

APPENDIX A

SUSITNA AREA PLAN
HUMAN USE AND ECONOMIC EFFECTS
SPORT FISHING

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INTRODUCTION

Sport fishing is an activity of major significance to land use planning in Southcentral Alaska. The continued growth and centralization of a recreationally oriented population has resulted in pressures on fish populations so great that nearly every river and lake system has required special regulatory protection, such as gear restrictions and emergency closures. These systems are often the first to exhibit the effects of habitat degradation associated with increased growth of the human population and numerous resource development efforts such as mining, road construction, agriculture, forestry, and the like. In addition, sport fishing is very popular in Southcentral Alaska. The vicinity map included in Atlas Map C4 identifies the major fishing locations, levels of effort in terms of days fished, and the major access modes to these fisheries.

To establish reliable estimates of the human use and economic effects presently associated with sport fishing in the Susitna basin, it is necessary to first assemble a profile of this activity basin-wide. The data base assembled under the Alaska Statewide Sport Fish Harvest Studies will be used for this purpose. Next, a more in-depth look will be taken at how sport fishing is pursued in the basin by selecting a sample of streams and lakes demonstrating typical patterns of harvest, access, travel mode, equipment, time requirements, and the types of users served. Economic values will be attributed to these systems and, by inference, to the entire basin through application of a simplified version of the travel cost method. Finally, the fisheries potential of the region is considered.

PRESENT USE PROFILE

Three types of information provide the basis for a profile of sport fishing in the Susitna basin: 1) angler days, 2) number of fish harvested, and 3) the residency of anglers. This information is organized by species, by area, and by fishery, and has been systematically collected by the Sport Fish Division since statehood. Formal questionnaires of a large sample of the sport fishing population (nearly 8,400 completed questionnaires were returned in 1981) have been used since 1977. This effort has resulted in one of the most carefully designed, consistently managed, and statistically accurate data bases available for any resource use in the state.

Table 1 summarizes sport fishing days, total harvests, and averages for the five-year period 1977-1981 for the principle river and lake systems in the Susitna basin.² Figure 1 displays these same data graphically. The fisheries referred to are generally well known. Excluding the Willow sub-basin area, fishing days range from 7 to 9% of the statewide total over this period. Only a small portion of the Glennallen area fisheries are included in the Susitna area: the Lake Louise complex and the fisheries off the Denali Highway. The eastside Susitna drainage is dominated by the fisheries north of Little Willow Creek, which are easily reached from the Parks Highway. The entire westside Susitna drainage is included, with effort and harvest concentrated in four main river systems that are generally reached by aircraft and boat. The available data on effort and harvest in 1980 for all Susitna basin fisheries are listed in Table 2. 1980 is taken as the typical year for purposes of this study.

Table 3 summarizes the residency of the users of Susitna basin fisheries in terms of fishing days at each location.

A review of these tables serves to verify several important features of the sport fishery in the Susitna basin.

Sport fishing is indeed a widespread and popular activity. For 1980, effort in the Susitna basin totaled 118,590 fishing days. At 1980 population levels (Anchorage: 174,431, Mat-Su Borough: 17,816), nearly every resident in the area could have participated sometime during the year.

A high percentage of effort (over 30%) is concentrated on a very limited number of small creeks clustered along the Parks Highway. This pattern is reinforced by the inclusion of Willow sub-basin data: taken together, these small drainages³ account for 89,694 fishing days, or 35% of the area total in 1980. Target species in these extremely popular drainages are primarily salmon.

A near one-to-one relationship between the number of days fished and the total harvest appears common. For the anadromous fisheries, harvest rates appear to be a little lower, whereas for the resident fish species rates are higher. Since the usual fishing limit is three fish per day, the 1980 harvest level required to satisfy every fisherman every day would be about 356,000 fish (118,590 days fished X 3) or 3.6 times the 1980 harvest.

TABLE 1. Sport Fishing Days and Total Harvests, Susitna Basin 1977-1981 (Willow Sub-basin Area excluded)

Fisheries	1977		1978		1979		1980		1981		Average	
	Days	Harvest	Days	Harvest	Days	Harvest	Days	Harvest	Days	Harvest	Days	Harvest
<u>Glennallen Area</u>												
Lake Louise, Lake Susitna & Tyone Lake	14,899	10,624	13,161	8,419	12,199	8,953	10,539	15,386	14,397	15,941	13,039	11,865
Other Waters (X 35%)	7,746	10,308	4,667	7,914	6,613	11,909	5,823	9,191	5,354	9,231	6,040	9,711
<u>Eastside Susitna Drainage</u>												
All waters except Willow & Little Willow Creek	38,044	33,163	57,641	67,598	54,140	38,561	54,103	54,340	41,949	35,884	49,175	45,909
<u>Westside Susitna Drainage</u>												
All Freshwater Areas	31,946	39,606	37,971	48,287	50,374	49,392	48,125	52,272	37,335	36,110	41,310	45,043
Total	92,635	93,701	113,440	132,218	123,326	108,815	118,590	131,189	99,035	97,166	109,565	112,528
(Total Less Pink Salmon)	(73,727)	(73,727)	(97,300)	(97,300)	(89,972)	(89,972)	(103,963)	(103,963)	(91,774)	(91,774)	(99,242)	(99,242)
Percent of Statewide Totals	7.7	9.6	8.8	12.7	9.0	8.3	7.9	10	7.0	10	8.1	10.1

Source: Mills, Michael J. 1977-1981. Statewide Harvest Studies. Selected from appropriate tables. "Days" are days of active fishing, all anglers. "Harvest" denotes all fish taken, all species included, but does not include catch and release fisheries.

