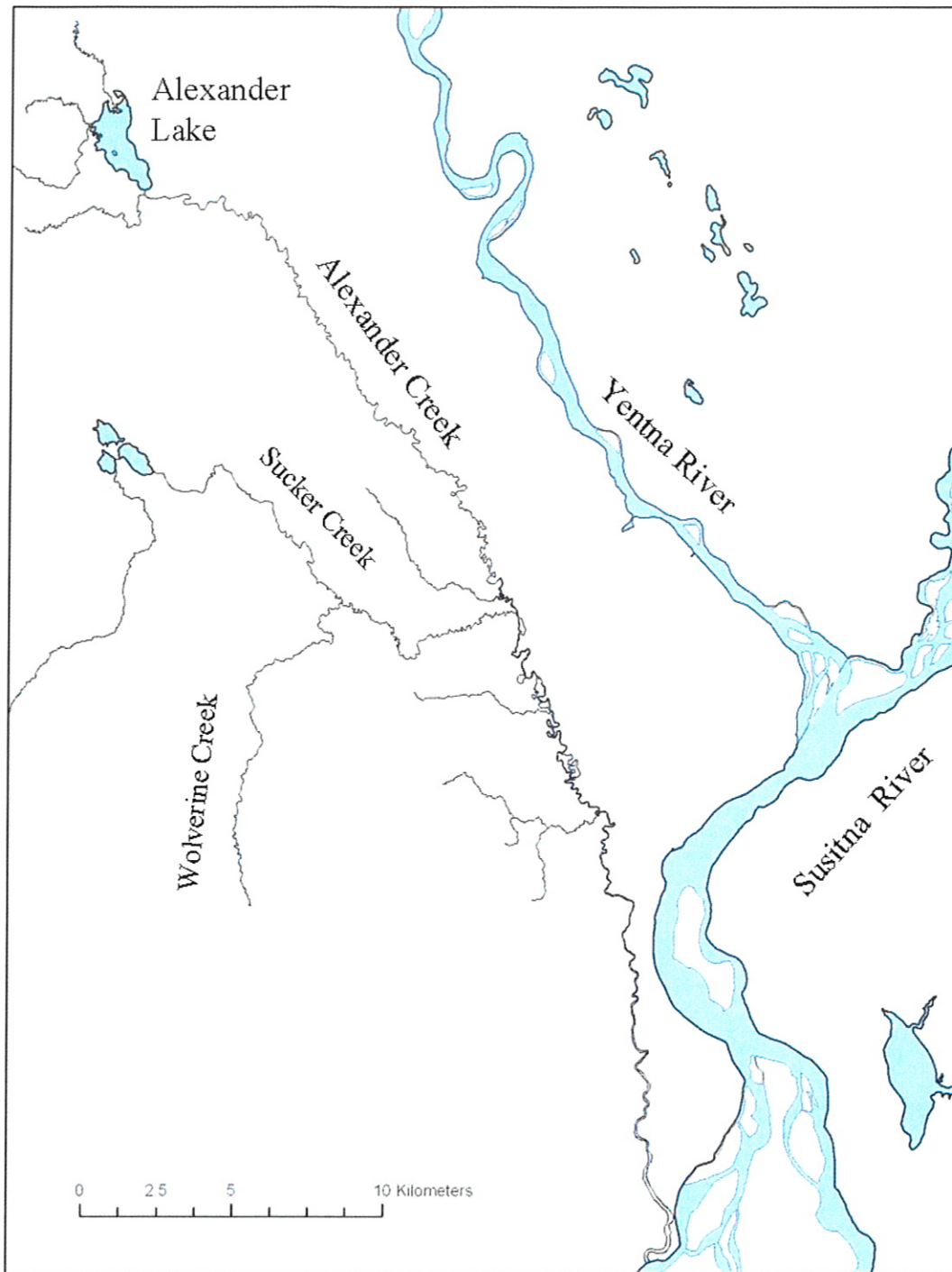


Figure 4. Map depicting the Alexander Creek drainage.