TABLE 2. 1980 Susitna Basin Sport Fishing Effort and Harvest by Fisheries and Species

Fisheries	Species Harvested													Total Harvest		
	Days Fished	KS	SS	LL	RS	PS	CS	RT	AC	LT	GR	NP	WF		BB	Other
Glennallen Area																
Lake Louise,																
Lake Susitna,																
Tyone Lake	10,539	0	0	0	0	0	0	0	0	2,609	4,477	0	1,688	6,612	0	15,386
other waters (x 35%)	5,823	145	57	75	301	0	0	461	292	784	5,985	0	63	687	341	9,191
Total	16,362	145	57	75	301	0	0	461	292	3,393	10,462	0	1,751	7,299	341	24,577
Eastside Susitna River Drainages																
Caswell Creek	4,963	215	1,124	0	77	1,663	19	154	83	0	353	0	0	26	26	3,740
Montana Creek	19,287	559	2,684	0	257	8,230	571	854	167	0	655	0	0	13	13	14,003
Sunshine Creek	5,208	13**	1,534	0	116	2,408	225	193	39	0	0	0	0	39	0	4,567
Clear (Chuniina) Creek	4,388	172	661	0	6	622	385	950	751	0	1,348	0	0	32	32	4,959
Sheep Creek	8,041	45**	430	0	0	6,362	648	385	83	0	725	0	0	45	0	8,723
Others	12,216	45**	2,234	1,663	257	3,403	1,445	2,658	790	267	4,854	0	0	212	520	18,348
Total	54,103	1,049	8,667	1,663	713	22,688	3,293	5,194	1,913	267	7,935	0	0	367	591	54,340
Westside Susitna River Drainages																
Kroto Creek (Deshka)	19,364	3,685	2,290	0	0	689	0	4,305	0	0	1,817	0	0	224	69	13,079
Lake Creek	8,325	775	2,351	0	267	2,101	69	2,144	121	0	1,972	103	0	0	0	9,903
Alexander Creek	6,812	1,438	999	0	52	809	121	1,945	353	0	1,145	0	0	0	0	6,862
Talachitna River	2,542	121**	491	0	112	276	17	379	982	0	1,713	0	0	0	0	4,091
Chuit River	614	17**	258	0	0	69	0	301	146	0	0	0	0	0	0	791
Theodore River	700	17**	370	0	0	232	0	250	129	0	0	0	0	0	0	998
Lewis River	43	0	0	0	0	0	0	9	0	0	0	0	0	0	0	9
Other Rivers	4,998	129**	6,010	0	34	362	284	1,722	603	181	1,808	0	0	448	0	11,581
Shell Lake	414	0	0	0	198	0	0	103	0	69	0	0	0	0	0	370
Whiskey Lake	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hewitt Lake	471	0	0	0	0	0	0	9	0	0	0	0	0	0	0	9
Judd Lake	814	0	0	0	267	0	0	86	723	0	232	0	0	0	0	1,308
Other Lakes	2,999	0	0	0	181	0	0	2,092	43	198	560	129	0	34	34	3,271
Total	48,125	6,182	12,769	0	1,111	4,538	491	13,345	3,100	448	9,247	232	0	706	103	52,272
GRAND TOTAL	118,590	7,376	21,493	1,738	2,125	27,226	3,784	19,000	5,305	4,108	27,644	232	1,751	8,372	1,035	131,189
Total Poundage	171,000/968	125,000	1,740	12,500	89,800	27,600	19,000	5,300	10,300	30,400	29,300	1,000	527,000			

Source: Mills, Michael J. 1981. Statewide Harvest Study - 1980 data. ADF&G, Division of Sport Fish, Juneau. Extracted from Tables 42, 44 and 45.

Species Harvested and average weights (lbs): Chinook salmon (KS) 24.4/2.2, Coho salmon (SS) 5.8, Landlocked Coho salmon (LL) 1.0, Sockeye salmon (RS) 5.9, Pink salmon (PS) 3.3, Chum salmon (CS) 7.3, Rainbow trout (RT) 1.0, Dolly Varden/Arctic char (DV/AC) 1.0, Lake trout (LT) 2.5, Arctic grayling (GR) 1.1, Northern pike (NP) 3.0, Whitefish (WF) 1.3, Burbot (BB) 3.5. (Source for poundages: ADF&G, Division of Commercial Fisheries, and ADF&G, Division of Sport Fish, Pers. Comm., L. Engel 3/83; and, Morrow, James E., 1980. The Freshwater Fishes of Alaska. Alaska Northwest Publishing Company, Anchorage.

** King salmon less than 20 inches.

TABLE 3. 1980 Fishing Days by Residency of Users

Fisheries	Days Fished	Non-Resident Days Fished	Anch. Area	Mat-Su Bof.	Fbks. Area	Balance of State
<u>Glennallen Area</u>						
Lake Louise,						
Lake Susitna,						
Tyone Lake	10,539	1,875	5,360	1,254	245	1,805
Other Waters (x 35%)	<u>5,823</u>	<u>1,142</u>	<u>2,177</u>	<u>220</u>	<u>784</u>	<u>1,500</u>
Total	16,362	3,017	7,537	1,474	1,029	3,305
<u>Eastside Susitna River Drainages</u>						
Caswell Creek	4,963	446	2,871	1,499	88	59
Montana Creek	19,287	3,106	13,128	1,967	1,026	60
Sunshine Creek	5,208	422	3,700	822	245	19
Clear (Chunilna) Creek	4,388	439	2,596	843	500	10
Sheep Creek	8,041	870	6,202	754	186	29
Others	<u>12,216</u>	<u>2,398</u>	<u>6,075</u>	<u>3,086</u>	<u>343</u>	<u>314</u>
Total	54,103	7,681	34,572	8,971	2,388	491
<u>Westside Susitna River Drainages</u>						
Kroto Creek (Deshka)	19,364	2,635	14,034	2,581	75	39
Lake Creek	8,325	1,140	6,291	807	25	62
Alexander Creek	6,812	1,104	4,877	360	161	310
Talachulitna River	2,542	536	1,608	25	50	323
Chuit River	614	93	447	12	0	62
Theodore River	700	37	534	54	0	75
Lewis River	43	0	43	0	0	0
Other Rivers	4,998	841	2,816	472	211	658
Shell Lake	414	0	414	0	0	0
Whiskey Lake	29	0	29	0	0	0
Hewitt Lake	471	0	457	14	0	0
Judd Lake	814	181	633	0	0	0
Other Lakes	<u>2,999</u>	<u>455</u>	<u>1,986</u>	<u>472</u>	<u>12</u>	<u>74</u>
Total	48,125	7,022	34,169	4,797	534	1,603
Grand Total	118,590	17,720	76,278	15,242	3,951	5,399

Differences in odd and even-year pink salmon harvests account for most of the annual fluctuations in harvest shown in Figure 1.

There may be a correlation between lower harvest rates and fisheries showing important King Salmon harvests. The Kroto, Montana, Caswell and Alexander creeks express this effect.

A surprisingly high level of effort takes place in the westside Susitna fishery, which is dominated by four particularly important streams. Most of these are in remote areas and demonstrate that the Alaskan angler is willing to undergo the extra time and expense to fly or boat into productive fishing areas.

It is possible to select fisheries for which access, use, and harvest patterns are typical for the basin. In the following section, use patterns of selected fisheries are discussed, including background data required for a preliminary economic analysis.