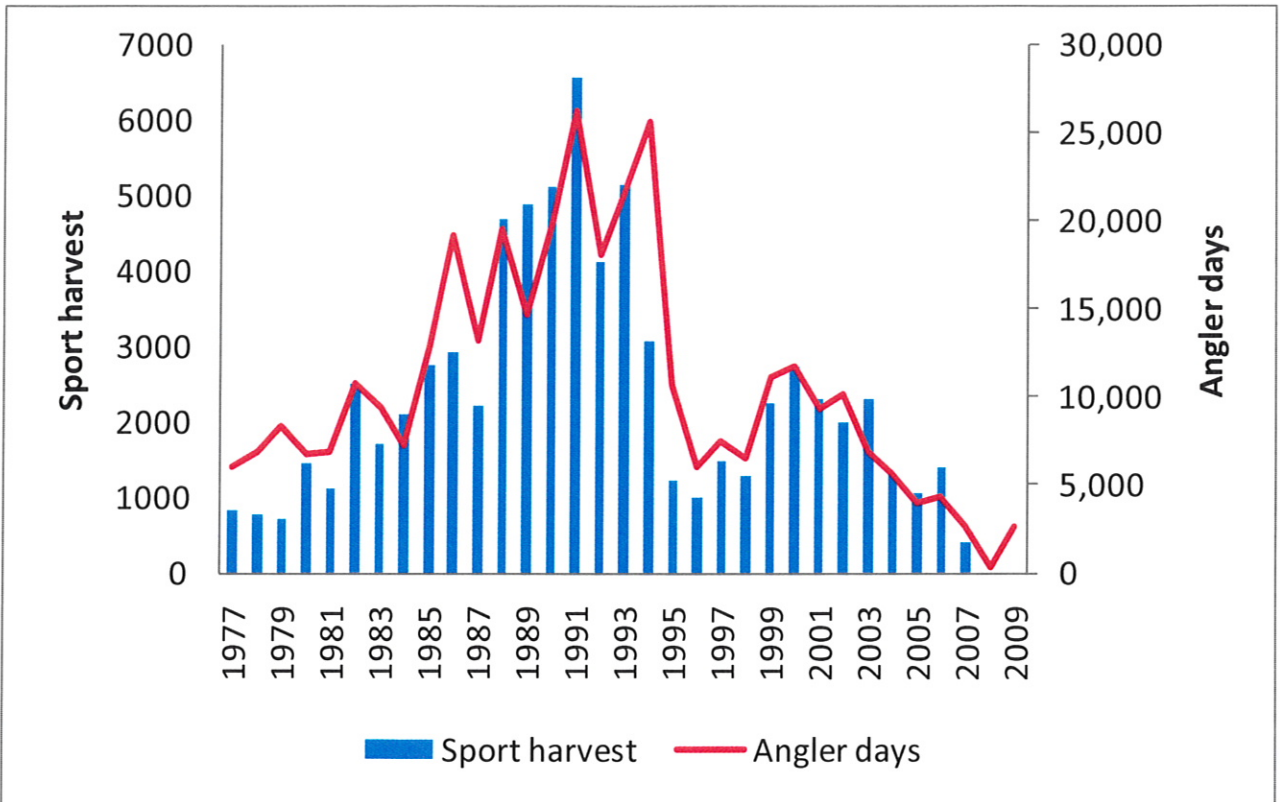


Figure 5. Alexander Creek Chinook salmon sport harvest and fishing effort, 1977–2009 (Jennings *et al.* *In prep.*).

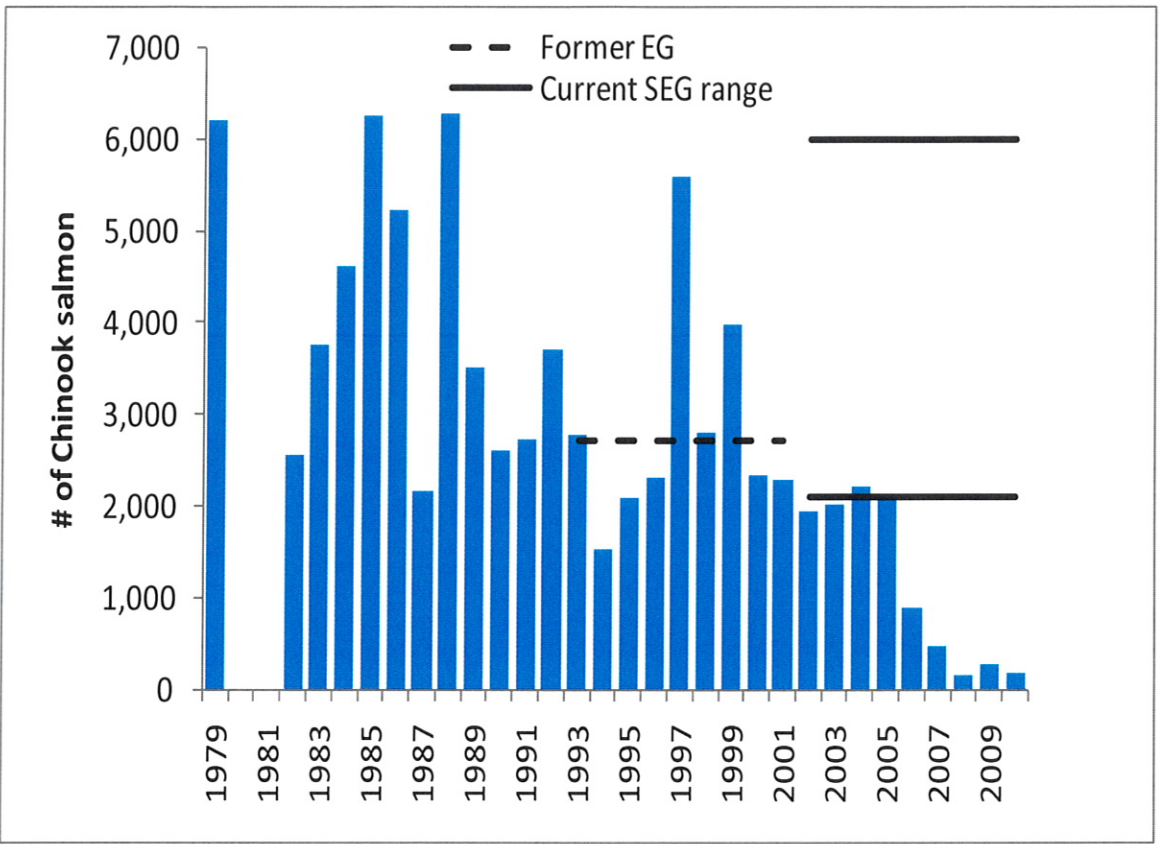


Figure 6. Alexander Creek Chinook salmon escapement index counts as counted by helicopter, 1979–2010.