Use Patterns

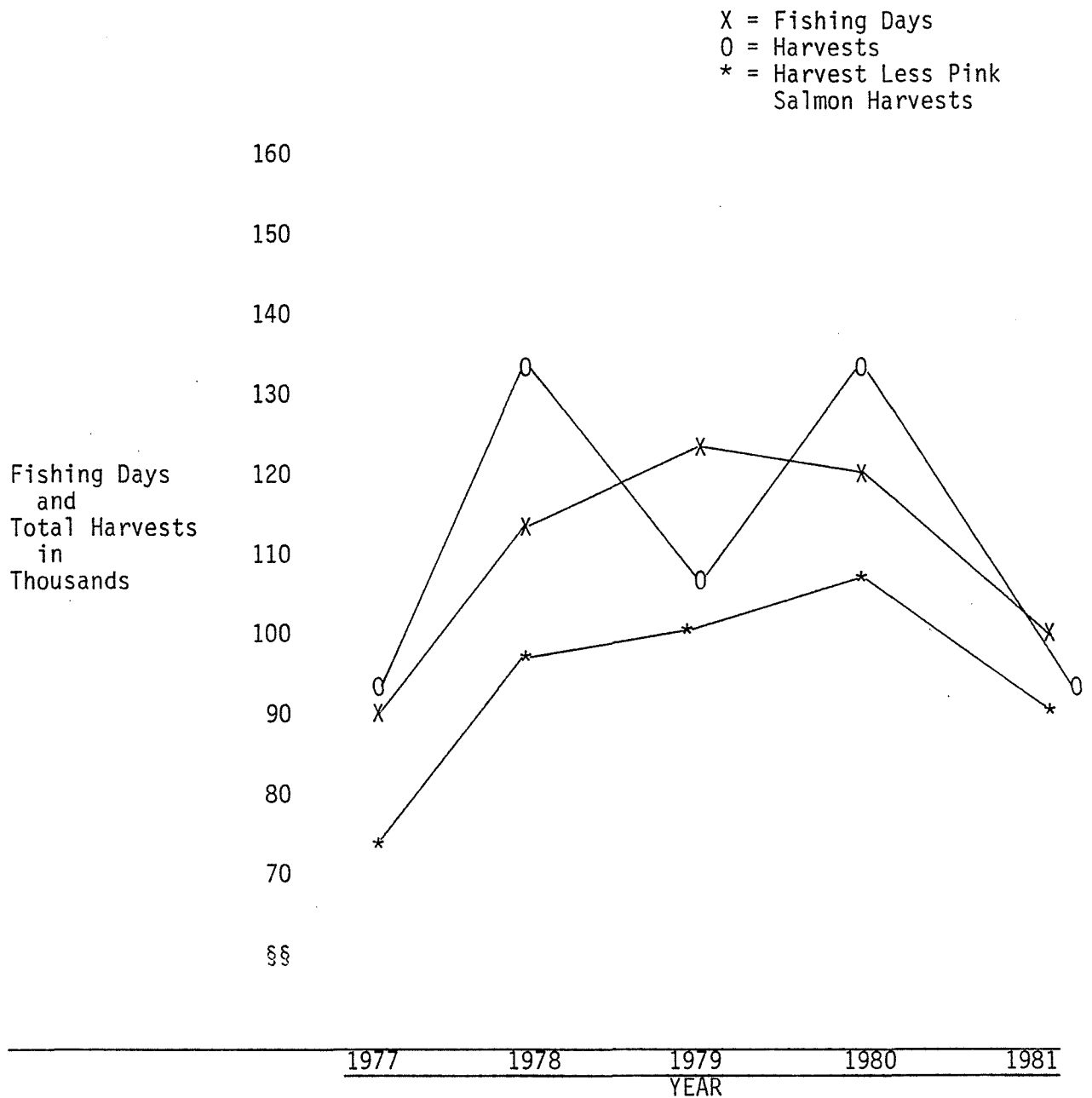
Rather than treating the Susitna basin as a homogeneous region, the approach taken here is to select and describe specific fisheries that typically share the same patterns of use. For this purpose the most common modes of access have been chosen as the basis for selection: family car, fly-in, and multiple modes for which combinations of road, air, and water transportation are required.

Fisheries accessible by family car. Table 4 summarizes the sport fisheries accessible by family car for which harvest and effort data are available. These fisheries are near major highways and characteristically serve as day or weekend fisheries. Target species are primarily salmon. Only the Lake Louise system and 35% of "other waters" occur within the Susitna basin. "Other waters" refers to numerous locations, primarily near the Denali Highway. The eastside Susitna drainages are relatively small, with only a small portion of these creeks accessible to anglers. Data in Table 2 for 1980 (our typical or indicator year) show about half of the fishing effort and half of the harvest (55%) occurring in these easily accessible fisheries. Overall success rates are 1.1 fish/day and somewhat lower for drainages dominated by anadromous salmon (0.8 fish/day). Of the westside Susitna drainages only the Kroto Creek - Deshka River system is accessible by road.

Fisheries accessible by air or multiple modes of transportation. In Table 5 a selected group of fisheries for which access is more difficult are listed. More equipment, time, and expense is required to reach these drainages: the distances travelled are greater, and very often the assistance of commercial operators is required for a portion or all of the trip. Data in Table 3 show residency of users. Frequency of use of the eastside and westside systems appears remarkably similar for non-resident and for Anchorage fishermen, but the westside fisheries appear less preferred by Mat-Su and Fairbanks fishermen. This is an effect created by the exclusion of Willow sub-basin fisheries from the analysis: total days fished for all eastside fisheries is 91,300 (1980, including Willow sub-basin, Table 1 and Table 6), or nearly double that of the westside fisheries. The importance of Montana and Kroto creeks is obvious.

That these streams can maintain productivity year after year under such enormous fishing pressure attests to their very high value as a resource.

FIGURE 1. Sport Fishing Days and Total Harvests, Susitna Basin 1977-1981



Source: See Table 1

TABLE 4. 1980 Use of Susitna Area Sport Fisheries Accessible by Family Car

Fisheries	Total Days Fished ¹		Total Harvests ¹		Round Trip Road Distances ²		Resident Travel Cost (\$) ³		Average Travel Costs	
	Anch Area	Mat-Su Boro	Anch Area	Mat-Su Boro	Anch Area	Mat-Su Boro	Anch Area	Mat-Su Boro	Fbx Area	Day
<u>Glennallen Area</u>										
Lake Louise,										
Lake Susitna,										
Iyone Lake	10,539	340	260	360	180,000	32,000	9,000		\$32.00	--
other waters (x 35%)	5,823	--	--	--	--	--	--		--	--
<u>Eastside Susitna River</u>										
Caswell Creek	4,963	190	100	560	53,000	15,000	5,000		\$28.00	
Montana Creek	19,287	210	130	540	270,000	25,000	54,000		\$29.00	
Sunshine Creek	5,208	230	140	530	83,000	11,000	13,000		\$30.00	
Sheep Creek	8,041	200	110	560	120,000	8,000	10,000		\$28.00	
Others (x 90%)	10,994	--	--	--	--	--	--		--	--
<u>Westside Susitna River</u>										
Kroto Creek (Deshka)										
(x 5%)	968	280	190	500	21,000	2,000			\$23.00	
Total	65,823	72,777	93,000	91,000	727,000 ⁴	93,000	91,000			
Grand Total							911,000			

¹ See Table 3.

² As calculated by use of a digital map plotter at scale 1/250,000 rounded.

³ (Days fished) X (Round trip travel distance) X travel cost per person per mile (\$0.097).

⁴ Average travel cost for Anchorage anglers: $\frac{727,000}{31,000}$ user days = \$23.45

TABLE 5. 1980 Use of Susitna Area Fisheries Accessible by Multiple Modes of Transportation

Fisheries	Days ¹ Fished	Total ¹ Harvest	Round Trip Travel Distances ²		Resident Travel Cost (\$ x 1000) ³		Average Travel Cost/Day		
			Anch Area	Mat-Su Boro· Fbx Area	Anch Area	Mat-Su Boro Fbx Area			
<u>Eastside Susitna Drainages</u>									
Clear Creek (Chunilna other waters (x10%))	4,388 1,222	4,959 919	250 --	160 --	570 --	37 --	17 --	15 --	\$20.50
<u>Westside Susitna Drainages</u>									
Kroto Creek (Deshka) (x95%)	18,396	12,425	76	40	790	695	64	5	40.00
Lake Creek	8,325	9,903	120	90	830	281	23	1	40.00
Alexander Creek	6,812	6,862	80	50	800	265	15	7	45.00
Talachulitna River	2,542	4,091	134	110	850	66	1.8	3	46.00
Chuit River	614	791	86	110	800	32	1	-	80.00
other waters	10,468	17,546	--	--	--	--	--	--	--
Total	52,767	57,496				1,376 ⁵	121	31	
							Grand Total		\$1,528,000 ⁴

¹See Table 3.

²Air travel distances only for Anchorage and Mat-Su. Anchorage air distance plus 716 road miles for Fairbanks.

³See Kroto Creek (Deshka) work sheet for example of calculation (Note 7).

⁴Anchorage, Matanuska Valley and Fairbanks values only.

⁵Average for Anchorage $\frac{1,376,000}{15,400} = \89.00

TABLE 6. 1980, Willow Sub-basin Sport Fishing Effort and Harvest by Fisheries and Species

Fisheries	Days Fished	Days Fished										Total Harvest					
		KS	SS	LL	RS	PS	CS	RT	AC	LT	GR		BB	Other			
Knik Arm Drainage																	
Little Susitna River	22,420	646	6,302	0	2,127	3,918	465	852	1,748	0	181	9	1,059				17,307
Wasilla Creek (Rabbit Slough)	5,726	0	3,555	0	0	310	9	121	189	0	0	0	0	0	0	0	4,184
Cottonwood Creek	9,268	0	3,375	0	2,660	0	0	1,085	439	0	0	0	0	0	0	0	7,559
Wasilla Lake	1,642	0	0	43	0	0	0	2,084	181	0	0	0	0	0	0	0	2,308
Finger Lake	6,483	0	0	10,685	0	0	0	0	0	0	0	0	0	0	0	0	10,685
Kepler Lake Complex	8,597	0	0	2,807	0	0	0	5,906	0	0	1,061	0	0	0	0	0	9,729
Lucille Lake	3,798	0	0	3,633	0	0	0	0	0	0	0	0	0	0	0	0	3,633
Big Lake	12,195	0	0	189	43	0	0	5,398	7,585	594	0	43	0	0	0	0	13,852
Nancy Lake																	
Recreation area, including Nancy Lake	9,153	0	0	146	69	0	0	2,540	327	749	0	34	43				3,908
Others	23,248	0	2,798	1,997	775	473	60	11,382	20,015	775	8,317	224	34				28,850
Total	102,530	646	16,030	19,500	5,674	4,701	534	29,368	12,484	2,118	9,514	310	1,136				102,015
East Side Susitna Drainage																	
Willow Creek	29,011	289	1,207	0	83	23,638	989	1,168	636	0	1,863	0	116				29,989
Little Willow Creek	8,190	32	494	0	77	6,420	270	353	122	0	1,156	0	13				8,937
GRAND TOTAL	139,731	967	17,731	19,500	5,834	34,759	1,793	30,889	13,242	2,118	12,533	310	1,265				140,941

Source: Mills, Michael J. 1981. Statewide Harvest Study - 1980 Data. Extracted from Tables 44 and 46. Alaska Department of Fish and Game, Division of Sport Fish, Juneau.

Species Harvested and average weights (lbs): Chinook Salmon (KS) 24.4/2.2, Coho salmon (SS) 5.8, Landlocked Coho salmon (LL) 1.0, Sockeye salmon (RS) 5.9, Pink salmon (PS) 3.3, Chum salmon (CS) 7.3, Rainbow trout (RT) 1.0, Dolly Varden/Arctic char (DV/AC) 1.0, Lake trout (LT) 2.5, Arctic grayling (CR) 1.1, Burbot (BB) 3.5 (Source for poundages: ADF&G, Division of Commercial Fisheries, and ADF&G, Division of Sport Fish, Pers. Comm., L. Engel 3/83; and, Morrow, James E., 1980. The Freshwater Fishes of Alaska. Alaska Northwest Publishing Company, Anchorage.