Eastside Susitna River Chinook salmon

Willow and Goose creeks

Background

Unit 2 of the Susitna River (5 AAC 61.106) includes all tributaries draining the Talkeetna Mountains into the east side of the Susitna River from its confluence with the Deshka River upstream to the Talkeetna River, excluding the Deshka and Talkeetna rivers (Figure 7). Unit 2 streams are also referred to as Parks Highway streams because they cross this highway. Because access to these streams is primarily from the road system, they receive relatively high sport angling effort and are managed conservatively. Popular Chinook salmon sport fisheries within Unit 2 include Willow, Little Willow, Caswell, Sheep, Goose, Greys, and Montana creeks, and the Kashwitna River.

Stock Status

Sport anglers expend an average of 63,000 angler days fishing within Unit 2. The largest Chinook salmon fisheries occur on Willow, Sheep, and Montana creeks. Sport anglers spend an average of 22,600 angler days fishing Willow Creek; 9,400 angler days fishing Sheep Creek; and 18,600 angler days fishing Montana Creek. Average sport harvest of Chinook salmon has been 2,100, 810, and 1,300 Chinook salmon, respectively (Table 1, figures 8 and 9). Willow Creek has been enhanced by stocking hatchery-reared Chinook salmon since 1985. Creel studies estimate that the contribution of hatchery fish to the sport harvest averaged 40% and ranged from 26–51% for 1991–2005, years in which a full complement of stocked fish returned (Ivey *et al.* 2009). Due to the loss of warm water for enhanced fish growth and other water-related issues with rearing hatchery fish in a cold water environment, both the quality and quantity of Chinook salmon stocked into Willow Creek have been below stocking goals since 2006. Therefore, hatchery contributions to the Willow Creek harvest have likely been below 40% since 2009, resulting in additional pressure on wild stocks.

The department has conducted annual single aerial surveys within this area since 1979 to index the spawning escapement of Chinook salmon in Willow, Little Willow, Sheep, Goose, and Montana creeks, and the Kashwitna River. SEGs were developed for all but the Kashwitna River in 2001. Most escapement goals have been achieved on these streams since the mid 1990s. However, since 2007, Chinook salmon escapements in some Unit 2 streams have been insufficient to attain their respective escapement goals (Figure 10). In the past four years escapement goals were not attained in Montana Creek in 2010, and Sheep Creek in 2007 and 2009; however, Sheep Creek was not surveyed in 2008 or 2010 due to poor water visibility. SEGs on Willow Creek (1,600–2,800) and Goose Creek (250–650) have not been achieved in the past four consecutive years. SEGs were not attained in 2009 and 2010 despite a closure of Unit 2 Chinook salmon fisheries inseason by emergency order.

Regulatory History for Sport and Commercial Fisheries

Selected Susitna River streams were reopened to Chinook salmon fishing in 1979 after closing for several years from low stock abundance. Cautious incremental expansion of fishing opportunity has been the management strategy since that time. Beginning in 1979, Willow, Caswell and Montana creeks were open on Saturdays and Sundays for four consecutive weekends commencing on the second Saturday in June. Harvest quotas, ranging from 200 to 7,000 Chinook salmon,

governed these fisheries from 1979 through 1982. In 1986, Little Willow, Goose, Sunshine, Sheep, and Birch creeks were added to the group of weekend-only fisheries. Fishing on Mondays was added to these fisheries in 1987, and the season for all Susitna River streams that formerly closed on July 6 was extended to July 13. In 1989, sport fishing for Chinook salmon was allowed within a one-quarter mile radius of the mouth of the Kashwitna River and fishing was permitted daily at Willow Creek between January 1 and the third Monday in June, and on Saturday through Monday for two consecutive weeks starting the fourth Saturday in June. In 1999, eastside Chinook salmon fisheries were further liberalized by extending daily fishing through the third Monday in June and for the next two consecutive three-day weekends. In 2005, Parks Highway streams were opened for an additional three-day weekend for Chinook salmon fishing. This regulation continues to the present. Bag, seasonal limits, and gear restrictions governing Chinook salmon fisheries within Unit 2 of the Susitna River are summarized below:

- 1977 All NCI harvest > 20 inches closed.
- 1979 Chinook salmon fishing open; seasonal limit of 5 over 20 inches.
- 1980 Bag limit changed from 1 to 2 over 20 inches; only 1 over 28 inches.
- 1981 Bag/possession returned to 1 daily/2 possession over 20 inches.
- 1986 Bag/possession 1 daily/2 possession over 16 inches.
- 1987 Season extended from July 6–July 13.
- 1990 No seasonal limit.
- 1992 Seasonal limit of 5 over 16 inches.
- 1995 Bait prohibited; bag/possession 1 over 16 inches.