**King salmon less than 20 inches.

ECONOMIC VALUES

Access is among the most important factors determining patterns of use. In addition, access is of central importance to the economic analysis, in which a simplified version of the travel cost method is used. The primary assumption of this method is that the net dollar value of a recreational fishery may be estimated by taking the cost of travel as a substitute for the price of a fishing trip. In other words, payment of the costs to travel to a specific location may be taken as an expression of "willingness to pay" to use that location and represents the net value, or worth, of that site to the user. Therefore, if the number of trips taken per year to a fishing area is known, the costs of travel may be estimated from standard sources and a dollar value determined. This is no more than a short-hand method of arriving at a preliminary determination of recreational use values "at zero price." Without preparation of a demand function for the fishing trip and with no prediction of the use of a site at increased costs, it is not possible to estimate willingness to pay the "margin above cost of sport fishing which measures the ⁴real monetary value which would be lost if the fishery were to disappear."⁴ The present effort is a first step towards application of the travel cost method to a large geographic region for the purpose of estimating net benefits from private recreational uses. Commercial operations of significant size serve the sport fishery and represent a significant additional source of value; but they are not included here, nor is any measure of consumer's surplus attempted.⁵

Fisheries Accessible by Family Car

Resident travel costs of \$911,000 (Table 4) portray a general perspective of the annual "value," or net benefit to the economy in general, of the fisheries identified. This analysis is driven by the use of two sets of data and a single cost factor: angler days, residency of fishermen, and the cost/mile of automobile travel. The cost of \$.097/mile used is derived from United States Department of Transportation data for 1977, updated for Alaska by use of the Alaska consumer price index and assuming that there are an average of 2.5 persons per car.⁶ The cost figures in Table 4 are generated by simply multiplying (days fished by origin of fishermen) X (round trip distance to site) X \$.097. It is assumed that all fishing trips are one-day trips.

The data shown in Table 4 may be used to estimate the value of all road-accessible fisheries. Anchorage, Mat-Su Borough, and Fairbanks residents spend over \$900,000 annually (\$911,000) in travel costs to sport fish in the six most popular fisheries in the Susitna basin. Using the appropriate averages, travel costs for unidentified fisheries may be estimated as follows:

Glennallen other waters
5,823 days X \$32/day = \$186,000

Eastside other waters
10,994 days X \$29/day = \$319,000

Total = \$505,000

Residents from elsewhere in the state (see "Balance of State" column, Table 3) used these waters, and estimates of their travel costs may also be made under the assumption that these users incur a travel cost similar to Anchorage users, plus a nominal air fare (\$150), and that they mostly take two-day fishing trips.

<u>Balance of state</u>			
Glennallen	$\frac{3,305 \text{ days}}{2 \text{ day/trip}}$	X (\$150 + \$32)/day	= \$301,000
Eastside	$\frac{481 \text{ days}}{2 \text{ day/trip}}$	X (\$150 + \$29)/day	= \$ 43,000
Westside	$\frac{2 \text{ days}}{2 \text{ day/trip}}$	X (\$150 + \$23)/day	= \$ <u>173</u>
		Total	\$340,000

In addition, considerable use of these fisheries occurs by non-residents (see Table 3), who generally fly to Anchorage and incur travel costs thereafter similar to Anchorage residents. If half of a round trip air fare from Seattle may be attributed to fishing and two-day fishing trips are assumed, the following costs are derived:

Non-residents. <u>Glennallen area</u>	$\frac{3,017 \text{ days}}{2 \text{ day/trip}}$	X (\$263 + $\frac{\$33.60}{\text{day}}$)	= \$ 448,000
<u>Eastside Susitna</u>	$\frac{7,242 \text{ days}}{2 \text{ day/trip}}$	X (\$263 + $\frac{\$29}{\text{day}}$)	= \$1,050,000
<u>Westside Susitna</u>	$\frac{132 \text{ days}}{2 \text{ day/trip}}$	X (\$263 + $\frac{\$30}{\text{day}}$)	= \$ <u>20,000</u>
		Total	\$1,520,000

In summary, the total value of fisheries accessible by road (excluding the Willow sub-basin) is as follows:

"Big Six" fisheries	\$ 911,000
other waters	\$ 505,000
Balance of State	\$ 340,000
Non-residents	<u>\$1,520,000</u>

Total \$3,276,000

Fisheries Accessible by Air or Multiple Modes of Transportation

The analysis of economic value of systems requiring multiple modes of access goes well beyond the usual application of the travel cost method. A number of assumptions are required concerning distances travelled, the preferred travel mode, residency of users, the number of days per

trip, and the variable costs incurred. It may be useful therefore to describe the analysis of one fishery: the Kroto Creek - Moose Creek - Deshka River system.

Access to the Deshka River system is available at five locations: by air to the mouth of the river, Neil Lake, and Butterfly Lake; by car and boat at the Petersville road crossing; and from the Kashwitna River dock on the Susitna River. It is estimated that 5% fish by car access along the Petersville road area, another 45% by boat access from the Kashwitna dock, and the remaining 50% by aircraft to the mouth of the river. It is further assumed that half the fishing on the Deshka is day fishing, the other half consisting of two-day trips. It is further assumed that all users resident in the Mat-Su Borough and Fairbanks areas access the fishery by car and boat from the Kashwitna dock and that their fishing trips last two and two-and-one-half days respectively. Travel cost is then calculated from Anchorage, the Mat-Su Borough, and Fairbanks, based upon round-trip miles by each mode of transportation, costs per mile, and the number of users grouped by residency. Travel cost for the remaining users (balance of state) is determined using an averaged value.

Travel costs for fisheries requiring multiple modes of transportation are shown in Table 5. Data may be used from this table in the same manner as above to estimate costs for "other waters" and the balance of state and non-resident costs.

Eastside "other waters"			
	1,222 X \$29	=	\$ 35,400
Westside "other waters"			
	10,468 X \$50	=	<u>\$523,000</u>
	Total	=	\$558,000

Users from elsewhere in the state (Balance of state, Table 3) show:

Eastside			
	$\frac{208 \text{ days}}{2 \text{ days/trip}}$	X (\$150 + \$89)	= \$ 24,900
Westside			
	$\frac{1603 \text{ days}}{2 \text{ days/trip}}$	X (\$150 + \$89)	= \$192,000
	Total	=	\$216,900

For non-residents, the approach is similar to that taken in Table 5:

Eastside Susitna			
	$\frac{679 \text{ days}}{2 \text{ days/trip}}$	X (\$263 + \$89)	= \$120,000

$$\frac{\text{Westside Susitna}}{\frac{7022 \text{ days}}{2 \text{ days/trip}}} \times (\$263 + \$89) = \$1,236,000$$

Total = \$1,356,000

In summary, the total net "value" of fisheries requiring multiple modes of transportation is as follows:

"Big Six" fisheries	\$1,528,000
other waters	\$ 558,000
Balance of State	\$ 217,000
Non-residents	<u>\$1,356,000</u>
Total	\$3,659,000

Total Willingness to Pay

Our current estimate of the total 1980 net "value" of these fisheries is in the range of \$7,000,000.

Willingness to Sell

One of the purposes for calculating the economic value of fish and wildlife resources is to assist in determining whether a project requiring the limitation or loss of these resources can be justified economically. In these situations, "willingness to pay" to enjoy the use of these resources is not the appropriate measurement. In cases where loss of a resource or an activity is the management option under consideration, the correct measure of value is the willingness of the users to sell or relinquish their right to use the resources in question.

The ADF&G Sport Fish Division has included hypothetical questions regarding the willingness of anglers to give up their right to fish pink salmon as part of a larger study of the values of sport fishing on Willow Creek (see Workman, William G. 1983. Valuing Outdoor Recreation Opportunities. Agroborealis. Fairbanks, p.29ff), with the following results:

Fishery: Willow Creek Pink Salmon
 Sample: 504 anglers
 Question: "What is the smallest amount you would accept to give up your rights to fish pink salmon on the Willow Creek in 1980?"
 Net willingness to sell: \$2,685,740
 Days fished pink salmon 1980: 19,121
 Net willingness to sell/day: \$140.46
 Days fished all species in 1980: \$29,989
 Extention to all species fished: \$4,212,255

As has repeatedly occurred in other studies, it appears that values based upon estimates of "willingness to sell" are considerably higher than based upon "willingness to pay." Using the figures for a pink salmon fishing day for the entire region (\$140.46), and using the five year average days

fishing for the entire basin (see Table 1), 109,565 days fishing results in a total average value of \$15,400,000.

ENHANCEMENT POTENTIAL AND PROJECTED USE

The enhancement objective for the recreational fisheries of the Susitna basin is to produce an additional 106,000 salmon and steelhead by 1988. Using a 2.3% annual growth rate, an increase of 87,000 angler days over 1979 is expected, or 522,000 angler days by 1988. To maintain the current catch rate of .35 salmon/day the total catch must therefore increase to 124,000 fish (Alaska Department of Fish & Game, Division of Sport Fish. 1981. Plan for Supplemented Production of Salmon and Steelhead for Cook Inlet Recreation and Fisheries. Juneau, Alaska.).

Enhancement of Access and Public Facilities

Because the road system and population centers are on the eastside of the Susitna River, access to the major sport fishing streams located on the westside is difficult. Since most eastside streams are intersected by (other than parallel to) the highway, access is limited by private land holdings (pp. 20-31). Given this situation, provision of any new access and facilities is expected to result in significant increases in fishing effort.