The commercial fishery was liberalized from 6 hours per period to 12 hours per period in 2005, and from 3 periods per season to 4 periods per season by the board in 2008. The most productive waters for commercial harvest of Chinook salmon are found from one mile south of the Theodore River to the mouth of the Susitna River; however, this area is open to fishing for the second regular Monday period only. The commercial fishery is limited to a harvest not to exceed 12,500 Chinook salmon, averaging 2,734 over the past five years and about 2,400 since 1993.

Stock of Concern Recommendation

SEGs on Willow Creek and Goose Creek have not been achieved in the past four years. SEGs were not achieved in 2009 and 2010 despite closure of Unit 2 Chinook salmon fisheries by inseason emergency order; the last weekend in the 2009 sport fishing season was eliminated and the last two consecutive weekends were closed in 2010. Because escapements to this system have not been meeting escapement goals despite specific management action taken inseason to reduce harvest, the department recommends the board consider Willow and Goose creeks Chinook salmon for stock of yield concern status.

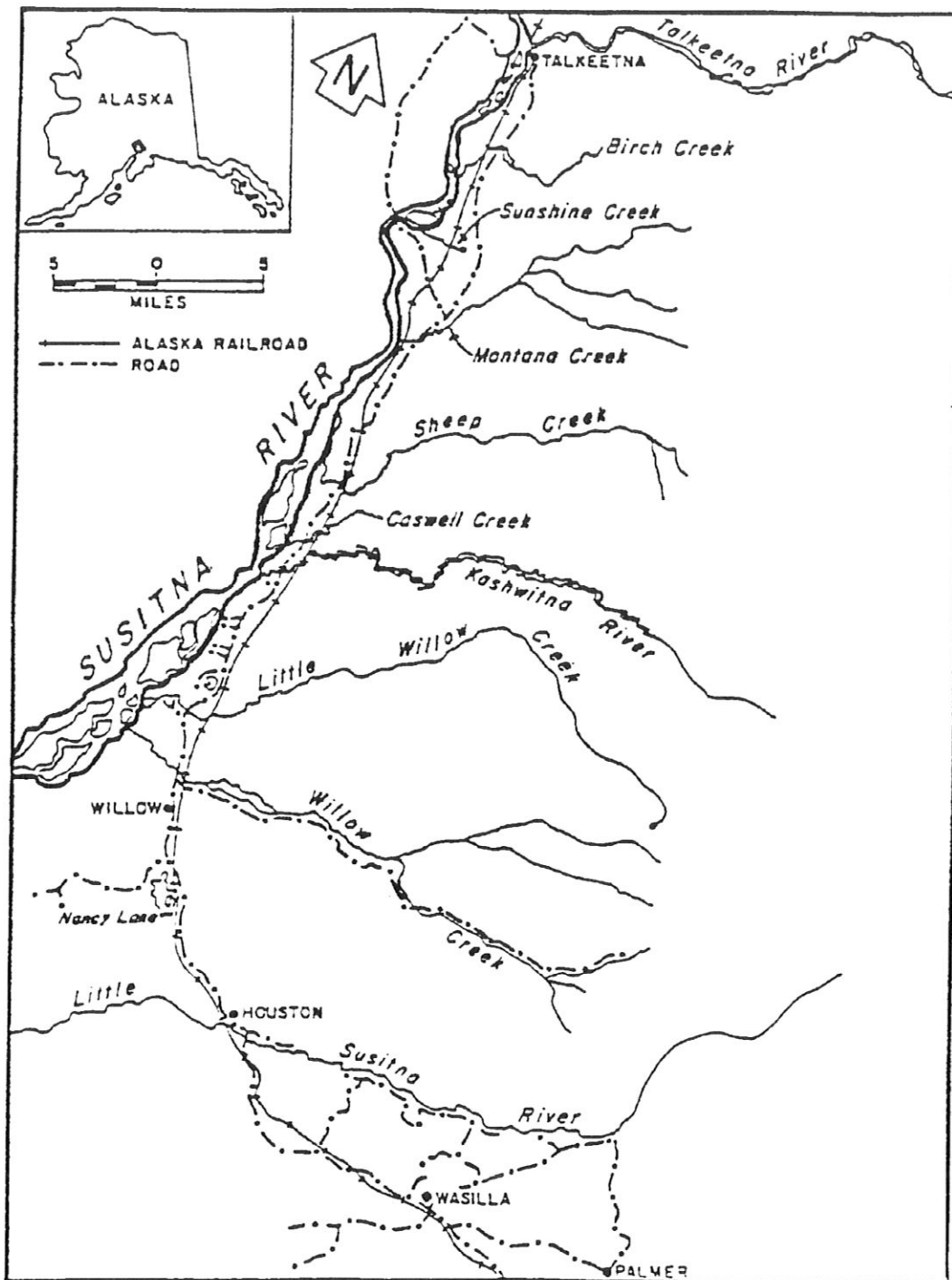


Figure 7. Map depicting Unit 2 of the Susitna River drainage.

Table 1. Unit 2 of the Susitna River drainage Chinook salmon sport harvest and effort (angler days) by fishery, 1977–2009.

Year	Harvest						Effort					
	Willow		Little		Kashwitna		Sheep		Goose		Montana	
	Creek	Willow	Willow	River	River	Creek	Creek	Creek	Creek	Creek	Creek	Total
1977	137	16	0	0	231	0	586	0	0	1,522	2,919	1,056
1978	47	0	0	0	0	0	527	0	0	979	2,594	886
1979	459	0	156	10	215	45	249	0	471	272	0	937
1980	289	32	215	45	249	0	471	0	241	504	1,541	1,140
1981	585	0	249	0	471	0	272	0	231	504	1,541	1,495
1982	629	0	0	0	0	0	0	0	0	0	0	1,341
1983	534	0	0	0	0	0	0	0	0	0	0	1,541
1984	774	37	527	0	0	0	0	0	0	0	0	2,919
1985	1,063	25	327	1,778	73	145	327	1,778	0	2,796	7,008	2,594
1986	1,017	872	88	1,610	116	334	88	1,610	334	1,726	6,572	7,008
1987	1,987	711	578	1,847	0	218	578	1,847	218	1,070	6,999	6,572
1988	2,349	937	357	1,116	11	385	330	1,537	504	478	6,479	6,999
1989	2,846	507	305	1,519	41	288	305	1,519	288	575	6,620	6,930
1990	3,237	387	592	2,663	16	1,033	592	2,663	1,033	3,078	17,289	6,479
1991	3,208	684	531	2,300	38	633	531	2,300	633	4,054	17,382	6,620
1992	8,884	1,023	562	1,349	78	361	562	1,349	361	3,111	12,186	17,382
1993	8,626	1,200	397	746	18	226	397	746	226	1,004	5,569	12,186
1994	5,980	745	128	1,397	21	437	128	1,397	437	1,612	7,181	5,569
1995	2,742	436	30	550	10	298	30	550	298	2,181	6,903	7,181
1996	2,690	896	226	700	15	348	226	700	348	1,471	6,099	6,903
1997	3,135	699	142	2,558	83	371	142	2,558	371	3,279	12,765	6,099
1998	2,793	546	561	851	160	258	561	851	258	1,728	7,918	12,765
1999	4,988	1,344	238	1,420	74	160	238	1,420	160	2,646	10,052	7,918
2000	3,782	578	115	928	217	403	115	928	403	2,026	7,860	10,052
2001	4,573	941	26	1,284	373	350	26	1,284	350	1,242	7,707	7,860
2002	3,591	580	23	914	125	335	23	914	335	1,071	5,731	7,707
2003	3,922	510	394	878	112	150	394	878	150	1,328	5,949	5,731
2004	2,818	445	264	707	210	27	264	707	27	1,672	5,470	5,949
2005	2,466	621	190	964	223	31	190	964	31	1,294	5,830	5,470
2006	2,141	449	30	589	237	134	30	589	134	1,188	3,784	5,830
2007	2,258	870	181	810	181	135	181	810	135	1,311	5,353	3,784
2008	1,101	505	885	393	212	0	17	393	0	257	2,263	5,353
2004-2008												
Mean	2,157	578	180	810	181	135	180	810	135	1,311	5,353	5,353
2009	499	885	17	393	212	0	17	393	0	257	2,263	2,263

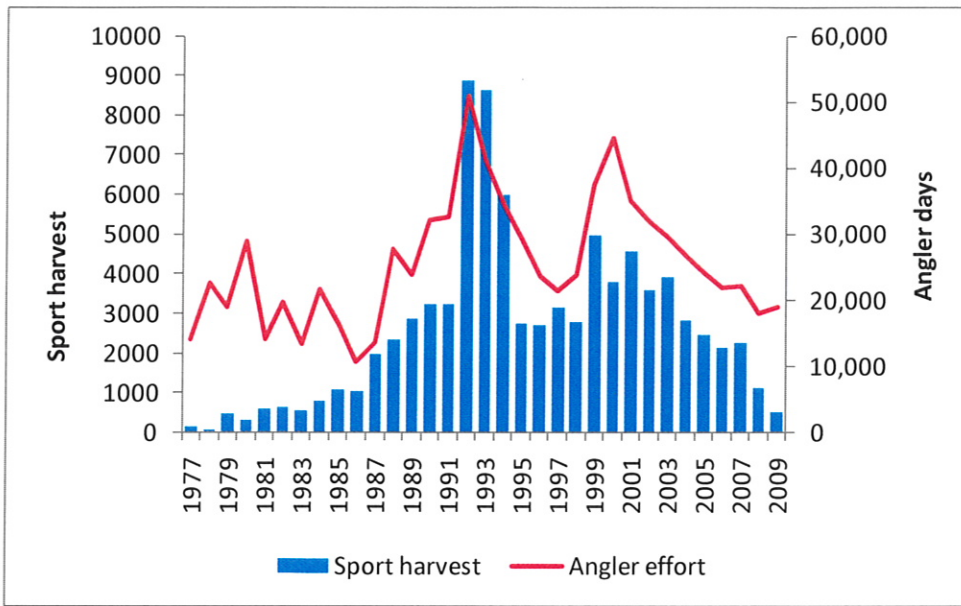


Figure 8. Willow Creek Chinook salmon harvest and effort, 1977–2009 (Jennings *et al.* *In prep.*).