NOTES

¹Mills, Michael. Statewide Harvest Survey, 1977-1981 Data. Volume 19-23, Federal Aid in Fish Restoration and Anadromous Fish Studies. Alaska Department of Fish and Game, Division of Sport Fish. Juneau, Alaska. 1979, 1980, 1981, 1982.

²Sport fishing activities within the Willow sub-basin area are excluded from this study. This area has already been treated under an area plan (see Alaska Department of Natural Resources, et al. Willow Sub-Basin Area Plan. Division of Research and Development, Anchorage. 1982.) For reference, sport fishing activity in this area for the 1980 indicator year is summarized in Table 6.

³Fisheries of this type for the Susitna basin are:

<u>Creek</u>	<u>Days Fished 1980</u>	<u>Miles of River Accessible to Angler</u>
Willow Creek	29,011	1.5
Little Willow Creek	8,190	1.5
Wasilla Creek	5,726	2.0
Cottonwood Creek	9,268	2.3
Montana Creek	19,287	.5
Caswell Creek	4,963	.5
Sunshine Creek	5,208	.5
Sheep Creek	<u>8,041</u>	<u>1.5</u>
Total	89,694	10.3

$$\text{angler days/mile/day: } \frac{89,694}{10.3 \times 60} = 145$$

(assume 60 day season, all species)

⁴Crutchfield, J. A. 1962. Valuation of Fishery Resources. Land Economics, 38(5): 148.

⁵A procedural guide and primary source for the travel cost method is provided by: Dwyer, J.F., J.R. Kelly, and M.D. Bowes. 1977. Improved Procedures for Valuation of the Contribution of Recreation to National Economic Development. Final Report to the Office of Water Research and Technology Grant No. 14-34-001-6237

⁶ cost/mile, standard auto determined as follows:

Item	¢/mile		
	1976 ^a U.S. National Average	Nov. 1982 ^b U.S. National Average <u>1976 X 1.8</u>	Nov. 1982 ^c Alaska Costs 1982 <u>USA X 1.24</u>
Variable Costs			
Maintenance			
Parts & Tires	4.2		
Gas & Oil	<u>3.3</u>		
Subtotal	7.5	13.5	16.7
Fixed Costs			
Depreciation	4.9		
Insurance	1.7		
Taxes	<u>1.6</u>		
Subtotal	8.2	<u>14.76</u>	<u>18.3</u>
Total	15.7	28.26	35.0

cost/mile, Recreation Vehicles assumed 20% above standard auto or
 $\$.35 \times 1.20 = \$.42$;

assume 70% family car use, 30% recreational vehicle use:

$$\frac{(70 \times 16.7) + (30 \times 42)}{100} =$$

$$11.70 + 12.60 = \frac{24.30}{2.5} = 9.7^d$$

Source

^aFederal Highway Administration. 1977. Transportation Trends and Choices. Tolls and parking fees excluded.

^bPers. Comm., Neal Freid, Alaska Department of Labor, 1/13/83, based upon United States Transportation CPI update factor:

$$\frac{\text{Nov. 1982, } 297.4}{1976, 165.5} = 1.8$$

^cIbid, 1/13/83, 11/82 Transportation Index for Alaska:1.24 or 24% higher in Alaska.

^dFor comparison see use of 7¢/mile in Nicholson, A.J. 1957. Summary of Sportsmen's Expenditures, Missouri River Basin. Spec. Sci. Report: Wildlife #35. United States Department of Interior Fish and Wildlife Service, Washington, D.C. Surveys from 1940's.

For comparison see also use of 30¢/mile for reimbursable cost of private auto use by State of Alaska.

7 Work Sheet - Fishing Recreation Values - Non-Road Accessed Areas

Fishing Location Kroto Creek (Deshka)
Point of Origin Anchorage

Two alternative methods of access:

1. Auto/Air Taxi

- a) Auto Round trip miles to air taxi = 25 miles
- b) Auto Miles in a) above x \$.097 = \$2.45
- c) Air taxi round trip miles to fishing location (river mouth)
= 180 miles
- d) Air taxi miles in c) above x \$.640 = \$115.20
- e) Total cost per person = b) \$2.45 + d) \$115.20 = \$117.65
- f) Assumed % of people using this access method 50%
- g) % in f) = .50 x e) \$117.65 = \$59.00 weighted cost

2. Auto/Boat

- a) Auto miles round trip to stream which accesses fishing location 185 miles Kashwitna
- b) Auto miles in a) above x \$.097 = \$17.95 Kashwitna
- c) Boat round trip miles to fishing location 60 miles Kashwitna
- d) Boat miles in c) above x \$.338 = \$20.28
- e) Total cost per person = b) \$17.95 + d) \$20.28 = \$38.23
- f) Assumed % of people using this access method 45% Kashwitna
- g) % in f) = .45 x e) \$38.23 = \$17.20

User day value

Weighted cost from 1. g) above = \$59.00

Weighted cost from 2. g) above = \$17.20

Total Cost = \$76.20

User day value = Total Cost \$76.20 ÷ average # of days/trip 1.5 = \$50.80

Total Value = User day value \$50.80 x Anchorage user days 14,034 =
\$712,927.00