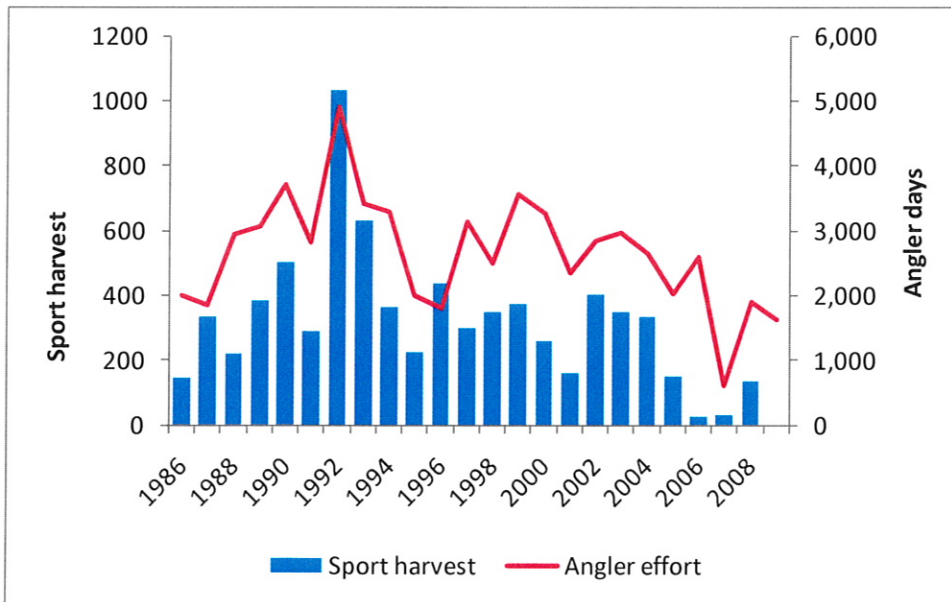


Figure 9. Goose Creek Chinook salmon harvest and effort, 1986–2009 (Jennings *et al.* *In prep.*).

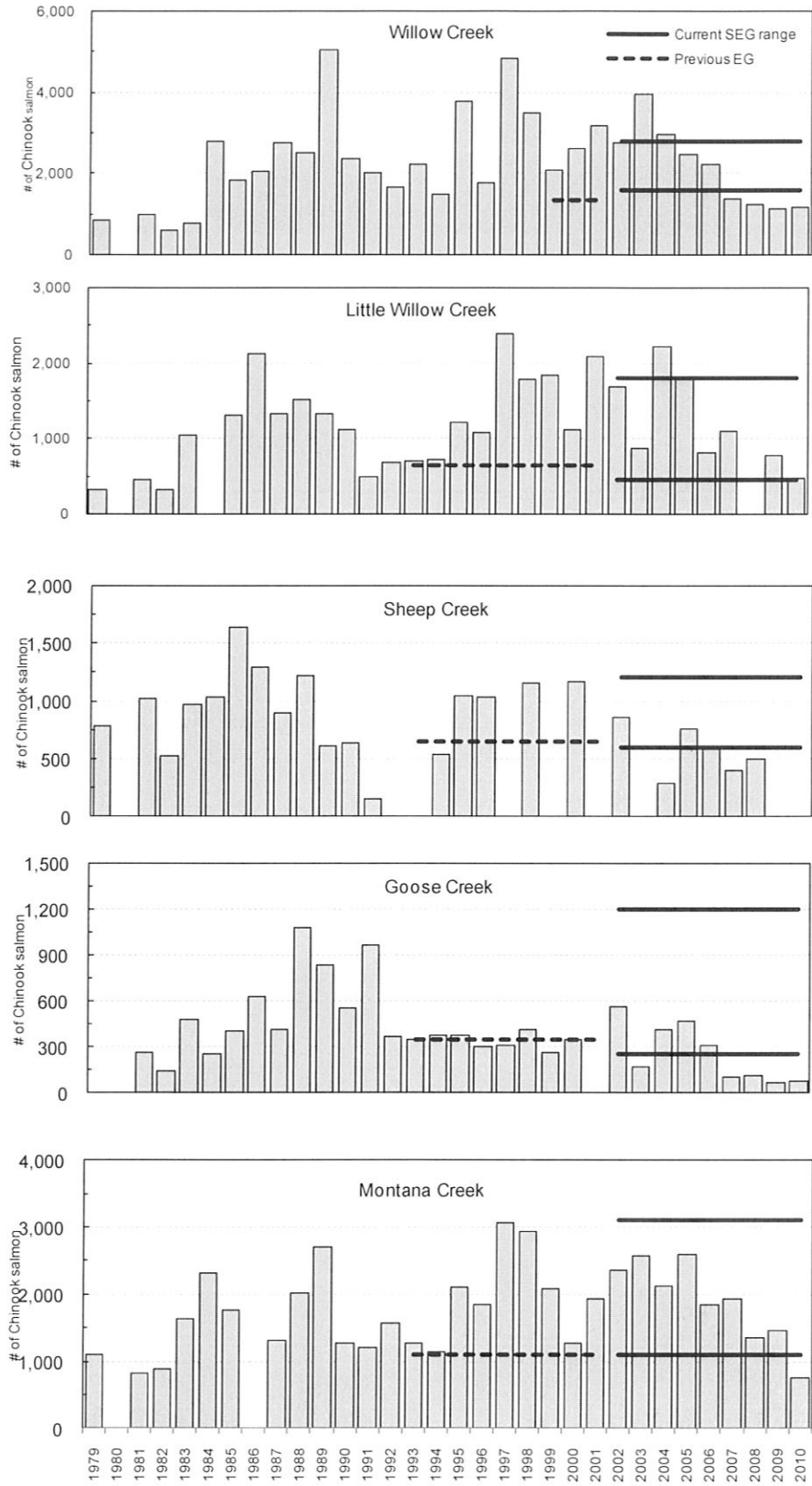


Figure 10. Unit 2 Chinook salmon escapement index counts, 1979–2010.

Susitna River Sockeye Salmon

Background and Stock Status

Early efforts to estimate the number of sockeye salmon spawning and rearing in the Susitna watershed were limited in scope and duration. Various lakes within the drainage were visited sporadically in the 1950s and 1960s by U. S. Fish and Wildlife Service and ADF&G personnel to collect salmonid juvenile and adult data. Adult spawner counts were primarily the product of aerial surveys (King and Walker 1997). At various times since the early 1970s, weirs were utilized to monitor sockeye salmon entering selected tributaries to spawn (e.g., at Chelatna, Fish, Judd, and Larson lakes, Shell Creek, and Talachulitna River (King and Walker 1997)).

Mark-recapture projects were conducted on the Susitna River in 1974 and 1975 as part of an effort to estimate juvenile and adult anadromous fish populations in the upper Susitna River between Devil's Canyon and the confluence of the Susitna and Chulitna rivers. These studies were part of the pre-authorization investigation for a proposed Susitna hydroelectric project (Barrett 1974; Friese 1975). The results of these studies indicated that the majority of sockeye salmon in the Susitna basin were produced in the Yentna and Skwentna river drainages (Namtvedt et al. 1978). Mark-recapture projects were also conducted on the Susitna River during 1982–1985 to estimate the inriver run of sockeye salmon (Barrett et al. 1985; Thompson et al. 1986).

Adult salmon escapements into the Susitna River were monitored with sonar at Susitna Station (river kilometer (rkm) 52) from 1976–1980. However, changes in riverbed characteristics at that sonar location precluded the project after 1980. Because no other site suitable for the sonar equipment then in existence was found in the mainstem Susitna River, the project was moved to the Yentna River, the largest tributary in the drainage. From 1981–2008, Yentna River daily sonar estimates were used as an indicator of sockeye salmon escapement into the Susitna River drainage. Yentna River sockeye escapement was thought to be approximately one-half the total Susitna River sockeye salmon escapement. This assumption was based on the combination of 1981–1985 mark-recapture abundance estimates of fish passing Sunshine (Susitna River rkm 116) and sonar abundance estimates of fish passing the communities of Yentna (at rkm 7 of the Yentna River) and Susitna Station (Westerman and Willette 2006). Mark-recapture studies in 2007 and 2008, however, suggest that Yentna River escapement is about 20–30% of the total Susitna River drainage escapement (Fair et al. 2009).

Prior to 2009, the Yentna River sockeye salmon escapement goal of 90,000–160,000 was an SEG adopted in 2002 (Bue and Hasbrouck *Unpublished*). Based on Bendix sonar estimates since 1981, the number of Yentna River spawners ranged from approximately 37,000 to 181,000 sockeye salmon. The Yentna River is a large, dynamic, glacial river that poses difficulties for sonar assessment of salmon escapement. In addition, significant runs of other salmon species occur; thus, fish wheels are required to apportion the total sonar count by species.

The sustained yield principle requires an understanding of the relationship between the abundance of a stock's spawning fish and the abundance of their offspring that survive to adulthood (often written by department scientists in a "brood table"). The number of offspring that survive to adulthood is calculated by adding the number of spawning fish and the number of fish harvested for each parent generation.

Accurately estimating the composition of a mixed-stock harvest is critical to determining the total run of each stock. Age composition has historically been used to facilitate estimation of stock composition. The department has used age composition estimates from the harvest and escapement, as well as run timing to allocate the harvest to each stock (Bernard 1983). This method assumes that stocks present in a district are equally exploited. This untested assumption can greatly affect estimated stock compositions. The age composition method probably underestimates the productivity of some stocks and overestimates the productivity of other stocks. Stock- and age-specific harvest and escapement data have been the basis for development of long-term brood tables used for both pre-season forecasting and for scientific estimation of escapement goals.

In recent years (2005 to present), the department has supported a genetics program for sockeye salmon in UCI. The primary goal of the program is to develop and apply genetic methods to identify stock composition of mixtures. The first comprehensive baseline using genetic markers in UCI employed microsatellites (Habicht et al. 2007). The need to differentiate among all the stocks led to development of methods to screen single nucleotide polymorphism (SNP) loci under selection. In a recent study of UCI sockeye salmon genetic diversity, simulations indicated that eight regional groups (Kenai, Kasilof, and Crescent rivers; Fish Creek; West Cook Inlet; Knik/Turnagain/Northeast Cook Inlet, Judd/Chelatna/Larson lakes; and remaining Susitna/Yentna stocks) could be identified in mixtures at high levels of precision and accuracy (Barclay et al. 2010).

Given the potential errors outlined above for estimating the harvest of Susitna sockeye salmon stocks in UCI using harvest and escapement age composition information, we are hesitant to estimate the historical yield for Yentna sockeye salmon stocks. There are many unsubstantiated assumptions involved in the estimation procedure. Nonetheless, in the context of “stock of concern” we examined the historical estimates of Yentna River sockeye salmon yield in both the Central and Northern districts.

Regulatory History

Commercial Fisheries

There are currently no actions in the Central District Upper Subdistrict (Eastside) set gillnet fishery for conservation of northern bound salmon stocks. However, in the Northern District set gillnet fishery, the department’s primary tools to reduce exploitation on Susitna stocks is to reduce gear from three nets to two or one from July 20–July 31, or to close the commercial fishery. In practice, the department has done both concurrently, but most commonly the fishery has been closed. Furthermore, from July 16–31 the drift gillnet fishery is restricted for two regular fishing periods to Drift Area 1 when Kenai River sockeye salmon runs are less than two million fish, or drift areas 1 and 2 when Kenai runs are between two and four million sockeye salmon. These restrictions are for conservation of both sockeye and coho salmon.

Sport Fisheries

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

Stock of Concern Recommendation

The Susitna River sockeye salmon stock was found to be a stock of yield concern during the February 2008 Upper Cook Inlet board meeting. In response to the stock of yield concern designation, the board designed an action plan within the framework of 5 AAC 21.358 *Northern District Salmon Management Plan* to do the following:

(a) From July 20 through August 7, the Northern District set gillnet fishery will fish regular 12-hour Monday and Thursday fishing periods, but will be limited to no more than one 35-fathom set gillnet per permit. If it is determined by the department that the Yentna River sockeye salmon [SEG or OEG] will be achieved during this time frame, the department may increase the allowable fishing gear from one 35-fathom set gillnet per permit to two 35-fathom set gillnets per permit or the full complement of 3 set gillnets that are not more than 105 fathoms in aggregate length per permit.

(b) On the first regular fishing period after August 7, and thereafter, the Northern District set gillnet fishery will again return to a full complement of fishing gear of 3 set gillnets that are not more than 105 fathoms in aggregate length per permit, unless restricted or closed by emergency order.

Other management plans affecting Susitna River sockeye salmon and their conservation remained unchanged. Additionally, the department initiated a suite of research projects to better understand the errors associated with sonar enumeration and catchability of different species in fish wheels, lake productivity, and historical harvested stock compositions.

Since establishment of the Susitna River sockeye salmon stock of concern status, the sonar-based Yentna River sustainable escapement goal was eliminated and replaced with three Susitna River weir-based sustainable escapement goals, for Chelatna Lake (Yentna River), Judd Lake (Yentna River), and Larson Lake (Susitna mainstem) (Fair et al. 2009). The new escapement goals were in effect during the 2009 and 2010 salmon runs. The Chelatna Lake escapement goal is 20,000–60,000; escapement in 2009 was below the goal range, but within the range in 2010. The Judd Lake escapement goal is 25,000–55,000; escapement in 2009 was within the goal range, but below it in 2010. The Larson Lake escapement goal is 15,000–50,000; 2009 and 2010 escapements were within the goal range.

In the Central District drift fishery, Susitna median yield estimates in 2008–2010 were 82% of those from 2003–2007, and about one-half of those from 1983–2002 and 1993–2002, the two time periods to which recent (2003–2007) yields were compared to when determining the stock of “yield” concern in February 2008. In the Northern District salmon fishery, the 2008–2010 median yield estimates were about two times larger than the periods 1993–2002 and 2003–2007, but only 32% of yields from 1983–2002.

Given that 1) the new Susitna River escapement goals have only been active for two years, 2) two of the escapements have been below the minimum goal, 3) harvests in Central and Northern districts in 2009 and 2010 were generally less than long-term averages, and that 4) many research studies are ongoing, we recommend that Susitna River sockeye salmon maintain their classification as a stock of yield concern.